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Risk factors for the prevalence of poor sleep quality in lecturers during COVID-19 pandemic in Ethiopia: an institution-based cross-sectional study

Amensisa Hailu Tesfaye , M Alemayehu, Giziew Abere , Gebisa Guyasa Kabito

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Environmental and Occupational Health and Safety, Institute of Public Health, University of Gondar College of Medicine and Health Sciences, Gondar, Ethiopia

Correspondence to
Amensisa Hailu Tesfaye;
amensisahailu@gmail.com

ABSTRACT

Objective This study was conducted to assess the prevalence and risk factors of poor sleep quality (SQ) among the academic staff at the University of Gondar, Northwestern Ethiopia.

Design An institution-based cross-sectional study was conducted from March to April 2021. A validated, self-administered, standardised Pittsburgh Sleep Quality Index (PSQI) was used to quantify the amount of self-reported poor SQ. The collected data were entered into EpiData V.4.6 and analysed using Stata V.14 software. Binary logistic regressions were computed to determine the association between variables. The association was determined using an adjusted OR (AOR) with a 95% CI at a p value of <0.05.

Setting The study was conducted at the University of Gondar, Northwestern Ethiopia.

Participants A total of 607 lecturers participated in this study.

Outcome measures The primary outcome is the prevalence of poor SQ, which was measured using the PSQI.

Results Overall response rate was 95.60% (N=607). The age of the participants ranges from 21 to 70 with a mean of 32.39 (SD±6.80) years. The magnitude of poor SQ during the COVID-19 pandemic in the last month was 60.30% (95% CI (56.28% to 64.21%)). Working greater than 10 hours per day (AOR=2.19, 95% CI (1.16 to 4.27)), electronic device use before bedtime (AOR=1.53, 95% CI (1.04 to 2.27)), high-risk perception of COVID-19 infections (AOR=1.60, 95% CI (1.04 to 2.46)) and perceived job stress (AOR=2.15 (95% CI (1.50 to 3.08)) were risk factors for poor SQ.

Conclusion The study revealed that the prevalence of poor SQ was high during the COVID-19 pandemic. The finding highlights the importance of optimising the working hours per day, minimising electronic device use before bedtime, promoting risk perception toward COVID-19 infection and developing workplace coping strategies for stress, which play a substantial role in minimising poor SQ.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The study has focused on one of the most potential groups affected by poor sleeping quality, particularly during COVID-19 pandemic.
⇒ This study is the first of its kind in exploring the magnitude and factors influencing poor sleep quality (SQ) among academic staff in Ethiopia.
⇒ Using the Pittsburgh Sleep Quality Index is an effective instrument used to measure the quality and patterns of sleep in adults.
⇒ The study has limitations due to the cross-sectional nature of the data; it does not show a temporal relationship between independent variables and the outcome variable.
⇒ The report of poor SQ may be underestimated or overstated because it relies on lecturers' subjective reports rather than objective measurements like actigraphy and polysomnography.

BACKGROUND

Scholars describe sleep quality (SQ) as 'one's perception that they fall asleep easily, sleep for a sufficient amount of time so that they wake up feeling rested and can get through their day without experiencing excessive daytime sleepiness'. An individual's subjective perception of his or her sleep can be evaluated using both subjective and objective methods.[1] The subjective method, Pittsburgh Sleep Quality Index (PSQI) is a widely used questionnaire to measure SQ.[2] General health and quality of life are directly correlated with SQ.[3] Sleep disorders involve problems with the quality, timing, duration and amount of sleep.[4] Poor SQ is a global phenomenon, which leads to poor health, increased risk of mortality, hormonal and biochemical changes, higher healthcare costs, increased use of health resources, absenteeism and increased risk of psychological morbidity and burnout.[5 6] Poor SQ has been a typical occurrence among the various working population during the COVID-19 pandemic and is regarded as a public health crisis that frequently goes undetected, under-reported and has very large economic impacts.[7 8] Teaching has been

identified as a profession associated with a high risk of poor SQ[9–11]; however, little research has been conducted to quantify the prevalence and risk factors of poor SQ among university academic staff worldwide.[12 13]

Academic staffs are at a higher risk of poor SQ, burnout, depression, stress and anxiety as a result of the current COVID-19 pandemic, which has serious consequences on occupational health both now and in the future.[14] Likewise, the WHO has classified poor SQ as a public health issue that exacerbates the risk of disease and death.[15] Poor SQ also has significant economic consequences. In the USA, for example, the annual costs of poor sleep have been estimated to be as high as US$16 billion in healthcare costs and US$50 billion in lost productivity.[16] In Australia, the costs were estimated to be approximately US$1.8 billion for the health system and US$66.3 billion for financial loss and decreased well-being.[17–19]

