ORIGINAL ARTICLE

A Cross-sectional Study on the Sleep Quality and Excessive Daytime Sleepiness of Filipino Medical Students in a State-run University during the Coronavirus Disease (COVID-19) Pandemic

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ABSTRACT

Introduction. Movement restrictions and changes in medical education around the world due to the Coronavirus 2019 pandemic have been sources of stress, which affect sleep and compound the demands of medical education. In the Philippines, stay-at-home orders were implemented in the National Capital Region on 15 March 2020, and despite various readjustments and re-definitions, remain in effect to date, March 2022.

Objectives. This cross-sectional study aims to determine the sleep quality and daytime sleepiness of Filipino medical students during prolonged stay-at-home orders, to compare them with pre-pandemic evaluations, and to explore associations between scores and participant characteristics.

Methods. The medical student population of a state-run university in the City of Manila was included, while those on a leave of absence were excluded. The Epworth Sleepiness Scale and the Pittsburgh Sleep Quality Index which measure excessive daytime sleepiness and sleep quality, respectively, were disseminated via Google Forms from April to May 2021.

Results. Response rate was 87.75% (n=709) with a mean age of 22.9 ± 2.0 years and a 1:1.09 male-to-female ratio. Among the respondents, 41.18% had excessive daytime sleepiness, and was significantly higher for first-year pre-medicine students. Compared to pre-pandemic scores, daytime sleepiness decreased during the pandemic. On the other hand, 62.34% of the respondents had poor sleep quality, with global scores being significantly higher for the first-year pre-medicine students. Relationships between participants' characteristics and their scores were extremely weak, while a moderately significant correlation existed between global daytime sleepiness and sleep quality scores.

Conclusion. Both excessive daytime sleepiness and poor sleep quality remain prevalent during prolonged stay-at-home orders. These reflect the effect of the pandemic on stress inherent to medical education, and may be additional facets to be regarded in evaluating the general well-being of medical students.

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INTRODUCTION

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV 2) was the identified pathogen responsible for the Coronavirus Disease 2019 (COVID-19) pandemic that has affected all countries, the Philippines included.[1] As an attempt to curb transmission, stay-at-home orders - locally termed as *community quarantine* - were implemented throughout various regions in the country starting with the City of Manila on 15 March 2020.[2,3] Throughout the 2 years, various

readjustments and re-definitions have been made, but these have nevertheless remained in effect to date, March 2022. The suspension of physical classes has been consistent throughout, among other prohibitions and guidelines such as maintaining physical distancing and avoiding mass gatherings.[2,4] As of 12 March 2022, the Philippines has recorded 3,670,177 cases, with the City of Manila contributing 146,585 cases.[5]

It is known that stressful situations such as public health emergencies affect the physical and mental well-being of individuals due to a variety of factors such as insecurity and confusion.[6] As a result, emotional responses such as distress, psychiatric conditions, and maladaptive behaviors, among others, may develop.[6,7] However, even prior to the pandemic, a high prevalence of stress has been one of the most important issues among medical students and is often attributed to the heavy academic load.[8,9] This has been compounded by stress due to the abrupt cessation of the semester and uncertainty accompanying the suspension of physical classes, leading to anxiety, depression, and sleep problems.[10-12] Further, changes in medical education such as changes in curricula, shifts in the academic calendar, and new policies on instructional delivery and assessment have also aggravated the stress brought about by the pandemic.[13]

Due to the known relationship between stress and sleep, it has become a particular interest in medical student populations.[14] Sleep is a critically important physiologic function not only related to mental health, but also to memory and learning. This importance is further emphasized by the fact that sleep deprivation is associated with fatigue, daytime sleepiness, and reduced neurocognitive performance.[9,14-16]

Literature regarding the affectation of the different dimensions of sleep due to the pandemic is currently growing. However, this remains relatively sparse when pertaining to medical students, even more so in the Philippine setting. Furthermore, limitations exist in relation to geographic and temporal variations in both the implementation of stay-at-home orders and the adaptations of medical institutions across the world.

Given these, the main objective of this study is to determine the sleep quality and the daytime sleepiness of medical students in a state-run university in the Philippines after more than a year of quarantine during the COVID-19 pandemic. Specifically, it aims to (1) examine the sleep quality of the participants using the Pittsburgh Sleep Quality Index (PSQI), (2) to evaluate the degree of excessive daytime sleepiness after more than a year of quarantine compared to pre-pandemic scores using the Epworth Sleepiness Scale (ESS), (3) to compare PSQI and ESS scores across year levels, and "(4) to explore associations among the PSQI scores, ESS scores, and participant characteristics. To the authors' knowledge, this is the first study on a Filipino medical student population examining daytime sleepiness and sleep quality during the COVID-19 pandemic.

