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# INCORPORATING LEADERSHIP SKILLS INTO MEDICAL STUDENTS-STUDENTS' PERSPECTIVE

Rafiullah<sup>1</sup>, Laiba Ali<sup>1</sup>, Farooq Ahmed<sup>2</sup>

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The life & leadership at a medical college is different & unique the majority think that It is so adventurous like someone has put someone in a grinder machine and forgot to switch it off! It is not because of how to manage things in different matters but of maintaining our collective and individual focus. Like in 1st year we aim to be neurosurgeons, just a medical student in 2nd year, and then, getting trapped in the inescapable loop of qualms like, "why am I a medical student?" in 3rd year. To minimize these fluctuations & then to come up with a plan to lead students at a medical college is not a cup of tea. It needs a triangle consisting of clarity, inclusion & strong communication.

### THE TRIANGLE

The very first thing as an individual & as well as a team that we need to have is clarity. As a leader in a medical college bringing clarity in the thoughts of colleagues is often irritating as the majority are used to being concerned mostly with the syllabus only. We should zoom in on the here and now. What is happening right now? What are today's greatest challenges and choices? After sketching the challenges we face, we should examine a wide range of potential responses. What should we pay attention to? What can we do about the epidemic of fake news? In a world deluged by irrelevant information, clarity is power. We need to look at the major forces that shape our life at campus. Clarity comes when people are relatively free to think what they like and to express themselves as they wish. For this we need to prefer discussion over arguments. Because an argument throws heat; a discussion throws light! One comes from ego and a closed mind, whereas the other comes from an open mind. An argument is an exchange of ignorance, whereas a discussion is an exchange of knowledge. An argument is an expression of temper, whereas a discussion is an expression of logic! An argument tries to prove who is right, whereas a discussion tries to prove

what is right. Therefore if we want to lead our colleagues in a true spirit we need to develop a culture of discussion<sup>2</sup>.

In the medical college, we get colleagues from different social, ethnic & religious backgrounds. To live in harmony, we need to understand diversity. It is like the different colors in a rainbow. The beauty of this universe is based only on diversity. We live in a binary world, the world of contrasts up and down, ebb and flow, high and low, hot and cold. But then contrasts have their beauty. We wouldn't be able to appreciate the warmth if we didn't experience the cold. Is this not beautiful? We all can not be the same. We need to welcome, accept & appreciate all the differences that exist in our colleagues. This deliberate action is termed an inclusion. This is a must-element if we want to lead a diverse batch or class. Each & every class is diverse how small it might be. With inclusion we get belonging<sup>3</sup> where then our voice is heard at the table. When we make sure that every single voice is being heard then it creates a sense of importance among our colleagues. This is one of the most magical & powerful senses that everyone tries to achieve. Once this is achieved we can bring wonderful & mega changes to our campus life. It works like a magic.

Good communication is key to understanding each other and resolving any issues that may arise. In all religions, there has been the strict direction of collective worship in various forms. This is basically to avoid the lack of communication. Because the gap of communication is the root cause of the majority of our issues. The very first thing that is generated due to this gap of communication is a misunderstanding. Misunderstanding leads to grouping. When various groups are created based on prejudices & hatred his then leads towards the instability of our campus life. To avoid this we need to develop strong interactions with each other. This can only be done through a good source of communication. Luckily, we are living in the 21st century-

the century of IT. We have various sources, like Facebook, WhatsApp & Telegram, etc. Without strong communication leading a batch or class is merely an illusion.

## WRAP UP

The choice is ours. We can turn our campus life into either a spring of hope under the leadership having the above triangle or a winter of despair where it is often said that the only place where medical students smile every time is in the brochure that medical colleges give you before admission.

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# ANALYSIS OF CALRETICULIN (CALR) MUTATION IN MYELOFIBROSIS PATIENTS IN KHYBER PAKHTUNKHWA

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## ABSTRACT

**Objective:** To analyze the prevalence of CALR and JAK2 mutation co-occurrence in myelofibrosis (MF) patients in KP.

**Methods:** This cross-sectional study included Myelofibrosis (MF) patients (n = 50) enrolled in the Hematology/Oncology department of Hayatabad Medical Complex (HMC), Institute of Radiotherapy and Nuclear Medicine, Peshawar (IRNUM) and Blood Diseases Clinic, Peshawar. Non-probability convenience sampling technique was used. All patients with JAK2 V617F positive and negative primary or secondary MF were included. After taking blood samples, DNA was extracted manually and analyzed for JAK2 mutations using conventional PCR. Sanger sequencing technique was employed to analyze the samples for CALR mutations. Data were recorded & analyzed statistically.

**Results:** Among the 50 patients, 48(96%) had JAK2 mutations. The typical CALR mutations was not identified in the current study. However, two specific genetic variants were identified in 30 patients i.e., a single nucleotide polymorphism (c.1381 G > T) in the 3' UTR and a novel insertion-deletion variant (c. 1099 CTT > AC). Seven patients had the Indel frameshift variant (p.Leu 367 Thr Fx 63), whereas 23 had SNP. In JAK-2 positive patients (n=28), six had the Indel variant, and 22 had the SNP. Two patients were JAK2 negative, one with SNP and the other with a frameshift mutation.

**Conclusion:** Majority of the MF patients had a novel frameshift variant (p. Leu367Thr Fx63) (n = 07) and an SNP in the 3' UTR (G > T) (n = 23) in CALR gene.

**Keywords:** Myelofibrosis, Calreticulin, JAK2.

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## INTRODUCTION

Myelofibrosis (MF) is a clonal stem cell aberration that, like polycythemia vera (PV) and essential thrombocythemia, is categorized as a Philadelphia (Ph) chromosome-negative myeloproliferative neoplasm (MPN)<sup>1</sup>. The disease is characterized by hepatosplenomegaly, cytopenia, thrombosis and fibrous bone marrow<sup>2</sup>. An yearly incidence of 0.5-1.5 cases per 100,000 people has made it the least prevalent myeloproliferative disease<sup>3</sup>. MF often affects those over the age of 65, however, it can impact any age group. The median survival time is between 3.5 and 5.5 years. The most common cause of death includes

infections, haemorrhage, thromboembolism, and development of acute leukemia<sup>4</sup>.

Reasons behind the onset of myelofibrosis and other MPNs can be grouped into two: 1) phenotypic driver mutations and 2) sub-clonal or co-operating mutations. These mutations can increase and change the effects of phenotypic driving mutations in a variety of ways. Mutations in the thrombopoietin receptor gene, the Janus kinase 2 (JAK2) gene, and the calreticulin gene (CALR) are the three most often occurring phenotypic mutations in humans<sup>5</sup>. A small percentage of MPN patients have no mutation in any of these three genes, and is referred to as "triple-negative"<sup>6</sup>. Several studies have demonstrated that the absence of mutations in these genes is associated with poor prognosis when compared to subgroups with a mutation<sup>7</sup>. The JAK2 V617F mutation is found in exon 14 of the JAK2 gene, which is situated on chromosome 9p24, and affects majority of MF patients (50-60 %) <sup>8</sup>. There have been somatic mutations detected in the CALR gene, which is located on chromosome 19p13.2 found in

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35% of JAK2 mutation PMF patients<sup>9</sup>. However, multiple recent investigations have documented coexistence of CALR and JAK2 mutations in MPNs, which is contrary to conventional wisdom<sup>10</sup>. CALR is a chaperon protein found in the endoplasmic reticulum (ER), where it is critical for calcium homeostasis as well as the proper folding of newly generated glycoproteins<sup>11</sup>. It also plays an important part in the processes of cell proliferation, apoptosis, and immune-mediated cell death<sup>12</sup>. Three structural and functional domains of CALR protein are identified i.e., N, C, and P domains. The domain "C" is an acidic domain with a negative charge with many calcium-binding sites<sup>13</sup>. Because CALR mutations are the second most common cause of myelofibrosis, screening should be included in the diagnostic process for patients with myelofibrosis that is not caused by a genetic alteration in JAK2<sup>14</sup>. Based on the findings of multivariate regression analysis, overall survival was better in patients with CALR mutations than JAK2 or MPL mutations. Unselected myelofibrosis patients with CALR mutations account for 15.6-35% of all cases, compared to 56-88% of individuals with JAK2 or MPL negative myelofibrosis<sup>15</sup>. Co-occurrence of CALR and JAK2 mutations have a significant bearing on the clinical outcomes of myelofibrosis patients, accordingly, modifying treatment strategy<sup>16</sup>. The current study was designed to determine the frequency of JAK2 and CALR mutations in myelofibrosis patients in Khyber Pakhtunkhwa, Pakistan.

## MATERIALS AND METHODS

A cross-sectional (descriptive) design was set for the study. The study was approved by the Ethical Committee, Khyber Medical University (KMU), Peshawar (Approval Number: DIR/KMU-EB/CM/000493). The research was carried out in the Department of Pathology, Institute of Basic Medical Sciences (IBMS), Khyber Medical University (KMU) Peshawar from June 2018 to May 2020. A total of 50 patients were enrolled at Hematology/Oncology department of Hayatabad Medical Complex (HMC), Institute of Radiotherapy and Nuclear Medicine, Peshawar (IRNUM) and Blood Diseases Clinic, Peshawar. The sample size was calculated using OpenEpi®. The margin of error used was 14%, the anticipated population proportion was 35% and the confidence interval was kept at 95%<sup>17</sup>. A non-probability sampling strategy was used. Patients with primary or secondary myelofibrosis due to ET & PV who tested positive for JAK2 V617F were included in the study. However, patients suffering from secondary MF because of other conditions such as tuberculosis, mycoses, lymphoma (Hodgkin or Non-Hodgkin), and other types of MPNs (PV, CML and ET) were excluded from the study. All of the patients provided informed and written consent before participating in the study. Information was gathered by using a specially designed proforma that included patients' demographic information, clinical history, physical examination, and investigations profile. Following standard protocols for blood sample transportation, blood samples

were collected from the patients and carried to the IBMS-KMU, where they were processed at the hematology laboratory and stored until final analyses were performed. DNA was isolated from blood samples by a manual method of DNA extraction. For detection of JAK2 and CALR gene polymorphisms in diseased patients, allele-specific primers were designed. For JAK2 V617F mutation detection, conventional PCR was used. The PCR amplified product was confirmed on 1.5% agarose gel according to the established protocol. The gel was finally visualized on a UV transilluminator. For CALR sequencing, 50 patient's samples were amplified and sent to Macrogen, Inc.® in Seoul, South Korea. Sanger sequencing technology was used to detect CALR mutations in both JAK2 positive & negative patients. Statistical analyses were performed using IBM SPSS® (version 23) software. Simple arithmetic analyses (mean, standard deviation and/or percentages) were deduced for each parameter. Age and gender-wise stratification were done.

## RESULTS

The study participants were between the ages of 20 and 80 years of age. Males comprised 34 (68%) of the 50 MF patients, while females comprised 16 (32%). There was a mean age of  $50.60 \pm 13.01$  years in the study population. Male patients were  $53.32 \pm 12.66$  years old, while female patients were  $44.81 \pm 12.36$  years old. (Table 1). The mean haemoglobin, leukocytes and platelets count with minimum and maximum values are summarized in Table 2. Participants in the study were classified into three groups based on their hemoglobin level: (i) Severe anemia (Hb 6.5-7.9 g/dL), (ii) Moderate anemia (8 to 9.4gm/dL), and (iii) Mild anemia (9.5 to 11gm/dL). This classification was made using the World Health Organization (WHO) anemia grading system<sup>18</sup>. In the current study, 36 (72%) of the patients had anemia, whereas the remaining 14 (28%) had normal haemoglobin levels. Nineteen of the 36 individuals with anemia had severe anemia, 12 had moderate anemia, and 05 had mild anemia. Patients with thrombocytopenia were classified into four groups based on platelet count: Grade I Thrombocytopenia (platelets count 76-150 x 10<sup>9</sup> cells/L), Grade II Thrombocytopenia (platelets count 50-75 x 10<sup>9</sup> cells/L), Grade III Thrombocytopenia (platelets count 25-50 x 10<sup>9</sup> cells/L), and Grade IV Thrombocytopenia (platelets count < 25x10<sup>9</sup>cells/L)<sup>19</sup>. The grade I thrombocytopenia was seen in 09 patients, Grade III in 03 patients, whereas 02 patients had Grade IV thrombocytopenia. Grade II Thrombocytopenia was not observed in any patients, while 03(6%) patients had a higher platelet level (> 450 x 10<sup>9</sup> cells/L).

In our study, 42 (82%) patients were identified as having primary myelofibrosis (PMF), whereas 09 (18%) had secondary MF due to PV 06 (12%) and ET 03 (06%). JAK2 mutations were found in 48 (96%) of the 50 patients with myelofibrosis, while it was not found in 2 (4%) pa-

tients. PCR amplified products are shown in Fig 1. Typical CALR mutations reported previously could not be identified in the current study upon sequencing. However, another novel variant and a single nucleotide polymorphism (SNP) were identified in a significant number of patients ( $n = 30$ , 60%), as shown in Table 3. Rest of the 20 patients did not have variant in the target gene. Novel Indel variant was found in seven patients, whereas 23 patients had the SNP in 3' UTR. The variant (p. Leu367Thr Fx 63) is a frameshift mutation with a forward shift of stop codon, where a substitution of CTT>AC was identified at position 1099 of the cDNA (c.1099 CTT>AC). The SNP identified in the current study was due to thymine substitution for guanine (ancestral nucleotide) at position 1381 of the cDNA (c.1381 G>T) in the 3' UTR region (Fig 2 and Fig 3). The identified genetic variations were also stratified with JAK2 mutation. Six patients with novel Indel variant were JAK2 positive while a single case was JAK2 negative. While, among the 23 patients with SNP, 22 were positive for a JAK2 mutation, whereas only one patient lacked the JAK2 mutation which was not statistically significant ( $p$ -value = 0.25).

**Table 1: Age-wise Classification of Patients ( $n = 50$ )**

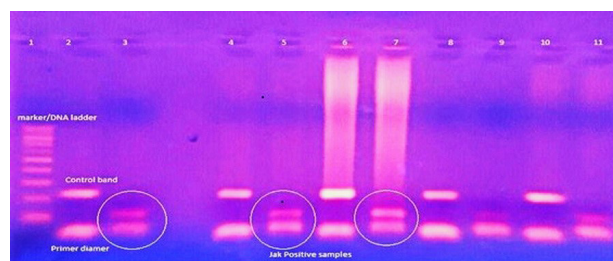
| Age Groups                | Frequency | Percentage |
|---------------------------|-----------|------------|
| Group I (20 to 40 yrs.)   | 13        | 26%        |
| Group II (41 to 60 yrs.)  | 26        | 52%        |
| Group III (61 to 80 yrs.) | 11        | 22%        |

**Table 2: Description of hematological parameters of patients ( $n = 50$ )**

| Parameters | Hemoglobin (g/dl) | Total leucocyte count (cells/L) | Platelet count (cells/L) |
|------------|-------------------|---------------------------------|--------------------------|
| Mean       | 9.426 $\pm$ 3.08  | 19.5 x 10 <sup>9</sup>          | 272.64 x 10 <sup>9</sup> |
| Minimum    | 5.5               | 1.19 x 10 <sup>9</sup>          | 10 x 10 <sup>9</sup>     |
| Maximum    | 18.8              | 77.60 x 10 <sup>9</sup>         | 656 x 10 <sup>9</sup>    |

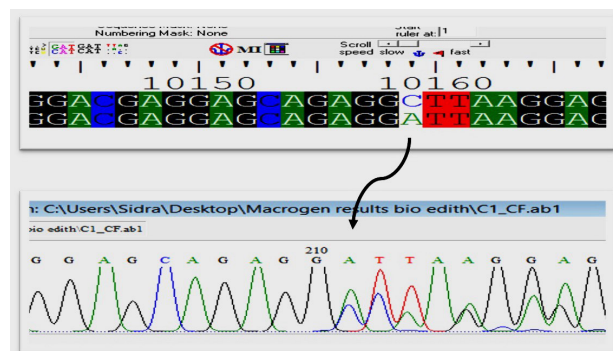
**Table 3: Genetic variations (SNP & Indel mutation) in the study population ( $n = 30$ )**

| Nucleotide Change | Outcome              | Location   | Nature of Variant         | Variation No |
|-------------------|----------------------|------------|---------------------------|--------------|
| c.1099 CTT > AC   | p. Leu 367 Thr Fx 63 |            | Indel Frameshift mutation |              |
| c.1381 G > T      | 3' UTR Variant       | 1254+54-73 | SNP                       | rs 1049481   |

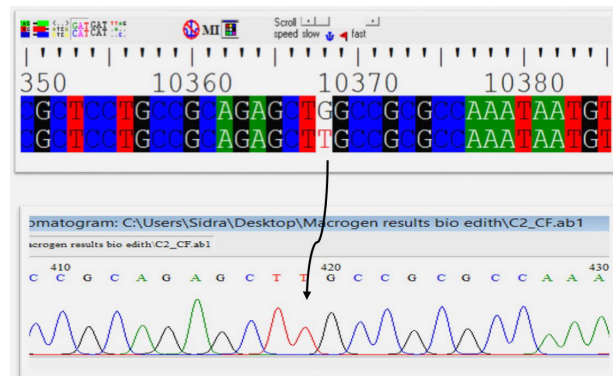


**Fig 1: Gel Electrophoresis of JAK2 positive sample: (Left to Right) Lane 1: DNA gene ruler ladder.**

**Lane 2: GG (Control), Lane 3: Protein dimers: Lane 4: GG (Control), Lane 5: TT. PCR product size of 460bp for Allele specific and Controls.**



**Fig 2: Chromatogram showing the CTT substitution by AC (CTT > AC)**



**Fig 3: Chromatogram showing the G/T change in the SNP.**

## DISCUSSION

CALR mutations were thought to be mutually exclusive with MPL and JAK2 since their discovery in late 2013. A few recent studies have verified coexistence of the JAK2 V617F mutation with CALR mutations<sup>14,20,21</sup>. Our study was designed to assess the prevalence of mutations in the CALR gene in myelofibrosis patients with or without JAK2 mutations. The study included 50 patients with primary and secondary myelofibrosis. In this study, the majority of the patients (68%) were male, and the majority of them were between the ages of 41 and 60 (Age Group II), with a median age of 50. These findings are endorsed by

a study of 1000 MF patients in the United States, which found a male predominance (male: female = 3:2) and a high connection with old age (median age of 60 years)<sup>22</sup>. The greater median age may reflect the US population's overall longer life expectancy as compared to the Pakistani population. Another population-based investigation of 21 cases of agnogenic myeloid metaplasia (AMM) in Olmsted County, Minnesota (USA), revealed comparable findings of greater median age and male predominance<sup>23</sup>. Around 5-17% of people are diagnosed earlier than the ages of 40 and 50<sup>24</sup>. In our study, 26% of patients were under the age of 40, which is greater than in earlier studies. Previous studies have shown a significant frequency of anemia among MF patients pertaining to the prescribed treatment i.e., JAK2 inhibitors<sup>25</sup>.

The JAK2 mutation was identified in 48(96%) patients, whereas only 02 (4%) patients did not carry this mutation. However, previously the frequency of JAK2 V617F mutation in myelofibrosis patients had been reported to be between 50-60%<sup>26</sup>. Patients are often misdiagnosed or diagnosed at a later stage of the disease due to the lack of facilities in the local healthcare system. Transformation of PV or ET has not been previously elucidated in the local population. The pathogenic role of CALR/JAK2 double mutations is still unknown, and it is unknown whether this will be another subgroup of MPNs in the future. In our study, JAK2/CALR double mutations were studied concerning primary and secondary myelofibrosis. The typical CALR mutations reported previously could not be identified in the current study. However, another novel variant and a single nucleotide polymorphism (SNP) were identified in a significant number of patients (n = 30, 60%). The novel Indel variant was found in 07 patients, 06 of whom were JAK2 positive, while a single case was JAK2 negative. A substitution of CTT>AC was identified at position 1099 of the cDNA (c.1099 CTT>AC). This variant (p. Leu367Thr Fx 63) is a frameshift mutation with a forward shift of stop codon. The integrity of the C-domain is imperative for the physiological functions of CALR protein. Damage to the C-domain is anticipated to culminate in loss of its function in CALR protein. Indel frameshift mutation of the kind identified in the current study is deemed to damage the protein structure at C-domain significantly. Future studies should be designed to determine this mutation and the resultant phenotypic effects on myelofibrosis patients.

The SNP identified in CALR gene in the current study was due to thymine substitution for guanine (ancestral nucleotide) at position 1381 of the cDNA (c.1381 G>T) in the 3' UTR region. The residue is located in the

P-domain of the CALR protein which is found in the dbSNP (NCBI) database with a respective single-nucleotide number 1049481 ([https://www.ncbi.nlm.nih.gov/projects/SNP/snp\\_ref.cgi?rs=1049481](https://www.ncbi.nlm.nih.gov/projects/SNP/snp_ref.cgi?rs=1049481)). These SNPs were identified in 23 patients; twenty two patients were JAK2 positive, while only one was JAK2 negative. The clinical and pathological significance of this SNP has not been reported yet. It is suggested that prognostic and therapeutic implications of this SNP should be studied in detail.

There are two limitations of our study. As the study consists of only 50 patients with myelofibrosis which was due to less prevalence of disease in our region, it is very early to make a conclusive decision on occurrence of JAK2/CALR double mutations. For this, a large patient's sample size is needed which may be studied in future studies. The other limitation of our study is that we did not measure the percentage of peripheral blood blasts i.e., studies showed that myelofibrosis patients with more than 4% peripheral blasts have poor prognosis.

## CONCLUSION

Our study concluded that majority of the MF patients have JAK2 mutation. Most of the patients have a novel frameshift variant (p. Leu367Thr Fx63) and an SNP in the 3' UTR of the CALR gene. Large-scale studies are required to elucidate the pathogenicity of newly identified frameshift variant and the prognostic and therapeutic implications of the observed SNP.

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#### AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

**Humayun S:** Conceived the idea, Literature review, Manuscript writing

**Khan MTM:** Sample collection and Laboratory Work, Final approval of draft

**Hassan J:** Sample collection, Bibliography

**Ali M:** Laboratory work and Data analysis

**Farooq G:** Results compilation and statistical analysis

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# MECHANICAL, CHEMICAL, AND BOND ANALYSIS OF NOVEL EXPERIMENTAL AND COMMERCIAL COMPOSITES

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## ABSTRACT

**Objective:** To compare and evaluate commercial grade composites with novel experimental dental composites.

**Materials and methods:** In this experimental study, two experimental and three commercial composites were tested and compared. The manufacturer data and available literature were used to determine the composition of commercial items. Using a four-figure balance and a concentration kit, we calculated mass and volume changes. Instron testing equipment was used to determine biaxial flexural strength (BFS) and modulus. The push-out test was used to examine composite bonding with dentine using various treatments.

**Results:** Mass change in the distilled water (DW) was  $1.3 \pm 0.1$  %, and in simulated body fluid (SBF) was  $1.1 \pm 0.1$  % for all materials. The volume changes in DW were  $2.2 \pm 0.2$  %, and in Simulated body fluid (SBF) was  $1.6 \pm 0.2$  % for all commercial and experimental materials. The BFS declined by 33 % for commercial, and 39 % for experimental materials in 6 months. In the case of modulus, the highest decline was associated with Vertise flow at 49 %, with the least decline of 23 % with commercial bulk filling materials. The push-out force for composites within ivory dentine suggests maximum bond strength with experimental composite C-4META.

**Conclusion:** The experimental composite had the potential to compete with commercial composites in mechanical, chemical, and microscopic properties, without compromising the properties.

**Keywords:** Commercial and control composites, Polymerization shrinkage, Volume changes.

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## INTRODUCTION

Dental caries is a bacterial disease which cause cavitation in tooth structure <sup>1</sup>. It affects people of all ages. The acid produced by bacterial fermentation of carbohydrates causes dental caries, which results in the destruction of dental hard tissues <sup>1</sup>. If left untreated, dental caries can result in natural and physical harm. Damaged dental hard tissues are treated with various restorative materials to restore lost tooth structure and function <sup>2</sup>.

Composites consist of resin monomers and inorganic fillers. The inorganic additives can be in the form of remineralizing or antibacterial fillers. Monomers with a large molecular mass for example bisphenol A-glycidyl methacrylate (Bis-GMA) and urethane dimethacrylate (UDMA) are used to make the composite ground substance <sup>3</sup>. Fillers on the other hand are added to increase strength, reduce polymerization shrinkage and heat gen-

eration<sup>4</sup>. A silane coupling agent is used for bonding these two components and to aid filler distribution. Additionally, an initiator and activator are added to control the polymerization process.

Most composites currently in the industry are bulk composites with high filler load. The composites used in this study were Gradia, and Z250. The above specific composites were chosen because of their widespread clinical use. The composites contain (Bis-GMA in Z250, and UDMA in Gradia) different bulk monomers. All these composites were supplied in cartridges that have been pre-mixed. They have an overall filler content of 80 wt % percent, making them highly viscous <sup>5, 6</sup>. The material properties of these bulk filled composites have been extensively investigated. In terms of effectiveness, Z250 was the strongest commercialized product, with a strength of up to 180 MPa <sup>7, 8</sup>. Gradia, on the other hand, is regarded as a weak composite with 80 MPa strength in twenty-four hours DW <sup>9</sup>. Vertise flow was the self-adhesive flowable composite investigated in this study. It is the most recent addition of composites. The composition of these composites is comparable to that of bulk-filled composites, but with less filler content <sup>10</sup>.

The other two bulk-filled composites were experimentally made. One contains the aqueous monomer with HEMA (5 wt %), while other contains the adhesive

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and de-mineralizing monomer 4-META (5 wt %). The filler component is made entirely of large particles. The goal of these experimental composites is to compare it with commercial composites, and offer standard properties for the creation of novel composites in the future.

## MATERIALS AND METHODS

This was an experimental study which was conducted in University College London from 2011-2015. Three commercial composites obtained from the market and two experimental composites were assessed Table 1 table 1 shows the details of the composites.

The manufacturer data and available literature were used to determine the composition of commercial items. Samples for changes in mass and volume were measured in distilled water, and simulated body fluid for up to twelve weeks using a density test and a four-figure scale ( $n=6$ ). Instron testing equipment was used to determine biaxial flexural strength (BFS) and modulus. BFS was carried out on specimen with a thickness of 1 mm and a circumference of 10 mm after 24 hours, one month, three months, and six months of storage in distilled water at 37 degrees centigrade ( $n=6$ ). Dentine blocks were used for the push-out test. Every test was carried out six times in total.

## RESULTS

### CHEMICAL PROPERTIES

#### Mass Changes

Figures 1 and 2 shows mass changes in simulated body fluid (SBF) and distilled water (DW) over twelve weeks of commercial as well as experimental composites. In DW, the largest mass change was 1.3 percent, whereas in SBF it was 1.1 percent. All composites mass kept increasing for 6 weeks. It was thought that equilibrium would be established in 6-12 weeks. The bulk changes in Vertise flow composite and C-HEMA were marginally greater as opposed to Gradia, Z250 and C-4META.

#### Volume Changes

Figures 3 and 4 shows volume changes in DW and SBF for twelve weeks of all composites. The volume change in distilled water was 2.2 percent, while the volume change in SBF was 1.6 percent. In the initial 24 hours, there is a 0.5-1.0 percent increase in volume of all composites. C-HEMA and Vertise flow had greater final volume changes than the other bulk-filled composites. The ultimate equilibrium was thought to be achieved around six and twelve weeks. The volume changes in SBF was lower than that of DW as general.

### MECHANICAL PROPERTIES

#### Biaxial Flexural Strength

Over the course of six months, the biaxial flexural strength of all composites was investigated in DW. Figure 5 shows the flexural strengths.

After twenty-four hours of storage in DW, the initial strengths were evaluated. C-4META, C-HEMA and Z250 all have similar initial strengths of approx. 158, 167, and 168 MPa, respectively. Gradia, and Vertise flow comprised much weaker in comparison to bulk composites. With initial strengths of 125 and 77 MPa, respectively. Z250, C-HEMA, and C-4META all showed a similar trend of strength loss over time. The strength decline at one month was more pronounced than at three and six months. Gradia and Vertise both showed an equivalent decline in strength at each time point.

#### Young's Modulus

The modulus of all composites was tested in DW at 37°C for six months. The moduli are given in figure 6. After twenty-four hours of storage in DW, the initial moduli were evaluated. Gradia had the lowest modulus (2.4 GPa), followed by Vertise flow (2.9 GPa), Z250 (3.7 GPa), C-HEMA (4 GPa), and C-4META (5.5 GPa).

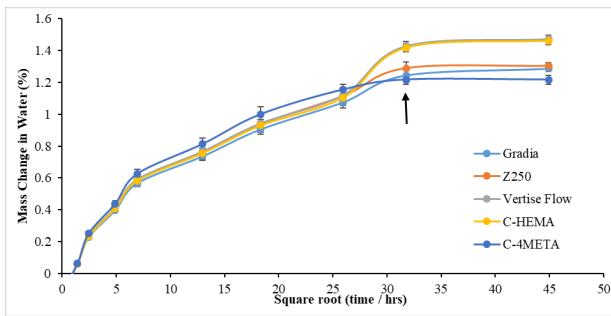
#### Push out Adhesion

The ISO-required push-out test was carried out. The usage of the adhesive Ibond has shown to be the most important element in boosting bond strength in this research. Samples comprising of prior Ibond for commercial composites had adhesion strength of 33-43 MPa, in contrast to experimental composites with bond strengths of 42-50 MPa.

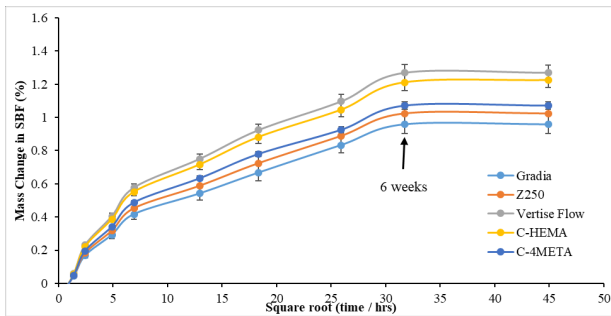
Higher overall adhesion strength was observed for both C-4META and flowable Vertise flow composites after acid etching and without the use of Ibond. The bond strength ranged from 26 to 35 MPa for bulk composites (Gradia, Z250, C-4META and C-HEMA) after acid treatment.

**Table 1: Details of Commercial and Experimental Composite used.**

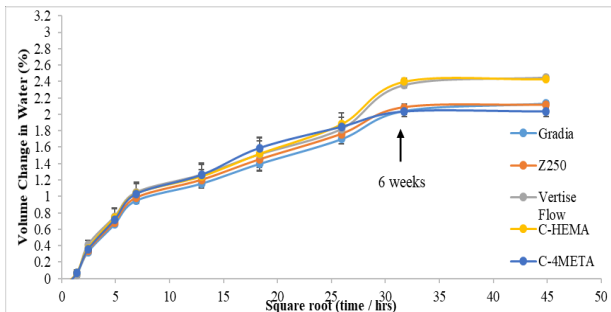
| Z250Filtek™                               | ESPE 3M, United states | Bulk Composite          |
|-------------------------------------------|------------------------|-------------------------|
| Global Company<br>Gradia Direct posterior | Global Company         | Bulk Composite          |
| Flow Vertise™                             | Corporation Kerr       | Composite Self-Adhering |
| C-HEMA                                    | Experimental Composite | Composite Bulk          |
| C-4META                                   | Experimental Composite | Composite Bulk          |



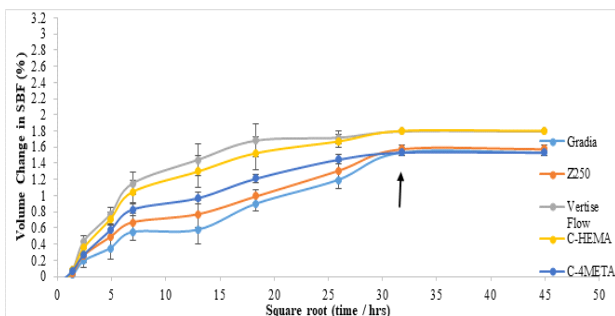
**Fig 1: Mass change after storage in DW for twelve weeks, bulk change of both test and industrial composites (error bars are ninety five percent confidence intervals, n=6).**



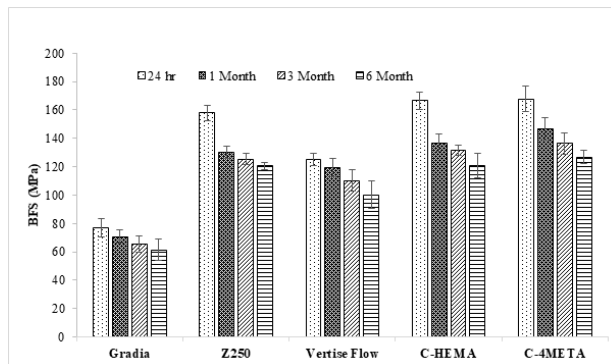
**Fig 2: Mass change after storage in SBF for twelve weeks, the bulk of both research and industrial composites changed (error bars represent ninety five percent confidence intervals, n=6).**



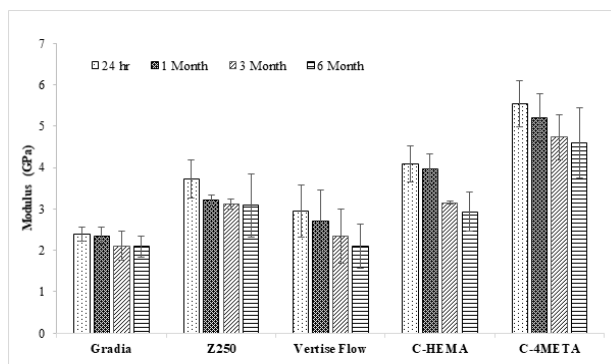
**Fig 3: Volume change of both industrial composites plus test after twelve weeks of depot in DW (error bars show ninety five percent confidence intervals, n=6).**



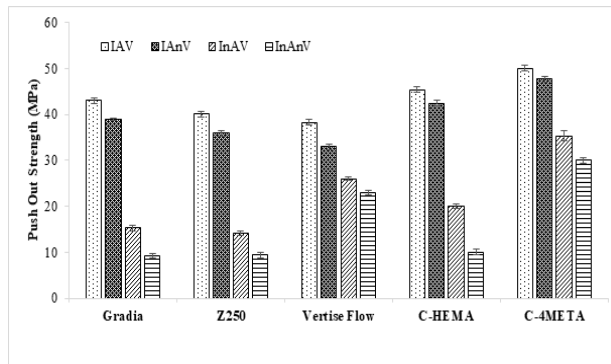
**Fig 4: Volume change of both industrial composites and trial following twelve weeks in simulated body fluid (error bars represent ninety five percent confidence intervals, n=6).**



**Fig 5: All composites biaxial flexural strength following twenty-four hours, one, three, and six months of storage in Distilled water. The error bars show the ninety five percent confidence interval (n=6).**



**Fig 6: After twenty-four hours, one, three-, and six-months storage in DW, the Young's Modulus of all composites was evaluated. The error bars show the ninety five percent confidence interval (n=6).**



**Fig 7: Use of various dentine treatment to assess the adhesion of each composite to dentine: (Only Ibond applied) IAnV, (Only thirty five percent phosphoric acid etching) InAV, (Acid cleaning accompanied by Ibond adhesive material IAV), (No dentine prior cleaning) InAnV. The error bars show the ninety five percent confidence interval (n=6).**

The experimental self-adhesive C-4META and Vertise flow composite adhesion strength was in between 23 to 30 MPa without any dentine prior treatment. The rest of bulk filled composites had adhesion strength of 9 to 10 MPa.

## DISCUSSION

Three commercial composites of which 2 were mass occupied and one was flow able composite and two experimental mass occupied composites were evaluated in this study. In addition the C4 Meta composite also possessed self-adhesive properties. The majority monomers shows least wetting as well as self-adhesive properties<sup>11</sup>. Water sorption by composites causes a variety of mechanical, biological, and chemical changes in the material. Water sorption elicits unreacted radicals which are produced from compounds, which should be of concern. These unreacted monomers have the potential to leak into the dental environment and cause cytotoxicity<sup>12</sup>. Furthermore, residual monomers cause the polymer matrix to plasticize and facilitate water sorption. This leads to hydrolytic breakdown, resulting in lower mechanical properties<sup>13, 14</sup>.

The mechanical characteristics of dental composites should be strong to handle masticatory load<sup>15</sup>. During mastication upon composite various stresses are incorporated, which includes compressive, shear and tensile stresses. All three stresses are combined in the form of flexural stress<sup>16</sup>. As a result bending strength may be the most accurate approach for assessing the technical execution of experimental composite when compared with the commercially available composites. The biaxial flexural strength values suggests that filler loading as an important factor in the stability of the material to behave in long term. The addition of self-adhesive components to the experimental composite showed added benefit in the bonding, without compromising the strength of the material when compared with the commercially available ones<sup>17</sup>.

The adherence of material to dentine was checked using a push out test. At first dentine blocks were made and was checked against all composites with varying dentine prior treatments. For class I cavities, the push out test was a good model<sup>18</sup>. The values obtained with Ibond use on dentine were in agreement with literature using un-etched human dentine<sup>19</sup>. With water present, the anhydride group in the 4-META within Ibond is hydrolysed to provide two carboxylic acid groups. It is suggested that these may partially de-mineralise the dentine to allow some micro-mechanical interlocking, but in addition enable a chemical bond with calcium in remaining hydroxyapatite. Hence improving the bond strength of the material.

Our study concludes that the experimental composite had the potential to compete with commercial composites in mechanical, chemical, and microscopic properties, without compromising the properties.

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#### **AUTHOR'S CONTRIBUTION**

Following authors have made substantial contributions to the manuscript as under

**Liaqat S:** Conceiving and designing the study, analysis, interpretation of data

**Jabeen H:** Writing of manuscript, Bibliography

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# EXPRESSION OF SURVIVIN IN ORAL MALIGNANCY AND PREMALIGNANCY

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## ABSTRACT

**Objectives:** To evaluate the immunohistochemical expression of survivin in oral squamous cell carcinoma (OSCC), oral potentially malignant disorders (OPMDs) and normal oral mucosa.

**Materials and methods:** This descriptive cross sectional study comprised of 25 already diagnosed cases of OPMDs, 25 cases of OSCC and 25 normal oral mucosa as a control. Immunohistochemical expression of survivin was analyzed.

**Results:** Immunoreactivity for survivin was found positive in 60% cases of OPMDs and 100% in OSCC but was negative in normal oral mucosa only one case showed mild staining intensity.

**Conclusion:** A statistically significant expression of survivin was observed in OPMDs which may indicate the probability of their transformation to OSCC.