The prevalence of poor SQ was increased during the COVID-19 pandemic period.[20] A couple of studies from Brazil[12 21] documented that 61.3% and 44.2% of university academic staff reported poor SQ. Scientific investigation showed that 4 out of 10 people do not get enough sleep, and 1 in 5 people sleeps poorly most nights, making poor sleep the second most common health issue after pain.[22 23] According to a study done in Iran,[24] 79.6% (n=133) of university staff reported having poor SQ. A similar finding was also found in a study conducted in Thailand,[25] where 78.3% of respondents experienced poor SQ. So far, epidemiological data from Turkey indicated that 55.1% of adults had poor SQ.[20] In Ethiopia, the pooled prevalence of poor SQ was 53% among general populations and university students, with incidences ranging from 26% to 66.2%.[26] However, studies on SQ, particularly among university academic staff, are lacking.

Recent research shows that during the COVID-19 pandemic, SQ was impaired and the prevalence of poor sleep increased in both the working and general population.[27–29] Furthermore, the global COVID-19 pandemic has compelled higher education institutions, including Ethiopian universities, to shift from face-to-face to online instruction, which has an impact on SQ.[30–32] Prolonged use of computers, coupled with the brightness of the light that they project onto the retina, are factors that are thought to trigger changes in sleep patterns.[33] The light emitted from computers is in close proximity to the retina.[34] This emitted optical radiation at short wavelengths is close to the peak sensitivity of melatonin suppression.[33] Academic staff members used computers more frequently during the COVID-19 outbreak, which may have increased their exposure to computer light and led them to poor SQ, and negatively affected their quality of sleep.[35] Moreover, poor SQ has been correlated to old age, low economic status, substance use, obesity, use of an electronic device before bedtime, higher risks of contracting COVID-19 at work, workload and job stress.[36–44]

Given the widespread and harmful consequences of poor SQ, it needs to be a top priority for public and occupational health. As previously stated, a thorough review of the literature revealed that even less is known about the prevalence and factors of poor SQ among academic staff and other university personnel in developing countries including Ethiopia.[45] The number of universities in Ethiopia is increasing, which is accompanied by an increase in academic staff workforces. However, the lack of reliable and up-to-date data on mental health, especially on SQ, makes it difficult for officials to plan for prevention and control measures. Therefore, in the current study, we aimed to assess the prevalence and associated factors of poor SQ among academic staff at the University of Gondar, Northwest Ethiopia.

METHODS AND MATERIALS

Study design, period and setting

An institution-based cross-sectional study was conducted between 17 March 2021 and 17 April 2021. The research was carried out at the University of Gondar, which is situated in the oldest and most ancient city of Gondar, Northwestern Ethiopia, which is 737 kilometres far from Addis Ababa, the capital city of Ethiopia.[46] The College of Medicine and Health Sciences (CMHS) Comprehensive Specialised Referral Hospital, Maraki, Atse Tewdros, Atse Fasil, and Teda are the university's five campuses.[47] On all campuses, there were 2858 academic staff members throughout the research period.

Study participants

The source population was the whole faculty members of the University of Gondar. The study population, however, consisted of a random sample of academic personnel from each campus. Academic personnel on critical illness, maternity leave or sabbatical leave and individuals diagnosed with sleep-related disorders were excluded, while academic staff with at least 1 year of teaching experience and who were available throughout data collection were included.

Sample size determination and sampling procedure

The sample size was calculated by using a single population proportion formula[48] by considering the following statistical assumptions:

- Confidence level of 95%.
- Proportion=50% (no previous study in the study area).
- Margin of error of 5%.
- Using the following single proportion formula:

$n = \left(Z\alpha/_2\right)^2 \frac{[p\ (1-p)]}{d^2}$ where:

n=initial sample size,

Z=1.96, the corresponding Z-score for the 95% CI

p=proportion = 50%,

d=margin of error=5% = 0.05,

$n = \left(1.96\right)^2 \frac{[0.5\ (1-0.5)]}{0.05^2} = 384.$

The final sample size was 635 people, after taking into account a 10% non-response rate and a design effect of 1.5, because, in the absence of prior literature, a design effect of 1.5 to 2.0 is endorsed.[49] We employed a stratified sampling technique to select participants from the

five campuses of the University of Gondar. A proportional allocation for each stratum defined how many sample points were needed. Thus, there were a total of 1027 academic staff members in the CMHS (N1=1027), 630 academic staff members in the Maraki campus (N2=630), 509 academic staff members in the Tewdros campus (N3=509), 536 academic staff members in the Fasil campus (N4=536) and 156 academic staff members in the Teda campus (N5=156). Consequently, the number of participants from each campus were 228, 140, 119, 113 and 35 from the CMHS, Maraki, Fasil, Tewdros and Teda campuses, respectively. The requisite sample sizes were then determined using a simple random sampling technique, and academic staff members from each stratum were randomly assigned using the OpenEpi random software V.3.

