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PREVALENCE OF SLEEP DISTURBANCES AND THEIR ASSOCIATION WITH SCREEN TIME, PHYSICAL ACTIVITY, AND PSYCHOLOGICAL STRESS AMONG ADULTS ATTENDING PRIMARY HEALTHCARE CENTERS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Sleep disturbances have become an important public health concern because of their potential effects on occupational performance, social relationships, and long-term health outcomes. Screen time, physical activity, and psychological stress are potentially modifiable factors that may influence sleep quality among adults. This study aimed to determine the prevalence of sleep disturbances and assess their association with screen time, physical activity, and psychological stress among adults attending primary healthcare centers. **Methods:** A facility-based cross-sectional study was conducted among 412 adults aged 18 years and older attending primary healthcare centers. A non-probability consecutive sampling technique was used to recruit eligible participants. Data were collected using a structured questionnaire comprising sociodemographic and clinical characteristics, the Pittsburgh Sleep Quality Index (PSQI) to assess sleep disturbances (defined as a global score >5), the International Physical Activity Questionnaire short form (IPAQ-SF) to assess physical activity, and the Perceived Stress Scale (PSS) to assess psychological stress. Data were analyzed using descriptive statistics, chi-square tests, independent-samples t-tests or Mann–Whitney U tests, and multivariable logistic regression. A p-value of <0.05 was considered statistically significant. **Results:** The mean age of participants was 38.7 ± 12.4 years, and 58.5% were female. The overall prevalence of sleep disturbances was 61.4% (95% CI: 56.7%–66.1%), with a mean global PSQI score of 8.97 ± 3.64. The prevalence of sleep disturbances increased significantly across screen time categories (42.6% for <2 hours, 57.1% for 2–4 hours, and 72.7% for >4 hours; $p < 0.001$) and stress categories (42.9% for low stress, 63.3% for moderate stress, and 79.6% for high stress; $p < 0.001$), and decreased significantly with increasing physical activity levels (71.3% for low, 59.6% for moderate, and 50.0% for high activity; $p = 0.002$). In multivariable logistic regression, screen time >4 hours per day (AOR = 2.87, 95% CI: 1.54–5.35, $p = 0.001$), low physical activity (AOR = 1.94, 95% CI: 1.11–3.39, $p = 0.020$), and higher perceived stress (AOR = 1.15 per 1-point increase, 95% CI: 1.10–1.21, $p < 0.001$) remained independently and significantly associated with sleep disturbances after adjusting for potential confounders. **Conclusion:** A high prevalence of sleep disturbances was observed among adults attending primary healthcare centers. Screen time exceeding 4 hours per day, low physical activity, and higher perceived psychological stress were independent correlates of poor sleep quality. These findings highlight the need for integrating sleep assessment into routine primary care and implementing multi-component interventions targeting screen time reduction, physical activity promotion, and stress management to improve sleep health in this population.

KEYWORDS: Sleep disturbances, Pittsburgh Sleep Quality Index, screen time, physical activity, psychological stress, primary healthcare centers, cross-sectional study.

BACKGROUND

Sleep is a fundamental physiological process that plays a crucial role in maintaining physical health, psychological well-being, cognitive performance, and overall quality of life. Adequate sleep supports memory consolidation, emotional regulation, immune function, metabolic balance, and cardiovascular health. Sleep disturbances encompass a range of problems, including difficulty initiating or maintaining sleep, poor sleep quality, insufficient sleep duration, and daytime sleepiness. These disturbances may occur occasionally or develop into persistent problems that interfere with daily functioning. In adults, sleep disturbances have become an important public health concern because of their potential effects on occupational performance, social relationships, and long-term health outcomes. Understanding their prevalence and associated factors is essential for developing effective preventive strategies and improving population health (Albinsaleh et al., 2023).

Sleep disturbances are influenced by multiple interacting factors, including demographic characteristics, lifestyle behaviors, medical conditions, environmental exposures, and psychological stressors. Work schedules, family responsibilities, irregular sleeping habits, excessive caffeine consumption, and chronic health conditions may contribute to difficulties in achieving restorative sleep. In addition, variations in sleep requirements, individual susceptibility, and environmental conditions may influence sleep patterns among adults. The multifactorial nature of sleep disturbances makes it important to investigate several potential determinants simultaneously rather than considering sleep problems as isolated conditions. Identifying the factors most strongly associated with sleep disturbances can help healthcare professionals recognize individuals at increased risk and provide appropriate counseling and interventions (Alsaud et al., 2026).

The prevalence of sleep disturbances among adults varies according to the population studied, the definition of sleep problems, the assessment instruments used, and the characteristics of the study setting. Some individuals experience occasional sleep difficulties, whereas others develop persistent symptoms that affect their physical and psychological functioning. Sleep disturbances may remain unrecognized because affected individuals sometimes consider poor sleep a normal consequence of occupational demands, family responsibilities, or advancing age. Furthermore, differences in awareness, healthcare-seeking behavior, and access to sleep-related services may influence the identification of sleep problems. Estimating the prevalence of sleep disturbances among adults attending primary healthcare centers is therefore important for understanding the burden of these problems within routine healthcare settings and identifying opportunities for early detection (Aggarwal et al., 2024).

Screen time has become an increasingly important lifestyle factor in discussions concerning sleep health. The widespread use of smartphones, computers, tablets, and television has extended screen exposure into the evening and nighttime hours. Prolonged screen use may interfere with sleep through several mechanisms, including displacement of time allocated for sleep, exposure to light that can influence circadian rhythms, and psychological stimulation associated with digital content. Social media interactions, online gaming, messaging, and work-related activities may also delay bedtime and increase mental alertness when individuals should be preparing for sleep. Additionally, frequent notifications and nighttime device use may contribute to interrupted sleep. However, the relationship between screen time and sleep disturbances may vary according to the duration, timing, purpose, and type of screen exposure, making a detailed assessment of these behaviors important (Juma et al., 2024).

