ORIGINAL ARTICLE

ASSOCIATION OF VITAMIN D DEFICIENCY WITH STROKE AND ITS RISK FACTORS: IN A TEACHING HOSPITAL, PESHAWAR

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ABSTRACT

Objectives: To assess the association of vitamin D deficiency with stroke and its risk factor among the stroke patients.

Material and Methods: This case control study was conducted in the ICU and Medical Unit of Khyber Teaching Hospital, Peshawar, Pakistan from April 2016 and October 2016, in which 100 patients and 200 controls were selected by convenience sampling. Cases were defined if patient had serum 25-hydroxy vitamin D level less than 20 ng/ml. Data was collected through a structured questionnaire.

Results: Our results showed that; 44% patients were male and 43% were female among the cases while 43.5% were male and 56.5% were females among controls. Among cases, 29 were in age groups of 30-40 years, 128 in 40 years while 143 having age above 60 years. Mean age in cases was 58.4 years $\pm$11.1 SD and in control the mean age was 58.6 years $\pm$11.5 SD. The results of all selected variables among the stroke patient showed positive association with OR > 1.

Conclusion: The deficiency of 25-hydroxy vitamin D had independent association with stroke and showed positive association with obesity, hypertension, family history of stroke, high lipid profile and reduced levels of vitamin D.

Keywords: Stroke, Vitamin D, Obesity.

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INTRODUCTION

Stroke refers to inability of the brain to function properly due to disturbance of its blood supply and due to either hemorrhage or ischemia[1]. Stroke is one of the major health problems globally, fourth commonest cause of disability and second leading cause of death worldwide[2]. Overall two thirds of stroke patients constitutes elderly patients i.e. over 65 years[3]. Men suffers from stroke 25% more than women but still the mortality rate from stroke in women is about 60% more than men[4]. According to a study conducted on elderly people, the prevalence of stroke was found to be 12.6% in women while 15.5% in men[5].

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Every year approximately 20 million people suffers from stroke. Stroke affects both developed and developing countries[6]. Moreover, developing countries have the largest burden of stroke i.e. 85% of stroke mortality[7]. With major demographic, epidemiological and nutritional transition, marked by economic growth, urbanization, decrease in mortality from infectious disease and an increase in life expectancy has led to large increase in morbidity and mortality attributable to coronary vascular disease[8].

Vitamin D deficiency is found in atleast half of the population and contributes to cerebro-vascular diseases[9,10]. Low serum 25(OH) D level have been found to be independent risk factor for fatal stroke[11]. A study done in Pakistan showed that the most common risk factors related to stroke were hypertension (86.8%) followed by diabetes mellitus (59.8%), dyslipidemia (59.1%) and also smoking which constitutes about 18.1%. Gender distribution of risk factors among Pakistani stroke patients revealed more prevalence of hypertension and dyslipidemia in females[12]. In another study confirmed

that most common risk factors were hypertension (63.75%), smoking (35%), diabetes mellitus (33.75%), hyperlipidemia (31.25%), and obesity (23.75%)[13].

According to survey conducted by Third National Health and Nutrition Examination, participants having low level of serum 25(OH) vitamin D i.e. <21 ng/mL had a higher prevalence of obesity (OR : 2.29), hypertension (OR : 1.30) and higher serum triglycerides level (OR : 1.47) with respect to participants having higher serum level of 25(OH) vitamin D i.e. ≥37 ng/mL[14]. According to study done in the United Kingdom, 77 % patients of acute stroke were found to have low vitamin D levels i.e. <20.0 ng/mL)[15].

Genetic and environmental factors also affect coronary heart diseases prevalence[12]. High LDL level and smoking are considered to be the main risk factors for stroke and is strongly associated with obesity[13]. Patients with BMI less than 20 showed decrease risk of stroke as compared to those with a BMI greater than 20[14]. Moreover, a cross-sectional study at the University of Minnesota reported 93% vitamin D deficiency (12.08 ng/mL), whereas in a study of Saudi Arabia, 83% had abnormally low level of 25(OH) vitamin D[15].

Pakistan is a developing country and having high rate of stroke due to high prevalence of vitamin D deficiency. This case control study was conducted to assess the association between deficiency of vitamin D and stroke and its risk factor among the stroke patients.

MATERIAL AND METHODS

A case control study was conducted in the ICU and Medical Units of Khyber Teaching Hospital Peshawar, Pakistan; between April 2016 and October 2016. One hundred patients within seven days of the first ever stroke confirmed on CT scan, aged more than 30 years, were selected as cases by convenience sampling technique. For each case, two controls were selected after matching for age and gender. Patients having renal problem, hepatic problem, taking steroids or vitamin D supplement were excluded to avoid the confounding effect. Height and weight were measured and BMI was calculated, blood pressure was recorded and blood was assessed for 25–hydroxyl vitamin D levels and lipid profile for both the cases and control through standard methods. Vitamin D deficiency can be defined as serum level of 25-hydroxy vitamin D level <20 ng/ml. Relevant data was collected from cases and controls through a structured questionnaire. Microsoft Word 2010 and SPSS 16 were used for statistical analysis and data was presented in form of tables.