Variable measurement and definition of terms

Poor SQ: The PSQI, a 19-item self-assessment of SQ, was used to measure academicians' poor SQ. The tool was free to use and designed to measure the outcome variable in the past month. It has a diagnostic sensitivity of 89.6% and a specificity of 86.5% at greater than five cut-off values for identifying cases with sleep disorders.[50] PSQI consists of seven component scores (ranging from 0 to 3), measuring subjective SQ, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. The seven component scores are summed to give a global PSQI score ranging from 0 to 21. A global PSQI score of greater than five indicates poor SQ.[33 51]

Body mass index: Weight in kilograms divided by the square of the height in metres (kg/m^2) categorised as underweight=body mass index (BMI) <18.5, normal (health)=BMI 18.5–24.9, overweight=BMI 25.0–29.9 and obese=BMI ≥30.0.[52]

Alcohol drinker: A scholar who drinks alcohol of any kind at least twice each week.[53]

Cigarette smoker: A scholar with a daily consumption of at least one stick of cigarettes.[54]

Khat chewer: A scholar who had chewed khat in the previous month.[42]

Doing physical exercise: Doing any type of physical activity at least twice a week for at least 30 minutes.[55]

Electronic device use: If the participant uses/watches at least one of the following: television, computer, tablet or mobile phone in bed before going to sleep.[44]

Chronic illness: Illnesses such as asthma, diabetes mellitus, stroke, kidney stone, hypertension that can be managed, but cannot be cured and have a greater risk of developing a poor quality of sleep.[56]

Risk perception of COVID-19 infection: Was assessed by two psychological dimensions; perceived susceptibility and perceived severity. The first dimension was proxied by how likely one considered oneself (his/her family) would be infected with COVID-19 if no preventive measures will be taken. The second dimension was proxied by how one rated the seriousness of symptoms caused by COVID-19, their perceived chance of having COVID-19 cured and that of survival if infected with COVID-19. By combining the two dimensions, five items with five response options were asked to determine the respondents' levels of risk perception, with a higher total score indicating a high perceived risk of COVID-19 infection.[57]

Job satisfaction: The total score of at least 32 on the general job satisfaction scale.[58]

Perceived job stress: A score of at least 21 on the workplace-stress scale.[59]

Data collection tools and procedures

Data were collected through a validated self-administered standardised structured questionnaire. The questionnaire was adapted after an extensive review of related literature and similar study tools.[12 42 56 60–62] The questionnaire embraces three sections containing different items. The first section, socio-demographic characteristics, assesses information on age, sex, religion, educational status, working experience and monthly salary. The second element of the questionnaire hugs information on poor SQ, which was assessed by using the PSQI, which is a measure of sleep disturbance for the period of 1 month immediately preceding the time of administration. PSQI is an effective and the most widely used instrument in diagnosis of sleep disorders in different populations.[9 63] The tool is easy to understand, patient compliant and requires about 5 min to be completed.[10] The PSQI contains 19 items and 7 clinically important components in relation to sleep difficulties: subjective SQ, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication and daytime dysfunction. The total PSQI score was calculated by summing up the seven component scores.[50] Scoring of the answers is based on a 0–3 scale, whereby 3 reflects the negative extreme on the Likert scale, as well a global score of between 0 and 21. Individuals scoring a global score of greater than 5 were deemed poor SQ.[64] The PSQI has been validated in many languages with acceptable psychometric properties[65] and is frequently used in clinical and research settings.[66] The PSQI has also been validated as reliable for use in Ethiopian community.[51] The PSQI's validity was supported by a comprehensive test used to diagnose sleep disorders like polysomnographic findings.[67 68] The PSQI has a sensitivity of 89.6% and specificity of 86.5% for identifying cases with sleep disorder, using a cut-off score of 5.[50] The last part of the questionnaire includes information used to assess behavioural factors and psychosocial factors like cigarette smoking (yes/no), BMI (kg/m^2), physical activity (yes/no), alcohol consumption (yes/no), use of an electronic device before bedtime (yes/no), history of chronic illness (yes/no), risk perception of COVID-19, job satisfaction, job stress and workload.

