

Original Research Article

EARLY POSTOPERATIVE COMPLICATIONS AFTER MILLIGAN-MORGAN HEMORRHOIDECTOMY IN A TRIBAL SECONDARY CARE HOSPITAL: A 3-YEAR COHORT STUDY

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ABSTRACT

Background: Milligan-Morgan hemorrhoidectomy (MMH) remains the standard surgical treatment for grade III/IV hemorrhoids, but early postoperative complications significantly impact recovery, particularly in resource-limited settings. This study aimed to determine the incidence and risk factors for early postoperative complications following MMH in a secondary care hospital in tribal India.

Materials and Methods: We conducted a retrospective cohort study of consecutive adults undergoing MMH over a 12-month period at a 75-bedded secondary care hospital in tribal India. The primary outcome was a composite of any early complication (≤ 30 days): hemorrhage requiring intervention, urinary retention requiring catheterization, wound infection (serous/purulent), anal stenosis, or 30-day readmission. Multivariable logistic regression modeled the odds of complications including age, sex, BMI, number of columns excised, anesthesia type, and postoperative analgesia. STROBE guidelines were followed.

Results: Among 100 patients (median age 47 years, 61% male), 46% experienced at least one early complication. Wound infections occurred in 29% (purulent 12%, serous 17%), anal stenosis in 18%, hemorrhage in 2%, urinary retention in 1%, and readmission in 3%. On univariate analysis, BMI category ($p=0.014$) showed significant association with complications, with a borderline effect for bowel habit ($p=0.084$). In multivariable analysis, no prespecified predictors reached statistical significance, though the number of columns excised showed a clinically meaningful direction of effect (OR=1.79, 95% CI 0.62–5.20, $p=0.284$).

Conclusion: Early postoperative complications after MMH occurred in nearly half of patients in this tribal secondary care setting, predominantly superficial wound issues and stenosis. These findings highlight the need for standardized perioperative bundles addressing infection control, stenosis prophylaxis, and bowel habit optimization.

Keywords: Hemorrhoids, Milligan-Morgan hemorrhoidectomy, postoperative complications, rural surgery, India, surgical site infection.

INTRODUCTION

Hemorrhoidal disease represents one of the most common anorectal conditions encountered in surgical

practice worldwide, with a reported prevalence ranging from 4.4% to 36.4% in general populations.^[1] The condition significantly impacts quality of life, and when conservative management fails or disease progresses to grade III or IV, surgical intervention

becomes necessary.^[2] Among various surgical techniques, the Milligan-Morgan open hemorrhoidectomy, first described in 1937, remains the most widely performed procedure globally and continues to be recommended as the definitive surgical option for advanced hemorrhoidal disease in contemporary clinical practice guidelines.^[3,4] The Milligan-Morgan technique involves excision of the three primary hemorrhoidal columns with preservation of skin bridges, allowing wounds to heal by secondary intention.^[5] While effective in achieving complete removal of hemorrhoidal tissue with low recurrence rates, the procedure is associated with significant postoperative morbidity.^[6] Early postoperative complications including hemorrhage, urinary retention, wound infection, and anal stenosis contribute substantially to patient discomfort, prolonged recovery, increased healthcare utilization, and delayed return to normal activities.^[7,8]

The reported incidence of complications following hemorrhoidectomy varies considerably across studies, reflecting differences in surgical technique, perioperative protocols, patient populations, and definitions of outcomes.^[9] Hemorrhage requiring intervention occurs in 1-5% of cases, urinary retention in 2-15%, wound infection in 3-10%, and anal stenosis in 3-18%.^[10] However, most published data originate from tertiary care centers in developed healthcare systems, with limited evidence from secondary care settings in resource-constrained environments.^[11] India presents unique challenges in surgical care delivery, particularly in tribal and rural areas where healthcare infrastructure is limited, patient populations have distinct demographic and nutritional profiles, and access to postoperative care may be restricted.^[12] Tribal populations in India often face higher prevalence of malnutrition, delayed healthcare seeking, and limited health literacy, all of which may influence surgical outcomes.^[13] Understanding the pattern and predictors of postoperative complications in these settings is essential for developing targeted interventions and optimizing resource allocation.^[14]

