International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 18s, 2025
https://theaspd.com/index.php

A Study On Prevalence Of Depression And Associated Factors Among Perimenopausal Women In Chengalpattu

Dr.Sangeetha.V[1], Dr.Vidhya Selvam[2], Dr. Meena .T.S[3], Dr.Kaavya.M[4]
[1]Department of Obstetrics and Gynaecology,Sree Balaji Medical College and Hospital,Chennai,India (Mail id:drsangeethaobg2012@gmail.com)
[2]Department of Obstetrics and Gynaecology,Sree Balaji Medical College and Hospital,Chennai,India (Mail id:vidhyarajan3@gmail.com)
[3]Department of Obstetrics and Gynaecology,Sree Balaji Medical College and Hospital,Chennai,India (Mail id:meenats@gmail.com)
[4]Department of Obstetrics and Gynaecology,Sree Balaji Medical College and Hospital,Chennai,India (Mail id: drkaavya87@gmail.com)

Abstract:
Background*: Perimenopause, marked by erratic hormonal fluctuations, heightens the risk of depression due to disruptions in neurotransmitter systems and compounded psychosocial stressors. Globally, studies report elevated depressive symptoms during this transition, yet in India, cultural stigma, patriarchal norms, and scarce mental health infrastructure obscure the true burden, necessitating localized research to guide targeted interventions.*
Objective*: To determine the prevalence of depression and identify associated socio-demographic and clinical risk factors among perimenopausal women in Chengalpattu, Tamil Nadu.*
Methods*: A cross-sectional study enrolled 400 women aged 40–55 years from urban and rural Chengalpattu. Depression was evaluated using the Menopause Rating Scale for Depression (MENO-D), and stress levels with the Perceived Stress Scale-4 (PSS-4). Structured interviews gathered socio-demographic and reproductive data. Chi-square tests assessed associations, and binary logistic regression identified predictors, with $p<0.05$ indicating significance.*
Results*: Depression affected 43.8% of participants, with 7.5% requiring psychiatric referral. Moderate to high stress was reported by 71.6%. Significant predictors included age 50–55 years (OR 4.33, 95% CI 2.37–7.92), illiteracy (OR 3.88), postgraduate education (OR 2.86), homemaker status (OR 2.41), retired status (OR 7.20), early menarche at 12 years (OR 13.33), and perimenopause onset after 50 years (OR 2.31). Irregular cycles were protective (OR 0.44). Stress and depression scores showed a strong correlation ($r=0.991$, $p<0.001$). Common symptoms included irritability (15%) and fatigue (14.8%).*
Conclusion*: The high prevalence of perimenopausal depression demands routine MENO-D and PSS-4 screening in gynecologic practice. Culturally tailored interventions are critical to mitigate this multifaceted challenge.*
Keywords*: Perimenopause, Depression, Menopause, Mental Health, Women's Health, Stress, Psychological, India, Socio-Demographic Factors, Hormonal Transition.*

INTRODUCTION

Perimenopause, a transitional phase preceding menopause, is characterized by significant hormonal fluctuations that influence both physical and psychological well-being. This period, marked by irregular menstrual cycles and symptoms such as hot flashes, insomnia, and irritability, is increasingly recognized as a window of heightened vulnerability to mental health challenges, particularly depression [1]. The interplay of biological, psychological, and social factors during perimenopause creates a complex landscape that amplifies the risk of depressive symptoms, often underdiagnosed in clinical settings due to overlapping menopausal complaints [9]. In India, where cultural and socio-economic factors shape women's health experiences, region-specific data on perimenopausal depression are scarce, necessitating targeted research to inform clinical and public health strategies [11]. Hormonal variability, particularly in estrogen and progesterone levels, plays a pivotal role in the etiology of perimenopausal depression. These hormones modulate neurotransmitter systems, including serotonin and norepinephrine, which are critical for mood regulation [3]. Longitudinal studies, such as the Study of Women's Health Across the Nation (SWAN), have demonstrated that fluctuations in estradiol and follicle-stimulating hormone (FSH) are independently associated with the onset of depressive symptoms, even in women without a prior psychiatric history [2]. These hormonal shifts disrupt limbic circuits and the hypothalamic-pituitary-

