

Research Article

Clinicopathological and Perioperative Predictors of Postoperative Complications and Early Recovery Following Modified Radical Mastectomy in Patients with Breast Carcinoma: A Prospective Observational Study

Mariam Shafqat^{1*}, Bibi Zahra², Shafaq Qureshi³, Manahil Ahmed⁴, Shakeel Ahmed⁵, Muhammad Bilal Chaudhry⁶

^{1*}MBBS, FCPS II General Surgery, MRCS UK, Medical Officer General Surgery department, Naseurallah Khan Babar Memorial Hospital, Peshawar.

²House Officer, General Medicine, Civil Hospital Quetta.

³Consultant General Surgeon, Liaquat University of Medical and Health sciences, Hyderabad.

⁴Department of General Surgery, Lady Reading Hospital, Peshawar.

⁵Assistant Professor, Surgery Department, Karachi Institute of Medical Sciences (KIMS), CMH, Malir, Karachi.

⁶Senior Registrar, Surgical Unit 3, Jinnah Hospital, Lahore.

Email: ^{1*}mariamshaf@hotmail.com, ²shafaq_qureshi@yahoo.com, ³hassanizahra929@yahoo.com, ⁴dr.manahil01@gmail.com, ⁵drshakeelmansoori@yahoo.com, ⁶surgeonbilal72@gmail.com

Corresponding Author: Mariam Shafqat

MBBS, FCPS II General Surgery, MRCS UK, Medical Officer General Surgery department, Naseurallah Khan Babar Memorial Hospital, Peshawar.

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ABSTRACT

Background: Modified radical mastectomy (MRM) remains an important surgical procedure for breast carcinoma, but there are several complications following the surgery and delayed recovery that may impact patients' outcomes. Predictors in clinics and perioperatively can aid risk assessment and perioperatively management.

Objective: To examine clinicopathological and peri-operative factors related to the early recovery and postoperative complications after modified radical mastectomy in breast carcinoma patients.

Place and Duration of Study: From July 2025 to March 2026 at the Department of General Surgery, Naseurallah Khan Babar Memorial Hospital and Peshawar.

Methods: A prospective observational study was carried out in 160 patients who were undergoing MRM. The WHO sample size calculation formula was used for the calculation of sample size. Demographic, clinicopathological and peri-operative parameters were collected such as tumour stage, tumor size, lymph node involvement, operative time, and blood loss. Characteristics of postoperative complications and recovery outcome were evaluated.

Results: Postoperative complications and delayed recovery were related to higher stages of the tumor, tumor size, lymph nodes, longer operating time, and blood loss.

Conclusion: Pre- and peri-operative factors can be useful in predicting postoperative outcomes following MRM. It might be possible to determine early in the process who is a high risk patient and help the surgeon develop their plan and treatment accordingly.

Keywords: Modified Radical Mastectomy, Breast Carcinoma, Postoperative Complications, Recovery, Predictors and Prospective Observational Study.

INTRODUCTION

Breast carcinoma is one of the most diagnosed cancers in the world in women and continues to be a significant contributor to morbidity and mortality due to breast cancer (Xie et al., 2022). Although there has been great progress in the field of early detection, systemic treatment and radiotherapy, breast surgery remains central to

the treatment of breast cancer. Although breast-conserving surgery remains the preferred procedure for most breast cancer patients, modified radical mastectomy (MRM) is still an important surgical procedure, especially for those with locally advanced diseases, or those who are not candidates for breast-conserving surgery (Khan et al., 2025).

MRM has proven to be an effective method for controlling local diseases, but a few patient, tumour and surgical factors may have an impact on postoperative recovery (Tageza Ilala et al., 2023). Surgical site infection, seroma, hematoma, wound complications, flap necrosis, shoulder dysfunction and delayed functional recovery are common complications following surgery. These issues can lengthen hospitalizations, health care expenses, psychological suffering, and treatment with adjuvant therapy (Adwall, 2025). It is therefore crucial to be able to identify factors associated with postoperative complications and the outcomes of recovery to better manage these patients.

The clinicopathological features include tumor size, histological grade, disease stage and lymph node involvement, which are important when it comes to how severe the disease is and can affect a patient's surgical outcomes (Ma et al., 2024). patients with more extensive lymph node involvement, advanced stages of disease and larger tumors may be candidates for more complex surgical procedures that may create more tissue trauma and postoperative morbidity. Likewise, factors such as the length of the surgical procedure, the amount of blood lost during surgery and surgical technique can play a major role in recovery following surgery (Dorogi, 2022).

