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Post mastectomy pain syndrome and its determinants among breast cancer survivors, in southern Ethiopia ,2025

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Abstract

Background

Postmastectomy pain syndrome (PMPS) is a crippling neuropathic pain syndrome that occurs following breast surgery which lasts more than three months. It affects 20%-68% of women worldwide. This study aims to assess magnitude of Postmastectomy pain syndrome and its determinants among breast cancer survivors who underwent mastectomy in southern Ethiopia cancer centers, from March 25- June 25,2025.

Methods

A cross-sectional study was conducted among 271 breast cancer patients from February 15-April 15,2025, at three cancer centers found in southern Ethiopia. All eligible participants have been included in the study. The data was collected using a structured questionnaire. Models of multivariable and bivariate logistic regression were both used.

Results

In the study 173(63.2%) of the respondents had Postmastectomy pain syndrome. The majority of respondents with post-mastectomy pain syndrome, 83 (48%) reported having moderate pain, younger age (AOR (Adjusted Odd Ratio)) = 3.79,95% CI (Confidence Interval): 1.323–10.888), unmarried (AOR = 0.199 CI: 0.063–0.635), having lower income (AOR = 0.334 CI:0.126–0.887), Receiving chemotherapy (AOR = 3.023 CI: 1.057–8.650), who do not engage in regular arm exercise (AOR = 2.214 CI:1.016–4.823) were significantly associated with Postmastectomy pain syndrome.

Conclusion

Post-mastectomy pain syndrome is highly prevalent in Southern Ethiopia and is associated with younger age, unmarried status, low income, chemotherapy exposure and lack of regular arm exercise. These findings highlight the need for routine screening, targeted preventive strategies, patient education, and individualized pain management, particularly for high-risk groups. Integrating post-mastectomy pain syndrome into cancer care policies and adopting a multidisciplinary approach may improve postoperative outcomes. Further longitudinal and qualitative studies are needed to better understand the long-term burden of post-mastectomy pain syndrome and patients lived experiences.

Introduction

Post-mastectomy pain syndrome (PMPS) is defined as pain following any type of breast surgery that is at least moderately severe, has neuropathic characteristics, is located in the arm, axilla, or ipsilateral

breast/chest wall, occurs at least 50% of the time, and may be made worse by shoulder girdle movements(1). Characterized as ongoing or recurrent discomfort lasting more than three months(2).

The majority of breast cancer survivors (90%)(3) have surgical treatment that often results in the development of chronic pain due to various types of mastectomies(4). In Ethiopia the most commonly used treatment modality is the combination of surgery, chemotherapy, and palliative care. (5).Although surgery is the primary treatment modality there are several Complications related to breast cancer surgery (6).

PMPS was once considered to be an uncommon occurrence, but despite the absence of consistent criteria and definitions in various research, it affects 20%–68% of women worldwide who have undergone a complete or partial surgical breast excision(7). According to studies in Africa, specifically in South Africa and Egypt, the morbidity of post mastectomy pain syndrome is 38.04% and 52%, respectively (8, 9).

PMPS have a profound impact on patients' well-being, functionality, and overall quality of life. It can endure for many years post-surgery, posing challenges in carrying out physical and occupational activities, managing emotions and sleep, sustaining relationships, and finding satisfaction in life. PMPS is linked to increased healthcare and a higher likelihood of unemployment following breast cancer surgery (10, 11).

It is unclear what causes PMPS, but some possible risk factors are being young, surgery that involves removing lymph nodes, and factors related to anatomy, psychology, sociology, and genetics. People who have a high Body mass index, a low level of education, who do not smoke, or undergo treatments like chemotherapy, hormone therapy, or radiotherapy are more likely to suffer from chronic pain (12, 13).

PMPS is an important condition that affects the quality of life of women who suffer from it. However, despite advances in medical technology, there is no research on PMPS particularly its prevalence and risk factors in Ethiopia, even though many patients have undergone breast surgery. Therefore, this research will provide better insight into how widespread the syndrome is and what risk factors may contribute to the development of PMPS in the southern part of Ethiopia.