adrenal (HPA) axis, contributing to mood instability [3, 24]. The Harvard Study of Moods and Cycles further corroborates this, reporting a nearly doubled risk of major depression during the menopausal transition, particularly in women sensitive to hormonal changes [6, 18]. Beyond biology, psychosocial stressors significantly contribute to perimenopausal depression. Midlife women often navigate multiple roles—caregivers, professionals, and partners—while confronting physical changes such as weight gain and sleep disturbances [4]. These challenges, compounded by financial insecurity, marital discord, or caregiving burdens, heighten psychological distress [11, 13]. In patriarchal societies like India, cultural perceptions of menopause as a decline in fertility and social value can exacerbate feelings of worthlessness, particularly among women lacking robust social support [22]. Cross-cultural analyses highlight that the interpretation of menopausal symptoms varies widely, underscoring the need for culturally sensitive diagnostic and therapeutic approaches [16]. Socio-demographic factors, including marital status, education, and income, further modulate depression risk. Women who are widowed, separated, or have lower educational attainment often report higher rates of depression, likely due to social isolation or limited access to resources [1, 13]. Conversely, highly educated women may experience role strain or societal pressure, contributing to emotional distress [16]. Occupational status also plays a role, with homemakers and retired women facing increased risks due to reduced social engagement or loss of structured roles [4]. These findings emphasize the importance of social determinants in shaping mental health outcomes during perimenopause. Clinically, perimenopausal depression presents with atypical features—irritability, fatigue, and cognitive complaints—often mistaken for vasomotor symptoms, leading to underdiagnosis in gynecologic settings [9, 10]. The overlap between climacteric and depressive symptoms complicates assessment, necessitating validated screening tools like the Menopause Rating Scale for Depression (MENO-D) to distinguish transient mood changes from clinical depression [5]. While hormone therapy may alleviate vasomotor symptoms, its efficacy for depression is inconsistent, highlighting the need for antidepressants, cognitive-behavioral therapy, and lifestyle interventions as primary treatments [8, 23]. The World Health Organization underscores that mental health during menopause is often neglected, particularly in resource-limited settings, where stigma and inadequate infrastructure exacerbate care gaps [12]. In the Indian context, the intersection of hormonal changes, cultural expectations, and limited mental health resources amplifies the burden of perimenopausal depression. Urbanizing regions like Chengalpattu, Tamil Nadu, offer a unique lens to study this issue, reflecting both traditional and modern influences on women's health-seeking behaviors [11]. Despite growing global awareness, clinical guidelines for screening and managing perimenopausal depression remain underutilized in India, where mental health is rarely integrated into gynecologic care [5]. This study addresses this gap by estimating the prevalence of depression among perimenopausal women in Chengalpattu and identifying associated socio-demographic and clinical factors using standardized tools like MENO-D and the Perceived Stress Scale (PSS-4). By providing region-specific data, it aims to inform screening strategies and integrative care models, fostering holistic approaches to midlife women's health. The multidimensional nature of perimenopausal depression—rooted in endocrinological shifts, exacerbated by psychosocial stressors, and shaped by cultural context—demands a biopsychosocial framework for intervention. Understanding its predictors and presentation is critical for delivering empathetic, evidence-based care to women navigating this pivotal life stage. This study contributes to the growing body of literature by highlighting the need for routine mental health screening and culturally tailored interventions to improve the quality of life for perimenopausal women in India and beyond [5, 12].

METHODOLOGY

Study Design and Setting

This community-based cross-sectional study aimed to estimate the prevalence of depression and delineate associated risk factors among perimenopausal women in Chengalpattu district, Tamil Nadu. The cross-sectional approach was selected for its efficacy in capturing prevalence and examining multiple variables simultaneously. Conducted in a region blending urban and peri-rural demographics, the study leveraged Chengalpattu's diverse socio-economic landscape to explore mental health dynamics during the menopausal transition. Data collection, spanning three months, occurred in urban outpatient gynecologic

clinics and rural field practice areas under the Department of Obstetrics and Gynecology, following approval from the Institutional Ethics Committee of Sree Balaji Medical College and Hospital.

Study Population

The study enrolled women aged 40–55 years, identified as perimenopausal based on self-reported menstrual irregularities and symptomatology. Perimenopause was defined per the Staging of Reproductive Aging Workshop (STRAW) criteria, encompassing cycle variability without 12 consecutive months of amenorrhea. This age range and definition ensured focus on the phase of pronounced hormonal and psychological shifts.

Inclusion and Exclusion Criteria

Eligible participants were women aged 40–55 years exhibiting menstrual irregularities or classic perimenopausal symptoms, such as hot flashes, sleep disturbances, or irritability, and willing to provide informed consent. Exclusions included women with diagnosed psychiatric disorders, those on antidepressants or mood stabilizers, individuals with chronic conditions affecting mood (e.g., uncontrolled hypothyroidism, malignancies, neurological disorders), and those using hormone replacement therapy. These criteria isolated mood changes linked to perimenopause, minimizing confounding factors.

Sample Size Estimation

The sample size was calculated using a reported depression prevalence of 42.47% from a comparable middle-income setting [1]. Employing the standard formula for proportion estimation, with a 95% confidence level and 5% margin of error, a sample of 374 was required. Adjusting for a 10% non-response rate, the final sample size was set at 400 participants to ensure statistical robustness.

Sampling Technique

A multistage stratified sampling strategy was implemented to achieve a representative cohort. Initially, one urban and one rural block in Chengalpattu were randomly selected to reflect demographic diversity. Subsequently, systematic random sampling identified households within each block. Finally, one eligible woman per household was screened based on menstrual and clinical history, ensuring equitable representation across socio-economic and cultural strata.

Data Collection Tools

Data were gathered via a pre-tested, structured questionnaire administered by trained female health workers fluent in Tamil, ensuring cultural and linguistic sensitivity. The questionnaire comprised three components: a socio-demographic and reproductive profile capturing age, marital status, education, occupation, income, parity, menarche age, menstrual status, and perimenopause onset; the Menopause Rating Scale for Depression (MENO-D), a validated tool assessing depressive symptoms across somatic, anxiety, mood, and cognitive domains; and the Perceived Stress Scale-4 (PSS-4), a concise instrument measuring subjective stress over the past month. Interviews were conducted privately to foster trust and confidentiality.

