

# Prevalence of Upper Extremity Impairments in Post 3 Months Mastectomy Patients An Observational Study

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**Abstract**---This observational cross-sectional study investigated the prevalence of upper extremity impairments in post-3 months mastectomy patients using standardized outcome measures. A total of 76 female patients aged 25-60 years who underwent mastectomy at least 3 months prior were evaluated using the Disability of the Arm, Shoulder and Hand (DASH) questionnaire and the SF-12 quality of life scale. Results demonstrated that 83% of patients experienced severe disability (DASH score), with no patients reporting normal function. Physical and mental component scores on the SF-12 were below the mean (40% and 45% respectively), indicating reduced quality of life. These findings highlight the substantial burden of upper extremity morbidity following mastectomy and underscore the critical need for systematic rehabilitation and surveillance protocols in post-mastectomy care.

**Index Terms**---Mastectomy, upper extremity impairment, DASH questionnaire, SF-12, quality of life, breast cancer rehabilitation.

## Introduction

Breast cancer represents a significant health burden globally and is the leading neoplasm among women. According to 2022 WHO data, India reported 192,020 new cases (26.6% of global incidence), with a 5-year prevalence of 526,248 cases[1]. Treatment approaches vary based on cancer stage and type, encompassing surgical intervention, medication, and radiation therapy. Mastectomy, the surgical removal of breast tissue, remains a primary intervention for stage I, II, and III breast cancer, often followed by adjuvant therapy[1].

The procedure involves complete removal of breast tissue and is classified into several types: total (simple) mastectomy, total mastectomy with axillary clearance, modified radical mastectomy (Patey's operation, Scanlon's operation, Auchincloss MRM), Halsted radical mastectomy, toilet mastectomy, extended radical mastectomy, and skin-sparing mastectomy[3]. Conservative breast-conserving surgeries such as wide local excision and quadrantectomy represent alternative approaches for selected cases[4].

Beyond immediate surgical concerns, mastectomy patients face significant physical and psychosocial challenges. Upper extremity complications including restricted shoulder range of motion, muscle weakness, pain, and limitations in activities of daily living (ADL) are well-documented consequences of mastectomy and associated lymph node dissection[5][6][7]. Physiotherapy intervention has demonstrated significant efficacy in addressing these complications, improving muscle strength, shoulder range of motion, reducing pain, enhancing chest expansion, and facilitating ADL independence[7][8][9].

Early physical therapy intervention following mastectomy has been shown to reduce adverse post-operative complications[10]. Conversely, patients who do not receive early therapeutic intervention frequently experience complications such as pectoral tightness, myofascial pain syndrome, rotator cuff disease, and adhesive capsulitis[10]. This study examines whether similar patterns of upper extremity impairment are evident in patients presenting at the 3-month post-mastectomy interval, a critical time-point for intervention and prevention.

# Need for Study

Upper-body morbidity following mastectomy extends significantly beyond lymphedema to encompass pain, shoulder dysfunction, and functional limitations that restrict self-care and overhead activities[8]. Existing evidence indicates considerable variability in symptom onset (as early as 1 month post-surgery) and progression patterns across the first post-operative year, supporting the rationale for targeted assessment at the 3-month interval to guide timely clinical referrals and patient education[20][21].

Current survivorship frameworks highlight persistent gaps in systematic follow-up for upper extremity morbidity. Standardized, locally-derived prevalence data are essential to embed systematic screening and rehabilitation into routine post-mastectomy care pathways[21]. This study aims to establish baseline prevalence data and identify the functional status of post-mastectomy patients to determine whether they would benefit from physiotherapy intervention based on their impairment profiles.

## Aim

To determine the prevalence of upper extremity impairments in post-3 months mastectomy patients.

## Objectives

1. To evaluate the prevalence of upper extremity impairments using the Disability of the Arm, Shoulder and Hand (DASH) questionnaire in post-3 months mastectomy patients.
2. To assess quality of life in post-mastectomy patients using the SF-12 questionnaire.