Method and material

Study setting

Our study was conducted in cancer centers which are located in southern part of Ethiopia, Hawassa university comprehensive specialized hospital cancer center, Wolaita Sodo University Comprehensive Specialized Hospital and Worabe Comprehensive Specialized Hospital

Hawassa University comprehensive specialized hospital (HUCSH) cancer center is found in Hawassa. HUCSH is accompanied with various units. The oncology center’s data from Hawassa University shows

that it has 1220 cancer patients in total. About 240 patients come to the center for chemotherapy, and 140–150 patients have monthly follow-ups.

Wolaita Sodo University's Comprehensive Specialized Hospital is located in Sodo, southern Ethiopia. The hospital offers routine patient treatment, as well as teaching and research. Services include both inpatient and outpatient care. Since January 2021, the hospital has been providing cancer care in a separate wing with its own outpatient and chemotherapy departments.

Worabe Comprehensive Specialized Hospital is located in worabe city Silte Zone, central Ethiopia. The hospital offers oncology service for patient with cancer, including chemotherapy and surgery.

Study Design, period and participants

An institutional based cross-sectional study was employed from March 25- June 25,2025. The study population included women who underwent surgical treatment for breast cancer and at least three months post-surgery. The study included all patients with breast cancer who were at least three months post-surgery and at least 18 years old. Patients who had other contemporaneous malignant tumors, were critically ill, had chronic conditions like diabetes mellitus that could induce neuropathic pain, had chest pain from non-surgical causes, or were unable to communicate were also excluded.

Sample size determination and sampling procedure

During the study period, a total of 362 post-mastectomy breast cancer patients were under follow-up at three oncology units in southern Ethiopia: HUCSH Cancer Treatment Center, WSUCSH Oncology Unit, and WCSH Oncology Unit. All patients were assessed for eligibility based on the predefined inclusion criteria. Those who met the criteria and were available during the data collection period were included in the study. Consequently, 271 eligible post-mastectomy breast cancer patients were enrolled, and this number constituted the final sample size of the study.

Data collection tools and procedure

Interviewer administered questionnaire was used, it contains three parts. Section one: contain sociology-demographic variables. Section two: includes clinical characteristics. Section three: contain the pain assessment tools DN4 (Douleur Neuropathic 4 questions) which is adopted from a validated and standardized in several languages. Bouhassira, Attal (14). and Pain intensity was measured according to visual analog scale (15).

The study was collected data from women who have had mastectomy and who qualify for the study, using record review/patient identification cards and interviews. Six oncology nurses were the data collectors. The questionnaire was in English, then translated to Amharic and back to English by experts.

First, the target of the study population was identified from registration books who had follow up. Then, a patient's medical records are retrieved. The data was collected using a structured questionnaire through face-to-face interview by using kobo mobile software during data collection, nine nurses (6 data collectors and 3 supervisors) were involved and training was given before data collection for one day on clarification of some terms and assessment tools, on the aim of the study, concerning the need for strict confidentiality of respondent's information, time of data collection, timely collection and reorganization of collected data and submission on due time. The data was collected for approximately four months including training of data collectors and pretest.

Operational definition and definition of terms

Pain: An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage(16).Post mastectomy pain syndrome (PMPS): is defined as the chronic pain occurring in the chest, armpit, upper arm, and shoulder after mastectomy for over 3 months (17). Post mastectomy pain syndrome (PMPS): The DN4 Questionnaire consists of a total of 10 items that are grouped in four sections. A score of 1 is given to each positive item and a score of 0 is given to each negative item. women with a DN4 score of 4 or more has PMPS and women with a DN4 score of less than 4 doesn't have PMPS (14).

Data quality control

In order to ensure the quality of the data, a pre-test data collection instrument was prepared; 1-day training was given for data collectors. One week before the actual data collection time, the pretest was conducted by data collectors incorporating a supervisor taking 5% participants in Tikur Anbesa comprehensive specialized hospital cancer unit to verify the validity and reliability of the questionnaire. Internal reliability was tested by Cronbach's-α test which is 0.86. Based on the pre-test findings, the vocabularies of the questionnaire and the order was revised. During data collection, regular follow up was held. Completeness and consistency were checked each data. The collected information was rechecked for its completeness and consistency by the principal investigator before transferring into computer software.

