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Research Article

Prevalence And Risk Factors Of Poor Quality Of Sleep In Working Women: A Cross-Sectional Study

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Abstract

Objective: An overwhelming number of working women report sleep difficulties, which in turn lead to various health issues. However, there is a dearth of studies focusing on increasing health problems. Consequently, the objective of the current investigation was to ascertain the potential determinants that contribute to this escalating health concern.

Methodology: A sample of 343 working women aged 25 to 50 years were recruited from the community. They completed an online/offline assessment performed for demographic details along with self-reported questionnaires (Pittsburgh Sleep Quality Index (PSQI), PROMIS 8b, Epworth Sleepiness Scale (ESS), Dysfunctional Attitudes and Beliefs about sleep (DBAS), Sleep Hygiene Index (SHI), International Physical Activity Questionnaire (IPAQ), and Short-Form (SF) – 12. Sleep quality, sleep health, daytime sleepiness, attitudes and beliefs about sleep, sleep hygiene, physical activity level and quality of life were examined respectively, as predictors of poor quality of sleep.

Results: The results revealed that 83.1% of the working women were poor sleepers. Linear regression analysis identified that sleep health, daytime sleepiness, attitudes and beliefs about sleep, and physical component scores of Quality of Life (QoL) were significant predictors of poor sleep quality.

Conclusion: Poor sleep quality is correlated with factors such as daytime sleepiness, sleep health, attitudes and beliefs about sleep, and the physical component scores of quality of life in working women.

Keywords: poor sleep quality, working women, day time sleepiness, sleep hygiene, quality of life

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1. Introduction

As we sleep for nearly one-third of our lives, it occupies a significant portion of our lives [1]. An individual's typical physical, emotional, and mental well-being is contingent upon sleep, which is a natural physiological activity. Optimal sleep is defined by sufficient length of sleep, suitable timing, consistency, and nonexistence of sleep disruptions or disorders. Sleep deprivation has developed into a significant global public health concern in the last two decades [2]. The National Health Portal of India (2018) declared insufficient or poor sleep to be a significant health concern for modern living. The reasons for this are the accelerated rate of urbanization and industrialization and quick and significant changes occurring in Indian families. Compared to a few decades ago, Indian women now have more access to opportunities for education. The aforementioned factors, including broader viewpoints, expanded awareness, and raised aspirations for personal advancement, have had a substantial impact on women's choices to join the workforce [3]. To do so, they must make several socio-familial adaptations, which puts them in the difficult position of having to thrive in both their personal and professional lives, which leads to overwork and frequent stress [4]. Given the importance of work done by women at home to care for their families, their underperformance could cause further issues in society [5].

It is commonly known that getting enough sleep is necessary to maintain both proper physiological and psychological health [6]. Despite being common, sleep-related issues are underreported and their effects are frequently ignored [7]. About 40 to 60% of women report frequent sleep difficulties, and 30% claim to have serious sleep issues that have a significant impact on their everyday lives. For women in the reproductive age range, the degree of sleep quality differs across nations. Approximately 45% of women in a study of young adult women reported poor sleep [8]. Furthermore, the occurrence of inadequate sleep quality among women in their reproductive years varies from 22% to 57% in different geographical regions [9].

According to some studies, working women are more likely to experience sleep issues than working males [10]. Issues with hormones, behavior, and mood could be a reason for increased risk of sleep issues among women throughout their lifetime [11]. Lack of good sleep has been linked to psychological, social, economic, and medical issues. Poor sleep quality has been linked to adverse health outcomes, including increased risk of cardiovascular disease, metabolic disorders, and mental health issues, all of which can further impact work productivity and overall quality of life. [2]. Anomalies in sleep patterns are the root cause of approximately 70% of mental health conditions, including postpartum psychosis, depression, and suicidal thoughts (11). Moreover, sleep problems can lead to daytime weakness, fatigue, drowsiness, sluggish driving, tension, lack of impulse control, and pain [12]. Given the detrimental effects of poor sleep quality on working women's health and well-being, this population

should undergo routine screening for poor sleep quality. However, few studies have focused on how well they sleep [13]. Despite mounting evidence that women in the workforce experience sleep-related issues, limited data exists on the prevalence and specific risk factors for poor sleep quality in Indian working women [14]. However, by examining the prevalence and risk factors associated with poor sleep quality in this population, this study aims to identify key predictors, such as excessive daytime sleepiness, sleep health, physical activity status, quality of life, and dysfunctional beliefs about sleep, that may uniquely impact sleep in Indian working women. Understanding these factors is essential for designing targeted interventions to improve sleep health and overall well-being in this population. Hence, the aim of this study is to determine the risk factors for poor sleep quality in this population, as well as the prevalence of poor quality of sleep and its associated factors among working women.