METHODS

Study Registration

The study is registered at the University of the Philippines Manila Research Grants and Administration Office with the registration number RGAO-2021-0072, as well as with the University of the Philippines Manila Research Ethics Board with the registration number 2021-182-01. The study is also registered at the Philippine Health Research Registry with the registration number PHRR210426-003503.

Participant Selection

The study includes the entire medical student population enrolled for the second semester of academic year 2020-2021 in a state-run university in the City of Manila. The specific medical college is chosen since other medical education institutions have differing practices regarding adjustments of online medical education. Additionally, this is the only medical college in the Philippines that has a previously published sleep study, hence would serve well as a point of reference.

The medical students from this study come from 6 learning units, corresponding to different year levels. Learning Units (LUs) 1 and 2 are unique to the Integrated Liberal Arts and Medicine (INTARMED) program of the university and pertain to the two pre-medicine years of the fast-tracked 7-year Doctor of Medicine program intended for high school graduates. These year levels are composed of approximately 40 students each. On the other hand, LUs 3 to 6 comprise the standard 4-year Doctor of Medicine program, and is represented by the first-, second-, and third-year medical students (LUs 3, 4, and 5, respectively); and the hospital clerks (LU 6). In contrast, these year levels have approximately 180 students each. Because medical interns of the university hospital, comprise students from various medical institutions, they are not included in the study. For academic year 2020-2021, LUs 1 to 5 have been conducting classes online, while for LU 6, clinical rotations have resumed for the second semester only, starting in January 2021.

Inclusion criteria include being enrolled in the Doctor of Medicine program for the second semester of academic year 2020-2021 in the state-run university of interest. Inclusion is regardless of demographics or existing comorbidities, even treated or untreated sleeping disorders. On the other hand, participants were excluded if they are currently on a leave of absence.

Outcome Measures

The Pittsburgh Sleep Quality Index (PSQI) is a self-administered questionnaire that was developed in 1989 that assesses sleep quality.[17] The PSQI contains 24 items (19 self-rated and 5 by a bedpartner or roommate) under seven clinically important components in relation to sleep difficulties, namely subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep

medication, and daytime dysfunction. Responses to questions under each component are given on a Likert scale from 0-4. Each component is then evaluated from 0-3 using a specific set of criteria, and a global score of 0-21 is obtained by summing up the seven individual sub-scores. Global scores of 5 or less were deemed sleep of good quality, while those above 5 were deemed sleep of poor quality.[11,17-18] The tool has a variety of applications, one of which is as a screening tool to identify good and poor sleepers.[17] It was demonstrated to be easy to use among subjects and participants, with high internal consistency, good test-retest reliability, and good validity.[17] However, studies evaluating the psychometric properties of the tool specifically for the Filipino population are limited. A study on Filipino domestic workers noted a low internal consistency of the global score, and a Cronbach's alpha value of 0.63 at baseline, and 0.67 after a 10-day follow-up period.[19] Additionally, it was noted that the tool demonstrates moderate reliability, suggesting that sleep is stably assessed using the PSQI global score and some of the component scores within the population.[19] However, the PSQI global score is reflective more of its 'subjective sleep quality' and 'sleep latency' components more than that of the 'use of sleeping medicine' and 'habitual sleep efficiency'.[19] Despite its limitation of not being able to provide an accurate clinical diagnosis, responses to specific questions may point toward a need for further investigation, or that a score of 5 also indicates certain degrees of difficulty in specific areas.[17]

The Epworth Sleepiness Scale (ESS) is also a self-administered questionnaire that was developed in 1991 that aimed to assess a patient's general level of sleepiness.[20] The questionnaire consists of 8 items scored in a Likert scale from 0 (low chance of falling asleep) to 3 (high chance of falling asleep). A global score is obtained by adding the scores from each item. In terms of the degree of daytime sleepiness, scores ranging from 0-5 indicate Lower Normal, 6-10 indicate Higher Normal, 11-12 indicate Mild Excessive, 13-15 indicate Moderate Excessive, and 16-24 indicate Severe Excessive.[20] A global score of greater than 10 indicates excessive daytime sleepiness and warrants a referral to a sleep specialist.[16] The tool has been validated in a Filipino population of community dwellers whereby the Filipino translation showed good internal consistency and reliability with a Cronbach's alpha of 0.57 ($p<0.05$).[21] The tool is primarily used to evaluate excessive daytime sleepiness stemming from conditions such as obstructive sleep apnea, narcolepsy, and hypersomnia, and triage them to sleep specialists.[16,21] It should be noted, however, that the tool is not validated to correlate excessive daytime sleepiness with disease entities, cognitive performance, as well as other psychosocial aspects.[16]