Data processing and analysis

The data was collected by kobo mobile software, coded and entered to SPSS (Statistical Program for Social Sciences Version 27.0). Descriptive statistics such as frequency, percentage, standard deviation, and mean was computed. The association between post mastectomy pain syndrome and explanatory variables was assessed first by bivariate logistic regression. In bivariate logistic regression, the variables with P-value < 0.25 was candidates for multivariable logistic regression. OR was calculated with 95% CI to show the strength of association and P-value < 0.05 was used to declare statistical significance.

Results

Socio demographic characteristics of respondents

A total of 271 participants were included in this study and there was 100% response rate. The mean age of participants was 44.3 (± 11.4 SD) year. The age range of the participants was 20–80 years old, and most participants were in the age group of 41–60 years old 46.1% (n = 125). Of all participants 175 (64.6%) were married and majority of the respondents 175 (64.6%) were living in urban. (For more detail see Table 1)

Table 1
Socio demographic characteristics of respondents among Breast Cancer patients in Southern, Ethiopia, 2025

Variables	Category	Frequency	Percent
Age	< 41(Young)	116	42.8
	41–60 (Middle Age)	125	46.1
	> 60(Older Age)	30	11.1
Level of education	Unable to read and write	49	18.1
	Primary completed	45	16.6
	Secondary completed	64	23.6
	Certificate and diploma	50	18.5
	Degree and above	63	23.2
Marital status	Single	30	11.1
	Married	175	64.6
	Divorced	33	12.2
	Widowed	33	12.2
Occupation	House wife	89	32.8
	Employed	74	27.3
	Private work	81	29.9
	Jobless	14	5.2
	Retired	13	4.8
Place of residence	Urban	175	64.6
	Rural	96	35.4
Monthly income	< 1500	56	20.7
	1500–4500	122	45.0
	> 4500	93	34.3
Having a child	Yes	206	76.0
	No	65	24.0

Clinical characteristics of respondents

Among the participants, the most 110(40.6%) were diagnosed with stage II cancer, followed closely by stage III cancer 105(38.7%). The smallest proportion 27(10%) fell into stage I. The vast majority of respondents 158(58.5) BMI was found to be in the normal range. Around 168(62%) participants were undergone the surgery with the side of dominant hand. (For more detail see Table 2)

Table 2
Clinical characteristics of respondents of Breast Cancer patients in Southern, Ethiopia, 2025

Variables	Category	Frequency	Percent
Time since mastectomy	< 18 Months	262	96.7
	≥ 18 Months	9	3.3
Cancer stage	Stage I	27	10.0
	Stage II	110	40.6
	Stage III	105	38.7
	Stage IV	29	10.7
Type of Rx	Chemotherapy	169	62.4
	Hormonal therapy	76	28.0
	Others	26	9.6
Axillary Involvement	Yes	167	61.6
	No	104	38.4
History of Headache	Yes	114	Yes
	No	157	No
Pain history	Yes	116	42.8
	No	155	57.2
BMI	< 18.5	41	15.2
	18.5–24.9	158	58.5
	25-29.9	57	21.1
	> 30	14	5.2
Regular Arm Exercise	Yes	198	73.1
	No	73	26.9
Surgery with side of dominant hand	Yes	168	62.0
	No	103	38.0

Magnitude of Post mastectomy pain syndrome

The findings of the study revealed that post-mastectomy pain syndrome affected 173 individuals, accounting for 63.2% of the study population. The estimated prevalence was supported by a 95% confidence interval ranging from 55.8% to 70%, indicating a substantial burden of this condition among the participants. (See Fig. 1)

Pain intensity among patients who have post mastectomy pain syndrome

The majority of respondents with post-mastectomy pain syndrome (PMPS), 83 (48%) reported having moderate pain, followed by mild pain 48 (27.7%) and severe pain 42 (24.3%). (See Fig. 2)

Factor Associated with post mastectomy Pain Syndrome

In bivariate logistic regression age, marital Status, residency, monthly income, time since mastectomy, anti-cancer treatment, regular arm exercise and history of headache were candidates for multivariable logistic regression analysis with a p-value of less than 0.25. In multivariable logistic regression age, marital status, monthly income, anti-cancer treatment regular arm exercise and history of headache have statically significance association with Post mastectomy Pain syndrome. The model classified 74.8% of the cases correctly and there is no any co-linearity among age, marital status, level of education, occupation, monthly income, residence, time since surgery, type of treatment, axillary involvement, dominant hand the same side of the surgery, and regular arm exercise because of above 0.1 tolerances and below 10 variance inflation factors for each variable.