Risk perception regarding COVID-19 in this study was measured by using two psychological dimensions; perceived susceptibility and perceived severity. The first dimension (perceived susceptibility) contains two questions; including how likely they will be infected with

COVID-19 and how likely one considered oneself (his/her family) would be infected with COVID-19 if no preventive measures will be taken. Responses of the two questions were rated on a 5-point Likert scale (ranging from 1=very likely to 5=very unlikely). The second dimension (perceived severity) contains three questions; including how one rated the seriousness of symptoms caused by COVID-19, their perceived chance of having COVID-19 cured and that of survival if infected with COVID-19. Responses of the three questions were rated on a 5-point Likert scale (ranging from 1=very serious/very low to 5=not serious at all/very high). By combining the two dimensions, making five questions each answered on a Likert scale of 1–5 giving rise to a total score ranging from 5 to 25. The higher the score the higher the risk perception of COVID-19 infection.[69] We used the 10-item generic job satisfaction scale questionnaire to measure academicians' job satisfaction.[58] The scale comprised 10 questions ranging from 1 to 5 each item and ranged from very dissatisfied, dissatisfied, neutral, satisfied and very satisfied, according to their occurrence respectively, in 1 month before the survey. The scale had 10 items with a rating of 1–5, and the responses ranged from very dissatisfied, dissatisfied, neutral, satisfied and very satisfied, depending on how frequently they occurred in the month before to the survey and then summing up all 10 items. The scale produced a single ranking, with high scores indicated higher job satisfaction vice versa. Perceived job-related stress of the participants was collected using the 8-item workplace stress scale questionnaire.[59] The scale comprised eight questions ranging from 1 to 5 each item and ranged from never, rarely, sometimes, often and very often, according to their occurrence, respectively, in 1 month before the survey. The 8-item workplace stress scores are obtained by reversing scores on three positive items, for example, 5=1, 4=2, 3=3 and then summing up all 8 items. Items 6, 7 and 8 are positive items. The scale produced a single ranking, with high scores indicated higher stress levels and vice versa. The instruments used in the current study have been employed in previous studies conducted in the country's context.[70–73]

Data quality control

To maintain uniformity, the questionnaire was initially created in English, translated into the local tongue of Amharic, and then translated back to English. Following appropriate training and orientation, three BSc nurses and MPH Environmental health specialist who were employed at the comprehensive specialised hospital of the University of Gondar participated in data collection. The data collectors and the supervisor took the orientation on issues relating to the clarity of the questions, objectives of the study, confidentiality of information, the voluntary involvement (consent) participants in the study and on time of data collection as study participants' regular duties should not be compromised. Both data collectors and supervisors were under the lead investigator's supervision. The pretest was carried out at Teda Health Sciences College in Gondar city on 5% (31) of the sample size to ensure the validity and reliability of the questionnaire, yet the college was not included in the final survey. Based on the results of the pretest analysis, various modifications were made including the clarification of a few ambiguities and misinterpretations, and an estimation of how long the data gathering process would take. Feedback was provided by discussing any issue that arose during data collection with the primary investigator, the supervisor and the data collectors.

Data processing and analysis

Data were entered into EpiData V.4.6 after being verified as complete and exported to Stata V.14 for additional analysis. We used descriptive statistics, narration, tabulation and graphics to present the findings. Prior to doing bivariable and multivariable binary logistic regression analyses, the variables' normality, outliers and multicollinearity were examined. A variance inflation factor was used to test the multicollinearity assumption, and all variables displayed values of less than 5. As a result, multicollinearity was not observed to exist. Also, the reliability of the questionnaire was tested using Cronbach's alpha and found a reliable Cronbach's alpha=0.79, and therefore the questionnaire was tolerable for its consistency in repeating what had previously been measured using the tool.[51] Additionally, Cronbach's alpha was used to examine the questionnaire's reliability, and the reliability Cronbach's alpha value was 0.79. As a result, the questionnaire was deemed satisfactory for its consistency in reproducing what had previously been measured using the instrument. A binary logistic regression was used to compute the relationship between the variables. To control the effects of potential confounders, variables with p values of 0.2 in the bivariable logistic regression analysis were exported to a multivariable logistic regression. Last but not least, in the multivariable binary logistic regression model, statistically significant variables were established at a p value of 0.05, and an adjusted OR (AOR) with a CI of 95% was provided to quantify the strength of the association. The Hosmer-Lemeshow test was used to determine the final model's goodness of fit, and the results revealed a good fit (p=0.65).[74]

Patient and public involvement statement

University lecturers were participated in this investigation by contributing useful information. However, they have never been involved in the study design, protocol, data collection tools and reporting and disseminating the findings.