2. Materials and Methods

2.1. Study design

A survey of cross-sectional design on working women was conducted for the duration of 12 months. For the ethical consideration, the study was ethically approved by the Ethics Committee of the institution (24/5/333/JMI/IEC/2020)

Before the commencement, and it followed the ethical guidelines given by declaration of Helsinki (1964). The study was also registered under the Clinical Trials Registry of government of the country (CTRI/2021/08/036078) as it is part of a larger study being conducted in the centre.

2.2. Study Participants

2.2.1. Sample size calculation.

A free open-source epidemiological statistics toolset (Open EPI) calculated a sample size of 306 participants (working women) using the data of assessment of the quality of sleep among urban working women [4]. The sample population was determined with an effect size of 1.0, a 95% confidence limit, and an anticipated frequency of 72.6%; 306 participants were required to address the research objectives. A total of 405 participants were screened and 350 were recruited based on the inclusion and exclusion criteria. The final analysis was done on 343 participants, seven were excluded because they had not filled out all the forms

2.2.2. Inclusion and exclusion criteria.

Participants were included if they were of age range 25 to 50 years old, had a working knowledge of the English language to complete the questionnaires and sign the informed consent, were currently working in the formal sector (not less than six hours for at least four days a week), had five to 20 years of work experience, and did not have major life event stressors that impacted their stress level within the last six months.

Participants were excluded if they were suffering from any condition/disease/disorder that limits them from being physically active, were using therapies that may

affect sleep (e.g., diuretics, continuous positive airway pressure), were suffering from any diagnosed psychiatric diseases/disorders, were pregnant or had been delivered in the past three years, post-menopausal women, or women suffering from dysmenorrhea or any other gynecological disease or disorder.

2.2.3. Study Procedure.

Word of mouth, social advertisements, and flyers were used to disseminate information regarding this study. Interested participants were assessed for eligibility by the principal investigators. The procedure was explained to all the screened participants in detail. Oral as well as written informed consent were obtained from each participant before the enrollment in the study. Following this, they were given hard copies or Google form links containing questions about personal and demographic data, along with study questionnaires that assessed sleep quality, sleep health, daytime sleepiness, attitudes and beliefs about sleep, sleep hygiene, physical activity, and QoL.

2.2.4. Outcome measures.

1. Pittsburgh Sleep Quality Index (PSQI). It is a standardized, widely used, and validated measure of sleep quality. The participants were asked about their sleep during the previous month on a scale with 19 self-rated questions [8]. The scale ranges from 0 to 21, with higher values representing poorer sleep.

2. PROMIS 8b. The 8-item PROMIS Sleep Disturbance Short Form 8b evaluates perceptions of sleep depth, quality of sleep, and sleep satisfaction. Using three alternative response scales with five possibilities each, each ranging from 1 to 5, this brief form asks respondents to identify their level of sleep quality during the last seven days. For the first four items, the possible answers were 1 = not at all, 2 = a little bit, 3 = somewhat, 4 = quite a little, and 5 = very much. The options for the following three questions were: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always. The last item is graded using the following response categories: 1 = very poor, 2 = poor, 3 = fair, 4 = good, and 5 = very good. Higher ratings suggest more severe sleep disruption [15].

3. Dysfunctional Beliefs and Attitudes about Sleep (DBAS). An evaluation of sleep-related cognitions was performed using the 16-item DBAS measure. A 10-point scale was used to score each item, in which 1 - strongest disagreement and 10 - strongest agreement. Participants were selected from "strongly disagree" (0) to "strongly agree" (10), depending on how much they agreed or disagreed with each statement. A higher score suggests unhealthy attitudes and beliefs about sleep [16].