The odds of having PMPS among participants aged < 41 years were 3.79 times higher (AOR = 3.79, 95% CI: 1.323–10.888) compared to those aged ≥ 60 years. Compared to single individuals, married participants had 80.1% lower odds (AOR = 0.199, 95% CI: 0.063–0.635) of developing post-mastectomy pain syndrome. Conversely, study participants earning more than 4,500 Ethiopian Birr were 66.6% less likely (AOR = 0.334, 95% CI: 0.126–0.887) to experience pain following mastectomy compared to those earning less than 1,500 Ethiopian Birr. Among respondents receiving chemotherapy, the odds of PMPS were three times higher (AOR = 3.023, 95% CI: 1.057–8.650) than among those receiving other treatments. Finally, the odds of having PMPS among participants who did not perform regular arm exercises were two times higher (AOR = 2.214, 95% CI: 1.016–4.823) than among those who performed regular arm exercises. (For more detail see Table 3)

Table 3
Factors associated with PMPS among breast cancer patients in southern, Ethiopia 2025

Variables	PMPS		COR (95%CI)	AOR (95%CI)	P-value
	Have PMPS	No PMPS			
Age					
< 41	89(76.7%)	27(23.3%)	3.296(1.430–7.599)	3.794(1.323–10.888)	0.013*
41–60	69(55.2%)	56(44.8%)	1.232(0.555–2.736)	1.097(0.410–2.934)	0.854
> 60	15(50%)	15(50%)	1	1	
Marital status					
Single	25(83.3%)	5(16.7%)	1	1	
Married	102(58.8%)	72(41.4%)	0.283(0.104–0.775)	0.199(0.063–0.635)	0.006*
Divorced	20(58.8%)	14(41.2%)	0.286(0.088–0.928)	0.272(0.073–1.015)	0.053
Widowed	26(78.8%)	7(21.2%)	0.743(0.208–2.651)	0.856(0.201–3.644)	0.833
Level of education					
Unable to read and write	15(30.6%)	34(69.4%)	1	1	
Primary completed	18(40%)	27(60%)	2.196(1.004–4.804)	0.749(0.262–2.137)	0.588
Secondary completed	21(32.8%)	43(67.2%)	0.670(1.453–3.152)	1.208(0.402–3.632)	0.736
Certificate and diploma	13(26%)	37(74%)	1.984(0.967–4.069)	2.511(0.743–8.488)	0.138
Degree and above	31(49.2)	32(50.8)	2.757(1.236–6.149)	0.794(0.238–2.650)	0.708
Occupation					
House wife	24(27%)	65(73%)	1	1	
Employed	29(39.2)	45(60.8)	0.573(0.296–1.110)	0.533(0.202–1.406)	0.204
Private work	33(40.7%)	48(59.3%)	0.537(0.282–1.023)	0.583(0.234–1.451)	0.264

Variables	PMPS		COR (95%CI)	AOR (95%CI)	P-value
	Have PMPS	No PMPS			
Jobless	6(42.9%)	8(57.1%)	0.492(0.155–1.566)	0.275(0.065–1.158)	0.078
Retired	6(46.2%)	7(53.8%)	0.431(0.131–1.411)	0.719(0.144–3.585)	0.688
Monthly income					
< 1500	43(74.1%)	15(25.9%)	1	1	
1500–4500	85(69.7%)	37(30.3%)	0.801(0.397–1.619)	0.709(0.313–1.606)	0.410
> 4500	45(49.5%)	46(50.5%)	0.341(0.167–0.699)	0.334(0.126–0.887)	0.028*