Ethical Considerations

Adhering to the Declaration of Helsinki, the study prioritized ethical integrity. Informed written consent was secured from all participants, with the study's objectives, procedures, and benefits clearly communicated. Participants with moderate to severe depressive symptoms or suicidal ideation were referred for psychiatric evaluation. Data were anonymized, securely stored, and accessible only to authorized researchers, safeguarding participant privacy.

Statistical Analysis

Data were organized in Microsoft Excel and analyzed using IBM SPSS version 22. Descriptive statistics, including means, standard deviations, frequencies, and percentages, summarized participant characteristics. Chi-square tests facilitated bivariate analysis of associations between categorical variables and depression. Binary logistic regression identified independent predictors, expressed as odds ratios with 95% confidence intervals. A p-value below 0.05 denoted statistical significance, ensuring rigorous interpretation of findings.

RESULTS

The findings from this cross-sectional study of 400 perimenopausal women in Chengalpattu, Tamil Nadu, elucidate the prevalence of depression, stress levels, and associated socio-demographic and reproductive

factors. Utilizing validated instruments and rigorous statistical methods, the results underscore the significant mental health challenges faced by this population.

Table 1: Distribution of Demographic and past history

Variable	Frequency (n=400)	Percent (%)
Age		
40–44 years	129	32.25
45–49 years	139	34.75
50–55 years	77	19.25
>55 years	55	13.75
Marital Status		
Single	76	19
Married	232	58
Divorced	16	4
Widowed	13	3.25
Separated	63	15.75
Education		
Illiterate	77	19.25
Primary School	49	12.25
Secondary School	105	26.25
Graduate	97	24.25
Postgraduate	72	18
Occupation		
Homemaker	208	52
Retired	69	17.25
Working Professional	123	30.75
Family Type		
Extended	88	22
Joint	117	29.25
Nuclear	195	48.75
Monthly Income		
< Rs.10,000	109	27.25
Rs.10,000–25,000	60	15
Rs.25,000–50,000	120	30
> Rs.50,000	111	27.75
Age at Menarche		
12	66	16.5
13	154	38.5
14	153	38.25
15	27	6.75
Current Menstrual Status		
Irregular	161	40.25
Regular	85	21.25
Stopped	154	38.5
Age at Perimenopause Onset		
41–45	81	20.25
46–50	159	39.75
>50	160	40

Table 2: Prevalence of Depression among Perimenopausal Women

Depression	Frequency	Percent (%)
Depressed	175	43.8
Not Depressed	225	56.3
Total	400	100

Table 3: Prevalence of Stress among Perimenopausal Women

PSS-4	Frequency	Percent
Low Stress	114	28.5
Moderate Stress	171	42.8
High Stress	115	28.8
Total	400	100

Table 4: Mean Scores for Depression and Stress Scales

Parameter	Mean	Standard Deviation (SD)
MENO-D Score	8.01	6.78
PSS-4 Score	6.76	2.91

Table 5: Association between Socio-Demographic Factors and Depression

Variable	Depressed (n=175) n (%)	Not Depressed (n=225) n (%)	p value
Age			
40–44 years	26 (14.86)	103 (45.78)	<0.001
45–49 years	42 (24)	97 (43.11)	
50–55 years	62 (32.43)	15 (6.67)	
>55 years	45 (25.71)	10 (4.44)	
Marital Status			
Single	53 (30.29)	23 (10.22)	<0.001
Married	60 (34.29)	172 (76.44)	
Divorced	6 (3.43)	10 (4.44)	
Widowed	0 (0)	13 (5.78)	
Separated	56 (32)	7 (3.11)	
Education			
Illiterate	56 (32)	21 (9.33)	<0.001
Primary School	6 (3.43)	43 (19.11)	
Secondary School	53 (30.29)	52 (23.11)	
Graduate	12 (6.86)	85 (37.78)	
Postgraduate	48 (27.43)	24 (10.67)	
Occupation			
Homemaker	115 (65.71)	93 (41.33)	<0.001
Retired	54 (30.86)	15 (6.67)	
Working Professional	6 (3.43)	117 (52)	
Family Type			

Extended	62 (35.43)	26 (11.56)	<0.001
Joint	20 (11.43)	97 (43.11)	
Nuclear	93 (53.14)	102 (45.33)	
Monthly Income			
< Rs.10,000	56 (32)	53 (23.56)	<0.001
Rs.10,000–25,000	48 (27.43)	12 (5.33)	
Rs.25,000–50,000	59 (33.71)	61 (27.11)	
> Rs.50,000	12 (6.86)	99 (44)	
Age at Menarche			
12	60 (34.29)	6 (2.67)	<0.001
13	53 (30.29)	101 (44.89)	
14	56 (32)	97 (43.11)	
15	6 (3.43)	21 (9.33)	
Current Menstrual Status			
Irregular	59 (33.71)	102 (45.33)	<0.001
Regular	20 (11.43)	65 (28.89)	
Stopped	96 (54.76)	58 (25.78)	
Age at Perimenopause Onset			
41–45	6 (3.43)	75 (33.33)	<0.001
46–50	65 (37.14)	94 (41.78)	
>50	104 (59.43)	56 (24.89)	