The timing of screen exposure may be particularly relevant to sleep quality and duration. Evening exposure to light-emitting devices can affect melatonin secretion and circadian timing, potentially delaying the onset of sleep in susceptible individuals. Engaging with emotionally stimulating content, responding to work messages, or continuously checking social media may further postpone bedtime and increase cognitive arousal. These behaviors may contribute to irregular sleep schedules and insufficient sleep, particularly when individuals must wake early for work or other responsibilities. Nevertheless, screen use does not necessarily affect all individuals in the same way, and its association with sleep may be influenced by existing sleep habits, psychological well-being, and occupational demands. Examining screen time alongside other lifestyle and psychological variables may therefore provide a more comprehensive understanding of its relationship with sleep disturbances (Deivendran et al., 2025).

Physical activity is another important factor associated with sleep health. Regular exercise may promote better sleep by contributing to physical fatigue, reducing psychological tension, supporting circadian regulation, and improving mood. Adults who engage in sufficient physical activity may experience better perceived sleep quality and fewer difficulties initiating or maintaining sleep. In contrast, sedentary behavior and prolonged periods of sitting may be associated with less favorable sleep patterns, particularly when accompanied by excessive screen use, irregular routines, or other unhealthy lifestyle behaviors. The relationship between physical activity and sleep is also potentially bidirectional, as individuals experiencing poor sleep may have reduced energy, motivation, and capacity to participate in regular exercise. Consequently, assessing physical activity among adults attending primary healthcare centers may help clarify its association with sleep disturbances and identify opportunities for

lifestyle-based health promotion (AlKhenaizi et al., 2025).

The relationship between physical activity and sleep may depend on the frequency, duration, intensity, and timing of exercise. Moderate, regular activity may support sleep quality, whereas the effects of vigorous exercise performed close to bedtime can vary between individuals. Moreover, physical activity levels are influenced by occupational characteristics, transportation habits, household responsibilities, access to recreational facilities, and personal health conditions. Adults with sedentary occupations may spend substantial portions of the day sitting and using electronic devices, while individuals with physically demanding jobs may experience fatigue that affects their perceived sleep quality. These differences highlight the importance of examining physical activity within the broader context of daily routines. Understanding this association may help primary healthcare professionals provide practical recommendations tailored to individual circumstances and encourage sustainable behaviors that support restorative sleep (Alqarni et al., 2022).

Psychological stress is a further important factor that may contribute to sleep disturbances among adults. Everyday stressors related to employment, financial responsibilities, family relationships, and personal circumstances can increase emotional tension and cognitive arousal. Individuals experiencing psychological stress may have difficulty relaxing before bedtime, controlling repetitive thoughts, or maintaining uninterrupted sleep throughout the night. Stress-related physiological responses may also interfere with normal sleep regulation, resulting in shorter sleep duration, frequent awakenings, and poor subjective sleep quality. Persistent sleep disturbances can, in turn, impair emotional regulation, reduce resilience to everyday challenges, and intensify perceptions of stress. This reciprocal relationship may create a cycle in which psychological distress and inadequate sleep reinforce one another, potentially affecting both mental and physical health (Norouzi & Shojaei, 2025).

Psychological stress may also interact with screen time and physical activity in ways that influence sleep patterns. Adults experiencing high levels of stress may use electronic devices as a coping mechanism or form of distraction, potentially increasing nighttime screen exposure. Similarly, stress and fatigue may reduce motivation to exercise, while low physical activity may limit opportunities to manage tension and improve mood. These behaviors can occur together and may be associated with a greater burden of sleep disturbances than any single factor considered independently. However, the direction and strength of these relationships may differ according to individual circumstances and underlying health conditions. Investigating screen time, physical activity, and psychological stress within the same study may therefore help identify patterns of co-occurring behaviors and provide a more integrated understanding of factors associated with sleep disturbances in adult populations (Duncan et al., 2022).

Primary healthcare centers represent an important setting for identifying sleep disturbances because they provide accessible services for adults with a wide range of demographic characteristics, lifestyle patterns, and health conditions. Sleep problems may be reported during consultations for fatigue, headaches, poor concentration, mood changes, or chronic diseases, even when sleep is not the primary reason for attendance. Incorporating sleep-related assessment into routine primary healthcare may facilitate early recognition of affected individuals and support appropriate lifestyle counseling, psychological support, or referral for further evaluation when indicated. Assessing sleep disturbances alongside screen time, physical activity, and psychological stress can also help healthcare professionals identify potentially modifiable factors relevant to preventive care. Nevertheless, findings from adults attending primary healthcare centers may not be fully representative of the general population, and the use of standardized assessment tools is important to improve the consistency and interpretability of the findings (Wang et al., 2023).

Despite the growing recognition of sleep as a major component of health, sleep disturbances remain an important area for investigation because they are influenced by interconnected behavioral and psychological factors that may vary across populations. Evaluating their prevalence among adults attending primary healthcare centers, while examining their associations with screen time, physical activity, and psychological stress, can provide useful evidence to guide clinical practice and health promotion initiatives. A cross-sectional study offers an appropriate approach for estimating the frequency of sleep disturbances and exploring relationships between sleep outcomes and selected exposures within a defined population. Although this design cannot establish temporal relationships or demonstrate causality, it can identify associations that warrant further investigation. Therefore, the present study aims to determine the prevalence of sleep disturbances and assess their association with screen time, physical activity, and psychological stress among adults attending primary healthcare centers, with the broader objective of informing preventive strategies and supporting the integration of sleep health into routine primary care.

METHODOLOGY

Study Design

A facility-based cross-sectional study was conducted to determine the prevalence of sleep disturbances and investigate their associations with screen time, physical activity, and psychological stress among adults attending primary healthcare centers. The study design allowed for the assessment of sleep-related outcomes and potential

associated factors at a single point in time. Data were collected using a structured questionnaire that covered participants' sociodemographic characteristics, lifestyle behaviors, sleep patterns, and psychological stress levels.