Variables	PMPS		COR (95%CI)	AOR (95%CI)	P-value
	Have PMPS	No PMPS			
Residence					
Urban	102(58.3%)	73(41.7%)	0.492(0.285–0.849)	1.298(0.604–2.787)	0.504
Rural	71(74%)	25(26%)	1	1	
Time since surgery					
< 18 Months	169(64.5%)	93(35.5%)	0.440(.115-1.679)	0.817(0.148–4.513)	0.817
≥ 18 Months	4(44.4%)	5(55.6%)	1	1	
Type of Treatment					
Chemotherapy	121(71.6%)	48(28.4%)	3.437(1.474–8.017)	3.023(1.057–8.650)	0.039*
Hormonal therapy	41(53.9%)	35(46.1%)	1.597(0.650–3.926)	0.988(0.308–3.169)	0.984
Others	11(42.3%)	15(57.7%)	1	1	
Axillary Involvement					
Yes	53(32.7%)	114(67.3%)	0.610(0.367–1.012)	1.566(0.818–2.995)	0.176
No	45(43.3%)	59(56.7%)	1	1	
Dominant hand with side of surgery					
Yes	55(32.7%)	113(67.3%)	0.679(0.409–1.128)	0.588(0.300–1.150)	0.121
No	43(41.7%)	60(58.3%)	1	1	
Regular Arm Exercise					
Yes	117(59.1%)	81(40.9%)	1	1	
COR – Crud odd Ratio					
CI – Confidence Interval					
AOR- Adjusted Odd Ratio					
*** - P values statistically significantly associated and less than 0.05**					

Variables	PMPS		COR (95%CI)	AOR (95%CI)	P-value
	Have PMPS	No PMPS			
No	56(76.7%)	17(23.3%)	2.281(1.236–4.207)	2.214(1.016–4.823)	0.046*
History of Headache					
Yes	83(72.8%)	31(27.2%)	1.993(1.185–3.352)	2.124(1.097–4.114)	0.0252*
No	90(57.3%)	67(42.7%)	1	1	
COR – Crud odd Ratio					
CI – Confidence Interval					
AOR- Adjusted Odd Ratio					
*** - P values statistically significantly associated and less than 0.05**					

Discussion

The study showed that prevalence of post mastectomy pain syndrome was 173(63.2%) which is aligned with the with studies conducted in Colombia ,North Carolina, USA, Turky, New Zealand which were (18–21).On the other hand, the finding in the present study was higher than the studies carried out at the national cancer center of China, more recent study in New Zealand, Pakistan, Wenzhou China, Pennsylvania USA, India ,Regional hospital in the Netherlands, South Africa, in the northeast of Brazil and Egypt which were of the study participants had post mastectomy pain syndrome (6, 8, 9, 22–27).

Our study included all patients with persistent pain that met the DN4 criteria, while some studies (e.g., the Indian cohort)(8) focus only on pain that affects quality of life, which may exclude mild but ongoing symptoms. By taking a more inclusive, real-world approach, we likely identified a wider range of PMPS cases that are often missed by stricter clinical definitions.

Differences from studies in the Netherlands (22)and USA(25) may be explained by variations in postoperative pain management. Early risk identification and access to supportive care, which are more common in European and North American settings, may reduce chronic pain, whereas limited access to these services may contribute to the higher prevalence observed in our study.

In comparison to patients who are ≥ 60, the chance of having PMPS was 3.79 times higher in age groups under 40. This result was consistent with research carried out at The National Cancer Center of China, Sri Lanka, Colombia (18, 26, 28). One interpretation that could be given is younger patients may be more sensitive to pain or have a lower pain threshold than older people, which could be one reason for this link. Additionally, more aggressive breast tumors in younger women may need more extensive surgery to

remove, which raises the possibility of nerve injury and the ensuing persistent pain (29). However, the role of age as an independent risk factor is not universally supported in the literature. A study from other regions have reported no significant correlation between chronological age and the incidence of PMPS. For instance, a study in Iran (30) found no statistical difference in the development of chronic pain between younger and older age groups. Married participants had 80.1% decreased risk of post-mastectomy pain syndrome compared to unmarried individuals. The possible explanation might be marriage provides a support system that enhances psychological resilience and may reduce the risk of chronic pain disorders like PMPS. (31) Another reason Might be, married people often report feeling subjectively well-off and experiencing less stress, which aids in pain management and healing, potentially lowering the prevalence of PMPS (32).In contrast, the odds of experiencing pain after a mastectomy was reduced by 66.6% times for research participants who made more than 4,500 Ethiopian Birr. And this finding is in line with the finding got from Denmark(33).This might be because of Individuals with higher financial resources often have better access to healthcare services, including pain management and rehabilitation programs, which can lead to improved recovery experiences post-surgery (34).