Previous studies have identified several potential risk factors for complications after hemorrhoidectomy, including advanced age, obesity, constipation, multiple column excision, and surgeon experience.^[15,16] However, the applicability of these findings to tribal secondary care settings remains uncertain.^[17] Furthermore, most risk factor analyses have been underpowered to detect clinically meaningful associations or have not adequately accounted for the unique characteristics of resource-limited practice environments.^[18] This study addresses this evidence gap by comprehensively evaluating early postoperative complications following Milligan-Morgan hemorrhoidectomy in a 75-bedded secondary care hospital serving a tribal population in Odisha, India.^[19] The primary objective was to determine the incidence of early (≤ 30 days) postoperative complications, while the secondary objective was to identify patient- and surgery-related

risk factors associated with these complications.^[20] The findings aim to inform quality improvement initiatives and guide perioperative care protocols in similar resource-constrained settings.^[21]

MATERIALS AND METHODS

Study Design and Setting: We performed a retrospective cohort analysis including all consecutive adult patients who underwent Milligan-Morgan hemorrhoidectomy during a 12-month uninterrupted period at a 75-bed secondary care hospital situated in a tribal area of Odisha, India. This institution primarily caters to a largely tribal population with restricted access to higher-level tertiary medical services and acts as the main referral facility for nearly 200,000 residents from surrounding villages and semi-urban communities. Operative care was delivered by general surgeons with varying levels of clinical experience, supported by anesthesia services and standard postoperative monitoring facilities. The study methodology and reporting were structured in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for cohort studies. As this investigation was retrospective and based solely on anonymized routinely collected clinical records, formal review by the ethics committee and the requirement for individual informed consent were waived in line with institutional regulations for retrospective audits. The study adhered to the ethical principles outlined by the institutional research committee and complied with the 1964 Declaration of Helsinki and its subsequent revisions.

Participants: All patients aged 18 years or older who underwent Milligan-Morgan hemorrhoidectomy during the study period were eligible for inclusion. The procedure was performed for symptomatic hemorrhoidal disease graded II-IV according to the operating surgeon's clinical assessment, following failure of conservative management or for patient preference for definitive surgical treatment. Both elective procedures and those performed on an emergency basis for acutely thrombosed or strangulated hemorrhoids were included to reflect real-world practice.

Inclusion Criteria:

- Patients diagnosed with hemorrhoids who underwent Milligan-Morgan hemorrhoidectomy.
- Patients with associated anorectal conditions (such as anal fissure or anal fistula) were included if these conditions were treated during the same operative session as the hemorrhoidectomy. This reflects routine clinical practice in our setting.

Exclusion Criteria:

- Patients who underwent anorectal procedures other than the Milligan-Morgan hemorrhoidectomy, including but not limited to stapled hemorrhoidopexy, hemorrhoidal artery ligation, or rubber band ligation.

- Patients who underwent additional major anorectal surgeries concurrently. (Note: Minor procedures such as a simple fissurectomy or fistulotomy were permitted and do not warrant exclusion.)
- Patients with incomplete data are necessary to assess the primary composite outcome of the study.
- Patients who were lost to follow-up within the first 30 days after surgery.

Surgical Technique and Perioperative Care:

All surgeries were carried out using the conventional Milligan–Morgan open hemorrhoidectomy technique in accordance with standard surgical practice. In each case, the three main hemorrhoidal cushions right anterior, right posterior, and left lateral were identified and excised. Care was taken to preserve adequate skin and mucosal bridges between the excision sites to prevent postoperative anal stenosis. The dissection was performed either with electrocautery or with a scalpel and scissors, depending on the surgeon's preference and intraoperative judgment. The vascular pedicles were securely ligated with absorbable sutures to ensure proper hemostasis. The operative wounds were intentionally left open and allowed to heal by secondary intention, without primary suturing or approximation. Perioperative management was consistent with the hospital's routine protocols. Patients received bowel preparation with enemas on the morning of surgery. A single prophylactic dose of a third-generation cephalosporin was administered at the time of anesthesia induction. Postoperative antibiotics were not routinely continued and were reserved for cases with evidence of infection or when deemed necessary for high-risk individuals at the discretion of the operating surgeon. The choice of anesthesia general or spinal was based on patient factors, anesthesiologist assessment, and availability. Spinal anesthesia was administered using hyperbaric bupivacaine, whereas general anesthesia was induced with propofol and maintained with inhalational agents as per standard practice.