Table 6: Multivariate Logistic Regression Table for socio demographic and depression variable

Variables	OR (95% CI)	p value
Age		
40–44 years	0.29 (0.17-0.49)	<0.001
45–49 years	0.5 (0.30–0.83)	<0.001
50–55 years	4.33 (2.37–7.92)	<0.001
>55 years	Ref	
Marital Status		
Single	Ref	
Married	0.23 (0.13–0.41)	<0.001
Divorced	0.39 (0.13–1.17)	0.092
Widowed	-	
Separated	-	
Education		
Primary School	Ref	
Illiterate	3.88 (2.15–7.00)	<0.001
Secondary School	1.44 (0.80–2.59)	0.223
Graduate	0.2 (0.10–0.40)	<0.001
Postgraduate	2.86 (1.55–5.27)	<0.001
Occupation		
Homemaker	2.41 (1.33–4.37)	<0.001
Retired	7.2 (3.68–14.09)	<0.001
Working Professional	Ref	
Family Type		
Joint	Ref	
Extended	2.33 (1.34–4.05)	<0.001
Nuclear	0.89 (0.53–1.50)	0.669

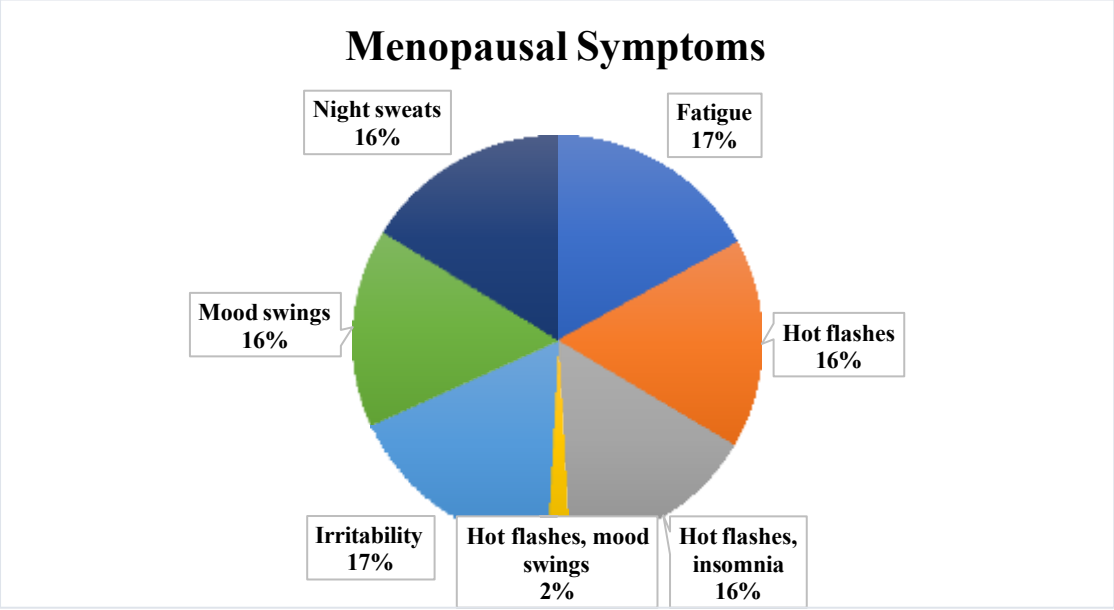
Monthly Income		
< Rs.10,000	0.88 (0.53–1.47)	0.627
Rs.10,000–25,000	3.33 (1.75–6.33)	<0.001
Rs.25,000–50,000	0.8 (0.48–1.33)	0.385
> Rs.50,000	Ref	
Age at Menarche		
12	13.33 (5.45–32.58)	<0.001
13	0.91 (0.38–2.17)	0.827
14	1 (0.42–2.38)	0.996
15	Ref	
Current Menstrual Status		
Irregular	0.44 (0.25–0.77)	0.004
Stopped	1.28 (0.74–2.22)	0.378
Regular	Ref	
Age at Perimenopause Onset		
41–45	Ref	
46–50	0.86 (0.49–1.51)	0.602
>50	2.31 (1.32–4.04)	0.003

Table 7: Correlation Matrix

Variables	**Values**	**Age at Perimenopause Onset**	**MENO-D Total Score**	**PSS-4 Total Score**
Age at Perimenopause Onset	**r value**	1	0.892	0.894
	p value		<0.001	<0.001
MENO-D Total Score	**r value**	0.892	1	0.991
	p value	<0.001		<0.001
PSS-4 Total Score	**r value**	0.894	0.991	1
	p value	<0.001	<0.001	

Table 8: Menopausal Symptoms Table

Categories	**Frequency (n=346)**	**Valid Percent**
Fatigue	59	14.8
Hot flashes	57	14.3
Hot flashes, insomnia	54	13.5
Hot flashes, mood swings	6	1.5
Irritability	60	15
Mood swings	54	13.5
Night sweats	56	14



