



Research Article

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Sleep Quality among University Students: Associations between Demographic Factors and Physical Activity Level

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ABSTRACT

Poor sleep quality among university students is a rising concern as it affects their well-being. Studies have shown an association between physical activity and sleep quality; however, studies in a local context focussing on health sciences undergraduate students are scarce. Thus, a cross-sectional study aiming to assess the prevalence of poor-quality sleep and its association with physical activity was conducted among health sciences students in Kuala Lumpur. A total of 90 undergraduate students aged 19 and above ($M=21.9\pm 1.4$ years) were recruited from three learning centers by using purposive sampling. A self-administered questionnaire was used to acquire the respondents' socio-demographic information as well as physical activity and sleep assessments. Results showed that 54% of respondents were poor sleepers and nearly half of them were minimally active (43.3%) while only 30% of the respondents were involved in health-enhancing physical activity. Nonetheless, there was no significant association between physical activity level and sleep quality ($\chi^2=1.54$, $p>0.05$). The residences of the respondents significantly contributed to poor sleep quality with those who stayed off-campus having five times the risk of poor sleep quality ($OR= 5.084$, $CI= 1.02-25.42$). In conclusion, the high prevalence of poor sleep quality among university students may not be affected by their physical activity; however, their place of residence plays an important role in determining their sleep quality.

Key words: university students, sleep quality, physical activity, residential.

INTRODUCTION

Sleep is one of the important factors that helps individuals to stay healthy [1]. Everybody needs to have a sufficient duration of sleep. Poor sleep quality will influence daily activity [2, 3]. Sleep is vital for memory consolidation where the memories are reorganized to become more resistant to interference and so ensure improvements in performance [4, 5]. In Asia, epidemiological data about sleep problems among university students are available from China [6], Taiwan [7], Hong Kong [8], and Thailand [9]. Among these Asian countries, the highest prevalence of poor sleep quality was reported in Hong Kong, which found that almost 60% of the students were diagnosed with poor-quality sleep [8]. On the other hand, a study in Thailand, indicated that approximately 42% of the students had poor sleep quality [9]. Across several studies conducted in local contexts, the prevalence of poor sleep quality ranged from 33.3% to 70.6% [10-13]. In general, the prevalence of poor sleep quality among undergraduates varies among studies; however, it remains a critical issue that should be taken into consideration.

The majority of the local studies assessing sleep quality have been conducted with undergraduate medical students [14-18], while limited studies were conducted among health sciences students [12, 19]. It is well-recognized that medical students may be associated with an increased risk of developing poor sleep quality due to a packed academic schedule and assignments [20]. In addition, increased levels of stress, work, and night-time activities may also increase the risk of poor sleep quality among medical students [17, 21]. However, health sciences students should not be neglected. Poor sleep quality may affect the learning process, which may affect academic performance, as well as performance as a healthcare professional in the future [14]. The studies involving health sciences courses conducted in a local context took place among biomedical students in Kuala Lumpur [19], while the studies conducted in the in Serdang involved medical and several health sciences courses [12]. This study revealed that a higher percentage of health sciences students suffered from poor sleep quality compared to medical students.

A recent study conducted among university students had proposed a favorable association for physical activity (PA) with sleep quality. Previous studies indicated that there was a significant association between PA and sleep quality among university students aged 18 years and above using two instruments: the International Physical Activity Questionnaire and the Pittsburgh Sleep Quality Index [22]. Another study of physical activity among university students showed that physically active students practice low intake of sugar and lower level of foods with carbohydrates [23]. A study in Malaysia among nursing students postulated that on average, the number of steps taken daily was in the 'somewhat active' category and did not achieve the 10,000-step target [24]. Barriers to performing physical activity were mostly external ones such as lack of equipment, lack of facilities and low levels of support from family and friends rather than internal barriers such as lack of energy, motivation, and self-confidence [25]. Many factors contributed to sleep quality such as age group [26], accommodation [27], stress level, excessive day time sleepiness [28], and knowledge [29]. Previous studies in Malaysia have shown that for a typical student age group, falling asleep during daytime and skipping classes have shown significant associations with sleep quality [27]. Among university students, a study shows that good sleep quality contributes to good academic performance for average to excellent students [30, 31]. Sleep quality was associated with gender, year of study, type of accommodation, and sleep hygiene among students in Hong Kong [27]. Sleep hygiene was assessed using a set of questions on the behavior before sleep such as eating, daily wake up time, exercise, screen time, and others. Meanwhile, a study of sleep quality among university students postulated that that poor sleep quality was due to skipping breakfast and tea-drinking habits [7]. Recognizing the importance of sleep and relationship between PA and sleep quality in enhancing the health status of the population, the present study aimed to assess the prevalence of poor sleep quality and its relationship with PA among health sciences students in Kuala Lumpur.

