Magnitude and correlates of sleep quality among undergraduate medical students in Ethiopia: cross –sectional study

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Abstract

Purpose: Poor quality of sleep has a negative effect on academic performance of medical students. Quantity and quality of sleep in addition to average sleep time are strongly linked with students' learning abilities, poor academic performance and poor interpersonal relationship which predispose them to mental illnesses. This study is aimed to assess magnitude and correlates of sleep quality among medical students in Ethiopia.

Method: An institutional based cross-sectional study was conducted among 576 undergraduate medical students. Data was collected by using interviewer administered structured questionnaires. Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality. The collected data were entered in to Epi-data version 3.1and analyzed using SPSS version 20. Logistic regression was used to identify the potential determinants of quality of sleep among undergraduate medical students. *P*-values less than 0.05 were considered statistically significant and strength of the association was presented by adjusted odds ratio with 95% C.I.

Result: The prevalence of poor sleep quality among undergraduate medical students was 62% (95%CI, 57.9, 65.3). The mean age (±SD) of the respondents was 21.5(±2.4), with age ranging from 18 to 28 and about 310 (53.8%) were males. Factors like, being depressed (AOR = 1.92,95%CI 1.16,3.19), poor social support (AOR = 5.39,95%CI 2.33, 2.49), being stressed (AOR = 2.04,95%CI 1.26,3.31), and poor sleep hygiene (AOR = 3.01,95%CI 1.75,5.18) were associated with poor sleep quality at *p*-value < 0.05. Findings also showed that, one unit increase in grade point average was associated with 81.5% decrease (AOR = 0.185, 95%CI 0.13, 0.28) in poor sleep quality.

Conclusion: A substantial proportion of medical students are affected by poor sleep quality. Routine screening of sleep quality, sleep hygiene, depression and stress is warranted. Moreover, it is better to educating medical students about proper sleep hygiene and the consequences of poor sleep.

Keywords: Sleeps quality, Medical students, Ethiopia

Introduction

Adequate sleep is important for maintaining good physical, mental, and emotional health and is one of the most important factor to the quality of life (Abiola et al. 2013; Ezquiaga et al. 2015). Sleep quality is phenomenon which is difficult to define and is measured by both

quantitative and qualitative components (Rodrigues et al. 2002). Sleep duration and the timing of sleep also influence cognitive performance. Sleep timing depends on both the length of prior wakefulness and on the control of the circadian clock (Genzel et al. 2013). Poor sleep quality can be a symptom of mental illnesses and many chronic physical illnesses, but can also be a common health problem for medical students (Foley et al. 2004; Dixon et al. 2003; Foster et al. 2013; Hyyppä and Kronholm 1989; Yang et al. 2003; Yazdi et al. 2016). The

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prevalence of poor sleep quality is high in both developing and high income societies (Shad et al. 2015; Azad et al. 2015). WHO report showed that about 27% of people suffer from sleep problems in worldwide (Yang et al. 2003). The studies also showed that 50 to 70 million people are chronically suffering from sleep disorders (Stranges et al. 2012; Altevogt and Colten 2006).

Medicine is one of the most stressful fields of education because of its highly demanding study which may be why poor sleep quality is common among medical students. Its prevalence is twofold high among medical students as compared to general populations (Azad et al. 2015; Brown et al. 2001; Waqas et al. 2015). Medical students have a more stressful academic program related to long duration of study year, high intensity of study, overnight clinical duties (Abdulghani et al. 2012; Sahraian and Javadpour 2010; Wong et al. 2005). A review study conducted in Brazil showed that 51.5%, of medical students had poor sleep quality (Pacheco et al. 2017). In US 50.9% of medical students had poor sleep quality (Brick et al. 2010). Study conducted in developing countries showed that 32.5–76% of medical students suffer from poor sleep quality (James et al. 2011; Almojali et al. 2017). Study conducted in Ethiopia among non-medical students and adults in community showed 55.8 and 65.4% of participants had poor quality of sleep respectively (Berhanu et al. 2018; Lemma et al. 2012).