The socio-demographic and reproductive characteristics of the cohort are detailed in Table 1. Predominantly middle-aged, 34.75% of participants were aged 45–49 years, followed by 32.25% aged 40–44 years, with fewer in the 50–55 years (19.25%) and >55 years (13.75%) groups. Marital status was largely married (58%), with single (19%), separated (15.75%), divorced (4%), and widowed (3.25%) women contributing to a diverse profile. Education levels showed secondary school as most common (26.25%), followed by graduates (24.25%), illiterates (19.25%), postgraduates (18%), and primary school-educated (12.25%). Homemakers dominated occupations (52%), followed by working professionals (30.75%) and retired individuals (17.25%). Nuclear families were most prevalent (48.75%), followed by joint (29.25%) and extended (22%) families. Monthly income was highest in the Rs.25,000–50,000 range (30%), with <Rs.10,000 (27.25%), >Rs.50,000 (27.75%), and Rs.10,000–25,000 (15%) less frequent. Age at menarche peaked at 13 (38.5%) and 14 years (38.25%), with 12 years (16.5%) and 15 years (6.75%) less common. Irregular menstrual cycles were most frequent (40.25%), followed by stopped cycles (38.5%) and regular cycles (21.25%). Perimenopause onset was most common at >50 years (40%) and 46–50 years (39.75%), with 41–45 years at 20.25%. Depression prevalence is reported in Table 2. Among the 400 women, 175 (43.8%) were identified as depressed, while 225 (56.3%) were not, highlighting a substantial mental health burden affecting nearly half the cohort. Stress levels, assessed via the Perceived Stress Scale-4 (PSS-4), are presented in Table 3. Moderate stress was most prevalent, affecting 171 women (42.8%), followed by high stress in 115 (28.8%) and low stress in 114 (28.5%). The predominance of moderate to high stress (71.6%) indicates significant psychosocial challenges during perimenopause.

Mean scores for the Menopause Rating Scale for Depression (MENO-D) and PSS-4 are shown in Table 4. The mean MENO-D score was 8.01 (SD 6.78), falling within the mild depression range (9–17 on a 0–36 scale), suggesting mild symptoms on average, though the wide standard deviation reflects variability from minimal to severe. The mean PSS-4 score was 6.76 (SD 2.91), within the moderate stress range (5–8 on a 0–16 scale), indicating moderate stress levels across the cohort. Associations between socio-demographic and reproductive factors and depression are detailed in Table 5, with all chi-square p-values <0.001. Depression was most prevalent among women aged 50–55 years (32.43%) and >55 years (25.71%), compared to 40–44 years (14.86%) and 45–49 years (24%). Single (30.29%) and separated (32%) women were more likely to be depressed, while married women (76.44%) were less affected. Illiterate (32%) and postgraduate (27.43%) women exhibited higher depression rates, while graduates (37.78%) and primary school-educated (19.11%) were less depressed. Homemakers (65.71%) and retired women (30.86%) showed elevated depression, unlike working professionals (52%). Extended (35.43%) and nuclear (53.14%) families had higher depression rates than joint families (43.11% not depressed). Lower (<Rs.10,000: 32%; Rs.10,000–25,000: 27.43%) and middle-income (Rs.25,000–50,000: 33.71%) groups were more depressed, while >Rs.50,000 (44%) was protective. Early menarche at 12 years (34.29%) was strongly linked to depression. Stopped menstruation (54.76%) was associated with higher depression,

while irregular (45.33%) and regular cycles (28.89%) were protective. Later perimenopause onset (>50 years: 59.43%) correlated with increased depression compared to 41–45 years (3.43%).

Multivariate logistic regression results are presented in Table 6. Women aged 50–55 years had a higher depression risk (OR 4.33, 95% CI 2.37–7.92, p<0.001) compared to >55 years, while younger groups had lower risks (40–44 years: OR 0.29, p<0.001; 45–49 years: OR 0.50, p<0.001). Married women had reduced risk (OR 0.23, 95% CI 0.13–0.41, p<0.001) compared to single women. Illiterate (OR 3.88, p<0.001) and postgraduate (OR 2.86, p<0.001) women had higher risks than primary school-educated, while graduates had lower risk (OR 0.20, p<0.001). Homemakers (OR 2.41, p<0.001) and retired women (OR 7.20, p<0.001) were at greater risk than working professionals. Extended families increased risk (OR 2.33, p<0.001) compared to joint families. The Rs.10,000–25,000 income group had higher risk (OR 3.33, p<0.001) compared to >Rs.50,000. Early menarche at 12 years increased risk (OR 13.33, p<0.001). Irregular cycles were protective (OR 0.44, p=0.004), and later perimenopause onset (>50 years) increased risk (OR 2.31, p=0.003).

Correlation analysis, shown in Table 7, revealed strong relationships among age at perimenopause onset, MENO-D, and PSS-4 scores. Age at perimenopause onset was strongly correlated with MENO-D (r=0.892, p<0.001) and PSS-4 (r=0.894, p<0.001) scores. MENO-D and PSS-4 scores exhibited an extremely strong correlation (r=0.991, p<0.001), indicating a tight interrelationship between depression, stress, and later perimenopause onset.

