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ASSOCIATION OF METABOLIC SYNDROME WITH POSTOPERATIVE SURGICAL COMPLICATIONS FOLLOWING ABDOMINAL HYSTERECTOMY

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Abstract

Background: *The incidence of postoperative complications following abdominal hysterectomy remains a significant concern in gynecological surgery. Metabolic syndrome (MetS), a cluster of cardiovascular and metabolic risk factors, may predispose patients to adverse surgical outcomes due to its systemic effects on inflammation, immunity, and healing.*

Objectives: *To determine the association between metabolic syndrome and the frequency of postoperative surgical complications in patients undergoing abdominal hysterectomy.*

Study Design & Setting: *A prospective observational study conducted at the Shalamar Medical & Dental College, Lahore over a period of six months.*

Methodology: *A total of 120 women aged 35–65 years undergoing elective abdominal hysterectomy for benign conditions were enrolled. Metabolic syndrome was diagnosed using NCEP ATP III criteria. Postoperative complications, including wound infection, dehiscence, febrile morbidity, urinary tract infection, thromboembolism, and prolonged hospital stay (>5 days), were recorded up to 30 days postoperatively. Data were analyzed using SPSS version 25.0; chi-square test was applied with $p \leq 0.05$ considered statistically significant.*

Results: *Metabolic syndrome was present in 66 (55%) patients. Postoperative complications occurred in 59.1% of patients with MetS compared to 24.1% without ($p < 0.001$). Wound infection (24.2% vs. 9.3%), febrile morbidity (19.7% vs. 9.3%), and prolonged hospital stay (33.3% vs. 11.1%) were more frequent among the MetS group. All thromboembolic events occurred in MetS patients.*

Conclusion: *Metabolic syndrome is significantly associated with increased*

postoperative complications following abdominal hysterectomy. Preoperative identification and management of MetS may help reduce surgical morbidity.

INTRODUCTION

Abdominal hysterectomy is one of the most commonly performed gynecological surgeries worldwide, primarily indicated for benign conditions such as uterine fibroids, abnormal uterine bleeding, endometriosis, and malignancies.[1,2] While advancements in surgical techniques and perioperative care have significantly reduced associated morbidity and mortality, postoperative complications continue to pose clinical challenges.[3,4] These complications can range from minor infections and delayed wound healing to serious outcomes such as venous thromboembolism, cardiovascular events, and prolonged hospital stays.[5] Increasing evidence suggests that underlying systemic conditions like metabolic syndrome (MetS) may contribute significantly to poor surgical outcomes and increased postoperative morbidity.[6,7]

Metabolic syndrome is a cluster of interrelated risk factors that includes central obesity, insulin resistance or glucose intolerance, hypertension, and dyslipidemia (elevated triglycerides and low high-density lipoprotein cholesterol).[8] The prevalence of MetS is increasing globally due to rising rates of obesity and sedentary lifestyles, particularly in women of reproductive and perimenopausal age groups, who also constitute a large proportion of the population undergoing abdominal hysterectomy. MetS has been linked to systemic inflammation, endothelial dysfunction, and impaired wound healing — all of which can negatively impact surgical recovery.[9]

Several studies have highlighted that patients with MetS are at higher risk of developing postoperative infections, wound dehiscence, cardiovascular complications, and delayed return to baseline function.[10,11] These adverse outcomes are believed to result from a combination of metabolic derangements and immune dysfunction associated with the syndrome. Insulin resistance and hyperglycemia impair neutrophil function and collagen synthesis, increasing susceptibility to infections and impairing tissue repair. Similarly, hypertension and dyslipidemia contribute to vascular compromise and impaired tissue perfusion, further compounding surgical risk.[12,13]

Understanding the relationship between MetS and postoperative outcomes in abdominal hysterectomy is crucial for preoperative risk stratification, optimizing patient care, and reducing surgical morbidity. Early identification and management of metabolic abnormalities may serve as a valuable strategy to mitigate complications and improve recovery trajectories. This study aims to investigate the association between metabolic syndrome and the frequency and severity of postoperative surgical complications following abdominal hysterectomy, thereby contributing to the body of evidence necessary for the development of targeted preoperative interventions and personalized perioperative care in gynecologic surgery.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Gynecology and Obstetrics at Shalamar Medical & Dental College, Lahore over a period of six months, from Nov 2024 to April 2025 after obtaining ethical approval from the institutional review board. A total of 120 female patients scheduled for elective abdominal hysterectomy were enrolled through non-probability consecutive sampling. The sample size was calculated using OpenEpi software with a 95% confidence level, 80% power, and an anticipated difference of 20% in postoperative complication rates between patients with and without metabolic syndrome.[14]

All women aged 35 to 65 years undergoing abdominal hysterectomy for benign conditions such as fibroids, dysfunctional uterine bleeding, or adenomyosis were included in the study. Patients with known immunosuppressive disorders, pre-existing malignancies, emergency surgeries, or those who declined to participate were excluded. Written informed consent was obtained from all participants.

