

Research Article

The Correlation between Sleep Quality and Level of Stress among Students in Islamic Boarding School Bogor

Hubungan antara Kualitas Tidur dengan Tingkat Stres pada Siswa di Pondok Pesantren Bogor

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ABSTRACTS

Sleep period and performance affect mental health. Multiple studies have linked sleep quality and duration to mental health in metabolic patients, but studies on sleep patterns and mental health symptoms in healthy people, especially in Islamic boarding schools, are limited. The goal of this research is to look into the relationship between sleep patterns and performance in relation to mental health in students who attend Islamic boarding schools. In this cross-sectional study, a self-administered questionnaire consisting of the Pittsburgh Sleep Quality Index (PSQI) and the Depression, Anxiety, and Stress Scale-21 (DASS21) was distributed to students at the Wadi Mubarak Islamic boarding school. Total blood sugar and cholesterol levels were measured using EasyTouch glucometer. Fasting glucose levels are used to support the results of stress conditions in the body, which are indicated by an increase in fasting blood glucose levels, which are normally less than 100mg/dl. To see the relationship, a Spearman rank correlation test was carried out. From the results of the examination, plasma glucose levels were 118.1±4.03mg/dl, and plasma uric acid levels were 5.54±0.24 mg/dl. There is a weak correlation between sleep quality and depression (r=0.341; p<0.05) and a fairly strong correlation between sleep quality and anxiety (r=0.437; p<0.05). In this study, poor sleep quality and short sleep duration were linked to an increased incidence of depression and anxiety symptoms. These findings imply that inadequate sleep duration and performance could be a contributor to the development of mental disorders.

Keywords: Anxiety, blood glucose, cholesterol, depression, Islamic boarding school, sleep quality

ABSTRAK

Durasi dan kualitas tidur memiliki dampak kesehatan. Beberapa penelitian menunjukkan hubungan antara durasi dan kualitas tidur dengan kesehatan jiwa pada pasien penyakit metabolisme, namun penelitian tentang durasi tidur dan dampaknya terhadap gejala kesehatan jiwa pada individu normal masih terbatas, terlebih pada lingkungan siswa di pondok pesantren. Tujuan dari studi ini untuk mengetahui hubungan kualitas tidur dengan gejala kesehatan mental pada santri yang bersekolah di pondok pesantren. Dalam studi cross-sectional ini, kuesioner yang terdiri dari *Pittsburgh Sleep Quality Index* (PSQI) dan *Depression, Anxiety, and Stress Scale-21* (DASS21) dibagikan kepada siswa di pondok pesantren Wadi Mubarak. Kadar gula darah total dan asam urat diukur menggunakan *EasyTouch glucometer*. Data kadar glukosa puasa digunakan untuk mendukung hasil terjadinya kondisi stres tubuh, hal ini ditandai dengan peningkatan kadar glukosa darah puasa yang secara normal dibawah 100 mg/dl. Analisis statistik dan uji deskriptif untuk melihat hubungan tersebut dilakukan uji korelasi Spearman rank. Kualitas tidur yang buruk dikaitkan dengan prevalensi gejala depresi dan kecemasan pada populasi penelitian ini. Dari hasil pemeriksaan, kadar glukosa plasma 118,1±4,03mg/dl, dan kadar asam urat plasma 5,54±0,24mg/dl. Terdapat korelasi yang lemah antara kualitas tidur dengan depresi (r=0.341; p<0.05) dan korelasi yang cukup kuat antara kualitas tidur dengan kecemasan (r=0.437; p<0.05). Hasil ini menunjukkan bahwa durasi dan kualitas tidur yang berkurang dapat menjadi faktor risiko terjadinya gangguan kesehatan mental.

Kata Kunci: Depresi, kadar gula, kadar asam urat, kecemasan, kualitas tidur, level stres

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DOI: <http://dx.doi.org/10.21776/ub.jkb.2023.032.04.7>

INTRODUCTION

Anxiety is distinguished by heightened psychological responses and a fearful demeanor. It is a natural part of the human condition, especially when confronted with an ambiguous and uncertain situation. Similarly, when confronted with a challenge, anxiety can boost one's self-confidence (1). When anxiety occurs in situations that most people can handle easily, it is considered abnormal. A generalized anxiety disorder is characterized by excessive and illogical fear and worry, sometimes concerning improbable events in one's life (2). This condition is present for the majority of the day and lasts at least 6 months. A long-term anxiety disorder can lead to clinical depression. Depression is a common mental illness with serious emotional, societal, and economic consequences. Furthermore, depressive symptoms, such as functional impairment, may have negative health consequences (3,4). Because of their significant occupational, social, and economic burdens, students in Islamic boarding had a higher frequency of depressive symptoms than middle-aged and elderly people. Given that a person's mental health can have a significant impact on their future life, maintaining mental health is critical (5).