Menopausal symptoms among 346 women are outlined in Table 8. Irritability was most prevalent (15%), followed by fatigue (14.8%), hot flashes (14.3%), night sweats (14%), hot flashes with insomnia (13.5%), and mood swings (13.5%). Hot flashes with mood swings were least common (1.5%), emphasizing the prominence of emotional and vasomotor symptoms.

DISCUSSION

This study reveals a significant prevalence of depression among perimenopausal women in Chengalpattu, Tamil Nadu, with 43.8% of the 400 participants exhibiting depressive symptoms, and 7.5% requiring psychiatric referral due to severity. These findings underscore the profound mental health challenges during the perimenopausal transition, driven by a complex interplay of hormonal, psychosocial, and socio-demographic factors. The results align with and diverge from existing literature, offering insights into the unique socio-cultural context of an Indian semi-urban population and contributing to the global discourse on midlife women's mental health [1, 2, 5]. The observed depression prevalence of 43.8% closely mirrors the 42.47% reported by Timur et al. in a comparable middle-income setting, affirming the high burden of depressive symptoms during perimenopause [1]. Similarly, the Study of Women's Health Across the Nation (SWAN) documented elevated depressive symptoms in perimenopausal women, particularly in late perimenopause, with prevalence rates ranging from 30–40% [2, 23]. However, our findings exceed those of Freeman et al., who reported a lower prevalence of 20–30% in women transitioning to menopause, possibly due to differences in study populations, with their cohort comprising more urbanized, Western women with greater access to healthcare [15, 21]. This discrepancy highlights the influence of socio-cultural and economic contexts on mental health outcomes, as Indian women may face additional stressors such as patriarchal norms and limited mental health resources [11, 22]. Age emerged as a significant predictor, with women aged 50–55 years showing the highest depression prevalence (32.43%) and a strong independent association (OR 4.33, 95% CI 2.37–7.92). This aligns with SWAN findings, which identified late perimenopause as a peak period for mood disorders due to pronounced estradiol and follicle-stimulating hormone fluctuations [2]. The Harvard Study of Moods and Cycles similarly noted a doubled risk of depression in this age group, particularly among women sensitive to hormonal variability [6, 18]. In contrast, Vesco et al.'s systematic review reported weaker age-related associations, suggesting that psychosocial factors may outweigh hormonal influences in some cohorts [14]. Our study's robust age effect may reflect the compounded impact of hormonal instability and life transitions, such as retirement or caregiving, prevalent in this age bracket in India [4].

Educational status presented a bidirectional risk profile, with both illiterate (OR 3.88) and postgraduate (OR 2.86) women at higher risk of depression compared to those with primary education. This finding partially aligns with Timur et al., who linked lower education to increased depression due to reduced health literacy and access to care [1]. However, the elevated risk among highly educated women is less

commonly reported but supported by Freeman et al., who noted that educated women may experience role strain or societal pressure during midlife [16]. Dennerstein's cross-cultural analysis further suggests that highly educated women may internalize stress from balancing professional and familial roles, a phenomenon likely amplified in India's patriarchal context where women face competing expectations [16]. This non-linear educational effect underscores the need for tailored interventions addressing both ends of the educational spectrum. Marital status was a critical determinant, with single and separated women showing higher depression rates (30.29% and 32%, respectively) compared to married women (OR 0.23). This is consistent with Kessler et al.'s global epidemiological data, which highlight the protective role of marital support against mood disorders [13]. In India, widowhood and separation often entail social isolation and economic dependency, exacerbating vulnerability, as noted by Morrow et al. [11]. Intriguingly, no widowed women in our study were depressed, contrasting with Timur et al.'s findings of elevated risk among widows [1]. This discrepancy may reflect cultural factors, such as community support for widows in Chengalpattu, or the small sample size of widowed participants (3.25%), limiting statistical power. Occupational status further influenced outcomes, with homemakers (65.71%) and retired women (OR 7.20) exhibiting higher depression rates than working professionals. Gordon et al. emphasize that homemakers may experience social isolation and lack of structured roles, while retired women face abrupt loss of identity, both contributing to midlife depression [4]. These findings align with Bromberger et al.'s SWAN analysis, which linked unemployment and role transitions to increased depressive symptoms [23]. However, Clayton et al. reported weaker occupational associations, suggesting that menopausal symptoms may overshadow role-related factors in some populations [10]. Our study's strong occupational effect likely reflects the socio-cultural valuation of professional engagement in urbanizing India, where work provides financial and social empowerment.

A striking finding was the association between early menarche (12 years) and a 13-fold increased depression risk (OR 13.33). Steiner et al. propose that early menarche, a proxy for prolonged estrogen exposure, may heighten sensitivity to hormonal fluctuations, predisposing women to affective dysregulation during perimenopause [25]. This is supported by Soares et al., who link reproductive hormone sensitivity to depression across the female life cycle [3]. However, Freeman et al. found no significant menarche-depression link, possibly due to their focus on hormonal rather than psychosocial pathways [15]. Early menarche may also correlate with adolescent stressors, such as body image issues, which have long-term psychological impacts in patriarchal settings like India [22].