RESULTS

Socio-demographic characteristics of study participants

A total of 635 questionnaires were distributed, giving a response rate of 95.59% (N=607). The age of the participants ranged from 21 to 70, with a mean (±SD) of 32.39 (±6.80) years old. Moreover, more than two-thirds of the

Table 1 Socio-demographic characteristics of academic staff in the University of Gondar, Ethiopia, 2021 (N=607)

Variables	Frequency (n)	Per cent
Sex		
Male	436	71.83
Female	171	28.17
Age (years)		
21–29	226	37.23
30–39	301	49.59
≥40	80	13.18
Religion		
Orthodox	486	80.07
Muslim	69	11.37
Protestant	52	8.57
Marital status		
Single	245	40.36
Married	362	59.64
Educational status		
Bachelor	94	15.49
Master	416	68.53
PhD	97	15.98
Work experience in years		
≤5	167	27.51
6–10	249	41.02
>10	191	31.47
Monthly salary (ETB)		
<10 000	99	16.31
10 000–13 000	331	54.53
>13 000	177	29.16

ETB, Ethiopian birr (currency).

participants were men (71.83%), and the majority of them, 362 (59.64%), indicated that they were married. Regarding educational status, 416 (68.53%) of the participants had master's degree. The participants' median estimated (IQR) monthly income was 11 305 (10 700–13 600) Ethiopian birr (table 1).

Behavioural and psychosocial characteristics of study participants

Four hundred and fourteen (68.20%) of the participants were working between 6 and 10 hours per day and 79 (13.11%) of the participants were working more than 10 hours per day. Of the study participants, the number of respondents who admitted to smoking cigarettes was 108 (17.79%). While 112 (18.45) said they had alcohol drinking habits, over one-third (33.28%) of the respondents were performing physical exercise at least twice a week. The majority of the respondents, 434 (71.5%), had a normal (18.5–24.9 kg/m^2) BMI, while 48 (7.91%) of them were underweight (>18.5 kg/m^2) BMI. Out of the study participants, 188 (30.97%) clarified that they had a chronic illness, and almost half (51.24%) of the study participants have used an electronic device before bedtime. Regarding psychosocial characteristics, nearly one-fourth (24.38%) of the respondents had high-risk perceptions of the COVID-19 virus. Moreover, 516 (85.01%) respondents supposed they were satisfied with their jobs. Furthermore, when asked whether they felt stressed out by their work, 276 respondents (45.47 %) said they did (table 2).

Prevalence of poor SQ and its components scores

The mean global score of PSQI (computed using the component scores) was 6.80 (95% CI 6.55 to 7.04). The result of this study revealed that 60.30% (95% CI 56.28% to 64.21%) of academicians were classified as having poor SQ. Seven components of SQ in the present study were assessed and the components identified their sleep status. Accordingly, 514 (84.68%) of the academicians had fairly good to very good sleep perception. From the total study participants, 342 (56.34%) had mild difficulty in falling asleep (PSQI latency). Regarding sleeping duration, only 165 (27.18%) of the respondents had more than 7 hours of sleep per night, and 326 (53.71%) had a very high habitual sleep efficiency (>85%). Moreover, most (66.39%) of academicians reported that they had mild difficulty in the PSQI disturbance domain and only 39 (6.42%) of them used sleep medication to sleep during the past month. Furthermore, 196 (32.29%) of them had mild-to-severe difficulty in PSQI day dysfunction due to sleepiness in the past month (table 3).

Factors associated with poor SQ

In the bivariable binary logistic regression analysis, sex (p value of 0.124), educational status (p value of 0.179), working hours per day (p value of 0.003), khat chewing (p value of 0.042), not perform physical activities (p value of 0.122), electronic devise use (p value of 0.004), chronic illness (p value of 0.002), risk perception towards COVID-19 virus (p value of 0.005), job dissatisfaction (p value of 0.112) and perceived job stress (p value of ≤0.001) were the factors associated with poor SQ. However, after controlling for confounding variables in the multivariable binary logistic regression analysis, only working hours per day, electronic device use before bedtime, risk perception towards COVID-19 infection and perceived job stress remained to have a significant association with poor SQ.

The probability of developing poor SQ was 2.19 times greater in employees who worked more than 10 hours per day compared with those who worked for 5 hours or less per day (AOR=2.19, 95% CI (1.16 to 4.27)) at a p value of 0.019. Similarly, participants who use electronic devices before bedtime were 1.53 times more likely to experience poor SQ compared with who did not use electronic devices before bedtime counterparts (AOR=1.53, 95% CI (1.04 to 2.27)) at a p value of 0.031. Moreover, the odds of having poor SQ were 1.60 times more likely among

Table 2 Behavioural and psychosocial characteristics of academic staff in the University of Gondar, Ethiopia, 2021 (N=607)

