

Sleep Quality and Sleep Hygiene as Predictors of Mental Health among University Students

Nudra Malik¹, Iqra Ashiq² and Raumish Masud Khan³

<https://doi.org/10.62345/jads.2024.13.1.560>

Abstract

Sleep is an integral human need. A significant public health issue is getting little sleep, which harms health. University students are one of the groups most at risk for poor sleep quality and chronic sleep loss, which could influence both physical and mental health. Students frequently report having persistent sleep issues and may exhibit poor sleep hygiene habits. However, little research has investigated the role of good sleep habits concerning sleep quality and mental health. The present study explores the relationship between sleep hygiene, sleep quality, and mental health among university students. The research design was cross-sectional, and the sample was chosen using a non-probability convenience sampling strategy. Sample comprised of university students (N= 210). The scale of positive mental health, sleep hygiene index, and general sleep scale were used for data collection. Results revealed a significant correlation between sleep quality, sleep hygiene, and mental health among university students. Both sleep hygiene and quality were found to be significant predictors of positive mental health. A significant gender difference was found between sleep quality, sleep hygiene, and positive mental health among male and female university students. These findings can provide information about the link between the study variables and interventions for developing good sleep hygiene habits and quality of sleep amongst university students. It could help improve mental health among this at-risk population.

Keywords: Sleep quality, Sleep hygiene, Mental health, University students.

Introduction

Sleep is a fundamental requirement for maintaining biopsychosocial functions in humans, directly related to well-being and standard of living. It is a condition of relaxation marked by low consciousness, low sensory activity, inhibited muscle action, and reduced collaboration with outside entities. The act of sleeping itself is a process by which the skeletal, muscular, nervous, and immunological systems are strengthened or restored by the body (Saunders et al., 2016).

Quality of sleep is contentment with the quality, quantity, and timing of sleep. The four elements of sound sleep are efficiency, latency, duration, and wakefulness (Davis, 2021). Environmental factors that affect sleep include temperature of the room, use of devices, and family and social obligations. Positive outcomes from feeling refreshed are a sign of good sleep, having regular reflexes, and having satisfying relationships. Fatigue, irritability, malfunctions during the day, slowed responses, and increased caffeine or alcohol consumption all impact poor sleep quality.

¹Assistant Professor, Department of Applied Psychology, Lahore College for Women University, Lahore.

Email: nudra.malik@lcwu.edu.pk

²MS Scholar, Department of Applied Psychology, Lahore College for Women University, Lahore.

³Assistant Professor, Department of Applied Psychology, Kinnaird College for Women, Lahore.

Email: raumish.masud@kinnaird.edu.pk



Lack of sleep has significant detrimental impacts on one's health. Due to the high prevalence of insomnia and disturbed sleep and the apparent connection between good sleep and optimal health and functioning, clinicians and researchers view sleep quality as a crucial construct. However, despite being widely used, the term "sleep quality" lacks an accurate definition (Krystal & Edinger, 2008). In reality, the term "sleep quality" may mean different things to different individuals. For someone who has problems falling asleep, the sleep start period may be the most important predictor of the quality of their sleep. On the other hand, someone whose sleep is disturbed and characterized by frequent awakenings might not consider how difficult it is to fall asleep.

According to the National Sleep Foundation (2020), sleep efficiency is a gauge of the quality of one's sleep or if it is restorative. Unlike sleep satisfaction, which is a more personalized evaluation of how you feel about the quality of your sleep, it is not a measure of sleep quality. A person's ability to begin, maintain, and finish a specific quantity of sleep and how well they felt rested when they woke up indicate their satisfaction with their sleep experience (Kline, 2014). Quantity and quality of sleep are two different things. While sleep quality measures how well you sleep, the amount of sleep you get each night is measured by sleep quantity. Measuring the amount of sleep you get is simple because it is easy to tell if you obtain the advised quantity of sleep each night (typically 7-9 hours for adults). It is more of an art than a science, perhaps going into evaluating sleep efficiency.

