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Research Article

# Sleep Quality and Associated Factors Among Health Sciences Students at Cheikh Anta Diop University of Dakar, Senegal: A Cross-Sectional Study

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## Abstract

Background: Sleep plays essential homeostatic, restorative, cognitive and psychological roles, and health sciences students, who face intense academic pressure and early exposure to clinical responsibilities, are particularly vulnerable to poor sleep quality. Objectives: To assess sleep quality among health sciences students of Cheikh Anta Diop University of Dakar (Senegal) and to determine the sociodemographic, behavioural and psychological factors associated with it. Materials and Methods: A cross-sectional, analytical study was conducted from May to June 2026 among 333 students (medicine, pharmacy and dental surgery) of the Faculty of Medicine, Pharmacy and Odontology, Cheikh Anta Diop University of Dakar, Senegal, recruited by convenience sampling. Data were collected through a self-administered online questionnaire assessing sleep quality (Pittsburgh Sleep Quality Index, PSQI), anxiety and depressive symptoms (Hospital Anxiety and Depression Scale, HADS), well-being (adapted WHO-5 Well-Being Index) and physical activity (International Physical Activity Questionnaire–Short Form, IPAQ-SF). Factors associated with poor sleep quality were examined using multivariable logistic regression. Results: Participants' mean age was 22.8 years, with 52.9% women and 79.3% medical students. Poor sleep quality (PSQI >5) was found in 62.5% of students; mean sleep duration was 6.2 h and 68.2% slept less than 7 hours per night. In multivariable analysis, poor sleep quality was independently associated with screen time before bedtime (adjusted odds ratio [aOR] 3.06, 95% CI 1.39–6.75 for 1–2 h and aOR 2.31, 95% CI 1.06–5.03 for >2 h, versus <30 min), anxiety symptoms (aOR 2.17, 95% CI 1.23–3.81) and low well-being (aOR 2.80, 95% CI 1.47–5.33). Depressive symptoms were associated with poor sleep quality in bivariate analysis but not after adjustment for well-being. Sex, coffee consumption and physical activity level were not independently associated. Conclusion: Poor sleep quality was common among health sciences students in this faculty and was associated with longer pre-sleep screen exposure, anxiety symptoms and low psychological well-being. Given the cross-sectional design, the direction of these associations cannot be established. These findings support preventive strategies, such as sleep hygiene psychoeducation and early screening for psychological distress in university settings.

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## Keywords

Sleep Quality, Health Sciences Students, Screen Time, Anxiety, Depression, Senegal

## 1. Introduction

Sleep is a key indicator of physical and psychological health, particularly in populations exposed to high levels of stress. It plays essential homeostatic, restorative, cognitive and psychological roles that directly influence daytime functioning, learning and decision-making. In young adults, insufficient or poor-quality sleep can have adverse long-term consequences, favouring the emergence of chronic disease or worsening pre-existing mental health problems [1, 2].

Health sciences students constitute a particularly vulnerable population. The transition from secondary school to university life is accompanied by profound changes: separation from family, the need for autonomy, and a substantial increase in workload. Medical students face intense academic pressure combined with early exposure to suffering and professional responsibilities. These environmental and psychosocial factors are known to disrupt the sleep–wake cycle and impair sleep quality [3-5].

The literature reports a high prevalence of poor sleep quality among students, often exceeding that observed in the general population. A meta-analysis of 95 studies estimated the worldwide prevalence of poor sleep quality among medical students at 55.6% [6], and single-centre studies have reported rates above 50–60% [7-9]. Studies conducted in high-pressure settings, such as during the COVID-19 pandemic, have reported rates as high as 72.5% of poor sleepers among medical students [3]. In Africa, a recent meta-analysis of 35 studies including 16,275 university students reported a pooled prevalence of poor sleep quality above 60%, with stress and electronic device use at bedtime among the associated factors [10]; sleep disturbances have also been documented among university students in Niger [11]. In Senegal, available data remain scarce and concern specific groups, such as seventh-year medical students during clinical rotations, 76% of whom reported sleeping less than 7 hours per night [12], and elite athletes, 27.8% of whom had poor sleep quality [13]. The consequences of insufficient or poor-quality sleep are multiple: excessive daytime sleepiness, impaired concentration and attention, and chronic fatigue. Furthermore, students' overall lifestyle appears closely linked to these disturbances; digital media use, particularly at bedtime, has been consistently associated with shorter sleep duration and poorer sleep quality in adolescents and young adults [14, 15], and daily activity patterns have been linked to sleep quality in college students [16].