Variables	Frequency (n)	Per cent
Working hours per day		
≤5 hours	114	18.78
6–10 hours	414	68.20
>10 hours	79	13.01
Cigarette smoker		
Yes	108	17.79
No	499	82.21
Alcohol consumption habit		
Yes	112	18.45
No	495	81.55
Khat chewing behaviour		
Yes	19	3.13
No	588	96.87
Physical exercise		
Yes	202	33.28
No	405	66.72
Body mass index		
Underweight	48	7.91
Normal	434	71.50
Overweight and obese	125	20.59
Chronic illness		
Yes	188	30.97
No	419	69.03
The habit of taking breaks		
Yes	329	54.20
No	278	45.80
Electronic device use		
Yes	311	51.24
No	296	48.76
Duration of electronic device use		
≤3 hours/day	127	40.84
>3 hours/day	184	59.16
Risk perception towards COVID-19 virus		
High	148	24.38
Low	459	75.62
Colleagues relationship		
Good	539	88.80
Poor	68	11.20
Job satisfaction		
Satisfied	516	85.01
Not satisfied	91	14.99
Perceived job stress		
Stressed	276	45.47
Not stressed	331	54.53
Workload		
Yes	506	83.36
No	101	16.64

workers who had a high-risk perception of COVID-19 infection than among those who had a low-risk perception about it (AOR=1.60, 95% CI (1.04 to 2.46)) at a p value of 0.032. Finally, the chances of suffering from poor SQ among academicians who had perceived job stress were 2.15 times higher as compared with those who had no job stress (AOR=2.15 (95% CI (1.50 to 3.08)] at a p value of ≤0.01 as shown in table 4.

DISCUSSION

Poor SQ incurs substantial health, economic and societal costs. Understanding the magnitude and various factors linked to the ailment would help researchers identify viable therapies to improve SQ in vulnerable populations. The higher education work environment is characterised by a highly competitive work nature. The university teaching staff in addition to their normal teaching activities, handled various tasks including conducting and preparing research for publication, providing community services and managing administrative positions. Furthermore, their regular teaching activities have shifted from face-to-face to online instruction during the COVID-19 pandemic, which has an impact on their SQ. Understanding the magnitude and investigating aetiologies of the condition plays a paramount role to establish effective prevention and control strategies. To our knowledge, the current study is the first to assess the prevalence and risk factors of poor SQ among the university academic staff in Ethiopia. The prevalence of poor SQ in the last 1 month was found to be 60.30% with 95% CI (56.28% to 64.21%). Working for more than 10 hours per day, electronic device use before bedtime, high-risk perception of COVID-19 infection and having job stress were factors positively associated with poor SQ in the current study.

Results of two investigations conducted in Brazil (57.9%)[75] and (61.3%)[12] supported the current data. This agreement could be due to the nature of tasks in the academic environments including roles related to teaching and research activities, which usually resemble in every higher academic institution. Participants in those nations might also be obliged to work in a substandard workplace in an unhealthy manner for prolonged periods, and fewer individuals are aware of sleep health and the effect of poor SQ. The other possible explanation might be due to study participants having a similar age group as compared with participants in those countries.

Table 3 Poor sleep quality and its components scores of academic staff in the University of Gondar, Ethiopia, 2021 (N=607)

Variables	Frequency (n)	Per cent
Sleep perception		
Very good	265	43.66
Fairly good	249	41.02
Fairly bad	80	13.18
Very bad	13	2.14
Sleep latency (falling asleep)		
0–15 min (0)	27	4.45
16–30 min (1)	342	56.34
31–60 min (2)	161	26.52
>60 min (3)	77	12.69
Sleep duration		
>7 hours (0)	165	27.18
6–7 hours (1)	148	24.38
< 6 hours (2 and 3)	294	48.43
Sleep efficiency		
>85% (0)	326	53.71
75% to 84% (1)	143	23.56
65% to 74% (2)	60	9.88
<65% (3)	78	12.85
Sleep disturbance		
Never (0)	116	19.11
1 time a week (1)	403	66.39
1–2 times a week (2)	84	13.84
≥3 times a week (3)	4	0.66
Used sleep medication		
Never (0)	568	93.57
1 time a week (1)	27	4.45
1–2 times a week (2)	7	1.15
≥3 times a week (3)	5	0.82
Daytime dysfunction		
No problem (0)	411	67.71
1 time a week (1)	143	23.56
1–2 times a week (2)	44	7.25
≥3 times a week (3)	9	1.48
Total score of poor sleep quality		
≤5 (good sleep quality)	241	39.70
>5 (poor sleep quality)	366	60.30

Key: 0=no difficulty, 1=mild difficulty, 2=moderate difficulty, 3=severe difficulty.