**Keywords:** Survivin, Oral Squamous Cell Carcinoma, Immunohistochemistry, Oral Potentially Malignant Disorders

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## INTRODUCTION

Oral cancer is among the 18th most common malignancies in the world, about 90% of the oral cancers are squamous cell carcinomas<sup>1</sup>. Worldwide, there is a large variation in geographical distribution and incidence of oral cancer. The geographic incidence of Oral squamous cell carcinoma (OSCC) is reported 30% in Eastern and 3-6% in Western countries<sup>2</sup>. South East Asia regions including Pakistan, Bangladesh, India, Sri Lanka, and Taiwan are reported with high incidence rates<sup>3,4</sup>. According to the SK-MCH&RC, Pakistan's collective cancer registry data (from December 1994 to December 2019), it is the third most prevalent malignancy in Pakistan<sup>5</sup>. Tongue is commonly affected (40-50%) site in oral cancer<sup>6</sup>. Tobacco (smoked and smokeless), alcohol and HPV are the most common risk factors for OSCC. Other causes like poor oral hygiene, low socioeconomic status, ill-fitting dentures, nutritional deficiencies, chronic irritation from fractured or rough teeth, and immunological alterations may also play a role<sup>7,8</sup>.

Oral potentially malignant disorders (OPMDs) are clinical manifestations in the oral cavity, whether in a clinically identifiable precursor lesion or clinically healthy mucosa that carry a risk of transformation to carcinoma<sup>9</sup>. World wide the prevalence of OPMDs varies between 1 and 5%<sup>10</sup>. The OPMDs comprises; oral submucous fibrosis, oral lichen planus, leukoplakia and erythroplakia<sup>9</sup>. Buccal mucosa, lateral edge of tongue and floor of mouth are common sites for these lesions<sup>11</sup>. It is important to identify the OPMDs which are at a greater risk of conversion into oral malignancy<sup>12</sup>. Therefore new molecular markers are required to identify high risk OPMDs<sup>13</sup>.

Survivin is the recently identified inhibitor of apoptosis protein (IAP)<sup>14</sup>. It has two functions that promotes cell cycle progression and also inhibits apoptosis. In G2M phase of cell cycle survivin is expressed, to support rapidly dividing cells and helps in chromosomes separation during cell division<sup>15</sup>. Survivin inhibits apoptosis by interfering with the action of caspases both directly and indirectly.<sup>15</sup>. The up-regulated expression of apoptosis inhibitors family prevents cancer cells from undergoing apoptosis<sup>16</sup>.

Early diagnosis of OPMDs and identification of their possible risk of conversion into malignancy is important to improve the survival rate. Regardless of the availability of several molecular markers for the diagnosis of OPMDs, an accurate predictive evaluation of OPMDs will depend on the development of newer markers with predictive potential. Survivin detection might be helpful as a candidate biomarker to identify the group with high-risk for malignant

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transformation in our region. Hence the present study is designed to evaluate the immunohistochemical expression of survivin in OPMDs, OSCC, and in normal oral mucosa.

## MATERIALS AND METHODS

This descriptive cross-sectional study comprised of 25 cases of OPMDs and 25 cases of OSCC that has been identified histologically. Non probability convenient sampling technique was adopted. Formalin-fixed paraffin embedded (FFPE) blocks were recruited from the archives of histopathology department of Pakistan Institute of Medical Sciences (PIMS). Recurrent cases and those who were receiving chemotherapy or radiotherapy were excluded from the study. After taking consent, 25 cases of non-inflamed normal oral mucosa were obtained from the patient's alveolar mucosa attached to extracted tooth and other dental procedures in Peshawar Dental College and were used as controls.

Before starting the study, ethical approval was taken under the approval No. Prime /IRB/2019-174 of Prime foundation from the institutional review board. After histopathological evaluation of various types of OPMDs and OSCC, Survivin immunohistochemistry was performed on sections with the maximum epithelial content. Slides kept for immunohistochemistry (IHC) were divided into 5 batches. One slide of colon carcinoma was added as positive control to each batch followed by immunohistochemical procedure.

During procedure antigen retrieval was carried out using microwave oven. Primary antibody (monoclonal mouse antihuman survivin) and secondary antibody (Dako EnVision™ detection system) were used for immunohistochemical staining of selected sections. The existence of brown colour immunostaining of the nucleus confirmed survivin immunopositivity. The survivin immunopositivity percentages was categorized according to the criteria adopted by Celina F.Lima et al and Rajanna et al<sup>17,18</sup>. The percentage of positive cells was examined in at least five

areas at 400X magnification and were scored as (0) <5%, (1) 5-25%, (2) 26-50%, (3) 51-75%, (4) >75%. Cases with zero score were considered negative, and with score 1-4 as positive. The intensity of survivin immunostaining was scored as Negative stain (0), Mild staining (1), Moderate (2), Strong (3). Survivin Immunoreactivity was evaluated by the immunoreactivity score (IRS; staining intensity x percentage of immunopositive cells). Statistical package for social sciences (SPSS) version 20 was used to perform statistical analysis. P-value ≤ 0.05 was considered statistically significant.

## RESULTS

The majority of patients with OSCC and OPMDs were over 60 years old, with mean ages of 56.76 and 60.9 years, respectively. In OSCC the ratio of male to female was 2:3 and in OPMDs it was 1:1.1. All the layers of epithelium was found positive for survivin expression in OSCC while in OPMDs staining was limited to the basal layer of (84%) cases and only (16 %) cases showed staining in both basal and in suprabasal layers. Table 1 shows the comparison of survivin immunoreactivity status among OSCC and OPMD. The statistical comparison made among the study participants (OSCC and OPMDs) for survivin immunoreactivity showed significant results p value (< 0.05).

Table 2 Shows the IHC staining percentage of survivin-positive cells in the cases of OSCC. The histological grades of OSCC were compared, and significant findings were revealed p value < 0.05.

Table 3 shows the staining percentage of survivin-positive cells in OPMDs. Comparison was made among the types of OPMDs which was statistically significant p value < 0.05. Out of 25 cases of normal oral mucosa only 1 case showed mild Immunopositivity and 24 cases were negative for survivin expression.

**Table 1: Comparison of survivin immunoreactivity status among OSCC and OPMDs**

| Survivin immunoreactivity | Positive | Negative | Total   | P-Value |
|---------------------------|----------|----------|---------|---------|
| OPMDs n(%)                | 15(60%)  | 10(40%)  | 25(50%) | < 0.05  |
| OSCC n(%)                 | 25(100%) | 0        | 25(50%) |         |
| Total                     | 40(80%)  | 10(20%)  | 50      |         |

**Table 2: Expression of survivin between different grades of OSCC**

|               | OSCC      |          |          | Total n (%) | P value |
|---------------|-----------|----------|----------|-------------|---------|
|               | WDSCC     | MDSCC    | PDSCC    |             |         |
| 0 = <5%       | -         | -        | -        |             | < 0.05  |
| 1 = 5%-25%    | 1(11.11%) | 3(37.5%) | 2(25%)   | 6 (24%)     |         |
| 2 = 26% - 50% | 3(33.3%)  | 4(50%)   | 3(37.5%) | 10 (40%)    |         |
| 3 = 51%-75%   | 4(44.4%)  | 1(12.5%) | 3(37.5%) | 8 (32%)     |         |
| 4 = > 75%     | 1(11.11%) | -        | -        | 1 (4%)      |         |
| Total         | 9(36%)    | 8 (32%)  | 8 (32%)  | 25          |         |

**Table 3: Expression of survivin among the cases of OPMDs**

| Staining Percentage of Positive cell | OPMDs            |                    |                    | Total n (%) | P value          |
|--------------------------------------|------------------|--------------------|--------------------|-------------|------------------|
|                                      | Oral Leukoplakia | Oral Lichen planus | Oral Erythroplakia |             |                  |
| 0 = <5%                              | 3(17.6%)         | 4(100%)            | 1(25%)             | 8 (32%)     | <b>&lt; 0.05</b> |
| 1 = 5%-25%                           | 3(17.6%)         | -                  | 1(25%)             | 4 (16%)     |                  |
| 2 = 26% - 50%                        | 2(11.7%)         | -                  | 1(25%)             | 3 (12%)     |                  |
| 3 = 51%-75%                          | 8(47%)           | -                  | 1(25%)             | 9 (36%)     |                  |
| 4 = > 75%                            | 1(5.8%)          | -                  | -                  | 1 (4%)      |                  |
| Total                                | 17 (68%)         | 4 (16%)            | 4 (16%)            | 25          |                  |

## DISCUSSION

In present study the common age group for OSCC and OPMDs was above 60 years with a mean age of 56.76 years and 60.9 years, which is consistent with the studies done in Pakistan and Saudia Arabia<sup>19,20</sup>. OSCC and OPMDs are more likely to develop in males than in females but in this study the male to female ratio in OSCC was 2:3, However, a study published from, Singapore, Sweden and Lebanon found that OSCC is more common in females than males in Austria, Ireland, Denmark, Bulgaria and England (the ratio was not mentioned)<sup>21</sup>, and in OPMDs it was 1:1.1, it is consistent with the studies done in Iran which shows a slight female predominance<sup>22</sup>. The discrepancy in male to female ratio is might be due to the small size of sample.

In this study, difference between the immunoreactivity score of OPMDs and OSCC was significant statistically ( $p < 0.05$ ) and the results are similar to study reported from India which showed the same statistically significant results<sup>23</sup>. The findings of this study suggests that the expression of survivin in OPMDs points to an early event in their malignant transformation. The survivin expression was found maximum in well differentiated Squamous cell carcinoma (WDSCC) followed by poorly differentiated Squamous cell carcinoma (PDSCC) and moderately differentiated Squamous cell carcinoma (MDSCC), this is inconsistent with the studies done in India which showed maximum expression in MDSCC and PDSCC as compared to WDSCC<sup>14,24</sup>. The difference in expression was due to the large size of the sample of the study done in India.

In cases of OPMDs, oral leukoplakia showed high expression of survivin 68%, which is consistent with other studies reported from India showing identical results<sup>13,18</sup>. In contrast oral lichen planus showed less survivin positivity 16% which is comparable to the study done in India in which oral lichen planus showed lesser percentage positivity<sup>13</sup>.

Similarly, oral erythroplakia showed 16% positive cells. After extensive literature research, no study could be found of survivin expression in oral erythroplakia. In this study, the normal oral mucosa exhibited negative expression for survivin, only 1 case showed mild nuclear staining. This sparse expression can be due to the active

mitotic figures and may be due to processing errors<sup>18</sup>. The results are comparable to the other studies done in China and India which showed survivin expression in few cases of normal oral mucosa<sup>13,18,25</sup>. In contrast other studies done in China and India showed negative expression in normal oral mucosa<sup>26,27</sup>.

Limitation of study is that a study with larger sample size is recommended. The study should include follow-up to determine the role of survivin in OPMDs progressing to OSCC.

Our study concluded that a statistically significant surviving expression was observed in OPMDs and OSCC which may indicate the probability of their transformation to OSCC.

Survivin expression was higher in OSCC, followed by OPMDs.

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#### AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

- Maryam H:** Conceiving and designing the study, analysis, interpretation of data
- Nasir S:** Designing of study, Analysis, interpretation of data
- Khan MM:** Designing study design, Approval of Final draft
- Saleem A:** Data analysis, Critical review of draft
- Basher N:** Data analysis
- Iqbal F:** Data collection
- Naushen T:** Bibliography

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# MOTIVATION AND ATTITUDE OF NEWLY INDUCTED DENTAL STUDENTS TOWARDS DENTISTRY AS A PROFESSION

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## ABSTRACT

**Objective:** To determine the motives and attitude of newly admitted first year dental students towards dentistry as a profession at Khyber College of Dentistry, Peshawar

**Material and methods:** A cross-sectional study with questionnaire consisting of 12 questions regarding decision making for choosing dentistry as a profession, motives and attitude were given to newly admitted 50 students of first year at Khyber College of Dentistry, Peshawar. The study was done at the start of session 2020-2021. The data collected was statistically analyzed using Microsoft excel 2016 and IBM SPSS Statistics Version 22.0

**Results:** Most of the students were internally motivated for selecting dentistry as a profession, 60% of the students didn't have any relatives in dentistry, 30% thought that it is an honorable profession, 30% thought that it is a financially good profession and 35% selected dentistry because of independent practice

**Conclusion:** Independent practice, good financial profession, honor in the society were the main factors in the selection of dentistry as a profession. It is important to know the reasons behind selecting a profession as it helps train the students accordingly

**Key words:** dentistry, motives, students, career, profession, practice

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## INTRODUCTION

Every individual has an inborn wish to grow and evolve with social, academic and ethical values.<sup>1</sup> The selection of a particular profession or career is largely advised by parents, relatives, colleagues, teachers or counsellors. The major driving forces of choosing a career varies over time and between nations. Obtaining the reasons behind entering dental field as a profession is very important for policy making, and in turn is very important for the health care system.<sup>2</sup>

There is a massive opportunity for professional and commercial growth in dentistry, with career opportunities such as a general practicing dentist or a specialist.<sup>3</sup> One of the few common reasons of why people opt dentistry as a career is economic stability, job security, or an easy going routine, where it is easy to spend time with family.<sup>4</sup>

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Dentists enjoy a very significant role in community as a professional health care provider.<sup>5</sup> The chance to involve in dental education, especially in the developing countries and the third world countries, is narrowed to only a minor chunk of the society.<sup>6</sup>

In some studies, the motivation levels based on gender have also been investigated. The studies in United States concluded that there some variations among the male and female students' motivations.<sup>7</sup> Female students were less bothered than their male counterparts in regards to the business element of selecting a profession and were more focused on providing their services to the people.

The results were similar to the studies done in Peru on first year dental students.<sup>8</sup> It is necessary to recognise and record the students' motivation and driving force behind selecting dentistry as a profession so that the future healthcare workers' motivation could be preserved.<sup>9</sup>

## MATERIAL AND METHODS

After approval from the ethical committee of Khyber College of Dentistry, Peshawar, this cross-sectional study was done among the newly inducted students of academic year 2020-2021 at Khyber College of Dentistry, Peshawar.

shawar. In each academic year, 75 students are inducted.

The students were informed about the purpose of study and a questionnaire containing 12 questions was given to the students to fill. The questionnaire covered information related to the students' socio-demographic features, their inspiration and driving force behind selecting dentistry as a career, their views and mindset about dentistry as a profession.

Some questions were left open-ended while some of the questions were close-ended, to which the students had to reply in yes/no, or tick options answering the question. The information was processed and analyzed using Microsoft excel 2016, SPSS statistics version 22.

## RESULTS

A total of 50 students participated in the study. Thirty two (64%) were females and 18(36%) were males with an age range between 18- 21 years. There were 30 (60%) students of age 18 years, 10 students (20%) of age 19 years, 5 students (10%) of age 20 years and 5 students (10%) of 21 years of age. All the 50 students had graduated from a regular high school. To the question "How many times did you apply for dentistry? Forty eight (96%) students responded first attempt, 2 (4%) students had applied twice.

Thirty eight students (76%) responded that they had decided to choose dentistry while in high school, 10 students (20 %) had decided after their high school and 2 students (4%) had decided before high school. 35 students (70%) chose the profession on their own will, 10 students (20%) were influenced by their parents and 5 students (10%) were influenced by their family dentists. Thirty students (60%) were found to have no relatives in the medical and dental profession and 20 students (40%) confirmed having close relatives in dentistry.

When asked about their first vs second choice for dentistry, 40 students (80%) chose dentistry as their first choice and 10 students (20%) as their second. Twenty students (40%) believed dentistry to be a very honorable and prestigious profession, 15 students (30%) thought it generates a good income and 15 students (30%) believed it to be a tough & competitive degree.

Lastly, the students were inquired about the reason that could make them end their education to which they responded as follows: 10 students (20%) due to financial problems, 15 students (30%) due to loss of interest while for the rest no reason could make them end their education.

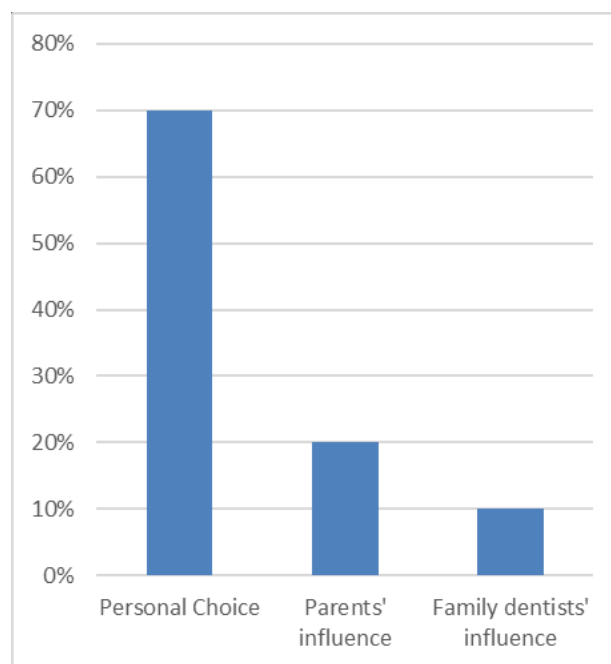


Fig 1: Influence behind choosing dentistry

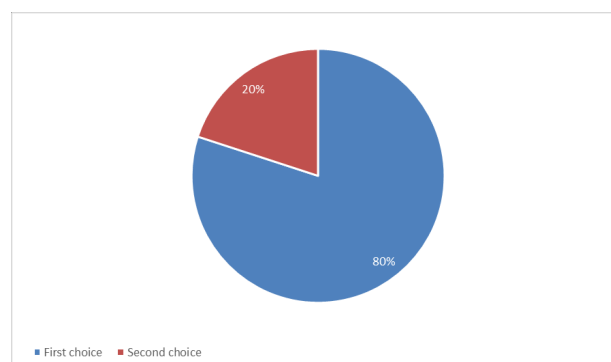


Fig 2: Dentistry as a choice

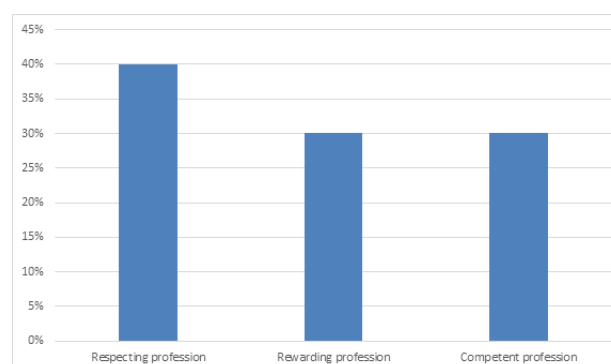
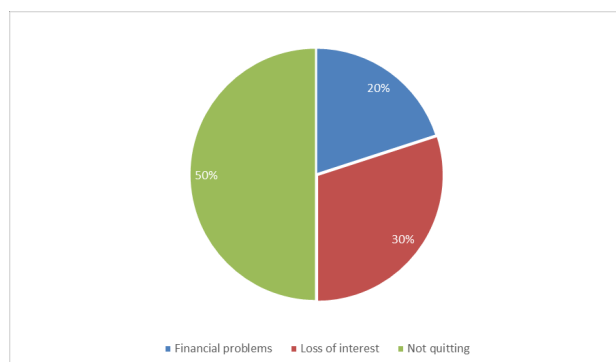


Fig 3: Consideration of Dentistry as a career



**Fig 4: Consideration of Dentistry as a career**

## DISCUSSION

In order to decide the profession to pursue, it is important to fully understand the pros and cons of that profession and this requires time. In our study, most students were found to have taken the decision at the higher secondary school level. Findings in this study indicate that most of the students were internally motivated for choosing dentistry. Yotov in 1986 in Bulgaria performed a study on 327 dental students and found that most of them (83.5%) had selected dentistry on their own will and the rest (16.5%) were either forced by family members and relatives or joined due to a low exam score. Job dissatisfaction among those who had not chosen the profession on their own will was high.<sup>10</sup> Similar results were obtained from a study by Marino *et al* in Australia in the academic session 2009-2010.<sup>11</sup> He found that 85.3% students were internally motivated.<sup>12</sup> The results of our study show that the impact of family members was less than the students' own will. About 2/3 of the students had no relatives in dentistry. Comparatively, the study by Tanalp *et al* showed that the influence of relatives was more than self-motivation.<sup>13</sup>

Hawley *et al* in 2008 performed a study on 152 students of the first year, in Nevada,<sup>14</sup> to determine their reasons for choosing dentistry as a profession and found that most of the students were influenced by dentists in their families, however, in our study, only 10% of the students chose dentistry as a profession because of dentists in their families.

There was one study in which economic motivation was found to be the primary factor for selecting dentistry. Aguiar *et al* (2009) in Pernambuco performed a survey on 1024 students and found that 73.5% students had opted for dentistry due to financial motivation.<sup>15</sup> While in our study, 30% of the students thought dentistry as a profession generates a good income.

## CONCLUSION

It can be concluded that although more than half of the students had relatives in the medical/dental field they still were enthusiastic enough and internally motivated towards dentistry to choose it as a profession. It was

revealed that they opted for dentistry because it was their first choice and weren't choosing it because of any lack of career options. The main factors that motivated the students for selecting dentistry as a profession were honor in the society as well as independent and good financial practice. This study further went on to express that majority of the students were not willing to quit dentistry as a profession and that nothing can persuade them to change their minds regarding quitting dentistry as a profession.

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**Yousufi S:** Data analysis

**Khan J:** Writing up

**Saood M:** Conceived the idea

**Shafi H:** Bibliography

**Shah AM:** Data collection

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# CONFIRMATORY FACTOR ANALYSIS OF URDU TRANSLATED CLINICIAN-ADMINISTERED PTSD (POST-TRAUMATIC STRESS DISORDER) SCALE

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## ABSTRACT

**Objectives:** Methods for Assessing and diagnosing psychological distress in culturally diverse individuals are not properly established. In Diagnostic Statistical Manual (DSM-5), PTSD is categorized as a trauma-related disorder. Clinician-Administered PTSD Scale (CAPS-5) is considered a gold standard to assess PTSD, which was adopted in DSM-5. This study is aimed to develop an Urdu translation of CAPS-5 and its psychometric properties.

**Methods:** The study was conducted to translate and validate CAPS-5 by using the steps forward translation (from English to the Urdu language), and back translation (Urdu to English). The psychometric properties of the scale were assessed using the bilingual sample of individuals from the general population, who had a history of trauma and injury. A total of 317 individuals participated in the study. For data collection, two steps approach was used. Initially, the participants responded to the Urdu Version of CAPS-5, and then participants answered the original English, (CAPS-5). Confirmatory factor analysis was used to validate the factor structure of the Urdu version of CAPS-5.

**Results:** The current study showed that first-order (RMSEA value < .05), and second-order (RMSEA value = 0.03, < 0.05) is a good fit model for PTSD symptom level. The factor loading was statistically positive and significant, which indicated that all items contributed to PTSD symptoms.

**Conclusion:** The result showed that the Urdu version of the Clinician-Administered PTSD scale has a good Confirmatory model, and statistically significant and positive value for the sample of trauma survivors.

**Keywords:** Factor Analysis, Clinician-Administered PTSD, PTSD

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## INTRODUCTION

The diversity of population throughout the world needed a cross-culturally validated scale or instrument. The researchers may have access to use a reliable and valid instrument in their own culture and language. PTSD is a psychological disorder caused by exposure to life-threatening, distressing, and traumatic events. The prevalence of lifetime PTSD may vary in general populations. The estimated range of PTSD prevalence is about 1.3% to 12.2% depending upon the sociodemographic characteristics.<sup>1</sup> According to DSM-5, PTSD symptoms include distress, avoidance, alteration of mood and cognition, and hypervig-

ilance.<sup>2</sup> The accurate diagnoses of PTSD symptoms may help in better understanding of etiology, which may help in intervention and rehabilitation process. PTSD for the first time was introduced in the third edition of DSM, while later on, the symptoms of PTSD were expanded. Recently, it has been included in the fifth edition of DSM (DSM-5) as a trauma-related disorder.<sup>3</sup> Previously, in DSM-IV, PTSD was listed as having 17 symptoms and divided into three clusters, such as re-experience, numbness, and avoidance. In addition, the PTSD symptoms were expanded in DSM-5 up to 20 symptoms across four factors structure. After fulfilling the criterion (A) about experiencing the traumatic events, these 20 symptoms have four structures, which include intrusive symptoms, avoidance symptoms, negative cognition, and hyperarousal and reactivity.<sup>4</sup>

Moreover, the trauma survivors who have at least one symptom re-experienced from criterion (B), one symptom from avoidance (criterion C), and two symptoms from negative cognition and hyper-arousal (Criterion D) and at least one-month duration, will meet the DSM-5 PTSD criteria.<sup>5</sup> Furthermore, the clinician-administered PTSD

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scale for DSM-5 is a gold standard structured interview that is used for assessing PTSD symptoms and which was adapted in DSM-5.<sup>6</sup> The CAPS-5, assess PTSD symptoms more effectively than self-report measure, as in self-report, the likeliness of bias has been found, which include under or over-reporting and lack of awareness about symptoms.<sup>7</sup> The scoring and assessing PTSD symptomology in CAPS-5, is different from the previous version of CAPS. In the current version of CAPS-5 for DSM-5, the two ratings such as frequency and intensity were combined as a single symptom (rating 0-4).<sup>8,9</sup>

## CONFIRMATORY FACTOR ANALYSIS

The latent factors related to CAPS-5 have remained an area of discussion for the last two decades. Researchers have planned and tested various models of CAPS-5.<sup>10-12</sup> Some recent studies have published CFA after the issue of DSM-5. Primarily, researchers have explored three models; two six models, the externalized and Anhedonia, and hybrid seven factors models.<sup>13-15</sup> The current version of CAPS-5 has been used for testing these models. Moreover, the Anhedonia model of six factors was used to assess the Criterion-D factor of DSM-5, separate negative effect (D,1-4) and decreasing positive affect (D,5-7) in two separate factors.

Moreover, this model was also used to evaluate the "Criterion-E" of PTSD, by using anxious and dysphoric arousal for (E3-4) and dysphoric (E1-2, and E5-6) symptoms respectively. This model has been supported by earthquakes survivors in china.<sup>13</sup> Similarly, six factors externalized behavioral models used the criterion E for externalizing behavior (E1-2), anxious arousal (E3-4), and dysphoric arousal (E5-6), and this model was supported by American veterans sample (15). This study aimed to assess the confirmatory factor analysis of the Urdu translated version of CAPS-5 for DSM-5.

## MATERIALS AND METHODS

### Participants and Procedure

In phase 1, we translated CAPS-5 into the URDU language through the following steps: forward translations, committee approach, backward translation, committee approach. In phase 2, cross-sectional data were obtained to validate the factor structure of the CAPS-5. A total of 317 patients who had a history of trauma and injury were recruited from the Pakistan Institute of Medical Sciences Islamabad Pakistan that is a public-sector hospital in Pakistan. Among these, 229 were male and 88 were female. In addition, some of them had physical injuries during violence including, 132 with head injuries, 137 with orthopedic trauma, and 48 were having multiple soft

tissue injuries. Furthermore, consent was obtained from all patients All the participants were older than 18 years of age. Clinician-Administered PTSD Scale for DSM-5 (CAPS-5) is a gold standard 30 items structured interview assessing PTSD according to DSM-5. It takes about 45-60 minutes to administer this scale. Initially, the clinician determined whether the respondent has experienced Criterion A related to traumatic events. If the respondents meet criterion A, then the clinician continued the structured interview to assess PTSD. Each item of the interview was rated with 5 points Likert scale ranging from 0 (absent) to 4 (severe). The minimum score of CAPS-5 is 0 and the maximum score 80. The scale was administered by a trained psychologist. The scale has good reliability ranging from 0.91-0.96.<sup>16</sup>

## RESULTS

Confirmatory factor analysis of PTSD Scale First and second-order confirmatory factor analyses were used to measure the factorial structure of overall CAPS-5 through AMOS-23. Table 1 shows the first-order model fit indices for confirmatory factor analysis of PTSD overall, and 2nd order model fit for symptoms level analyses of PTSD.

The factors structure of PTSD was estimated through confirmatory factor analysis for the overall PTSD scale figure 1, and for the symptoms that included; intrusive symptoms, avoidance symptoms; cognition and mood symptoms; and arousal and reactivity (figure 1).

Both models consist of 20 items. The findings of the first order and 2nd order CFA of PTSD showed good results where 20 items were independent in terms of their error covariances. Table 2 shows the factor loadings for first-order CFA, and Table 3, shows the 2nd order CFA factors loadings. Table 2 showed the standardized factor loading by first-order confirmatory factor analysis of Clinician-Administered PTSD Scale for DSM-5. The factor loading of all items was greater than 0.4 indicating that items contributed to PTSD. Table 3 showed the factor loading by second-order CFA of CAPS-5 for DSM-5 was higher than 0.4. It showed that all the items were responsible to assess the PTSD symptoms. Table 4 showed the first order goodness of fit model for CFA to trauma-related items of CAPS-5 for DSM-5. The findings of the first order of trauma-related PTSD showed good results where 11 items were independent in terms of their error. Covariance model fit indices were satisfactory too. Table 5 showed the first-order standardized factor loading of CFA for trauma-related items of CAPS-5. All the factor loading was statistically significant. All items were contributing to trauma-related PTSD symptoms.

**Table 1: Model Fit Indices for CFA of PTSD (N = 317)**

| Models                                | $\chi^2$ | df  | Fit Indices |     |     |     |        |       | $\chi^2 / df$ |
|---------------------------------------|----------|-----|-------------|-----|-----|-----|--------|-------|---------------|
|                                       |          |     | AGFI        | GFI | NFI | CFI | St.RMR | RMSEA |               |
| First Order (20 items, Default Model) |          |     |             |     |     |     |        |       |               |
|                                       | 682.6    | 170 | .87         | .90 | .86 | .89 | .039   | .03   | 3.9           |
| Second Order (20 items in 4 symptoms) |          |     |             |     |     |     |        |       |               |
|                                       | 944.82   | 334 | .92         | .91 | .90 | .91 | .037   | .03   | 2.9           |

\*\*\*p < .001

**Table 2: Standardized Factor loading by first order Confirmatory Factor Analysis of PTSD (N = 317)**

| Items | PTSD | Items | PTSD | Items | PTSD | Items | PTSD |
|-------|------|-------|------|-------|------|-------|------|
| 1     | .49  | 6     | .70  | 11    | .77  | 16    | .77  |
| 2     | .50  | 7     | .61  | 12    | .82  | 17    | .71  |
| 3     | .51  | 8     | .80  | 13    | .85  | 18    | .79  |
| 4     | .46  | 9     | .81  | 14    | .72  | 19    | .85  |
| 5     | .69  | 10    | .74  | 15    | .76  | 20    | .80  |

**Table 3: Standardized factor loading by second-order Confirmatory Factor Analysis of PTSD at symptoms level (N = 317)**

| Items | Intrusive | Items | Avoidance | Items | Cognition and Mood | Items | Arousal and Reactivity |
|-------|-----------|-------|-----------|-------|--------------------|-------|------------------------|
| 1     | .75       | 6     | .84       | 8     | .82                | 15    | .77                    |
| 2     | .73       | 7     | .74       | 9     | .82                | 16    | .78                    |
| 3     | .73       |       |           | 10    | .75                | 17    | .72                    |
| 4     | .73       |       |           | 11    | .77                | 18    | .80                    |
| 5     | .57       |       |           | 12    | .83                | 19    | .85                    |
|       |           |       |           | 13    | .86                | 20    | .80                    |
|       |           |       |           | 14    | .73                |       |                        |

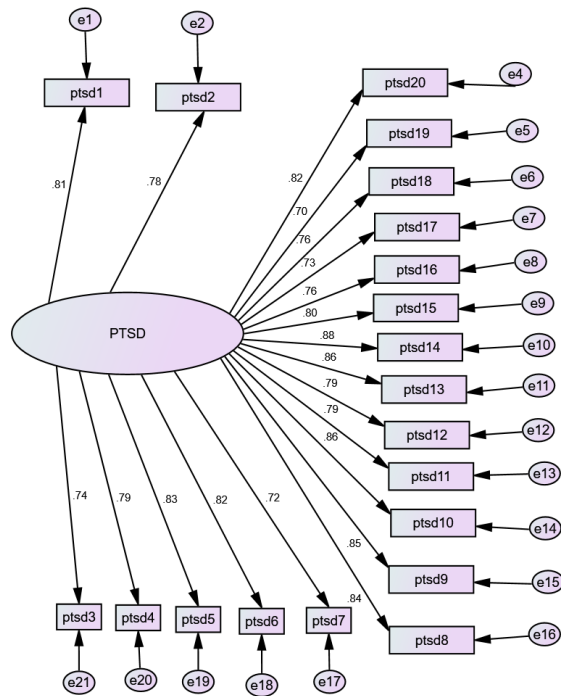
**Table 4: Goodness of Fit Model Indices for CFA of Trauma-Related PTSD (N = 317)**

| Models                                | $\chi^2$ | df  | Fit Indices |     |     |     |        |       | $\chi^2 / df$ |
|---------------------------------------|----------|-----|-------------|-----|-----|-----|--------|-------|---------------|
|                                       |          |     | AGFI        | GFI | NFI | CFI | St.RMR | RMSEA |               |
| First Order (11 items, Default Model) |          |     |             |     |     |     |        |       |               |
| 159.86                                | 44       | .87 | .91         | .94 | .95 | .04 | .04    | 3.63  |               |

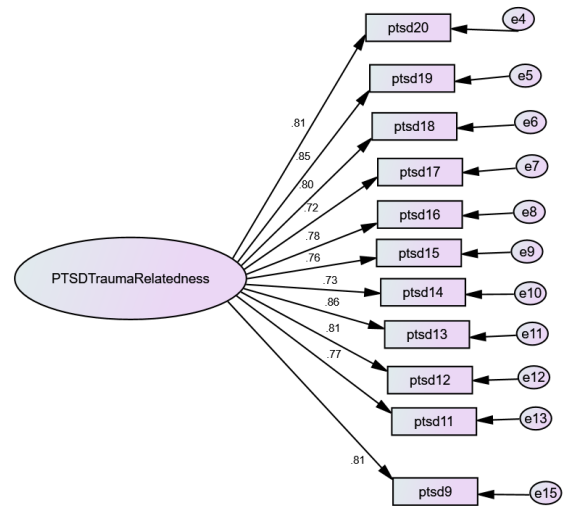
\*\*\*p < .001

**Table 5: Standardized factor loading by first-order Confirmatory Factor Analysis of trauma-related PTSD (N = 317)**

| Items | Trauma-Related PTSD | Items | Trauma-Related PTSD |
|-------|---------------------|-------|---------------------|
| 9     | .82                 | 16    | .78                 |
| 11    | .77                 | 17    | .72                 |
| 12    | .81                 | 18    | .80                 |
| 13    | .86                 | 19    | .85                 |
| 14    | .73                 | 20    | .81                 |
| 15    | .76                 |       |                     |



**Fig 1: Factor loading in first-order Confirmatory Factor Analysis (CFA) of PTSD**



**Fig 3: Standardized factor loadings in first-order confirmatory factor analysis of Trauma-Related PTSD**

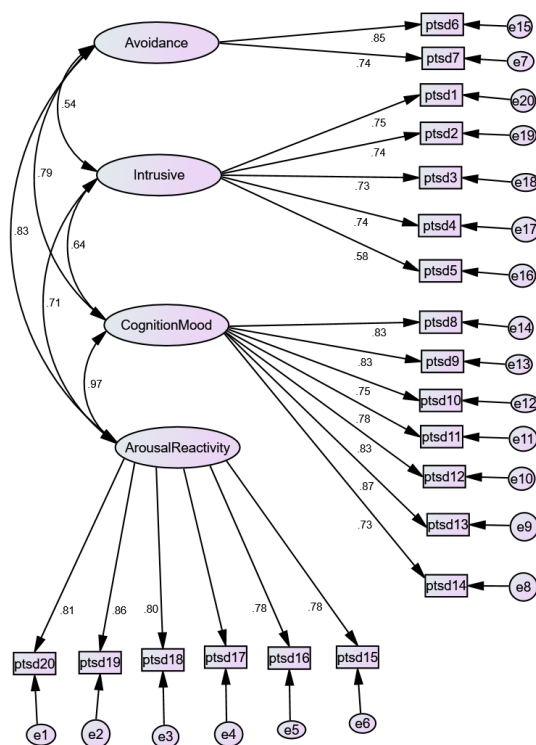
## DISCUSSION

In the current study, we aimed to have a validated Urdu version of the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5) for trauma survivors. A confirmatory factor analysis was carried out on CAPS-5, and no warning messages were received from AMOS. All 20 items were distributed into four symptoms i.e.

intrusive symptoms, negative cognition, avoidance, and hyper-arousal. All the factor loading had higher than 0.4 which indicated that all the items were responsible for PTSD symptoms. Additionally, trauma-related items were also loaded for first-order confirmatory factor analysis.

The result of factor loading was higher than 0.4 that indicated that the items contributed trauma related to PTSD. Furthermore, the result for model fit indices showed a satisfactory result. GFI= .90, AGFI=.87, NFI= .86, RMSEA= .03, and RMR= .03 indicate a good fit. Similarly, model for trauma-related items might also good fit. Coughlan recommended that some researchers may have calculated a relative chi-square ( $\chi^2/df$ ).

They have proposed a ratio range of 2 to 1 or 3 to 1, and was accepted.<sup>17</sup> The result of the present study showed 3.9 which is adequate for model fit. Similarly, some researchers suggested that RMR might be <0.08



**Fig 2: Standardized factor loadings in second-order confirmatory factor analysis of symptoms level of PTSD**

and ideally  $<0.05$ .<sup>18</sup> In the current study, RMR value was .03 which falls within the proposed range. The AGFI of the current study was 0.87, which is greater than  $>0.80$ .<sup>19</sup>

The psychometric characteristics of the Urdu translated version were supported by an entirely different American sample.<sup>20</sup> Regarding, the original factor structure of CAPS-5 for DSM-5 for PTSD symptoms, the current study result might also be providing support to the DSM-5 model, where these diagnostic criteria were recently considered the best evidence for PTSD symptoms.

The current study had several limitations. All the samples were recruited from hospitalized population and the majority were men. It is unclear how the result of the current study could be generalized to non-clinical samples and women. The sample was taken from a single geographic population, so the result may not be generalizable to samples belonging to other regions of the country. Further large-scale studies are needed to fill these gaps.

## CONCLUSION

The current study was intended to assess the CFA of translated Urdu version of the Clinician-Administered PTSD Scale for DSM-5 among trauma survivors. The result showed that the Urdu version of CAPS-5 has a good model fit which was statistically significant and positive for the sample of trauma survivors. It has been established through current results that CAPS-5 is psychometrically a good measure for PTSD symptoms.