The likelihood of developing post-mastectomy pain syndrome was three times higher for responders getting chemotherapy than for those receiving other therapies. Similar finding was reported from North Carolina, USA (19).Chemotherapy can cause peripheral neuropathy, inflammation at the surgical site, a delay in wound healing, and a delay in post-operative recovery, alterations in neurotransmitter levels and neuroplasticity have been noted (34, 35). While our findings provide compelling evidence for this association, it is important to note that international studies have reported inconsistent evidence regarding chemotherapy as an independent risk factor. For example, a nationwide Danish study(36) reported sensory disturbances but did not identify chemotherapy as a significant predictor of the pain syndrome itself.

Participants who did not engage in regular arm exercise had a twofold higher odd of having PMPS than those who did. This has similarities to previous research investigation in Pakistan.(6) According to the current study, one possible explanation is that people who don't regularly exercise their arms may have weaker neuromuscular function and muscle strength as well as poor blood circulation, which might hinder the healing process following surgery(37).This inactivity raises their risk of pain following mastectomy considerably since it might cause muscle atrophy and decreased arm and shoulder support(38). Although participants who did not engage in regular arm exercise had a twofold higher odd of PMPS, this association may not be causal. Reduced exercise could reflect early postoperative pain or shoulder dysfunction, making inactivity a consequence rather than a cause of PMPS. Supporting this interpretation, a systematic review and meta-analysis(7) found that structured exercise interventions significantly improved pain severity and quality of life among women with established post-mastectomy pain syndrome, highlighting exercise’s role as a therapeutic intervention rather than a preventive factor.

This study's strength is its multi-center design, which includes important cancer treatment centers throughout southern Ethiopia. The DN4 Questionnaire, which is used to measure neuropathic pain, has a

number of important limitations, though. For example, it does not account for pain that is triggered by light pressure, changes in temperature or weather, blunt force, reduced vibration sensitivity, skin changes, or autonomic dysfunction.

Conclusions

Post-mastectomy pain syndrome (PMPS) is highly prevalent in Southern Ethiopia and is associated with younger age, unmarried status, low income, chemotherapy exposure, and lack of regular arm exercise. These findings emphasize the need for routine PMPS screening during postoperative follow-up and early identification of high-risk patients. Cancer care services should incorporate patient education on regular arm exercises, and individualized pain control tailored to patient characteristics and treatment history. Policymakers and healthcare institutions should consider PMPS in cancer-related health policies and promote a multidisciplinary approach to improve postoperative pain management and overall quality of life among breast cancer survivors.

Acronyms and abbreviations

BC Breast Cancer

BGT Breast glandular tissue

BMI Body Mass Index

CI Confidence interval

DN4 Douleur Neuropathic 4 questions

HUCSH Hawassa university Comprehensive specialized hospital

MRM Modified radical mastectomy

NSM Nipple-areolar sparing mastectomy

PMPS Post mastectomy pain syndrome

QoL Quality of life

SSM Skin-sparing mastectomy

WCSH Worabe Comprehensive specialized hospital

WSCSH Wolaita Sodo university Comprehensive specialized hospital

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Declarations

Ethical approval and consent to participate

Ethical clearance was obtained from Institutional Review Board of Hawassa University, College of Medicine and Health sciences with Ref.No:158/16. This study was conducted in accordance with the Declaration of Helsinki. Further permission was obtained from the administrative and unit heads cancer centers which are the study was conducted. Confidentiality was guaranteed by excluding names or any other personal identifiers from data-collection sheets and reports. The identifier for each eligible subject was replaced by a code, and no master code exists that allows the research data to be linked with the identifiers. Participants were informed about the aim of the study, the advantages of the study, and their rights even to stop in the middle of the procedure. Informed consent was obtained from the study participants

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests
The authors declare that they have no competing interests.