Postoperative pain control was managed using non-steroidal anti-inflammatory drugs, most commonly diclofenac. Opioid analgesics such as tramadol or pentazocine were prescribed when pain was not adequately controlled with NSAIDs alone. Patients were usually discharged on the first or second postoperative day, once they were tolerating oral intake, able to void urine without difficulty, and comfortable on oral pain medications.

Variables and Data Sources:

Data was extracted from multiple sources including operating theater logs, anesthesia records, inpatient medical charts, nursing notes, and outpatient department follow-up records. All data were entered into a structured electronic spreadsheet (Study_MMH.xlsx) by two independent investigators, with discrepancies resolved through consensus or consultation with the senior author.

Patient-related variables included:

- Age (years, both as continuous and categorical variables)
- Sex (male/female)
- Body mass index (BMI, calculated as weight in kilograms divided by height in meters squared, both as continuous and categorized according to WHO Asian criteria: underweight <18.5, normal 18.5-22.9, overweight 23-24.9, obese ≥ 25)
- Comorbidities (documented medical conditions including diabetes mellitus, hypertension, thyroid disorders, asthma/COPD, seizure disorder, and tuberculosis, categorized as present or absent and by specific condition)
- Bowel habit (regular, constipation, or diarrhea, based on preoperative clinical assessment)

Disease-related variables included:

- Hemorrhoid grade (II, III, or IV as documented by the operating surgeon based on physical examination and/or proctoscopy)
- Number of hemorrhoidal columns excised (1, 2, or 3, corresponding to the number of primary hemorrhoids removed)
- Associated anorectal disease (anal fissure, anal fistula, pilonidal sinus, or none)

Procedure-related variables included:

- Anesthesia type (general anesthesia vs. spinal anesthesia)
- Postoperative analgesia regimen (opioid-based vs. non-opioid/NSAID-based)
- Surgeon seniority (consultant vs. junior registrar)
- Estimated blood loss (mL, as documented in operative notes)
- Intraoperative fluid volume (mL, crystalloids administered during surgery)

Outcome Measures: The main study outcome was a composite measure defined as the occurrence of any early postoperative complication within 30 days following surgery. This composite endpoint was determined in advance and comprised five clinically relevant events that were routinely and reliably recorded in patient case files. The first component was postoperative bleeding that required active management. This referred to any bleeding from the operative site occurring after the patient had left the recovery area and necessitating medical or surgical intervention, such as readmission, return to the operating room, blood transfusion, or emergency treatment for hemostasis. The second component was urinary retention requiring catheterization. This was defined as failure to pass urine spontaneously beyond the first postoperative day, requiring insertion of a urethral catheter. Patients who required catheterization only within the initial 24 hours after surgery were not considered to have this complication. The third outcome was surgical site infection diagnosed clinically by the treating surgeon during follow-up. Infections were categorized into two types:

- Purulent infection, characterized by pus discharge from the wound, with or without microbiological confirmation.

- Non-purulent (serious) infection, defined as serous discharge accompanied by surrounding redness and clinical suspicion of infection in the absence of frank pus.

The fourth component was anal stenosis, identified clinically during follow-up examinations. It was defined as narrowing of the anal canal detected on digital rectal examination, with or without associated symptoms such as painful or difficult defecation. The fifth component was unplanned hospital readmission within 30 days of the original procedure, irrespective of the underlying reason.

Secondary endpoints included the individual rates of each complication included in the composite outcome. Outcome data were obtained through detailed review of inpatient records from the initial hospital stay and outpatient records from subsequent follow-up visits. For patients who missed scheduled follow-up appointments, telephone contact was made to inquire about any postoperative complications or hospital readmissions. If patients reported receiving treatment at another facility, available documentation was reviewed whenever possible to verify the reported events.