Data Collection

The ESS and PSQI were converted into a single Google Form, which contained additional sections for (1) the cover letter explaining the purpose of the study, the associated risks and benefits, and the ethical considerations; (2) the consent form to which details of voluntary participation, withdrawal at any time, and anonymity and data handling were outlined; and (3) the demographics of the participants. The entire form is in English. It was distributed to each LU class starting in April 2021 and was open until May 2021. For a pre-pandemic point of comparison, mean ESS scores from a similar demographic of medical students of the same institution were obtained from a study by Jorge et al. (2020).[16]

Statistical Analysis

Data was analyzed using Stata® version 13 statistical software. Significant differences in both the component and global scores of the PSQI as well as the global scores of the ESS were determined via one-way ANOVA if there is constant variance, and via the Kruskal-Wallis test if there is nonconstant variance. Heteroscedasticity of variance was assessed via the Breusch-Pagan test. If a significant mean was detected, pairwise comparison was performed using the Bonferroni test. Additionally, correlations between participant characteristics and sleep parameters were assessed via Somer's D correlation value for nominal versus ordinal variables, and Spearman's correlation value for ordinal versus ratio variables. Level of significance was set to $p<0.05$.

RESULTS

Study Participants

Out of the 808 included medical students, 709 (87.75%) participated and completed the survey. Male-to-female ratio was 1:1.09, while the mean age was 22.9 ± 2.0. Most of the participants were clinical clerks (LU 6) (n=181; 25.53%) and lived in the National Capital Region (NCR) (n=401; 56.56%), where the City of Manila and the university of interest were located (Table 1).

Daytime Sleepiness

The results of the ESS indicated that only 41.18% of all the respondents have excessive daytime sleepiness, and a greater percentage of females were affected. Across the learning units, only LU 1 had excessive daytime sleepiness in more than half of the class. Conversely, LUs 2, 5, and 6 had relatively lower incidences of excessive daytime sleepiness (Figure 1).

Statistical analysis of the ESS scores revealed that there was a significant difference among global scores ($F(5,703)=2.5600$, $p=0.0264$) across LUs (Table 2). However, despite this, pairwise comparisons showed that no year level was significantly different from another (S-Table A). Moreover, ESS scores of participants in the NCR, where stay-at-home orders were initially declared and were often initially the most stringent across the various regions of the country, did not show a significant difference when compared to those of other regions (S-Table B).

Relative to pre-pandemic scores with the same population as obtained by Jorge et al. (2020)[16], average ESS scores decreased for almost all LUs during the pandemic (Figure 2). However, statistical analysis revealed a significantly lower value only for LU 1 (t (df)=-2.2838, p=0.0279), LU 2 (t (df)=-5.3968, p=0.0000), LU 3 (t (df)=-10.7937, p=0.0000), and LU 6 (t (df)=-9.1450, p=0.0000) (Table 3).

Table 1. Characteristics of Study Participants

Variable	Value
***Sex**, n (%)*	
Female	369 (52.1%)
Male	340 (48.0%)
***Age** (mean ± SD)*	(22.9 ± 2.0)
***Year Level**, response rate (%)*	
LU 1	40/41 (97.56%)
LU 2	34/40 (85.00%)
LU 3	142/175 (81.14%)
LU 4	147/186 (79.03%)
LU 5	165/179 (92.18%)
LU 6	181/187 (96.79%)
Total	709/808 (87.75%)
***Residence**, n (%)*	
Region 1	23 (3.2%)
Region 2	12 (1.7%)
Region 3	65 (9.2%)
Region 4-A	94 (13.3%)
Region 4-B	8 (1.1%)
Region 5	14 (2%)
CAR	10 (1.4%)
NCR	401 (56.6%)
Region 6	8 (1.1%)
Region 7	15 (2.1%)
Region 8	7 (1.0%)
Region 9	11 (1.6%)
Region 10	14 (2%)
Region 11	12 (1.7%)
Region 12	5 (0.7%)
Region 13	5 (0.7%)
BARMM	5 (0.7%)

LU: Learning Unit; CAR: Cordillera Administrative Region; NCR: National Capital Region; BARMM: Bangsamoro Autonomous Region of Muslim Mindanao

Sleep Quality

The results of the PSQI indicated that 62.34% of all the respondents were poor-quality sleepers. Similar to the ESS, a greater percentage of females were affected. Across all LUs, more than half of each class have poor sleep quality and was greatest in LUs 1, 2, and 3. Meanwhile, the lowest percentage of poor-quality sleepers came from the higher year levels, particularly LUs 5 and 6 (Figure 3).