Early recovery after MRM is a multi-dimensional outcome that is affected by wound healing, control of pain, mobility, lack of complications and re-establishment of daily living activities (Choi et al., 2022). Enhanced recovery strategies focus on the early detection of patients with a higher risk of complications to enable the right interventions to prevent them, the right perioperative care to support recovery, and better use of healthcare resources. But discrepancies between patient characteristics and surgical procedures underscore the importance of analyzing predictive factors by institution (Xiong et al., 2025).

Postoperative complications after breast cancer surgery have been studied in a number of studies, and there is some information available on the effects of clinicopathological and perioperative factors on the early recovery outcomes of breast cancer surgery, but little information is available on the combined effects of both clinicopathological and perioperative factors on both postoperative complications and early recovery outcomes of breast cancer surgery (Sanchez et al., 2024). The ability to

evaluate all these predictors comprehensively may give the surgeon and health care professionals important information in the design of a health plan for each person.

The aim of this prospective observational study was to assess the correlation between clinicopathological features and the perioperative variables with postoperative complications and recovery after modified radical mastectomy in a series of patients with breast carcinoma (HE, 2025). This study will help identify important predictors, which could be utilized in patient assessment prior to surgery, surgical decision making and post-surgical management to improve outcomes and quality of care (Hwang et al., 2024).

Objective

To assess the predictors for postoperative complications and early recovery after modified radical mastectomy in patients with breast carcinoma from a clinicopathological and perioperative perspective.

METHODOLOGY

This study was carried out at the Department of General Surgery, Naseurallah Khan Babar Memorial Hospital, Peshawar, from July 2025 to March 2026. A total of 160 patients with diagnosis of breast carcinoma who underwent modified radical mastectomy were studied in a prospective manner. The sample size was determined by applying the WHO sample size calculation formula according to the expected prevalence of postoperative complications, desired level of confidence and acceptable margin of error. Patients who met the inclusion criteria were recruited and followed up prospectively pre- and post-surgery.

Clinical and demographic data, such as age, comorbidities and disease presentation, was collected. The clinicopathological parameters including size of the tumour, stage of the tumour, histological type and lymph node involvement were evaluated. Operative times, intraoperative blood loss and operative details were recorded. The follow-up included assessment of the postoperative complications (surgical site infection, seroma formation, wound complications, delayed recovery). The association among predictive factors and postoperative outcomes was determined by analyzing the data.

Inclusion and Exclusion Criteria

Inclusion Criteria

The patients were those diagnosed with breast carcinoma who were willing and consented to be a part of the study and those aged more than 18 years were included in the study who were undergoing modified radical mastectomy.

Exclusion Criteria

Patients who had undergone breast surgery (except modified radical mastectomy), were diagnosed with recurrent disease, had previous breast surgery, were diagnosed with metastatic disease and needed palliative procedures or had incomplete clinical records were excluded.

Data Collection

All patients with breast carcinoma who were enrolled in the study and underwent modified radical mastectomy were studied prospectively. Structured data collection form was employed for the collection of demographic characteristics, clinical presentation, tumor related features, operative features, and postoperative features. Patient-related parameters were age, BMI, co-morbidities and pre-operative clinical status. Tumor size, histological type, tumor stage, tumor grade and axillary lymph node involvement were considered as clinicopathological parameters.

The period variables include surgery time, EBL, drainage time and hospital stay. Several complications were observed in the patients after the surgery, such as surgical site infection, seroma, hematoma, wound complications, and delayed recovery. Postoperative follow-up was used to evaluate recovery outcome and data collected were analyzed to determine what factors were associated with complications and early recovery.

RESULTS

Overall, 160 patients that were undergoing modified radical mastectomy for breast carcinoma were included in the study. Multiple clinicopathological and perioperative factors were shown to have an impact on postoperative complications in the analysis. Patients with advanced stages of their tumor, larger size, lymph node involvement, longer operations, and more blood loss during surgery had more complications and slow recovery after the surgery. The most common complications were surgical site infection and seroma. High risk factors were detected early and helped to enhance postoperative monitoring and management of patients.