On the contrary, the current study had a higher magnitude of the risk of poor SQ compared with the studies conducted in Turkey (38.9%)[13] and Malaysia (45%).[76] This difference might be due to the unstable socioeconomic status of the respondents in this study. The respondents in this study might attempt to compensate for their low salaries by teaching different shifts at multiple colleges and schools. This may lead to longer working hours because they start their daily work activities much earlier in the day and conclude their working day much later. The difference might be also due to the sample size variation; the previous studies were conducted among a small number of study participants compared with the number of participants in this study. The other possible justifications for the difference might be the variation in the educational system, study setting, workload and cultural differences between Ethiopia and those countries.

There were no study reports with a larger magnitude than the current finding. A possible reason for the increased magnitude of sleep problems in the current study could be due to the study period; we conducted the study during the early phase of the COVID-19 pandemic. Higher education institutions needed to look for alternate educational strategies to be adopted during the COVID-19 pandemic and the e-learning strategy emerged as an alternative solution to continue education. The educational institutions started using different educational platforms like Google classroom, Zoom and Microsoft teams. Lecturers were subjected to excessive use of digital devices without breaks as they were shifted to online teaching. There has also been an increased digitalisation for recreational purposes. Hence, it was noted as exposure to light emitted from digital devices has been interfering with the circadian regulation/melatonin rhythm,[33 77] which may lead to poor SQ.

In this study, long working hours per day (>10 hours/day) was significantly associated with poor SQ. The finding echoes the result of previous investigations.[9 78] A possible justification for this report may be that employees with long working hours need more time to recover from work-induced fatigue.[79] However, long working hours reduce the amount of private time available to them, which may lead to sleep deprivation.[80] For recovery from fatigue, not only sleep but also relaxation, for example, spending time with family and friends, resting or reading is needed, but long working hours may also reduce relaxation time.[81] Therefore, reduced private time for workers due to long working hours may lead to sleeplessness, and cause sleep disorders. In addition, due to the nature of their occupation, our study participants spend a lot of time working with computers and other electronic devices. Plausible investigations also confirmed that the usage of electronic devices for a long period of time is associated with sleep disorders.[33 34]

Electronic device use before bedtime showed a significant association with poor SQ. Similar results were reported in other studies.[82–84] This could be reasoned as sleep quantity and quality are significantly reduced when people use digital devices for an extended period.[85] For example, cell phones, tablets, readers, computers and laptops emit short-wavelength enriched light, which has been found to suppress or delay the normal generation of melatonin in the evening and minimise feelings of

Table 4 Bivariable and multivariable logistic regression analysis of factors associated with poor sleep quality among academic staff in the University of Gondar, Ethiopia, 2021 (N=607)

Variables	Poor sleep quality		COR with 95% CI	AOR with 95% CI	P value
	Yes	No			
Sex					
Male	256	180	1	1	
Female	110	61	1.27 (0.88 to 1.83)	1.42 (0.94 to 2.13)	0.091
Educational status					
Bachelor	62	32	1	1	
Master	243	173	0.72 (0.45 to 1.16)	0.74 (0.44 to 1.23)	0.245
PhD	61	36	0.87 (0.48 to 1.58)	0.87 (0.46 to 1.65)	0.674
Working hours per day					
≤5 hours	59	55	1	1	
6–10 hours	249	165	1.41 (0.93 to 2.13)	1.10 (0.76 to 1.85)	0.679
>10 hours	58	21	2.57 (1.39 to 4.78)	2.19 (1.16 to 4.27)	0.019
Khat chewing					
Yes	16	3	3.63 (1.05 to 12.58)	3.00 (0.82 to 11.00)	0.097
No	350	238	1	1	
Physical exercise					
Yes	113	89	1	1	
No	253	152	1.31 (0.93 to 1.85)	1.40 (0.97 to 2.03)	0.068
Electronic device use					
Yes	205	106	1.62 (1.17 to 2.25)	1.53 (1.04 to 2.27)	0.031
No	161	135	1	1	
Chronic illness					
Yes	131	57	1.80 (1.25 to 2.59)	1.45 (0.98 to 1.99)	0.059
No	235	184	1	1	
Risk perception of COVID-19 virus					
High	104	44	1.77 (1.19 to 2.65)	1.60 (1.04 to 2.46)	0.032
Low	262	197	1	1	
Job satisfaction					
Satisfied	318	198	1	1	
Not satisfied	48	43	0.70 (0.44 to 1.09)	0.67 (0.42 to 1.08)	0.099
Perceived job stress					
Stressed	197	79	2.39 (1.70 to 3.35)	2.15 (1.50 to 3.08)	≤0.01
Not stressed	169	162	1	1	

*Significant at p<0.05 in multivariable logistic regression analysis, Hosmer-Lemeshow test p=0.650.
AOR, adjusted OR; COR, crude OR.

