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COMPARATIVE STUDY OF BODY MASS INDEX VERSUS MENSTRUAL IRREGULARITY/HORMONAL IMBALANCE AS DETERMINANTS OF MASTALGIA SEVERITY IN PATIENTS PRESENTING TO A BREAST CLINIC OF A TERTIARY CARE CENTRE: A CROSS-SECTIONAL STUDY

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ABSTRACT:
Background: Mastalgia is a common breast complaint in premenopausal women and can markedly affect quality of life. Although elevated body mass index (BMI) and hormonal or menstrual factors are implicated in its pathogenesis, evidence comparing their influence on pain severity is limited.
Aim: To compare the relative contribution of BMI and menstrual irregularity/hormonal imbalance to mastalgia severity in women attending a tertiary care breast clinic.
Methods: This analytical cross-sectional study included 60 premenopausal women aged 18–55 years with cyclic mastalgia over six months. Pain severity was assessed using the Visual Analogue Scale (VAS). BMI, menstrual history, hormonal contraceptive use, and premenstrual symptoms (PMS) were recorded. Logistic regression identified predictors of moderate-to-severe mastalgia (VAS >4).
Results: Mean age was 31.8 ± 7.4 years and mean BMI was 25.3 ± 3.9 kg/m². Moderate-to-severe pain was seen in 43.3% of participants. BMI was significantly higher in women with moderate-to-severe pain than in those with mild pain (28.1 ± 3.4 vs. 22.4 ± 2.3 kg/m²; $p < 0.001$). Menstrual irregularity ($p = 0.031$), hormonal contraceptive use ($p < 0.001$), and PMS ($p < 0.001$) were also associated with higher pain scores. On logistic regression, BMI was the only independent predictor (OR 1.71; 95% CI: 1.23–2.38; $p = 0.001$).
Conclusion: Both BMI and hormonal/menstrual factors are associated with mastalgia severity, but BMI is the strongest independent predictor. Weight management should form part of routine mastalgia care.

KEYWORDS: Mastalgia; Body Mass Index; Menstrual Irregularity; Hormonal Imbalance; Breast Pain; Tertiary Care; Visual Analogue Scale

INTRODUCTION

Mastalgia, defined as pain arising from breast tissue, is the most frequent breast-related complaint encountered in general surgical and primary care outpatient settings. It is estimated that up to 70% of women experience breast pain at some point during their reproductive lives, making it a condition of considerable public health significance.1 The condition is most prevalent in premenopausal women aged 25–50 years, and in a substantial subset of patients, it is sufficiently severe to disrupt daily activities, sexual function, and psychological well-being.2

Mastalgia is classically categorised into cyclic, non-cyclic, and extramammary subtypes.3 Cyclic mastalgia, the most common form, follows the menstrual cycle and is characterised by bilateral breast heaviness, tenderness, and dullness that typically worsens during the luteal phase and resolves with the onset of menses.4 Its pathophysiology is widely attributed to alterations in the estrogen-to-progesterone ratio, elevated prolactin levels, and changes in breast fatty acid profiles.5

Among the demographic and clinical factors implicated in mastalgia, body mass index (BMI) has gained increasing attention as a modifiable risk factor. Adipose tissue serves as a major site of extragonadal estrogen synthesis through peripheral aromatisation of androgen precursors.6 An elevated BMI results in an expanded adipose compartment, augmented aromatase activity, and subsequent hyperestrogenism, a hormonal milieu conducive to breast pain.7 Additionally, the physical weight and distension of larger breasts in overweight or obese women may independently contribute to mastalgia through musculoskeletal mechanisms.8

Menstrual irregularity and hormonal imbalance represent another important cluster of risk factors. Irregular menstruation is frequently associated with anovulatory cycles, progesterone deficiency, and relative estrogen dominance — all of which are postulated to heighten breast tissue sensitivity.9 Hormonal contraceptive use,

premenstrual syndrome (PMS), and prolonged menstrual duration have similarly been linked to increased mastalgia severity in multiple studies.10,11

Despite the established associations of both BMI and hormonal/menstrual parameters with mastalgia, few studies have directly compared their relative contributions to pain severity, and data from tertiary care breast clinic populations remain scarce.12 The present study aims to compare the relative contribution of BMI and menstrual irregularity/hormonal imbalance to mastalgia severity in women attending a tertiary care breast clinic.