Interestingly, irregular menstrual cycles were protective against depression (OR 0.44), contradicting much of the literature. Santoro et al. and Avis et al. associate irregular cycles with increased depressive symptoms due to hormonal instability [7, 9]. Our finding may suggest that women with irregular cycles, still in active transition, experience less severe vasomotor or affective symptoms than those with stopped menstruation (54.76% depressed). Alternatively, behavioral adaptations or resilience in this subgroup warrant further exploration. This discrepancy highlights the need for longitudinal studies to clarify the temporal dynamics of menstrual status and mood. High perceived stress, measured by PSS-4, was a strong predictor of depression, with a near-perfect correlation between MENO-D and PSS-4 scores ($r=0.991$). This supports Soares et al.'s psychoneuroendocrinological model, which posits that chronic stress activates the HPA axis, exacerbating mood instability [3]. Bromberger et al.'s SWAN data similarly link stress to depressive symptoms, particularly in women with hormonal sensitivity [17]. However, the World Health Organization notes that stress-depression relationships are often understudied in low-resource settings, where external stressors like poverty amplify effects [12]. Our findings emphasize the critical role of stress in perimenopausal mental health, necessitating integrated stress management in clinical care.

Menopausal symptoms, particularly irritability (15%), fatigue (14.8%), hot flashes (14.3%), and night sweats (14%), were prevalent and correlated with depression, as shown in Table 8. Avis et al. and Santoro et al. confirm that symptom burden, beyond hormonal shifts, predicts psychological outcomes, with vasomotor and emotional symptoms clustering in depressed women [7, 9]. In contrast, Joffe et al. suggest that hormonal dysregulation may be the primary driver, with symptoms as secondary manifestations [8]. Our data support the symptom clustering hypothesis, advocating for symptom-based screening to identify at-risk women. Despite the high prevalence, only 7.5% of women with severe depression were referred for psychiatric evaluation, reflecting a significant care gap. Maki et al. advocate for integrating validated tools like MENO-D and PSS-4 into gynecologic practice to bridge this gap, a recommendation our

findings strongly endorse [5]. The low referral rate aligns with WHO's observation of neglected mental health in menopausal women, particularly in resource-limited settings where stigma and access barriers persist [12]. This underscores the urgency of scaling up screening and referral systems in India.

The study's strengths include its representative sample, use of validated instruments, and comprehensive statistical analyses, enhancing the reliability of findings. However, its cross-sectional design limits causal inference, and reliance on self-reported symptoms may introduce recall bias. These limitations are consistent with challenges noted by Bromberger et al. in SWAN, where longitudinal designs better elucidate causality [23]. Additionally, the small sample of widowed women and the unique protective effect of irregular cycles suggest areas for further investigation, potentially influenced by regional socio-cultural factors. In comparison to global literature, our study aligns with SWAN and Harvard findings on the hormonal and psychosocial drivers of perimenopausal depression but diverges in the magnitude of socio-demographic effects, likely due to India's unique cultural context [2, 6]. Discrepancies with Western studies, such as Freeman et al.'s lower prevalence, highlight the role of socio-economic disparities and cultural stigma in amplifying depression in Indian women [15]. These differences underscore the need for context-specific mental health strategies.

CONCLUSION

This investigation illuminates the substantial burden of depression among perimenopausal women in Chengalpattu, Tamil Nadu, with 43.8% of 400 participants reporting depressive symptoms [1]. Key risk factors include older age, early menarche, single or separated marital status, extreme educational levels, non-professional occupations, and elevated stress, reflecting a intricate blend of biological and socio-cultural influences [3, 4, 13, 25]. These findings resonate with global research but are accentuated by India's unique social fabric, where patriarchal values and limited mental health access heighten vulnerability [11, 22]. The near-perfect correlation between stress and depressive symptoms (r=0.991) emphasizes the urgent need for comprehensive mental health evaluations in midlife women [12].

Notably, only 7.5% of women with severe symptoms were referred for psychiatric care, exposing a significant shortfall in gynecologic practice [5]. Employing concise tools like MENO-D and PSS-4 can facilitate early detection and timely intervention in outpatient settings [5]. The study advocates for integrated care frameworks that merge reproductive and psychological health services, customized to India's cultural context. Policymakers should prioritize embedding menopause-focused mental health screening into routine healthcare to mitigate long-term psychological impacts [12]. Longitudinal studies are needed to clarify causal relationships and develop effective, culturally relevant interventions, ultimately enhancing the well-being of perimenopausal women in India and beyond [2, 23].