Statistical Analysis: We began by summarizing all study variables with methods appropriate to their type. To check whether continuous data followed a normal distribution, we used both the Shapiro–Wilk test and visual inspection of histograms. Since most of these variables departed from a normal distribution, we chose to present them as medians with interquartile ranges (IQRs). For categorical data, we used absolute frequencies and percentages. When comparing patients who developed at least one early postoperative complication to those who did not, we selected statistical tests based on the type of variable being analyzed. For categorical variables, we initially applied for the chi-square test. In cases where any cell had an expected count below five, we turned to Monte Carlo simulation with 10,000 iterations to obtain more reliable p-values that do not rely on asymptotic assumptions. For continuous variables, we used the Mann–Whitney U test to compare the two groups—a method well suited for skewed data and less influenced by outliers. To identify factors independently associated with the composite endpoint, we conducted a multivariable logistic regression analysis. From this model, we estimated adjusted odds ratios along with their 95% confidence intervals. Rather than basing variable selection on univariate screening, we chose which variables to include beforehand, guided by clinical judgment and existing literature. This prespecified approach helped minimize the risk of overfitting and reduced potential bias from data-driven decisions.

The following predictors were specified in advance for entry into the regression model:

- Age (years, continuous variable)
- Sex (male or female)
- Body mass index (continuous, kg/m²)
- Number of hemorrhoidal columns removed (continuous, 1 to 3)

- Anesthetic technique (general versus spinal anesthesia)
- Postoperative pain management strategy (opioid-based versus non-opioid regimen)

The model's predictive accuracy was assessed using the Hosmer–Lemeshow goodness-of-fit statistic. To detect possible multicollinearity among the predictor variables, variance inflation factors were examined. A total of 100 patients formed the study cohort, where the anticipated complication rate ranged between 40% and 50%. Given the inclusion of six predictive factors, this resulted in approximately seven to eight outcome events per predictor variable. While this falls modestly short of the generally advised threshold of ten events per variable, the model was deemed suitable for an exploratory analysis due to constraints imposed by the sample size. All statistical analyses were conducted within the Python environment. Data management was facilitated by the panda's library, statistical testing employed SciPy, and regression analyses utilized the statsmodels package. As the dataset contained no missing information for any of the subjects involved, imputation methods were not required. A two-tailed approach was used for all hypothesis tests. An alpha level of less than 0.05 was employed to determine statistical significance, whereas p-values ranging from 0.05 to 0.10 were interpreted with caution, reflecting potential trends consistent with the study's preliminary character.

RESULTS

Patient Characteristics: Over the one-year study period, 100 patients who underwent Milligan–Morgan hemorrhoidectomy and fulfilled the predefined inclusion criteria were analyzed. These patients were enrolled consecutively to avoid selection bias, and their baseline characteristics are detailed in [Table 1].

The age distribution showed a median of 47 years, with most patients falling between 36 and 58 years. Men formed most of the study group, representing 61 out of the 100 participants. The median body mass index was 23.6 kg/m², with an interquartile range of 21.3 to 27.7 kg/m². When categorized according to the WHO Asian BMI standards, almost half of the patients were within the normal BMI range. More than one-quarter were classified as overweight, while a smaller subset was underweight. Patients falling under the various obesity categories together accounted for 14% of the total cohort.

Comorbidities were present in 37% of patients, with diabetes mellitus (12%, n=12) and hypertension (11%, n=11) being the most common. Notably, 51% (n=51) of patients reported chronic constipation preoperatively, while only 3% (n=3) reported diarrhea. Most patients were presented with grade III hemorrhoids (82%, n=82), followed by grade IV (16%, n=16) and grade II (2%, n=2). Three-column excision was performed in 84% (n=84) of patients,

reflecting the prevalence of advanced disease. Associated anorectal conditions were present in 38% of patients, most commonly anal fissure (31%, n=31)

and anal fistula (6%, n=6). Perioperative characteristics are summarized in [Table 1].

Table 1: Baseline Characteristics of Study Population (N=100).

Characteristic	Value
Age, years, median (IQR)	47 (36-58)
Sex, n (%)	
Male	61 (61.0)
Female	39 (39.0)
BMI, kg/m ² , median (IQR)	23.6 (21.3-27.7)
BMI Category, n (%)	
Underweight (<18.5)	10 (10.0)
Normal (18.5-22.9)	48 (48.0)
Overweight (23-24.9)	28 (28.0)
Obese (25-29.9)	10 (10.0)
Severely obese (30-34.9)	3 (3.0)
Morbidly obese (≥35)	1 (1.0)
Comorbidity, n (%)	
None	63 (63.0)
Diabetes mellitus	12 (12.0)
Hypertension	11 (11.0)
Hypothyroidism	8 (8.0)
Asthma/COPD	2 (2.0)
Tuberculosis (treated)	2 (2.0)
Hyperthyroidism	1 (1.0)
Seizure disorder	1 (1.0)
Bowel Habit, n (%)	
Regular	46 (46.0)
Constipation	51 (51.0)
Diarrhea	3 (3.0)
Hemorrhoid Grade, n (%)	
Grade II	2 (2.0)
Grade III	82 (82.0)
Grade IV	16 (16.0)
Columns Excised, n (%)	
1 column	2 (2.0)
2 columns	14 (14.0)
3 columns	84 (84.0)
Associated Disease, n (%)	
None	62 (62.0)
Anal fissure	31 (31.0)
Anal fistula	6 (6.0)
Pilonidal sinus	1 (1.0)