Beyond behavioural factors, mental health is a major correlate of sleep quality. Anxio-depressive symptoms affect a substantial proportion of the student population; in France, a quarter of students report anxious or depressive symptomatology, often associated with dysfunctional coping strategies such as psychotropic substance use or avoidance [5]. Moreover, studies reveal a strong correlation between sleep disorders (particularly insomnia) and the severity of anxiety and depressive symptoms, and longitudinal evidence indicates that this relationship is bidirectional [2, 17]. Anxiety, by promoting cognitive hyperarousal and rumination, may prolong sleep latency and fragment sleep. Similarly, depression and feelings of hopelessness have been associated with poor sleep quality, and sleep disturbances may even constitute a marker of suicide risk in young adults [3, 17].

Despite these observations, little data are available on the combined association of lifestyle habits (such as screen time) and psychological symptoms (anxiety, depression) with the sleep quality of health sciences students in Senegal, where existing studies have focused on specific subgroups and have not jointly examined behavioural and psychological factors using standardised instruments [12, 13].

The objective of this study was therefore to assess sleep quality among health sciences students of the Faculty of Medicine, Pharmacy and Odontology of Cheikh Anta Diop University of Dakar and to determine the sociodemographic, behavioural and psychological (anxiety symptoms, depressive symptoms, well-being) factors associated with it. We hypothesised that longer screen exposure before bedtime, anxiety and depressive symptoms and lower psychological well-being would be independently associated with higher odds of poor sleep quality.

## 2. Materials and Methods

### 2.1. Study Design and Setting

An observational, cross-sectional, descriptive and analytical study was conducted at the Faculty of Medicine, Pharmacy and Odontology (FMPO), Cheikh Anta Diop University of Dakar (UCAD), Senegal.

### 2.2. Study Period

Data were collected from May to June 2026, during the second semester of the academic year. This period was chosen because it fell outside examination and intensive-revision periods, to reduce the potential effect of acute examination-related stress on the study variables.

## 2.3. Study Population

The study population comprised students regularly enrolled in medicine, pharmacy and dental surgery at the FMPO/UCAD during the 2025–2026 academic year.

## 2.4. Inclusion, Non-inclusion and Exclusion Criteria

Students regularly enrolled at the FMPO/UCAD, aged 18 years or older, accessible during the collection period, who had read the information notice and given informed consent, were included. Pregnant students, students reporting a diagnosed sleep disorder (notably sleep apnoea or narcolepsy), and those on psychiatric treatment likely to strongly influence sleep or psychological state (notably antipsychotics or mood stabilisers) were not included. Incomplete questionnaires, those with missing data, inconsistent responses, or duplicate entries were excluded from the analysis.

## 2.5. Sampling

A non-probability convenience sampling method was used. Accessible FMPO/UCAD students were recruited mainly through digital channels, including class group chats, student relays and year-group representatives.

## 2.6. Data Collection

Data were collected using a self-administered online questionnaire designed on KoboToolbox, comprising a sociodemographic section and four standardised scales. The sociodemographic section collected age, sex, year of study, height, weight (used to calculate body mass index, BMI), housing type, paid employment status and weekly working hours, coffee consumption, screen time before bedtime, and daily sitting time, as well as pregnancy status, sleep disorders and heavy psychiatric treatment. Information on clinical placements and night duty was not collected. The full questionnaire is provided as Supplementary Material S1.

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) [18], a 19-item self-rated questionnaire covering the previous month that generates seven component scores (0–3) summed into a global score (0–21); a global score >5 indicates poor sleep quality. Bedtime, wake-up time and sleep duration were derived from PSQI items 1, 3 and 4. Physical activity level was assessed using the International Physical Activity Questionnaire, Short Form (IPAQ-SF) [19] and categorised as low (<600 Metabolic Equivalent Task (MET)-min/week), moderate (600–3000 MET-min/week) or high (>3000 MET-min/week); an additional question estimated average daily sitting time outside of sleep. Subjective psychological well-being was assessed with a five-item questionnaire adapted from the WHO-5 Well-Being Index [20]. Items (feeling happy and in good spirits; difficulty concentrating; feeling relaxed; feelings of anxiety or depression; feeling in good health) were rated on a five-point frequency scale from "never" (0) to "always" (4). The two negatively worded items were reverse-scored, and the raw score (0–20) was multiplied by 5 to obtain a percentage score (0–100), a score ≤50 indicating low well-being. Internal consistency was good (Cronbach's $\alpha = 0.81$). Anxiety and depressive symptoms were assessed using the Hospital Anxiety and Depression Scale (HADS) [21], which comprises an anxiety subscale (HADS-A) and a depression subscale (HADS-D) of seven items each (score 0–21); a subscale score ≥8 was used to define the presence of symptoms, scores of 8–10 being considered doubtful/possible and scores ≥11 probable [21, 22]. The combined use of the adapted WHO-5 and the HADS allowed both the positive dimension of mental well-being and the symptomatic anxio-depressive dimension to be captured, offering a more comprehensive assessment of students' psychological state. The questionnaire was administered in French, the language of instruction at the university, using published French versions of the PSQI and HADS [23, 24]. These versions have been validated in French-speaking populations but, to our knowledge, not among Senegalese students, and the adapted WHO-5 has not been formally validated; HADS and well-being results are therefore reported as screening-level measures rather than diagnoses.