REFERENCES

1. Timur S, Sahin NH. The prevalence of depression symptoms and influencing factors among perimenopausal and postmenopausal women. Menopause. 2010;17(3):545–51.
2. Bromberger JT, Schott LL, Kravitz HM, Sowers M, Avis NE, Gold EB, et al. Longitudinal change in reproductive hormones and depressive symptoms across the menopausal transition: results from the Study of Women's Health Across the Nation (SWAN). Arch Gen Psychiatry. 2010;67(6):598–607.
3. Soares CN, Zitek B. Reproductive hormone sensitivity and risk for depression across the female life cycle: a continuum of vulnerability? J Psychiatry Neurosci. 2008 Jul;33(4):331-43. PMID: 18592034; PMCID: PMC2440795.
4. Gordon JL, Girdler SS. Hormonal and psychological factors in midlife depression. Womens Health (Lond). 2014;10(2):191–203.
5. Maki PM, Kornstein SG, Joffe H, Bromberger JT, Freeman EW, Athappilly G, et al. Guidelines for the evaluation and treatment of perimenopausal depression: summary and recommendations. Menopause. 2018;25(10):1069–85.
6. Cohen LS, Soares CN, Vitonis AF, Otto MW, Harlow BL. Risk for new onset of depression during the menopausal transition: the Harvard study of moods and cycles. Arch Gen Psychiatry. 2006;63(4):385–90.
7. Avis NE, Crawford SL, Greendale G, Bromberger JT, Everson-Rose SA, Gold EB, et al. Duration of menopausal vasomotor symptoms over the menopause transition. JAMA Intern Med. 2015;175(4):531–9.
8. Joffe H, Cohen LS. Estrogen, serotonin, and mood disturbance: where is the therapeutic bridge? Biol Psychiatry. 1998;44(9):798–811.
9. Santoro N, Epperson CN, Mathews SB. Menopausal symptoms and their management. Endocrinol Metab Clin North Am. 2015;44(3):497–515.
10. Clayton AH, Ninan PT. Depression or menopause? Presentation and management of major depressive disorder in perimenopausal and postmenopausal women. Prim Care Companion J Clin Psychiatry. 2010;12(1):PCC.08r00747. doi: 10.4088/PCC.08r00747blu. PMID: 20582297; PMCID: PMC2882813.

11. Morrow, M., Hankivsky, O., & Varcoe, C. (Eds.). (2022). Women's health in Canada: Challenges of intersectionality (2nd ed.). Toronto, ON: University of Toronto Press.

12. World Health Organization. Mental health aspects of women's reproductive health: A global review of the literature. Geneva: WHO; 2009.
13. Kessler RC, Bromet EJ. The epidemiology of depression across cultures. Annu Rev Public Health. 2013;34:119–38.
14. Vesco KK, Haney EM, Humphrey L, Myers E, Nelson HD. Influence of menopause on mood: a systematic review of cohort studies. Climacteric. 2007;10(6):448–65.
15. Freeman EW, Sammel MD, Lin H, Nelson DB. Associations of hormones and menopausal status with depressed mood in women with no history of depression. Arch Gen Psychiatry. 2006;63(4):375–82.
16. Freeman EW. Depression in the menopause transition: risks in the changing hormone milieu as observed in the general population. Womens Midlife Health. 2015 Aug 11;1:2. doi: 10.1186/s40695-015-0002-y. PMID: 30766689; PMCID: PMC6214217.
17. Bromberger JT, Kravitz HM, Matthews KA, Youk A, Brown C, Feng W. Predictors of first lifetime episodes of major depression in midlife women. Psychol Med. 2009;39(1):55–64.
18. Harlow BL, Wise LA, Otto MW, Soares CN, Cohen LS. Depression and its influence on reproductive endocrine and menstrual cycle markers associated with perimenopause: the Harvard Study of Moods and Cycles. Arch Gen Psychiatry. 2003;60(1):29–36.
19. National Institute of Mental Health. Depression in women: understanding the gender gap. Bethesda, MD: NIMH; 2020.
20. Lobo RA, Pickar JH, Stevenson JC, Mack WJ, Hodis HN. Back to the future: Hormone replacement therapy as part of a prevention strategy for women at the onset of menopause. Atherosclerosis. 2016 Nov;254:282-290. doi: 10.1016/j.atherosclerosis.2016.10.005. Epub 2016 Oct 6. PMID: 27745704.
21. Freeman EW, Sammel MD, Liu L, Gracia CR, Nelson DB, Hollander L. Hormones and menopausal status as predictors of depression in women in transition to menopause. Arch Gen Psychiatry. 2004 Jan;61(1):62-70. doi: 10.1001/archpsyc.61.1.62. PMID: 14706945.
22. Ussher, Jane. (2006). Managing the Monstrous Feminine: Regulating the Reproductive Body. 10.4324/9780203328422.
23. Bromberger JT, Kravitz HM. Mood and menopause: findings from the Study of Women's Health Across the Nation (SWAN) over 10 years. Obstet Gynecol Clin North Am. 2011;38(3):609–25.
24. Schmidt PJ, Rubinow DR. Sex hormones and mood in the perimenopause. Ann N Y Acad Sci. 2009 Oct;1179:70-85. doi: 10.1111/j.1749-6632.2009.04982.x. PMID: 19906233; PMCID: PMC2891531..
25. Steiner M, Dunn E, Born L. Hormones and mood: from menarche to menopause and beyond. J Affect Disord. 2003 Mar;74(1):67-83. doi: 10.1016/s0165-0327(02)00432-9. PMID: 12646300.