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Research Article

Sleep Quality of SHS STEM Students Post-pandemic

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ABSTRACT

Sleep is an integral component of maintaining overall health and well-being. Inadequate sleep can result in detrimental effects, both on mental and physiological aspects. While the impact of the COVID-19 pandemic on students' sleep quality was extensively examined, there remains a dearth of literature investigating the prevalence of sleep quality after the shift to a post-pandemic lifestyle. This study utilized a descriptive design and gathered data from 202 randomly selected grades 11 and 12 STEM students. We found that 68.81% of them have poor sleep quality. Data also showed that female students obtained high PSQI scores and had a significantly higher prevalence of poor sleep quality than males. However, there was no significant difference in sleep quality between grade levels. In conclusion, sleep quality among STEM students in the post-pandemic setting is poor, implying the need for further assessment of influencing factors in students' sleep patterns, strategies, and management skills. Furthermore, students should be educated on the importance of sleep and the negative consequences of poor sleep quality on regular activities, mental & physical health, and general well-being.

Keywords: *Descriptive research, Pittsburgh Sleep Quality Index, Post-pandemic, Prevalence of sleep quality, Sleep, STEM Students*

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Introduction

Sleep is an integral component of living a healthy life. It is vital for an individual's learning and mental well-being (Worley, 2018). Insufficient sleep leads to multiple adverse mental and physiological effects. For instance, poor sleep quality in children and teenagers leads to decreased learning, memory, and school performance (Duarte et al., 2014; Owens & Weiss, 2017).

According to the American Academy of Sleep Medicine, 8 to 10 hours per day is the recommended duration of sleep for students aged 13 to 18 years old (Paruthi et al., 2016). A 2018 American survey by the Centers for Disease Control and Prevention (CDC) finds that short sleep deprivation among high school students in the United States is 72.7%. Meaning 7 out of 10 high school students do not get enough sleep (Wheaton et al., 2015)

Sleep-deprived teenagers are more prone to experiencing symptoms of depression and being overweight. That said, sleep quality assessments are essential for assessing the risk early on of an individual, as it helps decrease the likelihood of future health complications (Chattu et al., 2018). According to a 2016 Healthy Living Index Survey, Filipinos earned the highest scores for sleep deprivation. As cited in the same survey, 46% of Filipinos did not get enough sleep, while 32% reported they did not get more than 6 hours. Another statistic by the Philippine Society of Sleep Medicine states that 20% of Filipinos are sleep-deprived. Reasons include lifestyle changes, odd occupational schedules, and personal and relational concerns. Factors such as gender, age, and drug abuse affect sleep quality and cause sleep problems (PSSMI, 2019).

A 2021 international study reports that changes brought about by the pandemic have resulted in a rise of people reporting sleep problems worldwide: 58% of respondents were dissatisfied with their sleep, 40% of the respondents reported a decrease in sleep quality compared to before the COVID-19 crisis, and the self-reported use of sleeping pills increased by 20% (Mandelkorn et al., 2021). Non-restorative sleep is more likely reported by students who are working as usual. Meanwhile, high school students, especially those confined at

home due to the absence of school work, are at a greater risk of difficulties initiating sleep, awakening too early in the morning, and sleep deprivation (Pinto et al., 2020).

The SHS STEM students for this study underwent two years of remote-based learning per the Department of Education Order No. 32 series of 2020 (DepEd, 2020). As such, the students stayed in their homes, and the limited face-to-face interactions meant that their lifestyles and behaviors had to cope with the pandemic setting (Labrague & Ballard, 2021). As the Philippines' COVID-19 restrictions were slowly uplifted, academic institutions reopened, and students had to go back to attending school (UNICEF, 2021). That said, the students were compelled to adapt to a post-pandemic shift where life is returning to normal.

The effects of the COVID-19 pandemic on sleep quality have been widely studied. However, limited study has been done to investigate sleep quality after the shift to a post-pandemic lifestyle. This study aims to examine students' sleep quality in the STEM strand of a secondary school in Central Philippines. Specifically, the study aims to:

1. Determine the profile of respondents based on sex and grade Level
2. Determine the global PSQI score in students as a whole and when grouped according to the profiling variables
3. Investigate the prevalence of sleep quality in students after the changes of the COVID-19 pandemic
4. Compare the significant differences in students' sleep quality when grouped according to the previously mentioned variables.