## 2.7. Statistical Analysis

Data were exported from KoboToolbox and cleaned using Microsoft Excel. Statistical analyses were performed using Epi Info and R software. Qualitative variables were described using frequencies and percentages, and quantitative variables using means ± standard deviation (SD) and medians (interquartile range, IQR). Correlations between continuous scores (PSQI, HADS-A, HADS-D and adapted WHO-5) were assessed using Spearman's rank correlation coefficient. Bivariate analyses explored associations between the main variables; comparisons between qualitative variables used the chi-squared test or Fisher's exact test as appropriate, the Cochran–Armitage test was used for trend across the ordered screen-time categories, and the Mann–Whitney U test was used for continuous variables. Variables significantly associated with sleep quality on bivariate analysis were entered into a multivariable logistic regression model to identify factors independently associated with poor sleep quality, with results expressed as adjusted odds ratios (aOR) and 95% confidence intervals (CI). Two models are presented: Model 1 included sex, screen time before bedtime, anxiety symptoms and depressive symptoms; Model 2 (final model) additionally included low well-being. Because poor sleep quality was a common outcome, odds ratios overestimate the corresponding prevalence ratios and are interpreted as odds, not risks [25]; adjusted prevalence ratios (aPR) were therefore also estimated using modified Poisson regression with robust variance [26]. A p-value

<0.05 was considered statistically significant.

### 2.8. Ethical Considerations

Before completing the questionnaire, students were informed of the study objective, the nature of the data collected, the voluntary nature of participation, the anonymity of responses, and the use of the data for scientific purposes. Free and informed written consent was provided before the questionnaire was completed; the online form was designed so that a negative answer to the consent question prevented access to the remaining questions.

## 3. Results

### 3.1. Sociodemographic Characteristics

A total of 333 health sciences students were included. Participants' mean age was 22.8 ± 2.8 years (median 23 years), with a slight female predominance (52.9%). Mean BMI was 21.7 ± 4.1 kg/m², consistent with an overall normal body build. Most students were enrolled in medicine (79.3%), followed by pharmacy (14.1%) and dental surgery (6.6%), and all years of study were represented: first year 52 (15.6%), second 48 (14.4%), third 38 (11.4%), fourth 20 (6.0%), fifth 44 (13.2%), sixth 35 (10.5%), seventh 45 (13.5%) and eighth year 51 (15.3%). Only 22 students (6.6%) reported paid employment, with a mean of 30.5 ± 21.2 working hours per week among those who reported their hours (n = 21). Full sociodemographic and lifestyle characteristics are presented in Table 1.

### 3.2. Lifestyle Habits

Mean coffee consumption was 1.1 ± 1.3 cups/day (median 1 cup/day). Regarding screen time before bedtime, 22.2% of students reported more than 2 hours of exposure before sleep, 25.5% 1–2 hours, 35.7% 30 minutes to 1 hour, while only 16.5% reported less than 30 minutes (Table 1). The median bedtime was 00:20 (IQR 23:45–01:20) and the median wake-up time 06:50 (IQR 06:00–08:00). Mean self-reported sleep duration was 6.17 ± 1.40 h; 227 students (68.2%) reported sleeping less than 7 hours per night and 115 (34.5%) less than 6 hours. On the IPAQ-SF, physical activity level was moderate in 50.8% of students, low in 33.0% and high in 16.2%, with a median score of 1053 MET-min/week; median daily sitting time was 180 min (IQR 60–300; n = 308).

***Table 1.*** *Sociodemographic and lifestyle characteristics of the study population (N = 333).*

| Variable | Value |
|---|---|
| Age (years), mean ± SD (median) | 22.8 ± 2.8 (23) |
| Sex - Female, n (%) | 176 (52.9) |
| Sex - Male, n (%) | 157 (47.1) |
| Body mass index (kg/m²), mean ± SD | 21.7 ± 4.1 |
| Academic programme - Medicine, n (%) | 264 (79.3) |
| Academic programme - Pharmacy, n (%) | 47 (14.1) |
| Academic programme - Dental surgery, n (%) | 22 (6.6) |
| Year of study - 1st–3rd year, n (%) | 138 (41.4) |
| Year of study - 4th year and above, n (%) | 195 (58.6) |
| Paid employment - Yes, n (%) | 22 (6.6) |
| Weekly working hours (employed students, n = 21), mean ± SD | 30.5 ± 21.2 |
| Housing - Living with family,% | 41.1 |
| Housing - Campus residence,% | 22.8 |
| Housing - Military Health School,% | 19.5 |
| Housing - Shared housing,% | 9.9 |
| Housing - Living alone,% | 3.6 |
| Housing - Other,% | 3.0 |
| Coffee consumption (cups/day), mean ± SD (median) | 1.1 ± 1.3 (1) |
| Screen time before bedtime - <30 min, n (%) | 55 (16.5) |