The behaviors that are thought to encourage better sleep quality and quantity are known as sleep hygiene practices (Stepanski & Wyatt, 2003). The term "sleep hygiene" refers to good practices that can be changed to improve one's sleep quality. Bad sleep habits that have been reinforced over years or even decades are frequently the root of some sleeping issues. Making a few changes to lifestyle and attitude can often improve the quality of one's sleep. According to Wiebe et al. (2012), cognitive decline and poor sleep hygiene can result in subpar academic performance and an increased risk of traffic accidents, which are severe consequences of poor-quality sleep. Good sleep hygiene is recommended by actions such as setting up a regular sleep pattern, being cautious of using naps, avoiding physical or mental activity too soon before night, minimizing stress, limiting exposure to light in the hours before sleep, and getting out of bed if sleep does not come. Good sleep hygiene is a crucial element in maintaining a satisfying sleep. According to studies in healthy adult populations, sleep quality is impacted by evening activities and environmental factors (Mastin et al., 2006). Other suggestions for improving sleep hygiene include reducing schedule irregularities, engaging in evening exercise, and avoiding alcohol, caffeine, and tobacco use (Stepanski & Wyatt, 2003). Reading and watching television are also linked to subjective indicators of poor sleep quality. According to research, irregular sleep patterns, being thirsty before bed, outside noise, and worrying as you try to fall asleep are all factors in poor sleep quality. Environment and behavior are factors in sleep hygiene, leading to better sleep and overall health (Mastin et al., 2006).

Bipolar illness, anxiety, and sadness are just a few of the disorders that have been related to sleep and mental and emotional health. Although additional studies are required to understand the links between sleep and mental health thoroughly, what is already known is a positive relationship between the two. Sleep issues typically indicate the presence of mental health issues. Additionally, poor sleep habits and sleep disorders, such as insomnia, can cause mental health problems to develop or worsen.

Although numerous intricate elements influence both mental health and sleep, there is evidence that enhancing sleep can benefit both and may even be a part of treating many psychiatric diseases. Many mental health issues do not develop in isolation; rather, co-occurring issues may have an

impact on one another as well as a person's sleep. People who have both depression and anxiety, for instance, are more prone to experience lower-quality sleep than those who only have one of those conditions (Soehner & Harvey, 2012). These conditions also affect other significant aspects of well-being, such as how one experiences pain, which may also affect the likelihood of experiencing sleeping difficulties.

According to some studies, getting enough sleep positively impacts mental health, including subjective well-being (Hamilton et al., 2007). Subjective well-being refers to how people perceive themselves regarding their emotional, cognitive, and life satisfaction (Diener et al., 2013). Biologically, subjective health has been linked to "health protective correlates, including low cortisol output, reduced cardiovascular stress responsivity, and heightened antibody responses to vaccination" (Steptoe et al., 2008). Even after adjusting for depressed symptoms, the potential for optimal sleep to foster or improve well-being has been studied (Hamilton et al., 2007).

According to a study, factors of well-being are associated with fewer sleep issues and higher-quality sleep (Hanson & Ruthig, 2012). Although research has found separate relationships between sleep and both good and bad aspects of mental health, very little research has looked at how sleep simultaneously affects both aspects. Additionally, there has not been much research on sleep patterns as mental health indicators. Sleep hygiene practices support getting enough sleep, getting good sleep, and being fully alert during the day. These activities typically fall under four categories: arousal-related activities, sleep scheduling, eating, and drinking, as well as the location where you sleep (Gellis & Lichstein, 2009).

For adolescents and young adults, good sleep hygiene practices have been linked to higher sleep quality and longer sleep durations (Brick et al., 2010; LeBourgeois et al., 2005). Sleep measures, such as quantity and quality, are related but distinct from sleep hygiene. By definition, it helps people get a good night's sleep and, presumably, wake up feeling alert, but it happens before sleep starts. As a result, it can be distinguished from sleep.

Worry, anxiety, exhaustion, decreased intelligence, cognitive disorders, and depression are all consequences of poor sleep (Redeker & McEnany, 2011). These findings have a helpful impact on designing interventions, allowing for the possibility of focusing on practices for good sleep hygiene rather than sleep quality as a changeable behavior for enhancing well-being.

Evidence from the literature indicates poor sleep quality among university students. The findings of several epidemiological studies have shown the prevalence of sleep issues in this population to be around 30-60%. Insufficient sleep, difficulty falling and staying asleep, and various sleep disorders are common complaints among university students (Becker et al., 2018).

Sleep hygiene, which consists of a combination of behavioral practices and environmental conditions, also impacts sleep quality and could contribute to sleep disturbances and issues. Evidence has shown that students' sleep hygiene practices are inadequate and worse than those of healthy adults. Commonly reported unhealthy sleep hygiene practices by university students are found to be irregular bedtimes, napping, use of stimulants, and use of electronic devices before bed (Ali et al., 2023).