4. Sleep Hygiene Index (SHI). It is a 13-item self-reporting questionnaire, which measures the existence of actions that are believed to be part of good sleep hygiene. Participants were enquired about the frequency of certain behaviors (always, frequently, occasionally, rarely, never). The diagnostic criteria for poor sleep

hygiene were obtained from the International Classification of Sleep Disorders to create the SHI [17]. The overall evaluation of sleep hygiene was performed by summing the item ratings [18].

5. Epworth Sleepiness Scale (ESS). A self-report questionnaire, the 8-item ESS, yields scores between 0 and 24. Significant daytime sleepiness was indicated by scores greater than 10. The Epworth Sleepiness Scale has been found to identify differences between individuals having or not having sleep disorders as well as between those who are and are not sleep-deprived [19]. Additionally, it exhibits good psychometric qualities and correlates to the objective and subjective sleepiness variables.

6. International physical activity questionnaire (IPAQ). The quick, self-administered version of the IPAQ was employed in the current study. The nine-item short form of the IPAQ assesses how much time was spent in the previous seven days walking, exercising vigorously, and exercising moderately. In addition, the duration of sitting hours on weekdays during the past seven days was counted. Participants had to state the number of days and minutes they spent in each activity category for each activity. For each category, the number of minutes was multiplied by 8 (vigorous), 4 (moderate), 3.3 (walking), or 1.3 (sitting) to obtain the number of Metabolic Equivalents (METs)-minutes. A total score is generated by summing the METs-minutes from the first three categories in addition to these four sub-scores [20].

7. Short Form – 12 (SF-12). It was utilized to assess the health-related quality of life. The 12 items were categorized into eight distinct domains: physical functioning, role physical, body discomfort, overall health, vitality, social functioning, role emotional, and mental health. This tool utilizes many metrics to assess both physical (PCS) and mental component scores (MCS), assigning varying weights to each aspect. The PCS and MCS scales were derived by coding, weighting, and totaling the raw values of each item. A greater score indicates an elevated standard of living. The SF-12, a questionnaire consisting of 12 items, was employed to assess the quality of life in the elderly population [21].

2.2.5. Statistical Analysis

IBM SPSS Statistics for Windows (Version 25.0. IBM Corp., Armonk, NY, USA) was used for data analysis. Descriptive statistics were done to represent participant's characteristics. Cross-tabulation analysis was executed to obtain the point prevalence of multiple variables such as age, BMI, marital status, Job type, sleep health, physical activity status, day time sleepiness, sleep-related beliefs and attitude, sleep hygiene and quality of life based on the type of sleep quality and hence, a better understanding of the distribution of these variables in the study population. Bivariate analysis (Spearman's correlation) was performed before applying linear regression analysis to identify significant associations between dependent and

predictor variables. The dependent variables chosen in the study was sleep quality, and daytime sleepiness, sleep health, attitudes and beliefs about sleep, sleep hygiene, physical activity, and quality of life were the predictors. Linear regression analysis was done to identify potential predictors of poor sleep quality. The statistically significant threshold was $p < 0.05$.

3. Results

A total of 350 participants were included in the study, and the final analysis was done on 343 participants. Age was classified into two categories: 25–35 and 35 and above; BMI as less than 25 and > 25 ; and marital status as married and unmarried, disability into two as present or not present. All other variables were categorized according to the standard scoring values provided in the questionnaire. Socio-demographic data and descriptive statistics are summarized in **Table 1**.

Table 1. Socio-demographic characteristics of Participants

Variable	Mean	SD	Participant characteristics	Frequency	Percentage
Age	32.06	6.29	25-35 years	238	69.4
			35 and above	105	30.6
BMI	24.40	4.51	Less than 25	215	62.9
			More than 25	127	37.1
Marital status	-	-	Married	188	54.8
			Unmarried	155	45.2
Disability	-	-	No	337	98.3
			Yes	6	1.7
PROMIS 8b	46.51	9.98	None to slight	160	46.6
			Mild	72	21.0
			Moderate	83	24.2
			Severe	28	8.2
IPAQ	-	-	Low	187	54.5
			Moderate	104	30.3
			High	52	15.2
ESS	8.75	4.927	Normal sleepiness	111	32.4
			Average daytime sleepiness	81	23.6
			Possible Excessive daytime sleepiness	113	32.9
			Excessive daytime sleepiness	38	11.1
DBAS	5.60	2.22	Good	77	22.4
			Poor	266	77.6
SHI	19.98	8.396	Excellent	59	17.2
			Moderate	214	62.4
			Fair	54	15.7
			Poor	16	4.7
SF-12 (PCS)	39.76	8.37	Excellent	66	19.2
			Fair	220	64.1
			Poor	57	16.6
SF-12 (MCS)	36.55	8.45	Excellent	41	12.0
			Fair	189	55.1
			Poor	113	32.9