| Variable | Value |
|---|---|
| Screen time before bedtime - 30 min–1 h, n (%) | 119 (35.7) |
| Screen time before bedtime - 1–2 h, n (%) | 85 (25.5) |
| Screen time before bedtime - >2 h, n (%) | 74 (22.2) |
| Physical activity level (IPAQ) - Low, n (%) | 110 (33.0) |
| Physical activity level (IPAQ) - Moderate, n (%) | 169 (50.8) |
| Physical activity level (IPAQ) - High, n (%) | 54 (16.2) |
| Daily sitting time (min/day, n = 308), median (IQR) | 180 (60–300) |
| Bedtime (hh: mm), median (IQR) | 00:20 (23:45–01:20) |
| Wake-up time (hh: mm), median (IQR) | 06:50 (06:00–08:00) |
| Sleep duration (h), mean ± SD | 6.17 ± 1.40 |
| Sleep duration <7 h, n (%) | 227 (68.2) |

## 3.3. Mental Health Assessment

Mean HADS-Anxiety and HADS-Depression scores were 7.60 ± 4.19 (median 7) and 6.09 ± 3.38 (median 6), respectively. Using standard HADS thresholds, 47.4% of students had anxiety symptoms (score ≥8) and 33.0% had depressive symptoms (score ≥8). On the adapted WHO-5 Well-Being Index, the mean score was 58.45 ± 16.40 out of 100 (median 60); 37.5% of students reported low psychological well-being (score ≤50) (Table 2). Well-being scores were negatively correlated with HADS-Anxiety (Spearman's $r = -0.672$, $p < 0.0001$) and HADS-Depression scores ($r = -0.592$, $p < 0.0001$). Compared with men, women more often had anxiety symptoms (61.9% vs 31.2%, $p < 0.0001$), depressive symptoms (40.3% vs 24.8%, $p = 0.004$) and low well-being (50.6% vs 22.9%, $p < 0.0001$).

## 3.4. Sleep Quality Assessment (PSQI)

The mean global PSQI score was 6.62 ± 2.87. Component scores are detailed in Table 2; habitual sleep efficiency was the least disturbed component (0.47 ± 0.88) and sleep duration the most affected (1.28 ± 0.83). Applying the standard clinical cut-off (PSQI >5), 62.5% of students had poor sleep quality, while 37.5% had good sleep quality.

***Table 2.*** *Sleep quality (PSQI), mental health and well-being scores.*

| Scale / component | Mean ± SD (median) | Category (%) |
|---|---|---|
| PSQI global score | 6.62 ± 2.87 | Poor sleep (>5): 62.5<br>Good sleep (≤5): 37.5 |
| PSQI - Subjective sleep quality (C1) | 1.20 ± 0.69 | — |
| PSQI - Sleep latency (C2) | 1.20 ± 0.97 | — |
| PSQI - Sleep duration (C3) | 1.28 ± 0.83 | — |
| PSQI - Habitual sleep efficiency (C4) | 0.47 ± 0.88 | — |
| PSQI - Sleep disturbances (C5) | 1.13 ± 0.52 | — |
| PSQI - Use of sleep medication (C6) | 0.17 ± 0.56 | — |
| PSQI - Daytime dysfunction (C7) | 1.17 ± 0.85 | — |
| HADS-Anxiety score | 7.60 ± 4.19 (7) | Symptoms (≥8): 47.4<br>Probable (≥11): 25.5<br>Doubtful/possible (8–10): 21.9 |

| Scale / component | Mean ± SD (median) | Category (%) |
|---|---|---|
| HADS-Depression score | 6.09 ± 3.38 (6) | Symptoms (≥8): 33.0<br>Probable (≥11): 9.6<br>Doubtful/possible (8–10): 23.4 |
| Adapted WHO-5 score (/100) | 58.45 ± 16.40 (60) | Low well-being (≤50): 37.5<br>Satisfactory (>50): 62.5 |

## 3.5. Factors Associated with Sleep Quality (Bivariate Analysis)

On bivariate analysis (Table 3), female sex was significantly associated with poorer sleep quality (68.2% of women vs 56.1% of men had poor sleep, p = 0.03), whereas age (p = 0.93), body mass index (p = 0.06), academic programme (p = 0.98), year of study (p = 0.62; 63.8% in the first three years vs 61.5% from the fourth year onwards, p = 0.77) and housing type (p = 0.18) showed no significant association.