MATERIALS AND METHODS

This analytical cross-sectional study was conducted at the Breast Clinic, Department of General Surgery, a tertiary care centre, over a period of six months. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants before enrolment. Premenopausal females aged 18–55 years presenting with cyclic mastalgia, defined as bilateral breast heaviness or dullness lasting for at least three months and occurring approximately one week before each menstrual cycle, were included in the study. Pregnant or lactating women, patients with recent breast abscess or inflammatory breast conditions, those with known breast cancer or previous breast surgery, and women currently using non-steroidal anti-inflammatory drugs (NSAIDs), analgesics, aspirin, or acetaminophen were excluded.

A total of 60 eligible participants attending the breast clinic during the study period were enrolled using convenience sampling. Data were collected using a structured pre-validated questionnaire administered by trained clinicians. Socio-demographic details, including age, residence, educational status, occupation, and marital status, were recorded. Anthropometric measurements were obtained using calibrated instruments, and body mass index (BMI) was calculated as weight in kilograms divided by height in metres squared and classified according to WHO criteria. Menstrual and reproductive history, including age at menarche, menstrual regularity, duration of menstrual flow, premenstrual symptoms (PMS), parity, and breastfeeding history, were documented. Information regarding contraceptive use was categorised as hormonal, non-hormonal, or none.

Mastalgia severity was assessed using a 10-cm Visual Analogue Scale (VAS), where 0 indicated no pain, and 10 indicated the worst imaginable pain. VAS scores were categorised as mild (1–4 cm) and moderate-to-severe (>4 cm). Data analysis was performed using IBM SPSS version 26.0. Categorical variables were presented as frequencies and percentages. Chi-square test or Fisher's exact test was used for categorical variables, and independent samples t-test for continuous variables. Pearson's correlation coefficient assessed the relationship between BMI and VAS scores. Binary logistic regression analysis was performed to identify independent predictors of moderate-to-severe mastalgia. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Demographic Characteristics of the Study Population (n = 60)

Variable	Category	n (%)
Age (years)	18–25 years	14 (23.3%)
	26–35 years	23 (38.3%)
	36–45 years	17 (28.3%)
	46–55 years	6 (10.0%)
BMI (kg/m²)	Underweight (< 18.5)	5 (8.3%)
	Normal (18.5–24.9)	22 (36.7%)
	Overweight (25.0–29.9)	17 (28.3%)
	Obese Class I (30.0–34.9)	11 (18.3%)
	Obese Class II (≥ 35.0)	5 (8.3%)
Marital Status	Married	41 (68.3%)
	Single	10 (16.7%)
	Divorced	5 (8.3%)
	Widow	4 (6.7%)
Education	Higher secondary / Graduate and above	31 (51.7%)
	Middle school / Secondary	23 (38.3%)
	No formal education	6 (10.0%)
Occupation	Employed / Working	34 (56.7%)
	Homemaker / Unemployed	26 (43.3%)
Residency	Urban	43 (71.7%)
	Rural	17 (28.3%)
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Table 2. Clinical, Menstrual, Reproductive, and Contraceptive Profile of Participants (n = 60)

Variable	Category	n (%)
Family history of breast pain	Present	17 (28.3)
	Absent	43 (71.7)
Breastfeeding history	Yes	40 (66.7)
	No	20 (33.3)
Menstrual regularity	Regular	40 (66.7)
	Irregular	20 (33.3)
Menstrual duration	≤5 days	26 (43.3)
	>5 days	34 (56.7)
Premenstrual tension symptoms	Present	33 (55.0)
	Absent	27 (45.0)
Contraceptive use	Hormonal	15 (25.0)
	Non-hormonal	17 (28.3)
	None	28 (46.7)
Breast pain laterality	Bilateral	43 (71.7)
	Unilateral	17 (28.3)
Pain duration	≤5 days	39 (65.0)
	>5 days	21 (35.0)

Table 3: Comparison of Clinical and Reproductive Variables between Mastalgia Pain Groups