SD: standard deviation; BMI: body mass index; PROMIS 8b: 8-item PROMIS Sleep Disturbance Short Form; IPAQ: International Physical Activity Questionnaire; ESS: Epworth sleepiness scale; DBAS: Dysfunctional Beliefs and Attitudes about Sleep; SHI: Sleep Hygiene Index; SF-12 PCS: physical health component of SF-12; SF-12 MCS: mental health component of SF-12

We found an overall 83.1%-point prevalence of poor quality of sleep in the data of women who work in the

formal sector. The cross-tabulation of covariates (age, BMI, marital status, disability, sleep disturbance, daytime sleepiness, DBAS, sleep hygiene, physical activity, and QoL) of the participants, both having good quality of sleep and poor quality of sleep, is shown in **Table 2**. Our results showed that 77.6% had poor sleep-related beliefs and attitudes, and 16.7% had poor sleep hygiene. We discovered that 9.3% of the target population suffered from moderate-to-severe sleep disturbances. More than half of our group (54.5%) had low physical activity status. . 8.7% of people had

excessive daytime sleepiness, and more than half of the population of poor sleepers had excessive daytime sleepiness

Table 2. Cross tabulation of covariates

Variable		Good sleep quality	Poor sleep quality	p value	Effect size
Age	25-35 years	75.9% (44)	68.1% (194)	.241	.063
	35 and above	24.1% (14)	31.9% (91)		
BMI	Less than 25	69.0% (40)	61.6% (175)	.291	.057
	More than 25	31.0% (18)	38.4% (109)		
Marital status	Married	62.1% (36)	53.3% (152)	.223	.066
	Unmarried	37.9% (22)	46.7% (133)		
Job type	Clerical /sales	10.3% (6)	17.9% (51)	.074	.142
	Managers/professional	86.2% (50)	69.8% (199)		
	Trades person	1.7% (1)	6.7% (19)		
	Others	1.7% (1)	5.6% (16)		
Disability	No	98.3% (57)	98.2% (280)	.987	.001
	Orthopedic	1.7% (1)	1.8% (5)		
PROMIS 8b	None to slight	46.6% (27)	46.7% (133)	.213	.114
	Mild	29.3% (17)	19.3% (55)		
	Moderate	15.5% (9)	26.0% (74)		
	Severe	8.6% (5)	8.1% (23)		
IPAQ	Low	53.4% (31)	54.7% (156)	.076	.123
	Moderate	39.7% (23)	28.4% (81)		
	High	6.9% (4)	16.8% (48)		
ESS	Normal sleepiness	44.8% (26)	29.8% (85)	.028*	.163
	Average daytime sleepiness	27.6% (16)	22.8% (65)		
	Possible Excessive daytime sleepiness	24.1% (14)	34.7% (99)		
	Excessive daytime sleepiness	3.4% (2)	12.6% (36)		
DBAS	Good	20.7% (12)	22.8% (65)	.725	.019
	Poor	79.3% (58)	77.2% (220)		
SHI	Excellent	36.2% (21)	13.3% (38)	.000**	.263
	Moderate	56.9% (33)	63.5% (181)		
	Fair	1.7% (1)	18.6% (53)		
	Poor	5.2% (3)	4.6% (13)		
SF-12 (PCS)	Excellent	34.5% (20)	16.1% (46)	.001**	.203
	Fair	60.3% (35)	64.9% (185)		
	Poor	5.2% (3)	18.9% (54)		
SF-12 (MCS)	Excellent	13.8% (8)	11.6% (33)	.686	.047
	Fair	50.0% (29)	56.1% (160)		
	Poor	36.2% (21)	32.3% (92)		

* denotes statistical significance at $p < 0.05$; ** denotes statistical significance at $p < 0.001$