RESULTS

In our study mean age in cases was 58.4 years with ±11.1 SD; whereas in control the mean age was 58.6 years with ±11.5 SD. Among cases, 44% patients were male and 56% were female while among controls, 43.5% were male and 56.5% were females. The age distribution and gender distribution among the stroke cases and controls were shown in Table 1. The relationship between stroke and different independent variables of obesity, hypertension, lipid profile, vitamin D levels and family history of stroke were shown in Table 2.

DISCUSSION

Our study results showed that the prevalence of stroke was more (47%) among patients older than 60 years as were assessed in various International studies[21,22], while vitamin D deficiency prevalence was more in elderly patients (75%) as compared to younger stroke patients[23]. The study we conducted, vitamin D deficiency was more common among female cases 56% as revealed by many international studies[12,23,24].

Many international and national studies reported strong positive association of vitamin D deficiency among obese people; as was confirmed and supported by our study findings showing 89% obesity among stroke patients and confirmed by the strong positive i.e. Odds Ratio of 8.42[23]. Our study results revealed positive association of hypertension with stroke and showed odds ratio of 8.56 and thus confirmed that patients developing stroke among hypertension was more compared to those without hypertension and was identified as strong associated risk factor of stroke[25].

A low serum level of Vitamin D is one of the most important modifiable risk factor for stroke[10]. Many inter-

Table No 1. Age and gender distribution of cases and controls (n=300) of KTH Peshawar

S. No	Cases		Control		Total
Age in years	Male	Female	Male	Female	
30-40	3 (3%)	4 (4%)	13 (6.5%)	9 (4.5%)	29
41-60	19 (19%)	25 (25%)	39 (19.5%)	45 (22.5%)	128
60 & above	22 (22%)	27 (27%)	35 (17.5%)	59 (29.5%)	143
Total	100		200		300

Table 2: Different variables Vs study population

Variables	Response	Cases	Control	Total	OR
BMI	Over > 25	89 (89%)	98 (49%)	187	8.42
	Normal	11(11%)	102(51%)	113	
Hypertension	HTN	73(73%)	48(24%)	121	8.56
	No HTN	27(27%)	152(76%)	179	
Lipid profile	Abnormal	69(69%)	72(36%)	141	3.95
	Normal	31(31%)	128(64%)	159	
Stroke Family History	Yes	61	106 (53%)	167	1.38
	No	39	94 (47%)	133	
Vitamin D Levels	Low levels	66(66%)	64(32%)	130	4.12
	Normal	34(34%)	136(68%)	170	

national studies confirmed that most common risk factors associated with stroke were hypertension (63.75%), hyperlipidemia (31.25%) and obesity (23.75%)[13]. According to survey conducted by Third National Health and Nutrition Examination, participants having low level of serum 25(OH) vitamin D i.e. <21 ng/mL had a higher prevalence of obesity (OR : 2.29), hypertension (OR : 1.30) and higher serum triglycerides level (OR : 1.47) with respect to participants having higher serum level of 25(OH) vitamin D i.e. ≥37 ng/mL[14] which was supported and confirmed by our study results. Moreover, in a study of Pakistan showed that common risk factors for stroke were hypertension (86.8%), which was supported by our study results showing 73% with O.R of 8.56; followed by dyslipidemia (59.1%), which was supported by our study results showing 69% prevalence among the stroke patients with O.R of 3.95, thus confirms existence of strong association in stroke cases. Our study had lower prevalence of vitamin D levels i.e. 66% as compared to 77% among stroke patients in the UK[15]. Our study results shows a strong association between deficiency of 25-hydroxyvitamin D and ischemic stroke and thus established an independent association[10,26].

A study conducted by Giovannucci et al, showed low serum level of 25- hydroxyl vitamin D as an important risk factor of stroke[27]. Moreover, in a cross-sectional study at the University of Minnesota reported 93% vitamin D deficiency (12.08 ng/mL)[19]; whereas in a study in Saudi Arabia; 83% had abnormally low 25(OH) vitamin D levels[20], thus our study confirmed the findings of previous international studies.

CONCLUSION

There is independent association between 25-hydroxy vitamin D deficiency and stroke and also showed positive association with family history of stroke, high lipid profile, obesity, hypertension and lower vitamin D levels.

RECOMMENDATIONS

The community needs to sensitize regarding this highly fatal global problem. Moreover, there is need of substantial stroke management through structured clinical pathways for thrombolysis; prevention and control of stroke associated mortality and morbidity.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Faisal MS:	Concept & idea.
Hayat W:	Planned study and wrote manuscript.
Inayat A:	Data collection.
Khalil KuR:	Statistics.
Ishtiaq M:	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.