Statistical analysis of PSQI component and global scores revealed that there was a significant difference across LUs for sleep duration (F(5,703)=4.2400, p=0.0008), day dysfunction (F(5,703)=5.3600, p=0.0001), and sleep quality (F(5,703)=4.0800, p=0.0012); as well as for global scores (F(5,703)=3.3200, p=0.0057) (Table 4). Additionally, similar to the ESS, PSQI global and component scores of participants in the NCR did not show significant difference compared to scores of other regions in the country (S-Table B).

Furthermore, a Bonferroni Post-hoc test revealed that LU 4 students had significantly shorter sleep duration when compared to LU 5, while LU 2 had significantly longer sleep duration than LU 3 and LU 4. For day dysfunction, it was found that LU1 students had significantly worse day dysfunction when compared to LUs 4, 5, and 6; while LU3 had significantly worse daytime dysfunction when compared to LU 6. Furthermore, LU 6 students perceived their sleep quality to be significantly better when compared with LUs 3 and 4. Lastly, the PSQI global scores revealed that LU 1 students had significantly worse sleep when compared with LUs 5 and 6 (S-Table C-F).

Association Analysis

While significant associations were noted between some of participants' characteristics and their ESS or PSQI scores, all these relationships were extremely weak (S-Tables G-H).

On the other hand, a significant and moderate correlation was found between the global PSQI score and the ESS score using both Spearman's (r=0.2848; p=0.0000) and Pearson's (r=0.3627; p=0.0000) correlation coefficient (S-Table I).

Table 2. Comparison of ESS Global Scores Across LUs

Year Level	ESS Global Score (mean ± SD)
LU 1	10.8 ± 4.7
LU 2	8.6 ± 4.3
LU 3	10.2 ± 4.8
LU 4	10.2 ± 4.3
LU 5	9.1 ± 4.2
LU 6	9.3 ± 4.3
All respondents	9.6 ± 4.4
p-value	0.0264*

** p<0.05*
LU: Learning Unit

Table 3. Comparison of ESS Scores (Pre-Pandemic vs. During Pandemic)

Learning Unit	AY 2016 - 2017 (Jorge et al., 2020)[16]	AY 2020 - 2021	t-stat	*p*-value
LU 1	12.5	10.8 ± 4.7	-2.2838	0.0279*
LU 2	12.5	8.6 ± 4.3	-5.3968	0.0000*
LU 3	14.5	10.2 ± 4.8	-10.7937	0.0000*
LU 4	10.2	10.2 ± 4.3	-0.1219	0.9031
LU 5	9.2	9.1 ± 4.2	-0.4114	0.6813
LU 6	12.2	9.3 ± 4.3	-9.1450	0.0000*

** p<0.05*
LU: Learning Unit

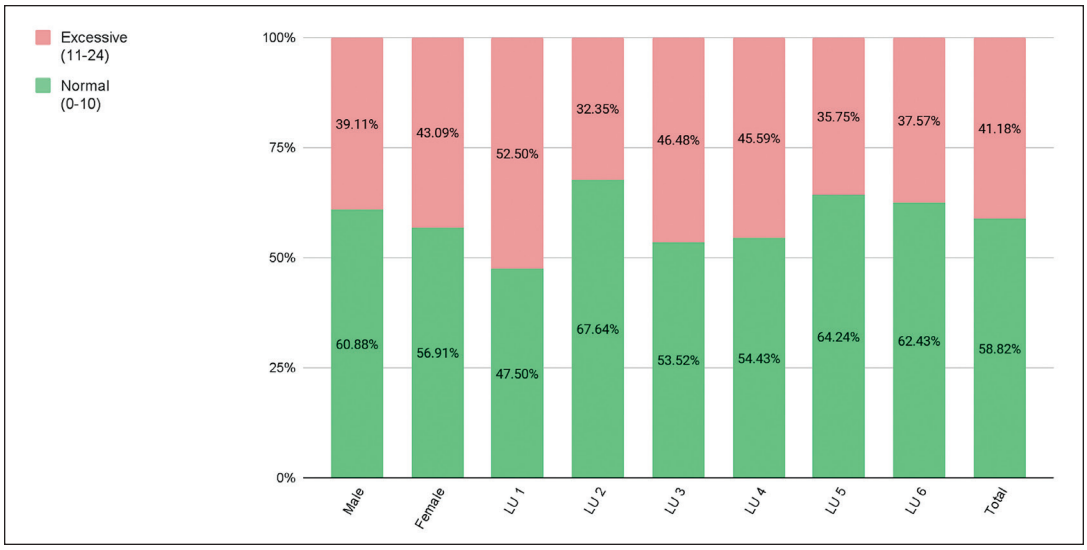

Figure 1. Degree of daytime sleepiness per sex and LU.