Methods

Research Design and Respondents

This study used the descriptive research design to determine the prevalence of sleep quality among STEM students in Grades 11 and 12 of a secondary school in the central Philippines after the COVID-19 pandemic. The study also sought to describe students' sleep quality when grouped according to different groups and variables.

Two hundred two randomly selected STEM students from Grades 11 and 12 enrolled in the school year 2022-2023 were taken as

respondents. It utilized Yamane's formula to calculate the sample size (Assefa & Cheru, 2018; Israel, 2012), while stratified random sampling was applied to divide the population into proportional groups (Murphy, 2021; Taderhoost, 2016).

Instrument

The study adopted the Pittsburgh Sleep Quality Index (PSQI) from a published work by (Buysse et al., 1989). The tool is designed to assess sleep quality and disturbance through the past month in clinical and non-clinical populations (Buysse et al., 1989; Manzar et al., 2015; Mollayeva et al., 2016). Nineteen items were employed to assess the individual's perceptions of their sleep quality (Buysse et al., 1989; Mollayeva et al., 2016). The 10th item on the questionnaire was excluded from the study as it did not contribute to the total PSQI score (Buysse et al., 1989).

Validity and Reliability

Previous studies established the validity of PSQI, the "Validity of the Pittsburgh Sleep Quality Index (PSQI) among Nigerian University Students" by Aloba et al. (2007), the "Test-retest Reliability and Validity of the Pittsburgh Sleep Quality Index in Primary Insomnia" by Backhaus et al. (2002), and the "Structural Validity of the Pittsburgh Sleep Quality Index in Chinese undergraduate students" by Guo et al. (2016). On reliability in the local context, the study of Arboleda (2022) had similar

respondents and obtained a Cronbach's Alpha value of 0.761 (Arboleda, 2022). Hence, the instrument is also reliable.

Data Gathering Procedure

Letters were sent to authorities for permission of the conduct of the study. Consent forms were also prepared along with the questionnaire. If the respondents refused to participate in the survey or were unavailable, another student set was assigned. Data were gathered and analyzed using appropriate statistical tools.

Ethical Considerations

The term "ethical considerations" refers to a set of moral principles or ideals that bind a society together (Rodgers, 2009). During research, certain fundamental principles and practices must be observed and maintained. These include the freedom from fear of violence, self-determination, privacy, confidentiality, and anonymity (Rogers et al., 1987).

Results and Discussion

Profile of STEM students of BCNHS

Table 1 presents the profile of Grade 11 and 12 STEM students in BCNHS in the academic year 2022-2023 when grouped according to sex and grade level. Among the respondents, (f=70, %=34.65) of the sample size are male students, while (f=132, %=65.35) are female students. When categorized based on grade level, (f=100, %= 49.50) are Grade 11, while (f=102, %=50.50) are Grade 12.

Table 1. Profile of BCNHS STEM Students for school year 2022-2023 when grouped according to sex and grade level

Profile		F	%
Sex	Male	70	34.65
	Female	132	65.35
Grade Level	Grade 11	100	49.50
	Grade 12	102	50.50

Total PSQI scores of STEM SHS students

Table 2 presents the PSQI score of BCNHS STEM SHS students when grouped according to sex. The data on the average PSQI scores indicate that poor sleep quality is present for both male (M=6.80, SD=2.86) and female (M=7.76, SD=3.05) populations of the study. Moreover,

females scored higher on average, in turn having poorer sleep quality compared to the opposite sex.

Table 2 presents the PSQI score of BCNHS STEM SHS students when grouped according to sex. The data on the average PSQI scores indicate poor sleep quality for the study's male

($M=6.80$, $SD=2.86$) and female ($M=7.76$, $SD=3.05$) populations. Moreover, females scored higher on average, having poorer sleep quality than the opposite sex.