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#### AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

**Zaman S:** Conceived and designed the research, collected data

**Irfan S:** Analyze data statistically and drafted the manuscript.

**Hussain B:** review manuscript.

**Arouj K:** reviewed the manuscript.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# BIOMECHANICAL CHANGES IN THIRD TRIMESTER OF PREGNANT FEMALES IN COMPARISON TO NON PREGNANT FEMALES OF SAME AGE GROUP

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## ABSTRACT

**Background:** In pregnancy women experience several changes in body's physiology, morphology, and hormonal system which lead to biomechanical changes for example range of motion at cervical, lumbar and gait patterns, which is considered as part of normal postural adaptations.

**Objective:** To determine biomechanical changes in third trimester pregnant and non-pregnant women in terms of range of motion at cervical and lumbar spine, step length, stride length and speed.

**Methodology:** A comparative cross-sectional study was conducted with sample size of 210 females comprising of 69 pregnant females and 141 non pregnant females for 6 months at Railway general hospital. Non probability convenience sampling technique was used. Females with a history of back pain, 1st or 2nd trimester of pregnancy, females suffering from any degenerative disease or musculoskeletal disorders or any serious pregnancy related complication were excluded. Assessment was done using an iPhone®5S I handy level® app for measuring the ROM at the cervical and lumbar spine. A 6" by 6" POP sheet for measuring step length, stride length, and number of steps.

**Results:** The assessment of cervical and lumbar flexion and extension ROM showed the non-pregnant females' group had greater range in both flexion and extension than pregnant females ( $P < 0.01$ ). Pregnant females presented with, decreased step length, stride length and speed than non-pregnant females having  $P < 0.001$ .

**Conclusion:** Pregnant females had decreased range of motion at cervical and lumbar spine, decrease in speed, step and stride length was observed in comparison to the non-pregnant females of the same age group.

**Key words:** Biomechanical Changes, Third Trimester of Pregnancy

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## INTRODUCTION

The biomechanical changes that occur during pregnancy are part of normal postural adaptations, which is counter balanced with compensatory changes in spinal column<sup>1</sup>. A mother's body undergoes numerous changes in the initial phase of pregnancy to maintain a supportive environment for the embryo and the pregnant female as well. The physiologic adaptations take place all over the maternal body to facilitate the expecting mother to conserve surplus energy to prepare for delivery and labor. Numerous hormones like human chorionic gonadotropin hormone (HCG), human placental lactogen (HPL) and relaxin, would help to sustain an environment that is supportive for the development and embedding of the em-

bryo and to prepare body for parturition.<sup>2,3</sup>

The structural and mechanical changes in spine are a part of the normal physiological changes during pregnancy.<sup>4</sup> During the phase of compensation due to increasing weight, the first area which is targeted to recompense is lumbosacral junction. As the pelvic inclination increases, there would be an exaggerated lumbar curve. Joint laxity at lumbar spine creates notable instability and leads to muscle strain all contributing to low back pain.<sup>5</sup> In 2019 GemmaBivia Roig PT compare effects of pregnancy on lumbar motion pattern in antenatal and postnatal periods. In his results he concluded that there is major decrease in lumbar flexion in pregnant females.<sup>14</sup>

The rise in relaxin hormone has found to be closely related to the changes in foot occurring in pregnancy like the size of foot, pressure on the sole and painful feet. Internal arches also become lax ensuing in flat arch due to the continuous increase in weight. All these changes in the anatomy and physiology of foot might also associate with other musculoskeletal and musculoligamentous changes occurring in the pregnant women body.<sup>6</sup>

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Greater laxity and a rise in body weight can shift body's COG to posterior part of foot that can lead to structural changes in feet which mostly affect the length of ligaments supporting the arches contributing a loss in arch height. In pregnancy length, width and volume of foot is increased which causes the head of talus to move downward due to the effect of relaxin on foot arches and increase in body mass.<sup>6</sup>

It is difficult to identify the major differences between the gait pattern of pregnant and non-pregnant women. There is a doubt that whether gait is much affected during pregnancy or not. Forczek W et.al concluded in his study conclude that during pregnancy plantar flexion and dorsiflexion decreases, hip abduction increases and due to heavy weight of the belly the pelvic tilts anteriorly and waddling gait in pregnant females too.<sup>7</sup> A study conducted in 2019 by Rebecca Conder et al and Rita Santos-Rocha et al. claimed that there is decrease in gait velocity and step length in females during pregnancy.<sup>12,13</sup>

This study was conducted to compare the pregnant females in their third trimester with the non-pregnant females of same age group to determine the biomechanical changes that occur in pregnancy. In this study we specifically assessed those musculoskeletal areas that are thought to undergo most of the changes biomechanically like the cervical and lumbar spine, and gait. There is a lack research findings present to assess effect of pregnancy on cervical range of motion. By these findings physical therapists can better understand the biomechanical complications of the pregnant females and design the antenatal treatment accordingly.

## MATERIAL AND METHOD

A comparative cross sectional study was conducted for pregnant females at Pakistan railway general hospital Rawalpindi and for non-pregnant was collected from community. By using non probability convenience sampling technique, 210 participants comprising of 69 pregnant females and 141 non pregnant females were selected. Informed consent was taken from each participant prior to participation. Ethical considerations were kept in mind while designing the questionnaire and conducting the survey Data was collected through structured questionnaire for pregnant and non- pregnant women. The study inclusion criteria were pregnant and non-pregnant females between ages 18 to 35 and females in third trimester of pregnancy. Females with a history of back pain, women in first or second trimester of pregnancy, females suffering from any degenerative disease or musculoskeletal disorders and with any serious pregnancy related complication were excluded.

## EXAMINATION

Assessment of spinal curves range of motion

An Iphone® 5s I Handy© level app was used for the assessment of cervical and lumbar range of motion. In standing position cervical flexion and extension range of motion were assessed by placing the phone on C7 as landmark. For assessing lumbar flexion and extension range of motion in same position the individual was asked to bend forward with knee straight and then from reference position bend backward according to their comfort level. Iliac crest was used a reference point landmark for identification of L4-L5 and phone was placed on it. Participants performed AROM's with one repetition for each movement to be assessed. Assessment of speed, step and stride length For the assessment of gait components a sheet of 6 by 6 feet was placed on a firm surface and plaster of Paris was spread on it uniformly to visualize the foot prints. Participants were asked to walk on it at their regular pace and the time they took to cover the distance was recorded on a stop watch. After these participants' step length, stride length were measured using an inches tape and speed is calculated by dividing the number of steps with time.

## STATISTICAL ANALYSIS

Data analysis was performed at SPSS 20.

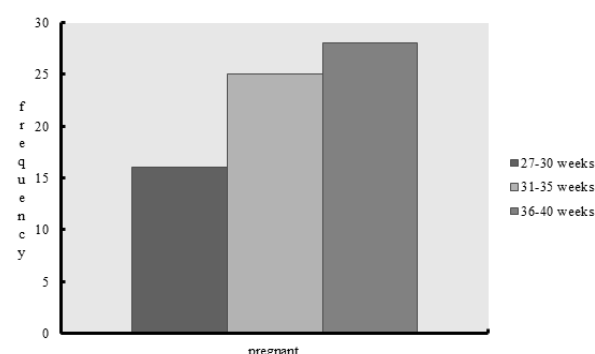
## RESULTS

In this study sample size was 210 in which 69 were pregnant females and 141 were non-pregnant having the mean age of  $27.4 \pm 4.34$  for pregnant females and  $26.3 \pm 5.15$  for non-pregnant females. In 69 pregnant females 24.6% participants were primigravida, 17.4% were secondigravida, 26% were tertigravida and 31.9% females were multigravida females. 28% pregnant females were nulliparous, 31% were primiparous, 17.4% pregnant females exist in each biparous and multiparous category, and only 4.3% females were in grand multipara group. In low back pain 14.5% pregnant females used back support and 85.5% did not use any back support for it.

Mean  $\pm$  SD of cervical, lumbar Range of motion step length, stride length, and speed in pregnant and non pregnant females with the P value is mentioned in (Table. no.1).and Figure.no.1 Shows gestational age of pregnant

**Table 1: Shows Mean  $\pm$  SD of cervical, lumbar Range of motion step length, stride length, and speed in pregnant and non pregnant females**

| Variables          | Pregnant         | Non pregnant     | P value |
|--------------------|------------------|------------------|---------|
| Cervical flexion   | $40.2 \pm 9.82$  | $51.9 \pm 12.1$  | 0.001   |
| Cervical extension | $-55.7 \pm 12.1$ | $-62.9 \pm 11.1$ | 0.001   |
| Lumbar flexion     | $45.4 \pm 20.4$  | $52.9 \pm 14.4$  | 0.002   |
| Lumbar extension   | $-9.15 \pm 5.5$  | $-15.3 \pm 7.87$ | 0.007   |
| Step length        | $17.0 \pm 3.4$   | $20.9 \pm 4.1$   | 0.001   |
| Stride length      | $34.8 \pm 5.96$  | $41.3 \pm 7.3$   | 0.001   |
| Speed              | $0.92 \pm 0.29$  | $1.13 \pm 0.32$  | 0.001   |



**Fig 1: Shows gestational age of pregnant females.**

females.

## DISCUSSION

Pregnancy creates change in the patterns of lumbar motion, with decline in the percentages of lumbar flexion during spine flexion in the time of pregnancy. A study carried out by Gemma Bivia Roig PT el. In 2019 concluded that there is profound decrease in lumbar range of motion especially flexion in females during their gestation phase. In current study there is also a significant decrease in pregnant woman lumbar flexion as compared to non-pregnant woman with P value (0.002\*)<sup>14</sup>

Rebecca Conder et al. conducted a systematic review in 2019, after his conclusion he claimed that there is profound decrease in trunk range of motion, gait velocity, step and stride length most commonly in third trimester of pregnant females. Likewise in current study our results concluded that there is also significant decrease in lumbar flexion extension, gait speed, step and stride length in third trimester of pregnancy in comparison with non pregnant.<sup>15</sup>

Wendy L Gilleard mentioned there will be an increased step width ( $p = 0.05$ ) and significant decrease in stride length ( $p = 0.05$ ) and the overall pelvic range of motion will decrease ( $p = 0.03$ ) as an individual progressively entered third trimester. But in our study step length and stride length both decreased in pregnant females for the duration of gestation.<sup>10</sup>

Eldeeb, A. M et al. in 2016 conducted a research study to check the relationship between trunk and pelvis kinematics during pregnancy trimesters. The result concluded that during pregnancy women has increased maximum anterior pelvic tilt, and reduced maximum trunk flexion.<sup>11</sup> In current study women who were pregnant had reduced ROM at cervical and lumbar region also.

Not much work has been done on the effects of increased lumbar lordosis on rest of the spinal curves i.e thoracic and cervical in gestation or what could be the effect of pregnancy on cervical spine range of motion (flexion and extension). According to our results likewise

the decreased lumbar range of motion, cervical ranges in flexion and extension also decreased during pregnancy in comparison to non pregnant females. Overall the females during gestation experienced compromised ranges of motion at cervical and lumbar region (flexion and extension).

## CONCLUSION

This study concludes that reduced range of motion at cervical and lumbar spine, a drop in arch height, pronated foot position, a decrease in speed, step and stride length was observed in the pregnant females when compared to the non-pregnant females of the same age group.

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# AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

|                  |                                                                    |
|------------------|--------------------------------------------------------------------|
| <b>Zia A:</b>    | Design, data analysis and interpretation, data collection, writing |
| <b>Sheraz S:</b> | Concept, data analysis,                                            |
| <b>Razzaq A:</b> | Critical review                                                    |
| <b>Asif R:</b>   | Data interpretation, data collection                               |
| <b>Khalid A:</b> | Data interpretation, data collection                               |

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# EPILEPSY IN THE CONSANGUINEOUS FAMILIES AT TRIBAL SOCIETY OF KHYBER PAKHTUNKHWA-PAKISTAN

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## ABSTRACT

**Objective:** To determine the association between epilepsy disease (ED) and consanguinity in the tribal society of Khyber Pakhtunkhwa-Pakistan.

**Material and methods:** Approximately, 150 clinically diagnosed epileptic patients of consanguineous families with ages ranging from 3 to 70 years were included during the period of (2018-19). Children in this study were aged 7-10 years and male to female ratio among the patients was 1:1.5. The target familial cases were included on the basis of sex, age, parental consanguinity, seizure type, cause of epilepsy, and family history. The parents were interviewed to collect the required information after informed consent. Non-consanguineous families, patients with acquired causes, and those who were not willing to participate were excluded from the study.

**Results:** In the current study, the consanguinity in parents of the epileptic patients was compared with the general population and we found significant results ( $P < 0.01$ ). Generally, 56 (37.33%) of the patient's parents were first cousins with ( $OR=3.245$  and  $95\%-CI=2.26-4.645$  and  $P<0.0001$ ), 24 (16.00%) were second-degree cousins with ( $OR=3.269$  and  $95\%-CI=2.032-5.258$  and  $P<0.0001$ ) and 70 (46.66%) were unrelated.

**Conclusion:** The overall results in this study clearly indicate the potential role of heritage lineage/consanguinity in epilepsy within consanguineous families. The present retrospective study supports genetic counselling prior to marriages. More significant genotype-phenotype correlation is also needed to minimize the risk of epilepsy disease.

**Key words:** Consanguinity, Epilepsy, Tribal society

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## INTRODUCTION

Epilepsy is a common neurological disorder characterized by recurrent seizures affecting more than 70 million people around the world and nearly 80% of epileptic patients are living in developing countries<sup>1</sup>. Seizure is defined by an excessive, abnormal neuronal firing in the brain. Clinically, an epileptic patient has at least 2 or more unprovoked seizures with duration of 24 hours apart<sup>2</sup>.

According to the published guidelines of the international league against epilepsy (ILAE) for the classification of epilepsy (2017), epileptic seizures are divided into

three groups i.e. generalized onset, focal onset, and unknown onset seizures. In Generalized seizures, the whole cerebral hemispheres of the brain are involved from the onset whereas, in focal onset seizures, an electrical discharge occurs in specific parts of the brain. Unknown seizures have no defined cause and therefore, are also called unclassified seizures<sup>3, 4</sup>.

Approximately 20–30% of epilepsy is due to defined causes such as brain tumor, head injury, stroke, CNS infection, metabolic disorders, and neoplasm but the remaining 70–80% cases are believed to be due to one or more genetic factors<sup>5</sup>. Some of the individuals with intellectual disability (ID), depression, mood disorder, autism, or schizophrenia have epilepsy as a co-morbid condition<sup>6</sup>. The overall prevalence of epilepsy in Pakistan is approximately 10 per 1000 while the prevalence of epilepsy is 64.70% and 35.50% in urban and rural areas of Pakistan respectively and the female (10.9%) are affected more than males (9.2%)<sup>7</sup>.

Consanguinity means shared DNA resulting from the union of biologically related persons whose offspring

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are at higher risk of certain genetic disorders while the risk of epilepsy with consanguinity has been increased many folds<sup>8</sup>. Worldwide, millions of people have consanguineous marriages, and up to 50 % of marriages in Arab and Middle Eastern countries are also consanguineous<sup>9</sup>. Consanguineous marriages are very common in Pakistan (~63%) but almost (70%) in the province of Khyber Pakhtunkhwa leading to higher rates of genetic disorders<sup>10</sup>. In consanguineous marriages, inherited diseases were found to be twice common as compared to non-consanguineous marriages<sup>11</sup>. Educational background, socio-economic status, conserved attitudes in people, and size and location of the area have been found as the cornerstone for consanguineous marriages<sup>12, 13</sup>.

The majority of the population studies reveal an increased familial history of epilepsy, particularly where the couples are first and second-degree cousins/relatives<sup>14</sup>. A number of risk factors have been linked to epilepsy but the fact about epilepsy and consanguinity is little known. This work was carried out to trace the epilepsy lineages in the tribal society of KP-Pakistan with consanguineous marriages, a common social practice of the studied region. Tribal societies are located in the north-western of Pakistan usually called the Federally Administered Tribal Areas (FATA) that existed from 1947 until being merged with the neighbouring province, Khyber Pakhtunkhwa in 2018. It consisted of seven tribal agencies (districts) and six frontier regions (F.Rs). The territory is almost exclusively inhabited by the Pashtun. The current study may help in providing a better understanding to implement proper interventions in order to minimize this serious health problem.

## MATERIAL AND METHODS

The retrospective data review was conducted in the tribal society of Khyber Pakhtunkhwa-Pakistan. The epileptic patients were registered for the study by visiting Hospitals and they were traced back to their dwellings for collecting the required information regarding the history of epilepsy within the family. The sampling criteria were based on the presence of at least two epileptic patients in the family, as well as their parent's cousin's marriage. A total of 150 patients with consanguinity in their parents were identified and selected among the total toll of 5000 patients. A larger part of the patients denied sharing their family information and willingly participating in such studies as per the common practice of the tribal norms. Informed consent of the involved families and all the necessary information were collected after the approval from the ethical committee and board of studies of the Institute of Biotechnology and Genetic Engineering (IBGE), the University of Agriculture Peshawar under project no. 2013-Agr-U-3179.

## ENROLMENT OF PATIENTS

A total of 150 epileptic patients were enrolled with an age range of (3-70 years). Patients, who experienced two or more unprovoked seizures with a time interval of more than 24 hours apart, were considered epileptic patients<sup>2</sup>. The epileptic patients suffering since their birth or childhood but mostly at young ages were enrolled for the study who were referred as outpatients in the Department of Neurology, Lady Reading Hospital (LRH), Peshawar during the period of (2018-19).

Only the target familial cases were included in the study and the inclusion criterion was comprised of sex, age, parental consanguinity, seizure type, cause of epilepsy, and family history. The required information was obtained through interviews of patients, their parents, or close relatives and by reviewing their medical records, after getting the informed consent in the local language. Patients whose parents were not in consanguineous marriages or had definitive acquired causes and those whose parents were not willingly participated were excluded from the study.

Statistical analysis using the odds ratio (OR), the Z-test, and the Chi-Square, with a P value of less than 0.01 considered significant. The Odds Ratio and its 95% confidence interval (CI) were calculated for first and second-degree relatives.

In the current study, the classification of seizures was carried out as generalized onset, focal onset, and unknown onset according to the recent guidelines published by the international league against epilepsy (ILAE)<sup>3</sup>.<sup>4</sup>. The seizures with no defined cause were classified as idiopathic.

Consanguinity in parents was classified as first-degree and second-degree cousins<sup>15,16</sup>. The patient's parental consanguinity was compared to the general population of the same geographical region. In the general population, the consanguinity percentage was collected through a survey of over 5000 patients inhabiting tribal society in Khyber Pakhtunkhwa.

## RESULTS

Male to female ratio was 1:1.5 with age range (3-70 years) among the studied patients, demonstrating clear etiology in 45 (30%), whereas 105 (70%) were assigned to genetic generalized epilepsy (GGE) formerly called idiopathic. The potential risk factors for epilepsy found in the patients are shown in (Table I).

## SEIZURES CLASSIFICATION

According to the ILAE classification (2017), epilepsy in the patients was classified as generalized onset, focal onset, and unclassified (Table II).

Consanguinity in epileptic families was found common in the idiopathic (GGE) patients. The percent consanguinity in epileptic families is shown in (Table III).

When patients with generalized seizures (118) were considered, 62 (52.54%) patients had consanguineous parents (OR=3.151, 95%-CI =2.183-4.547 and  $P<0.0001$ ) as compared to the general population. Similarly, in these patients, 42 (67.74%) were first cousins (OR=3.042, 95%-CI=2.026-4.569, and  $P<0.0001$ ). The second cousins in these patients were 20 (32.25%) with (OR=3.076, 95%-CI=1.838-5.147, and  $P<0.0001$ ). The remaining 56 (47.45%) were non-consanguineous parents.

In the remaining (19) patients expressing partial/focal epilepsy phenotypes, there was no significant statistical difference in the relation of married couples of the affected families and the general population on the basis of consanguinity. Only (8) consanguineous marriages (42.01%) were found in this category with (OR=2.06, 95%-

CI=0.83-5.15, and  $P=0.11$ ).

## DISCUSSION

Epilepsy is a neurological disorder characterized by recurrent seizures. Worldwide, it has a prevalence of 4–8 per 1,000 and a lifetime risk of seizures is 3% in the general population<sup>17</sup>. Consanguinity means the union of couples having close genetic relations and is a well-known tradition in the tribal society. About 700 million consanguineous marriages have been reported all around the world where about 50% of couples are consanguineous in the Middle East including the tribal society of KP<sup>9</sup>. The offspring of consanguineous marriages are at a greater risk of numerous genetic disorders including epilepsy and the intensity of risk increases if the married couples are first-degree cousins than second-degree cousins<sup>8</sup>. The current study is the very first attempt to find the association of consanguinity with epilepsy in the tribal society of Pakistan. In this study, the couples among the epileptic families were more consanguineous as compared to the general population which strongly suggests that consanguinity is one of the potential risk factors for epilepsy

**Table 1: Epileptic risk factors in the patients in current study**

| Risk Factor             | Number of Patients | %age |
|-------------------------|--------------------|------|
| GGE (Idiopathic)        | 105                | 70   |
| Intellectual Disability | 15                 | 10   |
| Mood Disorder           | 11                 | 7.33 |
| Developmental Delay     | 05                 | 3.33 |
| Down syndrome           | 03                 | 02   |
| Head Trauma             | 06                 | 04   |
| Others                  | 05                 | 3.33 |

**Table 2: Seizures classification in 150 epileptic patients in current study**

| Category      | Epilepsy                       | Number of Patients | %age  |
|---------------|--------------------------------|--------------------|-------|
| Generalized   | Generalized Tonic-clonic (GTC) | 70                 | 46.66 |
|               | Myoclonic                      | 21                 | 14    |
|               | Infantile Spasm                | 11                 | 7.33  |
|               | Atonic                         | 09                 | 06    |
|               | Absence                        | 07                 | 4.66  |
| Partial/Focal | Simple Partial                 | 11                 | 7.33  |
|               | Complex Partial                | 08                 | 5.33  |
| Unclassified  | Unclassified Epilepsy          | 13                 | 8.66  |

**Table 3: The comparison of parentage consanguinity with general population**

| Parameters         | First Cousins   | Second Cousins    | Unrelated   | Total |
|--------------------|-----------------|-------------------|-------------|-------|
| Patient's Family   | 56 (37.33%)     | 24 (16.00%)       | 70 (46.66%) | 150   |
| General Population | 912 (18.24%)    | 388 (7.76%)       | 3700 (74%)  | 5000  |
| OR, 95%-CI         | 2.33, 1.61-3.37 | 2.86, 1.79 - 4.56 | -           | -     |
| P-Value            | 0.0001          | 0.0001            | -           | -     |

which can be supported by the increased homozygosity in the inbred families up to many folds. Parental consanguinity of epileptic patients was shown to be a potential risk factor for epilepsy<sup>18</sup>. Similarly, in Iran, the percentage of consanguinity in parents of epilepsy patients was significantly higher in comparison to the general population (OR 2.6, 95% CI: 1.9-3.5,  $P < 0.0001$ ), indicating that consanguinity is a risk factor for epilepsy<sup>19</sup>. Another study carried out by Ramasundrum and Tan has reported an increased risk for epilepsy in children whose parents were in blood relation<sup>20</sup>. The study, conducted in Abha and Khamis, Kingdom in Saudi Arabia found that 19.4% of epileptic children had consanguineous marriages between their parents<sup>21</sup>. Consanguinity was suggested to be a potential risk factor for epilepsy and reported up to 20% in the patients suffering epilepsy<sup>22</sup>. The rate of epilepsy in the current study (53.33%) is much higher than in previous studies which are probably due to the higher consanguinity rate. It was found that epilepsy patients had an increased rate of consanguinity than those suffering random seizures. However, all these mentioned studies have confirmed a significant role of consanguinity in epilepsy. Keeping in view, the situation, the youth at schooling and the parents at their homesteads may be educated through genetic counselling regarding expected couples prior to their marriages. The model of Pre-marriage counselling in couples expecting thalassemia has proved successful recently in the tribal society of the frontier region in KP. It resulted in an approximately 19% decrease in cousin marriages prone to a high risk for thalassemia during the past 20 years i.e. from 65% in 1998 to 43% in 2018 (organization, Jihad for Zero Thalassemia JZT). In the case of partial epilepsy, the lower statistical significance may be due to a decreased influence of consanguinity or may be due to insufficient sample size, however, in the future; this aspect needs further investigation.

The unwillingness of the families to participate in the study, willingness to participate but unwillingness to sign the consent form, inaccessibility to the hard areas, non-consanguineous marriages, and unavailability of family and clinical history were some of our study limitations.

## CONCLUSION

The significant results in this study show a potential association between epilepsy and consanguinity. Genetic counselling is suggested prior to marriages within the family to minimize the risk of epilepsy.

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#### AUTHOR'S CONTRIBUTION

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**Badsha N:** Concept, Design, and Proofreading

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**Khan SH:** Analysis and interpretation of data

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Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# PREDICTORS FOR INSULIN RESISTANCE IN METABOLIC DYSFUNCTION ASSOCIATED FATTY LIVER DISEASE

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## ABSTRACT

**Objective:** Metabolic dysfunction-associated fatty liver disease is a new concept to replace NAFLD as it truly reflects metabolic dysfunction associated with fatty liver. The aim of the study is to find the predictors of insulin resistance in term of mid upper arm circumference and triceps fold thickness in MAFLD subjects.

**Material and methods:** This cross sectional study was conducted at King Edward Medical University in collaboration with Mayo hospital radiology out door patient department from 2016 to 2017 after taking Ethical approval from University (134/RC/KEMU). Total of 148 non diabetic subjects of aged 40-60 years with Nonalcoholic fatty liver disease diagnosed on ultrasonography were enrolled from Mayo hospital. Fasting blood glucose was measured to exclude the diabetic subjects. Mid upper arm circumference and triceps folds were measured following protocol. Subjects were divided into two groups i.e. insulin resistant and non-insulin resistant group(NIR) using cutoff values of HOMAIR. HOMA-IR value  $\geq 2.29$  were taken as IR group while subject with HOMA-IR value  $< 2.29$  were taken as NIR group.

**Results:** Study comprised of 148 NAFLD subjects of both genders. Out of total 148 subjects, 107 (72.3%) subjects were IR and 41 (27.7%) subjects were NIR. Spearman's Correlation did not show statistically significant association of IR with mid arm circumference. ( P-value 0.70) and triceps fold IR (P- value 0.83).

**Conclusion:** Insulin resistance is not associated with triceps skin fold and mid arm circumference in obese individual. Triceps fold and mid upper arm circumference cannot be used as clinical interpreter of IR in obese individuals.

**Key words:** Insulin Resistance, Mid Upper Arm Circumference, Metabolic dysfunction-associated fatty liver disease, Triceps Fold.

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## INTRODUCTION

Metabolic associated fatty liver disease (MAFLD) which was formerly known as Nonalcoholic fatty liver disease (NAFLD) is associated with diabetes mellitus insulin resistance and obesity. However, NAFLD is a disease which is considered as the accumulation of fat that is termed as steatosis without major injury to hepatic cells. However, this might progress and involve the spectrum of ballooning degeneration of hepatic cell or tissue fibrosis which is termed as NASH ultimately leading to other life threatening complication. However, there is not well defined clear demarcation between NAFLD and NASH<sup>1</sup>. Since, the nomenclature NAFLD does not depict all the features the subject is passing through thereby lacking

for any definitive diagnosis and treatment. Hence, nomenclature recently been improved because of the heterogeneous pattern of the disease and its consequent metabolic features

Rate of prevalence of this disease is hiking with every passing day and has no definitive treatment. It is believed that it is associated with other disorders that themselves are considered as major reasons for morbidity and mortality. Obesity is taken as one of the leading reasons for causing this condition, a condition that also significantly increases the risk for insulin resistance, hypertension and metabolic derangement<sup>2</sup>. This heterogeneous pattern of its pathogenesis referred this condition to be associated with metabolic dysfunction is termed as metabolic associated fatty liver disease (MAFLD). MAFLD is a new emerging concept proposed in 2020 concept related to these conditions, as NAFLD does not truly reflect the metabolic deregulation related to fatty liver disease. "MAFLD" was proposed as an appropriate terminology reflecting for these conditions. This will open the new horizons for researchers to upgrade the nomenclature of the disease to hike the translational path for advance management and treatments<sup>3</sup>.

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Obesity, especially visceral adiposity including fatty liver, is also an important component of the insulin resistance metabolic syndrome, a group of disorders including dyslipidemia, type 2 diabetes, and hypertension that might itself can lead to patient's health deterioration<sup>2</sup>.

Insulin being the vital hormone is responsible for maintaining the human blood sugar levels by utilization of glucose through peripheral tissues. When peripheral tissue utilization is affected in the presence of adequate amount of insulin then this condition is known as insulin resistance (IR)<sup>4</sup>. Hence, raised levels of blood glucose are found in subjects with insulin resistance. Certain tools are now been discovered for measuring the insulin resistance but Matthwes et al, was the first researcher being credited for describing the HOMA-IR. It is now been widely used especially in epidemiological studies because of its convenience and need of only single plasma sample for insulin and glucose. It is also described as the indicator of angiographic coronary artery disease in diabetic and non-diabetic subjects as well as for cardio metabolic risk factor<sup>4,5</sup>.

Utilizing the anthropometric tools relies upon its efficacy to determine pertinent health problems<sup>6</sup>. Body mass index is considered as an important sign to evaluate the degree of obesity or adiposity in adolescents as well as in children. Nevertheless, if alternate to BMI more specify to adiposity, could show strong association with health related outcomes and might impart significant contribution to research, provided that assessing obesity and adiposity with BMI is oppressed with conceptual challenges. Widely used anthropometric tools to determine adiposity are the triceps fold thickness and mid upper arm circumference (MUAC). Though its utility for determining the nutritional status is remarkable but is used rarely for assessing obesity and its associated outcomes including IR and deranged lipid profile. According to studies MUAC can be used as surrogate for HOMA-IR and can be the good predictor of mortality than BMI<sup>7</sup>. Hence our study aims to evaluate the association of mid upper arm circumference and triceps skin fold with insulin resistance because of it convenient utility and application in outdoor patient department and this could be used as a clinical predictor of IR and subsequent metabolic derangements in obese NAFLD subjects. Hence by keeping these causative factors under check we can be able to prevent NAFLD subjects progressing towards vicious cycle of the disease that is responsible for deteriorating subject's condition ultimately leading to early mortality.

## MATERIAL AND METHODS

This cross sectional study of 148 obese NAFLD subjects was conducted at King Edward Medical University (KEMU) attached with MAYO Hospital from January 2016 to December 2017. Before conducting the study, ethical (134/RC/KEMU) approval was obtained. Subjects were recruited by non-probability convenience sampling

technique.

One hundred and forty eight NAFLD subjects were recruited from outpatient sonology department Mayo hospital attached with King Edward Medical University. History was taken on predesigned proforma. Age, weight, triceps fold thickness and midarm circumference was measured following the protocol. Mid-arm circumference was taken by asking the subject to bend the left arm, then olecranon process and acromion process was marked, mid-point between these two marks was identified, while arm hanging straight down and then measuring the midpoint arm circumference. While triceps fold was measured with help of body fat measuring caliper.

Subject with BMI > 25kg/m<sup>2</sup> with normal fasting sugar less than 126mg/dl from age 40-60 were enrolled in the study. However subject with raised fasting blood sugar and known diabetics, subjects with any type of hepatitis, taking steroids and alcohol and on hikmat and homeopathic medicine were excluded. To exclude the diabetic subjects from the study, fasting blood sugar levels were checked using glucometer (model U-RIGHTTD -4251) subject with fasting blood sugar greater than 126g/dl were excluded from the study. Then under aseptic conditions 5ml of blood was drawn for measuring the levels of insulin. Afterwards, it was shifted in serum separator tubes to centrifuge the blood at 3000 rev/min for 15-20 minutes. Insulin levels were checked by ELISA technique. Then NAFLD subject were divided into insulin resistant and non-insulin resistant groups on the basis of values of having HOMA-IR (glucose (nmol/L) \* insulin (μU/mL)/22.5]. Subjects with HOMA-IR value ≥ 2.29 were taken as IR group while subject with HOMA-IR value < 2.29 were taken as NIR group.

## STATISTICAL ANALYSIS

SPSS version 21.0 was used for analyzing the data. Continuous variables were expressed as mean ± SD. Shapiro's wilk test was used to check the Normality of data, as p value ≤ 0.05, indicating that it was not normally distributed. Manwhitnys U test was performed to compare the median of triceps fold and MUAC among studied group. Spearman's Correlation was used to analyze association of triceps and MAUC with IR. p-value ≤ 0.05 was considered significant.

## RESULTS

Hundred and forty eight NAFLD participants of either gender were included this study. Forty three (29.1%) were males and 105 (70.9 %) were females. Descriptive of the studied population is shown in table1. Mean age of studied group was 44.8±6.2 and its median IQR was 43(8). Mean fasting sugar levels were 114.8± 12.8 with median (IQR) 118.0(10.0). Mean of triceps and mid arm

circumference of whole population is  $2.6 \pm 0.4$  and  $12.5 \pm 1.09$  while median(IQR) 2.5 ( 0.3 ) and 12.5(0.8) respectively. Out of total 148 subjects, 107 (72.3%) subjects were IR and 41 (27.7%) subjects were NIR. Spearman's Correlation did not show statistically significant association of IR with mid arm circumference. (p value=0.70) and triceps-fold IR (p value=0.83). table2

## DISCUSSION

Obesity is the growing pandemic worldwide and soaring cause of insulin resistance leading to metabolic disorders<sup>8</sup>. Insulin is the main factor for transporting glucose into skeletal muscles and adipose tissues. 60-70% of glucose uptake in the skeletal muscles and 10% in adipose tissues is via insulin dependent GLUT 4 receptors<sup>9</sup>. Skeletal muscle is a main source of insulin mediated glucose metabolism and can profoundly persuade IR. Obesity results in formation of free fatty acids and ectopic lipids accumulation that triggers the insulin resistance by activating atypical Protein kinase C( PKC). PKC contributes to the reduction of insulin signaling by promoting serine phosphorylation of Insulin receptor substrate 1( IRS 1) that attenuates IRS-1 tyrosine phosphorylation pathway for actual insulin signaling<sup>10</sup>. Moreover, adipose tissue macrophages (ATM) associated with obesity accounts for reduced insulin signaling by releasing inflammatory cytokines that expedites hepatic gluconeogenesis and decline in glycogen synthesis leading to hyperglycemia and oxidative stress<sup>9</sup>. Activation of Toll- like receptors by free fatty acids are additional factor for insulin resistance

due to obesity. In turn insulin resistance causes protein catabolism in skeletal muscles and further increase in free fatty acid concentration by decreasing lipoprotein lipase activity in adipocytes and release of adipocytokines like TNF $\alpha$ , IL6 and leptin, hence further aggravation of IR<sup>11</sup>. Evidences are available showing the relationship of adiposity with IR and all these factors accounts for nonalcoholic fatty liver diseases (NAFLD). Triceps fold thickness and mid upper arm circumference (MUAC) are important emerging predictors of adiposity and now been focused by the researchers of modern world. It is evident that as greater MUAC was positively associated with higher risks of several cardio-metabolic disorders<sup>12</sup>. It has been suggested by various researchers to use these parameters as a surrogate of HOMAIR<sup>4</sup>. MUAC and triceps skin fold are used to assess nutritional status and lean body mass. Skin fold thickness measurement methods are inexpensive, non-invasive and easy measurable tool, hence providing a direct measurement of subcutaneous layer of fat, can provide direct effect of insulin on lipid metabolism<sup>13,14</sup>. ADDO O also documented the significant utility of skin fold thickness for estimating insulin resistance and serum triglycerides in adolescents<sup>15</sup>.

It is salient to highlight the association of indices of skin fold thickness with IR. This study was designed to elucidate the relation between triceps skinfold thicknesses and mid arm circumference with insulin resistance in obese subjects.

Present study did not find any significant correlation of MAUC with IR in obese studied subjects. Current

**Table 1: Descriptives of the studied population**

|                     | Group | N   | Mean (SD)   | Median (IQR) |
|---------------------|-------|-----|-------------|--------------|
| Age                 | IR    | 107 | 44.6(6.1)   | 43(8)        |
|                     | NIR   | 41  | 45.1(6.6)   | 45(7)        |
| Fasting blood sugar | IR    | 107 | 115.2(10.3) | 118(9)       |
|                     | NIR   | 41  | 113.6(17.8) | 119(11.5)    |
| Weight              | IR    | 107 | 80.9(10.0)  | 82(10)       |
|                     | NIR   | 41  | 75.9(9.4)   | 76(11.5)     |
| Height              | IR    | 107 | 1.5(0.1)    | 1.6(0.8)     |
|                     | NIR   | 41  | 1.5(0.1)    | 1.6(0.9)     |
| Insulin             | IR    | 107 | 27.6(27.4)  | 19.6(33.20)  |
|                     | NIR   | 41  | 24.9(22.2)  | 16.6(32.35)  |

**Table 2: Comparison of skin fold thickness among the studied group by Mann Whitney U test**

|         | Triceps fold n=148 |                              | MUAC n=148       |                               |
|---------|--------------------|------------------------------|------------------|-------------------------------|
|         | Mean $\pm$ SD      | Median(inter-Quartile range) | Mean $\pm$ SD    | Median (inter-Quartile range) |
| IR      | 2.65 $\pm$ 0.44    | 2.5(2.8-2.5)                 | 12.67 $\pm$ 0.89 | 12.5(13.0-12.5)               |
| NIR     | 2.64 $\pm$ 0.56    | 2.5(2.7-2.5)                 | 12.38 $\pm$ 1.48 | 12.5(13.0-12.0)               |
| P value | 0.837              |                              | 0.705            |                               |

\*P value  $\leq 0.05$  is taken as significant.

results are justified by Chao et al study, which reported the interesting finding that they found significant positive association on MAUC with IR only in non-obese subjects, however they did not find similar association among the obese subjects<sup>4</sup>.

Our results are not in agreement with previous Pakistani study conducted at Lahore by Zafar U et al, which reported significant correlation of IR with MAUC<sup>16</sup>. These local results were in accordance with other studies also showing significant positive correlation between the AC and HOMA-IR<sup>17</sup>.

Our study did not find any significant association of triceps fold with IR and this was in line with very old study by Freedman et al, which also did not find any association between triceps fold thickness and IR and concluded that the Triceps skin fold thickness did not provide independent information on any outcome<sup>18</sup>. However current study is not in agreement with another Pakistani investigation who documented the strong association of triceps fold with IR, hence suggesting it as one of best predictor of IR and stated that it might be helpful in identifying the population at risk for IR and subsequent metabolic syndrome.<sup>16</sup> Findings of the aforementioned previous study had emphasized on the reduction in Central and upper body fat that might cause in improving insulin sensitivity and delay metabolic disorders due to insulin resistance.

