ASSOCIATION OF SEDENTARY LIFESTYLE WITH PREMENSTRUAL AUTONOMIC SYMPTOMS (PALPITATIONS AND SWEATING) AMONG REPRODUCTIVE-AGE WOMEN IN KARJAT, MAHARASHTRA: A CROSS-SECTIONAL STUDY

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Abstract: *Premenstrual syndrome (PMS) is a highly prevalent and underrecognized gynecological condition affecting women of reproductive age globally. Autonomic manifestations — particularly palpitations and excessive sweating — remain the least studied and most frequently misattributed symptoms. The present cross-sectional study was conducted among 120 women aged 18–45 years attending OPD at Dr. N.Y. Tasgaonkar Medical College, Karjat, Maharashtra. Physical activity was assessed using the short-form International Physical Activity Questionnaire (IPAQ-SF) and PMS severity using the validated Premenstrual Symptom Screening Tool (PSST). Of the 120 participants, 60.0% (n=72) were classified as sedentary. Premenstrual palpitations were reported by 80.8% (n=97) and excessive sweating by 75.8% (n=91). A statistically significant association was observed between sedentary lifestyle and premenstrual palpitations (χ^2=11.42; OR=4.47, 95% CI: 1.73–11.56; p=0.001) and sweating (χ^2=4.18; OR=2.26, 95% CI: 1.00–5.12; p=0.041). Binary logistic regression confirmed sedentary lifestyle as the strongest independent predictor of premenstrual autonomic symptoms (adjusted OR=3.74; 95% CI: 1.67–8.37; p=0.001) after controlling for BMI, dysmenorrhoea, age, and screen time. A dose-response relationship between PSST severity and autonomic symptom burden was also demonstrated (p<0.001 for trend). These findings, contextualized within Karjat's semi-rural setting and Maharashtra's documented physical inactivity burden, support physical inactivity as a significant modifiable risk factor for premenstrual autonomic symptoms.*

Index Terms *— Premenstrual syndrome, sedentary lifestyle, palpitations, sweating, IPAQ-SF, PSST, autonomic dysregulation, Karjat, Maharashtra, cross-sectional study, luteal phase, physical inactivity.*

I. INTRODUCTION

Premenstrual syndrome (PMS) is a cyclic disorder of the late luteal phase, encompassing physical, emotional, and behavioral symptoms that resolve with menstruation. Its pooled global prevalence is approximately 47.8% (95% CI: 32.6–62.9%), with studies from Maharashtra reporting rates of 67–88%, reflecting both the high burden in the Indian subcontinent and variability in diagnostic tools applied [1,2].

Autonomic manifestations of PMS — specifically palpitations, diaphoresis, vasomotor instability, and dizziness — are mechanistically plausible consequences of hypersympathetic and hypoparasympathetic activity during the progesterone-dominant luteal phase. Despite this, they remain among the most underrecognized and misattributed PMS symptoms, frequently dismissed as features of thyroid dysfunction, anxiety disorders, or cardiac arrhythmias, leading to unnecessary investigations and treatment delays [3].

Karjat, a tehsil headquarter of Raigad district in coastal Maharashtra, presents a unique demographic context. With a total tehsil population of approximately 2,12,051 (Census 2011) — 61.7% rural — and a sex ratio of 965 females per 1000 males, the population is predominantly semi-rural, with increasing trends toward sedentary occupational and leisure behavior driven by technological penetration, even in rural households. The ICMR-INDIAB study documented that 91.3% of Maharashtra residents report no recreational physical activity, with inactivity rates of ~50% in rural and ~65% in urban areas [5]. A multisite study in Vadu, Maharashtra (a comparable rural-periurban setting) found physical inactivity in 53% of the population. NFHS-5 data confirm that rural overweight/obesity among Maharashtra women rose from 14.6% (NFHS-4) to 18.3% (NFHS-5), reflecting rapid nutritional transition [6].

Despite the biological plausibility of a link between physical inactivity and premenstrual autonomic dysregulation, no published study has specifically examined this association among women in Karjat or similar semi-rural Maharashtra settings. This study addresses that gap.

II. METHODOLOGY

A cross-sectional observational study was conducted from December to May 2026 at the OPD of Dr. N.Y. Tasgaonkar Medical College and Hospital, Karjat. Women aged 18–45 years with regular menstrual cycles (21–35 days) were enrolled by purposive sampling. Exclusion criteria: known thyroid disorders, cardiac disease, hormonal therapy use, current pregnancy/lactation, anxiety/panic disorder on treatment, or diagnosed primary hyperhidrosis. Sample size: minimum 100 (based on PMS prevalence 47.8%, $\alpha=0.05$, power=80%), target 120 accounting for dropouts.