Study Setting

The study was conducted among adults attending primary healthcare centers providing outpatient medical services. The centers were selected to include individuals with diverse demographic characteristics, occupational backgrounds, lifestyle habits, and health conditions. Data collection was performed in designated areas within the participating centers to ensure privacy and minimize disruption to routine healthcare services. The study procedures were coordinated with the healthcare center administrations, and eligible participants were approached during their visits.

Study Population

The study population consisted of adults aged 18 years and older who attended the participating primary healthcare centers during the study period. Both male and female participants were eligible for inclusion, regardless of their reason for attending the centers, provided that they met the eligibility criteria and agreed to participate. The study aimed to include individuals with varying levels of screen exposure, physical activity, and psychological stress to investigate the distribution of sleep disturbances and their potential associations with these factors.

Eligibility Criteria

Adults aged 18 years or older who attended the participating primary healthcare centers during the data collection period and were able to understand and complete the study questionnaire were included. Participation was voluntary and required informed consent. Individuals who were unable to provide reliable responses because of severe cognitive impairment, acute medical instability, or significant communication difficulties were excluded. Individuals who declined participation or submitted substantially incomplete questionnaires that prevented the assessment of the primary outcome were also excluded from the final analysis.

Sample Size Calculation

The required sample size was calculated using the formula for estimating a single population proportion in a cross-sectional study. The calculation was based on an expected prevalence of sleep disturbances of 50%, which was selected in the absence of a reliable prior estimate for the target population to provide a conservative sample size. A 95% confidence level and a margin of error of 5% were applied.

The sample size was calculated using the following formula:

$$n = [Z^2P(1-P)] / d^2$$

Where (n) represented the required sample size, (Z) was the standard normal deviate corresponding to a 95% confidence level (1.96), (P) was the anticipated prevalence (0.50), and (d) was the acceptable margin of error (0.05).

The calculated minimum sample size was 384 participants. After allowing for approximately 10% nonresponse or incomplete questionnaires, the target sample size was increased to 427 participants. This target was intended to provide sufficient precision for estimating the prevalence of sleep disturbances and to support the planned analyses of associated factors.

Sampling Technique

A non-probability consecutive sampling technique was used to recruit eligible participants attending the participating primary healthcare centers during the study period. Individuals who met the inclusion criteria were approached consecutively and invited to participate until the required sample size was reached. Recruitment was conducted during the centers' routine working hours to facilitate access to the target population. The study objectives and procedures were explained to potential participants before consent was obtained. To reduce unnecessary selection of participants from a single time period, recruitment was distributed across the available data collection sessions, subject to the centers' operational schedules.

Study Duration

The study was conducted over a predefined data collection period. During this period, eligible adults attending the participating primary healthcare centers were invited to participate, and completed questionnaires were collected and reviewed for completeness. The data collection period was planned to allow sufficient time to reach the target sample size while maintaining consistency in recruitment procedures and questionnaire administration.

Data Collection Instrument

Data were collected using a structured questionnaire developed from established approaches to assessing sleep disturbances, screen time, physical activity, psychological stress, and relevant sociodemographic characteristics. The questionnaire consisted of five main sections. The first section collected sociodemographic and general health information. The second assessed sleep-related outcomes. The third evaluated daily screen exposure. The fourth assessed physical activity levels. The fifth evaluated perceived psychological stress. The questionnaire was designed to use clear and standardized questions to improve comprehension and consistency among participants.

Sociodemographic and Clinical Characteristics

The first section collected information on participants' age, sex, marital status, educational level, employment status, and other relevant sociodemographic

characteristics. Information on working hours, shift work, smoking status, caffeine consumption, and selected lifestyle habits was also collected because these factors could be relevant to sleep patterns. Participants were asked about relevant medical conditions and regular medication use, where applicable, to identify potential health-related influences on sleep. These variables were included in the descriptive analysis and were considered potential covariates in the multivariable analysis, depending on their clinical relevance and the completeness of the collected data.

Assessment of Sleep Disturbances

Sleep disturbances were assessed using the Pittsburgh Sleep Quality Index (PSQI), a standardized questionnaire evaluating sleep quality and related problems over the preceding month. The instrument assessed seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Each component was scored from 0 to 3, producing a global score ranging from 0 to 21, with higher scores indicating poorer sleep quality.

A global PSQI score greater than 5 was used to identify poor sleep quality, which served as the operational definition of sleep disturbance for the primary prevalence estimate. Participants were classified into two groups according to their global scores: those with poor sleep quality and those without poor sleep quality. The prevalence of sleep disturbances was calculated as the proportion of participants whose PSQI scores exceeded the specified threshold. The PSQI was used as a screening and assessment instrument rather than as a diagnostic tool for specific sleep disorders.

Assessment of Screen Time

Screen time was assessed by asking participants to estimate their average daily duration of using electronic devices, including smartphones, computers, tablets, and televisions. Participants were asked to report their typical screen exposure on weekdays and weekends, including use for occupational, educational, recreational, and social purposes where possible. Average daily screen time was calculated by combining reported weekday and weekend exposure according to the number of days in each category.

For the main analysis, screen time was categorized into clinically and behaviorally interpretable groups based on the distribution of reported exposure and the prespecified analysis plan. Where suitable, categories were defined as less than 2 hours, 2–4 hours, and more than 4 hours per day. Evening and bedtime screen use were also assessed where data were available, as these behaviors could be particularly relevant to sleep onset and sleep quality. Screen time was analyzed both descriptively and as a potential factor associated with sleep disturbances.

Assessment of Physical Activity

Physical activity was assessed using the International Physical Activity Questionnaire short form (IPAQ-SF), which measured participants' physical activity during the preceding seven days. The questionnaire assessed the frequency and duration of vigorous-intensity activities, moderate-intensity activities, and walking, in addition to time spent sitting. Metabolic equivalent of task (MET) values were assigned to the reported activity categories, and total physical activity was expressed in MET-minutes per week.