BMI: body mass index; PROMIS 8b: 8-item PROMIS Sleep Disturbance Short Form; IPAQ: International Physical Activity Questionnaire; ESS: Epworth Sleepiness Scale; DBAS: Dysfunctional Beliefs and Attitudes about Sleep; SHI: Sleep Hygiene index; SF-12 (PCS): physical component of SF-12; SF-12 (MCS): mental health component of SF-12

3.1. Predictors of poor quality of sleep

We have added sleep disturbances (PROMIS8b), daytime sleepiness (ESS), beliefs and attitudes about sleep (DBAS), sleep hygiene (SHI), physical activity (IPAQ), and quality of life both mental and physical component scores (SF12) as predictors in our linear regression analysis and found that sleep health (95 % CI [0.021,0.121], $p=0.006$) excessive daytime sleepiness(95 % CI [0.132,0.351], $p=0.000$), (beliefs and attitudes about sleep(95 % CI [0.118,0.569], $p=0.003$),

and quality of life (Physical Component Score) (95 % CI [-0.157,-0.037], $p=0.002$) were statistically significant predictors of poor sleep quality .The findings from regression analysis suggested that predictors of poor

quality of sleep explained a variance of 75% (Adjusted R square value =0.139, $f(5,337) =12.049$, $p < 0.05$). **Table 3** presents the results of linear regression analysis.

Table 3. Predictors of poor sleep quality

Variables	B	Std. Er	Beta	T	P	95.0% CI for B	
						Lower	Upper
PROMIS 8b	0.071	0.025	0.141	2.786	0.006*	0.021	0.121
SHI	-0.011	0.032	-0.019	-0.356	0.722	-0.075	0.052
ESS	0.241	0.056	0.237	4.337	0.000*	0.132	0.351
DBAS	0.343	0.115	0.152	2.993	0.003*	0.118	0.569
SF-12 (PCS)	-0.097	0.030	-0.162	-3.191	0.002*	-0.157	-0.037

PROMIS 8b: 8-item PROMIS Sleep Disturbance Short Form; SHI: Sleep hygiene index; ESS: Epworth sleepiness scale; DBAS: Dysfunctional Beliefs and Attitudes about Sleep; SF-12 (PCS): physical health component of SF-12

4. Discussion

The aim of this study was to determine the prevalence and risk factors of poor quality of sleep among working women. Women are nearly twice as likely as males to suffer from poor sleep quality and face an increased risk of disrupted sleep and fatigue. The current study indicated that the prevalence of poor sleep quality was significantly high at 83.1%. The prevalence seen in this study is analogous to the 66% reported in a Brazilian study [22]. In contrast to studies conducted in Canada (52.8%) and Southeast Texas (43.7%), the prevalence seen in this study is greater [23].

The findings of our study demonstrated that the physical component score of quality of life (QoL) significantly predicts poor sleep quality in working women. This corresponds with previous studies indicating that inadequate physical health, encompassing chronic pain, exhaustion, and physical constraints, directly influences sleep disruptions [24]. Working women frequently balance numerous commitments, and the physical pressure from occupational demands, caregiving duties, and inadequate recuperation time might intensify sleep disturbances [25]. Furthermore, physical health ailments, including musculoskeletal disorders and cardiovascular troubles, have been demonstrated to impair sleep, resulting in diminished sleep efficiency and quality [26]. Also, A Taiwanese cross-sectional study of 435 female shift nurses found a connection between poor sleep and QoL [27]. One more study found that sleep quality and daily disruptions predicted physical HRQoL [28]. This suggests the influence of sleep quality on physical HRQoL is typically strong, while the mental impact is less, thus corroborating our findings. This correlation findings between physical health and sleep quality of our study underscores the necessity of addressing overall well-being in treatments aimed at enhancing sleep among working women, highlighting the imperative for holistic strategies that include both physical and mental health factors.

Our findings also corroborate with prior research indicating that inadequate sleep health, as assessed by the PROMIS Sleep Disturbance 8b scale, forecasts poor sleep quality in working women. Comparable studies demonstrate that elevated PROMIS 8b scores, indicative of heightened sleep disturbance, correlate with augmented daytime sleepiness and reduced sleep satisfaction [29]. This correlation is likely attributable to increased stress and work obligations that interfere with sleep habits and recovery [30]. Furthermore, employed women often indicate that occupational stress and caregiving duties intensify sleep disturbances, highlighting the correlation between PROMIS-assessed sleep health and adverse sleep outcomes [31]. Additionally, findings of this study showed that maladaptive beliefs and attitudes towards sleep is a significant predictor of poor sleep quality in women. This aligns with an expanding corpus of research that underscores how maladaptive cognitive behaviours associated with sleep might intensify sleep disturbances, especially in women. Dysfunctional attitudes, such the fear of insomnia and its anticipated repercussions or an excessive need for sleep regulation, can induce increased arousal and anxiety over sleep, ultimately affecting total sleep quality [32].