Psychological health problems among these students are also prevalent. They could contribute to the prevalence of sleep disorders and reduced sleep quality in this population, especially among those suffering from depression and anxiety. Studies have also revealed stress and anxiety about academic performance or exams to be significantly related to reduced sleep quality. Poor nocturnal sleep could lead to daytime functioning and excessive daytime sleepiness, which also disturbs students' overall concentration and cognitive functioning (Zhang et al., 2018).

According to another study, there is a connection between quality of sleep and psychological health; university students with poor sleep quality are more likely to experience psychological disorders (Liu et al., 2008). Additionally, it is documented in the literature that factors like gender, academic achievement, educational background, general health, socioeconomic status, and stress level can impact how well a person sleeps (Yildirim et al., 2020) a young adult needs, on average, 8 hours a day of sleep. However, most students lack adequate sleep, as research shows that 70.6% of college students slept under eight hours per night, with a total mean of 7.02 hours (Lund et al., 2010). College pupils are likelier to experience sleep issues (Peltzer & Pengpid, 2016). According to a study of university students in Lebanon, more than half of the members had a Pittsburgh Sleep Quality Index score that fell into the "poor sleeper" category (Kabrita et al., 2014).

Study Rationale

Sleep appears to impact both positive and destructive elements of university students' mental health. Still, few studies have evaluated the impact of sleep quality and hygiene on mental health within a single study. In Pakistan, students enter different educational institutions; they face new challenges and tasks in everyday life. There is inadequate information on sleep quality and hygiene among students in Pakistan. However, studies have been conducted on different population groups, and sleep hygiene practices have not been studied much concerning sleep quality and mental health. Literature has focused more on sleep quality and hygiene, but less research has investigated the quality of sleep, sleep hygiene, and mental health among university students. The primary rationale for conducting this research is to collect data from university students and to interpret the relationship between sleep quality, sleep hygiene, and positive aspects of mental health.

Hypotheses

- There would be a significant positive correlation between sleep quality, sleep hygiene, and mental health among university students.
- Sleep quality and hygiene will significantly predict mental health among university students.
- There would be significant gender differences in sleep quality, hygiene, and mental health among university students.

Methodology

Research Design

It was a cross-sectional study designed to study the relationship between sleep hygiene, sleep quality, and mental health among university students. Two hundred ten participants were selected through a non-probability convenience sampling strategy. The sample was comprised of university students. They belonged to the age group of 18 and above, and before the survey, each participant gave their consent. Several questionnaires that assessed participants' mental health, sleep behaviors, and demographic data were filled out by participants.

Instruments

The positive mental health scale (Lukat et al., 2016) comprises of 9 items that measure social, emotional, and psychological well-being, with scores ranging from 0 (do not agree) to 3 (agree). A general indicator of psychological functioning, PMH asks judgements about a variety of hypothetical circumstances. The scale's unidimensional self-report nature and excellent internal consistency and retest reliability are confirmed by psychometric testing.

Sleep hygiene index (Mastin et al., 2006) was used to assess a person's sleeping habits. The scale has 13 items in total, and each one is evaluated on a scale from 0 (never) to 4 on a 5-point scale (always). It has good internal consistency reliability.

General sleep scale (Malik & Muazzam, 2018) was used in the study and has 6- items. The item responses range between 0-4 from 0 referring to never and 4 referring to daily.

Procedure

210 participants (105 men and 105 women) were chosen for this study to examine the connection between good mental health, quality sleep, and good sleep hygiene. First, the researcher briefed the participants on the study's goal before obtaining their consent to take part in the study. The participants were given instructions to attentively read the text and choose any choice from the scales as their response. Then researcher analyze and interpret the data by using statistical analysis.

Statistical Analysis

Bivariate correlation, linear regression, and t-tests on independent samples were conducted.

Results

Table 1: Descriptive of sample demographics (N = 210)

Characteristics	f (%)	M (S.D)
Age (Years)		20.96 (2.019)
Education		
Under-graduate	184 (87.6)	
Post-graduate	25 (11.9)	
Doctoral or PhD	1 (0.5)	
Gender		
Male	105 (50)	
Female	105 (50)	
Any sleep related disorder		
Yes	10 (4.8)	
No	200 (95.2)	

Note: %= Percentage, f=Frequency, M=Mean, SD=Standard Deviation

The sociodemographic characteristics of the sample have been numerically represented in table 1. Sample comprise of both gender each with 105 and 50%.The age range was 18-31, mean of age was 20.96 while standard deviation was 2.01. Majority of sample comprise of under-graduate students.