More adiposity in the skeletal muscle of obese subjects limits the estimation of muscle mass by MUAC. Accumulation of fat in skeletal muscle results in transition of type I more oxidative fibers into type II muscle less oxidative fibers that already lack insulin sensitivity. Finding of the current study suggested that the triceps skin folds and MUAC cannot be used as a surrogate of HOMA IR to predict IR in obese subject, most probably because of inability to assess the excessive amount of fat accumulated outside and inside the muscle. Further researches on broader scales are required concerning use of other anthropometric measurements like waist circumference (WC) and calf circumference (CC) as surrogate for HOMA IR to establish easily accessible methods for predicting IR frail obese individuals.

## CONCLUSION

Insulin resistance is not associated with triceps skin fold and mid arm circumference in obese individual and they are not use as clinical predictor of IR.

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## LIMITATION:

Causal inferences are not established due to cross-sectional nature of the study.

It is a single center study, so results may not be generalized to whole population.

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#### AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

**Altaf B:** Conception, data collection, writing up  
**Jawed S:** Data collection, statistical analysis  
**Salam RMT:** Literature research bibliography  
**Jawed S:** supervision

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# ARTHROSCOPIC PREVALENCE OF RAMP LESION IN PATIENTS PRESENTING WITH ANTERIOR CRUCIATE LIGAMENT (ACL) TEAR OF THE KNEE JOINTS

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## ABSTRACT

**Objective:** To determine the frequency of arthroscopic RAMP lesions in patients presenting with Anterior Cruciate Ligament (ACL) tear of the knee joints.

**Methodology:** This cross-sectional study was conducted at the Department of Orthopedic Surgery, Khyber Teaching Hospital Peshawar from 06 August 2019 to 06 February 2020. The patients were prepared for Arthroscopy under Spinal anesthesia by a consultant orthopedic surgeon, who had a fellowship in arthroscopy and sports medicine and had a minimum of three years' experience post-fellowship. All procedures were performed by the same surgeon. Standard two ports (anteromedial and anterolateral) arthroscopic technique was adopted and the inside of the knee was thoroughly examined for any ramp lesion in the posteromedial corner as per operational definition. The positive cases were recorded and one with no ramp lesion was labeled as negative.

**Results:** 19 (17.1%) patients were recorded with ramp lesions diagnosed on knee arthroscopy undergoing Anterior Cruciate Ligament reconstruction of the knee.

**Conclusion:** The RAMP lesion is a common meniscal injury that can occur at the time of ACL rupture or as a result of knee laxity associated with ACL insufficiency. The prevalence of ramp lesions in this study was 17.1%. Patients younger than 30 years of age and male patients had a higher prevalence of ramp lesions.

**Keywords:** Anterior Cruciate Ligament, RAMP Lesions, Arthroscopy

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## INTRODUCTION

Patients sustaining anterior cruciate ligament (ACL) rupture commonly present with concomitant intra-articular lesions. Approximately 43% of all ACL injured patients have been reported to have an associated lateral or medial meniscal injury<sup>1</sup>. Currently, known as a RAMP lesion, a pathology that has been historically under-recognized because it is commonly located within a posteromedial "blind spot" of the knee joint. The potential difficulty in its diagnosis is vital as RAMP lesions have been reported to be present in 9% to 17% of all ACL tears<sup>2</sup>. Furthermore, the use of imaging modalities such as magnetic resonance imaging (MRI) to detect RAMP lesions has a low reported sensitivity<sup>3</sup>. Due to the limited utility of MRI and the difficulty of identifying RAMP lesions through arthroscopy, it is important to perform a systematic arthroscopic

exploration of the knee joint to diagnose these "hidden" lesions<sup>4</sup>. The medial meniscus acts as a secondary stabilizer to anterior tibial translation. With anterior cruciate ligament (ACL) injury, the medial meniscal tear occurs in approximately 47% to 61% of cases<sup>5-9</sup>. In 1982, Strobel et al. initially coined the term "Ramp Lesion" to describe a tear in the attachment between the posteromedial meniscus and knee capsule in ACL deficient knees. Since that time, multiple authors have described similar injuries to the posteromedial meniscus-capsular attachment in conjunction with ACL injury<sup>6</sup>. Further, it is noted that in a chronically ACL deficient knee, the medial meniscus experiences increased loads with repetitive anterior tibial subluxations and rotation during sports. These repeated stresses across the posterior meniscus-capsular attachment lead to tears in the posterior horn of the medial meniscus or the development of ramp lesions. Cottet et al identified significantly more RAMP lesions in ACL deficient knees repaired after 6 weeks compared to acute ACL reconstruction before 6 weeks<sup>7</sup>. Song et al. observed significantly more RAMP lesions in knees undergoing ACL reconstruction greater than 6 months from the time of injury<sup>8</sup>. The great majority of ACL tears occur from athletic injuries. Football players sustain the greatest number of ACL tears, but these predominately contact injuries. Fe-

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male athletes sustain higher rates of ACL injury per athletic exposure across sports. The association of ACL tears with RAMP lesion, later on, is well documented in literature which further increases the morbidity, cost, and risk of osteoarthritis<sup>9</sup>. The reported incidence of RAMP lesion varies between 9.3-17% in the published literature<sup>9</sup>. In a study of 868 patients, with a co-existing ACL tear, the incidence of ramp lesion was 16.6%<sup>10</sup>. In another study on 301 patients, meniscal ramp lesions were present in approximately 17% of patients undergoing ACL reconstruction surgery<sup>1</sup>. J. song GY et al showed a prevalence of these lesions in ACL-injured patients to be 29.7%<sup>8</sup>. Sports injuries to the knee joint are very common in our population, especially in the young age group. Most patients present with an ACL tear on the initial MRI and the RAMP lesion remain undiagnosed<sup>3</sup>. These tears are visible on arthroscopy in the posteromedial corner of the knee joint. As these lesions are quite repairable but due to lack of initial diagnosis and pre-operative planning, we do not timely repair them which later on results in reconstructed ACL failure and early osteoarthritis.

This study will find the frequency of this specific injury in our population. In light of this study, we can modify the existing protocols regarding the management of knee sports injuries so we can repair them in a time before or at the time of ACL reconstruction. Furthermore, this study will provide local statistics and a base for further research.

## MATERIAL AND METHODS

This Cross-sectional study was conducted at the Department of Orthopedic Surgery, Khyber Teaching Hospital Peshawar from 06 Aug 2019 to 06 Feb 2020. After getting permission from the Ethical & Research Approval Committee of our institution. Patients were selected from the outpatient and Emergency department. The purpose and benefits of the study were explained to all patients, included in the study. Patients having Multi-ligament injury and associated fractures were excluded. Written informed consent was taken from all patients. A detailed clinical history was taken followed by a general physical and systemic examination from all patients presenting with MRI diagnosed anterior cruciate ligament tear. A plain radiograph of the involved knee was taken in sagittal and coronal planes, to identify any fracture or dislocations and make necessary exclusions. The selected patients were enrolled and a specific data sheet purposely designed, was filled for each of them. The patients were prepared for Arthroscopy under Spinal anesthesia by a consultant orthopedic surgeon who had a fellowship in arthroscopy and sports medicine, having a minimum of three years of experience post-fellowship. All procedures were performed by the same surgeon. Standard two ports (anteromedial and anterolateral) arthroscopic technique was adopted and the inside of the knee was thoroughly examined for any RAMP lesion in the posteromedial corner as per operational defi-

nition. The positive cases were recorded and one with no ramp lesion was labeled as negative. After confirming of ramp lesion, the frequency of ramp lesion was calculated among the total subjects included in the study. All data were recorded in the form of charts and tables. Confounder was controlled by strictly following exclusion criteria

Data were analyzed using statistical software SPSS version 21. All the quantitative variables like age, weight (Kg), time since ACL tear (months) were analyzed by Mean and standard deviation. Frequencies and percentages were calculated for qualitative variables like gender, type of sports injury (Cricket, Foot Ball, Hockey, Skiing, and others), Knee involved (right or left). RAMP lesion was stratified among age, gender, time since ACL tear, right or left side, weight, and type of sport to see effect modifications. Another effect modifier like obesity was controlled through stratification. Post-stratification chi-square test was applied keeping P value equal to or less than 0.05. All the results were presented in tables and graphs.

## RESULTS

This study was carried out on 111 patients. Mean and SDs for age and weight turned out to be 35 (SD±25.35 correct) and 77.32±7.560 respectively (Table-1). Sixty (54.1%) patients were reported in the 16-25 years' age group and 51 (45.9%) patients were in the 26-40 years, age group. Ninety-two (82.9%) were male and 19 (17.1%) patients were female. Sixteen (14.4%) patients were recorded as obese and 95 (85.6%) patients were non-obese. Sixty (54.1%) patients had right knee involved and 51 (45.9%) patients had left knee involved. In 62 (55.9%) patients knee injury from football, 19 (17.1%) from cricket, and 30 (27.0%) from playing hockey. Fifty-three (47.7%) patients had injuries of less than 1 month, 29 (26.1%) patients had injuries between 1-6 months whereas 29 (26.1%) patients' injuries were for more than 6 months. Nineteen (17.1%) patients were recorded with ramp lesions presenting with Anterior Cruciate Ligament tear of the knee (Table No. 2). Ramp Lesions were cross-tabulated with age, gender, obesity, knee involved, type of sports, and time since ACL tear at Table No. 3 to 8.

## DISCUSSION

In this study, 19 (17.1%) patients were recorded with ramp lesions presenting with Anterior Cruciate Ligament tear of the knee. Cottet et al identified significantly more ramp lesions in ACL deficient knees repaired after 6 weeks compared to acute ACL reconstruction before 6 weeks<sup>7</sup>. Song et al. observed significantly more ramp lesions in knees undergoing ACL reconstruction greater than 6 months from the time of injury<sup>8</sup>. The association of ACL tear with ramp lesion is well documented in literature which further increases the morbidity, cost, and risk of osteoarthritis<sup>9</sup>. The reported incidence of ramp lesions varies

**Table No. 1: age and weight distribution of patients**

|                     | N   | Minimum | Maximum | Mean  | Std. Deviation |
|---------------------|-----|---------|---------|-------|----------------|
| Age                 | 111 | 16      | 35      | 25.35 | 5.267          |
| Weight              | 111 | 68      | 98      | 77.32 | 7.560          |
| Valid N (list wise) | 111 |         |         |       |                |

**Table No. 2: RAMP Lesions identified**

|        |       | Frequency | Percent | Percent |
|--------|-------|-----------|---------|---------|
|        | Yes   | 19        | 17.1    | 17.1    |
| Validt | No    | 92        | 82.9    | 100.0   |
|        | Total | 111       | 100.0   |         |

**Table No. 3: Ramp Lesion-Age Groups**

|             |     | Age Groups  |             | Total |
|-------------|-----|-------------|-------------|-------|
|             |     | 25-16 Years | 40-26 Years |       |
| RAMP Lesion | Yes | 10          | 9           | 19    |
|             | No  | 50          | 42          | 92    |
| Total       |     | 60          | 51          | 111   |

**Table No. 4: Ramp Lesion-Gender**

|             |     | Gender |        | Total |
|-------------|-----|--------|--------|-------|
|             |     | Male   | Female |       |
| RAMP Lesion | Yes | 14     | 5      | 19    |
|             | No  | 78     | 14     | 92    |
| Total       |     | 92     | 19     | 111   |

**Table No. 5: Ramp Lesion-Obesity**

|             |     | Obesity |    | Total |
|-------------|-----|---------|----|-------|
|             |     | Yes     | No |       |
| Ramp Lesion | Yes | 6       | 13 | 19    |
|             | No  | 10      | 82 | 92    |
| Total       |     | 16      | 95 | 111   |

**Table No. 6: Ramp Lesion-Knee Involved**

|             |     | Knee Involved |      | Total |
|-------------|-----|---------------|------|-------|
|             |     | Right         | Left |       |
| Ramp Lesion | Yes | 10            | 9    | 19    |
|             | No  | 50            | 42   | 92    |
| Total       |     | 60            | 51   | 111   |

**Table No. 7: Ramp Lesion-Type of Sports**

|             |     | Type of Sports |         |        | Total |
|-------------|-----|----------------|---------|--------|-------|
|             |     | Football       | Cricket | Hockey |       |
| RAMP Lesion | Yes | 12             | 3       | 4      | 19    |
|             | No  | 50             | 16      | 26     | 92    |
| Total       |     | 62             | 19      | 30     | 111   |

**Table No. 8: Ramp Lesion-Time since ACL Tear**

|             |     | Time Since ACL Tear |           |           | Total |
|-------------|-----|---------------------|-----------|-----------|-------|
|             |     | < 1 month           | 6-1 month | > 6 month |       |
| RAMP Lesion | Yes | 7                   | 5         | 7         | 19    |
|             | No  | 46                  | 24        | 22        | 92    |
| Total       |     | 53                  | 29        | 29        | 111   |

between 9.3-17% in the published literature<sup>9</sup>. In a study of 868 patients with a co-existing ACL tear, the incidence of ramp lesion was found to be 16.6% which is comparable to the current study<sup>10</sup>. In another study on 301 patients, meniscal ramp lesions were present in approximately 17% of patients undergoing ACL reconstruction<sup>11</sup>. J. Song GY et al showed a prevalence of these lesions in ACL-injured patients to be 29.7% while it turned out to be 19 (17.1%) in our study<sup>8</sup>. Sports injuries to the knee joint are very common in our population, especially in the young age group. Most patients present with an ACL tear on the initial MRI and the ramp lesion remains undiagnosed. These tears are visible on arthroscopy in the posteromedial corner of the knee joint.

In 1988, Strobe first described a longitudinal meniscal lesion involving the peripheral union of the PHMM, typically associated with ACL injuries, which he termed ramp lesion to distinguish it from other types of posterior tears<sup>13</sup>. The choice of the name reflects the ramp appearance of the posteromedial zone, which is named as ramp zone when seen from the intercondylar notch toward the posteromedial compartment. This ramp zone corresponds to the peripheral union of the medial meniscus with the posteromedial meniscal-tibial ligament.<sup>4</sup>

Sometimes, ramp lesions are underdiagnosed, owing to the incomplete preliminary study or an incomplete diagnostic arthroscopy during ACL reconstruction surgery. Before surgery, magnetic resonance imaging is done for ACL tear but its ability to pick RAMP lesions is not very good<sup>3</sup>. Hence, it is not easy to make a diagnosis of this lesion beforehand.<sup>6,7,8,11</sup> Therefore, an accurate diagnosis is necessary during the arthroscopy, looking for the ramp lesion using an intercondylar notch view of the posteromedial compartment, and adding a posteromedial portal for direct vision. Literature is evident of the importance of detecting RAMP lesion in case of ACL deficiency and reconstruction while doing arthroscopy<sup>12</sup>. Likewise, several methodologies for the management of ramp-type meniscal lesions have been described with variable results comprising of all-inside and inside-out techniques<sup>13-17</sup>.

## CONCLUSION

The ramp lesion is a common meniscal injury that can occur at the time of anterior cruciate ligament rupture or as a result of knee laxity associated with anterior cruciate ligament insufficiency. The prevalence of ramp lesions in this study was 17.1. Patients younger than 30 years of age and male patients had a higher prevalence of ramp lesions. It is, therefore necessary to scrutinize for RAMP lesion while diagnosing or reconstructing ACL arthroscopically to prevent the sequel of its negligence.

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#### **AUTHOR'S CONTRIBUTION**

Following authors have made substantial contributions to the manuscript as under

**Akhtar W:** Conception, data collection, writing up

**Shah SDBA:** Data collection, statistical analysis

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# SCOPING REVIEW OF THE IMPACT OF COVID-19 ON ASSESSMENT FORMAT IN MEDICAL AND DENTAL INSTITUTES

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## ABSTRACT

**Objective:** Technology enhanced assessment or e-assessment is an emerging approach across the globe and is adapted by almost all medical and dental institutes. The objective of this study is to report on effects of COVID-19 on assessment format of medical institutes. This review seeks to find which methods are being used for a changed assessment format and who is being affected by sudden change in assessment format and what facilitators and/or barriers have been reported related to the success and/or failure of changed assessment format.

**Material and Methods:** This scoping review followed the methodology outlined by Arksey and O'Malley framework (2005). Data sources including PubMed, Eric, Medline, Semantic scholar and Google scholar were searched for the last 5 years of articles (from 2016 to 2021) related to e-assessment in medical education.

**Results:** In total, 9 articles met our inclusion criteria. Open book examination was considered to be a new normal keeping in mind its strengths and advantages in an online format. Digital literacy plays an important role in the acceptance of technology enhanced assessment. Faculty needs training to opt for this sudden change in teaching and assessment format. Connectivity issues need to be taken care of, as the whole format depends upon it.

**Conclusion:** e-assessment was well accepted by most of the students. Future studies should target students inconvenience for online assessment. Also lack of e-learning experience of some staff need attention. Insufficiency of IT technicians should be overcome. High speed internet is the requirement of the day. New software can be developed for a more reliable and valid assessment method

**Keywords:** technology enhanced assessment, open book examination, digital literacy, scoping review

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## INTRODUCTION

Coronavirus Disease 2019 (COVID-19) pandemic made it necessary to shut down physical lecture rooms. Furthermore, teaching of medical education shifted from physical face to face teaching to online system. <sup>1</sup> This was being a total transformation from tradition method to web based or online learning accompanied with a lot of challenges. <sup>2</sup> Recent evidence has explored that e learning enjoys the role as a catalyst in modern era. <sup>3</sup> Assessment is known to be one of the most important element of an educational experience as it not only determines a student's progress

but also provides observable evidence of learning. It helps students to develop necessary skill of autonomous and self-directed learning. <sup>4</sup>

In modern knowledge-intensive, higher education structure, individual and societal development is strongly directed by technological advances with expectations for amplified access, freedom and involvement in the construction of learning, including assessment methods and protocols. <sup>5</sup> Technological advances have taken over the educational sector within last few decades including technology assisted open universities and online lectures. <sup>6</sup>

Introduction of e-assessment/technology enhanced assessment internationally triggers change in assessment methodology and becomes an important part of e-learning movement which is a global growth industry. <sup>7</sup>

Whitelock and Reudal identified few main drivers for modern practices in technology enhanced assessment including better student retention, flexibility for distant learners, strategies to cater for large number of students,

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improved quality of feedback, objectivity in marking and effective use of virtual learning environments. In today's era of COVID-19 pandemic where we see a major paradigm shift in medical and dental education, these drivers are among the competing forces shaping today's higher education standards.<sup>8</sup> Talking about implementation of successful e-assessment methodology in Pakistan, one major determinant is lack of academic staff time and training.<sup>8</sup>

To overcome these technical and procedural hindrances for smooth implementation of e-assessment, all we need to do is to identify the gaps in these areas by reviewing the available data related to this particular topic. This can be done by doing scoping review which is a relatively new approach to synthesis of knowledge.

The topic of our scoping review is impacts of COVID-19 on assessment format in medical and dental institutes which is an emerging topic with very few studies available. Interventions in this area are less known and only few methodologies are being used for new interventions effecting the specific group of people involved in medical education.

The review is guided by the question, "What assessment methods are opted for e-assessment or technology enhanced assessment in these pandemic circumstances of COVID-19 and what are facilitators or barriers to the new examination format?"

We found relatively less number of articles targeting primary research in this area, which was one of our inclusion criteria. Although, we could find only articles related to the impact of COVID-19 but our inclusion criteria had included last 5 years of research related to online assessment so that we can compare what change this pandemic had brought to already present e-assessment or physical assessment methods in medical education.

## MATERIALS AND METHODS

After searching Google Scholar, PubMed, Semantic Scholar, and Medline, ERIC, Abstracts on impact of Covid-19 on Technology Enhanced assessment identification of articles addressing the subjects of online learning and medical and dental education was done. Search strategies were developed by MeSH words on PubMed, and keywords on Google scholar, Medline and ERIC.

The Search strategies were transplanted using each database platform's command, language-controlled vocabulary and appropriate search fields. Text words were used for the search concepts of e-learning, Medical Education, Dental Education, and Technology Enhanced Assessment. Searches were completed on 18<sup>th</sup> October 2021. Limited articles published were of last five years. We were predominantly interested in examining the literature published in last five years. English language limit was applied to all databases. Primary research articles written in English were included if these included online assessment, and whose

primary purpose was to review the impact of covid-19 pandemic on online assessment. Dissertations/thesis, reports or abstracts only, marketing or advertising material, review or editorials and studies based on data from online sources were excluded

All Articles were screened by 2 reviewers through a 2-step process of abstract and full text review to determine eligibility criteria through abstract review for inclusion. The articles that were included underwent full text review. Articles that met the inclusion criteria were then analyzed and charted according to the following iteratively developed categories 1. Author 2. Sample/participants 3. Measures 4. Inclusion.

Flow chart of literature review

## DATA CHARTING

A total of 28 articles were shortlisted out of which 25 were searched to check for the impact of COVID-19 on e-assessment out of which 9 articles were selected for scoping review on the basis of inclusion/exclusion criteria.

## RESULTS

Planning and rapid implementation of technology enhanced assessment presents next set of novel challenges that must be addressed by academic administrations across the globe.

We identified four key topics related to impacts of COVID-19 on technology enhanced assessment on medical education.

1. Strategies for overcoming challenges related to e-assessment
2. Strategies to overcome challenges related to ICTs
3. Challenges faced by the faculty for implementation of new format
4. Challenges related to internet connectivity issues

**Strategies for overcoming challenges related to e-assessment:** Traditionally there was a focus on memorisation and usual exam format followed was written CBEs including essay questions and different forms of MCQs mainly focusing on the content but due to pandemic, online exam format has to be adopted which obviously need a change of approach.

Several interesting online methods of assessment were found including Open book exams (OBEs), oral examination through video conferencing, oral presentations, video recording presentations and randomized questions in the virtual learning environment with an established maximum time for its completion.

Subjects in medical and dental institutes that need the development of clinical skills, there has been a paradigm shift to virtual learning environments. For example, the use of an electronic report in which the clinical supervisor

| Sr. No. | Study /Author                                      | Title                                                                                                                                                       | Sample /Participants                                                                                                                                                                                                                                                                                                                              | Methods                                                                                                                                         | Conclusion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | M H.Rajab, Abdalla M. Gazal, Khaled Alkattan 9     | Challenges to Online Medical Education During the COVID19- Pandemic                                                                                         | A total of 1289 students and faculty members out of which 208 responded (%54.8 females, %66.8 Medical students, %14.9 masters' students, %18.3 faculty)                                                                                                                                                                                           | Cross-sectional study using self-administered online questionnaire using Google forms having closed and open ended questions                    | Most (%70.7) respondents believed covid19- pandemic has boosted their confidence in the effectiveness of online teaching and assessment.                                                                                                                                                                                                                                                                                                                                                                    |
| 2.      | S Sarkar, P Mishra, A Nayak 10                     | Online open book examination of undergraduate medical students-a pilot study of a novel assessment method used during the coronavirus disease 2019 pandemic | A total of 98 students appeared for examination out of which 21.4 percent failed and 78.6 percent passed. 8 students scored above %75 and 55 students volunteered to give feedback                                                                                                                                                                | A Pilot study was carried out. An online open book test was conducted and feedback was obtained using pre-validated questionnaire               | Online open book exam has the potential to be a new normal form of assessment during and after pandemic                                                                                                                                                                                                                                                                                                                                                                                                     |
| 3       | Jake Prigoff, Madeleine Hunter, Roman Nowygrod 11  | Medical Students assessment in the time of covid 19-                                                                                                        | 19 students during COVID- interrupted clerkship and 61 students in similarly timed clerkship between 2017 to 2019. Out of 19 surveyed students, 9 responded                                                                                                                                                                                       | Previously validated free response clinical skill exam (CSE) as an open book exam and scores were adjusted based on historic norms              | Open book exam and virtually proctored shelf exam can be considered as a reasonable option for clinical assessment during and after pandemic                                                                                                                                                                                                                                                                                                                                                                |
| 4       | Roumiana Peytcheva-Forsyth and Lyubka Aleksieva 12 | Forced introduction of e-assessment during COVID19- pandemic: How did the students feel about that? (Sofia University case                                  | A total of 1102 students from Sofia university took part in study. 853 responded. Female participants in the study were %71 of students. Almost half of the surveyed students (%46) were aged 21 years or less. Another 40 % are between 22 and 30 years old. Between 31 and 40 years old are %7 of the participants and over 41 years old are %5 | A descriptive cross sectional study online survey of students at the end of the semester in academic year 2020/2019 was done from all faculties | Participants in the study were asked to define their level of digital literacy. Their responses reveal that over %80 of them consider themselves as experts or feel confident in using different ICT (%19 define themselves as experts, %63 feel confident in using new technologies). %14 need support and directions when using ICT and only %4 do not feel comfortable when using ICT. The revealed level of digital literacy of the respondents provides a good basis for introduction of e-assessment. |
| 5.      | Ahmed Elzainy, Abir EL Sadik. 13                   | Experience of E-learning and online assessment during the covid19- pandemic at the college of medicine, Qassim University.                                  | 620 virtual classes were done over 994 hours including theoretical lectures, PBL, seminar, and tutorials. %58 reflected their higher satisfaction towards virtual classrooms, and online assessment.                                                                                                                                              | Cross-sectional study recorded the number and duration of different online educational activities during covid19- pandemic.                     | The result shows the benefits of the E-learning assessment and observed higher achievements with improvement in their technological skills.                                                                                                                                                                                                                                                                                                                                                                 |

|   |                                             |                                                                                                                                   |                                                                                                                                                                                                                                                                             |                                                                                                                                                                                |                                                                                                                                                                      |
|---|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | Syeda sadia Fatima, romana Idress 14        | Online assessment in undergraduate medical education: challenges and solution from a LMIC university.                             | 3 pilot assessments were conducted to identify and process the refinement %80 of the class was unable to launch the lockdown browser. 1st pilot (lockdown browser, and zoom were used). 2nd pilot (MS, and teams were used). 3rd VLE were used.                             | Cross- section study was conducted between March to August 2020 at agha Khan University. 1st and 2nd year students participate in this study.                                  | In order for effective protocol for online assessment conducting multiple trials about feedback from stakeholders is necessary.                                      |
| 7 | S. Snekalalatha, S. Mohamed Marzuk et al 15 | Medical students' perceptions of the reliability, usefulness and feasibility of unprotected online and formative assessment test. | 100 students of 1st year physiology paper was enrolled in study. Questionnaire was filled online from students. %81.4 to undertake online tests, %73.1 online test helped them in learning                                                                                  | Cross-study was conducted regarding online assessment during pandemic covid19-.                                                                                                | The result showed that medical students who participated, appreciated the usefulness of the online assessment.                                                       |
| 8 | Kalpna sharma, Joshi A, et al 16            | Online learning in the face of covid- 19 pandemic: assessment of students' satisfaction at Chitwan medical college of Nepal.      | 434 undergraduate and postgraduate students were selected for the survey questionnaire with 31 items covering major student satisfaction domains was distributed to the students in google forms. %53.5 were satisfied with online learning while %29.7 have neutral views. | A web-based cross-sectional survey was undertaken among the undergraduate and postgraduate students from various academic programs who had participated in online in pandemic. | Response of students towards online classes gave a satisfaction response and appears to be good and prioritizing the weak links that could be assessed and improved. |
| 9 | Ghosal, Tanwi, and others. 17               | Assessment of online learning procedure through the eyes of medical students in covid19- scenario.                                | Total 54) 200/95 male, 41 female) most students were good at using smartphones (n=%94.7) and mobile internet (n=%82) and most of it agreed on digital educational materials being relevant.                                                                                 | Cross-sectional study was carried out in the first year MBBS students of north Bengal medical college during covid19- pandemic                                                 | Most students accepted online education, assessment positively. And most of it still prefer offline mode of education and assessment                                 |

Case Processing Summary

|                       | N  | %     |
|-----------------------|----|-------|
| Cases Valid           | 11 | 100.0 |
| Excluded <sup>a</sup> | 0  | .0    |
| Total                 | 11 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

| Cronbach's Alpha | N of Items |
|------------------|------------|
| 1.000            | 2          |

Intraclass Correlation Coefficient

|                  | Intraclass Correlation <sup>a</sup> | 95% Confidence Interval |             | F Test with True Value 0 |      |     |      |
|------------------|-------------------------------------|-------------------------|-------------|--------------------------|------|-----|------|
|                  |                                     | Lower Bound             | Upper Bound | Value                    | df1  | df2 | Sig. |
| Single Measures  | 1.000 <sup>b</sup>                  | 1.000                   | 1.000       | 44582.094                | 10.0 | 10  | .000 |
| Average Measures | 1.000 <sup>c</sup>                  | 1.000                   | 1.000       | 44582.094                | 10.0 | 10  | .000 |

Two-way mixed effects model where people effects are random and measures effects are fixed.

a. Type C intraclass correlation coefficients using a consistency definition-the between-measure variance is excluded from the denominator variance.

b. The estimator is the same, whether the interaction effect is present or not.

c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

assesses the students' skills, the use of an instrument to evaluate clinical skills, online discussion forums and presentations based on cases, assessing critical reflection and the use of literature, construction of simulated interactive cases, mind maps with links to important documents, podcasts, videos and other resources, and a final section for critical self-reflection and connection to clinical settings.

In a more integrated way with clinical practice, practical exams were also found in video conference, where real patients were being replaced by scenarios and images of virtual cases.

### Strategies to overcome challenges related to ICTs

Video conferencing was already being a part of tele-medicine but in case of pandemic, it definitely needed a more diverse use as it could be a major assessment tool for clinical e-assessment. Zoom and Skype could be used as videoconferencing platforms. Edmodo, Moodle and Google classroom could be used as digital platforms for formative and summative assessment as a part of TEA.

### Challenges faced by the faculty for implementation of new format

Faculty faced lots of challenges to cope with an entirely new exam format within a matter of days. Although, most of the faculty were familiar with use of technology or improved their knowledge by little guidance to combat the struggle related to new exam format. There was a good level of digital literacy among the faculty members but faculty training could be a very good option to overcome the challenges related to TEA.

### Challenges related to internet connectivity issues

Countries like Pakistan faced internet issues especially in remote areas and students opting online examination from remote areas faced lots of challenges. Gadgets and high speed internet were found to be necessary to take e-assessment format.

## DISCUSSION

Most of the students and faculty were in favour of open book exam format as it combats the problems related to cheating and invigilation issues related to e-assessment.<sup>17</sup> Studies revealed that OBE can be a useful tool for encouraging deep learning and critical thinking in students as compared to CBE which can cause rote learning.<sup>18</sup> The studied data revealed that OBE can be a new normal exam format during and after COVID-19 pandemic as most of the students and teachers were comfortable with this exam format.<sup>19</sup>

One of the major impacts of COVID-19 is widespread use of technology in educational sectors whether in the form of online learning or TEA. So, to be digitally literate is the need of the day.<sup>20</sup> Out of the three generations (X, Y and Z), generation Y and Z were familiar with ICT and felt confident using new technologies. Most of learners felt themselves expert, few of them needed support and directions while

using ICT while few were not willing to use ICT at all.<sup>21</sup> The study of level of digital literacy is very important for a better implementation of e-assessment.<sup>22</sup>

Reviewing data related to digital literacy revealed that 80% can confidently use new technologies, 16% can use it with help and guidance while only 4% need special attention to cope up with this digital transformation in COVID era. Similar results were seen in study in Australia, which showed 70-80 % digital literacy among healthcare workers.<sup>23</sup>

Faculty members of different medical colleges and medical students in Pakistan revealed that this is a totally new educational experience for most of them and hence is very challenging.<sup>24</sup> The transition from traditional to online evaluation has its own pro and cons as described by Hiller in his study in North Carolina.<sup>25</sup> The majority in Pakistan were not prepared for this sudden transition from in-person exams to a complete online exam format in a matter of days without any extensive planning and faculty training.<sup>26</sup>

## CONCLUSION

e-assessment format in medical education is well perceived by most of the students and appeared to heighten learner awareness. OBEs in online format are preferred over CBEs to avoid risks of cheating and lack of invigilation. Due to limited feasibility of CBEs because of COVID, this is the time for medical educators to explore the use of online OBEs in medical education. But before exposing students to OBEs, learners must be provided with sufficient OBE experience in lower stake settings. Like we can implement a series of formative OBEs before a summative assessment. Faculty needs proper faculty training to adapt to new exam format for both clinical and nonclinical exams. Availability of high speed internet and gadgets like laptops, tablets and smartphones for both students and faculty are need of the day. New softwares need to be developed for successful implementation of TEA.

Keeping in mind the studies under review, theoretical knowledge can be checked with online open book exams. Its advantages can be, no invigilation required, and less chances of cheating but user identity and internet access can be the disadvantages. But the main barrier is still the need to educate the academic staff in the field of e-assessment. Better softwares for online assessment need to be developed. Clinical exams need special attention and new methods need to be developed regarding clinical application of knowledge.

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Following authors have made substantial contributions to the manuscript as under

**Durrani M:** Concept and design of study

**Irshad S:** Concept and design of study

**Khan IA:** Manuscript writing

**Alam A:** Writing, review, and references management

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# EFFECT OF COUNSELLING ON PREFERENCE OF SPECIALITY IN DENTAL STUDENTS OF KHYBER COLLEGE OF DENTISTRY

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## ABSTRACT

**Objective:** To identify the preferences of dental graduates in the field of post-graduate specialty, factors that may influence their decision to select a particular specialty, and the effect of counselling on specialty preferences.

**Material & Method:** A pre-counselling and post-counselling questionnaire based study was carried out among final year students and House surgeons of Khyber College of Dentistry, Peshawar, between May to June 2020. A self-administered questionnaire, inquiring about the preference of specialty program, specialty subject and the reason for the preference, was given to the students. After filling the questionnaire, the participants were given a session on dental career counselling. After the session, they were again asked about their preference for a specialty for their future career. Both results were then compared.

**Results:** The most prevalent specialty before counselling was Endodontics (36.2%). The second one was Oral and Maxillofacial Surgery (21.3%) and then Periodontics (16.3%). After counselling, preference for Oral and Maxillofacial Surgery remained the same, however, Endodontics and Periodontics were reduced to 33.8% and 13.8%, respectively. Among post-graduation specialty programs, FCPS was the most prevalent program (77.5%).

**Conclusion:** Endodontics is the most preferred specialty among graduates followed by Oral and Maxillofacial Surgery. The most preferred program was FCPS. A single counselling session did not change the preference significantly. The reason most likely behind the preference was possession of unique set of skills for the specialty.

**Key words:** Dental graduates preferences, Specialties, Counselling

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## INTRODUCTION

During the last decade and a half, with the increase in the number of supervisors and infrastructure of post graduate programs throughout the world, the interest and quest for post-graduation among dental students has increased.<sup>1</sup> As with the medical field, the dental field as well has now well-developed clinical and non-clinical specialty programs. All specialties, clinical or non-clinical, require certain specific skill sets and talents.<sup>2, 3</sup> As per statistics of WHO, Pakistan is facing an acute shortage of dentists. However, the situation with the creation of Postgraduate Medical Institutes (PGMI) and College of Physicians and Surgeons Pakistan (CPSP) promoting both clinical and Basic Specialty is improving.<sup>2</sup>

American Dental Education Association reports that residency in Advanced General Dentistry is the most

sought off by the post graduate residency. The other nine residencies are Orthodontics, Oral and Maxillofacial Surgery, Pediatrics Dentistry, Prosthodontics, Endodontics, Oral Maxillofacial Radiology and Dental Public Health.<sup>3</sup> A study in Saudi Arabia showed Orthodontics was the most pursued residency, followed by Endodontics, Operative Dentistry, Prosthodontics, Periodontics and then Advanced Restorative Dentistry.<sup>4</sup> In Pakistan there are multiple programs which are being followed such as FCPS, MCPS and MDS in the clinical field, as well as in basic fields by the College of Physicians and Surgeons and MSC and MPhil.<sup>5</sup>

One of the practices lacking severely in the profession of dentistry is career counselling. Graduates and undergraduates require career counselling so that they can receive ample baseline information before they make a wise decision. Peng et al in a study showed that counselling helped participants who were facing indecisions in their career's path.<sup>6</sup> A study in Nigeria reported feedback from graduates that career counselling empowered undergraduates in rightfully choosing post graduate specialties.<sup>7</sup> A study done in Rawalpindi showed that counselling did influence the decision of graduates in the selection of postgraduate specialty.<sup>8</sup> Khyber College of Dentistry is one of the oldest and prestigious institutes in the province

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of KPK. As of yet, there is absence of any data on which specialties are prioritized by dental students once they graduate and what are the reasons behind the preference. Also, there is deficiency in knowledge of whether counselling session in general and one counselling session in specific will influence these dental graduates' decisions in selection of their specialty. The aim of this study is to find out the preferences of the graduates in the specialty they prefer, the reason for the preference and also to find out whether one career counselling session influences their preference.

## MATERIAL AND METHODS:

This pre/post-Counselling questionnaire based study was approved in January 2020 by Institute Ethical Review Committee and was carried out between May to June, 2020. A self-administered questionnaire was distributed among 80 students of final year and house surgeons of Khyber College of Dentistry, Peshawar. The questionnaire was initially developed from studies previously done on the topic.<sup>4,7</sup>

Initially a face validity was done by scrutiny of questions by three medical educationists and four subject specialists of orthodontics later content validity was done through a pilot study. Twenty final year students and house officers were given the questionnaire to be filled. These students and house officers were later not included as a part in the current study. The Cronbach alpha value came to 0.9 in the Pilot study. Sampling technique was non-probability consecutive sampling. In the first phase, all participants were asked about their preferences in the post graduate specialty subject, and the reason why they prefer a specific specialty.

They were further asked about their preference in different post-graduation programs like FCPS, MCPS, MDS, MSc & MPhil. After the questionnaire, they were given a counselling session with a panel of medical educationists and a group of faculty members already involved in the above-mentioned programs. The counseling session comprised of PowerPoint presentations explaining

strengths and limitations of each program, The skill sets and personality traits required for the Programs. The content of the counseling session was kept such that equal time was given to all career options and an unbiased approach was maintained by the panel of educationist and faculty members towards each program. After the session, they were again asked to fill the same questionnaire given before the counselling session. The data compiled was analyzed in SPSS version 2.0. The results were then displayed in the form of tables and figures. Frequencies of preferences before and after the counselling session were generated. The difference between the two was compared using Marginal Homogeneity test.