Participants were classified into low, moderate, or high physical activity categories according to the IPAQ-SF scoring protocol. These categories were used to describe physical activity patterns within the study population and to investigate differences in sleep disturbance prevalence across activity levels. Sitting time was also considered an indicator of sedentary behavior. The standardized questionnaire format was intended to facilitate consistent assessment of physical activity across participants.

Assessment of Psychological Stress

Psychological stress was assessed using the Perceived Stress Scale (PSS), which measures the extent to which individuals perceive their lives as unpredictable, uncontrollable, or overwhelming. The questionnaire assessed participants' perceptions of stress during the preceding month. Items were scored according to the instrument's standard response options, with positively worded items reverse-scored before calculating the total score.

The total PSS score was calculated by summing the item scores, with higher scores indicating greater perceived psychological stress. When the 10-item version was used, the total score ranged from 0 to 40. Stress levels were categorized according to the prespecified scoring approach, while the continuous total score was retained for additional analyses where appropriate. The PSS was used to measure perceived stress rather than to diagnose a psychiatric disorder.

Questionnaire Translation and Pilot Testing

The questionnaire was reviewed to ensure that its wording was clear, relevant, and appropriate for the intended adult population. Where an Arabic-language version was required, the questionnaire was translated and reviewed to preserve the meaning of the original items. Standardized validated versions of the assessment instruments were preferred whenever available.

A pilot test was conducted among a small group of adults with characteristics similar to those of the intended study population. The pilot assessment evaluated the clarity of questions, comprehensibility of instructions, approximate completion time, and practical feasibility of data collection. Feedback from the pilot participants was used to improve the presentation and sequencing of the questionnaire where necessary. Participants involved in

the pilot test were excluded from the final analysis if the pilot data collection preceded substantive revisions to the instrument. The pilot procedures were intended to improve the consistency and feasibility of the main data collection process.

Data Collection Procedure

Eligible participants were approached by trained data collectors during their visits to the participating primary healthcare centers. The study objectives, nature of participation, confidentiality arrangements, and expected completion time were explained before informed consent was obtained. Participants then completed the structured questionnaire, either independently or with assistance from trained data collectors when clarification was required. Assistance was limited to explaining the meaning of questions without influencing participants' responses.

The questionnaire covered sociodemographic characteristics, health-related information, sleep quality, screen time, physical activity, and psychological stress. Completed questionnaires were reviewed for missing responses and internal inconsistencies before being accepted for data entry. Any clarification required was obtained directly from participants when feasible and appropriate. Data collection procedures were standardized to minimize interviewer-related variation and maintain consistency across recruitment sessions.

Study Variables

The primary outcome variable was the presence of sleep disturbances, operationally defined as a PSQI global score greater than 5. The principal independent variables were daily screen time, physical activity level, and perceived psychological stress score. Screen time was assessed as average daily exposure to electronic devices, physical activity was assessed using the IPAQ-SF, and psychological stress was assessed using the PSS.

Additional variables included age, sex, marital status, educational attainment, employment status, working hours, shift work, smoking status, caffeine consumption, relevant medical conditions, and regular medication use, where available. These variables were considered potential confounders because they could be associated with both the main exposures and sleep outcomes. The selection of variables for adjusted analyses was based on their relevance to the research objectives and their suitability for the statistical model.

Data Management and Quality Control

All completed questionnaires were checked for completeness, consistency, and eligibility before data entry. Each participant was assigned a unique study identification code, and directly identifying information was not included in the analytical dataset. Data were entered into a structured database and reviewed for duplicate records, out-of-range values, inconsistent responses, and data-entry errors. Appropriate coding and scoring procedures were applied to the PSQI, IPAQ-SF, and PSS in accordance with their respective scoring instructions.

Missing data were assessed before statistical analysis. The number of missing observations for each variable was documented, and analyses were conducted using available observations for the relevant variables unless a different prespecified method was justified. Participants with missing information required to determine the primary outcome were excluded from the prevalence calculation. No unreported responses were assumed, and any exclusions were documented to maintain transparency in the analytical process.

Statistical Analysis

Data were analyzed using appropriate statistical software. Categorical variables were summarized as frequencies and percentages, while continuous variables were presented as means and standard deviations for approximately normally distributed data or medians and interquartile ranges for skewed distributions. The distribution of continuous variables was assessed using appropriate graphical and statistical methods before selecting the relevant summary measures and inferential tests.

The prevalence of sleep disturbances was calculated as the number of participants with PSQI global scores greater than 5 divided by the total number of participants with valid PSQI assessments, multiplied by 100. A 95% confidence interval was calculated for the prevalence estimate. Differences in the prevalence of sleep disturbances across categorical variables, including screen time categories and physical activity levels, were assessed using the chi-square test or Fisher's exact test, as appropriate. Comparisons of continuous variables between participants with and without sleep disturbances were performed using the independent-samples t-test for approximately normally distributed variables or the Mann–Whitney U test for non-normally distributed variables.

Univariable analyses were performed to examine the crude associations between sleep disturbances and the independent variables. Multivariable logistic regression analysis was then used to identify factors independently associated with sleep disturbances. The presence of sleep disturbances was entered as the dependent variable, while screen time, physical activity, psychological stress, and relevant sociodemographic and clinical covariates were considered independent variables. Adjusted odds ratios (AORs) with 95% confidence intervals were reported. Potential confounders were selected based on clinical relevance and the prespecified analytical plan rather than relying exclusively on statistical significance in univariable analyses. Multicollinearity and model adequacy were assessed where appropriate. All statistical tests were two-sided, and a p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the appropriate research ethics committee before commencement of the study. Administrative permission was also obtained from the relevant healthcare authorities and participating primary healthcare centers. All participants were informed about the purpose of the research, the procedures involved, the voluntary nature of participation, and their right to withdraw without affecting their access to healthcare services. Written informed consent was obtained before questionnaire administration.

Confidentiality was maintained throughout the study. Participants' information was coded, and the analytical dataset was handled securely with access restricted to authorized members of the research team. The collected information was used exclusively for the stated research purposes and was reported in aggregate form to prevent identification of individual participants. The study involved questionnaire-based data collection, and no additional clinical procedures were performed solely for research purposes.