Table 2: Reliability coefficient and descriptive statistics of study scales (N=210)

Scales	K	M	SD	α
PMH	9	21.76	4.60	.79
SHI	13	19.99	4.76	0.68
GSS	6	15.93	4.23	0.60

Note: M = Mean, K =Number of items, α =Cronbach's Alpha, SD= Standard Deviation, PMH=Positive Mental Health, SHI= Sleep Hygiene Index, GSS= General Sleep Scale.

Reliability analysis was applied on the three scales used in the research to assess internal consistency for given sample. PMH of 9 items, SHI of 13 items and GSS of 6 items generated quiet good coefficient $\alpha=0.79$, $\alpha= 0.68$, $\alpha=0.60$ respectively, depicting that measures are fairly used for the respective constructs in the research. These results along with number of items, means and standard deviations of the measures are given in the table. The table displayed each scale's internal consistency, which was used in the current investigation.

Table 3: Pearson product moment correlation among main variables positive mental health, sleep quality and sleep hygiene index (N=210)

Variables	1	2	3
PMH	-		
SHI	0.475**	-	
GSS	0.591**	0.489**	

Note: PMH= Positive Mental Health, SHI= Sleep Hygiene Index, GSS= General Sleep Scale, ** $p < 0.01$ (two tailed).

Results reveal existence of a statistically significant positive link between PMH and SHI ($r=.475$, $p=0.01$), moderately significant correlation between PMH and GSS ($r=.591$, $p=0.01$) and low significant positive correlation between GSS and SHI ($r=.489$, $p=0.01$). So, hypotheses is accepted that there exist a significant positive relationship between PMH, SHI and GSS.

Table 4: Hierarchical regression for predicting PMH from SHI and GSS

Variable	B	95% CI		SEB	β	R ²	ΔR^2
		LL	UL				
Step 1						.35	.35***
Constant	11.55***	9.56	13.51	1.00			
GSS	0.64***	0.52	0.76	.061	.60***		
Step 2						.39	.04***
Constant	8.88***	6.56	11.21	1.17			
GSS	0.51***	0.38	0.64	.067	.47***		
SHI	0.23***	0.11	0.35	.060	.25***		

Note: CI= Confidence Interval; LL = Lower Limit; UL = Upper Limit

*** $p < .001$

In order to gauge the predictability of PMH from main study variables the technique of hierarchical regression analysis was applied in two steps. Table 4 shows the impact of GSS and SHI on PMH. In step 1, the R² value of .35 revealed that the GSS explained 35% variance in PMH with $F(1, 208) = 111.39$, $p < .001$. In this model GSS came out to be significantly predicting PMH with ($\beta = .60$, $p < .001$). In step 2, the R² value of .39 revealed that GSS and SHI explained 39% variance in PMH with $F(2, 207) = 67.41$, $p < .001$. The findings revealed that GSS ($\beta = .47$, $p < .001$) and SHI positively predicted PMH ($\beta = .25$, $p < .001$). The ΔR^2 value of .04 revealed 4% change in the variance of model 1 and model 2 $\Delta F(1, 207) = 15.60$, $p < .001$.

Table 5: Mean comparison of University Students on PMH, GSS, and SHI

Variables	Male n=105		Female n=105		<i>t</i> (208)	<i>p</i>	95% CI		Cohen's <i>d</i>
	M	SD	M	SD			LL	UL	
PMH	22.68	4.21	20.84	4.79	2.94	.004	.608	3.06	0.40
SHI	20.69	4.40	19.28	5.02	2.16	.032	.123	2.69	0.29
GSS	16.59	3.81	15.27	4.53	2.27	.024	.173	2.45	0.31

Note: CI= Confidence Interval

Table 5 revealed significant mean differences in PMH with $t(208)=2.94$, $p<.05$, SHI with $t(208)=2.16$, $p<.05$ and GSS with $t(208)=2.27$, $p<.05$. Findings shows that male students exhibit higher scores on PMH ($M=22.68$, $SD=4.21$), SHI ($M=20.69$, $SD=4.40$) and GSS ($M=16.59$, $SD=3.81$). While female students exhibit lower scores on PMH ($M=20.84$, $SD=4.79$), SHI ($M=19.28$, $SD=5.02$), and GSS ($M=15.27$, $SD=4.53$). The hypothesis was that there would be significant gender differences in sleep quality, sleep hygiene, and mental health of university students. The gender disparities were measured using a t-tests for independent samples. Table results revealed significant mean differences in gender.