Preoperative evaluation included detailed history, physical examination, and laboratory investigations. Metabolic syndrome was diagnosed based on the National Cholesterol Education Program Adult

Treatment Panel III (NCEP ATP III) criteria, where the presence of any three out of five parameters — central obesity (waist circumference >88 cm), elevated triglycerides (≥150 mg/dL), reduced HDL-C (<50 mg/dL), elevated blood pressure (≥130/85 mmHg or on antihypertensive treatment), and raised fasting plasma glucose (≥100 mg/dL or on antidiabetic medication) — confirmed the diagnosis. All surgeries were performed by experienced consultants using standardized surgical and aseptic techniques. Postoperative complications were monitored for up to 30 days and were recorded in terms of wound infection, dehiscence, urinary tract infection, febrile morbidity, thromboembolic events, and hospital stay duration. Data were collected using a structured proforma.

Statistical analysis was carried out using SPSS version 25.0. Continuous variables like age and BMI were expressed as mean ± standard deviation, while categorical variables such as the presence of metabolic syndrome and postoperative complications were presented as frequencies and percentages. The Chi-square test was used to compare proportions, and a p-value of ≤0.05 was considered statistically significant. The association between metabolic syndrome and postoperative complications was assessed to determine its predictive role in adverse surgical outcomes following abdominal hysterectomy.

RESULTS

Table 1 presents the baseline characteristics of the 120 women included in the study. The mean age of the participants was 49.2 ± 7.6 years, and the mean BMI was 28.7 ± 4.2 kg/m², indicating that the majority were overweight or obese. Waist circumference greater than 88 cm was observed in 70.8% of the patients, while 56.7% had systolic blood pressure ≥130 mmHg and 52.5% had diastolic BP ≥85 mmHg. Elevated fasting blood glucose (≥100 mg/dL) was found in 49.2% of patients, triglyceride levels ≥150 mg/dL in 40.0%, and low HDL levels (<50 mg/dL) in 51.7%. Based on the NCEP ATP III criteria, metabolic syndrome was present in 66 out of 120 patients, accounting for 55% of the total sample.

Table 2 summarizes the frequency of various postoperative complications among all patients and their distribution according to the presence or absence of metabolic syndrome. Wound infection was the most common complication overall, affecting 17.5% of patients, with a higher occurrence in those with metabolic syndrome (24.2%) compared to those without (9.3%). Wound dehiscence occurred in 5.8% of patients, again more frequently among those with MetS (9.1%) than those without (1.9%). Febrile morbidity and urinary tract infections were noted in 15.0% and 12.5% of patients respectively, with both complications being more common in the MetS group. All four cases (3.3%) of thromboembolic events occurred exclusively in patients with metabolic syndrome. Moreover, prolonged hospital stays of more than 5 days were reported in 23.3% of the sample, significantly more common in the MetS group (33.3%) than the non-MetS group (11.1%).

Table 3 highlights the association between metabolic syndrome and overall postoperative complications. Among the 66 patients with metabolic syndrome, 39 (59.1%) developed at least one postoperative complication. In contrast, only 13 (24.1%) out of 54 patients without metabolic syndrome experienced complications. This association was found to be statistically significant with a p-value <0.001, indicating a strong relationship between the presence of metabolic syndrome and increased risk of adverse surgical outcomes following abdominal hysterectomy.