Screen time before bedtime was significantly associated with sleep quality (p = 0.007). The proportion of students with poor sleep quality was 49.1% in the <30 min group, 57.1% in the 30 min–1 h group, 75.3% in the 1–2 h group and 66.2% in the >2 h group (Cochran–Armitage test for trend, p = 0.008); the highest proportion was thus observed in the 1–2 h group and the pattern was not strictly monotonic. Neither coffee consumption (p = 0.95), physical activity level (p = 0.56), paid employment (45.5% vs 63.7%, p = 0.11), weekly working hours (p = 0.50) nor daily sitting time (p = 0.07) was significantly associated with sleep quality.

Psychological variables showed the strongest associations with sleep quality. Among students with anxiety symptoms, 77.8% had poor sleep quality versus 48.6% of those without (p < 0.0001); anxiety and PSQI scores were moderately and positively correlated (Spearman's r = 0.445, p < 0.0001). Similarly, 78.2% of students with depressive symptoms had poor sleep quality versus 54.7% of those without (p = 0.0001), with a comparable positive correlation between depressive symptom scores and PSQI score (r = 0.359, p < 0.0001). Low well-being was also significantly associated with poor sleep quality (83.2% vs 50.0%, p < 0.0001), and well-being and PSQI scores were negatively correlated (r = −0.494, p < 0.0001).

***Table 3.*** *Bivariate analysis of factors associated with poor sleep quality.*

| Variable | Poor sleep quality | p-value |
|---|---|---|
| Sex - Female vs Male | 68.2% vs 56.1% | 0.03 |
| Age | NS | 0.93 |
| Body mass index | NS | 0.06 |
| Academic programme | NS | 0.98 |
| Year of study | NS | 0.62 |
| Housing type | NS | 0.18 |
| Paid employment (yes vs no) | 45.5% vs 63.7% | 0.11 |
| Weekly working hours | NS | 0.50 |
| Daily sitting time | NS | 0.07 |
| Screen time before bedtime (4 categories) | <30 min: 49.1%; 30 min–1 h: 57.1%; 1–2 h: 75.3%; >2 h: 66.2% | 0.007 (p-trend 0.008) |
| Coffee consumption | NS | 0.95 |
| Physical activity level (IPAQ) | NS | 0.56 |
| Anxiety symptoms (HADS-A ≥8 vs <8) | 77.8% vs 48.6% | <0.0001 |
| Depressive symptoms (HADS-D ≥8 vs <8) | 78.2% vs 54.7% | 0.0001 |

| Variable | Poor sleep quality | p-value |
|---|---|---|
| Low well-being, adapted WHO-5 (≤50 vs >50) | 83.2% vs 50.0% | <0.0001 |

NS: not statistically significant (p ≥ 0.05). Anxiety and PSQI scores were positively correlated (Spearman's r = 0.445, p < 0.0001); depressive symptom and PSQI scores were also positively correlated (r = 0.359, p < 0.0001); adapted WHO-5 and PSQI scores were negatively correlated (r = −0.494, p < 0.0001).

## 3.6. Factors Independently Associated with Poor Sleep Quality (Multivariable Analysis)

In Model 1 (sex, screen time before bedtime, anxiety symptoms and depressive symptoms), screen time, anxiety symptoms and depressive symptoms were independently associated with poor sleep quality (Table 4). In the final model (Model 2), which additionally included low well-being as the latter was significantly associated with sleep quality on bivariate analysis, screen time before bedtime, anxiety symptoms and low well-being remained independently associated with poor sleep quality (Table 4, Figure 1), whereas the association with depressive symptoms was attenuated and no longer significant (aOR 1.54, 95% CI 0.84–2.84, p = 0.16). Female sex was not associated with poor sleep quality after adjustment (Model 1: p = 0.68; Model 2: p = 0.96), consistent with the higher prevalence of anxiety symptoms and low well-being among women.

In Model 2, compared with students exposed to screens for less than 30 minutes before sleep, those exposed for 1–2 hours had higher odds of poor sleep quality (aOR 3.06, 95% CI 1.39–6.75, p = 0.006), as did those exposed for more than 2 hours (aOR 2.31, 95% CI 1.06–5.03, p = 0.035), whereas the 30 min–1 h category was not significantly different from the reference (aOR 1.50, 95% CI 0.74–3.04, p = 0.26). The confidence intervals of the 1–2 h and >2 h categories overlapped widely; when screen time was entered as an ordinal variable, the adjusted trend was significant (p = 0.009).