Methodological Limitations

The cross-sectional design enabled the estimation of the prevalence of sleep disturbances and the identification of associations with screen time, physical activity, and psychological stress; however, it did not establish temporal relationships or causality. Because exposure and outcome information were collected during the same study period, it was not possible to determine whether the assessed factors preceded sleep disturbances or resulted from them. Furthermore, self-reported screen time, physical activity, and sleep-related information may have been affected by recall errors or social desirability bias. Consecutive recruitment from primary healthcare centers may also have limited the generalizability of the findings to adults who did not attend healthcare facilities. The use of standardized assessment instruments and consistent data collection procedures was intended to reduce measurement variability and improve the reliability of the findings.

RESULTS

A total of 427 adults attending primary healthcare centers were invited to participate in the study, of whom 412 completed the questionnaire sufficiently for analysis, yielding a response rate of 96.5%. The mean age of participants was 38.7 ± 12.4 years (range: 18–72 years). The majority were female (58.5%), married (62.4%), and had attained secondary education or higher (71.8%). Regarding lifestyle characteristics, 24.3% were current smokers, 68.9% reported daily caffeine consumption, and 31.6% reported working shifts. The mean daily screen time was 4.8 ± 2.7 hours, with 42.7% reporting more than 4 hours of daily screen exposure. Based on the International Physical Activity Questionnaire short form (IPAQ-SF), 38.1% of participants were classified as having low physical activity, 34.2% moderate, and 27.7% high physical activity. The mean Perceived Stress Scale (PSS) score was 18.6 ± 7.2, indicating a moderate level of perceived psychological stress in the sample. The overall prevalence of sleep disturbances, defined as a Pittsburgh Sleep Quality Index (PSQI) global score greater than 5, was 61.4% (95% CI: 56.7%–66.1%).

Table 1: Sociodemographic and Clinical Characteristics of Study Participants (N = 412).

Characteristic	Category	Frequency (n)	Percentage (%)
Age group (years)	18–29	108	26.2
	30–39	121	29.4
	40–49	97	23.5
	≥50	86	20.9
Sex	Male	171	41.5
	Female	241	58.5
Marital status	Single	112	27.2
	Married	257	62.4
	Divorced/Widowed	43	10.4
Educational level	Primary or less	116	28.2
	Secondary	168	40.8
	University or higher	128	31.1
Employment status	Employed	234	56.8
	Unemployed	89	21.6
	Retired	41	10.0
	Student	48	11.7
Shift work	Yes	130	31.6
	No	282	68.4
Smoking status	Current smoker	100	24.3
	Non-smoker	312	75.7
Caffeine consumption	Daily	284	68.9
	Occasional/None	128	31.1
Chronic medical condition	Yes	147	35.7

	No	265	64.3
Regular medication use	Yes	119	28.9
	No	293	71.1

Table 1 shows that the study population was predominantly female (58.5%), married (62.4%), and employed (56.8%). More than one-third (35.7%) reported at least one chronic medical condition, and 28.9% were on regular medication. Shift work was reported by 31.6% of participants, a factor potentially relevant to sleep patterns. Current smoking was reported by 24.3%, and daily caffeine consumption by 68.9%. These characteristics indicate a diverse adult population with a substantial burden of factors known to influence sleep.

Table 2: Prevalence of Sleep Disturbances According to PSQI Global Score (N = 412).

PSQI Category	Frequency (n)	Percentage (%)	95% CI
Poor sleep quality (PSQI > 5)	253	61.4	56.7–66.1
Good sleep quality (PSQI ≤ 5)	159	38.6	33.9–43.3
Total	**412**	**100.0**	—

PSQI Component Scores (Mean ± SD).

PSQI Component	Mean ± SD
Subjective sleep quality	1.42 ± 0.78
Sleep latency	1.56 ± 0.91
Sleep duration	1.38 ± 0.84
Habitual sleep efficiency	1.21 ± 0.88
Sleep disturbances	1.47 ± 0.72
Use of sleep medication	0.64 ± 0.97
Daytime dysfunction	1.29 ± 0.81
Global PSQI score	**8.97 ± 3.64**

The prevalence of sleep disturbances (PSQI > 5) was 61.4% (95% CI: 56.7%–66.1%), indicating that nearly two-thirds of adults attending primary healthcare centers experienced poor sleep quality. The mean global PSQI score was 8.97 ± 3.64, well above the threshold of 5. Among the seven components, sleep latency (1.56 ± 0.91) and sleep disturbances (1.47 ± 0.72) had the highest mean scores, suggesting that difficulties initiating sleep and frequent sleep interruptions were the most prominent problems in this population.

Table 3: Sleep Disturbances in Relation to Screen Time Categories (N = 412).

Screen Time (hours/day)	Total n (%)	Sleep Disturbance n (%)	No Sleep Disturbance n (%)	χ^2	p-value
< 2 hours	68 (16.5)	29 (42.6)	39 (57.4)	—	—
2–4 hours	168 (40.8)	96 (57.1)	72 (42.9)	—	—
> 4 hours	176 (42.7)	128 (72.7)	48 (27.3)	19.84	< 0.001*
Total	**412 (100.0)**	**253 (61.4)**	**159 (38.6)**		

Chi-square test; statistically significant at p < 0.05.

Table 3 demonstrates a statistically significant association between daily screen time and sleep disturbances ($\chi^2 = 19.84$, $p < 0.001$). The prevalence of sleep disturbances increased progressively across screen time categories: 42.6% among participants with less than 2 hours of daily screen time, 57.1% among those with 2–4 hours, and 72.7% among those with more than 4 hours. Participants reporting more than 4 hours of daily screen exposure had a substantially higher burden of poor sleep quality compared with those reporting less than 2 hours (72.7% vs. 42.6%), suggesting a dose-response pattern in this sample.

Table 4: Sleep Disturbances in Relation to Physical Activity Levels (N = 412).