Table 1: Baseline Characteristics of Study Participants (n = 120)

Variable	Mean ± SD / n (%)
Age (years)	49.2 ± 7.6
Body Mass Index (kg/m²)	28.7 ± 4.2
Waist Circumference >88 cm	85 (70.8%)
Systolic BP ≥130 mmHg	68 (56.7%)
Diastolic BP ≥85 mmHg	63 (52.5%)
Fasting Blood Glucose ≥100 mg/dL	59 (49.2%)
Triglycerides ≥150 mg/dL	48 (40.0%)

HDL <50 mg/dL	62 (51.7%)
Patients with Metabolic Syndrome	66 (55.0%)

Table 2: Frequency of Postoperative Complications in Study Population (n = 120)

Complication	Total (n=120)	With MetS (n=66)	Without MetS (n=54)
Wound Infection	21 (17.5%)	16 (24.2%)	5 (9.3%)
Wound Dehiscence	7 (5.8%)	6 (9.1%)	1 (1.9%)
Febrile Morbidity	18 (15.0%)	13 (19.7%)	5 (9.3%)
Urinary Tract Infection	15 (12.5%)	11 (16.7%)	4 (7.4%)
Thromboembolic Events	4 (3.3%)	4 (6.1%)	0 (0.0%)
Prolonged Hospital Stay >5 days	28 (23.3%)	22 (33.3%)	6 (11.1%)

Table 3: Association Between Metabolic Syndrome and Postoperative Complications

Postoperative Complication	MetS Present (n=66)	MetS Absent (n=54)	p-value
Any Complication Present	39 (59.1%)	13 (24.1%)	<0.001
No Complication	27 (40.9%)	41 (75.9%)	

DISCUSSION

Abdominal hysterectomy is a frequently performed surgical procedure for various benign gynecological conditions. Despite its routine nature, it carries a significant risk of postoperative complications. Metabolic syndrome (MetS), a cluster of metabolic abnormalities including obesity, hypertension, dyslipidemia, and hyperglycemia, is increasingly prevalent among surgical patients.[15] These metabolic disturbances contribute to impaired immunity, poor wound healing, and increased surgical morbidity.[16]

The findings of our study revealed a significant association between metabolic syndrome (MetS) and postoperative complications following abdominal hysterectomy. Among the 120 patients included, 55% had metabolic syndrome, and 59.1% of these patients experienced postoperative complications, compared to only 24.1% in the non-MetS group ($p < 0.001$). This aligns with the results reported by Shariq et al. (2018), who found that among 3,502 surgical patients, those with metabolic syndrome (11.3%) had significantly higher rates of mortality/morbidity, major complications, and longer hospital stays.[17]

However, the findings of Selph et al. (2018) present a contrast, showing no significant association of metabolic syndrome with perioperative complications in patients undergoing cystectomy and prostatectomy (OR 0.760 and OR 1.065, respectively). Nonetheless, their study did report a significant predictive value of MetS for complications after nephrectomy (adjusted OR 1.489, 95% CI: 1.146–1.934), indicating that the impact of metabolic syndrome may vary depending on the type of surgical procedure. In contrast, our study focused solely on abdominal hysterectomy, a gynecological procedure where central obesity and impaired healing mechanisms likely contribute more directly to postoperative morbidity.[18]

Our study also mirrors the findings of Ashraf et al. (2022), who identified a variety of postoperative complications in hysterectomy patients including anuria (19.2%), hematoma (19.2%), and pulmonary complications (8%). Similarly, we found that wound infection (17.5%), febrile morbidity (15.0%), and urinary tract infection (12.5%) were among the most common complications, especially in the MetS group. Though the types of complications varied slightly, both studies emphasize the vulnerability of hysterectomy patients to multiple postoperative issues.[19] Additionally, our wound infection rate (17.5%) closely resembles the 22% postoperative infection rate reported by Ahmed et al. (2001). They found wound and vaginal cuff infections in 6% and urinary tract infections in 16%, similar to our findings of 24.2% wound infections and 16.7% urinary infections in MetS patients. Ahmed et al. also reported advanced age and comorbidities as significant risk factors, which is consistent with our

cohort, where MetS was more prevalent among older individuals with metabolic comorbidities.[20]

This study uses a prospective design with clearly defined inclusion criteria and standardized surgical procedures. A structured data collection tool ensured uniformity in recording complications. The sample size of 120 patients was adequate for detecting statistically significant differences. However, the study was conducted at a single center, limiting generalizability. Short follow-up duration (30 days) may have missed late-onset complications. Potential confounding factors like nutritional status and physical activity were not assessed.

CONCLUSION

Metabolic syndrome was significantly associated with increased postoperative complications following abdominal hysterectomy. Early identification and management of MetS can improve surgical outcomes. Preoperative risk stratification should include metabolic assessment.

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