THE ROLE OF INTRA-OPERATIVE WOUND IRRIGATION WITH NORMAL SALINE IN REDUCTION OF SURGICAL SITE INFECTION IN GYNAECOLOGICAL SURGERIES- A PROSPECTIVE COHORT STUDY AT PAK-EMIRATES MILITARY HOSPITAL

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ABSTRACT

Objective: To evaluate the efficacy of intra-operative wound irrigation with normal saline in reducing surgical site infections in gynaecological surgeries.

Methods: It is a prospective cohort study carried out at Obstetrics and Gynaecology Department, Pak-Emirates Military Hospital, Rawalpindi from 1st November 2019 to 30th April 2020. A total of 400 patients undergoing abdominal surgery for gynecological reasons were recruited by consecutive non-probability technique. Patients with known comorbidities were excluded. Participants of study were allocated cohort and control groups at the end of the surgery after closing the abdominal fascia. In cohort group, the subcutaneous soft tissue was irrigated with 1000 ml of Normal saline solution before skin closure and sterile dressing. No intra-operative wound irrigation was performed in the control group. The primary and secondary endpoint measures (SSI up to 10th Post-Operative day) and (SSI up to 30th Post-Operative day) respectively, were assessed clinically.

Results: The study included 400 patients, with 200 in the cohort group and 200 in the control group with a mean Age of (Mean ± SD) 33.6±8.1 years. The majority of the patients had Pre-Op Hemoglobin of >11 g/dl (54%). The most common surgeries were Caesarean section (81%) and Hysterectomy (10%). Maximum surgeries were performed between 30-30 min (312)78% with mean hospital stay of (Mean ± SD) 2.9±0.5 days. Analysis of the results showed that Intra-operative wound irrigation with normal saline significantly lesser rate of postoperative SSIs in comparison to no irrigation at both primary outcome measure that was SSI at 10th Post-operative day (RR=0.417, 95 % CI [0.15;1.161]) and secondary outcome measure that was SSI at 30th POD (RR=0.286, 95 % CI [0.060;1.359]).

Conclusion: Intra-operative wound irrigation with Normal Saline decreases the risk of SSI by 58.3% (AR) at 10th POD and by 71.4% (AR) at 30th POD in otherwise healthy women with no comorbidities.

Key words: Surgical site infection, Gynecological surgeries, Intra-Operative Wound saline Irrigation.

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INTRODUCTION

Incidence of Surgical site infection following abdominal surgeries is as high as 15%–25% which invariably depends on the level of contamination making it one of the most frequently occurring infectious complication[1, 2, 3]. Surgical site infection is defined as an infectious complication of surgical wounds. Apart from other factors, surgical technique also influences SSI rate therefore significant number of intraoperative irrigation regimens in order to reduce postoperative SSI are documented in the literature.

The burden of SSI according to World Health Organization (WHO) was reported to be 11.8 per 100 surgical patients undergoing surgical procedures (95% CI: 8.6–16.0) and 5.6 per 100 surgical procedures (95% CI: 2.9-10.5) [4]. Wound infection occurring during first 30 postoperative days or one year postoperative (if an implant is left in place) as well as, the infection secondary to the surgery, is defined as surgical site infection by the Centers for Disease Control and Prevention [5]. It includes infections of incision area, below the incision in muscles and tissues surrounding muscles and infections in other parts of the body involved in the surgery. Any type of surgery inadvertently has a potential complication associated in the form of SSI which is void of access (minimal invasive or open) or surgical discipline. Studies identify SSI to be a significant cause leading to morbidity which can be effectively

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prevented [6,7].

