ISSN: 2457-0400
Impact Factor: 7.675
WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH
www.wjahr.com
Volume: 10, Issue: 7
Page N. 254-259
Year: 2026
Original Article
Coden USA: WJAMA3

POSTOPERATIVE COMPLICATIONS FOLLOWING MODIFIED RADICAL MASTECTOMY

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Article Received: 29 May 2026 **Article Revised: 19 June 2026** **Article Published: 01 July 2026**

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DOI: https://doi.org/10.5281/zenodo.21027979

How to cite this Article: Dr. Qusay Ahmed Njati Younus* (2026). Postoperative Complications Following Modified Radical Mastectomy. World Journal of Advance Healthcare Research, 10(7), 254–259.
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ABSTRACT
Background: Modified radical mastectomy remains one of the most commonly performed surgical procedures for the management of breast cancer, particularly in patients with locally advanced disease. Despite advances in surgical techniques and perioperative care, postoperative complications continue to contribute significantly to patient morbidity and may adversely affect recovery and subsequent oncological treatment. **Objectives:** To evaluate the frequency and pattern of postoperative complications following modified radical mastectomy and to identify factors associated with their occurrence among patients treated at Al Salam Teaching Hospital, Mosul. **Methods:** A retrospective cross-sectional study was conducted at Al Salam Teaching Hospital, Mosul, Iraq, between September 2024 and April 2026. A total of 112 female patients who underwent modified radical mastectomy for histopathologically confirmed breast cancer were included. Demographic, clinical, pathological, and operative data were collected from hospital records. Postoperative complications assessed included seroma formation, surgical site infection, hematoma, wound dehiscence, flap necrosis, lymphedema, readmission, and reoperation. Statistical analysis was performed using SPSS version 27. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. A P value of less than 0.05 was considered statistically significant. **Results:** The mean age of the patients was 52.6 ± 11.4 years. Invasive ductal carcinoma was the most common histopathological subtype, accounting for 83.0% of cases. Overall postoperative complications occurred in 47 patients (42.0%). Seroma formation was the most frequent complication, occurring in 25.0% of patients, followed by surgical site infection (11.6%), lymphedema (8.9%), wound dehiscence (7.1%), hematoma (4.5%), and flap necrosis (3.6%). Postoperative complications were significantly more common among diabetic patients (P = 0.004) and obese patients (P = 0.009). Multivariate logistic regression analysis identified diabetes mellitus (OR = 2.84, 95% CI: 1.27–6.38, P = 0.011) and obesity (OR = 2.41, 95% CI: 1.12–5.21, P = 0.024) as independent predictors of postoperative complications. **Conclusions:** Postoperative complications following modified radical mastectomy remain relatively common, with seroma formation representing the most frequent complication. Diabetes mellitus and obesity were identified as significant independent predictors of postoperative morbidity. Careful perioperative assessment, optimization of comorbid conditions, and meticulous surgical management may contribute to reducing complication rates and improving postoperative outcomes.

KEYWORDS: Breast cancer, Lymphedema, Modified radical mastectomy, Obesity, Postoperative complications, Seroma formation.

1-INTRODUCTION

Breast cancer is the most frequently diagnosed malignancy among women worldwide and remains one of the leading causes of cancer-related mortality. Despite significant advances in screening programs, diagnostic techniques, and treatment modalities, breast cancer continues to represent a major public health challenge. According to recent global estimates, breast cancer accounts for a substantial proportion of newly diagnosed cancers in women and is associated with considerable morbidity and mortality, particularly in developing countries where late presentation remains common.[1]

The management of breast cancer requires a multidisciplinary approach involving surgery, chemotherapy, radiotherapy, endocrine therapy, and targeted biological treatments. Surgical treatment remains a cornerstone in the management of operable breast cancer, with the primary objective of achieving complete tumor removal while providing accurate staging and local disease control. Although breast-conserving surgery has become increasingly popular, modified radical mastectomy (MRM) continues to play an important role in the treatment of many patients, particularly those with locally advanced disease, multicentric tumors, contraindications to breast conservation, or limited access to radiotherapy services.[2]

Modified radical mastectomy involves complete removal of the breast tissue together with axillary lymph node dissection while preserving the pectoralis major muscle. Since its introduction as a modification of the more extensive radical mastectomy, MRM has become one of the most commonly performed procedures for breast cancer because it provides effective local control with lower morbidity than more radical surgical approaches. Nevertheless, the procedure remains associated with a variety of postoperative complications that may negatively affect patient recovery, prolong hospitalization, increase healthcare costs, and delay the initiation of adjuvant therapy.[3]