Table 2 also displays the PSQI score of students in terms of grade level. The results show that both Grade 11 ($M=7.73$, $SD=3.33$) and Grade 12 ($M=7.14$, $SD=2.66$) STEM students have poor sleep quality. That said, Grade 11 students had worse sleep quality than their seniors.

The outcome of the study supports the findings of Arboleda (2022) and Bernas et al. (2022) that females tend to score higher PSQI scores than males, which is also similar to the studies of Eleftheriou et al. (2021) in Greece and Islam et al. (2021) in Bangladesh. Meanwhile, the outcomes of the studies by Shreshta et al. (2021) and Zhai et al. (2021) determined that the mean PSQI score for students was less than 5, implying that the average student in

their research had better sleep quality and contradicting the current study's findings.

The consensus of literature surrounding COVID-19 affecting sleep quality is less decisive. The study by Romero-Blanco et al. (2020), Marelli et al. (2021), and Mandelkorn et al. (2021) concluded that poor sleep quality escalated during the COVID-19 pandemic in students due to more significant sleep disturbances, stress from sedentary lifestyle (Pinto et al., 2020), and behavioral changes in habits surrounding sleep. Conversely, the studies of Luciano et al. (2021) and Shreshta et al. (2021) contradict these findings, claiming that sleep quality has improved because students had more time to relax due to having lenient class schedules. In the context of this study, it is possible that students retained their poor sleeping behaviors from being conditioned by the pandemic despite the shift to a regular class schedule, explaining the high prevalence of poor sleep quality in this study's population.

Table 2. BCNHS STEM Students' sleep quality score when grouped according to sex and grade level

		n	Mean	SD	Interpretation
As a whole		202	7.43	3.02	Poor Sleepers
Sex	Male	70	6.80	2.86	Poor Sleepers
	Female	132	7.77	3.05	Poor Sleepers
Grade Level	Grade 11	100	7.73	3.33	Poor Sleepers
	Grade 12	102	7.14	2.66	Poor Sleepers

Prevalence of sleep quality in STEM students

Table 3 shows the prevalence of sleep quality in students when grouped according to sex. 43 of 70 males (61.4%) scored higher than 5, indicating they were poor sleepers. The remaining 27 males (38.57%) were good sleepers. Likewise, 96 out of 132 (72.70%) females were found to be poor sleepers. Only 36 out of 132 (27.30%) were considered good sleepers in the female respondents. Hence, poor sleep quality was prevalent in both males and females, with females being more likely to be poor sleepers than the opposite sex.

Lastly, the table also displays the prevalence of sleep quality in students when grouped according to grade level. 68 out of 100 (68%) of Grade 11 students were reported as poor sleepers, while 32 out of 100 (32%) were considered good sleepers. In comparison, 71 out of 102

(69.60%) Grade 12 were poor sleepers, while 31 out of 102 (30.40%) were good sleepers. Thus, poor sleep quality was prevalent in both grade 11 and grade 12 students.

Several pre-pandemic studies support the study's results, with females having a higher prevalence of poor sleep quality when compared to males among students (Sanchez et al., 2013; Conception et al., 2014; Surani et al., 2015; Ibrahim et al., 2017; Hangouche et al., 2018). Likewise, Kesintha et al. (2018) endorse the current findings that female students are more likely than male students to have poor sleep quality, regardless of males being prevalent in the sample population.

Numerous studies also uphold the current results in the pandemic setting (Ahmed et al., 2020; Kumari et al., 2020; Saedeh et al., 2021). In addition, Merellano-Navarro et al. (2022)

support the study's results considering the majority of the sample is male. Moreover, despite contradicting current developments on the prevalence of poor sleep quality in the student population, Sundas. et al. (2020) and Zhai et al. (2021) agree that the prevalence of poor sleep

quality is higher in females than in male counterparts. In this context, Cheng et al. (2012) explain that students with insufficient social support, poor lifestyle habits, overuse of the Internet, and poor mental health are more likely to become poor sleepers.