Amongst hospital-acquired infections, SSIs are thought to be most frequent as well as an economic burden, accounting for 20% of all hospital acquired infections6. Statistical review undertaken by European Centre for Disease Prevention and Control 2011 reflected in SSI surveillance report indicate incidences with colorectal surgery at 9.5% besides 1.4% and 1.0% for cesarean section cholecystectomy respectively [7]. However, 11% of patients undergoing surgical procedures in developing countries develop SSI. In Africa, the incidence is up to 20%, contributing significantly to morbidity and mortality. Moreover, surgical site infections are problematic not only for poor countries but as well as developed countries like America, and it is documented that patients are spending more than 400000 extra days in hospitals due to SSIs, at a cost of an additional US$ 10 billion per year [8].

Keeping in view this high incidence of SSIs, surgeons all over the world are working on developing prophylactic measures to lessen the rates of SSIs. These prophylactic measures to prevent SSIs significantly alters surgical outcome [9]. Flow of solution experienced across the surface of a surgical incision before closure of wound is described as Wound irrigation (WI). Normal routine in surgical procedures for Prophylactic intra-operative wound irrigation (IOWI) is to undertake irrigation before skin closure. At contrary, no evidence reflects such practices to be effective in reducing chances of SSIs [10,11]. Study aims to undertake comparative review of intra operative saline irrigation of wound done prior to closure, with conventional wound closure method which is without irrigation, in terms of development of SSIs, which shall lead to identify preferred method having lesser cases of SSIs for patients treated for gynecological abdominal surgeries.

MATERIAL AND METHODS

A total of 400 patients undergoing abdominal surgery for gynecological reasons irrespective of the diagnosis were recruited by consecutive non-probability technique from 1st November 2019 to 30th April 2020. Approval of study was taken from Ethical Review Committee (A/28/EC/50/19) and consent taken from patients. Patients with known comorbidities such as essential hypertension, diabetes, thyroid disease, renal disease, anti-phospholipid Syndrome (APS), Systemic Lupus erythematosus (SLE) or any other medical illness were excluded from the study. Patients undergoing minimally invasive surgery like mini-laparotomy of more than 3 cm wound size were included. Any patient having pre-op hemoglobin < 11g/dl was excluded from the study as low Hb makes wound healing delayed. No discrimination was made between elective and emergency surgeries or between patients with or without drains. After initial screening and assessment of inclusion and exclusion criteria, demographical data was collected followed by base-line investigations as per indication of surgery. Allocation to cohort and control groups was done towards completion of surgical procedure after closing the abdominal fascia. In cohort group, the subcutaneous soft tissue was irrigated and carefully rinsed with 500ml of Normal saline solution (NaCl 0.9%), removing excessive fluid, debris and blood by suction. The wound, once irrigated and excess fluid removed was not mopped again and sterile dressing done after closing the skin was performed according to departmental protocols, without any further wound-related procedure. Detailed documentation including type and duration of surgical procedure, antibiotic prophylaxis, changing of gloves during the operative procedure, the wound closure technique as well as suture material selection, were done. No intra-operative wound irrigation was performed in the control group. The primary endpoint measure (SSI up to 10th Post-Operative day) and secondary endpoint measure (SSI up to 30th Post-Operative day) were assessed clinically by a person (with 10 years clinical experience), who was not part of the surgical team as well as was not involved in compiling the results, in order to minimize the bias. The data was compiled and statistically analyzed by SPSS 21. Descriptive tests were applied to calculate the frequencies, means, standard deviations and relative risk (RR) for association with confidence interval (CI=95%). A relative risk (RR) of <1 was considered statistically significant. Attributable risk was found using the formula [(RRR-I) = (1-RR) ×100].

RESULTS

The mean age of participants in both groups was 33.6 (±8.1) years. Majority of the patients belonged to middle socioeconomic class (71%) and had Pre-Op Hemoglobin of >11 g/dl (54%). Most of the abdominal surgeries included in the study were Caesarean section (324) followed by Hysterectomy (40) and laparotomy (36). Maximum surgeries were performed between 30-30 min (312) with mean hospital stay of (Mean ± SD) 2.9±0.5 days. Analysis of the results showed that Intra-operative normal saline irrigation of wound significantly decreased the rate of postoperative SSIs compared to no irrigation at both primary outcome measure that was SSI at 10th Post-operative day (RR=0.417, 95 % CI [0.15;1.161]) with Attributable Risk (AR= 58.3%) and secondary outcome measure that was SSI at 30th POD (RR=0.286, 95 % CI [0.060;1.359]) (AR=71.4%)