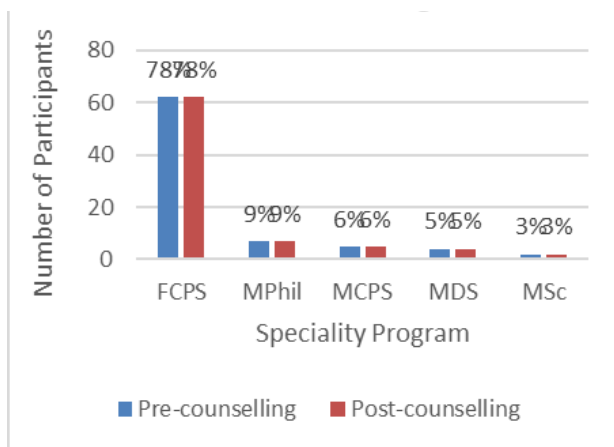
## RESULTS

All the 80 participants of this study responded to the questionnaire. Gender distribution was predominantly females (67.5%) to males (32.5%). Among postgraduate programs, FCPS was the most preferred program (77.5%), followed by MPhil (8.8%). The specialty program least responded by the study participants was MSc in Dentistry. (Figure 1) The most prevalent specialty subject was Endodontics with 36.2%, followed by Oral and Maxillofacial Surgery, 21.3% and Periodontics, 16.3%. The least opted specialty was Prosthodontics. (Table I) After the counselling session, program preferences before and after counselling remained unchanged. (Figure 1) Endodontics remained the most prevalent specialty subject, with a preference rate of 33.2%, followed by Oral and Maxillofacial Surgery 21.3% and Periodontics 13.8%. Prosthodontic still was the least opted specialty. (Table I)

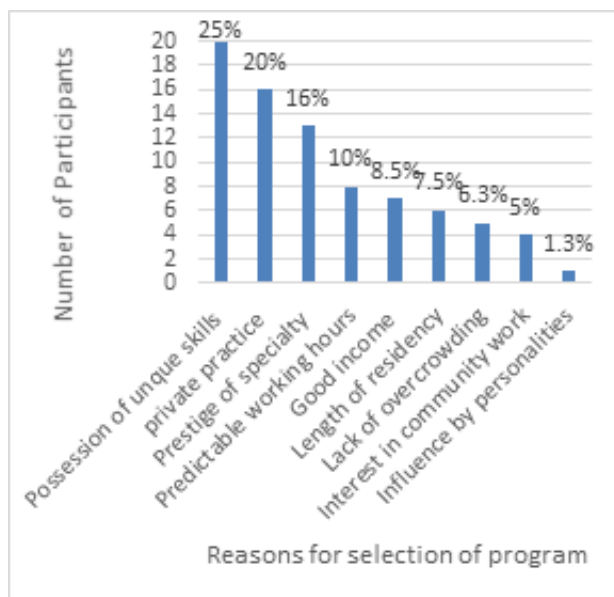
On applying marginal homogeneity test, it was apparent that a single counselling session did not make a statistically significant difference in the preference of the selection of the Specialty ( $p=0.136$ ). Most common reason given by the participant for preference of specialty selected was that graduates thought they had the skill sets required for the specialty. Second most common reason was the preference for later private practice in the said field. Third reason was the prestige and integrity of the

Table1: Perception of Specialties before and after Counselling

| Specialty                        | Before              | After      |                     | Margin Homogeneity Test |
|----------------------------------|---------------------|------------|---------------------|-------------------------|
|                                  | No. of participants | Percentage | No. of participants |                         |
| Endodontics                      | 29                  | 36.2       | 27                  | 0.136                   |
| Oral & Maxillofacial Surgery     | 17                  | 21.3       | 17                  |                         |
| Periodontics                     | 13                  | 16.3       | 11                  |                         |
| Orthodontics                     | 6                   | 7.5        | 7                   |                         |
| Pediatric Dentistry              | 4                   | 5          | 4                   |                         |
| Dental Public Health             | 4                   | 5          | 2                   |                         |
| Oral Pathology                   | 4                   | 5          | 4                   |                         |
| Restorative & Esthetic Dentistry | 3                   | 3.7        | 4                   |                         |
| Prosthodontics                   | 0                   | 0          | 4                   |                         |



**Fig 1: Preference of Specialty programs before & after Counselling**



**Fig 2: Reasons given for selection of Program**

specialty. (Figure II)

## DISCUSSION

This study was conducted to determine the preferences of dental specialty by the final year dental students and house surgeons, and also to investigate whether a single session influenced the dental specialty selection.

This study demonstrated that the most preferred specialty subjects were Endodontics, Oral and Maxillofacial Surgery and Periodontics, which is slightly different to a study done in Saudi Arabia where the preferred specialties were Orthodontics, Oral and Maxillofacial Surgery and Pediatric Dentistry.<sup>4</sup> One of the likeliest reasons why orthodontics is less of a preferred specialty among the participants of this study is the relative lack of oral hygiene awareness of the population and the length of the treatment orthodontic patients require.<sup>9,10</sup>

Although the participants in the counselling session asked many questions about different specialties from the conveners of the session, however, there was no statistically significant difference in the preference of specialties before and after the single counselling session. A study done in Rawalpindi showed a similar pattern where the preferences before and after two counselling sessions did not change dramatically. However, the counselling session did show significant difference in the preference of specialty subject selected. In terms of programs of specialty, there was no difference in the preferences of participants. Our results can signify that one counselling session, regardless of how elaborate, cannot bring a difference in the preference of the participants. From a different perspective it can also imply that the participants were already clear on the preferences beforehand and had made up their decisions.

In terms of main reason for the preference, Jonathan et al revealed that dentistry as a career was selected mostly by students due to less demanding duty hours.<sup>11</sup> Another study in Saudi Arabia showed that majorly, the preference is influenced by the family members and the scope of the specialty in private practice.<sup>4,12</sup> In our study the participant usually preferred the specialty they believed they had the unique skills set for. The participant preference in our study was, like the above-mentioned study, influenced by the private practice. The influence by family members was the least selected reason in our study probably because families are more interested towards medical profession than dental profession.<sup>13</sup>

One of the concerning findings in our study was that the specialty of dental materials was not opted by any of the participants. Also clinical specialties were selected by majority of participants with very little heed towards non-clinical specialties even though the counselling session had discussed them as a good option as well.

The main limitation of this study is that it was conducted in one dental college. Future studies should concentrate towards taking participants from all the dental colleges to understand preferences of dental specialties. Also, our study did not take into account gender preference of specialty. In our study the participants were only exposed to one counselling session and in future studies longer and more abundant counselling sessions can be scheduled. In our study, their least preferred specialty and the reason behind them were not inquired or recorded. Future studies should inquire these perspectives as well.

**Conclusion:** Our study concluded that Endodontics is the most preferred specialty among graduates followed by Oral and Maxillofacial Surgery and the most preferred program was FCPS. A single counselling session did not change the preference significantly. The reason most likely behind the preference was possession of

unique set of skills for the specialty and financial perspectives.

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## AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

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|------------------|-------------------------------------------------------------------|
| <b>Saood M:</b>  | Idea of article abstract.                                         |
| <b>Naz T:</b>    | Data collection results discussion writing.                       |
| <b>Shabir S:</b> | Questionnaire Formatting                                          |
| <b>Saif U:</b>   | Final approval                                                    |
| <b>Wadood S:</b> | Final approval                                                    |
| <b>Shah AM:</b>  | Literate search, Questionnaire formatting and overall supervision |

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# MEDICAL COLLEGE STUDENT'S PERCEPTION REGARDING CURRENTLY ADOPTED TEACHING METHODOLOGIES AND THEIR EFFECTIVENESS; A CROSS SECTIONAL STUDY FROM RAWALPINDI

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## ABSTRACT

**Objective:** Medical education is based upon innovating teaching strategies to teach more problem-solving attitudes in medical students. Teaching methodologies have evolved over the last few decades with the sole purpose of making teaching and learning interactive for students. This study aimed to evaluate the teaching methodologies and their effectiveness concerning students' perceptions.

**Material and Methods:** We conducted this cross-sectional study for six months. We included 115 medical students of Rawalpindi through convenient sampling who were willing to participate in the study. We used a self-structured questionnaire for the data collection, and data were analyzed using SPSS Version 24.

**Result:** In this study, 57% of participants were female, and 43% were male. The majority of the study participants (49%) were from second-year MBBS. Around 91% of students were aware of different teaching methodologies. As per student perception, the most preferred teaching methodology was task-based (27.0%). The most ineffective method for students was self-directed learning (34.78%) and conventional lectures (26.1%). 48.6% of students perceive that small group discussions augment lateral thinking whereas 32.1% consider problem-based learning to broaden thinking.

**Conclusion:** The findings of the current study suggest that a blend of both conventional lectures and innovative theoretical and clinical teaching methodologies could be effective for teaching medical college students as clear perception regarding different teaching methodologies and their effectiveness exists among these students.

**Key Words:** Medical Students, Perception, Preferences, Teaching Methods

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## INTRODUCTION

Education has always been diverse and dynamic, but with the evolution of new teaching and learning methodologies, there was a significant paradigm shift in general and medical education. With all the latest teaching methodologies, the traditional teacher-centered approaches

have been greatly shifted to more student-centered ones.

Samarakoon et al described teaching as an "ever-evolving progressions particularly in medical school requiring it to modernize continuously"<sup>1</sup>. Medical education is evolving daily contributed by the research and the knowledge can only be effectively transferred to the students if teaching aids and the Methodology are effective to the student's level of understanding. In all the medical and dental institutions of Pakistan, both conventional and non-conventional teaching methods are employed. This includes the traditional and most conventional methods of whiteboards and verbal content delivery to most upgrades done including "Overhead Projectors", "multimedia", "PowerPoint" Problem-based learning" etc<sup>2</sup>. The traditional method is still effective for giving face-to-face interaction

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to teachers and students. It helps to understand the content at a more personal level<sup>3</sup>. Still, many studies revealed that this method is hard to implement in classes where the number of students is drastically high<sup>4</sup>.

Of the many purposes of medical education, the key focus had always been to equip undergraduate medical students with a sense of responsibility as well as stimulate the lifelong exploration and self-learning qualities in them. In the context of Pakistan where the medical curriculum had been consistently uniformed over the decades, the traditional learning and teaching method was in practice. With the evolution of medical education, over the past few years, medical colleges had started incorporating new techniques and teaching and learning methodologies<sup>5</sup>.

Modern medical education is based mostly on hands-on practical skills. In Pakistan, various hands-on workshops are arranged by private and public medical and dental academies to polish the skills of young doctors and to freshen up their knowledge. At the same time, group discussions, and PBLs are also an effective ways to make the learning more interactive as students get a chance to openly discuss their queries and confusions with the teacher or demonstrator<sup>6</sup>. The ultimate aim of all the teaching methodologies is always to uplift students' mental capacity and to equip them with the complexity of the medical field.

This study aimed to evaluate the teaching methodologies and their effectiveness in relation to the student's perception. This study provides baseline evidence for a better understanding of the need of today's medical students.

## MATERIAL AND METHODS

We conducted this descriptive cross-sectional study at different medical colleges of Rawalpindi. Those medical students who were available and willing to participate in the study were included. The sample size was 115, which was calculated by using openepi.com. at 95% confidence level and absolute precision of 4% and taking the 95% of the students in favor of sizeable interactive group lectures<sup>7</sup>.

A self-structured questionnaire was piloted on 74 students who were not included in the final study. The Cronbach alpha was 0.743. The questionnaire was divided into two sections. Section 1 dealt with the study participants' socio-demographic profile, including name, age and gender. Section 2 dealt with the students' perceptions of different teaching methodologies.

Informed consent was sought from all the study participants. The collected data was entered into SPSS Version 24 and was thoroughly checked for any missing entries. Descriptive analysis for frequency and percentages was conducted.

## RESULTS

The age of participants ranged from 17 to 24 years having a mean age of  $20.25 \pm 1.59$  years. Forty-three percent of study participants were male and fifty-seven percent of study participants were female. Twenty-five percent of study participants were from the first year, 49% from the second year, 21% from the third year, 4% from the fourth year, and 1% from the final year. Ninety-one percent of study participants were aware of different teaching methodologies employed in their colleges while nine percent were not aware of different teaching methodologies. Hundred percent of study participants were taught by conventional lectures, 91% had exposure to problem-based learning, 89% of them were taught by task-based learning, 95% by self-directed learning, 83% were taught by hands-on practical skills, 46% percent by role-playing, 77% by case-based learning, eighty-five percent by small group discussion.

According to study participants, the most preferred teaching methodologies (Table 1) were task-based (27%) and small group discussion (24.3%). The teaching methodologies which kept them more attentive and engaged (Table 2) were task-based learning (21.7%) and case-based learning (20.9%). The most ineffective teaching strategies (Table 3) according to study participants were self-directed learning (34.78%) and conventional lectures (26.1%). The perceptions regarding different theoretical and clinical teaching methods are presented in table 4.

**Table 1: Preferred Teaching Methodology**

| Preferred Teaching Methodology |                           | Frequency (n) | Percentage (%) |
|--------------------------------|---------------------------|---------------|----------------|
|                                | Small Group Discussion    | 28            | 24.3%          |
|                                | Conventional Lectures     | 5             | 4.3%           |
|                                | Hands-On Practical Skills | 12            | 10.4%          |
|                                | Role play                 | 11            | 9.6%           |
|                                | Problem-Based             | 3             | 2.6%           |
|                                | Case-Based Learning       | 14            | 12.2%          |
|                                | Self-Directed Learning    | 11            | 9.6%           |
|                                | Task Based                | 31            | 27.0%          |
|                                | Total                     | 115           | 100.0%         |

**Table 2: Perception Regarding Most Engaging Teaching Methodology (n=115)**

| Most Engaging Teaching Methodology | Frequency (n) | Percentage (%) |
|------------------------------------|---------------|----------------|
| Small Group Discussion             | 16            | 13.9%          |
| Case-Based Learning                | 24            | 20.9%          |
| Role Play                          | 13            | 11.3%          |
| Task-Based Learning                | 25            | 21.7%          |
| Conventional Lectures              | 5             | 4.3%           |
| Hands-On Practical Skill           | 18            | 15.7%          |
| Problem Based Learning             | 12            | 10.4%          |
| Self-Directed Learning             | 2             | 1.7%           |
| Total                              | 115           | 100.0%         |

**Table 3: Most ineffective Teaching Methodology (n=115)**

| Most Ineffective Teaching Methodology | Frequency (n) | Percentage (%) |
|---------------------------------------|---------------|----------------|
| Conventional Lectures                 | 30            | 26.1%          |
| Task-Based Learning                   | 6             | 5.2%           |
| Small Group Discussion                | 8             | 6.95%          |
| Hands-On Practical Skills             | 5             | 4.37%          |
| Self-Directed                         | 40            | 34.78%         |
| Role play                             | 6             | 5.2%           |
| Problem-Based                         | 12            | 10.43%         |
| Case-Based Learning                   | 8             | 6.9%           |
| Total                                 | 115           | 100.0%         |

**Table 4: Perception of Students Regarding Theory and Clinical Teaching Methods (n=115)**

| Teaching methods                               | Perception                                                             | n (%)      |
|------------------------------------------------|------------------------------------------------------------------------|------------|
| Small Group Discussion                         | Augmentation of lateral thinking                                       | 56 (48.6%) |
|                                                | Better student interactions                                            | 59(51.3%)  |
| Problem Based Learning                         | Broadens thinking                                                      | 37 (32.1%) |
|                                                | Freedom to voice /opinion                                              | 33 (28.6%) |
|                                                | Better student-teacher interaction                                     | 17(14.7%)  |
|                                                | Positive competitive spirit                                            | 28(24.3%)  |
| Conventional Lectures                          | Better understanding of the subject                                    | 29(25.2%)  |
|                                                | Opportunity for active learning                                        | 25(21.7%)  |
|                                                | Effective utilization of time                                          | 16 (13.9%) |
|                                                | Informative                                                            | 45 (39.1%) |
| Perception Regarding Clinical Teaching Methods |                                                                        |            |
| Hands-On Practical Skills                      | Improves practical skills                                              | 42(36.5%)  |
|                                                | Helps in gaining more practical experience                             | 39(33.9%)  |
|                                                | Boosts the confidence                                                  | 34 (29.5%) |
| Case-Based Learning + Bed side Teaching        | Develops Clinical skills                                               | 46(40.1%)  |
|                                                | Improves communication skills                                          | 32(27.8%)  |
|                                                | Amalgamates both theoretical and clinical aspects to learn effectively | 37(32.1%)  |

## DISCUSSION

This cross-sectional study was conducted to find out the perception of students about different teaching methodologies in medical colleges of Rawalpindi. An overwhelming proportion of the medical students were aware of various teaching methodologies. In this study, 91% of students had been experienced being taught by problem-based learning and 100% had experienced traditional learning. Across the globe, the process of learning is based on the active strategy of delivering any lecture in a way to enhance the learning and professional skills of the learner<sup>8</sup>. The concept of problem-based learning for medical and dental students was to promote students to identify the problem areas and to search for possible solutions<sup>9</sup>. It was actively incorporated in different medical institutes as a part to make students more active and also to enhance cognitive skills by developing the core values like teamwork, problem identification, solution probing, communication skills, and active decision-making practices<sup>10</sup>. As per the results of this study, the study participants had a perception that task-based learning and discussion sessions in case-based learning keep them more attentive. Various studies had been conducted in past to evaluate the effectiveness of teaching methodologies in this regard<sup>11</sup>.

Another highlighting element of preferring discussion-based Methodology is that it gives students a medium for socialization. The preferred method cited in the results of this specific study does point out the fact this attentiveness ultimately contributes to the career progress of the students<sup>12</sup>. As per the results of this specific study, the study participants responded to having a task-based method as their preferred teaching methodology. Task-based teaching methodology encompasses the tasks assigned by the teacher and by the amalgamation of different activities, the tasks are completed and the possible solutions to the tasks are designed. In recent times this task-based learning is considered to be a crucial element for medical education as history taking, diagnosis and drug prescription is one of the key components of any medical practice. Such task-based learning methodologies equip the students with real-life task handling<sup>13</sup>.

At the same time, task-based learning stated as the preferred teaching methodology by the respondents<sup>13</sup>. The striking feature of task-based learning and problem-based learning is mastering the competencies of students<sup>14,15</sup>. Since this study is conducted in recent times, the medical students currently enrolled in different years in medical colleges do understand the dynamics of advancement in the medical field.

It is also projected in the results of this study that the medical student participating in this study reported self-directed learning as the most ineffective teaching and learning methodology. However, these results are quite

contradictory to studies conducted in other parts of the world where self-directed learning was successfully implemented and adopted by different medical students and its impact was projected in their results<sup>16,17</sup>.

One possible reason for the student not preferring this self-directed learning in our part of the world is that the modalities attached with self-directed learning, including facilitated self-directed learning, are yet to be probed here. Since the medical curriculum in Pakistan is emerging by incorporating new teaching and learning methodologies, students need to be guided about the details of all new such methodologies.

## CONCLUSION

The findings of the current study suggest that a blend of both conventional lectures and innovative theoretical and clinical teaching methodologies could be effective for teaching medical college students as clear perception regarding different teaching methodologies and their effectiveness exists among these students. However, there is a need for in-depth probing into evaluating the perception associated with their academic performance and also to equip medical students about the methodologies they dislike and prefer.

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Following authors have made substantial contributions to the manuscript as under

- Mahsood N:** Concept, Design, and Proofreading  
**Mehboob A:** Acquisition and critical review  
**Alam AN:** Analysis and interpretation of data  
**Kibria Z:** Data collection, Final approval  
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Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# FREQUENCY AND RISK FACTORS OF OVERWEIGHT AND OBESE SCHOOL GOING ADOLESCENTS OF DISTRICT PESHAWAR, KHYBER PAKHTUNKHWA, PAKISTAN

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## ABSTRACT

**Objective:** To assess the frequency and risk factors of overweight and obese school-going adolescents of district Peshawar and to determine the association of these risk factors with obesity in school-going adolescents.

**Material and methods:** This was a cross-sectional descriptive study, conducted in public and private schools of district Peshawar from 1st October 2020 till 30th March 2021. A pre-validated questionnaire was used to assess the dietary habits of students. The schools were stratified into three categories according to the fee structure i.e., low SES (socioeconomic status (fee < 1000 PKR), middle SES (fee = 1000-2500 PKR), high (SES) (fee > 2500 PKR). A sample of 300 was calculated using who sample size calculator. Stratified random technique was used to select two schools from each category. From each school, a sample of 50 students were taken. Six students were selected from each class using simple random method (balloting). Data were analyzed using SPSS 23. Chi-square test was used to determine the association between obesity and socioeconomic status and between obesity and dietary habits. Kendal-tau was used to determine the statistical correlation between obesity and socioeconomic status and between obesity and dietary habits.

**Results** The overall frequency of overweight and obesity was found to be 14.7 % and 8% respectively. After applying chi-square test, it was found that obesity had a significant association with the socioeconomic condition and dietary habits of adolescents. Kendal-tau was applied to develop correlation. It was found that obesity has positive correlation with socioeconomic condition +0.312. However, obesity had a negative correlation with dietary habits -0.092.

**Conclusion** Obesity in adolescents is rising significantly in district Peshawar where every 4th or 5th adolescent is either overweight or obese. The major risk factors were socioeconomic status and dietary habits, which were statistically found to be associated with obesity.

**Keywords:** BMI, school going adolescents, obesity, overweight.

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## INTRODUCTION

Obesity is the fifth major cause of death, to be associated with approximately 3.4 million deaths in 2019<sup>1</sup>. Childhood obesity has now reached the level of an epidemic in developed countries<sup>2</sup>. The burden of overweight and obese people has found to have increased significantly from 857 million to 2.1 billion in the last 3 decades. According to statistics worldwide, 37% of men and 38% of women are overweight and obese. However, 10% of the adolescents are estimated to be overweight and obese<sup>3,4,5</sup>

Within the United States, nearly one-third of adoles-

cents are either overweight or obese with the prevalence of 17%<sup>6</sup>. In the U.S, obesity rates in youth (2-19 years) are increasing tremendously. In developed countries, the prevalence of obesity in adolescents has increased from 17% to 24% in boys and from 16% to 23% in girls over 4 decades. However, in developing countries, the increase is 8% to 13% in boys and 8% to 13% in girls<sup>7,8,9</sup>. In Africa, the prevalence of childhood obesity has increased from 8.5% to 12.7% from 2010 to 2022, which shows an alarming increase by 49%<sup>10,11,12</sup>.

In Asian countries, there is a large variation within and between countries 3.5% in rural Bangladesh<sup>13,14</sup> to over 65% in the Maldives<sup>15,16</sup>, 30% in Iran and Saudi Arabia<sup>17</sup> and approximately 12.5% for Chinese<sup>18</sup>. In Asia, Obesity is found to be the highest among Thailand and lowest in India<sup>19</sup>. Pakistan is a country which is in the transition state and must deal with the double burden of coexistent over nutrition and undernutrition simultaneously. National Health Survey, Pakistan, 2017-18<sup>20</sup> found that among adolescents aged 5-17, 17% were overweight and 8.1% were obese.

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According to the Bureau of Statistics Planning and Development Department Government of Khyber Pakhtunkhwa <sup>21</sup> there is total of 1181 government primary schools, 171 government middle schools and 155 government high schools in Peshawar. According to the Elementary and Secondary Education Department Government of Khyber Pakhtunkhwa <sup>22</sup> there are total of 247 private primary schools, 388 private middle schools and 344 private high schools in Peshawar.

Because of the increasing prevalence of obesity in adolescents, it is an important issue to examine and monitor the risk factors in among adolescents who are vulnerable. The objective of this study is to determine the frequency of overweight and obese school-going adolescents and its associated risk factors in areas of district Peshawar Pakistan. As no information regarding the burden and contributing factors of overweight and obesity among school-going adolescents in district Peshawar is available, this study will provide fresh data and will identify the magnitude of the factors involved, which will help for planning interventional strategies focusing on primordial and primary prevention. Along with weight management measures on the individual level, societal interventions on the community level are also necessary.

## MATERIAL AND METHODS

A total of 300 students were involved in the study and was completed in 6 months period from 1<sup>st</sup> October 2020 till 30<sup>th</sup> March 2021. Apparently healthy adolescents both male and female, aged 10- 18 years attending private and government primary, secondary and high schools in the district Peshawar Khyber Pakhtunkhwa are included in our study. Any child with known medical conditions such as asthma, tuberculosis, chronic bronchitis, diabetes was excluded from study, because medications like insulin put them at risk of weight gain. Using WHO formula for prevalence studies for calculation of sample size using 95 % confidence interval and 5% margin of error.

Based on an overweight/obesity prevalence of 24.5% among school adolescents in Lahore sample size of 288 was estimated which was rounded off to 300. <sup>3</sup>

The listed schools in district Peshawar were stratified into three categories according to the monthly fee structure of the schools (figure-1). Those with a fee of 2500 PKR or above were categorized as high SES, those with a fee between 1000-2500 PKR in middle SES and those with a fee < 1000 PKR were put into low SES. Approval was sought from the school administration for data collection. The sample of 300 students was divided among three categories. Sample of 100 students was taken from 2 schools from each category which were selected using convenient sampling technique. From each school a sample of 50 students was taken. Six students were taken from each class i.e., grade 2-10. A Simple random sampling tech-

nique (balloting) was used to select male and female students from each age group. There was a bowl with papers coded as "yes" or "no". Students were asked to pick from the bowl and were then selected accordingly. The Weight and height of selected students were measured using digital weight machine and stadiometer respectively. Students were asked to remove shoes, jackets, watches or any excessive material. "BMI was calculated as Weight in kilograms over height in meters squared ( $BMI = \text{weight} / \text{height}^2$ )" <sup>(2)</sup>. According to the Center for Disease Control and Prevention (CDC), "adolescents who measure BMI-for-age at or above the 95th percentile as obese and with 85th and 95th percentile as overweight". <sup>23</sup> A pre-validated questionnaire was given to students to assess students' dietary habits. Answers are evaluated by assigning a score ranging from 0 to 3 with the maximum score assigned to the healthiest one and the minimum score to the least once. The total score of this section is 33. It is divided into three ranges, where the lowest one (15-21) referred to "inadequate eating habits", the medium one (22-27) referred to "partially satisfactory eating habits" and the highest score range from (28-33). <sup>27</sup> The Frequency of obesity is measured and its association with SES and dietary habits of students is determined by using chi-square test through SPSS-23. Kendall's Tau was used to determine statistical correlation between obesity and socioeconomic status and between obesity and dietary habits.

Ethical approval was sought from Institutional Review Ethical Board, Khyber Medical College Peshawar and from the administration of selected schools for data collection. Parents of students were contacted through consent forms.

## RESULTS

The age group range was between 10-18 years for both girls and boys with a mean of (13.80 years+ 2.48 S.D). The overall frequency of overweight and obesity was found to be 12.3% and 6.0% respectively.

Socioeconomic status was related to adolescents' risks of being overweight and obese. Highest frequency was found in adolescents of high socioeconomic status i.e., 35%, followed by middle SES 18% and 15% in low socioeconomic adolescents. After applying chi-square test, it was found that with overweight and obesity has a strong statistical association with socioeconomic status, with  $p=0.0001$ . By applying chi-square test, overweight and obese were found to have a significant relationship with dietary habits with  $p=0.002$ . Kendal-tau was applied to develop correlation. It was found that overweight and obesity has a positive correlation with socioeconomic condition +0.312. However, a negative correlation with dietary habits -0.092. .

**Table 1: Descriptive statistics**

| Variables | Sub classes | Under weight | Normal | Overweight | Obese | Total |
|-----------|-------------|--------------|--------|------------|-------|-------|
|           | 10          | 1            | 24     | 3          | 5     | 33    |
|           | 11          | 0            | 27     | 4          | 2     | 33    |
|           | 12          | 9            | 21     | 7          | 3     | 40    |
|           | 13          | 6            | 26     | 5          | 0     | 37    |
|           | 14          | 4            | 24     | 5          | 2     | 35    |
|           | 15          | 6            | 27     | 4          | 0     | 37    |
|           | 16          | 5            | 19     | 5          | 3     | 32    |
|           | 17          | 1            | 21     | 2          | 1     | 25    |
|           | 18          | 4            | 20     | 2          | 2     | 28    |
|           | Total       | 36           | 209    | 37         | 18    | 300   |
| Gender    | Male        | 22           | 106    | 17         | 13    | 158   |
|           | Female      | 14           | 103    | 20         | 5     | 142   |
|           | Total       | 36           | 209    | 37         | 18    | 300   |

**Table 2: Distribution of responses to different questions in the survey**

|                                                | Options            | Under weight | Normal | Overweight | Obese | Total |
|------------------------------------------------|--------------------|--------------|--------|------------|-------|-------|
| Do you eat breakfast?                          | Often              | 8            | 63     | 13         | 7     | 91    |
|                                                | Always             | 28           | 146    | 24         | 11    | 209   |
|                                                | Total              | 36           | 209    | 37         | 18    | 300   |
| Which beverage do you drink at Breakfast?      | Tea                | 21           | 72     | 10         | 8     | 111   |
|                                                | Fruit juice        | 1            | 32     | 4          | 2     | 39    |
|                                                | Milk               | 14           | 105    | 23         | 8     | 150   |
|                                                | Total              | 36           | 209    | 37         | 18    | 300   |
| Do you eat cereal (roti) in breakfast?         | No                 | 11           | 47     | 16         | 8     | 82    |
|                                                | Yes                | 25           | 162    | 21         | 10    | 218   |
|                                                | Total              | 36           | 209    | 37         | 18    | 300   |
| Do you eat morning snacks?                     | Always             | 19           | 81     | 14         | 11    | 125   |
|                                                | Often              | 17           | 128    | 23         | 7     | 175   |
|                                                | Total              | 36           | 209    | 37         | 18    | 300   |
| Do you eat afternoon snacks?                   | Always             | 24           | 114    | 25         | 8     | 171   |
|                                                | Often              | 12           | 95     | 12         | 10    | 129   |
|                                                | Total              | 36           | 209    | 37         | 18    | 300   |
| Do you consume snacks with                     | Cereals            | 26           | 131    | 17         | 6     | 180   |
|                                                | Fruits/fruit juice | 8            | 53     | 12         | 5     | 78    |
|                                                | Milk/yogurt        | 2            | 25     | 8          | 7     | 42    |
|                                                | Total              | 36           | 209    | 37         | 18    | 300   |
| Do you consume two portions of Fruit/day?      | Often              | 16           | 120    | 20         | 14    | 170   |
|                                                | Always             | 20           | 89     | 17         | 4     | 130   |
|                                                | Total              | 36           | 209    | 37         | 18    | 300   |
| Do you consume two portions of Vegetables/day? | Often              | 23           | 91     | 19         | 13    | 146   |
|                                                | Always             | 13           | 118    | 18         | 5     | 154   |
|                                                | Total              | 36           | 209    | 37         | 18    | 300   |
| Do you consume dessert at each meal?           | Always             | 12           | 65     | 11         | 9     | 97    |
|                                                | Often              | 24           | 144    | 26         | 9     | 203   |
|                                                | Total              | 36           | 209    | 37         | 18    | 300   |

|                                               |                    |    |     |    |    |     |
|-----------------------------------------------|--------------------|----|-----|----|----|-----|
| Do you consume soft drink at each meal?       | Always             | 5  | 40  | 14 | 7  | 66  |
|                                               | Often              | 31 | 169 | 23 | 11 | 234 |
|                                               | Total              | 36 | 209 | 37 | 18 | 300 |
| Do you consume five meals/day?                | Always             | 10 | 75  | 14 | 9  | 108 |
|                                               | Often              | 26 | 134 | 23 | 9  | 192 |
|                                               | Total              | 36 | 209 | 37 | 18 | 300 |
| Your habitual diet is                         | Unchanging         | 9  | 114 | 25 | 8  | 171 |
|                                               | Varied             | 27 | 95  | 12 | 10 | 129 |
|                                               | Total              | 36 | 209 | 37 | 18 | 300 |
| Which beverages do you consume Out of meals?  | Soft drinks        | 6  | 56  | 15 | 6  | 83  |
|                                               | Fruits/fruit juice | 3  | 23  | 5  | 0  | 31  |
|                                               | Water              | 27 | 130 | 17 | 12 | 186 |
|                                               | Total              | 36 | 209 | 37 | 18 | 300 |
| Do you consume a glass of milk or Yogurt/day? | Often              | 20 | 107 | 24 | 14 | 165 |
|                                               | Always             | 16 | 102 | 13 | 4  | 135 |
|                                               | Total              | 36 | 209 | 37 | 18 | 300 |
| Do you consume a liter of water/day?          | Often              | 13 | 107 | 24 | 14 | 165 |
|                                               | Always             | 23 | 102 | 13 | 4  | 135 |
|                                               | Total              | 36 | 209 | 37 | 18 | 300 |

**Table 3: The relationship of nutritional status with socioeconomic status**

|               |                                        | Health status |           |            |           | Total      | P=0.0001 | Correlation<br>+0.301 |
|---------------|----------------------------------------|---------------|-----------|------------|-----------|------------|----------|-----------------------|
|               |                                        | Underweight   | Normal    | Overweight | Obese     |            |          |                       |
|               |                                        | n (%)         | n (%)     | n (%)      | n (%)     |            |          |                       |
| Fee Of School | (<1000) low socioeconomic status       | 24(66.7%)     | 65(31.1%) | 8(21.6%)   | 3(16.7%)  | 100(33.3%) |          |                       |
|               | 1000_2500(middle socioeconomic status) | 10(27.8%)     | 77(38.6%) | 9(24.3%)   | 4(22.2%)  | 100(33.3%) |          |                       |
|               | >2500 (high socio-economic status)     | 2(5.6%)       | 67(32.0%) | 20(54.1%)  | 11(61.1%) | 100(33.3%) |          |                       |
| Total         |                                        | 36(100%)      | 209(100%) | 37(100%)   | 18(100%)  | 300(100%)  |          |                       |

**Table 4: The relationship of nutritional status with dietary habits**

|             |                                  | Health status |           |            |           | Total      | P=0.004 | Correlation<br>+0.301 |
|-------------|----------------------------------|---------------|-----------|------------|-----------|------------|---------|-----------------------|
|             |                                  | Underweight   | Normal    | Overweight | Obese     |            |         |                       |
|             |                                  | N (%)         | N (%)     | N (%)      | N (%)     |            |         |                       |
| Food status | Inadequate food habits           | 7(19.4%)      | 18(8.6%)  | 8(21.6%)   | 4(22.2%)  | 37(12.3%)  |         |                       |
|             | Partial satisfactory food habits | 20(55.6%)     | 97(26.4%) | 21(56.8%)  | 12(66.7%) | 150(50.1%) |         |                       |
|             | Satisfactory food habits         | 9(25.1%)      | 94(45.1%) | 8(21.6%)   | 2(11.1%)  | 113(37.7%) |         |                       |
| Total       |                                  | 36(100%)      | 209(100%) | 37(100%)   | 18(100%)  | 300(100%)  |         |                       |

## DISCUSSION:

The overall frequency of overweight and obese School-going adolescents was found to be 12.3 % and 6.0% respectively. A Higher prevalence was found in girls with 23% girls being overweight and obese and boys were 22%. It was also determined by Ahmed J et al <sup>24</sup>, a study

was done in Hyderabad Pakistan, thirteen percent (95% CI) adolescents were overweight and 7.5% (95% CI) were obese.

Although, obesity was seen in all categories of socioeconomic status adolescents, it was found to be more prevalent in high socioeconomic adolescents as

compared to middle and low socioeconomic adolescents which were also ascertained by Mushtaq et al<sup>25</sup> that adolescents of high socioeconomic status living in the urban area were significantly at risk of obesity (both  $P < 0.001$ ) as compared to adolescents of low SES living in the urban area. Our study results are also consistent with Anekwe CV et al<sup>28</sup> who studied the effects of socioeconomic status with obesity and found it significant. Our study results are also in line with Gnani R<sup>29</sup> studied obesity in Prepubertal adolescents and found significant association with socioeconomic status.

Dietary habits were also associated with obesity. Our results were also consistent with Abdullah et al<sup>26</sup> who found a negative correlation between obesity and dietary habits. Ludwig et al<sup>27</sup> conducted a study of 548 participants to find the relationship of obesity with eating food types and found increasing obesity with high calorie consumption. Our study results are consistent with Brownell KD<sup>30</sup>. Our study results are also in line with Leung CW et al<sup>(31)</sup> who studied associations of food and its Dietary Quality with Obesity in Adolescents and found it to be significantly associated.

Obese people were found to have inadequate dietary habits due to the easy lifestyle, high calorie consumption and sedentary behavior of urban adolescents.

The limitations of my study were that due to financial constraints we couldn't take sample from all the districts of KPK.

## CONCLUSION

Obesity in adolescents is rising significantly in district Peshawar where every 4<sup>th</sup> or 5<sup>th</sup> adolescent is either overweight or obese. The major risk factors were socioeconomic status and dietary habits, which were statistically found to be strongly associated with obesity.

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**Mustafa A:** Concept and design of study

**Ayub R:** Manuscript writing

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# PERINATAL MORTALITY IN BOOKED AND UN-BOOKED PAKISTANI MOTHERS

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## ABSTRACT

**Objective:** Perinatal mortality is a key parameter of the health services quality, provided to pregnant females and their babies. Perinatal mortality search finds out the status of quality of services, helps in determining the cause of perinatal deaths and how to reduce it in an institution. The study aims to detect the effect of antenatal booking on perinatal outcome as many women in this part of world do not get antenatal care due to various avoidable factors.

**Methods:** This descriptive cross sectional study was performed in Gynae/Obs department, Lady Reading Hospital, Peshawar from May 2016 to November 2016. In which a total of 165 patients were followed. After approval from hospital ethical committee, written consent was taken from all included mothers. After admission, detailed history and examination was done, to exclude confounding risk factors like diabetes mellitus, hypertension, antepartum hemorrhage and malpresentation. Base line investigations were done. Fetal cardiac activity was confirmed by ultra-sonography and monitored by cardiotocography. All the mothers were followed till delivery and baby was followed for a week. Number of still births and deaths in the first seven days of life in the two groups were determined.

**Results:** Mean age was 30 years with  $SD \pm 1.27$  in this study, the frequency of perinatal mortality was 6%, in which 23% patients were booked and 77% patients were un-booked.

**Conclusion:** Our study concludes that the frequency of perinatal mortality was 6%, in which 23% patients were booked and 77% patients un-booked.

**Key Words:** Perinatal mortality, Booked, un-booked mother, Cardiotocography

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## INTRODUCTION

Perinatal mortality is a key parameter of the health services quality provided to pregnant ladies and their babies. Perinatal mortality search finds out the status of quality of services, helps in determining the cause of perinatal deaths and how to reduce it in an institution. According to WHO, the number of perinatal deaths is more than 7.6 million, with 98% of these in less developed countries<sup>1</sup>. Perinatal mortality rates are used to assess the outcome of pregnancy and to monitor the quality of antenatal care (maternity and childbirth)<sup>2</sup>. One hundred and thirty million babies are born annually worldwide, 140 lac die in first twenty eight days of life, 3/4 of infant deaths occur in the first week and  $>1/4$  in the first twenty four hours<sup>3</sup>.