## Review of Literature

### Upper Extremity Functional Outcomes After Breast Cancer Treatment: Analysis of DASH Score in Breast Reconstruction Patients

Humar et al. (2024) conducted a retrospective analysis of 289 breast reconstruction patients, with 157 completing the DASH questionnaire[22]. Mean patient age at reconstruction was  $52.6 \pm 8.6$  years. Reconstruction methods included implant-based repair (n=111), autologous reconstruction (n=15), and combined approaches (n=24). DASH scores ranged from 0.0 to 52.5 (mean), with 74.1% of patients reporting some level of impairment (score >0). Multivariable regression identified significant associations: age 50-60 years (p=0.13), radiation history (p=0.01), sub-pectoral implant location (p=0.06), surgical complications (p=0.10), and lymphedema (p<0.01). Autologous reconstruction correlated with significantly lower DASH scores (p=0.04), suggesting superior functional outcomes with this reconstructive approach[22].

### Correlation Between Hand Grip Strength and Scapular Muscle Strength Post-Mastectomy

Priya et al. (2022) evaluated 33 breast cancer survivors who underwent modified radical mastectomy at least 6 months prior[23]. Hand-held dynamometry was used to measure grip strength and scapular muscle strength (serratus anterior and trapezius). Strong positive correlation was demonstrated between grip strength and serratus anterior (r=0.848) and lower trapezius strength (r=0.868). Moderate positive correlations were found with upper trapezius (r=0.665) and middle trapezius (r=0.444) (p<0.05). These findings indicate that hand grip strength may serve as a proxy marker for scapular stabilizer strength in mastectomy survivors[23].

# Effects of Exercise on Shoulder Function and Morbidity Following Mastectomy

Das et al. (2018) conducted a prospective randomized controlled trial examining exercise intervention in 75 post-mastectomy patients (exercise group n=38, control n=37)[24]. The exercise group received 19 active and active-assisted range of motion exercises plus strengthening activities with frequent follow-up. Controls received minimal structured exercise. Outcomes measured included pain, numbness, shoulder range of motion, muscle strength, lymphedema, and ADL limitations at baseline, 24 hours post-drain removal, and 3, 6, and 12 weeks post-surgery.

Results demonstrated significant improvements in the exercise group: superior pain scores and shoulder range of motion ( $p<0.001$ ), reduced numbness incidence, lower lymphedema rates ( $p<0.001$ ), and improved ADL scores ( $p<0.05$ ). Notably, no significant difference in grip strength was detected between groups[24]. Exercise intervention significantly reduced lymphedema incidence and ADL impairment while improving shoulder mobility, though strength outcomes were not significantly different.

## Upper Limb Morbidity in Newly Diagnosed Individuals: AMBER Cohort Study

McNeely et al. (2023) prospectively evaluated upper limb morbidity in breast cancer surgery patients using objective measures within 3 months of surgery[25]. Upper limb morbidity was identified in 54% of participants and was associated with poorer function and higher pain levels. Multivariable analysis identified significant associations: mastectomy versus breast-conserving surgery (OR 3.51, 95% CI 2.65-4.65), axillary lymph node dissection versus sentinel node biopsy (OR 2.67, 95% CI 1.73-4.10), earlier post-operative timing (OR 1.58, 95% CI 1.15-2.18), and younger age (OR 1.01, 95% CI 1.00-1.03). Greater body fat percentage and lower muscular endurance associated with moderate-to-severe morbidity. Findings facilitate prospective surveillance of high-risk individuals[25].

## Prevalence of Upper Extremity Lymphedema Post-Mastectomy

Koca et al. (2020) examined upper extremity complications in 67 post-mastectomy patients through an observational cross-sectional design[26]. Lymphedema prevalence was 23.9%, predominantly grade 1 ISL classification (76.1%), with median duration of 12 months (range 3-72 months). Radical or modified radical mastectomy was the most common procedure (58.2%). Median pain score on visual analogue scale was 2 (0-7 range); shoulder pain affected 40.3% and movement limitation occurred in 7.5%. Quality of life assessment using WHO QOL-BREF revealed that lymphedema negatively impacted shoulder, arm, and hand function even in early stages. Recognition of risk factors and early detection of complications was emphasized as critical to rehabilitation success[26].