Variable	Mild Pain (VAS ≤4) n = 34	Moderate-to-Severe Pain (VAS >4) n = 26	p-value
Age group			0.622
18–25 years	9 (26.5)	5 (19.2)	
26–35 years	13 (38.2)	10 (38.5)	
36–45 years	10 (29.4)	7 (26.9)	
46–55 years	2 (5.9)	4 (15.4)	
BMI category			<0.001 *
Underweight (<18.5)	4 (11.8)	1 (3.8)	
Normal (18.5–24.9)	18 (52.9)	4 (15.4)	
Overweight (25.0–29.9)	7 (20.6)	10 (38.5)	
Obese Class I (30.0–34.9)	4 (11.8)	7 (26.9)	
Obese Class II (≥35.0)	1 (2.9)	4 (15.4)	
Marital status			0.841
Married	24 (70.6)	17 (65.4)	
Single	6 (17.6)	4 (15.4)	
Divorced/Widow	4 (11.8)	5 (19.2)	
Family history of breast pain			0.842
Present	9 (26.5)	8 (30.8)	
Absent	25 (73.5)	18 (69.2)	
Contraception type			<0.001 *
None	21 (61.8)	7 (26.9)	
Hormonal	2 (5.9)	13 (50.0)	

(OCP/Injectable/Implant)			
Non-hormonal (IUD/Barrier)	11 (32.4)	6 (23.1)	
Menstrual regularity			0.031†
Regular	28 (82.4)	11 (42.3)	
Irregular	6 (17.6)	15 (57.7)	
Menstrual duration			<0.001 *
3–5 days	24 (70.6)	2 (7.7)	
>5 days	10 (29.4)	24 (92.3)	
Premenstrual tension symptoms (PMS)			<0.001 *
Present	9 (26.5)	24 (92.3)	
Absent	25 (73.5)	2 (7.7)	
Duration of breast pain per cycle			<0.001 *
≤5 days	29 (85.3)	7 (26.9)	
6–10 days	4 (11.8)	12 (46.2)	
>10 days	1 (2.9)	7 (26.9)	
Side of breast pain			0.002*
Unilateral	15 (44.1)	2 (7.7)	
Bilateral	19 (55.9)	24 (92.3)	
Associated pelvic pain			0.403
Present	7 (20.6)	11 (42.3)	
Absent	27 (79.4)	15 (57.7)	

Table 4: Correlation of BMI and Age with Mean VAS Pain Score

Variable	Pearson's Correlation Coefficient (r)	p-value
BMI (kg/m²)	0.689	<0.001*
Age (years)	−0.032	0.673

Table 5. Binary Logistic Regression Analysis for Independent Predictors of Moderate-to-Severe Mastalgia

Variable	Regression Coefficient (B)	Standard Error (SE)	Wald Statistic	Adjusted Odds Ratio (95% CI)	p-value
BMI	0.538	0.169	10.14	1.71 (1.23–2.38)	0.001*
Menstrual irregularity	−0.391	0.512	0.584	0.68 (0.25–1.84)	0.445
Hormonal contraception	−0.412	0.301	1.876	0.66 (0.37–1.19)	0.171
Premenstrual tension symptoms (PMS)	−0.574	0.621	0.855	0.56 (0.17–1.89)	0.355
Menstrual duration >5 days	0.311	0.578	0.289	1.36 (0.44–4.22)	0.591

A total of 60 premenopausal women participated in the study. Among them, 23 (38.3%) belonged to the 26–35 years age group, followed by 17 (28.3%) in the 36–45 years age group, 14 (23.3%) in the 18–25 years age group, and 6 (10.0%) in the 46–55 years age group. The mean age of the participants was 31.8 ± 7.4 years. Regarding BMI categories, 22 participants (36.7%) had normal BMI, 17 (28.3%) were overweight, 11 (18.3%) had Obese Class I obesity, 5 (8.3%) had Obese Class II obesity, and 5 (8.3%) were underweight and the mean BMI was 25.3 ± 3.9 kg/m². Most participants were married (41, 68.3%), while 10 (16.7%) were single, 5 (8.3%) divorced, and 4 (6.7%) widowed. Higher secondary education or graduation and above was observed among 31 participants (51.7%), whereas 23 (38.3%) had middle or secondary school education and 6 (10.0%) had no formal education. A majority of participants were employed or working (34, 56.7%) and resided in urban areas (43, 71.7%). (Table 1)