A case-control study involving 406 un-booked and 396 booked births, preterm delivery rate was half as likely in booked vs un-booked pregnancies, stillbirth rate was seven time more in unbooked vs booked pregnancies, low birth weight babies birth, was a third as likely in booked vs unbooked pregnancies. Birth weight of  $2.95 \pm 0.53$  kg in unbooked births while  $3.08 \pm 0.45$  kg in booked births. Mean Apgar score at one and five minutes was much lower in un-booked births than booked births. Un-booked births are common and their birth effects can lead to high Morbidity and disability was high in unbooked births, thus leading to more infants deaths in developing countries. Providing better health facilities to mothers through the process of birth and to babies in early life and to all un-booked births results in good birth outcome<sup>4</sup>.

A study (cohort) done to compare booked vs un-booked pregnancies, in term of maternal and fetal outcome, socio-economic demographics from September 2006 to march 2008 showed that preterm delivery rate was five time more (OR)=6.44, 94% (CI)= 2.24-18.50,  $p < 0.0002$ : low birth weight babies { $<2500$  g} were three time more (OR)=2.87, 94% (CI)=1.21-6.82,  $P < 0.02$ : and post-partum hemorrhage was twice more (OR)=1.85, 94% (CI)

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= 0.69-4.98,  $p = 0.3$ )<sup>5</sup> in unbooked patients. The study aims to detect the effect of antenatal booking on perinatal outcome as many women in this part of world do not get antenatal care due to various avoidable factors.

## MATERIALS AND METHODS

The study was performed in Gynea/Obs department, Lady Reading Hospital, Peshawar from May 31, 2016 to November 31, 2016. Sample size was calculated through WHO Sample size calculator. A total of 165 mothers were included by taking prevalence of perinatal mortality 0.4%, confidence level 95% and margin of error 4.5%. This was a cross-sectional study (descriptive) and consecutive (non- probability) sampling technique was used. Patients included were having age 15 to 45 years, Primigravida, Laboring patient and Gestational age (>37 weeks) seen in Gynae department of this hospital. Patients with identifiable risk factors for perinatal mortality like Diabetes Mellitus, Hypertension, Antepartum hemorrhage, malpresentation and IUGR were excluded. All above conditions were confirmed on history and medical records.

After approval from hospital ethical committee, a consent was taken from all patients. After admission to the hospital, detailed history and examination was done to exclude confounding risk factors like diabetes mellitus, hypertension, antepartum haemorrhage and malpresentation. Base line investigations were done. Foetal cardiac activity was confirmed by ultra-sonography and monitored by cardiotocography. All the mothers were followed till delivery and baby was followed for a week. All the data was noted in form of a predesigned proforma. Number of still births and deaths in the first seven days of life in the two groups were determined. Data was analyzed using SPSS version 7 computer software programme. Quantitative variables like gestational age, mother age were described as mean and standard variables (SD). Categorical variables like booking, perinatal mortality, gravidity and labor was described in term of frequencies and percentages, results was tabulated. Perinatal mortality was stratified among patient age, gestational age and gravidity. Considering  $P \leq 0.05$  as significant post stratification chi square was used.

## RESULTS

In this study, age distribution among 165 patients was analyzed as 33(20%) < 20 years, 73(44%) 21 to 30 years, 41(25%) 31 to 40 years, 18(11%) 41 to 50 years. Mean age was 30 years with  $SD \pm 1.27$ . (See in Table No 1). Gestational age in 165 patients was analyzed as 127(77%) patients had POG range 37-39 weeks, while 38(23%) patients had POG range 40-42 weeks. Mean POG was 38 weeks with standard deviation  $\pm 3.27$ . (See in Table No 2) All the women were Primigravida and were in active labor (Shown in table no 3, 4). Booking status among 165 patients was analyzed as 46(28%) patients were booked while 119 (72%) patients were un-booked

(as shown in Table No 5). Frequency of perinatal mortality among 165 patients was analyzed as 10(6%) mother had perinatal mortality while 155 (94%) mother didn't had perinatal mortality. (As shown in Table No 6)

Frequency of perinatal mortality in booked and un-booked patients was analyzed as 3(23%) mother had perinatal mortality who were booked patients, on the other hand 7(77%) mother had perinatal mortality who were un-booked. (As shown in Table No 10). Stratification of perinatal mortality with respect to age, gestational age, gravida and booking status is given in Table No 7, 8,9,10.

**Table 1: Maternal Age (N=165)**

| Age         | Frequency | Percentage |
|-------------|-----------|------------|
| < 20 years  | 33        | 20%        |
| 21-30 years | 73        | 44%        |
| 31-40 years | 41        | 25%        |
| 41-45 years | 18        | 11%        |
| Total       | 165       | 100%       |

30 with  $SD \pm 1.27$  was mean age

**Table 2: Gestational Age (N=165)**

| POG         | Frequency | Percentage |
|-------------|-----------|------------|
| 37-39 weeks | 127       | 77%        |
| 40-42 weeks | 38        | 23%        |
| Total       | 165       | 100%       |

38 weeks with  $SD \pm 3.27$  was mean POG

**Table 3: Genetic variations (SNP & Indel mutation) in the study population (n = 30)**

| Gravidity     | Frequency | Percentage |
|---------------|-----------|------------|
| Primi gravida | 165       | 100%       |
| Total         | 165       | 100%       |

**Table 4: Labour (N = 165)**

| Labour | Frequency | Percentage |
|--------|-----------|------------|
| Yes    | 165       | 100%       |
| No     | 00        | 100%       |
| Total  | 165       | 100%       |

**Table 5: Booking Status (N = 165)**

| Booking status | Frequency | Percentage |
|----------------|-----------|------------|
| Booked         | 46        | 28%        |
| Un booked      | 119       | 72%        |
| Total          | 165       | 100%       |

**Table 5: Booking Status (N = 165)**

| Perinatal Mortality | Frequency | Percentage |
|---------------------|-----------|------------|
| Yes                 | 10        | 6%         |
| No                  | 155       | 94%        |
| Total               | 165       | 100%       |

**Table 5: Stratification of Perinatal Mortality W.R.T age Distribution (N = 165)**

| Perinatal Mortality | < 20 years | 21-30 years | 31-40 years | 41-45 years | Total |
|---------------------|------------|-------------|-------------|-------------|-------|
| Yes                 | 2          | 4           | 3           | 1           | 10    |
| No                  | 31         | 69          | 38          | 17          | 155   |
| Total               | 33         | 73          | 41          | 18          | 165   |

## DISCUSSION

Perinatal mortality is a key parameter of the health services quality provided to pregnant ladies and their babies. Perinatal mortality search finds out the status of quality of services, helps in determining the cause of perinatal deaths and how to reduce it in an institution. According to WHO, the number of perinatal deaths is more than 7.6 million, with 98% of these in less developed countries<sup>1</sup>. Perinatal mortality rates are used to assess perinatal care quality and pregnancy outcome evaluate the outcome of pregnancy and monitor the quality of perinatal care<sup>2</sup>.

In this study mean age was 30 years with  $SD \pm 1.27$ , the frequency of perinatal mortality was 6% in which 23% patients were booked and 77% patients were un-booked. In another study, similar results were observed conducted by Sahoo S et al<sup>5</sup> in which perinatal mortality was (3.44%) in booked and (27.26%) in un-booked patients ( $p < 0.05$ ). A marked difference of intrauterine death was present between un-booked and booked mothers. In another study, similar results were observed conducted by Kalim D et al<sup>6</sup> in which 840 (42%) were un-booked and 1160 (58%) were booked out of 2000 antenatal patients. Instrumental delivery and emergency operative delivery rates were 3.6% and 8.89% in un-booked patients as compared to 2.3% and 4.15% in booked patients ( $p < 0.001$ ) respectively. Premature rupture of membranes, Pregnancy-induced hypertension and Anemia were observed in 90 (4.5%), 38 (1.9%) and 53 (2.65%) booked and 223 (11.15%), 109 (5.45%), 102 (5.1%) un-booked patients, respectively. Perinatal asphyxia, low Apgar score, low birth weight and sepsis were observed in 104 (5.2%), 43 (2.15%), 61 (3.05%) and 40 (2%) babies of booked mothers and 170 (8.5%), 76 (3.8%), 208 (10.4%) and 62 (3.1%) babies of un-booked mothers ( $p < 0.001$ ) respectively. Perinatal mortality rate was 1.65% ( $n=33$ ) and 3.6% ( $n=72$ ) in babies of booked and un-booked mothers respectively ( $p < 0.001$ ). Maternal mortality was zero. In another study, similar results were observed, conducted by Shamshad et al<sup>7</sup> in which 5412 deliveries with perinatal mortality of 9.2% occurred (498 deaths). In these patients, 88.7% un-booked and 11.2% were booked. Perinatal death rate was 9.4%, 44.9%, 39.95%, and 5.6% in patients under 20 years, under 30 years, under 40 years and above 40 years respectively. There were 26.7%, 42.9%, 30.3% deaths in Primigravida, in multipara and in grand multipara respectively. Regarding pregnancy, 40.3% patients had pregnancy of 24 to 32 weeks, 31.7% had of 33 to 36 weeks and 28% had 37 to 42 weeks pregnancy. Regarding deaths, 21.8% were due to bleeding in pregnancy, 20.4% hypertensive disorders

of pregnancy, 18% mechanical cause, 14.4% congenital anomalies, 12.8% neonatal causes, 5% maternal medical disorders and 5% unknown causes.

## CONCLUSION

Our study concludes that the frequency of perinatal mortality was 6%, in which 23% patients were booked and 77% patients were un-booked.

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Following authors have made substantial contributions to the manuscript as under

- Ajmal H:** Conceived the idea, Literature review, Manuscript writing
- Rahim R:** Sample collection and Laboratory Work, Final approval of draft
- Said S:** Sample collection, Bibliography

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# KNOWLEDGE, ATTITUDE, AND PRACTICE REGARDING BIOMEDICAL WASTE MANAGEMENT AMONG HEALTH CARE PROVIDERS AT A TEACHING HOSPITAL, LAHORE

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## ABSTRACT

**Objectives:** To check the knowledge, attitude, and practice among health care providers regarding biomedical waste management in Government Teaching Hospital Shahdara Lahore.

**Material and Methods:** A cross-sectional study was conducted at Government Teaching Hospital Shahdara, Lahore, Pakistan, from 15 March to 31 June 2020. A stratified random sampling technique was used to select samples. One hundred subjects, 58 nurses, 26 doctors, and 16 paramedical staff were selected by the WHO formula. Departmental and ethical permission was taken. Data were collected from health care providers (doctors, nurses, and paramedics) through a self-administered questionnaire.

**Results:** Results revealed that nurses have higher knowledge than doctors and paramedical staff regarding biomedical waste management as nurses have 66%, doctors 45%, and paramedics have only 26% scores. Furthermore, nurses have a positive attitude regarding biomedical waste management. On the contrary, a negative attitude was found among doctors and paramedical staff. Good practice was found among nurses; scores were 87%, followed by doctors and paramedics with the same score as 34%.

**Conclusion:** The risks of injuries or occupational hazards are increased due to a lack of knowledge about standard protocols and guidelines of biomedical waste management.

**Keywords:** Paramedics, Segregation, Biomedical Waste

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## INTRODUCTION

Waste generated during the treatment, diagnosis and immunization of human beings and animals is called biomedical waste. Biomedical waste increases day by day with the increase in health care facilities. About 0.33 million biomedical waste is generated annually in India. 10% to 25% of waste is biohazard waste, and 75% to 85% is general or domestic waste. Each bed generated 0.5 to 2.0kg of waste in India<sup>1</sup>. Biomedical waste management and handling rules were first passed in 1998. The main aim of these rules is proper handling and segregation

of infectious and non-infectious waste. Globally a rise in health institutions and hospitals has also increased the burden of biomedical waste due to excessive usage of disposable medical items. The risk of illness increases among health care providers due to improper handling of biomedical waste<sup>2</sup>. In 2019, WHO stated that highly developed countries generate 0.5kg of infectious waste per day and underdeveloped countries 2.0kg per day per bed<sup>3</sup>. Biomedical waste handling is an important issue. If infectious isolation and end disposal waste are not handled correctly, it can cause severe illness and environmental problems<sup>4</sup>. Improper handling and transmission of biomedical waste are the reason to generate diseases like HIV/AIDS, hepatitis B, and hepatitis C<sup>5</sup>.

Healthcare providers, including doctors, nurses, and janitorial staff, are at greater risk of being infected with biomedical waste. About 59 million people worldwide work as health care workers. These large numbers of people are at risk of occupational hazards<sup>6</sup>. These peo-

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ple's higher risk are due to their more extensive exposure to healthcare waste, inability to manage waste properly by hospitals and no awareness by the health personnel regarding their health hazards <sup>7</sup>. According to the WHO, about 500 million people globally are getting infected with either Hepatitis B or Hepatitis C<sup>8</sup>. These hazards are due to a lack of knowledge, awareness, and practice of biomedical waste and non-implementation of handling rules and regulations given by World Health Organization and Centers for Disease Control and Prevention (CDC) <sup>9</sup>.

## MATERIAL AND METHODS

A cross-sectional study was conducted in the Emergency, gynae, ICU, medical and surgical department of Government Teaching Hospital Shahdra Lahore, Pakistan, from 15 March to 31 June 2020. A stratified random sampling technique was used to collect data from participants. Three strata were made, one for doctors, the second for nurses, and the third for paramedical staff. A list of total doctors, nurses, and paramedical staff was made. The total population was 927, from which 540 nurses, 240 doctors, and 147 paramedical staff was included. The sample size was selected by WHO proportional formula.<sup>8</sup> According to the formula, 58 nurses, 26 doctors, and 16 paramedical staff was selected Health care professionals who have more than 3 years of experience and working in the emergency, ICU, gynae, medical and surgical departments of hospitals were included in this study. A self-administered questionnaire was used to collect data from participants that consist of four sections, 1st demographic

data, 2nd knowledge, 3rd attitude, 4th practice regarding biomedical waste among health care providers.<sup>9</sup> Data collection was completed within three months. The questionnaires were delivered to all the participants, and it was assured that their information would be kept confidential. Data collection was started 1st April-15 May 2020. SPSS version 20 was used to analyze data. Frequency and percentage were used to interpret data.

## RESULTS

In this study, 58 nurses, 26 doctors, and 16 paramedics have participated. According to criteria, it was considered good if responses were above 60%. 50% of responses were assessed at an average level, and below 50% were regarded as poor knowledge. The present study results revealed that nurses with 66% scores have good knowledge, followed by doctors having average knowledge with 45% scores on analysis, and the paramedics have poor knowledge with 26% scores regarding biomedical waste management. The attitude of nurses regarding biomedical waste was positive (60%), but it was shown that doctors and

paramedics have a negative attitude with scores of 30% and 21%, respectively. The practice of biomedical waste management was found excellent in nurses as results showed 87% scores. Still, doctors and paramedical staff had a meager practice of BM waste management as results were 34% and 34%.

**Table 1: Distribution of subjects according to Knowledge, Attitude, and practice scores**

| Categories | Knowledge | Attitude | Practice |
|------------|-----------|----------|----------|
| Doctors    | 45%       | 30%      | 34%      |
| Nurses     | 66%       | 60%      | 87%      |
| Paramedics | 26%       | 21%      | 34%      |

**Table 2: Knowledge regarding biomedical waste management among healthcare providers (n=100)**

| Questions                                                                 | Doctors (n=26) | Nurses (n=58) | Paramedics (n=16) |
|---------------------------------------------------------------------------|----------------|---------------|-------------------|
| Do you know about BM waste generation and legislation?                    |                |               |                   |
| Yes                                                                       | 17(65%)        | 50(86%)       | 4 (25.0%)         |
| No                                                                        | 5(19%)         | 5(8.0%)       | 6(37.5%)          |
| Don't know                                                                | 4(16%)         | 3(5.1%)       | 6(37.5%)          |
| What agency (ies) regulate(s) wastes generated at health care facilities? |                |               |                   |
| Yes                                                                       | 15(57.6%)      | 12(20%)       | 2(13%)            |
| No                                                                        | 8(30.5%)       | 36(62%)       | 10(62%)           |
| Don't know                                                                | 3(11.5%)       | 10(17%)       | 4(25%)            |
| Do you know about the color-coding segregation of BM waste?               |                |               |                   |
| Yes                                                                       | 12(46%)        | 49(84%)       | 8(50%)            |
| No                                                                        | 10(38%)        | 6(11%)        | 5(31%)            |
| Don't know                                                                | 4(16%)         | 3(5%)         | 3(19%)            |
| Biomedical Waste (Management & Handling) Rules were first proposed in:    |                |               |                   |
| Yes                                                                       | 19(73%)        | 41(70%)       | 1(6%)             |

|                                                                                   |          |         |         |
|-----------------------------------------------------------------------------------|----------|---------|---------|
| No                                                                                | 3(11.5%) | 7(12%)  | 10(63%) |
| Don't know                                                                        | 4(15%)   | 10(18%) | 5(31%)  |
| Modifications to the Biomedical Waste (Management & Handling) Rules were made in: |          |         |         |
| Yes                                                                               | 6(23%)   | 41(70%) | 5(31%)  |
| No                                                                                | 12(46%)  | 10(18%) | 8(50%)  |
| Don't know                                                                        | 8(31%)   | 7(12%)  | 3(19%)  |
| Which statement describes one type of BM waste?                                   |          |         |         |
| Yes                                                                               | 8(30%)   | 42(72%) | 6(37%)  |
| No                                                                                | 12(46%)  | 14(24%) | 7(44%)  |
| Don't know                                                                        | 6(24%)   | 2(4%)   | 3(19%)  |
| Do you need a separate permit to transport biomedical waste?                      |          |         |         |
| Yes                                                                               | 7(26%)   | 38(65%) | 4(25%)  |
| No                                                                                | 14(54%)  | 8(14%)  | 8(50%)  |
| Don't know                                                                        | 5(20%)   | 12(20%) | 4(25%)  |

**Table 2: Knowledge regarding biomedical waste management among healthcare providers (n=100)**

| Questions                                                                                                                                                                                                                       | Doctors (n=26) | Nurses (n=58) | Paramedic (n=16) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------|------------------|
| Do you think it is important to know about BM waste generation, hazards, and legislation?                                                                                                                                       |                |               |                  |
| Yes                                                                                                                                                                                                                             | 10(38%)        | 39(67%)       | 8(50%)           |
| No                                                                                                                                                                                                                              | 9(35%)         | 8(14%)        | 6(38%)           |
| Don't know                                                                                                                                                                                                                      | 7(27%)         | 11(19%)       | 2(12%)           |
| Safe management of health care waste is not an issue at all.                                                                                                                                                                    |                |               |                  |
| Yes                                                                                                                                                                                                                             | 20(76%)        | 45 (77%)      | 5 (31%)          |
| No                                                                                                                                                                                                                              | 4(15%)         | 8(14%)        | 5(31%)           |
| Don't know                                                                                                                                                                                                                      | 2(8%)          | 5(9%)         | 6(38%)           |
| Is the waste disposal practice correct in your hospital?                                                                                                                                                                        |                |               |                  |
| Yes                                                                                                                                                                                                                             | 9 (34%)        | 47 (81%)      | 7(43%)           |
| No                                                                                                                                                                                                                              | 7(27%)         | 5(9%)         | 3(19%)           |
| Don't know                                                                                                                                                                                                                      | 10(39%)        | 6(10%)        | 6(38%)           |
| Do you think Objects that may be capable of causing punctures or cuts, that may have been exposed to blood or body fluids including scalpels, needles, glass ampoules, test tubes, and slides, are considered biomedical waste? |                |               |                  |
| Yes                                                                                                                                                                                                                             | 4(15%)         | 40(68%)       | 1(6%)            |
| No                                                                                                                                                                                                                              | 18(70%)        | 11(19%)       | 9(56%)           |
| Don't know                                                                                                                                                                                                                      | 4(15%)         | 7(13%)        | 6(38%)           |
| The color code for the BM waste to be autoclaved disinfected is:                                                                                                                                                                |                |               |                  |
| Yes                                                                                                                                                                                                                             | 8(30%)         | 27(46%)       | 0 (0%)           |
| No                                                                                                                                                                                                                              | 9(35%)         | 15(26%)       | 7(44%)           |
| Don't know                                                                                                                                                                                                                      | 9(35%)         | 16(28%)       | 9(56%)           |
| Are you satisfied with the team of waste management in your hospital?                                                                                                                                                           |                |               |                  |
| Yes                                                                                                                                                                                                                             | 10(38%)        | 48(82%)       | 2 (12%)          |
| No                                                                                                                                                                                                                              | 11(42%)        | 6(10%)        | 11(69%)          |
| Don't know                                                                                                                                                                                                                      | 5(19%)         | 4(7%)         | 3(19%)           |
| All of the following statements about hazardous waste containers are true, except for:                                                                                                                                          |                |               |                  |
| Yes                                                                                                                                                                                                                             | 4(15%)         | 36(62%)       | 5 (31%)          |
| No                                                                                                                                                                                                                              | 15(58%)        | 14(24%)       | 8(50%)           |
| Don't know                                                                                                                                                                                                                      | 7(27%)         | 8(14%)        | 3(19%)           |

**Table 4: Practice regarding biomedical waste management among healthcare Providers (n=100)**

| Questions                                                                                                  | Doctors (n=26) | Nurses (n=58) | Paramedics (n=16) |
|------------------------------------------------------------------------------------------------------------|----------------|---------------|-------------------|
| The approximate proportion of infectious waste among total waste generated from a health care facility is: |                |               |                   |
| Yes                                                                                                        | 8(31%)         | 46(79%)       | 4(25%)            |
| No                                                                                                         | 10(38%)        | 8(14%)        | 10(63%)           |
| Don't know                                                                                                 | 8(31%)         | 4(7%)         | 2(12%)            |
| Is there proper segregation of BM waste in your institution?                                               |                |               |                   |
| Yes                                                                                                        | 9(34%)         | 49(84%)       | 7(43%)            |
| No                                                                                                         | 12(46%)        | 4(7%)         | 5(31%)            |
| Don't know                                                                                                 | 5(19%)         | 3(5%)         | 4(25%)            |
| Is the infectious waste sterilized by autoclaving before shredding and disposal in your institution?       |                |               |                   |
| Yes                                                                                                        | 10(38%)        | 50(86%)       | 6(37%)            |
| No                                                                                                         | 9(35%)         | 5(9%)         | 3(19%)            |
| Don't know                                                                                                 | 7(27%)         | 3(5%)         | 7(44%)            |
| Safe management efforts by the hospital increase the financial burden on management.                       |                |               |                   |
| Yes                                                                                                        | 8(30%)         | 38(65%)       | 8(50%)            |
| No                                                                                                         | 11(42%)        | 18(31%)       | 6(38%)            |
| Don't know                                                                                                 | 7(65%)         | 2(4%)         | 2(13%)            |
| Do Containers labeled before filling it with waste in your institution?                                    |                |               |                   |
| Yes                                                                                                        | 6(24%)         | 39(67%)       | 3(18%)            |
| No                                                                                                         | 10(38%)        | 7(12%)        | 9(56%)            |
| Don't know                                                                                                 | 10(38%)        | 12(21%)       | 4(25%)            |
| Do you follow color-coding for BM waste?                                                                   |                |               |                   |
| Yes                                                                                                        | 10(38%)        | 52(89%)       | 7(43%)            |
| No                                                                                                         | 12(46%)        | 4(7%)         | 6(38%)            |
| Don't know                                                                                                 | 4(15%)         | 2(4%)         | 3(19%)            |
| Have you attended voluntarily programs that enhance and upgrade your knowledge about waste management?     |                |               |                   |
| Yes                                                                                                        | 13(50%)        | 29(50%)       | 0(0%)             |
| No                                                                                                         | 8(31%)         | 17(29%)       | 10(63%)           |
| Don't know                                                                                                 | 5(19%)         | 12(21%)       | 6(17%)            |
| Is the waste disposal practice correct in your hospital?                                                   |                |               |                   |
| Yes                                                                                                        | 6(23%)         | 38(65%)       | 4(25%)            |
| No                                                                                                         | 12(46%)        | 8(14%)        | 8(50%)            |
| Don't know                                                                                                 | 8(31%)         | 10(17%)       | 4(25%)            |

## DISCUSSION

This study was conducted at Government Teaching Hospital Shahdra Lahore to evaluate the knowledge, attitude, and practice of biomedical waste management among health care providers, including doctors, nurses, and paramedical staff. The present study results showed that nurses with 66% scores had good knowledge, followed by doctors having average knowledge with 45% scores on analysis, and the paramedics have poor knowledge with 26% scores regarding biomedical waste management. The attitude of nurses regarding biomedical waste was positive 60% while doctors and paramedics had lower scores of 30% and 21%, respectively. The prac-

tice of biomedical waste management was found excellent in nurses as results showed 87% scores. Still, doctors and paramedical staff had a meager practice of BM waste management as results were 34% and 34% respectively.

The current study revealed the same results as one previous study where the nurses had more knowledge than others, in our study too, with 66% nurses were in the lead in knowledge about biomedical waste management <sup>10</sup>. Appropriate awareness regarding biomedical waste is essential because it has hazardous effects on health, severely destroying health and the environment. The present study contradicts the results of a previous study <sup>11</sup> that doctors have good knowledge of biomedical waste

disposal because only 45% of doctors have knowledge about waste disposal in this study. Still, it was found that nurses have good knowledge about BM waste management because 66% of nurses responded correctly. This study's results were also in similarity with one previous study<sup>12</sup> that paramedical staff have less knowledge about BM waste management because our results showed that only 26% of paramedics know BM waste management.

Furthermore, the current study assessed the attitude of health care workers towards the safe management of biomedical waste, which revealed that nurses have the highest attitude regarding BM waste management as results showed 60% of nurses showing a good attitude toward safe management of BM waste. The results of the present study opposed the results of one previous study (2) that doctors have a good attitude regarding BM waste management. Whereas another study conducted<sup>13, 14</sup> in India had the same results as this study revealing that paramedical staff had a lower attitude regarding BM waste management.

Healthcare professionals in various facilities practice unsafe and inappropriate means of biomedical waste. The results of this study were in line with one previous study<sup>1</sup> that hazardous waste was not properly collected, segregated, and disposed off in an appropriate manner. This study is also in compliance with the results of one previous study (14) that nurses have good practice of BM waste management followed by doctors, but due to poor knowledge and attitude, paramedical staff have less practice of biomedical waste segregation and disposal.

## CONCLUSION

Biomedical waste management puts healthcare providers at significant risk for infectious diseases. The present study outlines a substantial gap in knowledge, awareness, and practices in the execution of biomedical waste management rules by health care professionals. In addition, the lack of regular training and updates on occupational safety measures was also found. There was also poor management of collection, segregation, transportation, and biomedical waste disposal.

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#### AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

**Shaheen M:** Concept and design of study

**Yousaf N:** Concept and design of study

**Bibi T:** Manuscript writing

**Shaheen S:** Writing, review, and references management

**Rehman A:** literature search, data collection and review

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# BREASTFEEDING PRACTICES AMONG INFANTS PRESENTING WITH ACUTE DIARRHEA

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## ABSTRACT

**Objectives:** To determine the frequency of feeding practices among infants presenting with acute diarrhea.

**Material and Methods:** This cross sectional study was carried out from October 2019 to March 2020 in the Paediatric Out-Patient Department of Khyber Teaching Hospital, Peshawar. Infants with acute diarrhea were included in the study after meeting the inclusion criteria. Sampling was done by consecutive (non-probability) sampling. Sample size was 141 by using WHO sample size calculator. data was statistically analyzed using SPSS v23.

**Results:** Out of 141 infants who presented with acute diarrhea in our study, 26(18.4%) were exclusively breastfed, 79(56%) were partially breastfed, while 36(25.5%) were non breastfed. Out of 141, 80(56.7%) were male and 61(43.3%) were female, with frequency of exclusive breastfeeding in males being 17.5% and in females being 19.7%. The mean age of the infant presenting with diarrhea was 3.25 months, while the mean age of the mother in the study was found to be 26.4 years. The rate of exclusive breastfeeding was 7.7% in working mothers compared to 19.5% in housewives.

**Conclusion:** The most common feeding practice among infants presenting with acute diarrhea is partial breastfeeding which is not as effective as exclusive breastfeeding in preventing and reducing morbidity from diarrheal diseases.

**Key Words:** Feeding practices, Exclusive breastfeeding, Partial breastfeeding, Non breastfeeding and Acute Diarrhea.

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## INTRODUCTION

Diarrheal diseases are the second leading infectious cause of mortality globally, after lower respiratory infections, among children.<sup>1</sup> Diarrhea is a global problem. In 2016, diarrhea was the eighth leading cause of mortality, responsible for more than 1.6 million deaths. More than a quarter (26-93%) of diarrheal deaths occurred among children younger than 5 years, and about 90% (89-37%) of diarrheal deaths occurred in south Asia and sub-Saharan Africa.<sup>2</sup>

Global mortality may be declining rapidly, but the overall incidence of diarrhea has only declined from 3.4 to approximately 2.9 episodes per child-year in the past 2 decades, and it is estimated to account for 23 million childhood disability-adjusted life years. In addition to the risk of mortality, persistently high rates of diarrhea, especially prolonged and persistent diarrhea among young

children may be associated with long term adverse outcomes. Diarrheal illnesses, especially early and repeated episodes among young children can be associated with malnutrition, micronutrient deficiencies, and significant deficits in psychomotor and cognitive development.<sup>3</sup>

Malnutrition is another public health problem, often associated with an increased risk of mortality and commonly a cause and a consequence of diarrheal disease. Indeed, diarrhea episodes among malnourished children seem to be more complicated and prolonged than among non-malnourished children, and convey a worse prognosis.<sup>4</sup>

Breastfeeding has documented short and long term medical and neurodevelopmental advantages. Thus, the decision to breastfeed should be considered a public health issue and not only a lifestyle choice. The American Academy of Pediatrics and the World Health Organization recommend that infants should be exclusively breastfed or given breast milk for 6 months.<sup>5</sup> Complementary foods are introduced after this initial period, but breastfeeding is recommended for another two years or more.<sup>6</sup> Despite efforts to promote exclusive breastfeeding through 6 months, less than 50% of women continue to breastfeed at 6 months.<sup>5</sup> Lack of exclusive breastfeeding among infants 0- 5 months of age and no breastfeeding among children 6-23 months of age are associated with increased

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diarrhea morbidity and mortality in developing countries. In Africa, Asia, Latin America, and the Caribbean, only 47-57% of infants less than 2 months and 25-31% of infants 2-5 months are exclusively breastfed.<sup>7</sup>

Feeding practices like early breastfeeding initiation, exclusive breastfeeding, complementary feeding initiation, complementary food hygiene, hand washing at the time of feeding, and child vaccination are factors associated with childhood diarrhea.

An increasing number of studies has confirmed that breastfeeding acts as a protective factor against diarrhea, which reduces the occurrence of childhood diarrhea and its severity.<sup>8</sup> Pakistan is a populous country of 185 million people with the fourth highest burden of child mortality globally, and insufficient progress in improving child survival.<sup>9</sup> Diarrhea and other infectious diseases remain major killers.<sup>10</sup>

In order to address the preventable causes of acute diarrhea, we conducted this study to determine the role of exclusive breastfeeding. Not much local data is available in our population regarding feeding practices among children presenting to health care facility with diarrhea so that the rate of exclusive breastfeeding be increased through parental education and by providing good environment for breastfeeding.

## MATERIAL AND METHODS

It was a descriptive (cross-sectional) study, conducted on patients coming to Out Patient Department of Khyber Teaching Hospital, Peshawar. Patients from all socioeconomic groups come to this hospital. Calculated sample size was 141 using 19% proportion of exclusive breastfeeding, 95% confidence interval and 7% margin of error by using WHO sample size calculator.

Sampling was done by consecutive (non-probability) sampling. Infants with Acute Diarrhea (3 or more episodes of watery diarrhea in 24 hours), of either gender, with ages between 1-6 months were included in our study, after taking written informed consent. We defined feeding practices as either exclusively breast fed (meaning they were getting only breast feed), partially breast fed (meaning children were given breast feed as well as other form of feed like cow's milk, formula milk, honey or any other thing) and not breastfed (meaning these babies were not breast fed and were on feed other than breast milk).

Data was collected on pre designed proforma including name, age, gender and feeding practice of the infant, as well as age and working status of the mother and was analyzed using SPSS v23. Mean  $\pm$  Standard deviation were calculated for continuous variables like age. Frequency and percentages were calculated for categorical variables like gender and breastfeeding practices. Breastfeeding Practices were stratified among age and gender

of the infant and age and working status of the mother to see the effect modification.

## RESULTS

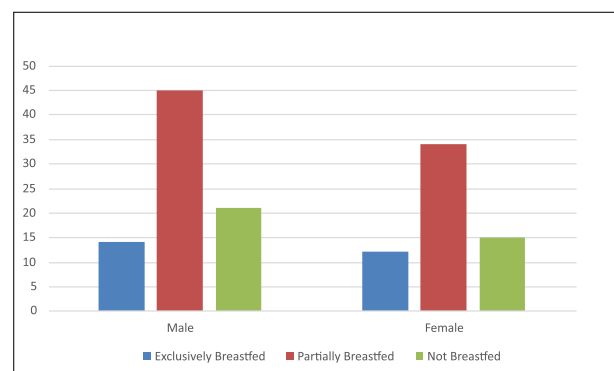
In our study 141 infants with acute diarrhea were observed for feeding practices, out of 141, 26(18.4%) were exclusively breastfed, 79(56%) were partially breastfed, while 36(25.5%) were not breastfed. In the study population, 80(56.7%) were male and 61(43.3%) were female, with frequency of exclusive breastfeeding in males being 17.5% and in females being 19.7%. The mean age of the infant presenting with diarrhea in our study was 3.25 months with  $\pm$  1.2 SD, with minimum and maximum ages between 1.5 months and 5.5 months respectively. Mean age of the mother in the study was found to be 26.4 years with  $\pm$  4 standard deviation from the mean, with minimum and maximum ages between 18 and 35 years respectively. Working status of the mother was also considered in our study which showed that the rate of exclusive breastfeeding was only 7.7% in working mothers compared to 19.5% in housewives.

**Table 1: Breastfeeding Practices**

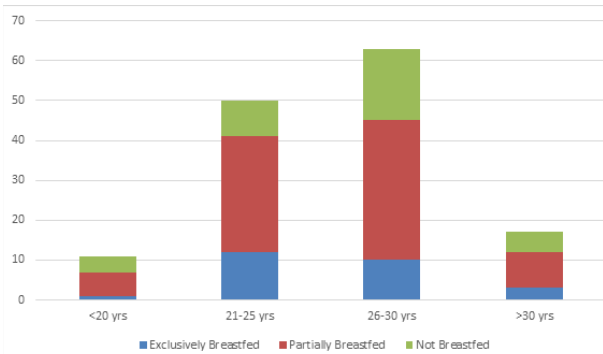
| Breastfeeding Practices | Frequency | Percentage |
|-------------------------|-----------|------------|
| Exclusively breastfed   | 26        | 18.4%      |
| Partially breastfed     | 79        | 56.0%      |
| Not breastfed           | 36        | 25.5%      |
| Total                   | 141       | 100.0%     |

**Table 2: Working status wise distribution of breastfeeding practices**

| Working Status of the Mother | Breastfeeding Practices |                     |               | Total      |
|------------------------------|-------------------------|---------------------|---------------|------------|
|                              | Exclusively Breastfed   | Partially Breastfed | Not Breastfed |            |
| Working Lady                 | 1 (7.7%)                | 9 (69.2%)           | 3 (23.1%)     | 13 (100%)  |
| House Wife                   | 25 (19.5%)              | 70 (54.7%)          | 33 (25.8%)    | 128 (100%) |
| Total                        | 26 (18.4%)              | 79 (56.0%)          | 36 (25.5%)    | 141 (100%) |



**Fig 1: Gender wise distribution of Breast feeding practices in infants.**



**Fig 2: Breastfeeding practices amongst different age groups of mothers.**

## DISCUSSION

Results of our study showed that out of 141, only 26 (18.4%) were exclusively breastfed, 79 (56%) were partially breastfed, while 36 (25.5%) were non breastfed, these results are comparable to the results of some other studies as in one study, carried out in Canada had results similar to our study which clearly shows that at six months of age, the proportion of infants who were exclusively breastfed was only 15.5%. After adjusting for the infant's age, and the interaction between the type of breastfeeding and the infant's age, exclusive breastfeeding significantly protected the infant against many of the studied morbidities (OR: 0.28, CI: 0.15-0.51) and specifically against diarrhea (OR: 0.38, 95% CI: 0.17-0.86)<sup>11</sup> thus confirming the protective role of exclusive breastfeeding on diarrhea.

In another study, significant decrease in diarrheal episodes was observed among infants who were exclusively breastfed compared to those who were not (OR: 0.26, 95% CI: 0.08-0.83).<sup>12</sup> A study on infants who were exclusively and predominantly breastfed experience less diarrheal episodes compared to those who were not breast fed with AOR: 0.31, 95% CI: 0.16-0.59,  $p < 0.001$  for exclusively breastfed and AOR: 0.30, 95% CI: 0.10-0.89,  $p = 0.031$  for predominantly breastfed.<sup>13</sup>

Our study results are also comparable to a study in England which showed that formula feeding was associated with nearly a fourfold increase in diarrheal disease compared with exclusive breast milk in infants aged under and over 6 months. Receiving no breast milk and not receiving exclusive breast milk were both significantly associated with an increase in diarrheal disease (AOR: 2.74 and 3.62 respectively).<sup>14</sup> Another study in Botswana also showed the protective effect of exclusive breastfeeding against diarrhea as exclusive breastfeeding was present in only 12% of infants presenting with diarrhea.<sup>15</sup> A study in Vietnam showed the incidence of diarrhea being 12.2%, although 99% of the children were breastfed, the prevalence of exclusive breastfeeding in the first 4 months was 21.3%.<sup>16</sup>

Low rates of exclusive breastfeeding have been found in our study which were also evident by another study in Egypt in which only 9.7% were exclusively breastfed for 6 months.<sup>17</sup> Another study in Saudi Arabia revealed that only 24.4% of infants were exclusively breastfed at the age of 6 months.<sup>18</sup> Another study also supported our results that maternal age <20 years and primiparity are responsible for improper feeding technique and are more in need of support and guidance for appropriate breastfeeding techniques.<sup>19</sup> Our study results that working mothers were less likely to exclusively breastfed their infants is also supported by another study in India in which also only 13.6% of the working mothers exclusively breastfed their infants.<sup>20</sup> In another study more than or 6 months of exclusive breastfeeding reduced significantly the risk for more than or 1 episode of gastrointestinal infection(s) during months 1-9 compared to no or less than 4 months of breastfeeding AOR: 0.60; 95% CI: 0.44-0.82.<sup>21</sup>

In one of local study in Lahore, it was found out that non breastfed infants were four times more admitted in the hospital for the management of ailments as compared to the breastfed infants. The breastfeeding was 43% at 3 months and 20% at 6 months. The acute diarrhea was 6% in breastfed and 21% in non-breastfed infants<sup>22</sup> thus again showing the protective effect of breastfeeding on diarrhea.