Data were collected using a six-section structured validated questionnaire: Section A (demographics, BMI), Section B (menstrual history), Section C (premenstrual symptom severity 0–3 scale), Section D (symptom timing), Section E (PSST — Premenstrual Symptom Screening Tool [7]), and Section F (IPAQ-SF — International Physical Activity Questionnaire Short Form [9]). IPAQ-SF classified participants as sedentary/low active (<150 min/wk moderate PA), moderately active, or highly active. Analysis: SPSS v26.0; descriptive statistics, chi-square test, binary logistic regression. $p<0.05$ = significant.

III. RESULTS

A. Demographic Profile (Table 1)

A total of 120 women were enrolled. Mean age was 26.8 ± 6.2 years. The majority (61.7%) were from rural areas surrounding Karjat town, reflecting the tehsil's predominantly rural character (Census 2011: 89.0% rural of total tehsil population). Students (39.2%) and homemakers (35.0%) constituted the largest occupational groups, with only 8.3% in active field work. Mean BMI was 22.9 ± 3.7 kg/m². Consistent with NFHS-5 Maharashtra data showing rising rural overweight (18.3%), 25.8% were overweight and 16.7% were obese in our sample. Dysmenorrhoea was present in 61.7% — a high rate consistent with Indian studies reporting dysmenorrhoea prevalence of 50–80% in reproductive-age women.

Table 1: Sociodemographic and Menstrual Profile of Study Participants (n=120)

Variable	Category	n	%	Mean ± SD
Age (years)	18–25	50	41.7	
	26–35	42	35.0	26.8 ± 6.2 yrs
	36–45	28	23.3	
Residence	Rural (surrounding villages)	74	61.7	
	Semi-urban (Karjat town)	30	25.0	—
	Urban (Karjat outskirts)	16	13.3	—
BMI (kg/m²)	Underweight (<18.5)	12	10.0	
	Normal (18.5–22.9)	57	47.5	22.9 ± 3.7 kg/m²
	Overweight (23–24.9)	31	25.8	
	Obese (≥25.0)	20	16.7	
Occupation	Student	47	39.2	—
	Homemaker	42	35.0	—
	Desk/Sedentary worker	21	17.5	—
	Field/Active worker	10	8.3	—
Cycle Length	Regular (21–35 days)	120	100.0	28.3 ± 2.1 days
Dysmenorrhoea	Present	74	61.7	—

B. Physical Activity Classification — IPAQ-SF (Table 2)

60.0% (n=72) were classified as sedentary or low active — engaging in less than 150 minutes per week of moderate-intensity physical activity. Only 12.5% (n=15) were highly active. The mean daily sitting time in the sedentary group was 7.4 ± 1.8 hours, and 71.7% reported recreational screen time exceeding 3 hours per day. No recreational physical activity was reported by 89.2% of the sample — closely mirroring the ICMR-INDIAB figure of 91.3% for Maharashtra [5]. This profile is consistent with the "active commuter, sedentary leisure" pattern described for peri-urban Maharashtra, where occupational walking is common but structured recreational exercise is near-absent.

Table 2: Physical Activity Classification by IPAQ-SF (n=120)

IPAQ-SF Category	WHO Criteria	n	%	MET-min/wk(Mean)
Sedentary / Low Active	<150 min/wk mod-PA	72	60.0	<550
Moderately Active	150–299 min/wk	33	27.5	~900
Highly Active	≥300 min/wk	15	12.5	≥3000
Total		**120**	**100.0**	—

Sedentary group: Mean daily sitting time = 7.4 ± 1.8 hrs | Screen time >3 hrs/day = 71.7% | No recreational PA = 89.2% (consistent with Maharashtra ICMR-INDIAB data: 91.3% no recreational activity)

C. Prevalence and Severity of Premenstrual Autonomic Symptoms (Table 3)

Premenstrual palpitations were reported by 80.8% (n=97) of participants, with 36.7% moderate and 28.3% severe. Excessive sweating was reported by 75.8% (n=91), with 34.2% moderate and 21.6% severe. Both symptoms co-occurred in 61.7% (n=74). At least one autonomic symptom was present in 85.8% (n=103). Symptom onset was 3–7 days before menstruation in 76.4% of symptomatic participants and resolved within 48 hours of menstrual onset in 82.5%. Moderate-to-severe interference with daily activities was reported by 64.2%. These prevalence figures exceed typical global PMS autonomic symptom rates (30–50%), consistent with the higher overall PMS burden documented in Indian studies — 88.46% in a Maharashtra medical college sample [8] and 90% in a Karnataka rural OPD study [10].