Poor sleep quality among medical students have significant impact on mental and physical health, lead to problem of drinking and suicidal thought which adversely affects academic performance and influence the community in the form of accidents and medical error (Mume et al. 2011; Kenney et al. 2012; Nadorff et al. 2011).

As we tried to revise details of literatures done among medical students in different countries; correlates like, coffee or tea, excessive use of social media, use of drugs, medical problems, irregular sleep schedule, depression, anxiety, academic performance and gender were associated with poor sleep quality in different studies (Azad et al. 2015; Haseli-Mashhadi et al. 2009; Lund et al. 2010a). Factors like, poor social support and poor sleep hygiene were also add as determinants of poor sleep quality among medical students.

Studies showed that medical students are very susceptible to develop poor sleep as compared with non-medical students due to more stressful academic program, to the long duration of study year, high intensity of study, clinical duties, emotionally challenging work, that include overnight duties affect their habits of sleep (Azad et al. 2015; James et al. 2011; Dahl and Lewin 2002; Surani et al. 2015a; Yeung et al. 2008). In Ethiopia medical students are also over stressed, because they learn intensive period of their lives and even they have limited health break time as compared with non-medical students. Despite this, as per the investigators' knowledge; there is no specific study among medical students in Ethiopia.

Therefore, this study is aimed to assess magnitude and correlates of poor sleep quality among medical students in Tikur Anbessa Specialized hospital, is first hospital in Ethiopia which addresses students coming from all regions of Ethiopia. Intervention focused to factors of poor sleep quality is important to maintain concentration, sensorimotor integration, and memory processing to medical students (Vyazovskiy 2015).

Methods and materials
Study design and setting
Institutional based cross-sectional study was conducted from May 1–June 8, 2019. The study was conducted in Tikur Anbessa Specialized hospital which is found in Lideta sub city in Addis Ababa and it is the largest referral hospital in the country with more than 700 beds. It was transferred to the school by the federal ministry of health, and it became university teaching hospital for both clinical and preclinical training of most discipline. Hospital addresses students of year one up to year six coming from all parts of Ethiopia and in hospital a total of 20,100 students are learning medical science.

Study population
The study participants were selected from all undergraduate medical students (year one up to year six) at Tikur Anbessa Specialized Hospital. Participants who were ill with difficulty of communication during the study period were excluded.

Sample size determination and sampling procedure
The sample size was calculated with the following assumptions: margin of error 4, at 95% CI, the prevalence of poor sleep quality 61.4% which was taken from similar study from Sudan (Mirghani et al. 2015). After adding 10% non-response rate the final calculated sample size was 626. To assure representativeness of the sample, proportional allocation was done to the respective class year. The list of students was obtained from college registrar and computer generated simple random sampling method was used to select each study participants from their respective group.

Data collection and tools
Data was collected by using interviewer administered structured questionnaires. It was collected by three BSc psychiatry nurses and regularly supervised by one mental health professional.

Socio-demographic characteristics like; age, sex, marital status, year of the study and average cumulative grade

point were collected by semi-structured socio-demographic questionnaires. Substance related factors were assessed by WHO ASSIST (alcohol smoking and substance involvement screening tool). In this study we considered current use of substance like khat, alcohol, cigarette and others. Participants with response of yes for either of substance use for non-medical purpose were considered as they use substance for that respective substance (Kessler et al. 1998) An outcome variable, Sleep quality was assessed by using Pittsburgh Sleep Quality Index (PSQI); the instrument has been validated among college students in sub-Saharan Africa (Aloba et al. 2007). The PSQI is composed of 19 questions which evaluate sleep in the past 1 month. The PSQI provides seven component scores which measures subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, daytime dysfunction and use of sleep medications. The score for each component ranges from 0 to 3; with 3 indicating the greatest dysfunction. A total global PSQI is derived by summing the seven components; higher scores indicating poor sleep quality and it ranged from 0 to 21. Based on prior literature students with PSQI score greater than 5 was labeled as having poor sleep quality and those with PSQI score less than or equal to 5 was labeled as having good sleep quality (Buysse et al. 1989). Internal consistence (Cronbach alpha) of PSQI in current study is 0.78. The sleep hygiene was assessed by a 13 item sleep hygiene index (SHI) questionnaire with components of taking day time nap for more than 2 h, going to bed in different time form day to day, using caffeine or stimulants while going to bed, going to bed while feeling stressed and related items. Each item is rated on a five-point scale ranging from 0 (never) to 4 (always). Total scores range from 0 to 52, and participants with score of greater than 16 were considered as having poor sleep hygiene (Mastin et al. 2006; Ozdemir et al. 2015). Internal consistence (Cronbach alpha) in current study was 0.74.