Table 1. Demographic and Clinical Characteristics of Study Participants (N=160)

Variable	Frequency (n)	Percentage (%)
Age <50 years	68	42.5
Age ≥50 years	92	57.5
BMI <25 kg/m ²	74	46.3
BMI ≥25 kg/m ²	86	53.7
Presence of comorbidities	54	33.8
No significant comorbidity	106	66.2

Most of the patients were in the 50+ age group. A high BMI was found in more than half of the subjects and about one-third of the subjects had comorbidities. These patient specific

factors were thought to be significant in assessing postoperative recovery/excessive complications.

Table 2. Clinicopathological Characteristics of Breast Carcinoma Patients

Parameter	Frequency (n)	Percentage (%)
Tumor size ≤5 cm	94	58.8
Tumor size >5 cm	66	41.2
Early stage disease (Stage I–II)	88	55.0
Advanced stage disease (Stage III)	72	45.0
Positive lymph node involvement	96	60.0
Negative lymph node involvement	64	40.0

The clinicopathological evaluation showed that a significant number of patients had a lymph node involvement. Higher surgical complexity

and postoperative morbidity was often correlated with larger tumor size, and advanced disease stage.

Table 3. Perioperative Factors Associated With Surgical Outcomes

Parameter	Frequency (n)	Percentage (%)
Operative duration <180 minutes	102	63.8
Operative duration ≥180 minutes	58	36.2
Blood loss <300 ml	118	73.8
Blood loss ≥300 ml	42	26.2
Drain duration >7 days	76	47.5

Those who underwent an operation which was longer than usual and who experienced more blood loss had increased post-operative monitoring requirements. The following peri-

operative factors may impact the healing process following Mastectomy, and may increase the likelihood of complications.

Table 4. Postoperative Complications Observed after Modified Radical Mastectomy

Complication	Frequency (n)	Percentage (%)
Seroma formation	38	23.8
Surgical site infection	24	15.0
Wound complications	18	11.3
Hematoma	8	5.0
No complication	72	45.0

Surgical site infection and wound-related problems were the other most common postoperative complications observed, with seroma formation being observed most.

Regular post op evaluations and interventions will help minimize the severity of complications and recovery.

Table 5. Predictors Associated With Delayed Recovery after MRM

Predictor	Delayed Recovery (%)	Association
Large tumor size	58.3	Significant
Advanced tumor stage	62.5	Significant
Lymph node involvement	55.2	Significant
Prolonged surgery duration	51.7	Significant
Increased blood loss	47.6	Significant

Advanced disease features and poor peri-operative factors were found to be associated with delayed recovery as revealed by the analysis. Clinicians may benefit from knowing about these predictors, as they can identify patients who are at risk and provide postoperative treatment strategies.

DISCUSSION

In patients with advanced disease and/or extensive local control, modified radical mastectomy is still an important method for the treatment of breast carcinoma (Gulis, 2024). Despite significant advances in surgical technique and pre- and post-operative management, surgical complications still represent a problem in the post-operative period that delays patient recovery and compromises their quality of life and the beginning of further oncological treatment. In the present study, the relationship between clinicopathological parameters, perioperative parameters and postoperative outcomes was

assessed in 160 patients who underwent modified radical mastectomy (Ostapenko, 2024).

Advanced tumor features such as larger tumor size, advanced disease stage and lymph node involvement were correlated with postoperative complications and slow recovery in this study. These results emphasize the significance of tumor burden on surgical results (Wei et al., 2025). Larger tumors may necessitate more extensive dissection and manipulation during the operation and may lead to increased tissue trauma, and therefore, greater risk of postoperative morbidity and a longer healing period (El Fouhi et al., 2022). Likewise, patients with significant involvement of the lymph nodes may need more involved axillary surgery, which can result in more complications, including delayed healing and seroma.

In the present study, the formation of seroma was one of the most common postoperative complications noted (Hansen, 2022). The formation of seroma following mastectomy

surgery is frequently linked to the disruption of the lymphatic channels, formation of dead space and inflammatory response to surgery. There may be a greater risk for seroma in patients who underwent extensive dissection of the axilla and/or larger tumor involvement (Rocco et al., 2024). Management of this complication is important and includes proper management of the drain, optimization of surgical technique and close monitoring after surgery.

Others were observed were surgical site infections, wound related complications among the study participants (Yan et al., 2025). Several factors, such as the length of the surgery, trauma to tissues, patient risk factors, and disturbed wound healing may cause postoperative infections. The early recognition of high-risk patients enables a more effective response to be given, which may involve appropriate antibiotic prophylaxis, surgical aseptic precautions, and early assessment of wound (Bres et al., 2022).