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Authors' contributions

1. Eyasu Anbessie – Principal investigator, Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Validation, Writing-original draft, Writing – review & editing
2. Bedilu Deribe - Conceptualization
3. Fikru Tessema- Data analyzing
4. Tomas Yeheyis– Involved in drafting the manuscript
5. Feyisa Abeshu- Interpretation of data
6. Melaku Manisa- Manage ethical approvals and informed consent
7. Lesley Taylor- Implement quality control checks
8. Eva Johanna Kantelhardt- Acquisition of data
9. Susanne Unverzagt- Document results and draft scholarly reports
10. Betty Ferrell- Design and implement appropriate methodology
11. Abigiya Wondimagegnehu- Conceptualization
12. Eric Sven Kroeber- Review literature to establish theoretical foundation

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Figures

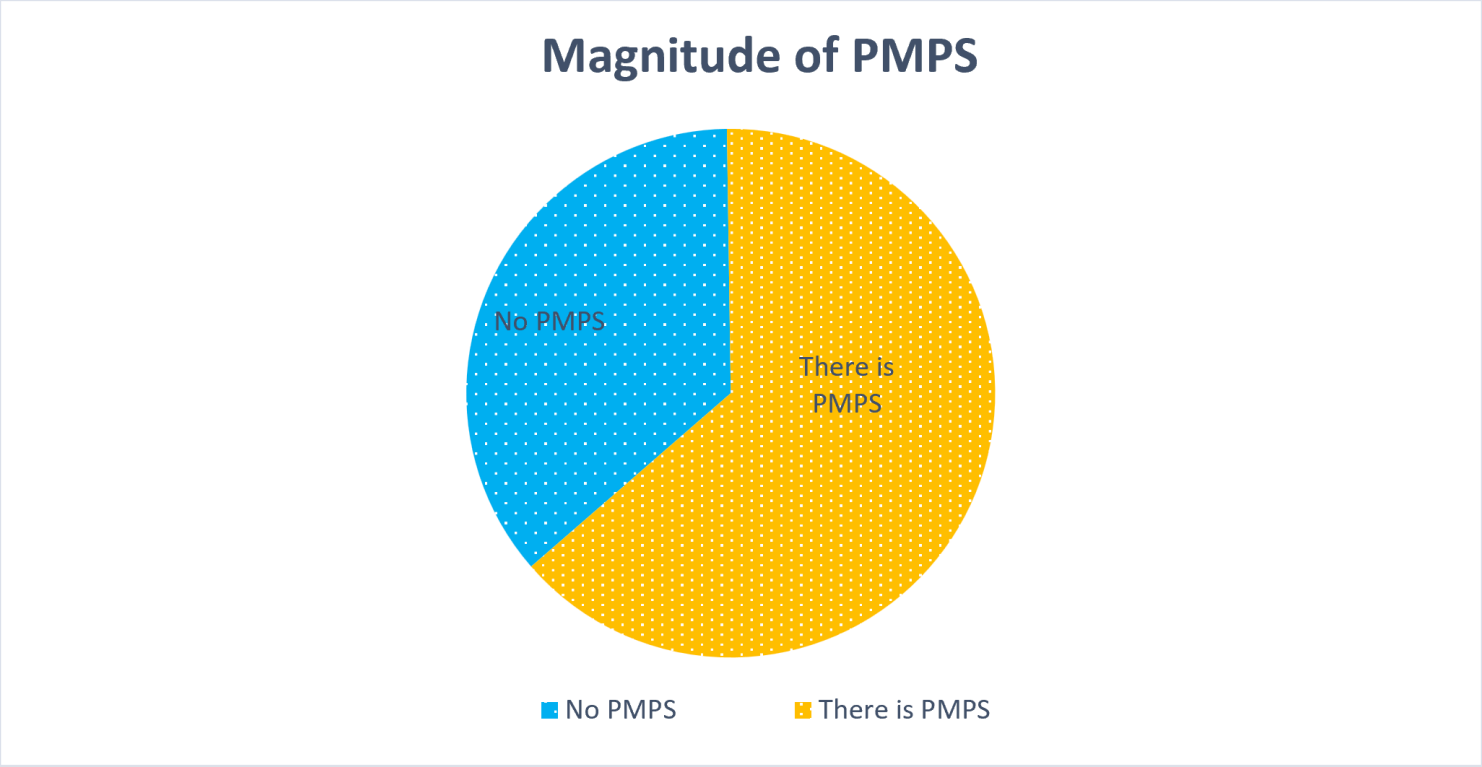


Figure 1

Prevalence of post mastectomy pain syndrome at southern Ethiopia cancer centers 2025