## Upper-Body Morbidity After Breast Cancer: Surveillance and Management

Hayes et al. (2012) reviewed incidence, diagnosis, and management strategies for upper-body morbidity (arm and breast symptoms, impairments, and lymphedema)[23]. Literature synthesis indicated that 10-64% of women report upper-body symptoms between 6 months and 3 years post-cancer, with approximately 20% developing lymphedema[23]. Symptoms persist into longer-term survivorship, and mild lymphedema carries increased risk for progression to moderate-severe categories. While known risk factors correlate with treatment extent, they cannot reliably predict individual outcomes. Physical therapy demonstrated efficacy in morbidity management, with evidence supporting integration of routine surveillance into standard breast cancer care[23].

## Effects of Mastectomy on Shoulder and Spinal Kinematics

Crosbie et al. (2010) evaluated shoulder girdle kinematics in women following unilateral mastectomy using 3-dimensional motion analysis[27]. Three groups were compared: dominant-side mastectomy (n=29, age 62.4±8.9 years), non-dominant side mastectomy (n=24, age 59.8±9.9 years), and age-matched controls (n=22, age 58.1±11.5 years) without upper limb or shoulder

pathology. All participants performed bilateral arm movements in sagittal, scapular, and coronal planes without pain. Post-mastectomy patients demonstrated altered scapular kinematics in all movement planes compared to controls, with markedly greater upward scapular rotation on the mastectomy side and excessive scapular excursion overall. These kinematic alterations may predispose to compensatory injury patterns[27].

# Methodology

## Study Design and Setting

**Study Type:** Observational

**Study Design:** Cross-sectional

**Study Location:** Shalini Tai Meghe Hospital and Research Centre, Wannadongri, Hingna, Nagpur

**Study Population:** Female patients at least 3 months post-mastectomy for breast cancer

**Sampling Method:** Convenience sampling

**Study Duration:** 6 months

## Sample Size Estimation

Sample size was calculated using the standard formula for proportions with 95% confidence level and 10% precision:

$$n = \frac{Z^2 \times P \times (1 - P)}{e^2}$$

Where:

- n = sample size
- Z = critical value at 95% confidence level (1.96)
- P = proportion of attribute (26.6% = 0.266)
- e = precision level (0.10)

**Calculated Sample Size:** n = 76 participants

## Inclusion Criteria

- Female gender
- Age 25-60 years
- Minimum 3 months post-mastectomy for breast cancer
- Absence of active infections or serious acute medical conditions

## Exclusion Criteria

- Ongoing treatment for other malignancies
- Pre-existing upper extremity disorders (cervical spondylosis, frozen shoulder, brachial plexus injury, axillary web syndrome)
- Recent road traffic accidents
- Active chemotherapy or radiotherapy

- History of significant upper extremity surgery or trauma (shoulder surgery, previous contralateral mastectomy)
- Medical conditions affecting upper extremity function (stroke, severe arthritis, neurological disorders)
- Bilateral breast cancer

## Outcome Measures

**Primary Outcome Measure:** DASH (Disability of the Arm, Shoulder and Hand) Questionnaire

The DASH is a 30-item self-administered questionnaire measuring functional status, disability, and participation limitations of the upper extremity. Scoring is calculated as:

$$\text{DASH Score} = \left[ \frac{(\text{sum of } n \text{ responses}) - 1}{n} \right] \times 25$$

Where n = number of completed responses

Interpretation: 0 = minimum disability; 100 = maximum disability

DASH Score	Disability Level
≤ 20	No disability
20-40	Mild disability
40-60	Moderate disability
> 60	Severe disability

Table 1: DASH Score Interpretation Categories

**Secondary Outcome Measure:** SF-12 (Short Form 12) Health Survey

The SF-12 is a validated 12-item multipurpose health survey measuring functional health and well-being. It yields two components:

- Physical Component Score (PCS)
- Mental Component Score (MCS)

Scores range from 0-100, with higher scores indicating better health status. Mean population score = 50; scores <50 indicate below-average health status. SF-12 provides efficient assessment of quality of life across physical and mental dimensions[14].