It was found in another study that not breast feeding was associated with a 165 % [relative risk (RR) 2.65, 95 % confidence interval (CI) 1.72-4.07] increase in diarrhea incidence in infants aged 0-5 months, a 32 % (RR: 1.32, 95 % CI 1.06-1.63) increase in those aged 6-11 months, and a 32 % (RR: 1.32, 95 % CI 1.06-1.63) increase in those aged 12-23 months. Not breastfeeding was also associated with a 952 % (RR: 10.52, 95 % CI 2.79-49.6) increase in diarrhea mortality as compared to exclusive breastfeeding in infants aged 0-5 months of age, a 47 % (RR: 1.47, 95 % CI 0.67-3.25) increase as compared to any breastfeeding practice in those aged 6-11 months, and a 157 % (RR: 2.57, 95 % CI 1.10-6.01) increase in those aged 12-23 months.<sup>23</sup>

## LIMITATIONS

The limitation of our study was that it was performed in a single hospital, the results could have been better if the study was carried out on a wider scale with a bigger sample size.

## RECOMMENDATIONS

As evident from our study, diarrhea in infants who were exclusively breastfeed was the least among other groups. Breast feeding in first 6 months of life is very important not only for infants' growth but also to protect them from diarrhea, which is the leading cause of morbidity and mortality in this age group particularly in de-

veloping country like ours. So certain suggestions and recommendations should be drawn by us as a pediatrician for competent authorities for the promotion of exclusive breastfeeding and also health education of mothers during their antenatal visits, and thus obstetrician should also be involved. It is also recommended that each mother especially young ones should be observed for mothers' and infants' positioning and attachment at the onset of breastfeeding and if subsequent counseling needed, should be given on correct positioning and attachment. There should be no promotion of formula milk on any media. Working mothers should be encouraged and given good environment to continue breastfeeding.

## CONCLUSION

Exclusive breastfeeding reduces the incidence of diarrhea and thus has got protective effect against diarrheal diseases. The most common feeding practice is partial breastfeeding which is not as effective as exclusive breastfeeding in preventing and reducing morbidity from diarrheal diseases. Education of mothers regarding advantages of exclusive breastfeeding is thus required particularly in antenatal clinics to improve the prevalence of exclusive breastfeeding. Working mothers are least likely to exclusively breastfed their infants, so such mothers should be counseled and working environment should be made comfortable and favorable for breastfeeding mothers so as to improve the health of the infants by increasing the prevalence of exclusive breastfeeding and thereby reducing the incidence of diarrhea.

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# COMPARISON OF RECURRENT LARYNGEAL NERVE (RLN) PALSY WITH AND WITHOUT INTRAOPERATIVE NERVE IDENTIFICATION DURING THYROIDECTOMY – A CROSS-SECTIONAL STUDY FROM A TERTIARY LEVEL HOSPITAL IN PESHAWAR

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## ABSTRACT

**Objectives:** To determine the frequency of RLN palsy with and without intraoperative nerve identification during thyroidectomy.

**Materials and Methods:** This is a descriptive cross-sectional study spanning over 9 months during the period from July 2020 to March 2021. Seventy patients were included in the study comprising 18 males and 52 females. Demographic data, clinical and postoperative variables were compared about RLN palsy.

**Results:** Among the seventy patients of our study, RLN palsy was reported in 7.1%. Intraoperative nerve identification was performed in 81.42% of cases and left out in 18.6% of cases. Omitting nerve identification resulted in a higher 13.04% cases of RLN palsy as compared to only 3.51% cases with intraoperative nerve identification. The frequency of RLN palsy was 14.82% in ages above 45 years, 11.11% in males, 14.29% after total thyroidectomy, and 40% with follicular carcinoma.

**Conclusion:** Intraoperative identification of the recurrent laryngeal nerve by visualization resulted in a significantly lower rate of RLN palsy. The method described for identification of the nerve during the operation is highly recommended.

**Keywords:** Recurrent laryngeal nerve, thyroid surgery, intraoperative nerve identification.

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## INTRODUCTION

Nodular thyroid diseases and thyroid cancers are common and recent studies cite the global incidence of thyroid cancers at 255,490 and annual deaths at 41,240.<sup>[1]</sup> Based upon the indication, thyroidectomy may be performed in various capacities as thyroid lobectomies to total thyroidectomies.<sup>2</sup> Thyroid surgeries are associated with complications just like any other surgery. One of the most prevalent and dreaded complications of thyroid and parathyroid surgeries is recurrent laryngeal nerve paralysis.<sup>2-5</sup> Decades ago, the risk of RLN palsies with thyroid surgery used to be high with incidences reported at 3 - 14%.<sup>5</sup> A recent cross-sectional review has cited thyroid surgeries as the cause in 36.9% of cases of RLN Palsy.<sup>6</sup> Research-

ers from around the world have reported the rate of RLN injuries due to thyroid surgeries at 0.3 to 38%.<sup>4, 7-13</sup> A significant level of variability exists in the statistics relating to RLN injuries resulting from thyroid surgeries which have been attributed to several factors like expertise, operating conditions, and technique of surgery, the technique of RLN identification as well as the nature and type of thyroid disease.<sup>4, 5, 9, 11</sup> Variability of statistics is because some dies were produced before the advent of intraoperative nerve monitoring (IONM).<sup>14-17</sup> Decades ago, RLN palsy was averted by simply avoiding dissection of thyroid tissue in proximity to the nerve.<sup>22</sup> However, this conservative approach was discouraged by many out of the fear of leaving behind any residual cancerous tissue.<sup>18</sup> Visualization of the RLN with the naked eye and use of surgical landmarks such as Berry's ligament and the Joll's, Riddle's, or Beahr's triangle to tackle variations in the course of RLN is one of the earliest techniques of preventing RLN palsy.<sup>18</sup> Another recent study has shown a lower risk of RLN palsy with various RLN preserving methods as compared to the 7.9% cases where nerve identification techniques were not utilized.<sup>23</sup> Luckily, the risk of RLN palsy has reduced substantially due to the advancements in nerve identification techniques.<sup>18, 19</sup>

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This study was conducted with the intent of emphasizing the complete exploration of the nerve from within the vicinity of the thyroid till its entry into the larynx by comparing the outcomes to thyroidectomies where this technique was not practiced.

## MATERIALS AND METHODS

This study employed a descriptive cross-sectional design and non-probability convenient sampling, including 70 patients who underwent thyroidectomy at the department of ENT in Khyber Teaching Hospital, a tertiary care hospital of Peshawar over 9 months from July 2020 to March 2021. All the patients either had nodular disease or cancer of the thyroid with euthyroid status as reported by thyroid function test. Normal vocal cord function was ensured before thyroid operation using laryngoscopy. Patients with preoperative hoarseness of voice, end-stage hepatic or renal disease, advanced thyroid malignancy also involving the carotid artery, recurrent thyroid disease, or previous radiotherapy were excluded from the study. Consent was obtained from the patients after being briefed about the nature and intended benefits of the study. Intraoperative, identification of the recurrent laryngeal nerves was done using surgical landmarks described earlier as the Joll's, Riddle's, and Beahr's triangles. These surgical landmarks could be mapped appropriately after the surgical dissection was extended to the level of Berry's ligament. Follow-up examination was done after 1 week, 1 month, 3 months, and 6 months to assess vocal cord mobility and function using fiber-optic laryngoscopy (FODL). The primary outcome of interest in this study was RLN palsy appearing within a week of the thyroid surgery which has been defined by the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) as the appearance of hoarseness or vocal cord dysfunction after the first postoperative day with or without confirmation by laryngoscopy or severe vocal cord dysfunction leading to sudden airway obstruction warranting a tracheostomy.<sup>10</sup>

Data acquired from the study were analyzed using SPSS® version 23 (IBM, New York, USA). Statistical differences of demographic, clinical, and post-thyroidectomy variables about RLN palsy were determined using an independent sample t-test, and comparisons were made by chi-square.<sup>22,27</sup> Two-sided P value of 0.05 or less was considered as the significance level.

## RESULTS

Above 70 patients were initially selected for this study, seven were excluded; one due to the previous radiotherapy, two due to preoperative hoarseness, and four patients did not appear for follow-up visits. The remaining 70 patients had ages from 37 to 53 years with the mean age at presentation being  $44.43 \pm 4.11$  years, mostly appearing in their fifties. 74.3% of the subjects were female

while 25.7% were male giving a male to female ratio of 1:2.9. Majority of the cases that warranted surgery were of multi-nodular goiter (78.6%, n=55) followed by papillary carcinoma (11.4%, n=8), follicular carcinoma (7.1%, n=5), and medullary carcinoma (2.9%, n=2). The nature of these cases was confirmed by histopathological studies as well. The most frequently performed procedures were hemi-thyroidectomies (78.6%, n=56) followed by total thyroidectomies (10.0%, n=7), near-total thyroidectomies (7.1%, n=5), and thyroid lobectomies (2.9%, n=2). Recurrent laryngeal nerve was identified in 81.4% (n=57) cases. It was accurately identified on the right side in 38.6% (n=27) cases, on the left side in 27.1% (n=19) cases and on both sides in 15.7% (n=11) cases. Recurrent laryngeal nerve palsy was found in 7.1% (n=5) cases. All five RLN palsies were transient. Three of these recovered to normal functional capacity within the first month of the thyroid procedure, one recovered within three months while one recovered in six months. Out of 57 cases where the nerve was identified, RLN palsy was found in 3.5% (n=2) cases. On the other hand, among the 13 cases where the nerve was not identified, RLN palsy was found in 23.1% (n=3) cases. This concluded the fact that intraoperative identification of the recurrent laryngeal nerve is associated with a considerably lower risk of RLN palsy.

Bivariate analysis indicated significantly lower rates of RLN palsy in patients of ages  $\leq 45$  years ( $p = 0.04$ ). No significant difference was observed in the rate of palsy against both genders ( $p = 0.45$ ) and various procedures ( $p = 0.78$ ). Higher rates of RLN palsy were also observed in cases of follicular carcinoma as compared to benign multi-nodular goiter ( $p = 0.02$ ).

## DISCUSSION

Weighing out the need for thyroidectomy and its extent as indicated for thyroid disease against the subsequent risk of RLN paralysis has been a matter of controversy for some time.<sup>13, 24</sup> This issue is fueled further by the disparity found in the statistical information regarding the incidence of RLN palsy after thyroid surgeries which may be attributed to the variation among surgeons' expertise, approach, and technique of thyroidectomy, indication for surgery, and operating conditions.<sup>4, 5, 9-11</sup> However, over the past few decades, advances in surgical procedures and operation theatre practices have led to more favorable outcomes of surgeries. Regarding thyroid operations, advanced instruments meant for accurate nerve identification combined with the novel approach of 'capsular dissection' from 'lateral dissection' have resulted in a significant decline in the incidence of RLN Paralysis and post-thyroidectomy hoarseness.<sup>3, 13</sup>

Previous studies on the rate of RLN palsy with and without means for nerve identification and monitoring have revealed a magnitude of disparity. Our study observed a statistically significant difference among the rates

Table 1: Stratification of RLN Palsy against study variables

| Parameters             | RLN Palsy    |           |           |                | p    |
|------------------------|--------------|-----------|-----------|----------------|------|
|                        | Total (n=70) | No (n=65) | Yes (n=5) | Rate of Injury |      |
| Age                    |              |           |           |                |      |
| Mean (years)           | 44.43        |           |           |                | 0.04 |
| ≤ 45 years             | 43           | 42        | 1         | 2.33%          |      |
| > 45 years             | 27           | 23        | 4         | 14.82%         |      |
| Gender                 |              |           |           |                |      |
| Male                   | 18           | 16        | 2         | 11.11%         | 0.45 |
| Female                 | 52           | 49        | 3         | 5.77%          |      |
| Surgery performed      |              |           |           |                |      |
| Total thyroidectomy    | 7            | 6         | 1         | 14.29%         | 0.78 |
| Subtotal thyroidectomy | 5            | 5         | 0         | 0%             |      |
| Hemithyroidectomy      | 56           | 52        | 4         | 7.14%          |      |
| Lobectomy              | 2            | 2         | 0         | 0%             |      |
| Thyroid Disease        |              |           |           |                |      |
| Goiter                 | 55           | 52        | 3         | 5.45%          | 0.02 |
| Papillary carcinoma    | 8            | 8         | 0         | 0%             |      |
| Follicular carcinoma   | 5            | 3         | 2         | 40.0%          |      |
| Medullary carcinoma    | 2            | 2         | 0         | 0%             |      |
| RLN Identified         |              |           |           |                |      |
| Yes                    | 57           | 55        | 2         | 3.51%          | 0.04 |
| No                     | 23           | 20        | 3         | 13.04%         |      |

of RLN palsy which showed a poor negative correlation between nerve identification and RLN palsy,  $r(1) = -.29$ ,  $p = .013$ . Two different meta-analyses conducted by Cirocchi and Jeannon had revealed RLN palsy at rates of 2.8 and 9.8%, respectively.<sup>7, 11</sup> In studies conducted by Jiang, Gunn, and Schneider, RLN palsy was found at rates of 4.98%, 5.95%, and 4.7%, respectively.<sup>10, 25</sup> Several authors had also conducted comparisons of the rates of RLN palsy with and without nerve identification. Zakaria et al found a significantly lower rate of 2.6% with RLN identification as compared to the 7.6% that occurred without nerve identification ( $p = .039$ ).<sup>13</sup> A significant difference was found with nerve identification measures in the study by Anuwong et al where RLN palsy was found at rates of 3.8% and 82% in the presence and absence of perioperative nerve identification, respectively.<sup>26</sup> No significant difference in the rates of RLN palsy was found in the retrospective study by Bergenfelz et al where the rate of RLN palsy with and without nerve identification was 13.81% and 10.54%, respectively.<sup>21</sup> Higgins et al conducted a meta-analysis comprising of 64,699 nerves-at-risk from a clinical trial, 7 comparative trials, and 34 case series where intraoperative nerve monitoring (IONM) was compared against visual identification alone, and surprisingly, the rate of RLN palsy with visual identification alone was 3.12% that was comparatively less than the 3.52% rate found with IONM, (OR 0.93; 95% confidence interval [CI], 0.76-1.12).<sup>18</sup> Calo et al reported no

significant difference in the rates of RLN palsy found with routine identification and IONM which were 2.82% and 2.21%, respectively.<sup>27</sup> This study concluded that age was independently related to the rate of RLN palsy occurrence after thyroid surgeries as patients of ages above 45 years had a higher tendency to develop RLN palsy as compared to the patients having ages below 45 years,  $r(1) = -.24$ ,  $p = .049$ . These findings are consistent with previous studies conducted by Gunn et al and Francis et al where both authors determined a higher risk of RLN palsy in patients above 65 years.<sup>8, 10</sup> However, the reason why the older age groups are associated with an increased risk for RLN palsy is not clear.<sup>8</sup> A study conducted by Serpell et al showed comparable findings as left RLN palsy was mostly reported in cases of unilateral involvement at a rate of 3% ( $p = .007$ ) while right RLN palsy was found at a rate of 1.8% ( $p < .001$ ) in cases of bilateral involvement.<sup>2</sup> According to the study by Bergenfelz et al, the side of the nerve having palsy did not show any significant relationship to intraoperative nerve identification. His study found bilateral RLN palsy in 0.1% of the cases and unilateral palsy in 1.4% of the cases with equal involvement of the right and left nerves.<sup>21</sup> Sturniolo et al had studied the identification of different anatomical variations of the RLN relating to its course and dimensions. Bilateral identification was possible in the majority of the cases (77.2%) while the right and left RLN were independently identified less frequently.

This study claimed that the relative ease of identifying the right RLN may be attributed to the less tortuous course followed by the right RLN in the furrow of the trachea-esophageal groove.<sup>17</sup> The surgical procedures most frequently performed in this study were hemi-thyroidectomies followed by subtotal thyroidectomies, total thyroidectomies, and lobectomies. However, the rate of RLN palsy reported after these hemi-thyroidectomies was 7.14% which was significantly lower than the rate of 14.29% reported with total thyroidectomies. Gunn et al had also determined the comparative rates of RLN palsy for different thyroid procedures. Most patients had gone through a total thyroidectomy (63.2%). Similar to our study, their study reported high rates of RLN palsy with total thyroidectomy (6.9%) as compared to lobectomies (4.3%) ( $p < 0.001$ ).<sup>10</sup>

Dralle et al and Riddell et al provided explanations for the occurrence of RLN palsy despite intraoperative RLN identification. According to these authors, such cases of RLN palsy occur due to the inevitable stress incurred by the nerve in the form of stretch, heat, or de-vascularization. These factors usually lead to a transient form of palsy resulting from neuropraxia which usually relieves within 6 months.<sup>14, 19</sup>

## CONCLUSIONS

The rate of RLN palsy was significantly lower in patients where intraoperative nerve identification had been performed as compared to the thyroid operations where intraoperative identification of the RLN was not performed.

## RECOMMENDATION

Intraoperative nerve identification is an essential step in any thyroid surgery and has proven beneficial in reducing the occurrence of RLN palsy.

## LIMITATIONS

This study was limited only by the variation in the course or location of the recurrent laryngeal nerve which led to a lack of uniformity regarding the use of surgical landmarks for identification of the recurrent laryngeal nerve.

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#### AUTHOR'S CONTRIBUTION

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# EFFECTS OF TASK-ORIENTED TRAINING ON WALKING IN CHILDREN WITH CEREBRAL PALSY

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## ABSTRACT

**Objective:** To determine the effects of task-oriented training on walking and balance in children with spastic diplegic Cerebral Palsy (CP).

**Material and methods:** A randomized control trial (ClinicalTrials.gov ID: NCT04561349) was conducted on 44 CP children. Both male and female children were randomized into experimental groups (Task-oriented training) and control groups (mat activities and range of motion exercises). Children with spasticity  $\leq 2$ , age 4-14 years, who could walk and follow the command, were included. However, children with cognitive impairment, lower limb surgery in the last 6 months, tetraplegic CP were excluded. Children were assessed before and after the intervention. The outcome measures were Gross Motor Function Classification Scale (GMFC), Timed Up and Go (TUG), Functional Walking Test (FWT), and Modified Ashworth scale (MAS).

**Results:** Out of 38, 53.3% males and 44.7% females with the mean age of  $9.3 \pm 2.9$  years. The experimental group had significant improvement in walking as the p-value for both TUG and FWT was significant after the 6th week ( $p < 0.05$ ) but no significant change in manual muscle testing (MMT) and modified Ashworth scale (MAS) was observed ( $P > 0.05$ ).

**Conclusion:** It is concluded that both techniques are effective to improve walking and balance in CP children. However, task-oriented training has a significant improvement in walking and balance in spastic CP children.

**Keywords:** Cerebral Palsy, Cognitive Impairment, Spasticity, Walking.

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## INTRODUCTION

“Cerebral palsy” (CP) is a common motor problem in children and it is used to define multiple ailments of movement which result in a number of activity limitations<sup>1</sup>. The greatest cause of motor damage in children is cerebral palsy and motor impairment occurs in about 2 out of 1000 live births<sup>2</sup>. CP refers to the most prevailing motor impairment which occurs at an early age and happens with 1 in 1000 births<sup>3</sup>.

Cerebral palsy causes motor and postural impairments thus limiting activity. Movement impairments hinder the child's physical activities of daily life. One of the main objectives while dealing with cerebral palsy children

is to improve mobility. Various methods of physiotherapy are required to improve the child's functional status. Evidence from the recent studies indicates the benefits of functional therapeutic approaches for specific tasks on the level of function of cerebral palsy children<sup>4</sup>. Task-oriented training is derived from the science of movement and “motor learning”. The fundamental principle behind this approach is the repetition of daily tasks carried out through setting specific goals for specific activities instead of merely emphasizing decreasing the impairment. This training includes performing routine tasks again and again with or without modification in order to improve functional activities. According to research, task-oriented training enables “cortical reorganization” and enhances function<sup>5</sup>.

A task-oriented approach comprising of functional activities is the new technique of motor learning. Task-oriented training consists of repetition and practice of motor tasks. These are beneficial for cerebral palsy children as it improves their ability to perform functional tasks which help them in their routine activities. It is effective because it involves the children in therapy and encourages them to perform the tasks<sup>6</sup>. It has been used for multiple rehabilita-

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tion purposes such as balance exercises for equal weight distribution on both lower limbs and walking training practice don't read mill and ground, strength training for the maintenance of muscle mass, and general body exercise for overall fitness and wellbeing<sup>7</sup>. In 2017, a study was conducted to evaluate the effect of task-oriented training of lower limbs and its effect on walking and postural stability in cerebral palsy children. It mainly emphasized the strength training of lower limbs during a 40-minute session two times per week for a total of 8 weeks. Functional activities of their daily life were performed. This training resulted in improved Gross Motor Functional Classification scoring and better performance of daily tasks<sup>4</sup>. Motor learning training has brought the rehabilitation technique towards task-centered training from the facilitation and inhibition approach. Task-oriented training helps to improve the functional tasks which are useful in routine activities. It involves the repetition of tasks and serves as a good training method for cerebral palsy children encouraging them to perform functional tasks in an interesting manner<sup>6</sup>. In another research held in 2015, task-oriented training was performed with repetitions and gait training was done on the treadmill. The improvement in walking function in cerebral palsy children was observed which reflected the benefit of a task-oriented approach in cerebral palsy children who have some impairment in walking. The results indicated that task-oriented training has positive impact on functional abilities, balance, and walk in cerebral palsy children<sup>8</sup>. Task-oriented training was used in a randomized control trial (RCT), focusing on the mobility status of cerebral palsy children. The Control group was given conventional therapy focusing on the improved walk and facilitation of normal movements. The experimental group received task-oriented training (TOT) emphasizing lower limb strengthening along with the practicing of functional tasks. It was found that after the period of 5 weeks, positive changes started to show in Gross Motor Functional Classification scores. Scores for the time up and go (TUG) test also showed that the experimental group took lesser time to complete it. This study supported the time up and go and its positive effects on mobility and balance<sup>9</sup>.

Stella Maris et al, found in their study that task-specific training improved the functional outcomes in patients with stroke<sup>10</sup>. In another randomized control trial, task-oriented training was used in cerebral palsy and traumatic brain injury children in order to assess the improvement in their functional level by task-oriented training. It included simple tasks of daily activities such as sitting to standing and stepping up for a period of six weeks. After the intervention, a positive change was observed in balance in the experimental group<sup>11</sup>.

In our study, task-oriented training (TOT) of the experimental group included balance and reaching exercises, walking forward-backward and sideways, tandem walking, sitting to stand, throwing and catching the ball in

different directions, and carrying an object while walking. Protocol for the control group consisted of conventional mat activities, range of motion (ROM) of all limbs, walking on a treadmill without inclination, walking in parallel bars, and cycling.

Children were encouraged and motivated to complete each step of their treatment. All the subjects were given 30 minutes sessions thrice a week for the duration of 6 weeks.

## MATERIALS AND METHODS

This randomized control trial (RCT) (ClinicalTrials.gov ID: NCT04561349) was carried out at Armed Forces Institute of Rehabilitation Medicine (AFIRM) Rawalpindi, Pakistan. This study was approved by Riphah research ethical committee with Ref # Riphah/RCRS/REC/00407. The study duration was six months i.e., August 2018 to January 2019. A sample of 44 cerebral palsy children was equally and randomly divided into experimental and control groups i.e., 22 in each group. A purposive non-probability sampling technique was used. Inclusion criteria were spastic diplegic CP children of age between 4 to 14 years with spasticity scores of 2 or less on the Modified Ashworth scale, who can walk gross motor functional classification scale (GMFCS level 1-3) and can perform different activities on command. Children with cognitive impairment, lower limb surgery in the last 6 months, and tetraplegic cerebral palsy were excluded. Participants were divided equally into Group A (experimental) and Group B (control) groups. Task-oriented training (TOT) was given to the experimental group consisting of different functional tasks for lower limbs to improve balance and walk. These tasks included standing unsupported and reaching in different directions for certain objects placed at a distance from the arm for activation of lower limb muscles, sitting to stand from floor to strengthen muscles of lower limbs, sidestepping, stair climbing, walking on a straight line, tandem walking, walking on inclination, walk and carry a glass filled with water to improve multi-tasking and catching and throwing the ball for better balance. Each task was given for 5 minutes. The child was encouraged to complete the task and was verbally cued during training. Tasks were progressed according to each child's performance. These progressions included increasing the number of repetitions, speed, and switching between the tasks. One hour practice of these tasks was advised as a home plan.

## FOLLOWING TREATMENT WAS GIVEN TO THE CONTROL GROUP:

Conventional mat activities and range of motion (ROM) of all limbs, lower limb strengthening and stretching exercises for weak and tightened muscles respectively, walking on a treadmill at speed comfortable for the child with zero inclination, cycling on a stationary or moving bicycle, and parallel bar walking. Each exercise was

performed for 5 minutes. One hour practice of the above exercises and thermotherapy for the spastic muscles was advised for 10 minutes once a day at home. Tools used for data collection were the Modified Ashworth scale (MAS), Gross Motor Function Classification Scale (GMFCS), Timed Up and Go (TUG) test, and Functional Walking Test (FWT).

## RESULTS

A total number of 44 subjects were included in our study, out of which 38 remained after dropouts. 20 subjects were included in the experimental group while 18 were in the control group. Among the total participants of the study, 21 were male i.e, 53.3% and 17 were female i.e, 47.3%. The number of male and female participants in the experimental group was 10 and 5 respectively. In the control group, the number of male and female participants was 8 and 10 respectively. The mean age of the subjects was  $9.3 \pm 2.9$  years. Out of 38 subjects, 14 children had a gross motor functional scale (GMFCS) level of 1, 19 children had GMFCS level 2 and 5 children had gross motor functional scale (GMFCS) level 3.

### WITHIN GROUP RESULTS

Experimental group (A): Within-group analysis was performed for time up and go test (TUG), functional walking test (FWT), and Manual muscle testing (MMT) at baseline, at 3<sup>rd</sup> week, and at 6<sup>th</sup> week. A significant improvement was observed in the time up and go test (TUG), functional walking test (FWT) p-value < 0.01. But, no significant changes were seen in Manual muscle testing

(MMT) of right and left lower limb p-value > 0.01 (Table 1). MAS scoring of the lower limb was also done at baseline, 3<sup>rd</sup>, and 6<sup>th</sup> week. P-value was significant for Quadriceps muscle i.e, 0.01 and was insignificant for Hamstrings and Calf muscles, i.e, 0.4.

Control group (B): In the control group (group B), analysis was performed for the time up and go test (TUG), functional walking test (FWT), and Manual muscle testing (MMT) at baseline, at 3<sup>rd</sup> week, and at 6<sup>th</sup> week. A significant improvement was observed in the functional walking test (FWT) p-value < 0.01. While there is no significant changes were seen in the time up-and-go test (TUG) and Manual muscle testing (MMT) of the right and left lower limb p-value > 0.01 (Table 2). MAS scoring had an insignificant P-value, i.e., 0.4 for Quadriceps, 0.4 for Hamstrings, and 0.4 for Calf muscles.

### BETWEEN GROUP RESULTS

The balance of participants was assessed by using a score of the time up and go (TUG) test. In groups A and B, the mean  $\pm$  SD for balance at baseline was  $41.3 \pm 18.4$  and  $41.1 \pm 21.6$  seconds respectively. Mean  $\pm$  SD for balance at 6<sup>th</sup> week for group A and group B was  $38.6 \pm 16.9$  and  $39.8 \pm 22$  seconds respectively. The mean difference for group A was -2.7 and for group B it was -1.3.

Results showed that in the experimental group time taken to complete the time up and go (TUG) test was decreased after 6 weeks of task-oriented training and the mean difference for the experimental group was more than that of the control group who received conventional physiotherapy treatment. (Table 3). The improvement in

**Table 1: Table 1: Within Group Analysis TUG, FWT & MMT GROUP A (n=20)**

|             | Baseline     | 3rd week     | 6th week     | p-value     |
|-------------|--------------|--------------|--------------|-------------|
|             | Median (IQR) | Median (IQR) | Median (IQR) | <b>0.01</b> |
| TUG         | 38.5 (31.3)  | 39 (31.8)    | 37 (30.8)    |             |
| FWT         | 10 (6.5)     | 11 (7.3)     | 12.5 (5.8)   | 0.01        |
| MMT LL (RT) | 3 (1)        | 3 (1)        | 3 (1)        | 0.75        |
| MMT LL (LT) | 3 (1)        | 3 (1)        | 3 (1)        | 0.75        |

**Table 2: Within Group Analysis TUG, FWT & MMT GROUP B (n=18)**

|             | Baseline     | 3rd week     | 6th week     | p-value      |
|-------------|--------------|--------------|--------------|--------------|
|             | Median (IQR) | Median (IQR) | Median (IQR) | <b>0.062</b> |
| TUG         | 37 (38.2)    | 40 (38)      | 36 (38)      |              |
| FWT         | 12 (9.2)     | 12.5 (8)     | 13.5 (10)    | 0.03         |
| MMT LL (RT) | 3 (1)        | 3 (1)        | 3 (1)        | 0.722        |
| MMT LL (LT) | 3 (1)        | 3 (1)        | 3 (1)        | 0.722        |

**Table 3: Mean  $\pm$  SD of Variables Pre and Post Treatment Between Both Groups**

| Variables       | Assessment  | Group A Mean $\pm$ SD | Group B Mean $\pm$ SD |
|-----------------|-------------|-----------------------|-----------------------|
|                 | At Baseline | 41.3 $\pm$ 18.4       | 41.1 $\pm$ 21.6       |
|                 | At 6th week | 38.6 $\pm$ 16.9       | 39.8 $\pm$ 22         |
| Mean Difference |             | -2.7                  | -1.3                  |
|                 | At Baseline | 11.8 $\pm$ 4.1        | 12.8 $\pm$ 4.6        |
|                 | At 6th week | 13.6 $\pm$ 3.7        | 13.7 $\pm$ 4.8        |
| Mean Difference |             | 1.8                   | 0.9                   |

functional walking ability was assessed by using scores of the functional walking test (FWT). In group A and group B, the mean  $\pm$  SD for functional walking ability at baseline was 11.8  $\pm$  4.1 and 12.8  $\pm$  4.6 respectively, and mean  $\pm$  SD for walking ability at 6<sup>th</sup> week for group A and group B was 13.6  $\pm$  3.7 and 13.7  $\pm$  4.8 respectively. The mean difference of walking ability for group A and group B was 1.8 and 0.9 respectively (Table 3).

The results showed that there was more improvement in walking ability in the participants of the experimental group than that of the control group as the mean difference of the scores of the functional walking test (FWT) of group A was greater than that of group B.

## DISCUSSION

The purpose of this study was to prove the effects of task-oriented training (TOT) on spastic cerebral palsy children by assessing the subjects through the time up and go test (TUG) and functional walking test (FWT). Moreover, this research was conducted in order to explore an intervention that will eventually help to overcome the deficits in balance and walk of cerebral palsy children.

In 2016 MK Franklin Shaju conducted a study to evaluate the effectiveness of task-oriented training on balance and spasticity in children with a spastic type of diplegic cerebral palsy. It was a randomized control trial to compare task-oriented training and conventional physiotherapy over the intervention period of 6 weeks. Scales used for balance and mobility assessment were the time up and go test and Pediatric Balance Scale (PBS) respectively. The mean difference of pre and post-intervention between the two groups was 18.1 and SD was 4.59<sup>6</sup>. The task-oriented training program conducted for 26 CP children for 15 weeks showed improvement on Pediatric Balance Scale (PBS) where results were significant ( $P < 0.05$ )<sup>12</sup>. Similarly, a study done in 2009 by Salem et al. for an intervention period of 5 weeks and a sample size of 10 cerebral palsy children showed that the time taken by the subjects of experimental reduced to complete the time up and go test after task-oriented training. The P-value for the time up and go test came out to be significant, i.e.  $P = 0.017$ <sup>9</sup>. These findings were somehow in line with our outcomes. On the 6<sup>th</sup> week of intervention, there was a

decrease in time taken by the participants of both groups to complete the time up-and-go test which was used to assess the improvement in the balance of the subjects. However, group A showed more decrease in the time taken to complete the test. But the p-value was not significant for the outcome as the time period for intervention was only 6 weeks.

Research conducted in Korea (2016) by Hyun-Kyung Han et al found the effectiveness of task-oriented training on "gross motor function measure, balance and gait function" in cerebral palsy children. This RCT study consisted of 24 subjects who were given intervention over the period of 4 weeks. The functional gait outcomes of the task-oriented training group had more scores for the Functional Gait Index than that of the control group. After 4 weeks of treatment, the difference of Mean  $\pm$  SD between pre and post-treatment was 15.25 $\pm$ 10.25 for experimental and 4.42 $\pm$ 5.26 for the control group. Therefore, it can be clearly seen that subjects who received task-oriented training had much improved functional gait after the treatment as compared with the control group who were given conventional therapy (including neurodevelopment treatment)<sup>8</sup>. Task-oriented training was used to find its effects on functional ability in CP children. Mobility Assessment Scale and Five-Time Sit to Stand Test were used for evaluation. Significant results were seen in the task-oriented training group ( $P = 0.03$ ) after 6 weeks of training<sup>13</sup>. In the current study, 38 subjects were reported with cerebral palsy and treated with task-oriented training over the period of 6 weeks. The task-oriented training group showed more improvement as compared to the control group. So, the task-oriented training showed more improvement in balance and walking in patients with cerebral palsy.

In another research after activity-focused physiotherapy, there was an improvement in gross motor functional GMFM-66 scores (mean=3.8) and also in the Mobility dimension of the PEDI scale, the mean difference (SD) came out to be 2.3 (3.8)<sup>4</sup>. In 2017 a study was conducted to observe the effects of task-oriented training on mobility and posture. It was found that after 8 weeks of intervention gross motor functional GMFM scoring for walking and standing improved and significant results ( $p < 0.05$ ) were obtained. Gross motor functional GMFM scores for pre and

post-intervention were  $56.34 \pm 18.86$  and  $59.81 \pm 17.76^\circ$ . This finding supports the results of our study. After the completion of the 6<sup>th</sup> week, functional walking of the CP children was improved in both groups. However, the improvements seen in functional walking test scores of experimental groups after task-oriented training were more than that of conventional therapy given to the control group. There was an increase in the mean and standard deviation groups. Mean  $\pm$  SD for the experimental group for functional walking was  $11.8 \pm 4.1$  at baseline and  $13.6 \pm 3.7$  at week 6 whereas for the control group it was  $12.8 \pm 4.6$  at baseline and  $13.7 \pm 4.8$  at 6<sup>th</sup> week. Thus, it indicates that the functional walking improvement after the task-oriented training was much better than that of the conventional physiotherapy treatment. Difficulty in gaining attention, non-cooperation, and loss of follow-up due to health issues were the main limitation of our study.

## CONCLUSION

It is concluded that both techniques are effective to improve walking and balance in cerebral palsy children. However, task-oriented training has a significant improvement in walking and balances in spastic cerebral palsy children. Specific digital parameters should be used to assess gait patterns and concern muscles of walking. More participants should be recruited for better comparison. Effect of nutrition should also be assessed on mobility and balance as nutrition plays an important role in the health of CP participants.

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## AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

- Tariq M:** Concept, Design, and Proofreading  
**Rafique N:** Acquisition and critical review  
**Aftab A:** Analysis and interpretation of data  
**Rafique A:** Data collection, Final approval  
**Altaf S:** Acquisition and critical review

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

# EFFECTS OF DIFFERENT EXERCISE THERAPIES ON OBSTRUCTION, DYSPNEA, AND QUALITY OF LIFE IN COPD PATIENTS: A SYSTEMATIC REVIEW

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## ABSTRACT

**Objective:** Chronic obstructive pulmonary disease (COPD) is the third leading cause of death, causes pulmonary and extra-pulmonary symptoms, and also impacts the quality of life. Rigorous evidence on manual and mechanical chest physiotherapy is still scarce. Therefore, this review aims to evaluate the effects of different exercise therapies on obstruction, dyspnea, and quality of life in COPD patients.

**Materials and Methods:** We performed a systematic review of randomized controlled trials published from 2011 to 2020 to evaluate the effects of exercise therapies on obstruction, dyspnea, and quality of life in obstructive patients. Databases such as Medline, BioMed Central, CINHAL, and Cochrane were reviewed. Methodological quality and risk of bias were assessed using the Cochrane tool.

**Results:** Most of the trials supported the effectiveness of mechanical chest physiotherapy in improving obstruction, dyspnea, and quality of life.

**Conclusion:** High-to-moderate evidence shows that mechanical chest physiotherapy is useful in the improvement of obstruction, dyspnea, and quality of life in COPD patients.

**Keywords:** Borg dyspnea scale, COPD, High-frequency chest wall oscillation, mMRC dyspnea scale, St. George Respiratory Questionnaire, Spirometry

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## INTRODUCTION

According to the WHO-Global initiative for Chronic Obstructive Pulmonary Disease (GCOPD), Chronic Obstructive Pulmonary Disease (COPD) has pulmonary and extra-pulmonary symptoms, which impact the quality of life<sup>1</sup>. The prevalence of COPD as a health problem is increasing. There has been a need for advances in the rehabilitation field to control COPD symptoms<sup>2</sup>. In 2010, it was ranked as the third worldwide cause of death; however, it will be the fourth-largest cause of death by 2030<sup>3</sup>. Due to the high prevalence of smoking in some high-income countries, the burden of COPD has been reported to be high in these settings<sup>4</sup>. More than 10% of elder individuals with COPD are greater than 40 years<sup>5</sup>. It is characterized by chronic airflow limitation, limb muscle dysfunction, and

major systematic dysfunction<sup>6</sup>. It is a mixture of parenchymal alveolar disease (emphysema) and small-airway disease (obstructive bronchiolitis) and the FEV1/FVC less than 0.7 shows that the airflow limitation is not completely reversible<sup>7,8</sup>.

According to the American Thoracic Society/European Respiratory Society procedure report on respiratory rehabilitation, increasing the accessibility of pulmonary rehabilitation is an important concern<sup>9</sup>. Physiotherapy is an integral part of the management of COPD patients and high-frequency chest wall oscillation technique (HFCWO) and airway clearance techniques (ACT) are harmless procedures in patients with COPD<sup>10</sup>.