With regard to clinical and reproductive characteristics, 17 participants (28.3%) had a positive family history of breast pain, while 43 (71.7%) had no such history. Breastfeeding history was present among 40 participants (66.7%). Regular menstrual cycles were reported by 40 women (66.7%), whereas 20 (33.3%) had irregular cycles. Menstrual duration exceeding five days was noted in 34 participants (56.7%). Premenstrual tension symptoms were present in 33 women (55.0%). Hormonal contraceptive use was reported by 15 participants (25.0%), non-hormonal contraceptive use by 17 (28.3%), and 28 (46.7%) were not using any contraceptive method. Bilateral breast pain was observed in 43 participants (71.7%), while unilateral pain was reported in 17 (28.3%). Pain duration of ≤5 days per menstrual cycle was noted in 39 women (65.0%). (Table 2)

In the present study, 34 (56.7%) had mild mastalgia (VAS ≤4), while 26 (43.3%) had moderate-to-severe mastalgia (VAS >4). Among the participants with mild mastalgia, 13 (38.2%) belonged to the 26–35 years age group, while among the 26 participants with moderate-to-severe mastalgia, 10 (38.5%) belonged to the same age

group. BMI category showed a statistically significant association with mastalgia severity ($p < 0.001$). In the mild pain group, 18 participants (52.9%) had normal BMI, whereas only 4 (15.4%) in the moderate-to-severe group had normal BMI. Conversely, overweight and obesity were more frequent among participants with moderate-to-severe mastalgia, including 10 overweight women (38.5%), 7 with Obese Class I obesity (26.9%), and 4 with Obese Class II obesity (15.4%). Hormonal contraceptive use was significantly more common among women with moderate-to-severe mastalgia compared to those with mild mastalgia (13 [50.0%] vs. 2 [5.9%]; $p < 0.001$). Menstrual irregularity was also significantly higher in the moderate-to-severe group (15 [57.7%] vs. 6 [17.6%]; $p = 0.031$). Menstrual duration exceeding five days was observed in 24 participants (92.3%) with moderate-to-severe mastalgia compared to 10 (29.4%) with mild mastalgia ($p < 0.001$). Premenstrual tension symptoms were present in 24 women (92.3%) with moderate-to-severe mastalgia and 9 (26.5%) with mild mastalgia ($p < 0.001$). Bilateral breast pain was observed in 24 participants (92.3%) in the moderate-to-severe group compared with 19 (55.9%) in the mild pain group ($p = 0.002$). (Table 3)

Pearson's correlation analysis demonstrated a strong positive correlation between BMI and mean VAS pain score ($r = 0.689$, $p < 0.001$), indicating that increasing BMI was associated with greater mastalgia severity. In contrast, age showed no significant correlation with pain score ($r = -0.032$, $p = 0.673$). (Table 4)

On binary logistic regression analysis, BMI emerged as the only independent predictor of moderate-to-severe mastalgia after adjustment for other variables. Each unit increase in BMI increased the odds of moderate-to-severe mastalgia by 1.71 times (OR 1.71; 95% CI: 1.23–2.38; $p = 0.001$). Menstrual irregularity, hormonal contraception, premenstrual tension symptoms, and prolonged menstrual duration did not retain independent statistical significance after multivariate adjustment. (Table 5)

DISCUSSION

The present study investigated the relative contributions of BMI and menstrual/hormonal factors to mastalgia severity in 60 premenopausal women attending a tertiary care breast clinic. Both domains showed significant univariate associations with mastalgia severity; however, BMI was the sole independent predictor on logistic regression, consistent with findings from multiple international studies.1,13