Discussions

The findings from this research study on sleep quality and sleep hygiene concerning Pakistan reveal significant insights into the factors associated with deteriorated mental health among students. The nature and direction of the relationship among study variables, i.e., sleep quality, sleep hygiene, and positive mental health, along with participants' demographic characteristics, were examined in the current study. This study explored the connection among the mentioned variables and examined the significant gender differences among all study variables. For this purpose, statistical analyses bivariate correlation, hierarchical regression, independent t-test were carried out.

Correlation analysis revealed a significant correlation between sleep quality, hygiene, and mental health. The findings are consistent with a study by Lund et al. (2020), investigating the link between sleep quality, sleep hygiene, and positive mental health in Norwegian university students. The study found that higher scores on measures of sleep quality and hygiene were significantly associated with higher scores on measures of positive mental health. Specifically, good sleep quality was correlated with greater emotional well-being and happiness with life. In contrast, good sleep hygiene was associated with higher levels of emotional well-being, life satisfaction, and academic performance. The current study findings are also similar to the past research conducted by Peach et al. (2016), whose revealed a significant positive correlation between sleep hygiene, sleep quality, and positive mental health.

The current study result revealed the presence of a significant positive correlation between mental health and Sleep hygiene; as the sleep hygiene practices increase, mental health will also be improved, and results also revealed a moderately significant correlation between Positive mental health and sleep scale quality, which means as sleep quality increases the positive mental health will also be improves, consistent with previous researches (Hirshkowitz et al., 2015) which revealed good sleep hygiene was linked to better sleep quality and lower levels of daytime sleepiness. The current study results are also consistent with findings that imply that awareness of sleep hygiene is associated with sleep behaviors, which are connected to the general health of sleep. The findings are similar to past research (Peach et al., 2016; Brick et al., 2010).

The hierarchical regression analysis revealed that sleep quality and hygiene are significant predictors of mental health in the studied sample. Based on the regression coefficients (b values) provided in the analysis, it is revealed that sleep quality is a better predictor of mental health than sleep hygiene. Therefore, sleep hygiene procedures and quality are essential factors to consider when promoting positive mental health. The results are consistent with a study by Ali et al. (2023), which found that sleep quality and hygiene were significant predictors of mental health in Turkish university students. Similarly, a study by Lund et al. (2020) found that sleep quality and hygiene were significantly associated with mental health measures in Norwegian university students. However, sleep quality was a stronger predictor than sleep hygiene. The outcomes are also reliable, as shown by another study by Kabrita et al. (2014), which found that sleep quality was a significant predictor of mental health outcomes in Korean university students. In addition, the study indicated that sleep hygiene practices may moderate the link between mental health and quality of sleep outcomes.

Overall, these studies suggest that sleep quality is a stronger predictor of positive mental health outcomes than sleep hygiene practices in university students. However, at the same time, sleep hygiene procedures and sleep quality are important factors to consider when promoting positive mental health.

Results also revealed significant gender differences in students' sleep quality, hygiene, and mental health. The findings revealed that male students exhibited better mental health, sleep hygiene, and sleep quality, while female students had lower levels. The results are consistent with previous research that reported that male college students exhibited higher levels of positive mental health than female college students (Rajab et al., 2021). In addition, research has also found that male college students may engage in better sleep hygiene practices than female college students (Lund et al., 2020).

The findings are also similar to the past study conducted by Cheng and Cheng (2017), which found that male university students in Hong Kong reported significantly better sleep quality and fewer sleep disturbances than female students. In addition, male students had greater levels of daytime sleepiness and lower degree of depression symptoms than female students. Similarly, a study by Zhai et al. (2021) found that male university students in China had significantly better sleep quality and lower levels of daytime sleepiness than female students. Another investigation by Gao et al. (2020) found that female university students in the United States reported significantly higher levels of stress, anxiety, and depression symptoms than male students. In addition, compared to male students, female students slept less well and experienced more sleep issues.