The period of life between 21 and 39 years old is the stage at which an individual usually becomes independent and it is a crucial period in which they learn to adopt a healthy lifestyle [32]. However, they might face new challenges when they enter universities such as academic schedules, performance assessment, new living environments, and social events [33]. Thus, they might alter their sleeping behavior to adapt to these challenges [34]. In addition, university students have always been neglected and overlooked in this area of research as compared to the wider population [35], which may result in several complications in the later stages of life such as obesity and non-communicable diseases [36]. Without preventive methods, it is suggested that the prevalence of poor sleep quality may increase. Therefore, the aim of this study was to determine the association between gender, environment (residential and learning centers), and PA level with sleep quality among health sciences undergraduate students in Kuala Lumpur.

MATERIALS AND METHOD

This was a cross-sectional study conducted among undergraduate students in Kuala Lumpur. The sample size for the study was calculated based on the formula by [37]:

$$n = [Z_{\alpha/2} \times \sigma]^2 / \Delta^2 \quad (1)$$

where n = the calculated sample size, $Z_{\alpha/2}$ = 1.96 (95% confidence interval), σ = 2.63 [12], Δ = 0.5, Eqn. (1) yielded 106 respondents.

Students were from three different centers: Applied Health (KH), Community Health (CH), and Rehabilitation (RH). Purposive sampling was used to obtain the required number of undergraduate students from each center. Students who were pregnant, had physical disabilities, consumed or were prescribed with sleep medication or

diagnosed with chronic metabolic diseases such as diabetes, heart problems, cancers, and others were excluded from the study. Informed consent was obtained from all participants prior to data collection. However, only a total of 90 respondents participated in this study due to the low response rate. Background information such as age, sex, ethnicity, marital status, total monthly household income, and accommodation were included in this questionnaire to assess the subject's socio-demographic status.

The sleep quality of the subjects was assessed using the Pittsburgh Sleep Quality Index (PSQI) questionnaire, which consists of 19 questions related to sleep. PSQI differentiates "poor" from "good" sleep quality by measuring seven components for the past month: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. The scores for each component were added together to obtain the global PSQI score, with a minimum score of "0" and a maximum score of "21". A total score of 5 or greater indicates "poor" sleep quality, while scores below 5 indicate "good" or normal sleep quality [38]

The subjects' PA was assessed using the International Physical Activity Questionnaire (Short) (IPAQ). This questionnaire comprises a set of 4 questions about vigorous activities, moderate activities, walking, and sitting. The results of IPAQ were reported in categories (low activity levels, moderate activity levels or high activity levels) and in units of energy expenditure, MET minutes, per week [36] All the data collected were analyzed using Statistical Package for Social Science (SPSS) version 25.0.

RESULTS AND DISCUSSION

This study involved 90 respondents. Based on Table 1, the mean age of respondents was 21.9 ± 1.4 years, a majority (75.6%) of the respondents were Malay, followed by Chinese (22.2%) and only approximately 2% of the respondents were Indian. Of the respondents, 83.3% were female and almost all were single. Results showed that more than 80% of the respondents stay on campus with only a minority (16.7%) living off-campus. The distribution of respondents from the three learning centers was 34.4%, 37.8%, and 27.8% from KH, CH, and RH, respectively.

Table 1: Sociodemographic profile of the subjects (n=90)

Characteristics	Frequency (n)	Percentage (%)
Race		
Malay	68	75.6
Chinese	20	22.2
Indian	2	2.2
Gender		
Male	15	16.7
Female	75	83.3
Marital Status		
Single	89	98.9
Married	1	1.1
Residential		
On-campus	75	83.3
Off-campus	15	16.7
Learning Centers		
Applied Health (KH)	31	34.4
Community Health (CH)	34	37.8
Rehabilitation (RH)	25	27.8
Physical Activity		
Inactive	24	26.7
Minimally Active	39	43.3
HEPA Active	27	30.0

Table 2: Percentage of subjects based on overall PSQI category (n=90)

Components	Frequency (n)	Mean ± SD
Overall PSQI		
Good Sleep Quality	36(40%)	4.22 ± 0.99
Poor Sleep Quality	54(60%)	7.39 ± 1.48

Table 3: Mean and SD of PSQI

Domain PSQI	Median	IQR	H	p
Subjective Sleep Quality	1	0	2.11	0.55
Sleep Latency	1	0	1.03	0.79
Sleep Duration	1	1	5.25	0.15
Habitual Sleep Efficiency	0	1	2.60	0.46
Sleep Disturbances	1	0	0.40	0.94
Use of sleep medication	0	0	4.69	0.20
Daytime dysfunction	1	2	0.44	0.93