Traditionally, delayed cholecystectomy was recommended following initial conservative management with antibiotics, analgesics, and supportive care. This approach aimed to allow resolution of inflammation before surgery, theoretically reducing operative difficulty and complication rates. Delayed cholecystectomy is usually performed several weeks after the acute episode, often between 6 and 12 weeks following hospital discharge. However, this strategy may expose patients to recurrent attacks of cholecystitis, biliary colic, pancreatitis, cholangitis, repeated hospital admissions, and increased healthcare costs during the waiting period.[4]

Several patient-related, tumor-related, and surgical factors have been reported to influence the development of postoperative complications after modified radical mastectomy. Advanced age, obesity, diabetes mellitus, hypertension, smoking, neoadjuvant chemotherapy, tumor stage, extent of axillary dissection, prolonged operative time, and postoperative drainage management have all been identified as potential risk factors. Early recognition of these factors may facilitate the implementation of preventive strategies and improve postoperative outcomes.[5]

Recent studies have emphasized the importance of identifying predictors of postoperative morbidity following breast cancer surgery. Improved understanding of complication patterns and associated risk factors can assist surgeons in optimizing perioperative management, reducing complication rates, shortening hospital stay, and enhancing patient satisfaction. Furthermore, minimizing postoperative morbidity may reduce treatment delays and improve the overall effectiveness of multidisciplinary breast cancer care.[6]

In Iraq, breast cancer remains the most common cancer among women and continues to represent a significant healthcare burden. Although modified radical mastectomy is frequently performed in many surgical centers, local data regarding postoperative complications and associated risk factors remain limited. Evaluating surgical outcomes in the local population is essential for identifying areas for improvement and developing evidence-based strategies to enhance patient care.[7]

The aim of this study is to evaluate the frequency and pattern of postoperative complications following modified radical mastectomy and to identify factors associated with the occurrence of these complications among patients treated at Al Salam Teaching Hospital in Mosul.

2-PATIENTS AND METHODS

Data collection was approved by Nineveh Directorate of Health ethics committee. All patients gave verbal or written informed permission. The study employed anonymous data collecting forms to protect patient privacy and use all data for scientific research. This retrospective cross-sectional study was conducted at Al Salam Teaching Hospital, Mosul, Nineveh Governorate, Iraq, to evaluate postoperative complications following modified radical mastectomy and to identify factors associated with their occurrence. The study period extended from September 1, 2024, to April 30, 2026. A total of 112 patients who underwent modified radical mastectomy for histopathologically confirmed breast cancer during the study period were included in the study.

Patients were identified through a review of hospital medical records, operative reports, pathology reports, anesthesia records, and postoperative follow-up documentation. Female patients aged 18 years and older who underwent modified radical mastectomy for primary breast cancer were eligible for inclusion. Patients with incomplete medical records, recurrent breast cancer, metastatic disease at presentation, breast-conserving surgery, simple mastectomy, or other surgical procedures were excluded from the study.

All patients underwent modified radical mastectomy under general anesthesia. The procedure involved complete removal of the breast tissue, including the nipple–areola complex, together with level I and level II axillary lymph node dissection while preserving the pectoralis major muscle. Following standard skin preparation and draping, an elliptical incision was made, and skin flaps were carefully elevated to ensure adequate

exposure of the breast tissue. The breast was then dissected from the underlying pectoral fascia and removed en bloc with the axillary lymphatic tissue.

Meticulous hemostasis was achieved throughout the procedure to minimize blood loss and reduce the risk of postoperative hematoma formation. One or two closed-suction drains were routinely inserted into the axillary and mastectomy bed regions before wound closure. The wound was closed in layers using absorbable sutures for the deeper tissues and nonabsorbable or subcuticular sutures for skin closure according to surgeon preference. Postoperatively, all patients received standard care, including analgesia, prophylactic antibiotics when indicated, wound care, and drain monitoring. Patients were followed regularly for the assessment of postoperative complications such as seroma formation, surgical site infection, hematoma, wound dehiscence, flap necrosis, lymphedema, prolonged drainage, readmission, and the need for reoperation.

Data were collected using a structured data collection form. Demographic variables included age, residence, body mass index, smoking status, and comorbidities such as diabetes mellitus and hypertension. Clinical and pathological variables included tumor size, histopathological type, tumor stage, lymph node involvement, and history of neoadjuvant chemotherapy. Operative variables included duration of surgery, number of lymph nodes removed, and duration of postoperative drainage.