Social support was collected by Oslo-3 item social support scale, it is 3 item questionnaires, commonly used to assess social support and it has been used in several studies, the sum score scale ranging from 3 to 14, which has 3 categories: poor support 3–8, moderate support 9–11 and strong support 12–14 (Dalgard et al. 2006).

Depression, anxiety, and stress were measured using Lovibond and Lovibond's short version of the depression Anxiety stress scale (DASS-21). The questions inquire the experience of the items in the past week and each item is scored from 0 (did not apply to me at all) to 3 (applied to me very much). The values obtained were multiplied by two to obtain score and finally score of 10 and above for depression, score of 8 and above for anxiety and score of 15 and above for stress were considered as participants had depression anxiety and stress (Szabó

2010). The internal consistency (Cronbach's alpha) in current study was as follows; (DASS21-D subscale 0.91; DASS21-A subscale 0.72.; and DASS21-Ssubscale 0.82.).

Statistical analysis

Coded and checked data were entered into the computer using EPI Data version 3.1 and imported to statistical package for social science (SPSS) window software version 20. Descriptive statistics such as (frequency, percentage and mean) were computed and presented using tables to show picture of the data. Bivariate binary logistic analysis was performed to determine each of explanatory variables with outcome variable (quality of sleep) and variables with p- value less than 0.2 during bivariate analysis were entered to multivariate analysis. Multivariate binary logistic regression analysis was conducted to determine the presence of a statistically significant association between explanatory variables and outcome variables. Finally variables with P values less than 0.05 were considered statistically significant and strength of the association was presented by adjusted odds ratio with 95% C.I.

Results

Socio-demographic characteristics of respondents

A total of 576 participants were included in the study with the response rate of 92%. The mean age (±SD) of the respondents was 21.5(±2.4), with age ranging from 18 to 28 years and about 294(51%) of the respondents were ≤ 21 years and also about 310 (53.8%) were males. Educational status of the students indicated that about 128(22%) of respondents were fourth year. Regarding marital status, large numbers of the respondents were single (94.1%) and the mean of cumulative grade was 2.81 ± 0.59 (Table 1).

Clinical, substance and social factors of the respondents

From participants, 369 (64.1%) and 322(55.9%) had symptom of depression and stress respectively. Nearly half of 277(48.1%) respondents had poor sleep hygiene. Regarding substance related factors about 236 (41%) of the respondents use alcohol currently within 3 months and 280(48.6%) of the respondent reported that they had poor social support, (Table 2).

Magnitude of poor sleep quality and its components scores among the respondents

According to this study, among a total of included 576 students 357 [62% (95%CI, 58.2, 65.8)] of medical students have poor sleep quality. Regarding to the sleep latency, about 156 (27.1%), of participants had sleep latency of 16-30 min. The median amount of sleep latency was 25 min, and only 65 (11.3%) of participants slept greater than 7 h per night. When assessment was limited

Table 1 Socio demographic characteristics among undergraduate medical students at Tikur Anbessa Specialized hospital, Addis Ababa, Ethiopia, 2019 (N = 576)