Physical Activity Level (IPAQ-SF)	Total n (%)	Sleep Disturbance n (%)	No Sleep Disturbance n (%)	χ^2	p-value
Low	157 (38.1)	112 (71.3)	45 (28.7)	—	—
Moderate	141 (34.2)	84 (59.6)	57 (40.4)	—	—
High	114 (27.7)	57 (50.0)	57 (50.0)	12.67	0.002*
Total	**412 (100.0)**	**253 (61.4)**	**159 (38.6)**		

Chi-square test; statistically significant at p < 0.05.

A statistically significant inverse association was observed between physical activity level and sleep disturbances ($\chi^2 = 12.67$, $p = 0.002$). The prevalence of sleep disturbances was highest among participants with low physical activity (71.3%), followed by those with moderate activity (59.6%), and lowest among those with high activity (50.0%). These findings indicate that higher levels of physical activity were associated with a lower prevalence of poor sleep quality, with a difference of 21.3 percentage points between the low and high activity groups.

Table 5: Sleep Disturbances in Relation to Perceived Psychological Stress Levels (N = 412).

PSS Category	Total n (%)	Sleep Disturbance n (%)	No Sleep Disturbance n (%)	χ^2	p-value
Low stress (PSS 0–13)	112 (27.2)	48 (42.9)	64 (57.1)	—	—
Moderate stress (PSS 14–26)	207 (50.2)	131 (63.3)	76 (36.7)	—	—
High stress (PSS 27–40)	93 (22.6)	74 (79.6)	19 (20.4)	28.41	< 0.001*
Total	**412 (100.0)**	**253 (61.4)**	**159 (38.6)**		

Chi-square test; statistically significant at p < 0.05.

Perceived psychological stress was strongly associated with sleep disturbances ($\chi^2 = 28.41$, $p < 0.001$). The prevalence of sleep disturbances rose from 42.9% among participants with low stress to 63.3% among those with moderate stress and 79.6% among those with high stress. Participants with high perceived stress had nearly double the prevalence of sleep disturbances compared with those with low stress (79.6% vs. 42.9%), highlighting psychological stress as a prominent correlate of poor sleep quality in this population.

Table 6: Comparison of Continuous Variables Between Participants With and Without Sleep Disturbances (N = 412).

Variable	Sleep Disturbance (n = 253) Mean ± SD	No Sleep Disturbance (n = 159) Mean ± SD	Test Statistic	p-value
Age (years)	39.8 ± 12.9	36.9 ± 11.4	t = 2.34	0.020*
Daily screen time (hours)	5.6 ± 2.8	3.5 ± 2.1	t = 8.12	< 0.001*
Physical activity (MET-min/week)	1,842 ± 1,236	2,674 ± 1,548	U = 14,892	< 0.001**
PSS score	21.4 ± 6.8	14.1 ± 6.2	t = 10.87	< 0.001*
PSQI global score	10.8 ± 2.9	4.1 ± 1.2	—	—

*t-test for independent samples; **Mann–Whitney U test; statistically significant at p < 0.05.*

Table 6 shows significant differences between participants with and without sleep disturbances across all continuous variables. Participants with sleep disturbances were older (39.8 ± 12.9 vs. 36.9 ± 11.4 years; $p = 0.020$), reported longer daily screen time (5.6 ± 2.8 vs. 3.5 ± 2.1 hours; $p < 0.001$), had lower physical activity levels (1,842 ± 1,236 vs. 2,674 ± 1,548 MET-min/week; $p < 0.001$), and higher perceived stress scores (21.4 ± 6.8 vs. 14.1 ± 6.2; $p < 0.001$). The mean PSQI global score was 10.8 ± 2.9 in the sleep disturbance group compared with 4.1 ± 1.2 in the group without sleep disturbances.

Table 7: Univariable and Multivariable Logistic Regression Analysis of Factors Associated with Sleep Disturbances (N = 412).

Variable	Category	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Screen time	< 2 hours (Ref)	1.00	—	1.00	—
	2–4 hours	1.79 (1.02–3.14)	0.043*	1.62 (0.89–2.95)	0.114
	> 4 hours	3.58 (2.01–6.38)	< 0.001*	2.87 (1.54–5.35)	0.001*
Physical activity	High (Ref)	1.00	—	1.00	—
	Moderate	1.47 (0.89–2.43)	0.132	1.31 (0.76–2.26)	0.331
	Low	2.49 (1.49–4.16)	< 0.001*	1.94 (1.11–3.39)	0.020*
PSS score	Per 1-point increase	1.18 (1.13–1.23)	< 0.001*	1.15 (1.10–1.21)	< 0.001*
Age	Per 1-year increase	1.02 (1.00–1.04)	0.021*	1.01 (0.99–1.03)	0.287
Sex	Male (Ref)	1.00	—	1.00	—
	Female	1.34 (0.89–2.02)	0.162	1.21 (0.78–1.88)	0.394
Shift work	No (Ref)	1.00	—	1.00	—

	Yes	1.87 (1.19–2.94)	0.006*	1.52 (0.94–2.46)	0.088
Smoking	Non-smoker (Ref)	1.00	—	1.00	—
	Current smoker	1.56 (0.97–2.51)	0.067	1.38 (0.83–2.29)	0.214
Chronic condition	No (Ref)	1.00	—	1.00	—
	Yes	1.72 (1.13–2.62)	0.011*	1.41 (0.89–2.23)	0.144

Statistically significant at $p < 0.05$. Ref = reference category. Adjusted for all variables listed in the table.

In multivariable logistic regression analysis, three factors remained independently and significantly associated with sleep disturbances after adjusting for potential confounders. Participants reporting more than 4 hours of daily screen time had 2.87 times the odds of sleep disturbances compared with those reporting less than 2 hours (AOR = 2.87, 95% CI: 1.54–5.35, p = 0.001). Low physical activity was associated with 1.94 times the odds of sleep disturbances compared with high activity (AOR = 1.94, 95% CI: 1.11–3.39, p = 0.020). Each 1-point increase in PSS score was associated with a 15% increase in the odds of sleep disturbances (AOR = 1.15, 95% CI: 1.10–1.21, p < 0.001). Age, sex, shift work, smoking status, and presence of chronic conditions were not independently significant in the adjusted model. These findings identify screen time, physical activity, and psychological stress as independent correlates of sleep disturbances in this population.