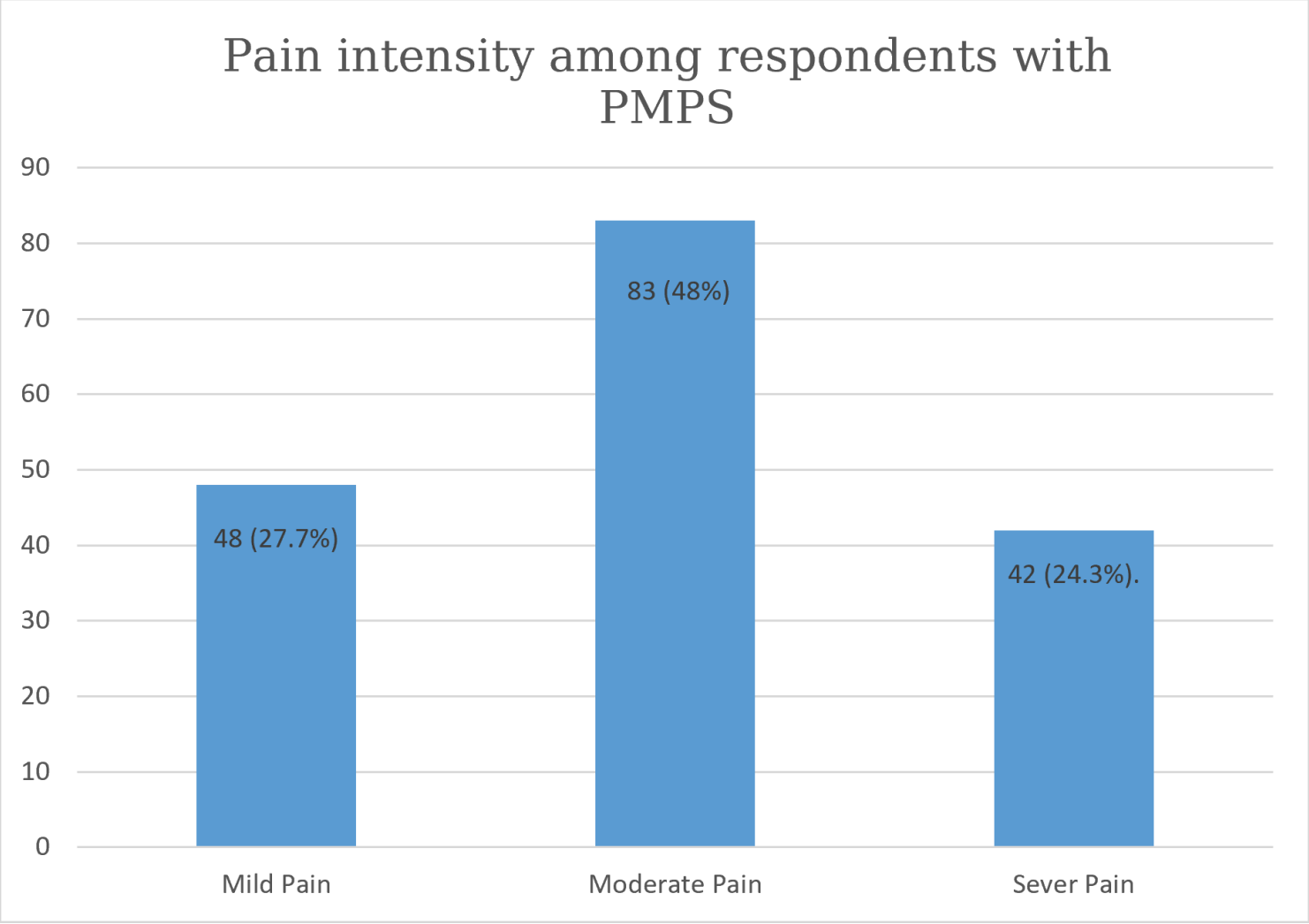


Figure 2

Pain intensity Scale of patients with PMPS at southern Ethiopia cancer centers 2025