IQR, interquartile range; BMI, body mass index; COPD, chronic obstructive pulmonary disease.

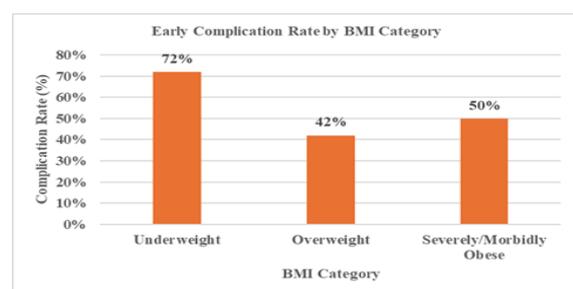


Figure 1: Early Complication Rate by BMI Category.

The median estimated blood loss was 69 mL (IQR 56-76 mL), and the median intraoperative fluid volume administered was 740 mL (IQR 697-821 mL). Spinal anesthesia was the predominant technique (data not shown in table), and postoperative analgesia was managed with a

combination of NSAIDs and opioids as clinically indicated.

Interpretation: The bar chart data demonstrates that underweight patients face the highest early complication risk (72%), followed by severely/morbidly obese patients (50%), while overweight patients have the lowest rate (42%). This U-shaped risk pattern underscores the importance of BMI as a predictor of wound healing outcomes in hemorrhoid surgery and supports targeted interventions for patients at the extremes of body weight.

Incidence of Early Postoperative Complications: Within 30 days of surgery, 46 patients (46.0%) experienced at least one early postoperative complication. The incidence of individual complications is presented in [Table 2].

Table 2: Incidence of Early Postoperative Complications (≤30 days).

Complication	Number (N=100)	Percentage (%)
Any early complication	46	46.0
Wound infection (any)	29	29.0

Purulent infection	12	12.0
Serous infection	17	17.0
Anal stenosis	18	18.0
Postoperative hemorrhage requiring intervention	2	2.0
Urinary retention requiring catheterization	1	1.0
30-day readmission	3	3.0

Wound infection was the most frequently observed complication, occurring in 29 patients (29.0%). Among these, purulent infection was documented in 12 patients (12.0%), while serous discharge with clinical suspicion of infection was noted in 17 patients (17.0%). Anal stenosis was diagnosed in 18 patients (18.0%) during follow-up within the 30-day postoperative period. Major complications requiring intervention were less common. Postoperative hemorrhage necessitating medical or surgical intervention occurred in 2 patients (2.0%), and urinary retention requiring catheterization beyond postoperative day 1 occurred in 1 patient (1.0%). Three patients (3.0%) required unplanned readmission within 30 days of surgery, all related to complications identified during follow-up.

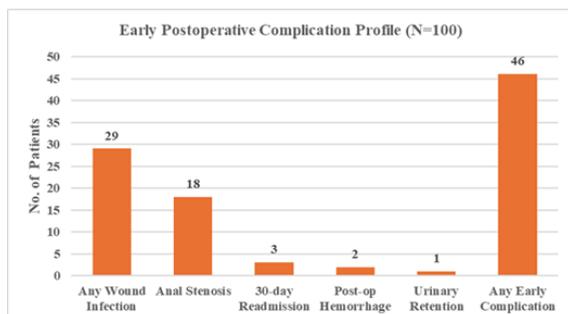


Figure 2: Distribution of early postoperative complications following Milligan-Morgan hemorrhoidectomy (N=100).