Meanwhile, for sleep quality, three out of five respondents were classified as having poor sleep quality with the remaining 40% having good sleep quality, as shown in Table 2. Results in Table 2 show that 60% of the students had poor sleep quality. This study also compared the sleep quality score between the year of study using the Kruskal Wallis test. However, according to Table 3, there was no significant median difference in the sleep quality domain between the year of study. The median for the subjective sleep quality domain was 1, indicating that most of the students reported their sleep quality as fairly good overall. The median sleep latency was 1, indicating that mostly fall asleep after 15 to 30 minutes and they have a problem sleeping less than once a week. Meanwhile, a median of 0 in domain 4 indicates that students had more than 85% habitual sleep efficiency. Furthermore, the median for domain 6 was 0, indicating that none had taken any sleep medication in the past month.

Table 4 reveals that both males (6.40 ± 2.10) and females (6.07 ± 2.03) had unsatisfactory sleep quality. Approximately 60% of female respondents and more of the male respondents (66.7%) were having poor-quality sleep; however, no significant association was found between gender and sleep quality ($\chi^2= 0.33$, $p= 0.774$). A higher percentage of respondents (80.0%) who stayed off-campus had poor-quality sleep compared with those staying on-campus (56.0%), third indicating respondents had poor sleep quality regardless of residence. However, no significant association was found between residence and sleep quality ($\chi^2= 3.00$, $p= 0.174$). The percentages having poor sleep for each learning center are 51.6% for KH students, 70.6%, and 56.0% for CH and RH students with mean scores of 6.16 ± 1.85, 6.38 ± 2.13, and 5.72 ± 2.13, respectively. A higher proportion of students from the CH learning center were experiencing poor-quality sleep compared to those from KH and RH learning centers; however, the association between learning centers and sleep quality was not significant ($\chi^2= 2.67$, $p= 0.264$). In terms of PA, approximately 66.7% with a HEPA active level were reported with poor-quality sleep, while only half of the inactive respondents were diagnosed with poor sleep quality. However, this study revealed that the PA level was not significantly associated with sleep quality ($\chi^2= 1.54$, $p= 0.463$).

Table 4: Percentage and mean score of gender, residential, learning center and physical activity based on PSQI category

Variables	Good Sleep Quality, n (%)	Poor Sleep Quality, n (%)	χ^2	P
Female	5 (33.3) 31 (41.3)	10 (66.7) 44 (58.7)	0.33	0.774
Residential				
On-Campus	33 (44.0)	42 (56.0)	3.00	0.174
Off-Campus	3 (20.0)	12 (80.0)		
Learning Centers				
KH	15 (48.4)	16 (51.6)	2.67	0.264
CH	10 (29.4)	24 (70.6)		
RH	11 (44.0)	14 (56.0)		

Physical Activity				
Inactive	12 (50.0)	12 (50.0)	1.54	0.463
Minimally Active	15 (38.5)	24 (61.5)		
HEPA Active	9 (33.3)	18 (66.7)		

The mean differences for gender, residential, learning center and PA based on the PSQI category are reported in Table 5. The two-way ANOVA analysis revealed a non-statistically-significant main effect for residential, $F(1, 84) = 0.206$, $p = 0.651$, $\omega^2 = -0.03$, gender, $F(2, 84) = 2.023$, $p = 0.139$, $\omega^2 = 0.06$ and learning centre, $F(2, 84) = 0.977$, $p = 0.381$, $\omega^2 = -0.003$. The present study found that students who stayed on campus ($M = 6.01$, $SD = 2.10$) achieved significantly lower PSQI scores compared to students off-campus ($M = 6.67$, $SD = 1.63$, $\omega^2 = -0.019$). Results also showed that male students achieved significantly higher PSQI scores ($M = 6.40$, $SD = 2.10$) than female students (PSQI score; $M = 6.07$, $SD = 2.03$). With regard to learning center, CH learning center ($M = 6.38$, $SD = 2.13$) achieved a significantly higher PSQI score than RH ($M = 5.72$, $SD = 2.13$) and KH ($M = 6.16$, $SD = 1.85$). However, there were no significant effects of gender, learning centers and residence on sleep quality among subjects in the present study.

In Table 6, results from the Wald test indicated that the main predictor for poor sleep was the learning center and residential. As demonstrated in Table 6, residential was the only variable that contributed significantly to poor sleep quality among health sciences students. The results showed that students who stayed off-campus had a five times higher risk of developing poor sleep quality as compared to students who stay on-campus ($OR = 5.084$, $CI = 1.02-25.42$).