DISCUSSION

Surgical site infection (SSI) is one of the most commonly occurring postoperative complication worldwide with an incidence of about 20% and is described as an infectious complication of surgical wounds and effective measures for its prevention is an ongoing research subject [12]. Literature shows that 20% of patients undergoing abdominal surgery will suffer from SSI, leading to increase overall morbidity rate [13]. Implementation of strategies pre-

Table 1: Demographic variables

		Frequency (n)	Percentage (%)
Socioeconomic Status	High	48	12
	Middle	284	71
	Low	68	17
Pre-Operative Haemoglobin(g/dl)	10-11g/dl	112	28
	>11 g/dl	216	54
Type of Surgery	Caesarean Section	324	81
	Hysterectomy	40	10
	Laparotomy	36	9
Duration of Surgery(min)	<30 min	32	8.0
	30-60min	312	78.0
	>60min	56	14.0
Age (Mean ± SD)	8.10 ± 33.6		
Post-Op Hospital Stay (Mean ± SD)	0.72 ± 2.96		

Table 2: Findings at 10th Post-Op day (Saline Irrigation Vs No Saline Irrigation)

Saline Irrigation	Infection		RR	RRR(I): [(1-RR)×100] %
	No n (%)	Yes n (%)		
Done	195(97.5)	5(2.5)	0.417	58.3
Not Done	188(94)	12(6)		

Table 3: Findings at 30th Post-Op day (Saline Irrigation Vs No Saline Irrigation)

Saline Irrigation	Infection		RR	RRR(I): [(1-RR)×100] %
	No n (%)	Yes n (%)		
Done	198(99)	2(1)	0.286	71.4
Not Done	193(96.5)	7(3.5)		

venting wound infection is gaining further attention. It is easier to prevent the surgical infections leading to grave complicationsthan to treat them [14]. Intra-operative surgical site irrigation or lavage is a common practice in surgical procedures advocating some form of irrigation before wound closure [15]. It is imperative to further develop clinical efficacy and ascertain optimal combinations, as well as the cost-effectiveness of such measures. Normal saline is cost effective solution (compared to topical antibiotics) as well as easily available. It has high safety profile being isotonic with normal human tissue making it hypertonic for bacteria. The incidence of SSIs is decreasing due to the global campaign that invloved all the stakeholders. Studies had also shown a significant reduction in wound infection rate in patients where wound irrigation with 300 ml of normal saline was done preoperatively [16].

The rate of SSI in our study was lower as compared to the global statistics. Studies conducted at Saudia Arabia and Tanzania found statistically significant relationship between intra-operative irrigation of wound with isosmotic solution and reduction in the rate of SSI observed both on the 10th Post-operative day (RR=0.417) and 30th Post-Operative day (RR=0.286) which agrees with randomized controlled trials conducted locally in Pakistan[17-20]. Another local study on the efficacy of Normal Saline as an irrigation medium showed comparable results [21]. Our findings are also in agreement with the study by Edmiston et al [22]. One of the limitations of study was that the role of Normal Saline as irrigation agent was compared to controls where patients had no comorbidity. There is a need to carry out further studies for standardization of the technique of wound irrigation to reduce post-operative surgical site infections.

CONCLUSION

Intra-operative wound irrigation with Normal Saline decreases the risk of SSI by 58.3% at 10th POD and by 71.4% at 30th POD in otherwise healthy women with no comorbidities.

Furthermore, procedure has considerable reduction of SSIs with no comorbidities whilst being of low cost.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Khan S: Main concept, data collection.

Imran R: Data collection.

Urooj U: Data analysis.

Kashif A: Bibiliography.

Zohra S: Critical review.

Afzal S: Proof reading.

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.