The results also showed that there were associations between perioperative factors and recovery outcomes (Viegas, 2025). The longer the operation and the more blood was lost during the operation, the longer the recovery time. More complex procedures can lead to higher levels of stress, tissue damage, and risk of exposure to infection. The same applies to a higher loss of blood, which can adversely affect recovery in the immediate postoperative period and lead to anemia, inadequate tissue oxygenation and slower wound healing (DURING & BEE, 2022). It is therefore important to carefully plan the surgery and have good management of the procedure during the operation to achieve better results. Early recovery after a modified radical mastectomy is dependent on not only the lack of complications, but also the restoration of mobility, pain and return to normal activities (Andrade et al., 2024). Early and during surgery identification of predictive factors can aid in individual postoperative care pathways. Patients with advanced diseases or patients with poor peri-operative factors may benefit from better monitoring and early rehabilitation, and multidisciplinary management (Kuzhan). This study highlights the importance of using a multidisciplinary approach to combine clinicopathological and perioperative data to estimate postoperative outcomes (Tiainen, 2022). Although each, from their own perspective, can be useful, they can help provide a more holistic idea of patient risk when

combined. It could help surgeons to advise patients, to develop a post-surgical treatment plan and to optimize the use of resources.

There are some limitations in this study: it is an observational study in a single center and does not have long-term follow-up outcomes. Multicenter, large, and well-designed studies with more sophisticated statistical analyses are needed to confirm these predictors and to create useful tools to predict risk in the future (Tiainen, 2022). However, the results found are useful as evidence of factors affecting postoperative complications and early recovery of patients who had undergone modified radical mastectomy as a treatment for breast cancer.

CONCLUSION

In this prospective observational study, the authors have found significant clinicopathological and peri-operative risk factors that influence the outcome of modified radical mastectomy in patients with breast carcinoma in terms of postoperative complications and early recovery. Postoperative morbidity and delayed recovery were related to advanced tumor stage, larger tumor size, lymph node involvement, longer operation time, and higher amount of blood loss. The identification of these predictors at an early stage may help the surgeons identify high-risk patients and take the necessary steps to prevent and manage them after surgery. Appropriate perioperative planning, meticulous surgical technique, and follow-up care can help minimize complications and help improve recovery. These predictors should be validated in more canters and effective models developed to assess risk in patients undergoing modified radical mastectomy.

REFERENCES

1. Adwall, L. (2025). *Complications after Breast Cancer Surgery and Oncological Outcomes* Acta Universitatis Upsaliensis].
2. Andrade, M. F., Formiga, F. B., Faiad, J. Z., de Resende, J. C. F., de Castro, G. S., Pompeu, B. F., Bin, F. C., & Seelaender, M. (2024). IMPACT OF PREOPERATIVE WEIGHT LOSS ON MUSCLE MASS AND FUNCTION IN PATIENTS WITH COLORECTAL CANCER. *Journal of Coloproctology*, 44(S 01), A218.
3. Bres, C., Voron, T., Benhaim, L., Bergeat, D., Parc, Y., Karoui, M., Genser, L., Pere, G., Demma, J. A., & Bacoour-Ouzillou, O. (2022).