sleepiness.[86] Moreover, workforces in a higher education context are often confronted with demanding responsibilities requiring work overload, long working hours and stress, in addition to the COVID-19 pandemic difficulties in the world of education. Because of the pandemic, universities were forced to conduct all of their activities online, including in the current study setting, which increased the usage of electronic devices, contributing to or exacerbating poor SQ.[87]

Our current study revealed a high-risk perception of COVID-19 infections was found to be a determinant factor of poor SQ. This finding is in concordance with other research reports.[43 88] This could be explained as those people who thought they were at a higher risk of developing COVID-19 had more fear than those who thought they were at a lower risk. Fear and rumination were also found to be adversely related to SQ, indicating that fear of infection and rumination did lead to poor

SQ during the pandemic, which contribute to poorer SQ both directly and indirectly by increasing fear.[43] Several researchers had examined the influence of the COVID-19 pandemic on mental health, concluding that persons who are fearful of becoming infected are more likely to develop sleeping disturbances.[89]

Participants who reported having job stress were 2.38 times more likely to have poor SQ than those who did not have stress. The result is in agreement with results of the studies conducted in Brazil,[75] Malaysia[9 90] and Indonesia.[91] The plausible reason might be due to the linkages between sleep, stress regulation and alteration in the hypothalamic–pituitary–adrenal axis implication of psychopathology and sleep–wake cycle. Job stress can lead to the release of an excessive level of glucocorticoids hormones like cortisol. A higher level of cortisol during stressful life events primes to sleep rhythm disruption that results in sleep deprivation.[92 93]

This study is the first of its kind to examine the magnitude and factors influencing poor SQ among academic staff in Ethiopia, who are more likely to suffer from sleep disturbances, particularly during the COVID-19 pandemic. Nevertheless, there are few studies published in the scientific literature that address the prevalence and risk factors of SQ problems in higher education employees. This study would likely contribute significant evidence to literature regarding prevalence and the factors influencing occurrences of sleep problems. As part of this study, the following limitations should be considered while interpretation. First, the study was based on a cross-sectional study design which hinders the temporal relationship between the outcome of interest (poor SQ) and factors influencing its occurrences. Second, the study was based on participant's self-reported data. As a result, underestimation of the condition due to recall bias may be expected. Moreover, participants' responses may also be susceptible to social desirability bias, which leads them to give answers that are socially acceptable. To decrease social desirability, however, precautions were taken by making sure that only study participants were present during data collection and that data confidentiality was upheld. Finally, the finding was not supported by clinical diagnoses, like actigraphy and polysomnography testing that help to identify sleep disorders objectively. However, we made use of the validated PSQI questionnaire, which is a standardised instrument used to measure the quality and patterns of sleep in adults.

CONCLUSION

This study revealed that two-thirds of the participants had poor SQ during the COVID-19 pandemic, indicating a considerable prevalence of the condition. The finding highlights the importance of optimising the working hours per day, minimising electronic device use before bedtime, promoting risk perception toward COVID-19 infection and developing workplace coping strategies for stress, which play a substantial role in minimising poor SQ. We recommend future studies to account for different sectors such as telecommunication, healthcare, transportation, with an interventional study design and objectively measure SQ parameters.

Contributors AHT: Initiated the research concept, wrote up the research proposal, analysed the data, presented the results and discussions, wrote up of the draft manuscript, reviewed and finalised the manuscript document, the guarantor, and is the corresponding author. MA: Involved in the presentation and interpretation process of results and discussions, and reviewed the final drafted manuscript document. GA: Involved in presentation and interpretation process of results and discussions, and reviewed the final drafted manuscript document. GGK: Involved in presentation and interpretation process of results and discussions, and reviewed the drafted manuscript document. All the authors read and approved the final manuscript.

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Patient consent for publication Consent obtained directly from patient(s).

Ethics approval Ethical approval was secured from the Institutional Ethical Review Board (IRB) of the University of Gondar, College of Medicine and Health Sciences, Institute of Public Health (Reference #: IPH/1425/2021). The study followed the tenets of the Declaration of Helsinki and also complied with the ethical requirements set by the University of Gondar. Written informed consent was obtained from each respondent before commencing data collection after an explanation of the nature and possible consequences of the study. The information sheet that clearly shows the research topic, the objectives of the study, confidentiality of the participant's responses, the study benefits and associated risks was prepared and presented. We removed any personal identifiers to assure confidentiality of the participants and only anonymous data were used for interpretations. Furthermore, since the data were collected during the COVID-19 pandemic, we implemented infection prevention protocols including social distancing and wearing of face masks. Participants gave informed consent to participate in the study before taking part.

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ORCID iDs
Amensisa Hailu Tesfaye http://orcid.org/0000-0002-9428-394X
Giziew Abere http://orcid.org/0000-0002-7187-8270

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