Conclusion

The present research attempted to evaluate sleep hygiene practices, sleep quality, and mental health amongst university students and to gauge their relationship concerning gender. A significant positive correlation was found among all the variables. The findings suggest that positive mental health, sleep hygiene practices, and overall sleep quality are interrelated and may impact each other. The present research enlightened some crucial connections between the variables that have significant implications for society and the field of health psychology. This research will open pathways for future studies on mental health, sleep hygiene practices, and sleep quality. The study's results inform the development of educational programs to promote practices for good sleep hygiene and positive mental health among university students. Moreover, these findings can provide the basis for developing mental health support services for university students, focusing on promoting good sleep hygiene practices. The study could stimulate further research on

interventions to improve sleep quality, hygiene, and positive mental health among university students, which could have significant public health implications.

Future research could associate the outcome of this study with those of other cultures to investigate if there are any cultural differences in sleep quality, sleep hygiene, and mental health among university students. In the long run, it will add to research studies and academia and can be utilized in further indigenous studies.

Limitations and Recommendations

- It was a cross-sectional research with a small sample size needed to be more significant, and more is needed to generalize the results of SHI, GSS, and PMH to the entire population of university students.
- The study used nonprobability purposive sampling to fetch a sample of interest, which lacks representativeness and operates only according to the researcher's convenience, so the research was restricted due to time, resources, and scope.
- The sample was collected from two universities only because of limited financial and time resources to access students. Thus, the use of a random sampling strategy and incorporation of a larger sample size from different locations of Pakistan in future studies with university students is recommended so that more meaningful results can be obtained and generalization on the whole population is ensured.

References

- Ali, R. M., Zolezzi, M., Awaisu, A., & Eltorki, Y. (2023). Sleep quality and sleep hygiene behaviours among university students in Qatar. *International Journal of General Medicine*, 2427-2439.
- Becker, S. P., Jarrett, M. A., Luebbe, A. M., Garner, A. A., Burns, G. L., & Kofler, M. J. (2018). Sleep in a large, multi-university sample of college students: sleep problem prevalence, sex differences, and mental health correlates. *Sleep health*, 4(2), 174-181.
- Brick, C. A., Seely, D. L., & Palermo, T. M. (2010). Association between sleep hygiene and sleep quality in medical students. *Behavioral sleep medicine*, 8(2), 113-121.
- Cheng, W. J., & Cheng, Y. (2017). Night shift and rotating shift in association with sleep problems, burnout and minor mental disorder in male and female employees. *Occupational and environmental medicine*, 74(7), 483-488.
- Davis, J. P., Prindle, J., Saba, S. K., DiGiuseppi, G. T., Hummer, J., Lee, D. S., & Pedersen, E. R. (2022). What's sleep got to do with it? Longitudinal associations between insomnia, PTSD, and alcohol use among US Veterans. *Addictive behaviors*, 132, 107358.
- Diener, E. (2013). The remarkable changes in the science of subjective well-being. *Perspectives on Psychological Science*, 8(6), 663-666.
- Gao, W., Ping, S., & Liu, X. (2020). Gender differences in depression, anxiety, and stress among college students: a longitudinal study from China. *Journal of affective disorders*, 263, 292-300.
- Gellis, L. A., & Lichstein, K. L. (2009). Sleep hygiene practices of good and poor sleepers in the United States: an internet-based study. *Behavior Therapy*, 40(1), 1-9.
- Hamilton, N. A., Nelson, C. A., Stevens, N., & Kitzman, H. (2007). Sleep and psychological well-being. *Social Indicators Research*, 82, 147-163.
- Hanson, B. L., & Ruthig, J. C. (2012). The unique role of sleep quality in older adults' psychological well-being. *Journal of Applied Gerontology*, 31(5), 587-607.