## Data Collection Procedure

1. Institutional approval obtained from Datta Meghe College of Physiotherapy administration and ethics committee
2. Participant identification and consent (informed written consent obtained; bilingual consent forms provided in English and Marathi)
3. Demographic data collection (age, type of mastectomy, time since surgery, adjuvant therapy status)
4. DASH questionnaire administration and scoring
5. SF-12 questionnaire administration and scoring
6. Data entry and analysis

## Statistical Analysis

Data were entered into MS Excel spreadsheets and analyzed using SPSS version 26.0 statistical software. Descriptive statistical methods including frequencies, percentages, and mean values were employed to determine prevalence of upper extremity impairment and quality of life outcomes. Interpretation of questionnaire scores utilized established scoring algorithms and normative data.

# Results

## DASH Questionnaire Findings

DASH Classification	Frequency (n)	Percentage (%)
Normal Function	0	0%
Mild Difficulty	3	4%
Moderate Difficulty	10	13%
Severe Difficulty	63	83%
<b>Total</b>	<b>76</b>	<b>100%</b>

Table 2: Table 1: Distribution of DASH Score Interpretation in Post-Mastectomy Patients

DASH questionnaire analysis revealed marked functional impairment in the study population. No participants reported normal upper extremity function. Mild difficulty was documented in 4% (3/76), moderate difficulty in 13% (10/76), and the majority (83%, 63/76) experienced severe functional disability. Mean participant age was 45 years (range 25-60 years), reflecting predominantly middle-aged women requiring mastectomy intervention.

## SF-12 Quality of Life Findings

SF-12 Component	Mean Score (%)
Physical Component Score (PCS)	40%
Mental Component Score (MCS)	45%

Table 3: Table 2: SF-12 Quality of Life Component Scores

SF-12 analysis demonstrated compromised quality of life across both physical and mental domains. Physical component score averaged 40% and mental component score 45%, both substantially below the population mean of 50. These findings indicate significant limitations in physical functioning, pain, fatigue, and role performance, coupled with compromised mental well-being regarding emotional health, vitality, and social functioning. The overall reduction in quality of life scores reflects the substantial burden of post-mastectomy morbidity.

# Discussion

Breast cancer represents the most common neoplasm in women, with India accounting for a significant disease burden (26.6% prevalence). Mastectomy, though effective for cancer control, generates substantial morbidity. This study quantified upper extremity impairment and quality of life in post-3 months mastectomy patients using validated outcome measures[1].

## Demographic and Clinical Characteristics

Study participants demonstrated wide age range (25-60 years, mean 46 years), reflecting the broad demographic distribution of mastectomy patients. Time since surgery varied (range 3-24 months, mean ~10 months), enabling analysis of impairment patterns across various post-operative intervals and providing insight into recovery trajectories.

# Functional Impairment Patterns

The substantial burden of functional impairment identified in this cohort aligns with existing literature. Multiple post-surgical factors contribute to observed impairments: surgical pain, axillary lymph node dissection extent, adjuvant radiation exposure, and scar tissue formation collectively restrict shoulder mobility and reduce muscle strength[12]. Psychological factors including kinesiophobia and reduced physical activity amplify functional decline.

The DASH questionnaire, validated for upper extremity musculoskeletal assessment, revealed severe functional impairment in 83% of patients, consistent with comparative literature. Similar observational studies documented upper limb disability in 73% or greater of post-mastectomy patients[20][21], corroborating the prevalence and severity of functional limitations identified in this investigation.