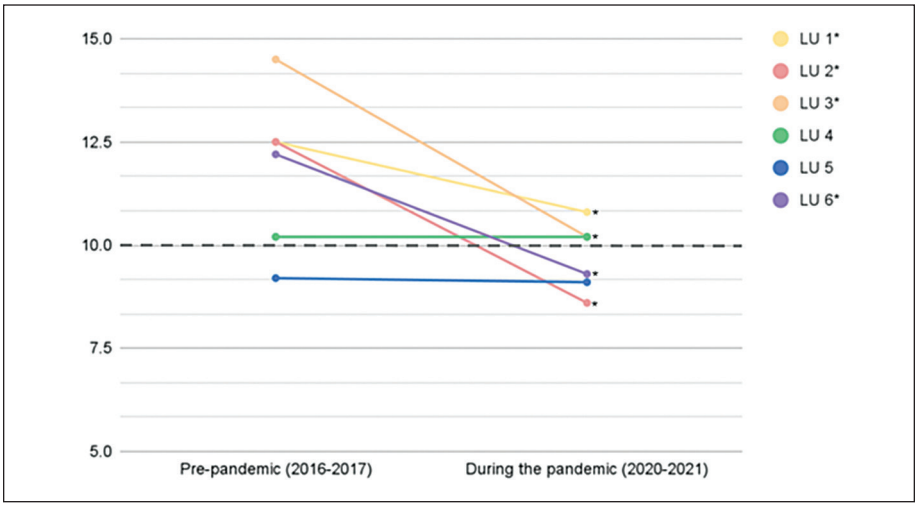

Figure 2. Average ESS score per LU pre-pandemic versus during the pandemic (*p<0.05).

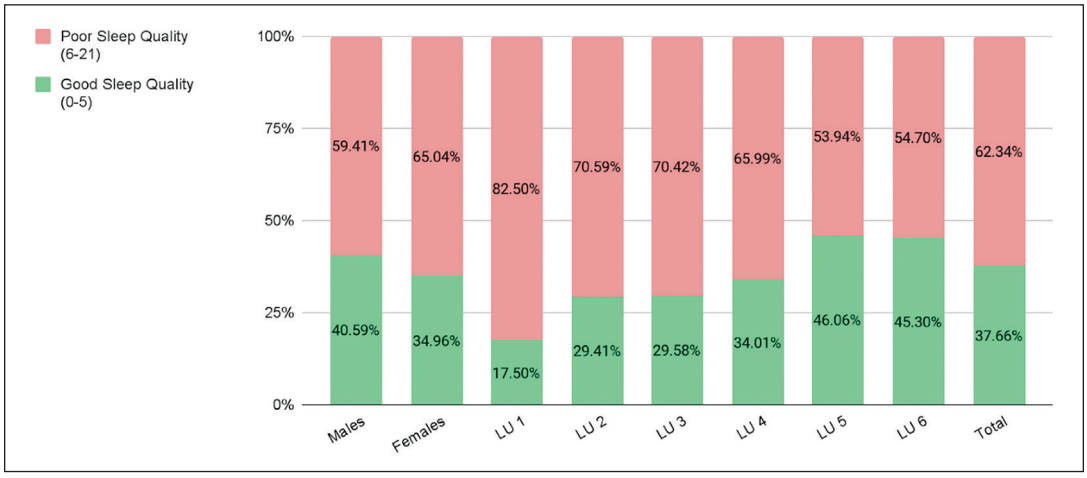

Figure 3. Percentage of good- and poor-quality sleepers per sex and LU.