Anxiety symptoms (aOR 2.17, 95% CI 1.23–3.81, p = 0.007) and low well-being (aOR 2.80, 95% CI 1.47–5.33, p = 0.002) were also independently associated with higher odds of poor sleep quality. As expected for a common outcome, adjusted prevalence ratios were smaller than the corresponding odds ratios (aPR 1.44 for 1–2 h and 1.38 for >2 h of screen time, 1.31 for anxiety symptoms and 1.35 for low well-being; Table 4).

***Table 4.*** *Factors independently associated with poor sleep quality – multivariable logistic regression.*

| Variable | Model 1: aOR (95% CI); p | Model 2 (final): aOR (95% CI); p | Model 2: aPR (95% CI) |
|---|---|---|---|
| Female sex (ref: male) | 1.11 (0.67–1.83); 0.68 | 0.99 (0.59–1.64); 0.96 | 0.99 (0.83–1.17) |
| Screen time 30 min–1 h (ref: <30 min) | 1.50 (0.75–2.99); 0.25 | 1.50 (0.74–3.04); 0.26 | 1.18 (0.89–1.56) |
| Screen time 1–2 h (ref: <30 min) | 3.35 (1.55–7.26); 0.002 | 3.06 (1.39–6.75); 0.006 | 1.44 (1.11–1.88) |
| Screen time >2 h (ref: <30 min) | 2.18 (1.01–4.70); 0.045 | 2.31 (1.06–5.03); 0.035 | 1.38 (1.03–1.83) |
| Anxiety symptoms, HADS-A ≥8 (ref: <8) | 2.96 (1.74–5.04); <0.0001 | 2.17 (1.23–3.81); 0.007 | 1.31 (1.08–1.59) |
| Depressive symptoms, HADS-D ≥8 (ref: <8) | 2.04 (1.15–3.62); 0.014 | 1.54 (0.84–2.84); 0.16 | 1.14 (0.96–1.34) |
| Low well-being, adapted WHO-5 ≤50 (ref: >50) | — | 2.80 (1.47–5.33); 0.002 | 1.35 (1.12–1.62) |

aOR: adjusted odds ratio; aPR: adjusted prevalence ratio (modified Poisson regression with robust variance, Model 2); CI: confidence interval. Model 1 was adjusted for sex, screen time before bedtime, anxiety symptoms and depressive symptoms; Model 2 additionally included low well-being (adapted WHO-5 ≤50). Odds ratios express odds and not risks; because poor sleep quality was common (62.5%), they overestimate the corresponding prevalence ratios.

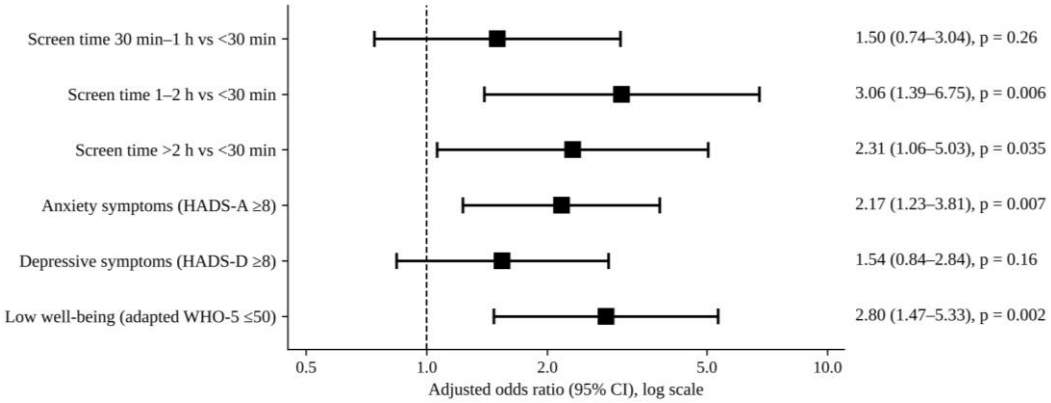


***Figure 1.*** *Forest plot of adjusted odds ratios (95% confidence interval, log scale) from the final multivariable logistic regression model (Model 2): screen time before bedtime (30 min–1 h, 1–2 h and >2 h, reference <30 min), anxiety symptoms (HADS-A ≥8), depressive symptoms (HADS-D ≥8) and low well-being (adapted WHO-5 ≤50), adjusted also for sex. The dashed vertical line indicates the null value (OR = 1).*