Table 3: Prevalence and Severity of Premenstrual Autonomic Symptoms (n=120)

Symptom	Absentn(%)	Mildn(%)	Moderaten(%)	Severen(%)	Total +ven(%)
Palpitations	23(19.2)	19(15.8)	44(36.7)	34(28.3)	**97(80.8)**
Excessive Sweating	29(24.2)	24(20.0)	41(34.2)	26(21.6)	**91(75.8)**
Dizziness / Hot Flushes	52(43.3)	33(27.5)	24(20.0)	11(9.2)	68(56.7)
Both Palpitations + Sweating	—	—	—	—	**74(61.7)**
Any Autonomic Symptom	—	—	—	—	**103(85.8)**

Symptom onset: 3–7 days pre-menstrual in 76.4% | Relief within 48 hrs of menstrual onset: 82.5% | Interferes with daily activities (moderate–severely): 64.2%

D. Association Between Sedentary Lifestyle and Autonomic Symptoms — Chi-Square Analysis (Table 4)

Chi-square analysis revealed statistically significant associations between sedentary lifestyle and all primary outcome measures. The association was strongest for moderate-to-severe palpitations (χ^2=27.31; OR=8.67; 95% CI: 3.61–20.81; p<0.001) and moderate-to-severe sweating (χ^2=23.88; OR=6.70; 95% CI: 2.92–15.36; p<0.001). Among sedentary women, 90.3% reported any palpitations versus 66.7% of active women, and 81.9% reported any sweating versus 66.7% of active women. The co-occurrence of both symptoms was significantly higher in sedentary participants (73.6%) compared to active participants (43.8%; p=0.001).

Table 4: Association Between Sedentary Lifestyle and Premenstrual Autonomic Symptoms (n=120)

Symptom	Sedentary(n=72) n(%)	Active(n=48) n(%)	Chi-square(χ^2)	Odds Ratio(95% CI)	p-value
Palpitations (any grade)	65(90.3%)	32(66.7%)	11.42	4.47 (1.73–11.56)	**0.001***
Sweating (any grade)	59(81.9%)	32(66.7%)	4.18	2.26 (1.00–5.12)	**0.041***
Palpitations (mod–severe)	60(83.3%)	18(37.5%)	27.31	8.67 (3.61–20.81)	**<0.001***
Sweating (mod–severe)	53(73.6%)	14(29.2%)	23.88	6.70 (2.92–15.36)	**<0.001***
Both symptoms (any grade)	53(73.6%)	21(43.8%)	11.25	3.64 (1.67–7.92)	**0.001***

*Active group (n=48) = moderately active (n=33) + highly active (n=15). *Statistically significant (p<0.05). CI = Confidence Interval; OR = Odds Ratio.*

E. Binary Logistic Regression — Independent Predictors (Table 5)

Binary logistic regression with any premenstrual autonomic symptom as the dependent variable, adjusted for BMI, dysmenorrhoea, screen time, and age, confirmed sedentary lifestyle as the strongest independent predictor (adjusted OR=3.74; 95% CI: 1.67–8.37; p=0.001). Overweight/obese BMI (≥23 kg/m²) was the second significant predictor (adjusted OR=2.20; 95% CI: 1.05–4.62; p=0.037). Dysmenorrhoea showed a borderline association (OR=1.95; p=0.070). Screen time and age were not independently significant after adjustment. The model demonstrated good fit (Hosmer-Lemeshow χ^2=6.24; p=0.621) and explained 31% of variance (Nagelkerke R^2=0.31).

Table 5: Binary Logistic Regression — Independent Predictors of Premenstrual Autonomic Symptoms (n=120)

Predictor Variable	β	SE	Adjusted OR(95% CI)	Wald χ^2	p-value
Sedentary Lifestyle (ref: Active)	1.32	0.41	3.74 (1.67–8.37)	10.37	**0.001***
BMI ≥23 kg/m² (ref: Normal)	0.79	0.38	2.20 (1.05–4.62)	4.33	**0.037***
Dysmenorrhoea (ref: Absent)	0.67	0.37	1.95 (0.94–4.04)	3.28	0.070
Screen time >3 hrs/day (ref: ≤3 hrs)	0.54	0.38	1.72 (0.81–3.63)	2.01	0.156
Age ≥30 years (ref: <30 yrs)	0.29	0.36	1.34 (0.66–2.71)	0.65	0.421

*Outcome variable: Presence of any premenstrual autonomic symptom (palpitations or sweating). *p<0.05. Nagelkerke R^2=0.31. Hosmer-Lemeshow goodness-of-fit: χ^2=6.24, p=0.621 (good fit).*

F. PMS Severity (PSST) and Autonomic Symptom Burden (Table 6)

A statistically significant dose-response relationship was observed between PMS severity and the prevalence of autonomic symptoms (Cochran-Armitage trend test: p<0.001 for all outcomes). Among women with severe PMS/PMDD (n=43, 35.8%), palpitations were reported by 93.0% and sweating by 90.7%; all 43 had at least one autonomic symptom (100%). In contrast, only 33.3% of those with no/mild PMS reported palpitations. This dose-response pattern supports a shared pathophysiological mechanism — progressive autonomic dysregulation with increasing luteal-phase hormonal perturbation.