Variables	Frequency	Percent
Sex		
Male	310	53.8
Female	266	45.2
Age		
> 21	282	49
≤ 21	294	51
Marital status		
Married	34	5.9
Single	542	94.1
Year of Education		
First year	112	19.4
Second year	85	14.8
Third year	108	18.8
Fourth year	128	22.2
Fifth year	69	12.0
Six year	74	12.8
Cumulative grade		
Mean + Standard deviation		2.81 ± 0.59

Table 2 Clinical, Substance and Social factors among undergraduate medical students at Tikur Anbessa Specialized hospital, Addis Ababa, Ethiopia, 2019 (N = 576)

Variables	Frequency	Percent
Depression		
Yes	369	64.1
No	207	35.9
Anxiety		
Yes	315	54.7
No	261	45.3
Stress		
Yes	322	55.9
No	254	44.1
Sleep hygiene		
good	299	51.9
poor	277	48.1
Current cigarette use		
No	544	94.4
Yes	32	5.6
Current khat use		
No	518	89.9
Yes	58	10.1
Current alcohol use		
not use	340	59
Use	236	41
Social support		
Poor	280	48.6
Moderate	174	30.2
Strong	122	21.2

to the component item of sleep quality tool, about 136 (23.6%) of the students stated that their subjective experience of sleep quality was very bad. The use of medication for sleep in three or more times a week was reported by 49 (8.5%) of the participants, (Table 3).

Factors associated with quality of sleep

In bi-variable logistic analysis variables; sex, current alcohol use, current Khat use, depression, stress, anxiety, sleep hygiene, social support and CGPA were found to have *p*-value less than 0.2. These variables fulfilled minimum requirements for further multivariable logistic regression.

In multivariable logistic regression variables; depression, stress, sleep hygiene, poor social support and CGPA were statistically significant with poor sleep quality at p-value less than 0.05.

The odds of having poor sleep quality among respondents who are depressed were 1.9 times higher as compared to non-depressed respondents (AOR = 1.92, 95%CI,1.92(1.16,3.19). Respondents who had poor sleep hygiene were 3 times more likely to have poor sleep quality as compared to those with good sleep hygiene (AOR = 3.01, 95%CI (1.75,5.18). The odds of having poor sleep quality among participants with stress was 2 times higher as compared with their counterparts (AOR = 2.04, 95%CI, 1.26, 3.31).

Regarding social support, participants with poor social support were 5.4 times more likely to have poor sleep quality as compared with respondents who had strong social support (AOR = 5.39, 95%CI, 2.33,12.49). CGAP was also another factor which associated with quality sleep. As average grade point of students increase in a unit, poor sleep quality decreases/changes by 81.5% [AOR = 0.185, 95%CI (0.13, 0.28)], (Table 4).

Discussion

The study was conducted among medical students in Tikur Anbessa specialized hospital, which is first and well known specialized hospital; address students coming from all regions of country. As our knowledge this is the first study regarding sleep quality and associated factors among medical students in our country.

In this study the prevalence of poor sleep quality was 62% (95%CI, 57.9, 65.3) which was consistent with the study conducted in Sudan 61.4% (Mirghani et al. 2015) and Iraq 60.4% (Al-Humairi 2018). However, result of

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Table 3 Sleep quality and its component score among undergraduate medical students at Tikur Anbessa Specialized hospital, Addis Ababa, Ethiopia, 2019 (N = 576)

Components	Frequency	Percent
Sleep latency		
0	141	24.5
1	156	27.1
2	132	22.9
3	147	25.5
Sleep duration		
.> 7 h	65	11.3
6-7 h	220	38.2
5-6 h	39	6.8
< 5 h	252	43.8
Sleep efficiency (%)		
> 85	270	46.9
75–84	115	20.0
65–74	71	12.3
> 65	120	20.8
Day time dysfunction		
0	188	32.6
1	84	14.6
2	148	25.7
3	156	27.1
Sleep disturbance		
0	114	19.8
1	194	33.7
2	148	25.7
3	120	20.8
Subjective sleep quality		
Very good	184	31.9
Fairly good	124	21.5
Fairly bad	132	22.9
Very bad	136	23.6
Use of sleep medication		
Not during the past month	294	51.0
Less than once a week	80	13.9
Once or twice a week	153	26.6
Three or more times a week	49	8.5
Sleep quality score		
Good sleep	219	38.0
Poor sleep	357	62.0