# 4. Discussion

## 4.1. High Prevalence of Poor Sleep Quality in a University Setting

This study found a high prevalence of poor sleep quality, affecting 62.5% of health sciences students in our sample. This is consistent with the view that medical and health sciences students constitute a population particularly vulnerable to disturbances of the sleep–wake rhythm. This prevalence is higher than the worldwide pooled estimate of 55.6% among medical students [6] and close to the pooled estimate of more than 60% reported among African university students [10]. It is comparable to recent single-centre estimates, such as 67.9% among Croatian medical students [9], and lower than the 72.5% reported among medical students during COVID-19 confinement [3]. Poor sleep is also frequent among medical interns [27]. In Senegal, our findings extend those obtained among seventh-year medical students during clinical rotations, most of whom reported short sleep [12], and the prevalence is much higher than the 27.8% observed among elite athletes [13], a population with very different lifestyles. Sleep disturbances have also been documented among university students in Niger [11]. These comparisons should nevertheless be interpreted cautiously, given differences in sampling methods, timing relative to examinations and instrument versions.

Analysis of PSQI components showed that sleep duration was the most affected component (1.28 ± 0.83), whereas habitual sleep efficiency was the least affected (0.47 ± 0.88). Consistently, mean sleep duration was only 6.2 h, 68.2% of students slept less than 7 hours and 34.5% less than 6 hours per night, with a median bedtime of 00:20 and a median wake-up time of 06:50. This pattern suggests that poor sleep quality in this population is largely driven by a restricted sleep window rather than by difficulty maintaining sleep once in bed, in line with the short sleep reported by Senegalese medical students during clinical rotations [12] and below the 7–9 hours recommended for young adults [1]. Late bedtimes may reflect evening study, social and digital activities combined with early morning teaching schedules [4, 16].

## 4.2. Screen Time Before Bedtime: A Behavioural Factor Associated with Poor Sleep

Multivariable analysis showed that screen time before bedtime was independently associated with poor sleep quality. This finding is consistent with systematic reviews linking digital media use, particularly at bedtime, with shorter sleep and poorer sleep quality among adolescents and young adults [14, 15], with the pooled association between bedtime electronic device use and poor sleep among African university students [10], and with earlier observations among medical students [28]. Several mechanisms have been proposed: displacement of sleep time, cognitive and emotional arousal related to content, and exposure to evening light, which may delay melatonin secretion [14, 15]. The relationship was, however, not strictly monotonic: the proportion of poor sleepers rose from 49.1% (<30 min) to 75.3% (1–2 h) and was 66.2% for >2 h, and the odds were higher for 1–2 h than for >2 h of exposure, although the confidence intervals overlapped widely and the overall trend was significant (p = 0.008). This pattern may reflect limited statistical power within individual categories, imprecision of self-reported categorical screen time, or differences in the content and timing of use that were not measured; it should not be interpreted as a protective effect of very long exposure. Finally, the direction of the association cannot be established: students who have difficulty falling asleep may use screens longer while in bed, so reverse causality is plausible.

## 4.3. Anxiety Symptoms, Depressive Symptoms, Well-Being and Sleep Quality

Psychological variables showed the strongest associations

with poor sleep quality in this study. Anxiety symptoms, reported by nearly half of the students (47.4%), remained independently associated with poor sleep quality in both models (final aOR 2.17), as did low well-being (aOR 2.80); because the outcome is common, these odds ratios overstate the corresponding prevalence ratios (aPR 1.31 and 1.35) [25]. Depressive symptoms were associated with poor sleep quality in bivariate analysis and in Model 1 (aOR 2.04), but not after adjustment for well-being. As depressive symptoms and well-being were strongly correlated ($r = -0.59$), and both partly capture low mood and anhedonia, their independent contributions cannot be fully separated in this sample; this attenuation should not be interpreted as an absence of association between depressive symptoms and sleep. The moderate correlations of HADS-Anxiety ($r = 0.445$), HADS-Depression ($r = 0.359$) and well-being ($r = -0.494$) scores with the global PSQI score are consistent with recent findings among medical students, in whom PSQI scores correlated with anxiety ($\rho = 0.489$) and depression ($\rho = 0.566$) [9], and with earlier work in medical and college students [7, 29]. Anxiety may promote cognitive hyperarousal and rumination, which prolong sleep latency; conversely, poor sleep can increase emotional reactivity and contribute to the onset of anxiety and depressive symptoms, and longitudinal studies support a bidirectional relationship [2, 17]. With a cross-sectional design, our data cannot determine whether psychological symptoms precede poor sleep or result from it. These observations nevertheless echo previous work linking insomnia, dysfunctional coping strategies in the face of university-related stress, and suicide risk in young adults [3, 5].