## Quality of Life Implications

SF-12 scores (Physical 40%, Mental 45%) fell substantially below normative mean of 50, indicating meaningful quality of life reduction. Physical component compromises encompass limitations in physical functioning, pain, fatigue, and role performance, while mental component reductions reflect emotional health, vitality, and social participation challenges[26]. This comprehensive quality of life burden underscores the multi-dimensional impact of mastectomy-related morbidity.

Comparative evidence identified similar patterns: observational studies consistently report SF-12 scores near or below 46%, validating findings of this investigation and establishing upper extremity morbidity as a critical quality of life determinant in post-mastectomy populations[20][21].

## Post-operative Timeline and Impairment Severity

The 3-month post-operative time-point represents a critical interval for intervention. Severe impairments evident at 3 months may persist or progress without systematic rehabilitation, as documented by longitudinal studies tracking impairment across 12+ months post-operatively[25]. The prevalence findings at this interval support the clinical rationale for early, intensive rehabilitation programs targeting upper extremity function restoration and quality of life preservation.

## Clinical Implications

Findings emphasize the necessity of integrating systematic upper extremity rehabilitation into routine post-mastectomy care pathways. The high prevalence of severe functional impairment and reduced quality of life justify comprehensive, multidisciplinary management approaches addressing pain reduction, functional restoration, and emotional support. Tailored rehabilitation protocols personalized to individual risk factors (age, adjuvant therapy type, surgical extent) may optimize outcomes[25].

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## Conclusion

This observational cross-sectional study demonstrates substantial prevalence of upper extremity impairments in post-3 months mastectomy patients. DASH questionnaire findings revealed 83% with severe disability, indicating profound functional impact. SF-12 scores (Physical 40%, Mental 45%) documented reduced quality of life across physical and mental health domains.

These findings establish upper extremity morbidity as a significant clinical burden requiring systematic intervention. The prevalence and severity of impairment justify implementation of evidence-based rehabilitation protocols integrated into routine post-mastectomy surveillance and management. Early identification and targeted physiotherapy intervention represent critical components of comprehensive cancer survivorship care.

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# Limitations

1. Relatively small sample size (n=76) may limit generalizability of findings
  2. Cross-sectional design prevents causal inference and longitudinal outcome tracking
  3. Psychological and social factors influencing rehabilitation outcomes were not assessed
  4. Study limited to female post-mastectomy patients; findings not generalizable to male breast cancer patients
  5. Single institution setting limits geographic and demographic diversity
  6. Confounding variables (chemotherapy regimen, radiation protocols, prior surgery) not controlled
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# Future Scope

1. Larger sample sizes with concurrent control groups receiving standardized physiotherapy protocols for direct outcome comparison
  2. Longitudinal studies tracking upper extremity function and quality of life from pre-operative baseline through extended post-operative follow-up (12+ months)
  3. Investigation of early versus delayed physiotherapy intervention timing to establish optimal rehabilitation initiation windows
  4. Integration of psychological counseling with physical rehabilitation to comprehensively address morbidity
  5. Development and validation of personalized rehabilitation programs targeting specific risk factors (age, adjuvant therapy type, surgical extent)
  6. Multidisciplinary investigation establishing integrated cancer survivorship pathways combining surgical oncology, physiotherapy, psychology, and social services
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# Operational Definitions

**Post-Mastectomy:** The period following mastectomy (surgical removal of one or both breasts, typically for breast cancer treatment or prevention). During this phase, patients recover from surgery and may experience upper extremity impairments[3].

**DASH Questionnaire:** The Disability of the Arm, Shoulder and Hand questionnaire comprises 30 items assessing functional status, disability, and participation limitations of the upper extremity following surgery[12].

**SF-12:** The Short Form 12-item health survey, a widely-used multipurpose instrument measuring functional health and well-being across physical and mental health dimensions[14].

**Upper Extremity Impairments:** Functional limitations of the upper quadrant resulting from surgical treatment, encompassing pain, muscle weakness, tissue tightness, reduced range of motion, and postural deviations.

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