Postoperative complications assessed in this study included seroma formation, surgical site infection, hematoma, wound dehiscence, flap necrosis, lymphedema, prolonged drainage, readmission, and reoperation when applicable. The primary outcome measure was the occurrence of one or more postoperative complications following modified radical mastectomy.

The primary outcome measure was the comparison of postoperative complications between early and delayed cholecystectomy groups. Secondary outcomes included operative duration, conversion to open surgery, length of hospital stay, and overall surgical outcomes.

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 27. Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were presented as frequencies and percentages. Associations between postoperative complications and potential risk factors were evaluated using the Chi-square test or Fisher's exact test for categorical variables and the independent samples t-test for continuous variables. Multivariate logistic regression analysis was performed to identify independent predictors of postoperative complications. A P value of less than 0.05 was considered statistically significant.

3-RESULTS

A total of 112 female patients who underwent modified radical mastectomy for histopathologically confirmed breast cancer at Al Salam Teaching Hospital between September 2024 and April 2026 were included in this study. The mean age of the patients was 52.6 ± 11.4 years (range: 29–78 years).

Table 1 presents the demographic and clinical characteristics of the study population. The age of the patients ranged from 29 to 78 years, with the highest proportion of patients belonging to the 50–59-year age group (33.9%), followed by the 40–49-year age group (26.8%). Diabetes mellitus was present in 29.5% of patients, while hypertension was reported in 37.5%. Obesity was identified in 36.6% of patients, and only 10.7% were smokers. These findings indicate that a substantial proportion of patients had comorbid conditions that may influence postoperative recovery and complication rates.

Table 1: Demographic and clinical characteristics of the studied patients.

Variable	Number (%)
<40 years	18 (16.1%)
40–49 years	30 (26.8%)
50–59 years	38 (33.9%)
≥60 years	26 (23.2%)
Diabetes mellitus	33 (29.5%)
Hypertension	42 (37.5%)
Obesity	41 (36.6%)
Smokers	12 (10.7%)

Table 2 demonstrates the pathological and clinical characteristics of breast cancer among the studied patients. Invasive ductal carcinoma was the predominant histopathological type, accounting for 83.0% of all cases, whereas invasive lobular carcinoma represented 10.7%. Stage II disease was the most frequently encountered tumor stage (51.8%), followed by stage III disease (32.1%). Positive axillary lymph node involvement was identified in 61.6% of patients, and 42.0% had received neoadjuvant chemotherapy before surgery.

Table 2: Tumor characteristics of the studied patients (n=112).

Variable	Number (%)
Invasive ductal carcinoma	93 (83.0%)
Invasive lobular carcinoma	12 (10.7%)
Other types	7 (6.3%)
Stage I	18 (16.1%)
Stage II	58 (51.8%)
Stage III	36 (32.1%)
Positive lymph nodes	69 (61.6%)
Neoadjuvant chemotherapy	47 (42.0%)

Table 3 summarizes the operative characteristics of patients undergoing modified radical mastectomy. The mean operative time was 115.4 ± 24.8 minutes, reflecting

the complexity of the surgical procedure and associated axillary dissection. The mean number of lymph nodes removed was 14.7 ± 5.2 nodes, while the mean duration of postoperative drainage was 8.6 ± 3.1 days. These findings indicate that adequate axillary clearance was achieved in most patients with acceptable postoperative drainage duration.

Table 3: Operative characteristics of the studied patients (n=112).

Variable	Mean ± standard deviation
Operative time (minutes)	115.4 ± 24.8
Lymph nodes removed	14.7 ± 5.2
Drain duration (days)	8.6 ± 3.1

Table 4 presents the frequency and distribution of postoperative complications following modified radical mastectomy. Seroma formation was the most common complication, occurring in 25.0% of patients. Surgical site infection was observed in 11.6% of cases, followed by lymphedema in 8.9% and wound dehiscence in 7.1%. Hematoma and flap necrosis were relatively uncommon, occurring in 4.5% and 3.6% of patients, respectively. Overall, postoperative complications occurred in 42.0% of patients, indicating that postoperative morbidity remains an important concern following modified radical mastectomy.

Table 4: Postoperative complications following modified radical mastectomy (n=112).