Interpretation: In the early postoperative period, 46 out of 100 patients developed at least one complication following surgery. Although this figure reflects the overall complication rate, the combined frequency of individual complications exceeds 46%

because a few patients experienced more than one adverse event. Wound infection was the most frequently observed problem, affecting 29 patients. Anal stenosis was the next most common complication and was noted in 18 patients. Serious complications were uncommon. Postoperative hemorrhage occurred in only two patients, and urinary retention was documented in one patient. Overall, major adverse events were rare in this cohort.

Univariate Analysis of Factors Associated with Complications: Univariate comparisons between patients with and without any early complication are presented in [Table 3a and 3b].

Among categorical variables, BMI category demonstrated a statistically significant association with the occurrence of any early complication ($p=0.014$). Examination of the contingency table revealed that patients at the extremes of BMI distribution (underweight and obese categories) appeared to have higher complication rates compared to normal and overweight patients, though small cell sizes precluded stable subgroup estimates. Bowel's habit showed a borderline significant association with complications ($p=0.084$). Patients with constipation (51% of the cohort) tended to have higher complication rates compared to those with regular bowel habits, while the small number of patients with diarrhea ($n=3$) precluded meaningful inference. No other categorical variables, including sex, comorbidity presence, hemorrhoid grade, number of columns excised, associated anorectal disease, anesthesia type, analgesia regimen, or surgeon seniority, demonstrated statistically significant associations with the composite outcome.

Table 3a. Univariate Analysis of Categorical Variables.

Variable	Test	p-value
Sex	Chi-square (Monte Carlo)	0.521
BMI Category	Chi-square (Monte Carlo)	0.014
Comorbidity	Chi-square (Monte Carlo)	0.920
Bowel Habit	Chi-square (Monte Carlo)	0.084
Hemorrhoid Grade	Chi-square (Monte Carlo)	0.434
Columns Excised	Chi-square (Monte Carlo)	0.138
Associated Disease	Chi-square (Monte Carlo)	0.180
Anesthesia Type	Chi-square (Monte Carlo)	0.728
Analgesia Type	Chi-square (Monte Carlo)	0.260
Surgeon Seniority	Chi-square (Monte Carlo)	0.658

Table 3b. Univariate Analysis of Continuous Variables.

Variable	Test	p-value	Median with Complication	Median without Complication
Age (years)	Mann-Whitney U	0.285	49.0	46.0
BMI (kg/m ²)	Mann-Whitney U	0.633	23.4	23.6
Blood Loss (mL)	Mann-Whitney U	0.319	70.0	62.5
Intraoperative Fluids (mL)	Mann-Whitney U	0.592	754.5	738.5

None of the continuous variables showed statistically significant differences between patients with and without complications. The median age was slightly higher in the complication group (49.0 vs. 46.0 years), but this difference did not reach statistical significance ($p=0.285$). Median BMI was virtually identical between groups (23.4 vs. 23.6 kg/m², $p=0.633$). Estimated blood loss and intraoperative fluid volume also showed no significant between-group differences, though both were marginally higher in the complication group.

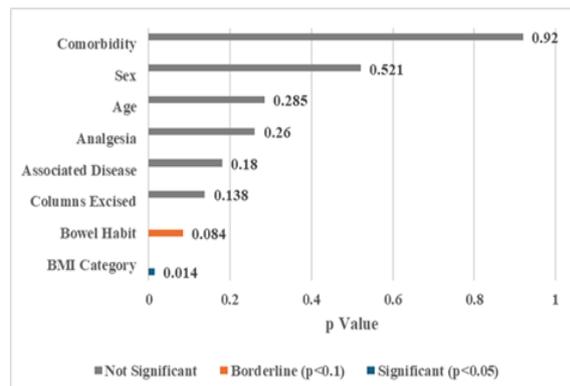


Figure 3: Univariate Analysis of Factors Associated with Early Postoperative Complications.

Interpretation: Horizontal bar chart displays p-values from univariate analysis comparing patients with and without any early complication after Milligan-Morgan hemorrhoidectomy. P-values were derived from chi-square tests with Monte Carlo simulation for categorical variables and Mann-Whitney U test for continuous variables (age). BMI category was the only variable reaching statistical significance ($p=0.014$), confirming a true association between body habits and complication risk. Bowel habit showed a borderline association ($p=0.084$), suggesting a clinically meaningful trend that may achieve significance in larger studies. All other variables columns excised ($p=0.138$), associated disease ($p=0.180$), analgesia type ($p=0.260$), age ($p=0.285$), sex ($p=0.521$), and comorbidity ($p=0.920$) were not significantly associated with complication occurrence. These findings suggest that in this tribal secondary care setting, patient-specific factors (particularly nutritional status and bowel habits) may be more important predictors of early surgical outcomes than traditional demographic or procedural variables.