The mean age of 31.8 years in our sample aligns with the well-established epidemiological finding that cyclic mastalgia predominantly affects women in their third and fourth decades of life.14,15 Similarly, Mohammed et al. in a study from Iraq found a mean patient age of 34 years among those attending the breast clinic with mastalgia.16 The BMI findings are particularly noteworthy. Patients with moderate-to-severe mastalgia had a significantly higher mean BMI (28.1 ± 3.4 kg/m²) compared to those with mild pain (22.4 ± 2.3 kg/m²; $p < 0.001$), and the correlation between BMI and average pain score was strong ($r = 0.689$; $p < 0.001$). These findings corroborate the report by Sabry et al., who similarly identified BMI as the strongest predictor of pain severity in an Egyptian outpatient cohort.1 The biological plausibility of this relationship is well supported: adipose tissue is the primary extragonadal site of estrogen synthesis, mediated through the enzyme aromatase.6 Elevated BMI increases adipose mass, upregulates aromatase activity, and results in higher circulating estrogen levels — directly sensitising breast ductal epithelium to pain.17

Menstrual irregularity was significantly more prevalent in patients with moderate-to-severe pain (57.7% vs. 17.6%; $p = 0.031$). Irregular cycles are often a marker of anovulation, which is associated with progesterone deficiency and unopposed estrogen exposure — a hormonal state that has been consistently linked to mastalgia.18,19 A study by Karimian et al. demonstrated that correction of menstrual irregularity led to significant pain relief in women with cyclic mastalgia, further underscoring the mechanistic relationship.13 Shobeiri et al. reported contrasting results, finding no significant association between menstrual irregularity and mastalgia.10 These discrepancies may reflect differences in study design, population characteristics, and the method used to define menstrual irregularity.

Hormonal contraceptive use was strongly associated with greater pain severity in our study ($p < 0.001$), with the vast majority of hormonal contraceptive users falling into the moderate-to-severe pain category. This is consistent with findings by Mohammed et al., who reported a significant positive correlation between oral contraceptive pill use and mastalgia.16 However, this finding contrasts with Shobeiri et al. and with earlier work by Arya et al., who observed that hormonal contraceptive use was associated with less cyclical mastalgia, potentially due to its effect in suppressing ovulation and regularising the estrogen-to-progesterone ratio.10,20 The net hormonal effect of a given contraceptive on breast pain depends critically on the specific progestogenic component and its androgenic activity — factors that could not be fully disaggregated in the present study.19

Prolonged menstrual blood flow (>5 days) was similarly associated with higher pain scores, aligning with findings from Sabry et al.1 On logistic regression, however, only BMI remained an independent predictor after adjustment for hormonal and menstrual variables. The OR of 1.71 per unit increase in BMI suggests a substantial and clinically meaningful effect. This finding implies that while hormonal and menstrual factors contribute to mastalgia on univariate analysis, their effects may be partially mediated through or confounded by BMI — as obesity itself predisposes to menstrual irregularity, PMS, and hormonal disturbance through insulin resistance and the hypothalamic-pituitary-ovarian axis.18

Regarding the bilateral nature of pain, 71.7% of our participants reported bilateral mastalgia, consistent with the observations of Varizi et al. (64%) and Sabry et al. (72.3%), lending further validity to our findings.1,19 Our study has certain limitations. Hormonal profiles were not biochemically assessed, which would have provided direct corroboration of estrogen/progesterone ratios. Additionally, dietary habits, physical activity, and

psychological comorbidities were not fully characterised, all of which may independently modulate mastalgia severity. Future prospective studies with hormonal profiling and larger sample sizes are warranted.

CONCLUSION

The present study concludes that both elevated BMI and hormonal/menstrual factors are significantly associated with mastalgia severity among premenopausal women attending a tertiary care breast clinic. Moderate-to-severe mastalgia was observed in 26 (43.3%) participants and was significantly associated with overweight and obesity ($p < 0.001$), menstrual irregularity (57.7% vs. 17.6%; $p = 0.031$), hormonal contraceptive use (50.0% vs. 5.9%; $p < 0.001$), prolonged menstrual duration (92.3% vs. 29.4%; $p < 0.001$), and premenstrual tension symptoms (92.3% vs. 26.5%; $p < 0.001$). Importantly, BMI showed a strong positive correlation with mean VAS pain score ($r = 0.689$, $p < 0.001$) and emerged as the only independent predictor of moderate-to-severe mastalgia on multivariate logistic regression analysis (OR 1.71; 95% CI: 1.23–2.38; $p = 0.001$). These findings suggest that increased BMI exerts a greater influence on mastalgia severity than hormonal or menstrual factors, highlighting the importance of weight management and lifestyle modification as part of routine mastalgia management.

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