Complication	Number (%)
Seroma	28 (25.0%)
SSI	13 (11.6%)
Lymphedema	10 (8.9%)
Wound dehiscence	8 (7.1%)
Hematoma	5 (4.5%)
Flap necrosis	4 (3.6%)
Readmission	7 (6.3%)
Reoperation	3 (2.7%)
Any complication	47 (42.0%)

Table 5 demonstrates the relationship between selected patient-related factors and the occurrence of postoperative complications. Patients with diabetes mellitus experienced significantly higher complication rates compared with non-diabetic patients (63.6% versus 32.9%, P = 0.004). Similarly, obesity was significantly associated with postoperative complications, with obese patients showing a complication rate of 58.5% compared with 32.4% among non-obese patients (P = 0.009). These findings suggest that both diabetes mellitus and obesity may adversely affect postoperative recovery and increase the risk of postoperative morbidity.

Table 5: Association between patient-related factors and postoperative complications (n=112).

Variable	Present	Absent	P value
Diabetes mellitus	21 (63.6%)	12 (36.4%)	**0.004**
No diabetes	26 (32.9%)	53 (67.1%)	
BMI ≥30 kg/m²	24 (58.5%)	17 (41.5%)	**0.009**
BMI <30 kg/m²	23 (32.4%)	48 (67.6%)	

Table 6 shows the relationship between tumor stage and postoperative complications. Patients with stage III breast cancer demonstrated significantly higher rates of postoperative complications compared with those with stage I and II disease (55.6% versus 35.5%, P = 0.018). This finding may reflect the more advanced nature of the disease and the greater extent of surgical dissection required in patients with advanced-stage tumors.

Table 6: Association between tumor-related factors and postoperative complications (n=112).

Variable	Present	Absent	P value
Stage I–II	27 (35.5%)	49 (64.5%)	**0.018**
Stage III	20 (55.6%)	16 (44.4%)	

Table 7 presents the results of multivariate logistic regression analysis performed to identify independent predictors of postoperative complications following modified radical mastectomy. Diabetes mellitus was associated with a 2.84-fold increased risk of postoperative complications (OR = 2.84, 95% CI: 1.27–6.38, P = 0.011), while obesity increased the risk by approximately 2.4-fold (OR = 2.41, 95% CI: 1.12–5.21, P = 0.024). Although stage III disease was associated with increased postoperative morbidity, it did not remain statistically significant after adjustment for confounding factors. Age ≥60 years was also not identified as an independent predictor of postoperative complications. These findings indicate that diabetes mellitus and obesity are the most important independent risk factors for adverse postoperative outcomes in the studied population.

Table 7: Multivariate logistic regression analysis of predictors of postoperative complications (n=112).

Variable	OR	95% CI	P value
Diabetes mellitus	**2.84**	**1.27–6.38**	**0.011**
BMI ≥30 kg/m²	**2.41**	**1.12–5.21**	**0.024**
Stage III disease	1.89	0.91–3.94	0.086
Age ≥60 years	1.31	0.59–2.92	0.504

4- DISCUSSION

The present study evaluated the frequency, pattern, and predictors of postoperative complications following modified radical mastectomy among patients treated at Al Salam Teaching Hospital. The findings demonstrated that postoperative complications remain relatively common, with an overall complication rate of 42.0%. Seroma formation was the most frequently encountered complication, followed by surgical site infection, lymphedema, and wound dehiscence. Furthermore, diabetes mellitus and obesity were identified as significant independent predictors of postoperative morbidity.

The mean age of patients in the current study was 52.6 ± 11.4 years, with the majority of patients belonging to the fifth and sixth decades of life. This finding reflects the well-recognized epidemiological pattern of breast cancer, which predominantly affects middle-aged and older women. Similar observations were reported by **Sung *et al*.**, who demonstrated that breast cancer incidence increases significantly with advancing age and remains one of the leading causes of cancer-related morbidity among women worldwide.[1]

Invasive ductal carcinoma represented the predominant histopathological subtype in the present study, accounting for 83.0% of all cases. This finding is consistent with the established pathological distribution of breast cancer reported in contemporary literature. Similar findings were reported by **Gradishar *et al*.**, who observed that invasive ductal carcinoma remains the most common histological subtype among patients undergoing surgical treatment for breast cancer.[2]

One of the principal findings of the present study was the high frequency of seroma formation, which occurred in 25.0% of patients and represented the most common postoperative complication. Seroma formation following modified radical mastectomy remains a major challenge because it may prolong drainage duration, delay wound healing, and increase the risk of infection. Similar observations were reported by **Srivastava *et al*.**, who identified seroma formation as the most frequent complication following breast cancer surgery and highlighted the important role of disrupted lymphatic channels and extensive tissue dissection in its pathogenesis.[4]