- Hirshkowitz, M., Whiton, K., Albert, S. M., Alessi, C., Bruni, O., DonCarlos, L., & Hillard, P. J. A. (2015). National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep health*, 1(1), 40-43.
- Kabrita, C. S., Hajjar-Muça, T. A., & Duffy, J. F. (2014). Predictors of poor sleep quality among Lebanese university students: association between evening typology, lifestyle behaviors, and sleep habits. *Nature and science of sleep*, 11-18.
- Kline, C. E., Irish, L. A., Buysse, D. J., Kravitz, H. M., Okun, M. L., Owens, J. F., & Hall, M. H. (2014). Sleep hygiene behaviors among midlife women with insomnia or sleep-disordered breathing: the SWAN sleep study. *Journal of Women's Health*, 23(11), 894-903.
- Krystal, A. D., & Edinger, J. D. (2008). Measuring sleep quality. *Sleep medicine*, 9, S10-S17.
- LeBourgeois, M. K., Giannotti, F., Cortesi, F., Wolfson, A. R., & Harsh, J. (2005). The relationship between reported sleep quality and sleep hygiene in Italian and American adolescents. *Pediatrics*, 115(Supplement_1), 257-265.
- Liu, X., Zhao, Z., Jia, C., & Buysse, D. J. (2008). Sleep patterns and problems among Chinese adolescents. *Pediatrics*, 121(6), 1165-1173.
- Lukat, J., Margraf, J., Lutz, R., van der Veld, W. M., & Becker, E. S. (2016). Psychometric properties of the positive mental health scale (PMH-scale). *BMC psychology*, 4, 1-14.
- Lund, H. N., Pedersen, I. N., Johnsen, S. P., Heymann-Szlachcinska, A. M., Tuszewska, M., Bizik, G., & Mainz, J. (2020). Music to improve sleep quality in adults with depression-related insomnia (MUSTAFI): study protocol for a randomized controlled trial. *Trials*, 21, 1-10.
- Malik, N., & Muazzam, A. (2018). Sleep disorders as predictor of health-related quality of life in patients with COPD. *Annals of King Edward Medical University*, 24(S), 897-901.
- Mastin, D. F., Bryson, J., & Corwyn, R. (2006). Assessment of sleep hygiene using the Sleep Hygiene Index. *Journal of behavioral medicine*, 29, 223-227.
- Peach, H., Gaultney, J. F., & Gray, D. D. (2016). Sleep hygiene and sleep quality as predictors of positive and negative dimensions of mental health in college students. *Cogent Psychology*, 3(1), 1168768.
- Peltzer, K., & Pengpid, S. (2016). Sleep duration and health correlates among university students in 26 countries. *Psychology, health & medicine*, 21(2), 208-220.
- Rajab, A. M., Rajab, T. M., Basha, A. C., Al-Khani, A. M., Ali, M. A., Enabi, S., & Saquib, N. (2021). Gender differences in sleep and mental health among Saudi adolescents. *Sleep Disorders*, 2021.
- Redeker, N. S., & McEnany, G. P. (2011). The nature of sleep disorders and their impact. *Sleep Disorders and Sleep Promotion in Nursing Practice*. New York, NY: Springer, 43-52.
- Saunders, T. J., Gray, C. E., Poitras, V. J., Chaput, J. P., Janssen, I., Katzmarzyk, P. T., & Carson, V. (2016). Combinations of physical activity, sedentary behaviour and sleep: relationships with health indicators in school-aged children and youth. *Applied physiology, nutrition, and metabolism*, 41(6), S283-S293.
- Sletten, T. L., Weaver, M. D., Foster, R. G., Gozal, D., Klerman, E. B., Rajaratnam, S. M., & Czeisler, C. A. (2023). The importance of sleep regularity: a consensus statement of the National Sleep Foundation sleep timing and variability panel. *Sleep Health*, 9(6), 801-820.
- Soehner, A. M., & Harvey, A. G. (2012). Prevalence and functional consequences of severe insomnia symptoms in mood and anxiety disorders: results from a nationally representative sample. *Sleep*, 35(10), 1367-1375.

- Stepanski, E. J., & Wyatt, J. K. (2003). Use of sleep hygiene in the treatment of insomnia. *Sleep medicine reviews*, 7(3), 215-225.
- Wiebe, S. T., Cassoff, J., & Gruber, R. (2012). Sleep patterns and the risk for unipolar depression: a review. *Nature and science of sleep*, 63-71.
- Yildirim, S., Onder, N., & Avci, A. G. (2020). Examination of sleep quality and factors affecting sleep quality of a group of university students. *International Journal of Caring Sciences*, 13(2), 1431-1439.
- Zhai, X., Wu, N., Koriyama, S., Wang, C., Shi, M., Huang, T., & Fan, X. (2021). Mediating effect of perceived stress on the association between physical activity and sleep quality among Chinese college students. *International Journal of Environmental Research and Public Health*, 18(1), 289.
- Zhang, G. Q., Cui, L., Mueller, R., Tao, S., Kim, M., Rueschman, M., & Redline, S. (2018). The National Sleep Research Resource: towards a sleep data commons. *Journal of the American Medical Informatics Association*, 25(10), 1351-1358.