the present study was higher than the study reported among non-medical students in Ethiopia 55.8% (Lemma et al. 2012), Nigeria 32% (James et al. 2011), Iran 57.5%, (Yazdi et al. 2016) central India 32.53% (Rathi et al. 2018), Pakistan Karachi 39.5% (Surani et al. 2015b), Brazil 51.5% (Pacheco et al. 2017) and US 50.9%. (Brick et al. 2010) On the other hand, our study was lower than the previous studies done in India 67.42%, (Priya et al. 2017) Saudi Arabia 70.4–76% (Almojali et al. 2017; Siddiqui et al. 2016; Ibrahim et al. 2017), India 72.9% (Shad et al. 2015) and Pakistani 77% (Waqas et al. 2015). The possible reasons for the variability could be due to differences in sampling technique, which was consecutive sampling technique used in Pakistan Karachi and systematic and meta-analysis study was conducted in Brazil. Socio-cultural difference might be other reasons for this difference. Study population also might have its contribution for variation since study conducted in Nigeria used only 5 and 6 years of medical students, in Central India first and second year medical students were study participants. It is fact that medical students had class over load than non-medical students, this might be the possible reason for high prevalence of poor sleep quality among medical students than non- medical students in Ethiopia.

The second objective of this study was to identify factors associated with poor sleep quality among medical students. The correlates associated with poor sleep quality were selected based on our professional experience in our country and revision of previous similar studies. The significant association was found between stress and poor sleep quality among medical students. This is similar to the finding of study conducted in Pakistan (Waqas et al. 2015) and Saudi Arabia (Almojali et al. 2017), Physiologically, many studies have found that sleep and stress are closely linked to the hypothalamus- pituitary adrenal (HPA) axis (Kashani et al. 2012; Van Reeth et al. 2000a), which may explain the close relationship between these two variables (Van Reeth et al. 2000b). Acute stress is accompanied by a decrease in slow wave, raped eye movement and increase sleep deprivation (Van Reeth et al. 2000b).

In this study the odds of having poor sleep quality among depressed respondents was 2 times higher as compare to non-depressed responders. This finding coincides with results from Virginia (Lund et al. 2010b), Egypt (Fawzy and Hamed 2017) and Saudi Arabia (Ibrahim et al. 2017). The possible reason might be depression decreases neurotransmitter serotonin and results in diminished cognitive performance that affect normal sleep pattern (Sadock and Ruiz 2014).

The study revealed that the CPGA is a significant predictor of sleep quality, this is consistent to previous study in Iraq (Al-Humairi 2018) and Saudi Arabia. The possible justification for this might be poor academic performance may adversely affect sleep through concomitant stress and also students with poor academic performance spend more hours at night for reading

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Table 4 Logistic regression showing association between factors and sleep quality among undergraduate medical students at Tikur Anbessa specialized hospital Addis Ababa Ethiopia, 2019 (N = 576)

Explanatory variables	Sleep quality		Crude Odds ratio (95% ci)	Adjusted Odds ratio (95% ci)
	Poor (n = 357)	Good (n = 219)		
Sex				
Female	189	77	2.08 (1.47, 2.93)	1.48 (0.93,2.36)
Male	168	142	1.00	1.00
Current alcohol use				
Yes	154	82	1.27 (0.89,1.79)	1.22 (0.78,1.92)
No	203	137	1.00	1.00
Current khat use				
Yes	41	17	1.54 (0.85, 2.79`)	1.91 (0.89,4.06)
No	316	202	1.00	1.00
Depression				
Yes	273	96	4.16 (2.89, 5.98)	1.92 (1.16, 3.19)*
No	84	123	1.00	1.00
Stress				
Yes	238	84	3.21 (2.27,4.56)	2.04 (1.26, 3.31)**
No	119	135	1.00	1.00
Anxiety				
Yes	234	81	3.24 (.2.28,4.60)	1.47 (0.907, 2.39)
No	123	138	1.00	1.00
Sleep hygiene				
Poor	205	72	2.75 (1.94,3.91)	3.01 (1.75,5.18) **
Good	152	147	1.00	1.00
Social support				
Poor	208	72	2.08 (1.33,3.25)	5.39 (2.33, 12.49)**
Moderate	78	96	0.58 (0.37,0.93)	1.58 (0.69,3.59)
Strong	71	51	1.00	1.00
CGPA			0.195 (0.14,0.27)	0.19 (0.13, 0.28)**