Surgical site infection was the second most common complication observed in the current study, affecting 11.6% of patients. The development of postoperative infection may be influenced by several factors, including obesity, diabetes mellitus, prolonged drainage duration, and impaired wound healing. Similar findings were reported by **O'Connell *et al.*** and **Degnim *et al*.**, who demonstrated that surgical site infection remains one of the most important causes of postoperative morbidity following mastectomy and axillary surgery.[6,8]

Lymphedema occurred in 8.9% of patients in the present study. This complication remains one of the most important long-term consequences of axillary lymph node dissection and may negatively affect upper limb function and quality of life. Comparable findings were reported by **DiSipio *et al*.** and **McLaughlin *et al*.**, who found that axillary surgery remains the most significant risk factor for the development of breast cancer-related lymphedema.[9,10]

Wound dehiscence, hematoma, and flap necrosis occurred less frequently than seroma and infection in the current study. Nevertheless, these complications may significantly affect patient recovery and occasionally necessitate additional intervention. Similar observations were reported by **Beecher *et al*.**, who found that flap-related complications are relatively uncommon but may contribute to prolonged hospitalization and delayed postoperative recovery.[11]

A significant association was observed between diabetes mellitus and postoperative complications. Diabetic patients experienced substantially higher complication rates compared with non-diabetic patients, and diabetes mellitus remained an independent predictor of postoperative morbidity following multivariate analysis. This finding may be explained by impaired immune function, delayed wound healing, reduced tissue perfusion, and increased susceptibility to infection among diabetic patients. Similar findings were reported by **Fisher *et al*.**, who identified diabetes mellitus as a significant determinant of adverse surgical outcomes following breast surgery.[12]

Obesity was also found to be significantly associated with postoperative complications and remained an independent predictor after adjustment for confounding variables. Obese patients demonstrated markedly higher complication rates than non-obese patients. This observation may be attributed to impaired wound healing, increased dead-space formation, reduced tissue oxygenation, and greater technical difficulty during surgery. Comparable findings were reported by **Tjeertes *et al*.** and **Chun *et al*.**, who concluded that obesity is one of the strongest predictors of postoperative morbidity following breast cancer surgery.[13,14]

Patients with stage III disease demonstrated higher rates of postoperative complications compared with patients with stage I and II disease. Although this association was statistically significant on univariate analysis, it did not remain significant after multivariate adjustment. This finding suggests that patient-related factors, particularly obesity and diabetes mellitus, may exert a greater influence on postoperative outcomes than tumor stage alone. Similar observations were reported by **Meretoja *et al*.**, who noted that pre-existing comorbid conditions frequently have a stronger impact on postoperative recovery than pathological tumor characteristics.[15]

The findings of the present study emphasize the importance of careful perioperative assessment and optimization of modifiable risk factors before surgery. Appropriate control of diabetes mellitus, management of obesity, meticulous surgical technique, and close postoperative monitoring may contribute significantly to reducing complication rates and improving overall patient outcomes. Similar recommendations were emphasized by ***Toss et al*.**, who highlighted the importance of identifying high-risk patients and implementing preventive strategies to minimize postoperative morbidity following breast cancer surgery.[5]

This study has several limitations that should be considered when interpreting its findings. The retrospective design relied on the accuracy and completeness of medical records, which may have resulted in missing or inconsistently documented clinical information. In addition, the study was conducted at a single tertiary care center with a relatively limited sample size, which may affect the generalizability of the results. Furthermore, long-term outcomes such as chronic pain, quality of life, and late-onset lymphedema were not evaluated. Despite these limitations, the study provides valuable local data regarding postoperative complications following modified radical mastectomy and identifies important factors associated with adverse surgical outcomes.

5- CONCLUSION AND RECOMMENDATION

The findings of the present study demonstrate that postoperative complications following modified radical mastectomy remain relatively common, with seroma formation being the most frequent complication, followed by surgical site infection and lymphedema. Diabetes mellitus and obesity were identified as significant independent predictors of postoperative morbidity. Careful preoperative assessment, optimization of comorbid conditions, meticulous surgical technique, and appropriate postoperative care are essential to minimize complications and improve surgical outcomes. Special attention should be directed toward high-risk patients, particularly those with diabetes mellitus and obesity. Further multicenter prospective studies with larger sample sizes and longer follow-up periods are recommended to validate these findings and evaluate long-term postoperative outcomes and quality-of-life measures.

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