Multivariable Logistic Regression Analysis: To identify predictors of any early complication, we ran a prespecified multivariable logistic regression model; the findings are displayed in [Table 4].

Table 4: Multivariable Logistic Regression for Any Early Complication.

Variable	Odds Ratio	95% Confidence Interval	p-value
Age (per year)	1.02	0.98 - 1.05	0.295
Male Sex	0.64	0.27 - 1.50	0.300
BMI (per kg/m ²)	1.04	0.95 - 1.14	0.367
Columns Excised (per column)	1.79	0.62 - 5.20	0.284
General Anesthesia (vs. spinal)	0.30	0.03 - 3.49	0.338
Opioid Analgesia (vs. non-opioid)	1.67	0.63 - 4.42	0.298

Model fit: Pseudo R² = 0.051, Log-likelihood = -65.46, LLR p-value = 0.315

In the multivariable analysis, none of the prespecified predictors reached statistical significance at the conventional $\alpha=0.05$ level. The number of columns excised demonstrated the strongest association with complications, with an odds ratio of 1.79 (95% CI 0.62-5.20, $p=0.284$), suggesting that each additional column excised was associated with approximately 79% higher odds of experiencing any early complication. While this effect did not achieve statistical significance, the confidence interval includes clinically meaningful effect sizes, and the direction of effect is consistent with clinical expectation. Age showed a minimal positive association (OR 1.02 per year, 95% CI 0.98-1.05, $p=0.295$), while male sex appeared potentially protective (OR 0.64) but with wide confidence intervals crossing unity. BMI demonstrated a small positive association (OR 1.04 per kg/m², 95% CI 0.95-1.14, $p=0.367$). General anesthesia showed an unexpected inverse association (OR 0.30) compared to spinal anesthesia, but the extremely wide confidence interval (0.03-3.49) reflects the small number of patients receiving general anesthesia and precludes any definitive conclusion. Opioid analgesia

was associated with higher odds of complications (OR 1.67), though again not statistically significant. The overall model fit was modest (Pseudo R² = 0.051), indicating that the included predictors explained only approximately 5% of the variance in complication occurrence. The likelihood ratio test comparing the full model to a null model was not significant ($p=0.315$), suggesting that the set of predictors collectively did not provide significantly better prediction than chance alone.

DISCUSSION

This study examined early postoperative outcomes after Milligan-Morgan hemorrhoidectomy in a secondary care hospital catering predominantly to a tribal population.^[22] Within 30 days of surgery, 46% of patients experienced at least one complication. Most of these were minor and related to wound healing. Superficial wound infection was the most frequently observed issue (29%), followed by anal stenosis (18%). Serious complications were uncommon, with postoperative bleeding seen in 2% of patients and urinary retention in 1%. Overall,

although complications were common, they were largely manageable and rarely life-threatening.^[23] When interpreting the overall 46% complication rate, it is important to consider the context. Published rates following open hemorrhoidectomy vary widely, largely depending on how complications are defined and the duration of follow-up.^[24] In this study, even relatively minor problems such as serous discharge were documented, which contributed to the higher overall rate. In addition, most patients had advanced hemorrhoidal disease requiring excess of three columns, and more than half reported chronic constipation, both of which may increase postoperative morbidity.^[25]

The wound infection rate of 29% appears higher than figures reported from specialized colorectal centers.^[1] However, this finding may reflect differences in patient factors and local circumstances, including nutritional status, hygiene practices, and access to postoperative care.^[2] Some cases labeled as infection may have represented inflammatory discharge from open wounds by secondary intention, making direct comparison with other studies difficult.^[3] The frequency of anal stenosis (18%) was at the upper end of reported ranges.^[4] Given that most patients underwent three-column excision, the extent of anoderm removal may have contributed to postoperative narrowing.^[5] Early identification of such changes is important, as timely dilation may prevent progression.^[6]