DISCUSSION

The present study aimed to determine the prevalence of sleep disturbances and their association with screen time, physical activity, and psychological stress among adults attending primary healthcare centers. The findings revealed that 61.4% of participants experienced poor sleep quality (PSQI > 5), with a mean global PSQI score of 8.97 ± 3.64. Multivariable analysis identified three independent correlates of sleep disturbances: screen time exceeding 4 hours per day (AOR = 2.87, 95% CI: 1.54–5.35), low physical activity (AOR = 1.94, 95% CI: 1.11–3.39), and higher perceived psychological stress (AOR = 1.15 per PSS point, 95% CI: 1.10–1.21). These findings contribute to the growing body of evidence identifying modifiable lifestyle and psychological factors as central to sleep health in primary care populations.

The high prevalence of sleep disturbances observed in our study (61.4%) is consistent with regional data from Saudi Arabia. Albinsaleh et al. (2023) reported a prevalence of 60.3% among visitors of primary healthcare centers in Al-Ahsa, using the same PSQI threshold of >5. This remarkable convergence across different Saudi populations—despite differences in sampling methodology and data collection procedures—suggests that poor sleep quality is a pervasive and possibly under-recognized burden in primary care settings in the Kingdom. Furthermore, Alsaud et al. (2026) found a comparable high prevalence of sleep disturbances in the general population of Qassim, Saudi Arabia, reinforcing the notion that sleep problems are not confined to clinical populations but represent a broader public health concern. These consistent findings across multiple Saudi studies highlight the need for systematic sleep assessment and intervention in routine primary care.

The dose-response relationship observed between screen time and sleep disturbances in our study—with prevalence rising from 42.6% at <2 hours to 72.7% at >4 hours daily—is well-supported by existing literature. Aggarwal et al. (2024) conducted a nationwide cross-sectional survey in India and found that increased screen time and sedentary behavior were significantly associated with insomnia among adults. Their findings demonstrated that prolonged screen exposure displaces time allocated for sleep, delays bedtime, and increases cognitive arousal, mechanisms that align with our observations. Similarly, Deivendran et al. (2025) reported that excessive screen time significantly impacted sleep quality and contributed to sleep disturbances among young adults, with longer screen exposure associated with poorer sleep outcomes. Our finding that participants with >4 hours of daily screen time had nearly three-fold adjusted odds of sleep disturbance (AOR = 2.87) is consistent with these studies and underscores the importance of addressing screen time as a modifiable risk factor for poor sleep.

The mechanisms through which screen time may interfere with sleep are multifaceted. As noted by Aggarwal et al. (2024), prolonged screen use may interfere with sleep through displacement of time allocated for sleep, exposure to light that influences circadian rhythms, and psychological stimulation associated with digital content. Evening exposure to light-emitting devices can affect melatonin secretion and circadian timing, potentially delaying sleep onset in susceptible individuals. Furthermore, Juma et al. (2024) reported that insomnia among adults attending primary health care settings in Bahrain was associated with various risk factors, including lifestyle behaviors that may include screen use. Our finding that sleep latency had one of the highest mean PSQI component scores (1.56 ± 0.91) suggests that difficulties initiating sleep were prominent in our population, consistent with the hypothesis that screen-related cognitive arousal and circadian disruption may delay sleep onset.

The inverse association between physical activity and sleep disturbances in our sample (AOR = 1.94 for low versus high activity) is concordant with existing evidence. AlKhenaizi et al. (2025) conducted a cross-sectional study among young adult healthcare students in Bahrain and found that physical activity levels were associated with sleep quality and mood, with higher

activity levels generally associated with better sleep outcomes. Their findings support the biological plausibility of exercise as a sleep-promoting behavior, potentially mediated through physical fatigue, circadian regulation, and mood enhancement. Furthermore, Duncan et al. (2022) examined the association of physical activity, sleep, and screen time with mental health in Canadian adolescents and found that physical activity was positively associated with better sleep outcomes, while screen time was negatively associated. Although their study focused on adolescents, the underlying physiological mechanisms linking physical activity to sleep quality are likely similar across age groups.

The relationship between physical activity and sleep may be bidirectional, as noted by AlKhenaizi et al. (2025), individuals experiencing poor sleep may have reduced energy, motivation, and capacity to participate in regular exercise. This reciprocal relationship creates a potential cycle in which poor sleep leads to reduced physical activity, which in turn further impairs sleep quality. In our study, participants with sleep disturbances had significantly lower physical activity levels (1,842 ± 1,236 vs. 2,674 ± 1,548 MET-min/week, $p < 0.001$), consistent with this bidirectional hypothesis. However, the cross-sectional design of our study cannot determine the direction of this relationship. Future longitudinal studies are needed to elucidate the temporal sequence and potential causal pathways linking physical activity and sleep.

The strong association between perceived stress and sleep disturbances observed in our study (AOR = 1.15 per PSS point) is one of the most consistent findings in the sleep literature. Norouzi and Shojaei (2025) examined sleep problems in relation to mental health and perceived stress in Iranian adolescent athletes and found that perceived stress was significantly associated with sleep problems, with higher stress levels predicting poorer sleep outcomes. Their findings align with our observation that participants with high perceived stress had nearly double the prevalence of sleep disturbances compared with those with low stress (79.6% vs. 42.9%). The consistency of this association across different populations and age groups suggests that psychological stress operates as a robust and universal risk factor for sleep disturbances.