N.B. 1.00 reference, *p-value less than 0.05, **p-value less than 0.001

which often deprive themselves from sleep to improve their grade. This creates a vicious cycle that is associated with an adverse effect on sleep quality. In addition that poor sleep might affect certain parts of the brain, especially the frontal and partial regions including subcortical structure such as basal ganglia and thalamus (Goel et al. 2009).

Regarding social support, participant who had poor social support were 5 times more likely to have poor sleep quality. This finding is in agreement with study done in Taiwan (Cheng et al. 2012). The possible reason might be students with low or poor social support have higher rate of mental distress than those with strong social support which may leads to sleep disturbance. Social support may also influence emotional regulation and emotional reactivity that implicate in the development of sleep problem (Jin et al. 2014).

The odd of having poor sleep quality was 3 times higher among participant with poor sleep hygiene as compared to those with good sleep hygiene. The finding of the current study coincides with study done in Iran in Qazvin university (Yazdi et al. 2016) and US (Brick et al. 2010). This is might be due to the fact that participants with poor sleep hygiene could have poor psychosocial functioning, diminished cognitive performance and deterioration of daily functioning which can affect normal sleep. Studies conducted in different countries showed that good sleep hygiene practice is important for good academic performance of students (BaHammam et al. 2012). This is might be due to stimulant drinking at evening for purpose of study affects melatonin hormone production. Other reason might be lack of regular activity, lack of regular sleep-awake schedule and going to bed without

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sleep sensation that disturb sleep pattern and leads to poor sleep quality (19).

In this study, no significant association was found between sex and sleep quality, in contrast a few studies did report that being a female medical student was significant predictor of high poor sleep quality (Ibrahim et al. 2017). In addition in this study no significant association was found anxiety and poor sleep quality. Finding is not in agreement with study done in Jeddah, Saudi Arabia (Ibrahim et al. 2017), The possible reason might be the previous studies focus on preclinical students, attributed to the high number of lectures, study load during the early pre-clinical years. The other reason might be participants might not adapt to environment.

Limitation of the study
The limitation of this study might be due to the nature of study design, which cannot establish temporal relationship between outcome and independent variables.

Conclusion
A high prevalence of poor sleep quality was prevailed among medical students in the current study. CGPA, stress, depression, poor sleep hygiene and poor social support were found to be significant factors associated with poor sleep quality. Institution based academic counseling center focusing on student's study skill and coping with their stressful environment is crucial. Moreover, it is better to educating medical students about proper sleep hygiene and the consequences of poor sleep practices. It would have been better conduct prospective study to investigate the cause effect relationship of risk factors of poor sleeps quality.

Abbreviations
DASS: Depression, Anxiety, Stress Scale; CGPA: Cumulative Grade Point Average; SHI: Sleep Hygiene Index; SPSS: Statistical Package for Social Sciences; PSQI: Pittsburgh Sleep Quality Index

Ethics approval and consent to participate
Ethical clearance was obtained from the joint ethical review committee of University of Gondar and Amanuel mental specialized hospital. Formal letter of permission was obtained from Amanuel mental specialized hospital and submitted to Tikur Anbessa medical school. Participants gave their written informed consent after adequate information about the study, and the potential benefits had been provided. Data was collected after obtaining written consent from participants.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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