On risk factor analysis, body mass index showed an association with complications when categorized, but not when treated as a continuous variable.^[7] This suggests that both extremes of BMI may influence outcomes differently.^[8] Underweight individuals may have impaired wound healing, whereas obesity may increase local mechanical stress and compromise hygiene.^[9] Constipation showed a possible trend toward association with complications.^[10] Straining after surgery can interfere with wound healing and may contribute to both bleeding and stenosis, underscoring the importance of perioperative bowel regulation.^[11] Although excision of additional hemorrhoidal columns did not reach statistical significance, the direction of effect suggested a possible increase in risk with more extensive tissue removal.^[12] The small number of patients undergoing limited excursions likely reduced the power to detect meaningful differences.^[13] No clear associations were found with age, sex, anesthesia type, analgesic regimen, or surgeon seniority.^[14] This may be explained by the relatively small sample size, the predominance of similar surgical approaches, and the lack of detailed data on certain operative and postoperative variables.^[15] From a clinical standpoint, these findings indicate that while minor postoperative problems are relatively common after Milligan–Morgan hemorrhoidectomy in this setting, serious adverse events are rare.^[16] Patients should be counseled accordingly.^[17] Practical measures such as structured wound care instructions, emphasis on

hygiene and sitz baths, optimization of bowel habits, nutritional assessment, and early follow-up may help reduce complication rates.^[18] The study has several strengths, including complete inclusion of consecutive cases and systematic outcome assessment.^[19] However, limitations must be acknowledged.^[20] The single-center design and modest sample size restrict generalizability.^[21] The retrospective nature of data collection introduces the possibility of incomplete documentation.^[22] Follow-up was limited to 30 days, which may underestimate longer-term complications such as persistent stenosis.^[23] Additionally, detailed information on nutritional status, socioeconomic background, and specific technical variations were not available.^[24,25]

CONCLUSION

This cohort study from a secondary care hospital serving a tribal population in India demonstrates that early postoperative complications after Milligan–Morgan hemorrhoidectomy occur in nearly half of patients, driven predominantly by superficial wound issues and anal stenosis rather than major surgical morbidity. The 29% wound infection rate and 18% stenosis rate represent the primary targets for quality improvement, while the low rates of hemorrhage and urinary retention (2% and 1% respectively) suggest acceptable fundamental surgical technique. Although multivariable analysis did not identify statistically significant independent predictors likely due to sample size limitations the clinically meaningful signal for number of columns excised (OR 1.79) and the univariate associations for BMI category ($p=0.014$) and bowel habit ($p=0.084$) provide direction for preventive efforts. For surgical practice in similar resource-constrained settings, these findings support implementation of structured perioperative bundles addressing three key areas: (1) preoperative optimization of bowel habits with systematic constipation management and nutritional assessment, particularly in underweight patients; (2) standardized surgical technique emphasizing maximum anoderm preservation and meticulous hemostasis; and (3) enhanced postoperative care including structured wound education, early follow-up with digital examination to detect and treat early stenosis, and clear protocols for when to seek care. Such bundles, developed with input from local providers and adapted to cultural contexts, have the potential to substantially reduce the morbidity burden of this common procedure. The broader implication of this work is the critical need for surgical outcomes research from understudied populations and settings. Tribal and rural communities in low- and middle-income countries bear a disproportionate burden of surgical disease yet remain systematically excluded from the evidence base that informs clinical guidelines. Prospective multicenter studies, embedded within routine care delivery and leveraging simple, scalable data collection tools, are

urgently needed to generate locally relevant evidence and support data-driven quality improvement. Until such evidence is available, descriptive studies like this one provide the best available guidance for surgeons working in these challenging and rewarding environments.

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Ethics Approval: This investigation was based on a retrospective assessment of existing clinical records obtained during routine hospital care. All data were anonymized before evaluation to maintain patient privacy. In accordance with institutional norms governing clinical audits and analyses of de-identified data, separate ethics committee approval and informed consent were not mandated. The study was performed in alignment with institutional research standards and adhered to internationally accepted ethical principles for medical research involving human participants.

Data Availability: The data analyzed in this study are protected under institutional policies and patient confidentiality regulations; therefore, they are not available in the public domain. Interested researchers may approach the corresponding author with a formal request. Any data access, if granted, will strictly comply with institutional requirements and privacy safeguards.

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