Table 4. Comparison of PSQI Component and Global Scores Across LUs

Year Level	PSQI Component Scores (mean ± SD)							PSQI Global Score (mean ± SD)
	Sleep duration	Sleep disturbance	Sleep latency	Day dysfunction	Sleep efficiency[a]	Sleep quality[a]	Medication use[a]	
LU 1	(1.0 ± 1.0)	(1.2 ± 0.5)	(1.7 ± 1.1)	(2.0 ± 0.8)	(0.7 ± 1.0)	(1.4 ± 0.7)	(0.1 ± 0.4)	(8.0 ± 3.2)
LU 2	(0.5 ± 0.9)	(1.1 ± 0.5)	(1.7 ± 0.9)	(1.6 ± 0.8)	(0.3 ± 0.5)	(1.2 ± 0.6)	(0.1 ± 0.5)	(6.5 ± 2.6)
LU 3	(1.1 ± 0.9)	(1.1 ± 0.5)	(1.5 ± 1.0)	(1.7 ± 0.7)	(0.3 ± 0.5)	(1.4 ± 0.7)	(0.0 ± 0.2)	(7.0 ± 2.5)
LU 4	(1.2 ± 1.0)	(1.0 ± 0.6)	(1.4 ± 1.0)	(1.5 ± 0.8)	(0.4 ± 0.8)	(1.3 ± 0.7)	(0.2 ± 0.6)	(7.1 ± 3.2)
LU 5	(0.8 ± 1.0)	(0.9 ± 0.5)	(1.5 ± 1.0)	(1.5 ± 0.7)	(0.4 ± 0.7)	(1.2 ± 0.6)	(0.1 ± 0.5)	(6.4 ± 2.9)
LU 6	(0.9 ± 1.0)	(1.0 ± 0.5)	(1.5 ± 1.1)	(1.4 ± 0.8)	(0.3 ± 0.7)	(1.1 ± 0.6)	(0.1 ± 0.5)	(6.3 ± 3.1)
All respondents	(1.0 ± 1.0)	(1.0 ± 0.5)	(1.5 ± 1.0)	(1.5 ± 0.8)	(0.4 ± 0.7)	(1.2 ± 0.6)	(0.1 ± 0.5)	(6.7 ± 3.0)
P-value	0.0008*	0.1511	0.5992	0.0001*	0.3244	0.0008*	0.3921	0.0057*

** p<0.05; [a] Kruskal-Wallis Test*
LU: Learning Unit

DISCUSSION

Similar to previous studies on medical students, our study reports a higher incidence of excessive daytime sleepiness and poor sleep quality in a greater percentage of females.[9,22,23] These findings may be attributed to females being more vulnerable to behavioral changes leading to reduced sleep duration, prolonged sleep latency, and sleep- and stress-related disorders.[24,25]

Findings from our study also show that lower year levels have greater affectation of sleep. The pre-pandemic ESS findings of Jorge et al. (2020)[16] are similar to ours, where LU 1 students had the highest average scores. Additionally, global PSQI scores share this trend where the proportion of poor sleepers are greatest in LUs 1 and 2, and least in LUs 5 and 6. Statistical analysis supports this trend in terms of global PSQI scores as well as component scores for sleep duration, day dysfunction, and sleep quality. These are in contrast to findings from other countries where variable affectation in different year levels was not noted, or that higher year levels had greater affectation.[23,25-27]

Despite mixed results among studies, the primary finding of greater affectation in lower year levels has been documented in other studies and is often attributed to the transition period from attending high school or an undergraduate school to entering medical school.[27] This transition is often laden with large variations in terms of class load, shifts, breaks, and free study periods, which requires adjustment.[16,27] Additionally, more academic experience and exposure to higher academic classes are reflections of having been accustomed to medical education, reducing the likelihood for poor sleep quality.[25] Furthermore, the shift to online learning for the academic year 2020-2021 may have also contributed to a greater demand for adjustment during this transition period. Both are supported in our study where the fast-tracked pre-medicine students of LU 1 are fresh high school graduates while the first-year medical students are mostly fresh college graduates, with both groups starting medical school online. It is also worth noting that the resumption of clinical rotations may have played a role in reducing stress, at least for the clinical clerks (LU 6). A study on an American medical student population notes that medical students, even when not present in a clinical environment, may take on emotional burden evidenced by their desire to return to clinical rotations.[28] In this study, 87.1% of the population agreed that physicians have an ethical obligation to provide care during the COVID-19 pandemic, possibly reflecting how they view the ethical transition from student to physician.[28] It may then be surmised that a resumption of clinical work partly addresses the emotional burden stemming from the need to provide patient care experienced by medical students withdrawn from their clinical rotations.

Despite the majority of literature indicating that the pandemic has negatively impacted sleep, LUs 1, 2, 3, and 6 from our study demonstrated a statistically significant decrease in daytime sleepiness relative to pre-pandemic scores of a similar population. This may be attributed to the effects of a shift to online education, which allow for more flexible schedules and facilitate the alleviation of morning commitments, urgent school demands, social jetlag, and sleep deprivation.[24,29] For medical students, this may include daily routine changes, online lectures, suspended clinical rotations, and diminished travel time.[30] Additionally, social media partly addresses the increased need to communicate during times of common stress despite physical restrictions.[31] This improvement in sleep, albeit in lower percentages of samples, is supported by North American, Canadian, and Italian studies on both general and medical student populations.[24,29,30,32]