Women, specifically, seem more vulnerable to these cognitive tendencies owing to elevated baseline levels of worry and rumination relative to men [33]. Studies indicate that women generally express heightened concern around sleep and its repercussions compared to men, resulting in a higher susceptibility to sleep disorders [34]. Dysfunctional beliefs frequently center on inflated worries regarding the effects of inadequate sleep on everyday performance, resulting in an intensified sense of urgency and pressure to attain "perfect" sleep. This urgency paradoxically results in greater difficulty in falling asleep and diminished sleep quality due to heightened alertness. A study by Carney et al. (2010) indicated that elevated sleep-related anxiety and maladaptive beliefs regarding sleep correlated with

increased severity of insomnia symptoms in women.[35] Our results also indicate that excessive daytime sleepiness (EDS) is a substantial predictor of poor sleep quality in women. This corresponds with current literature indicating that EDS may foster a self-reinforcing cycle of inadequate sleep and heightened daytime weariness, particularly in women, who frequently encounter distinct biological and social stressors affecting their sleep.

Biological and hormonal factors significantly influence the correlation between EDS and sleep quality in women. Hormonal variations throughout the menstrual cycle, pregnancy, and menopause might result in interrupted sleep and increased daytime drowsiness [36]. Psychological stressors, such as elevated levels of anxiety and depression in women, seem to affect the link between EDS and sleep quality. Literature suggests that women are more prone to stress and anxiety related to performance and caregiving responsibilities, potentially resulting in heightened daytime exhaustion and subsequently diminished sleep quality [37]. This social and emotional stress may result in "sleep anticipation anxiety," where the apprehension of encountering EDS the next day fosters a self-reinforcing cycle of diminished sleep quality and increased daytime drowsiness [34]. The correlation between EDS and inadequate sleep quality in women seems to be mutually reinforcing. Women with elevated EDS may resort to maladaptive coping mechanisms, such as daytime napping or caffeine consumption, which might disrupt nocturnal sleep [38]. Our findings demonstrate a high prevalence of poor quality of sleep among working women and found that sleep health, dysfunctional attitudes and beliefs about sleep, daytime sleepiness, and physical component score of quality of life as significant predictors of poor sleep quality. These findings underscore the need for the development of effective patient-centered preventive interventions and treatment strategies.

4.1. Limitations of the study and future recommendations

A few caveats should be considered, along with the findings of our study. We employed a cross-sectional nature of survey, which made it impossible to determine the causal relationships between the study variables. We have included a wide age range and did not exclude the peri and pre-menopausal women. We have not addressed work environment, family responsibilities and financial status of the participants. The results were based on the self-reports of the participants, which made it susceptible to recall and social desirability biases. However, at the same time, a large sample size compensates for these issues. Future study should investigate specialized therapies, tailored to the specific requirements of working women, and examine the influence of workplace policies on enhancing sleep health.

5. Conclusion

This study found a considerable prevalence of poor quality of sleep among working women. Poor sleep

quality is correlated with factors such as daytime sleepiness, sleep health, attitudes and beliefs about sleep, and the physical component scores of quality of life. These findings have significant implications for programs designed to enhance sleep quality in employed women. By mitigating excessive daytime drowsiness, enhancing physical health, and confronting maladaptive sleep beliefs, clinicians can assist women in attaining more restful sleep and enhanced well-being. This study underscores the essential requirement for customised, multimodal strategies to improve sleep quality in working women, thereby benefiting their physical health, psychological well-being, and overall quality of life. Moreover, by creating health education and promotion efforts that consider the predictors of poor quality of sleep, it might be possible to reduce the burden of insufficient sleep among working women.

Statements and Declarations

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Data availability statement: The data are not publicly available due to restrictions and their containing information that could compromise the privacy of research participant

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