Table 3. Prevalence of sleep quality in BCNHS STEM students when taken as a whole and when grouped according to variables

		n	Poor Sleeper f	Poor Sleepers %	Good Sleeper f	Good Sleepers %
As a whole		202	139	68.81	63	31.19
Sex	Male	70	43	61.43	27	38.57
	Female	132	96	72.70	36	27.30
Grade Level	Grade 11	100	68	68.00	32	32.00
	Grade 12	102	71	69.60	31	30.40

Significant Difference in Sleep Quality

Table 4 shows the significant difference in sleep quality when grouped according to sex. The null hypothesis is rejected because the test statistic and p values are (test statistic = 3,828.50 and p=.044). Hence, there is a significant difference in the total PSQI scores when grouped according to sex.

The data of the current investigation are consistent with the studies of Marta et al. (2021) and Cheng et al. (2012), stating that sleep quality varies significantly based on sex. The results also validate decades of study concerning the differences in sleep between sexes.

Despite exhibiting shorter sleep onset latency and longer sleep duration, both being indications of good polysomnographic sleep quality (Goel et al., 2005), females are more prone to sleep disturbances and awakenings, in turn causing poor sleep quality (Reyner et al., 1995; Middlekoop et al., 1997, Santhi et al., 2016). Moreover, females are also more prone to insomnia, anxiety, and mood disturbances which impact sleep quality (Lindberg, 1997; Zhang and Wing, 2006; McLean et al., 2011; Santhi et al., 2016; Cao et al., 2020). The data from the current study implies that females have significantly worse sleep quality than males.

Table 4. Significant difference in sleep quality when grouped according to sex

Sex	Mean	Test	Test Statistic	P	Interpretation
Male	6.80	Mann-Whitney	3,828.50	.044	Significant
Female	7.77				

Table 5 highlights the difference in sleep quality when grouped according to grade level. The null hypothesis is not rejected with test statistic and p-values set to (test statistic = 4,769.50, p = .423). Hence, there is no significant difference in the total PSQI scores when grouped according to grade level.

Searches in relevant literature revealed only one study that compared the sleep quality between the two grade levels in senior high school. The study's outcome supports the findings from Bernas et al. (2022) that senior high

school students' sleep quality is similar based on their grade level. Despite showing no significant difference in grade levels in a senior high school context, some studies do show significant differences in education level (Zhai et al., 2021; Fu et al., 2021).

Stress from academic workload can worsen sleep quality, as highlighted in the studies of Rasekhi et al. (2016), Maheshwari et al. (2019), Duarte et al. (2014), and Owens & Weiss (2017). Since the current research was limited to senior high school students, academic stress

may not be as pronounced as in other studies comparing samples with different educational levels (e.g., significant differences between the sleep quality of elementary, middle, high

school, and college students). This might explain why there are no significant differences between students' sleep quality in grade levels.

Table 5. Significant difference in sleep quality when grouped according to grade level

Grade Level	Mean	Test	Test Statistic	P	Interpretation
Grade 11	7.73	Mann-Whitney	4,769.50	.423	Not Significant
Grade 12	7.14				

Conclusion

This study will give an in-depth understanding of the sleep quality of Bacolod City National High School STEM students for the school year 2022-2023. Thus, overall, the sleep quality among STEM students in the post-pandemic setting is poor.

The total PSQI score of the general population presents poor quality of sleep. Both sexes and grade levels obtained a total PSQI score greater than 5, indicating poor sleep quality.

Likewise, the prevalence of sleep quality in the general population consists of poorer than good sleepers. When categorized by sex and grade levels, poor sleep quality is more prevalent than good sleep quality among STEM students.

Despite males and females both experiencing poor sleep quality, it is notable that females obtained high PSQI scores and were more prevalent in poor sleep quality than males.

Hence, poor sleep quality is prevalent in 68.81% of BCNHS STEM students in a post-pandemic setting, implying the necessity for further assessment of influencing factors in students' sleep patterns and strategies and management skills to prevent STEM students from having poor quality sleep. Furthermore, students should be educated on the importance of sleep and the negative consequences of poor sleep quality on regular activities, mental and physical health, and general well-being.

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