Our study revealed that 62.34% were poor quality sleepers. This was notably higher compared to reports of poor sleep quality from other countries, including 39.5% of medical students from pre-pandemic Saudi Arabia; and 33.2%, 34.6%, and 29.5% of medical students from China, India, and Turkey, respectively, during the pandemic.[11,22,23,33] Moreover, 62.34% was much higher than the reported prevalence estimate of 32-57% for studies using the PSQI.[22] While this higher percentage was notable, a direct comparison cannot be readily made due to local variations in terms of stay-at-

home orders and changes in medical education. However, confounders that have negative effects on mental health such as stringency and the late implementation of measures, both prominent in the Philippine response to the pandemic, may be contributors.[4,34-36]

A significantly moderate correlation between ESS and PSQI scores was noted in our study. Some pre-pandemic studies reported only a weak correlation between the two tools and attributed it to the difference in the dimensions of sleep being measured, namely nighttime sleep quality in PSQI, and the tendency to doze off during the day in ESS.[37,38] Additionally, it was noted that removing the Daytime Dysfunction component of the PSQI made the relationship insignificant.[37] A pre-pandemic study on an American student population has found that the PSQI components demonstrated consistently low correlations with the ESS.[39] It was noted that the PSQI has substantial overlap with the ESS, implying that the PSQI provides useful information about sleep in college students, but that caution must be used in interpreting the PSQI global score as a measure of sleep disturbance due to its multifaceted nature. In a similar light, the study noted that the ESS demonstrated low correlations with the PSQI components, with the highest of which is with the 'daytime dysfunction' component.[39]

Despite the weak correlation from previous studies, it may be surmised that the increased burden of stress on mental health brought about by the pandemic is reflected by both tools and strengthens this relationship. Additionally, despite a moderately significant association, excessive daytime sleepiness was noted in 41.18% of the participants, while poor sleep quality was at a much higher 62.34%. While lower ESS scores may in part be due to the alleviation of some stressors, it may also be due to the assignment of additional tasks or loads, which leads to an increase in the attention threshold and constant stimulation which in turn decreases daytime sleepiness, as was found in a population of physicians during the pandemic.[40] Lastly, some studies noted that increased stringency and delayed implementation of stay-at-home orders resulted in a greater affectation of mental health.[34-36] This contrasts our findings where those from areas with stricter measures did not show a significant difference compared to others. This difference may be due to the fact that approximately 80% of our participants came from the NCR and Regions 3 and 4-A, which were areas that had the strictest lockdowns initially, possibly skewing the results.

Limitations of this study include its reduced generalizability, attributed to all the participants belonging to only a single institution. Further, there are virtually no studies evaluating the validity of the tools used specifically for a Filipino medical student population. Additionally, the cross-sectional study design prohibits the establishment of causal relationships. Recall bias may also be present due to the nature of the instruments used and may be exacerbated by the pandemic.[29] Lastly, confounders include the variations on the stringency and timing of implementation of stay-at-home orders based on the participants' locale, as well as the inclusion of students with possible existing sleep disorders, treated or not. It is our recommendation that longitudinal studies in the Philippines be conducted to establish the relationship between stay-at-home orders and sleep, and to include not just students from various institutions, but also from various regions to account both for institutional differences of changes in online medical education as well as local differences in the implementation of stay-at-home orders.

CONCLUSION

ESS scores reflective of daytime sleepiness were noted to have decreased compared to pre-pandemic scores. Despite this, a large percentage of Filipino medical students in the university of interest were found to have excessive daytime sleepiness, and an even larger percentage was noted to have poor sleep quality, as reflected by global PSQI scores. Moreover, lower year levels, particularly first-year pre-medicine students and first-year medical students were noted to be more affected.

This study contributes to the growing body of knowledge examining the effects of this current pandemic on the various dimensions of sleep of medical students, more so after more than a year of stay-at-home orders. Additionally, this study pioneers medical literature related to sleep in Filipino medical students, offering a perspective on their current state and how they have been affected by the pandemic. Lastly, it highlights stress as an important problem that medical students experience in the course of their education, whether during this current pandemic or even before; and represents an additional indicator of student well-being that may be descried to improve future policy implementation and curricula development.

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Statement of Authorship

All authors contributed in the conceptualization and design of the study, acquisition, analysis, and interpretation of data, drafting and revision of the manuscript for important intellectual content, approval of the final version to be published, and agreement to accountability of the work.

Author Disclosure

All authors declared no conflicts of interest in preparing this article.