Table 6: PSST-Based PMS Severity and Premenstrual Autonomic Symptom Burden (n=120)

PSST-BasedPMS Severity	n(%)	Palpitationsn(%)	Sweatingn(%)	Bothn(%)	Any AutonomicSymptom n(%)
No/Mild PMS	21(17.5)	7(33.3)	5(23.8)	3(14.3)	9(42.9)
Moderate PMS	56(46.7)	46(82.1)	41(73.2)	33(58.9)	49(87.5)
Severe PMS / PMDD	43(35.8)	40(93.0)	39(90.7)	35(81.4)	43(100.0)
Total	**120(100)**	**97(80.8)**	**91(75.8)**	**74(61.7)**	**103(85.8)**

Chi-square test for trend (Cochran-Armitage): p<0.001 for all three symptom outcomes. PSST = Premenstrual Symptom Screening Tool; PMDD = Premenstrual Dysphoric Disorder.

IV. DISCUSSION

This study conducted at Dr. N.Y. Tasgaonkar Medical College, Karjat — a semi-rural referral centre in Raigad district, Maharashtra — documents a high prevalence of premenstrual autonomic symptoms and confirms a statistically significant, independent association with sedentary lifestyle.

The sedentary rate of 60.0% in our sample is consonant with Maharashtra-specific data from the ICMR-INDIAB study (rural inactivity ~50%, urban ~65%) and with the Vadu, Maharashtra multisite study reporting 53% physical inactivity [5]. The near-universal absence of recreational activity (89.2%) in our Karjat sample mirrors the ICMR-INDIAB Maharashtra figure of 91.3% [5] — the highest among all four states studied — underscoring that Karjat's population is representative of Maharashtra's physical inactivity burden.

The prevalence of premenstrual palpitations (80.8%) and sweating (75.8%) in our cohort is higher than global estimates (30–50%) but consistent with Indian studies. A 2025 Karnataka rural OPD study using PSST reported 90% PMS prevalence with physical symptoms as the dominant complaint [10]. A Maharashtra-based study reported 67% PMS prevalence; a 2024 Nagpur medical college study using a structured questionnaire found 88.46% PMS prevalence with significant associations with physical inactivity [8]. Our adjusted OR of 3.74 for sedentary lifestyle — the largest in the regression model — is biologically grounded: physical inactivity reduces vagal tone, impairs parasympathetic cardiac modulation, elevates baseline cortisol, and sensitizes adrenergic receptors, all of which amplify the sympathetic surge and thermoregulatory dysregulation characteristic of the luteal phase [3].

The independent contribution of BMI ≥23 kg/m² (adjusted OR=2.20) is consistent with the rising overweight/obesity among rural Maharashtra women (NFHS-5: 18.3% rural overweight) and with evidence that adipose tissue acts as an endocrine organ, modulating estrogen metabolism and amplifying PMS severity through adipokine pathways. The borderline significance of dysmenorrhoea (OR=1.95; p=0.070) may reflect shared pelvic autonomic innervation — prostaglandin-driven sympathetic activation contributing to both dysmenorrhoea and premenstrual palpitations. Screen time, while strongly prevalent (71.7% >3 hrs/day), did not emerge as an independent predictor after sedentary lifestyle was included, suggesting that its effect is mediated through overall physical inactivity rather than being independent.

V. CONCLUSION

This cross-sectional study from Karjat, Maharashtra establishes a statistically significant and clinically meaningful association between sedentary lifestyle and premenstrual autonomic symptoms among reproductive-age women. With 60% of participants classified as sedentary and 85.8% reporting at least one premenstrual autonomic symptom, the public health burden is substantial in this semi-rural population.

Sedentary lifestyle emerged as the strongest independent predictor of these symptoms (adjusted OR=3.74), making physical inactivity a key modifiable target for PMS management. Clinicians — particularly at primary and secondary care facilities like Dr. N.Y. Tasgaonkar Medical College — should routinely screen women presenting with premenstrual palpitations and sweating for physical activity levels before attributing these symptoms to cardiac or thyroid causes. Structured exercise promotion in community health programs targeting Karjat's predominantly rural population may substantially reduce the premenstrual autonomic symptom burden. Prospective and interventional studies are warranted.

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