### 4.4. Sex and Non-significant Variables

After adjustment, female sex was no longer associated with poor sleep quality. Women in our sample more often had anxiety symptoms (61.9% vs 31.2%) and low well-being (50.6% vs 22.9%), which likely explains the initial bivariate association. Physical activity level (IPAQ-SF) and coffee consumption were not associated with sleep quality, in contrast to studies linking daily activities and sleep hygiene to sleep quality in students [16, 30]. Several explanations are possible: the low mean coffee intake (1.1 cups/day) and its limited variability, the absence of information on the timing of caffeine intake, the categorisation of physical activity into three levels, the known tendency of self-reported questionnaires such as the IPAQ-SF to overestimate activity, and limited statistical power. Daily sitting time showed only a non-significant tendency ($p = 0.07$), and some reported values were implausibly low, suggesting reporting errors. Paid employment was too infrequent ($n = 22$) to allow reliable conclusions. Finally, the absence of association with year of study suggests that poor sleep quality is present from the first years of training and is not restricted to the clinical years.

### 4.5. Strengths, Limitations and Implications

The joint use of standardised instruments widely used internationally (PSQI, HADS, IPAQ-SF and an adapted WHO-5) is a strength of this study, as is data collection outside examination periods, which limited the influence of acute stress. This study also has several limitations. First, its cross-sectional design precludes causal inference, and reverse causality is plausible for both screen time and psychological symptoms. Second, all data were self-reported and therefore subject to recall bias and social desirability bias, particularly for screen time, coffee consumption, sitting time and physical activity. Third, recruitment through online channels with convenience sampling may have led to self-selection of students more interested in, or more affected by, sleep problems, which may have inflated prevalence estimates. Fourth, the study was conducted in a single faculty of one university, with a predominance of medical students (79.3%), which limits generalisability to other health sciences programmes and to other Senegalese or West African universities. Fifth, continuous scores were dichotomised using conventional cut-offs, which entails a loss of information, and these cut-offs have not been validated among Senegalese students; HADS and well-being results reflect screening-level measures, not clinical diagnoses. Sixth, well-being was measured with an adapted five-item version of the WHO-5 that has not been formally validated, which limits comparison with studies using the standard instrument. Seventh, potential confounders were not measured or not analysed, including clinical placements and night duty, chronotype, alcohol and other substance use, timing of caffeine intake and academic stress. Finally, the exclusion of students with diagnosed sleep disorders or psychiatric treatment may have led to an underestimation of the prevalence of poor sleep quality. Despite these limitations, the associations of poor sleep quality with pre-sleep screen time, anxiety symptoms and low well-being support targeted preventive interventions, including sleep hygiene psychoeducation and early screening for psychological distress within health science faculties; longitudinal and multicentre studies are needed to clarify the direction of these associations.

## 5. Conclusions

This study found a high prevalence of poor sleep quality (62.5%) among health sciences students of the Faculty of Medicine, Pharmacy and Odontology of Cheikh Anta Diop University of Dakar, Senegal, most of whom slept less than 7 hours per night. Poor sleep quality was independently associated with longer screen exposure before bedtime, anxiety symptoms and low psychological well-being. Because of the cross-sectional design and the single-centre convenience sample, these associations do not establish causality and should be confirmed by longitudinal, multicentre studies. These findings nevertheless support targeted preventive strategies in university settings, including sleep hygiene psychoeducation focused on screen exposure management, and early screening and management of psychological distress, in order to preserve the overall health of these future practitioners.

## Abbreviations

| | |
|---|---|
| aOR | Adjusted Odds Ratio |
| aPR | Adjusted Prevalence Ratio |
| BMI | Body Mass Index |
| CI | Confidence Interval |
| FMPO | Faculty of Medicine, Pharmacy and Odontology |
| HADS | Hospital Anxiety and Depression Scale |
| HADS-A | Hospital Anxiety and Depression Scale – Anxiety Subscale |
| HADS-D | Hospital Anxiety and Depression Scale – Depression Subscale |
| IPAQ-SF | International Physical Activity Questionnaire – Short Form |
| IQR | Interquartile Range |
| MET | Metabolic Equivalent of Task |
| NS | Not Statistically Significant |
| OR | Odds Ratio |
| PSQI | Pittsburgh Sleep Quality Index |
| SD | Standard Deviation |
| UCAD | Cheikh Anta Diop University of Dakar (Université Cheikh Anta Diop) |
| WHO-5 | World Health Organization Five Well-Being Index (Adapted Five-item Version Used in This Study) |

## Supplementary Material

The supplementary material can be accessed at https://doi.org/10.11648/j.aap.20261102.12

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## Author Contributions

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## Data Availability Statement

The data will be provided on request.

## Conflicts of Interest

The authors declare no conflicts of interest.

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