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APPENDICES

S-Table A. Bonferroni Post-Hoc Test for ESS Global Scores

	LU 1	LU 2	LU 3	LU 4	LU 5	LU 6
LU 1						
LU 2	0.4380					
LU 3	1.0000	0.8650				
LU 4	1.0000	0.8490	1.0000			
LU 5	0.3840	1.0000	0.4640	0.4380		
LU 6	0.7400	1.0000	1.0000	1.0000	1.0000	

** p<0.05*
LU: Learning Unit; ESS: Epworth Sleepiness Scale

S-Table B. ESS and PSQI T-test results for NCR vs. Other Regions

	t-stat	p-value
ESS Global	-0.0210	0.9833
PSQI: Sleep Duration	-0.6438	0.5199
PSQI: Sleep Disturbance	1.6853	0.0924
PSQI: Sleep Latency	-0.3754	0.7075
PSQI: Day Dysfunction	0.8600	0.3901
PSQI: Sleep Efficiency	-0.2525	0.8007
PSQI: Sleep Quality	0.3022	0.7626
PSQI: Medication Use	-0.2612	0.7940
PSQI Global	0.1261	0.8997

** p<0.05*
PSQI: Pittsburgh Sleep Quality Index; NCR: National Capital Region; LU: Learning Unit

S-Table C. Bonferroni Post-Hoc Test for Sleep Duration Scores

	LU1	LU2	LU3	LU4	LU5	LU6
LU1						
LU2	0.4870					
LU3	1.0000	0.0320*				
LU4	1.0000	0.0050*	1.0000			
LU5	1.0000	1.0000	0.3030	0.0200*		
LU6	1.0000	0.5520	1.0000	0.1170	1.0000	

** p<0.05*
LU: Learning Unit

S-Table D. Bonferroni Post-Hoc Test for Day Dysfunction Scores

	LU1	LU2	LU3	LU4	LU5	LU6
LU1						
LU2	0.6130					
LU3	0.3880	1.0000				
LU4	0.0160*	1.0000	1.0000			
LU5	0.0010*	1.0000	0.1480	1.0000		
LU6	0.0000*	1.0000	0.0180*	1.0000	1.0000	

** p<0.05*
LU: Learning Unit

S-Table E. Bonferroni Post-Hoc Test for Sleep Quality Scores

	LU1	LU2	LU3	LU4	LU5	LU6
LU1						
LU2	1.0000					
LU3	1.0000	1.0000				
LU4	1.0000	1.0000	1.0000			
LU5	0.4810	1.0000	0.0920	0.2370		
LU6	0.1710	1.0000	0.0110*	0.0350*	1.0000	

** p<0.05*
LU: Learning Unit

S-Table F. Bonferroni Post-Hoc Test for PSQI Global Score

	LU1	LU2	LU3	LU4	LU5	LU6
LU1						
LU2	0.4270					
LU3	1.0000	1.0000				
LU4	1.0000	1.0000	1.0000			
LU5	0.0300*	1.0000	0.7230	0.4950		
LU6	0.0240*	1.0000	0.5600	0.3730	1.0000	

** p<0.05; [a] Kruskal-Wallis Test*
PSQI: Pittsburgh Sleep Quality Index; LU: Learning Unit

S-Table G. Association Between Participant Characteristics and PSQI Scores

Characteristic	PSQI Component Scores (Correlation coefficient)							
	Sleep duration	Sleep disturbance	Sleep latency	Day dysfunction	Sleep efficiency	Sleep quality	Medication use	PSQI Global Score
Sex[a]	-0.0455369	-0.0363781	-0.0042005	-0.0947134*	-0.0264228	-0.0106249	0.0046469	-0.0664116
Age[b]	-0.0395	-0.0255	-0.0224	-0.1750*	-0.0092	-0.0175	0.1008*	-0.0843*
Year Level[a]	-0.0452676	-0.0468548*	-0.0341114	-0.1243803*	-0.0172139	-0.1037105*	-0.0060176	-0.1096126*
Residence[a]	0.0330703	-0.0093096	0.0179093	0.0188702	0.0338599	0.0246298	0.0225121	0.0347903

** p<0.05; [a] Kruskal-Wallis Test; [a] Somer's D; [b] Spearman's Coefficient*
PSQI: Pittsburgh Sleep Quality Index

S-Table H. Association Between Participant Characteristics and ESS Global Scores

Characteristic	ESS Global Score (Correlation coefficient)
Sex[b]	-0.0744062
Age[c]	-0.0434
Year Level[b]	-0.0662035*
Residence[b]	0.0178603

** p<0.05; [a] Kruskal-Wallis Test; [b] Somer's D; [c] Spearman's Coefficient*
ESS: Epworth Sleepiness Scale

S-Table I. Correlation Between ESS and PSQI Scores

	PSQI Global
ESS Global[a]	0.3627*
ESS Global[b]	0.2848*

** p<0.05; [a] Pearson's Correlation; [b] Spearman's Correlation*
ESS: Epworth Sleepiness Scale; PSQI: Pittsburgh Sleep Quality Index