Physiotherapy rehabilitation (PR) has been evidenced to be effective in increasing exercise tolerance<sup>11</sup>. PR includes HFCWO yields compression of the rib cage wall through blowup sheath connected to air thump generator<sup>12</sup>. HFCWO creates a cough-like expiratory flow bias that enhances mucociliary transport and removes secretions from alveoli, bronchi, and bronchioles.<sup>13-15</sup> Exercise therapies support the recovery after an acute exacerbation in COPD patients<sup>16</sup>. Intrapulmonary percussive device (IPV) could be effective in COPD patients<sup>17</sup>.

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Physiotherapy improves the quality of life, reduces breathlessness, and increases exercise tolerance through therapeutic exercises<sup>18</sup>. Conventional chest physical therapy (CPT) is a combination of huffing, coughing, percussion, shaking, vibration, and postural drainage, which is effective in mucus clearance in chest diseases<sup>19</sup>. Aerobic exercises also improve exercise tolerance in obstructive patients<sup>20</sup>.

There are few numbers of studies to find out the effects of chest physiotherapy in COPD patients and rigorous review on the effects of chest physical therapy (CPT) is still scarce. Therefore, this systematic review aims to evaluate the effects of manual and mechanical chest physiotherapy among patients with COPD and bronchiectasis

## MATERIALS AND METHODS

A systematic review was conducted on randomized controlled trials that assessed the effects of PR in obstructive patients. The review was conducted in consideration to follow the guidelines as defined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement<sup>21</sup>. All grading of COPD plus Spirometrically defined finding of COPD reliable using GOLD principles and bronchiectasis patients (forced expiratory volume in 1: forced vital capacity [FEV1: FVC] <70%)<sup>22</sup> were used. CPT (HFCWO and manual chest physiotherapy) was used as an intervention which was to compare CPT versus control (or usual care, pharmacological therapy, vibratory sensation, and chest physiotherapy. Spirometry, MMRC dyspnoea scale, Borge dyspnea scale, St. George respiratory questionnaire (SGRQ), and 6MWT were used as outcomes. Only Randomized Controlled trials (RCTs) were included. Studies that ensured a huge proportion of missing data and implemented insufficient numerical analysis, not in English or else translated and Studies beyond 2011 were excluded from this systematic review. Six electronic databases such as Google Scholar, Medline, BioMed Central, CINAHL, and Cochrane were reviewed in March 2021. Medical subject headings (MeSH) terms included "COPD", "HFCWO", "mMRC dyspnea scale", "spirometry", "St. George respiratory questionnaire" and "pulmonary rehabilitation" were used. "AND" Boolean logic operator was used for a combination of terms. Titles and/or abstracts were reviewed and those articles not meeting eligibility criteria were excluded. The remaining articles were read in detail and considered according to PRISMA guidelines.

Initial screening was carried out by two authors (F.H. and H.A.S.). Then the detailed evaluation of full text and analysis against inclusion and exclusion criteria was performed by two viewers (F.H. and A.A.). The primary search sought a total of 152 studies, some studies were not freely accessible and others were irrelevant. Finally, the trials included in this review met the eligibility criteria on the effects of CPT on obstruction, dyspnea, and quality

of life in obstructive patients. The information like author, year of publication, sample size, target population, intervention applied, frequency, and outcome measures were extracted from included trials. The risk of bias was evaluated using the Cochrane tool<sup>23</sup>. It evaluates biases in various manners, which include random sequence generation, allocation concealment, blinding of participants, blinding of outcome assessment, incomplete outcome data, and selective reporting.

## RESULTS

### Selection of studies

The searches generated over 152 studies and subsequent screening of titles and abstracts, 80 complete articles were reviewed. Subsequently the complete analysis procedure 25 studies were considered appropriate for inclusion. Out of 25 studies, 15 eligible RCTs were included in the systematic review.

Ten studies were omitted because some articles were irreverent, some were not available in English, some full texts were not available and some methodological quality was not good. A total of 15 RCTs were analyzed in this review<sup>24-38</sup>. Figure 1 shows the PRISMA flow diagram of the selection strategy of the trials. The RCTs included in this review comprise a total sample size of 1831 and investigated the effects of exercise therapies on obstruction, dyspnea and/or quality of life in obstructive patients. The trials published from 2011 to 2020 are included in this review.

The sample size of a study related to the effects of standard physical therapy on obstruction in COPD was 54, which lacks sample size calculation. However, the study used spirometry to measure obstruction<sup>25</sup> (Table 1). The sample size of the two studies related to the effects of mechanical chest physical therapy on dyspnea in COPD was 90. However, the study used the mMRC dyspnea scale to measure dyspnea<sup>27,33</sup> (Table 1). The sample size of the four studies related to the effects of manual and mechanical chest physical therapy on quality of life in COPD was 192. However, the study used SGRQ to measure the quality of life<sup>29-30, 32, 38</sup> (Table 1).

The sample size of the two studies related to the effects of manual and mechanical chest physical therapy on both obstruction and dyspnea in COPD was 160. However, the study used spirometry and SGRQ to measure obstruction and dyspnea<sup>24, 31</sup> (Table 1). The sample size of the six studies related to the effects of manual and mechanical chest physical therapy on both dyspnea and quality of life in COPD was 1,335. However, the study used mMRC dyspnea scale or Borg dyspnea scale and SGRQ to measure dyspnea and quality of life. <sup>26, 28, 34-37</sup> (Table 1). Data extraction and quality assessment Chronic obstructive pulmonary disease: COPD; Acute exacerbation of chronic obstructive pulmonary disease: AECOPD; Exper-

imental group: EG; Control group: CG; High-frequency chest wall oscillation: HFCWO; Positive expiratory pressure: PEP; Neuromuscular electrical stimulation: NMES; Intrapulmonary ventilation: IPV; Saint George respiratory questionnaire: SGRQ; Modified medical research council: mMRC; 6-minute walking distance: 6MWD; Forced expiratory volume: FEV Risk of bias within studies and quality appraisal. All trials had no risk of bias in random sequence generation, fewer studies had a lower risk of bias in allocation concealment, most studies had a higher risk of bias in

blinding of participants and personnel, and in the blinding of outcome assessment, only a few studies had unclear risk of bias in incomplete outcome data and all studies had a low risk of bias in selective reporting as shown in table 2<sup>24-38</sup>.

## SYNTHESIS OF RESULTS

Most trials support the effectiveness of manual and mechanical chest physiotherapy in improving obstruction, dyspnea, and quality of life.

**Table 1: Features of the articles in this systematic review**

| Authors                          | Year | Sample Size | Target Population        | Group | Intervention                                                                                                                            | Outcome measures                                    |
|----------------------------------|------|-------------|--------------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Mahajan et al. <sup>24</sup>     | 2011 | 52          | COPD and asthma patients | EG    | 4 session/3 times a day/15 minutes each received HFCWO                                                                                  | SQ; Borg Modified Scale; Spirometry (FEV1)          |
|                                  |      |             |                          | CG    | sham device provided a vibratory sensation                                                                                              |                                                     |
| Tang CY et al. <sup>25</sup>     | 2012 | 54          | AECOPD                   | EG    | 2 sessions/day and 15 min each exercise session received standard physical therapy, upper and lower limb resisted and aerobic exercises | FEV1%; spirometry testing; 3 min walk test          |
|                                  |      |             |                          | CG    | 1 session/day physical therapy including sputum clearance technique and functional training                                             |                                                     |
| Cross JL et al. <sup>26</sup>    | 2012 | 526         | COPD                     | EG    | Manual chest physiotherapy and airway clearance technique                                                                               | SGRQ; Quality of life index; and mMRC dyspnea scale |
|                                  |      |             |                          | CG    | Chest clearance alone                                                                                                                   |                                                     |
| Nicolini A et al. <sup>27</sup>  | 2013 | 30          | Bronchiectasis           | EG 1  | 15 days/2 times a day/ 30min/session received HFCWO                                                                                     | Dyspnea and mMRC dyspnea scale                      |
|                                  |      |             |                          | EG 2  | 15 days/2 times in a day/45 min/session received traditional technique of air-way clearance                                             |                                                     |
|                                  |      |             |                          | CG    | Medical therapy only                                                                                                                    |                                                     |
| Osadnik CR et al. <sup>28</sup>  | 2014 | 90          | COPD                     | EG    | 5 repetitions/session of PEP and usual care with 20 min duration each                                                                   | SGRQ; FEV1; mMRC dyspnea scale; 6MWD                |
|                                  |      |             |                          | CG    | Usual care                                                                                                                              |                                                     |
| Pradella CO et al. <sup>29</sup> | 2015 | 50          | COPD                     | EG    | 24 sessions received warm-up, aerobic activity, stretching, and relaxation 3 times/week and duration of the program                     | SGRQ; 6MWD                                          |
|                                  |      |             |                          | CG    | No intervention                                                                                                                         |                                                     |
| Maddock M et al. <sup>30</sup>   | 2016 | 52          | COPD                     | EG    | Daily over 6 weeks NMES                                                                                                                 | FEV1; 6MWT; SGRQ;                                   |
|                                  |      |             |                          | CG    | Placebo NMES                                                                                                                            |                                                     |
| Farag TS et al. <sup>31</sup>    | 2017 | 108         | AECOPD                   | EG 1  | 4 weeks/3 session/week of 20-30 min/session HFCWO with AECOPD medications                                                               | Spirometry; mMRC scale and 6MWD                     |
|                                  |      |             |                          | EG 2  | 4 weeks/3 session/week Flutter with AECOPD medications                                                                                  |                                                     |
|                                  |      |             |                          | CG    | Treated with medication only                                                                                                            |                                                     |
| Khan W et al. <sup>32</sup>      | 2018 | 30          | COPD                     | EG    | Chest physiotherapy and standard medical treatment                                                                                      | SGRQ                                                |
|                                  |      |             |                          | CG    | Standard medical treatment                                                                                                              |                                                     |

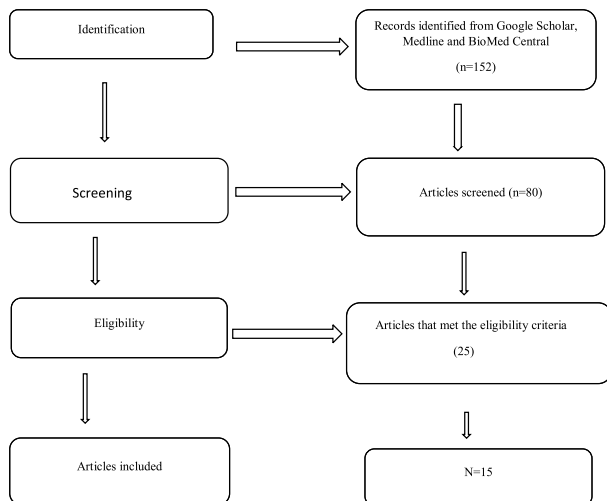
|                                 |      |     |      |         |                                                                                                                                                                             |                                              |
|---------------------------------|------|-----|------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Nicolini A et al. <sup>33</sup> | 2018 | 60  | COPD | EG 1    | 14 days/2 times in a day /15 min / session received physiotherapy and IPV                                                                                                   | mMRC Dyspnea scale; SGRQ; mMRC dyspnea scale |
|                                 |      |     |      | EG 2    | 14 days/2 times in a day/20 min/ session received percussive device physiotherapy and HFCWO                                                                                 |                                              |
|                                 |      |     |      | CG      | Treated with physiotherapy alone                                                                                                                                            |                                              |
| Varas AB et al. <sup>34</sup>   | 2018 | 33  | COPD | EG      | A community-based 8-week program consisting of exercise training                                                                                                            | mMRC dyspnea scale                           |
|                                 |      |     |      | CG      | Recommendations to walk more every day                                                                                                                                      |                                              |
| Silva CM et al. <sup>35</sup>   | 2018 | 51  | COPD | EG      | 8 weeks/3 sessions/week received warm-up, aerobic exercise, inspiratory muscle training, three sets of upper limb resistance exercise, stretching and followed by a massage | 6MWT and SGRQ                                |
|                                 |      |     |      | CG      | Received warm-up, aerobic exercise, inspiratory muscle training, and stretching followed by a massage                                                                       |                                              |
| Schultz K et al. <sup>36</sup>  | 2018 | 602 | COPD | EG      | 3 weeks received highly intensive inspiratory muscle training                                                                                                               | 6MWD and SGRQ                                |
|                                 |      |     |      | CG      | Received sham inspiratory muscle training                                                                                                                                   |                                              |
| Gurudut P et al. <sup>37</sup>  | 2019 | 33  | COPD | Group 1 | Calisthenics                                                                                                                                                                | Modified Borge scale and SGRQ                |
|                                 |      |     |      | Group 2 | Yoga                                                                                                                                                                        |                                              |
|                                 |      |     |      | Group 3 | Chest Physiotherapy                                                                                                                                                         |                                              |
| Shamakh M et al. <sup>38</sup>  | 2020 | 60  | COPD | Group 1 | 6 months received ACBT's                                                                                                                                                    | Quality of life                              |
|                                 |      |     |      | Group 2 | ACBT's plus PEP                                                                                                                                                             |                                              |
|                                 |      |     |      | Group 3 | ACBT's plus Acapella                                                                                                                                                        |                                              |

Chronic obstructive pulmonary disease: COPD; Acute exacerbation of chronic obstructive pulmonary disease: AECOPD; Experimental group: EG; Control group: CG; High-frequency chest wall oscillation: HFCWO; Positive expiratory pressure: PEP; Neuromuscular electrical stimulation: NMES; Intrapulmonary ventilation: IPV; Saint George respiratory questionnaire: SGRQ; Modified medical research council: mMRC; 6-minute walking distance: 6MWD; Forced expiratory volume: FEV

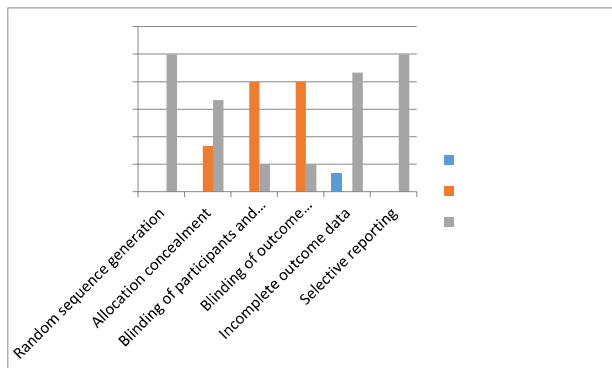
**Table 2: Author judgments regarding the risk of bias assessment**

| Domains                                | Random sequence generation | Allocation concealment | Blinding of participants and personnel | Blinding of outcome assessment | Incomplete outcome data | Selective reporting |
|----------------------------------------|----------------------------|------------------------|----------------------------------------|--------------------------------|-------------------------|---------------------|
| Mahajan AK al., 2011 <sup>24</sup>     | ✓                          | ✓                      | ✓                                      | ✓                              | ✓                       | ✓                   |
| Tang CY et al., 2012 <sup>25</sup>     | ✓                          | ✓                      | ✗                                      | ✗                              | ✓                       | ✓                   |
| Cross JL et al., 2012 <sup>26</sup>    | ✓                          | ✗                      | ✗                                      | ✗                              | ✓                       | ✓                   |
| Nicolini A et al., 2013 <sup>27</sup>  | ✓                          | ✓                      | ✗                                      | ✗                              | ✓                       | ✓                   |
| Osadnik CR et al., 2014 <sup>28</sup>  | ✓                          | ✓                      | ✗                                      | ✗                              | ✓                       | ✓                   |
| Pradella CO et al., 2015 <sup>29</sup> | ✓                          | ✓                      | ✗                                      | ✗                              | ✓                       | ✓                   |
| Maddock M et al., 2016 <sup>30</sup>   | ✓                          | ✓                      | ✓                                      | ✓                              | ✓                       | ✓                   |
| Farag TS et al., 2017 <sup>31</sup>    | ✓                          | ✓                      | ✗                                      | ✗                              | ✓                       | ✓                   |
| Khan W et al., 2018 <sup>32</sup>      | ✓                          | ✗                      | ✗                                      | ✗                              | ✓                       | ✓                   |
| Nicolini A et al., 2018 <sup>33</sup>  | ✓                          | ✓                      | ✗                                      | ✗                              | ✓                       | ✓                   |

|                                      |   |   |   |   |   |   |
|--------------------------------------|---|---|---|---|---|---|
| Varas AB et al., 2018 <sup>34</sup>  | ✓ | ✓ | × | × | ✓ | ✓ |
| Silva CM et al., 2018 <sup>35</sup>  | ✓ | ✓ | × | × | ? | ✓ |
| Schultz K et al., 2018 <sup>36</sup> | ✓ | × | × | × | ? | ✓ |
| Gurudut P et al., 2019 <sup>37</sup> | ✓ | × | × | × | ✓ | ✓ |
| Shamakh M et al., 2020 <sup>38</sup> | ✓ | × | ✓ | ✓ | ✓ | ✓ |



**Fig 1: Flow chart according to PRISMA strategies**



**Fig 1: Flow chart according to PRISMA strategies**

## DISCUSSION

This systematic review has critically analyzed RCTs conducted over the past 10 years (2011-2020) to assess the effects of different exercise therapies on obstruction, dyspnea, and quality of life in obstructive patients. The review consists of 15 trials with a total sample size of 1831 obstructive patients.

A study conducted by Mahajan AK et al. that HFCWO significantly improved dyspnea in COPD patients<sup>24</sup> because it is easy to use for obstructive patients and no need for assistance in mechanical chest physiotherapy, so it will be used by obstructive patients itself to relieve their obstruction, dyspnea and quality of life. Tang CY et al. reported that standard physical therapy is effective in the management of COPD to improve their exercise capability and improvement in activities of daily living<sup>25</sup>.

Cross JL et al., conducted a study that manual chest physiotherapy has no part in controlling COPD symptoms<sup>26</sup> because it's difficult for the patient to visit a daily hospital for manual chest physiotherapy that's why obstructive patients did not prefer manual chest physiotherapy. Nicolini A et al. conducted a study that HFCWO with traditional chest physiotherapy revealed a substantial improvement in lung capacities and volumes as well as in ADL's<sup>27</sup>.

In contrast, Osadnik CR et al. study proved that positive expiratory pressure (PEP) has no part in controlling COPD symptoms such as dyspnea, sputum and cough because the device only creates positive pressure and assists expiration it has no role in mucus clearance and dyspnea<sup>28</sup>. Pradella CO et al., a study found that home-based pulmonary rehabilitation improved quality of life in COPD patients<sup>29</sup>.

Maddock M et al. conducted a study that neuromuscular electrical stimulation to quadriceps muscle enhanced efficient exercise capability and recovery from disuse atrophy of lower limb muscles<sup>30</sup>. Farag TS et al. study concluded that HFCWO and Flutter device is highly effective in the treatment of patients with AECOPD in terms of improvement in ventilatory function and oxygenation parameters with better exercise tolerance<sup>31</sup>.

Khan W et al. analysis shows that chest physiotherapy with standard medical treatment has beneficial effects in pain management and quality of life but it requires the expertise of therapist and when family members apply chest physical therapy that's why it has no such good effects<sup>32</sup>. Nicolini A et al. conducted a study that HFCWO and IPV are also effective in the management of COPD patients<sup>33</sup>. Varas AB et al. study shows that community-based exercise training has useful effects in improvement of quality of life<sup>34</sup>. Silva CM et al. conducted a study that upper limb resistance exercise improved quality of life in COPD patients<sup>35</sup>.

Schultz K et al. study shows that inspiratory muscle training has no effects on quality of life and dyspnea<sup>36</sup>. Gurudut P et al. study shows that yoga, chest physiotherapy, and calisthenics are equally effective in improvement of quality of life<sup>37</sup>. Shamakh M et al. study conducted a study that shows positive expiratory pressure is effective in improvement of pulmonary functions<sup>38</sup>.

Compare with review from Alvarenga et al.<sup>1</sup> that HFCWO technique is effective in COPD patients and this

study has similar results to our study because mechanical chest physical therapy produces vibrations to clear mucus and secretions and helps in the expiration of air that relieves dyspnea and ultimately improves the quality of life in obstructive patients.

One of the strengths of this review is focusing on the use of RCTs (2011 to 2020) with valid and reliable instruments to measure outcomes.

Further high-quality studies with the latest manual and mechanical intervention are needed to clearly understand which type of chest physiotherapy is most effective to achieve a better outcome in the management of obstructive patients and what will be the dose of exercise in obstructive patients.

## CONCLUSION

High-to-moderate evidence supports that mechanical chest physical therapy is effective in the improvement of obstruction, dyspnea, and quality of life in COPD patients. HFCWO alone or in combination with standard physical therapy, traditional chest physiotherapy, and flutter device relieve mucus and secretions that help in the expiration and ultimately improves dyspnea and quality of life in obstructive patients and mechanical chest physical therapy requires visits and expertise and patients used by their self while on the other side manual chest physical therapy and home-based pulmonary requires visits and expertise which limit the therapist to continue their pulmonary rehabilitation, so it's feasible for the obstructive patients to use mechanical chest physical therapy to relieve their symptoms and improve quality of life.

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#### AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

**Hussain F:** Concept, design of study and manuscript writing

**Shaikh HA:** Data Collection

**Ahmed A:** Reviewing and Editing

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Authors should express all measurements in conventional units, with System International (SI) units given in parentheses throughout the text.

### **Abbreviations**

Except for units of measurements abbreviations are discouraged. The first time an abbreviation appears it should be preceded by the words for which it stands. However title and abstract must not contain any abbreviation.

### **Statistics**

Describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. When possible quantify findings and present them with appropriate indicators of measurements error or uncertainty (such as confidence intervals). Avoid relying solely on statistical hypothesis testing, such as the use of *p* values, which fails to convey important quantitative information. Discuss the eligibility of experimental subjects. Describe the methods for and success of any binding of observations. Report complications of treatment. Give numbers of observations. Report losses to observation (such as dropouts from a clinical trial). Specify any computer programs used.

Put a general description of methods in the Methods Section. When data is summarised in the Results Section, specify the statistical methods used to analyse it. Restrict tables and figures to those needed to explain the argument of the paper and to assess its support avoid non technical uses of technical terms in statistics, such as "random" (which implies a randomizing device) "normal" significant, "correlation", and sample.

Define statistical terms, abbreviations, and most symbols.

### **Drug Names**

Only generic names should be used.

### **Permissions**

Materials taken from other sources must be accompanied by a written statement from both author an publisher giving permission to the journal for reproduction.

### **Case Report**

Short report of cases, clinical experience, drug trials or adverse effects may be submitted. They must not exceed 500 words, 5 bibliographic references and one table or illustration. The report must contain genuinely new information. The format is title, abstract, introduction, case report, discussion, references.

### **Review and Action**

All articles on receipt for publication are immediately acknowledged but that does not imply acceptance for publication.

Submitted manuscripts are reviewed for originality, relevance, statistical methods, significance, adequacy of documentation, reader interest and composition. Manuscripts not submitted according to the instructions will be returned to the author for correction prior to beginning the peer review process. All manuscripts considered suitable for review are evaluated by a minimum of two members of editorial board. The manuscripts is then sent to two or more than two reviewers who may take a couple of months time to review the manuscript. The ultimate authority to accept or reject the manuscript rests with the Editor.

Revised manuscripts are judged on the adequacy of responses to suggestions and criticisms made during the initial review. All accepted manuscripts are subject to editing for scientific accuracy and clarity by the office of the Editor. When the manuscripts is deemed fit for publication, letter of acceptance is issued to the author. No article is rejected unless similar comments are received from at least two reviewers.

**FOR DETAILS, SEE OUR EDITORIAL POLICY IN THE NEXT SECTIONS**

# AUTHOR'S AGREEMENT

Journal of Medical Sciences (KMC Peshawar pISSN 1997-3438)

ArticleTitle \_\_\_\_\_

The undersigned author (after reviewing criteria for authorship as defined by International Committee of Medical Journal Editors [ICJME] found at 'http://www.icmje.org/' and have participated reasonably in the intellectual content, analysis of data and writing of the article) jointly and severally, hereby transfer and assign all rights, title, and interest therein, including any and all copyrights in all forms and media now or hereafter known, to the Journal of Medical sciences. The author/s retain the nonexclusive right to use part or all of the article in future work of their own, provided proper credit is given to the Journal of Medical Sciences. In case, the submitted article is not published, the Editorial Board agrees to release its rights therein.

## I certify that

- A) None of the material in the manuscript has been published previously/currently under consideration for publication elsewhere.
- B) The article has not been accepted for publication elsewhere
- C) I have not signed any right or interest in the article to any third party
- D) I am able/willing to produce the data on which this article is based, should the Editorial Board of the Journal of Medical Sciences request such data.
- E) Animal Care Committee/Institutional Review Board approval was granted for this study.  
I (including spouse and children), disclose financial interest at the level  
a) Nothing to disclose    b) Financial interest to the amount of \_\_\_\_\_
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- G) I/we suggest the following two overseas reviewers to review our article.

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**Note:** Author agreement form must be signed by each author (one page for each) and submitted with the article.

## Author's Checklist:

- i) Eliminate nonstandard abbreviation in the titles
- ii) Supply full author names (including institutional affiliation and contact informations)
- iii) Contribution of individual authors
- iv) Nomination of first 3 co-authors by the principal author
- v) Abstract: 200 words, Article: 2000 words (excluding references).
- vi) Supply references in Vancouver style, accurately cited in the text in numerical order
- vii) Cite tables in the text in numerical order
- viii) Send 03 Hard copies and on a R/W CD (in MS Word), in a protective envelop, do not use clips

- ix) Cite figures in the text in numerical order
- x) Author agreement is signed by all authors.
- xi) Departmental Permission Letter for the study.
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- xiii) Bank draft for Rs. 5000/- (Rs. Five Thousand) in the name of Journal of Medical Sciences, Peshawar, Pakistan/or deposit in cash with Managing Editor Account No. 4048685170 (3548-9) Can be transferred ONLINE to the Account No. 4048685170 (3548-9) Branch Code 0388 at National Bank of Pakistan, University Campus Branch, Peshawar.

# EDITORIAL POLICY

## EDITORIAL POLICY OF JOURNAL OF MEDICAL SCIENCES (JMS), KHYBER MEDICAL COLLEGE, PESHAWAR

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### OVERVIEW

This document highlights the mission, objectives and editorial policy of JMS in regard to publication process by adhering to the guidelines by COPE (Committee in Publication Ethics) and ICMJE (International Committee of Medical Journals Editors). Each component of the editorial policy is explained in the next sections.

### A MISSION OF JMS

To publish relevant, scientific and accessible material to help medical students and health professionals in their practice, teaching and learning, and career development

### B OBJECTIVES OF JMS

- a To publish clinical, epidemiological, public health, educational, translational, and allied sciences research to enable the scientists, clinicians and researchers to learn about developments and innovations in these disciplines
- b To publish high quality descriptive and experimental research, review articles, editorials and case reports to enhance the understanding of scientific community regarding clinical practice and education
- c To provide a platform for scientific community in promoting their career development through publishing quality research

### C EDITORIAL POLICY

#### 1 Open access

JJMS is an Open access scholarly literature source that is free of charge and often carries less restrictive copyright and licensing barriers than traditionally published works, for both the users and the authors. However, it complies with well-established peer review processes and tries to maintain high publishing standards.

#### 2 Peer review process

The review process of JMS is following a “triage approach”. Upon submission of a manuscript, either online or physical, the document undergoes a preliminary open (un-blinded) review in the office of the chief editor. The document is either accepted for further review, sent for revision back to the authors, or rejected at that time. Further review of JMS is following a blinded approach, where the article is sent to 2 reviewers, a local and international. During this process, all the relevant information about the authors and reviewers is kept confidential. However, we encourage to share reviewers’ comments with co-reviewers of the same paper in a blinded manner, so reviewers can learn from each other in the review process. We also encourage the readers to send us the post publication reviews about a research work in the form of letters to the editors, which are then published and shared with the authors of relevant articles. The editorial board has the authority to retract an article if serious violation of credibility or quality of research is found after the article is published.

The journal is under no obligation to send submitted manuscripts for review, and under no obligation to follow reviewer recommendations, favourable or negative at all times. The editor of a journal is ultimately responsible for the selection of all its content, and editorial decisions may be taken by issues unrelated to the quality of a manuscript, such as suitability for the journal. An editor can reject any article at any time before publication, including after acceptance, if concerns arise about the integrity of the work.

#### 3 Authorship

According to the ICMJE criteria, authorship is based on 4 criteria; (1) conceptualization and designing, (2) AND, data collection, (3) AND, writing and critical review, (4) AND, taking responsibility for the authenticity and integrity of all the research process. All those designated as authors should meet all these 4 criteria. The

co-authors should declare their roles and contributions in the research process explicitly. Those who do not meet all 4 criteria should be **ACKNOWLEDGED** only. If agreement cannot be reached about who qualifies for authorship, the institution(s) where the work was performed, not the journal editor, should be asked to investigate. If authors request removal, addition or change in the sequence of an author after manuscript submission or publication, journal editors should seek an explanation and signed statement of agreement for the requested change from all listed authors and from the author to be removed or added. The corresponding author is the one individual who takes primary responsibility for communication with the journal during the manuscript submission, peer review, and publication process. The corresponding author typically ensures that all the journal's administrative requirements, such as providing details of authorship, ethics committee approval, clinical trial registration documentation, and disclosures of relationships and activities, are properly completed and reported.

#### **4 Submission of manuscript**

The manuscript should be submitted through journal website which is using the Online Journal System (OJS) along with the Institution research and ethics board (IREB) certificate. The article should have the following format:

- 4.1: The abstract should be structured with word count of not more than 250 words.
- 4.2: The fonts should be Calibri, with size 12, and spacing of 1.5, with justified margins in MS office format.
- 4.3: The whole document should not be more than 3000 words (excluding references and appendices).
- 4.4: The number of figures and tables should not exceed 5 in the whole document.
- 4.5: The pictures and tables should be black and white in color.
- 4.6: Copied pictures and tables from other sources will not be entertained, unless a written approval from the original researcher and publisher is provided

#### **5 Institutional research and Ethics board (IREB) certificate**

Under no circumstances, an article will be accepted if approval from the relevant ethical board / committee is not taken before the start of a research. The board / committee should assess the proposal of a research in both ethical and technical aspects before giving a certificate of approval.

#### **6 Conflict of interest**

To ensure transparency in the research conduction, writing and publication, the authors, peer reviewers and editors have to declare conflicts of interest regarding financial aspects, academic competitions, and relationships during writing, reviewing and publishing the manuscripts. Details of sponsors along with their roles and access to data should be clearly stated.

#### **7 Confidentiality**

The editorial board in no way should publicize the work of a researcher in any form unless it is published. They should not publicize the comments and critique given by reviewers. Similarly, the reviewers are bound to keep the confidentiality of the work of researchers during and after the review. The work of researchers and the critique should never be discussed or exemplified in forums. The confidentiality of the researchers should be maintained in every possible way when the documents are sent for review. However, our review process is open (non-blinded) in the first phase, as per policy of the journal. In this case, the policy is clearly displayed on journal's website for the researchers. Reviewers must not retain the manuscript for their personal use and should destroy paper copies of manuscripts and delete electronic copies after submitting their reviews. If a manuscript is rejected, it should be deleted from the editorial system. If an article is published, the manuscript along with its reviews and other relevant documents should be retained for a period of 3 years and then deleted. The only situation where confidentiality needs to be breached is when a situation of fraud or misconduct is found during the review process or after publication. Still, the authors and sometimes the reviewers, have to be notified.

## 8 Correction and retraction of articles

The guidelines for correction and retraction of articles are as follows:

- 8.1: A specific page is allocated in the journal (both electronic and printed) that will be used for news related to corrections in articles published in previous journals.
- 8.2: The editor should also post a new article version in the journal with details of the changes from the original version and the date(s) on which the changes were made.
- 8.3: Previous electronic versions will prominently note that there are more recent versions of the article (that will be placed at the end of abstract). Similarly, the more recent version should be cited by the authors or others.
- 8.4: If the error is judged to be unintentional, and the underlying science appears valid, and the changed version of the paper survives further review and editorial scrutiny, then retraction with republication of the changed paper, with an explanation, allows full correction of that research paper.
- 8.5: If serious violation of credibility or quality of a research paper is found after the publication, the article has to be retracted after approval of at least 3 members of the editorial board in consultation with chief editor. The whole process will follow the guidelines presented by Committee on publication ethics (COPE).
- 8.6: The retracted article should clearly be notified on the website and the word "retracted" should be mentioned along the title of the article.

## 9 Correspondence

Correspondence for submitting an article in JMS will be through a corresponding author. The duties of a corresponding author have already been presented in a previous section. Correspondence regarding debating an article is given high value and a separate page for letters to the editors has been allocated. Derogatory and demeaning letters are screened and letters which promote debates and critique are encouraged to be

published. However, correspondence about the articles published in the last 1 year will be included only.

## 10 Fee submission process

The editorial board in a recent meeting has fixed a fee of 7000/- Rs (Pakistani), for local authors and 250 \$ (US) for international authors. The fee should be submitted as bank draft/online payment through account (IBAN) no: PK56NBPA0388004048685170 (Branch code: 0388 / National Bank of Pakistan, University campus branch, Peshawar, Pakistan) as follows:

- 1) Article processing fee of 3000/- PKR at the time of submission of article after acceptance for preliminary / initial triage, open review by the Chief Editor. This amount will be non-refundable.
- 2) Article publication fee of 4000/- PKR at the time of acceptance of article after external review. This amount will be refundable if the article is rejected for any reason.
- 3) For international authors, the amount of 250 US dollars will be accepted after both internal and external review. Researchers belonging to countries other than Pakistan are advised to submit the fee after the whole process of review is completed and the article is accepted for publication.

## 11 Roles of editorial board, editors and members

The editorial board of JMS is following the Higher Education Commission (HEC) policy for research journals. The roles of the editorial board for JMS are mentioned below:

11.1: The roles of the Editorial Board are:

11.1.1: To offer expertise in their specialist area

11.1.2: To review submitted manuscripts

11.1.3: To advise on journal policy and scope

11.1.4: To work with the Editor to ensure ongoing development of the journal

11.1.5: To identify topics for special issues of the journal or recommend a Conference which would promote the journal, which they might also help to organize and/or guest edit

11.1.6: To attract new and established authors and articles

11.1.7: To submit some of their own work for consideration, ensuring that they adhere to Conflict of Interest rules and stating their relationship to the journal. This is very important as the journal cannot be seen to publish only papers from members of the Editorial Board.

11.1.8: It is important that Editorial Boards have a regular communication forum with other boards of similar nature, either face to face in person (depending on their country of origin, funding availability, etc.) or as more journals are doing today, communicating by teleconference, Skype or other web platforms.

11.2: The Patron:

The Patron is usually the Dean of the institute, and is overall in charge of the journal, who needs to be kept informed of the decisions taken by the editorial board. The patron is the final authority to approve the decisions and policies of the editorial board.

11.3: The Chief Editor:

11.3.1: The criteria for selection of Chief Editor are:

- i. Expertise and experience in the specialist field related to the journal
- ii. Publication record of a number of articles and /or books (usually in / related to the specialist field)
- iii. Being a reviewer for an international peer-reviewed journal
- iv. Senior research position with equivalent experience in research and scholarship
- v. Enthusiasm to undertake the Editor role
- vi. Preferably a diploma, master or doctoral degree in Education and Research. It is not necessary to fulfill all the criteria to become a chief editor

11.3.2: The roles of Chief Editor are:

- i. The key role of a journal's chief editor is to promote scholarship in the specialist field associated with the journal, whilst also promoting the journal as the best journal to publish in. For any journal, the editor will need to encourage new and established authors to submit articles and set up a reliable panel of expert reviewers. Editors are also

responsible for offering feedback to reviewers when required and ensure that any feedback to authors is constructive.

- ii. An editor should also familiarize themselves with the Committee on Publication Ethics (COPE) 'Code of Conduct and Best Practice Guidelines for Journal Editors'.
- iii. Depending on how the journal is managed and how it is structured, an Editor may have to make all the decisions regarding which articles to accept or reject for publication.

11.3.3: Managing editor:

***The roles of managing editor are:***

- i. To help the chief editor to achieve the above-mentioned goals
- ii. To communicate with the authors, reviewers, publishers and other agencies for smooth running of the journal
- iii. To regularly evaluate the research work
- iv. To communicate with funding and regulating agencies (HEC and others) for grants and accreditations.

11.3.4: Executive editor:

***The roles of executive editor are:***

- i. To evaluate the research articles presented for publication
- ii. To help the editorial board in policy making
- iii. To help the editorial board in smooth publishing
- iv. To communicate with reviewers and collaborate with external agencies for relevant purposes

11.3.5: Section editors:

***Section editors are allotted different responsibilities. Some of these are mentioned below:***

- i. Bibliography
- ii. Proof-reading

- iii. Academic writing reviewing, grammar and spell checking
- iv. Dissemination of articles for review
- v. Contact with publishers under the supervision of senior editorial team
- vi. Training of future reviewers, young members and other faculty members
- vii. others

#### 11.3.5: Editorial advisory board:

Editorial advisory board members consist of national and international senior academicians, researchers, clinicians and others to help the current editorial board in designing, implementing and evaluating policies regarding upgrading the quality of research work. These people also share best practices to help the editorial team to refine their research work.

## 12. POLICY REGARDING RECRUITMENT AND CONTINUATION OF EDITORIAL BOARD

Policy for recruitment and continuation of the editorial board is based on the guidelines discussed in the previous section. The chief editor, managing editor and executive editors are recruited by the patron in-Chief. Members are then selected by them from amongst

the faculty who have an aptitude for research, and their names are endorsed by the patron. The tenure of editorial board is decided by the Patron after a period of 3 years whether to continue or recruit a new team or member. The editorial advisory board members are recruited for indefinite period by the editorial team of JMS.

## 13. Plagiarism policy

he journal is following the plagiarism policy of Higher Education Commission of Pakistan, and for this purpose, a plagiarism standing and review committee has been established under the chairmanship of Chief Editor of JMS along with 4 members amongst senior faculty. The committee has been given the authority to review research papers and plagiarism complaints related to published work in the journal.

## 14 Contact information

The office of managing editor or chief editor should be contacted anytime in working hours or can be contacted through their emails for correspondence.

## REFERENCES

1. ICMJE recommendations
2. COPE guidelines
3. SCOPUS

This document is prepared in January 2020 to be used by editorial board, reviewers, researchers and faculty as a guide to make them aware of policies and procedures of publishing, conducting, writing, reviewing and evaluating the research published in JMS. This document is developed by including the recommendations of ICMJE (2019) and COPE guideline and in case of any conflict, lack of clarity and ambiguity, the recommendations of latest ICMJE recommendation and COPE will prevail.