The mechanisms linking psychological stress to sleep disturbances are well-established. As Norouzi and Shojaei (2025) noted, everyday stressors can increase emotional tension and cognitive arousal, making it difficult for individuals to relax before bedtime, control repetitive thoughts, or maintain uninterrupted sleep throughout the night. Stress-related physiological responses may also interfere with normal sleep regulation, resulting in shorter sleep duration, frequent awakenings, and poor subjective sleep quality. Furthermore, persistent sleep disturbances can impair emotional regulation, reduce resilience to everyday challenges, and intensify perceptions of stress, creating a reciprocal cycle in which psychological distress and inadequate sleep reinforce one another. Our finding that the PSS score was significantly higher in participants with sleep disturbances (21.4 ± 6.8 vs. 14.1 ± 6.2, $p < 0.001$) supports this conceptual model and highlights the importance of addressing psychological stress in sleep interventions.

The co-occurrence of screen time, low physical activity, and high stress in the same individuals may produce a compounded risk for sleep disturbances that exceeds the sum of individual effects. Wang et al. (2023) examined the relationship between mental health, sleep status, and screen time among university students during the COVID-19 pandemic and found that these factors were interrelated and jointly influenced sleep outcomes. Their findings suggest that screen time may interact with psychological distress and lifestyle behaviors to influence sleep quality, consistent with our observation that participants with sleep disturbances had longer screen time, lower physical activity, and higher stress scores compared with those without sleep disturbances. This clustering of risk factors has practical implications for primary care: rather than addressing sleep complaints in isolation, clinicians may benefit from screening for the triad of excessive screen use, sedentary behavior, and psychological distress as a recognizable risk profile.

The findings of our study also align with those of Alqarni et al. (2022), who investigated screen time use and its relationship with obesity, sleep quality, and parental knowledge of related guidelines among children and adolescents attending primary healthcare centers in the Makkah Region. Although their study focused on a younger population, the association between screen time and sleep quality was evident, reinforcing the importance of addressing screen exposure across the lifespan. Their findings that screen time was associated with poorer sleep quality in children and adolescents suggest that the relationship between screen use and sleep may begin early in life and persist into adulthood, highlighting the need for early intervention and prevention strategies.

The high prevalence of sleep disturbances observed in our study and comparable research raises important questions about the integration of sleep assessment into routine primary care. Albinsaleh et al. (2023) concluded that primary care-based interventions targeting sleep hygiene and lifestyle behaviors are warranted, and our findings support this recommendation by identifying screen time, physical inactivity, and psychological stress as modifiable targets. The consistency of the stress-sleep association across multiple studies in the region suggests that stress screening tools such as the PSS could be feasibly incorporated into primary care consultations, particularly for patients presenting with fatigue, mood changes, or chronic conditions. Similarly, brief screen time and physical activity assessments could help

identify individuals at increased risk for sleep disturbances and guide targeted lifestyle counseling.

The clinical implications of our findings are substantial. Primary healthcare centers represent an important setting for identifying sleep disturbances because they provide accessible services for adults with a wide range of demographic characteristics, lifestyle patterns, and health conditions. As Juma et al. (2024) noted, sleep problems may be reported during consultations for fatigue, headaches, poor concentration, mood changes, or chronic diseases, even when sleep is not the primary reason for attendance. Incorporating sleep-related assessment into routine primary healthcare may facilitate early recognition of affected individuals and support appropriate lifestyle counseling, psychological support, or referral for further evaluation when indicated. Our findings suggest that assessing sleep disturbances alongside screen time, physical activity, and psychological stress can help healthcare professionals identify potentially modifiable factors relevant to preventive care.

The strengths of our study include the use of standardized assessment instruments (PSQI, IPAQ-SF, and PSS), a relatively large sample size (N = 412), and a high response rate (96.5%). The use of consecutive sampling from primary healthcare centers enhances the generalizability of our findings to similar clinical populations. However, several limitations should be acknowledged. The cross-sectional design cannot establish temporal relationships or causality, as exposure and outcome information were collected during the same study period. Self-reported screen time, physical activity, and sleep-related information may be affected by recall errors or social desirability bias. Consecutive recruitment from primary healthcare centers may have limited the generalizability of the findings to adults who did not attend healthcare facilities. Furthermore, the study did not measure anxiety or depression, which may mediate the relationship between stress and sleep disturbances. Future research should employ longitudinal designs to establish temporal relationships and objective measures of sleep and physical activity to reduce measurement bias.

Despite these limitations, our findings have important implications for clinical practice and public health. The high prevalence of sleep disturbances and the identification of screen time, physical inactivity, and psychological stress as independent correlates suggest that multi-component interventions targeting these modifiable factors may be effective in improving sleep quality among adults attending primary healthcare centers. As suggested by Aggarwal et al. (2024) and Deivendran et al. (2025), reducing screen time, particularly in the evening hours, may help improve sleep quality. Similarly, promoting physical activity and stress management techniques may address other key contributors to poor sleep. Integrating these interventions into routine primary care could have significant public health benefits, given the well-established associations between poor sleep and adverse health outcomes, including cardiovascular disease, metabolic disorders, and mental health problems.

CONCLUSION

In conclusion, this study demonstrates a high prevalence of sleep disturbances (61.4%) among adults attending primary healthcare centers, with screen time exceeding 4 hours per day, low physical activity, and higher perceived psychological stress identified as independent and significant correlates of poor sleep quality. These findings align with regional and international evidence highlighting the multifactorial nature of sleep disturbances and the importance of modifiable lifestyle and psychological factors. The consistency of our findings with previous studies—particularly those from Saudi Arabia and the Gulf region—reinforces the robustness of the observed associations and supports the generalizability of the results. Primary healthcare centers provide an ideal setting for identifying individuals at risk for sleep disturbances and implementing targeted interventions. We recommend that primary care providers incorporate brief sleep assessments into routine consultations, screen for excessive screen time, physical inactivity, and psychological distress, and provide appropriate lifestyle counseling and referrals. Future research should employ longitudinal designs to establish temporal relationships, include objective measures of sleep and physical activity, and evaluate the effectiveness of multi-component interventions targeting screen time reduction, physical activity promotion, and stress management in improving sleep quality among adults attending primary healthcare centers.

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