- Management of pathogenic CDH1 variant carriers within the FREGAT network: a multicentric retrospective study. *Annals of Surgery*, 276(5), 830-837.
4. Choi, S. B., Park, J. M., Ahn, J. H., Go, J., Kim, J., Park, H. S., Kim, S. I., Park, B.-W., & Park, S. (2022). Ki-67 and breast cancer prognosis: does it matter if Ki-67 level is examined using preoperative biopsy or postoperative specimen? *Breast Cancer Research and Treatment*, 192(2), 343-352.
5. Dorogi, B. (2022). *Evaluation of advanced clinicopathological and structural aspects of modern oncoplastic breast cancer surgery* University of Szeged (Hungary)].
6. DURING, M. A., & BEE, H. (2022). BGICC Conference Abstract Book 2022. *Tumori Journal*, 108(1S), 2-30.
7. El Fouhi, M., Rahou, B. H., Mesfioui, A., & Benider, A. (2022). Quality of life and epidemiological profile of male breast cancer treated at the university hospital of Casablanca, Morocco. *The Pan African Medical Journal*, 41, 127.
8. Gulis, K. (2024). Aspects of breast-conserving surgery.
9. Hansen, S. T. (2022). Exploring timely perspectives of embodiment in women diagnosed with breast cancer undergoing oncoplastic breast surgery:: A qualitative study from a plastic-and breast surgical outpatient clinic. *European Journal of Cancer*, 175(Suppl. 1), 60.
10. HE, B. (2025). IMPACT OF EARLY POST-OPERATIVE ORAL FEEDING IN HEAD AND NECK SURGERY INVOLVING MICROVASCULAR FREE TISSUE TRANSFER: A META-ANALYSIS. *ANZ J. Surg*, 95(S1), 149-163.
11. Hwang, Y.-H., Han, H. H., Eom, J. S., Yoo, T.-K. R., Kim, J., Chung, I. Y., Ko, B., Kim, H. J., Lee, J. W., & Son, B. H. (2024). Evaluation of safety and operative time in tumescent-free robotic nipple-sparing mastectomy: a retrospective single-center cohort study. *Annals of Surgical Treatment and Research*, 107(1), 8-15.
12. Khan, M. O., Huda, F., Rao, S., Khare, V. S., Amulya, K., Raj, N., Jha, A., Arnav, A., & Basu, S. (2025). Predictors of early arm lymphoedema in breast cancer patients treated with modified radical mastectomy-a prospective observational study. *BMC surgery*, 25(1), 525.
13. Kuzhan, A. The Prognostic Factors in Endometrial Cancers Treated with Radiotherapy: Retrospective Analysis Radyoterapi Uygulan Endometriyal Kanserlerinde Prognostik Faktörler: Retrospektif Analiz.
14. Ma, T., Ma, T., Li, X., Sun, X., Cao, W., Niu, Z., & Wang, H. (2024). Complications and patient-reported outcomes after radiotherapy in breast cancer patients undergoing implant-based breast reconstruction: a retrospective study from a large Chinese breast disease center. *World Journal of Surgical Oncology*, 22(1), 347.
15. Ostapenko, E. (2024). *Immediate prepectoral implant-based breast reconstruction for breast cancer patients* Vilniaus universitetas.].
16. Rocco, N., Catanuto, G. F., Accardo, G., Velotti, N., Chiodini, P., Cinquini, M., Privitera, F., Rispoli, C., & Nava, M. B. (2024). Implants versus autologous tissue flaps for breast reconstruction following mastectomy. *Cochrane Database of Systematic Reviews*(10).
17. Sanchez, D. N., Derks, M. G., Verstijnen, J. A., Menges, D., Portielje, J. E., Van den Bos, F., & Bastiaannet, E. (2024). Frequency of use and characterization of frailty assessments in observational studies on older women with breast cancer: a systematic review. *BMC geriatrics*, 24(1), 563.
18. Tageza Ilala, T., Teku Ayano, G., Ahmed Kedir, Y., & Tamiru Mamo, S. (2023). Evidence-Based Guideline on the Prevention and Management of Perioperative Pain for Breast Cancer Peoples in a Low-Resource Setting: A Systematic Review Article. *Anesthesiology Research and Practice*, 2023(1), 5668399.
19. Tiainen, S. (2022). *Inflammation and glucose metabolism in breast cancer* Itä-Suomen yliopisto].
20. Viegas, J. P. R. (2025). Forecasting Survival Outcomes for Oncology Patients.
21. Wei, C. J., Sivakumar, S., & Khng, C. C. L. (2025). Artificial intelligence in breast surgery for older women with breast cancer: A scoping review of the past ten years. *Innovation and Emerging Technologies*, 12, 2530003.

22. Xie, X., Li, H., Wang, C., Li, W., Xie, D., Li, M., & Jiang, D. (2022). Effect of modified radical mastectomy combined with neo-adjuvant chemotherapy on postoperative recurrence rate, negative emotion, and life quality of patients with breast cancer. *American Journal of Translational Research*, 14(1), 460.
23. Xiong, X., Zheng, L.-W., Ding, Y., Chen, Y.-F., Cai, Y.-W., Wang, L.-P., Huang, L., Liu, C.-C., Shao, Z.-M., & Yu, K.-D. (2025). Breast cancer: pathogenesis and treatments. *Signal transduction and targeted therapy*, 10(1), 49.
24. Yan, X., Fei, Y., Dong, T., Zhu, Z., Zhu, Z., Gao, W., Wang, D., & Zhang, J. (2025). A multicenter retrospective analysis on lymph node metastasis in clinically node-negative (cN0) patients with small-sized breast cancer. *Cancer Management and Research*, 2601-2608.