Table 5: Mean differences of gender, residential and learning center based on PSQI category

	df	F value	P-value
Residential	1	0.206	0.651
Center	2	0.977	0.381
<i>Residential*Center</i>	2	0.520	0.597
Residential	1	0.779	0.374
Gender	1	0.002	0.968
<i>Residential*Gender</i>	1	0.030	0.863
Center	2	2.023	0.139
Gender	1	0.002	0.965
<i>Center*Gender</i>	2	1.578	0.212

Table 6: Result of logistic regression between variables with poor sleep quality (n=90)

Variables	Wald	Logistic Regression	
		Odds Ratio	Confidence Interval
Gender			
Male	0.67	1.82	0.43-7.65
Female	Ref	1	
Residential			
Off-campus	3.92	5.08*	1.02-25.42
On-campus	Ref	1	
Learning Centers	4.08		
CH	0.14	3.00	0.98-9.12
RH	2.12	1.25	0.39-3.98
KH	Ref	1	
Physical Activity			
HEPA Active	2.31	2.144	0.67-6.83
Minimally active	0.16	2.67	0.75-9.44
Inactive	Ref	1	

* $p < 0.05$

The present study showed that the prevalence of poor sleep quality was similar to other studies, namely, that 65% of the university students were poor sleepers [13]. It was found that more than half of the male and female students were poor sleepers in the present study, which was in contrast to several studies [12, 21, 22], which revealed that higher numbers of female students (55.3%) were poor sleepers compared to their male counterparts. This may be due to female students experiencing more difficulty in falling asleep and having to wake up several times in the middle of sleep as compared to their male counterparts [39]. This may be due to female students being more likely to feel depressed and stressed as well as having a higher risk of pre-test anxiety [40].

The present study also showed that the highest number of students with poor-quality sleep was from the community health center as compared to the other two learning centers. This finding was supported by the previous local study, which showed that a certain program of health sciences students had reported the highest PSQI score, indicating poor sleep quality [14, 41]. Studies had reported that university students trying to read all the books and chapters assigned and meet paper deadlines whilst joining in the extracurricular activities may become overwhelmed and have insufficient time to complete all their work adequately [14, 42]. This indicated that high workloads and the total credit hours that students were required to achieve a result in poor sleep quality [43].

The results also reported that half of the inactive students were poor sleepers, while minimally-active students (61.5%) and HEPA active respondents (66.7%) had poor sleep quality. Interestingly, the present study indicated that more poor sleepers were among the students who were physically active, whereas previous studies had reported that physical activity was known to improve mood, reduce stress, and enhance sleep quality [42, 44]. Another study among college students agrees with the results of this study: that there was no significant relationship between sleep quality level and PA level [45]. Another study by Yahia *et al.* (2017) found that nighttime eating habits may also influence sleep quality [46]. Therefore, students with poor-quality sleep might try to improve their sleep by increasing their PA and avoid night-time eating habits.

The present study indicated that only the area of residence contributed to poor sleep quality among undergraduate health sciences students, while gender, learning centers, and PA level failed to exhibit any links. The results showed that staying off-campus exposes students to five times greater risk of developing poor sleep quality as compared to those who stay on-campus; this result was supported by a study conducted in Turkey among nursing students. However, it should be noted that nursing students have a busier schedule compared to other health sciences students, which may also result in a higher risk of poor sleep quality. The study also indicated that staying on-campus, which is more crowded, increased the risk of having poor sleep quality as compared to staying off-campus [47, 48]. This study agrees with other studies that found a relationship between sleep quality and type of residence. However, the poor sleep quality among students in this study may be due to the year of study and sleep hygiene [27]

The results in the current study have some limitations. We did not conduct interviews with respondents regarding PA and sleep quality. The association between PA and sleep quality could not, however, clarify if there were sleep problems among respondents. Finally, the questionnaire on PA was self-administered and may contribute to an over- or under-estimate of the PA among the respondents.

A study among a large population in Malaysia has indicated that non-leisure-time physical (NLTP) activity was an important factor contributing to PA activity according to age and residences. Therefore, NLTP such as walking and cycling may contribute to sleep quality in this study [49]. However, the result of the present study was in contrast to a previous local study [12]. As revealed by [50], students staying in hostel experienced more freedom, which may result in a higher risk of poor sleep quality and health conditions. The relationship between freedom and sleep quality is still not clear; thus, more research should be conducted to assess the relationship. In addition, students may also encounter stressful events when adapting to the hostel environment, which can be crowded and with poor facilities, which can lead to poor sleep quality and can affect academic performance [12, 51].

CONCLUSION

In conclusion, the prevalence of poor sleep quality was 60% among undergraduate health sciences students, most of whom were minimally active (43.3%). This study showed that only the area of residence contributed

significantly to poor sleep quality, while other variables may not contribute significantly to predicting sleep quality.

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