Sleep is a state of prolonged altered awareness that occurs over time. Sleep allows the body's systems to rest in preparation for the next time we wake up again. This physiological sequence is maintained by changes in the endocrine, circulatory, respiratory, and muscular systems, as well as highly integrated activity of the central nervous system (6). The quality of sleep is determined by how the sleep phases progress; from stage 1 to stage 4, the quality of sleep gets better. Stages 1 and 2 are distinguished by shallow sleep, and waking up is easier. Stages 3 and 4 involve deep sleep, which is called slow-wave sleep, and it's difficult to wake up from. REM sleeps happens at the end of each sleep cycle, about 90 minutes before a person wakes up (7). Chronic activation of the biological system involved in the stress response can lead to disordered physiological reactions, heightened, prolonged, or diminished stress responses, increased disease risk, and detrimental health effects. The relationship between sleep quality and participants with normal glucose levels, on the other hand, is largely unknown (8). A cross-sectional study done at the Ummul Mukminin Islamic Boarding School by Sulastri *et al.*, in 2020 showed that interventions in the form of psychoeducation were proven

to be able to reduce the longing felt (9). While research by Machmud *et al.* states that there is a relationship between sleep quality and headaches in students at Islamic boarding schools, based on these data and the results of the researchers' initial observations, life in Islamic boarding schools is accompanied by busy activities, academic requirement, and longing felt that make students feel stress (10). Due to a lack of research, researchers have been able to conduct studies on the relationship between sleep quality and mental health at Mubarak Islamic boarding schools.

According to the results of the author's interviews, Wadi Mubarak, an Islamic boarding school in Bogor with the goal of preparing its graduates to study religion, found that its students had strenuous activities and a high degree of responsibility in carrying out their duties, leading to a negative impact on their sleep quality. Based on the findings, we tried to ascertain whether there is a correlation between stress levels and the quality of sleep among students at the Islamic Boarding School in Bogor.

METHODS

Participant

This study employs a cross-sectional investigation. Wadi Mubarak Islamic Boarding School in Bogor, West Java, enrolled 41 students starting September to October 2022, and students' physical health was assessed to recruit research participants. The UHAMKA Ethics Committee has registered this study under the number KEPKK/FK/007/01/2023. All participants provided written informed consent. Participants were given time to complete a questionnaire prior to the physical examination and measurement of plasma parameters. A cross-sectional study was done on the Wadi Mubarak Islamic Boarding School in Bogor, West Java. From September to October 2022, 41 students participated in this study. Participants' blood pressure, BMI, glucose levels, and plasma uric acid levels were all measured. During 20-30 minute sessions in the classroom, self-administered questionnaires containing information on indicators of mental health and sleep quality are administered. All participants provided written informed consent. The results of this study may only be applicable to the Bogor area and not to all Islamic boarding schools in Indonesia because the participants came from a single Islamic boarding school in the area.

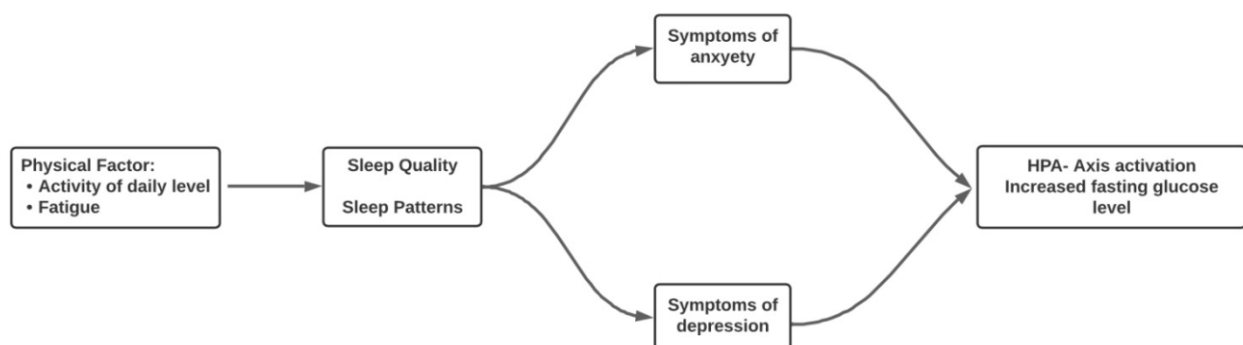


Figure.1 Flowchart showing the correlation between sleep quality with symptoms of anxiety and depression

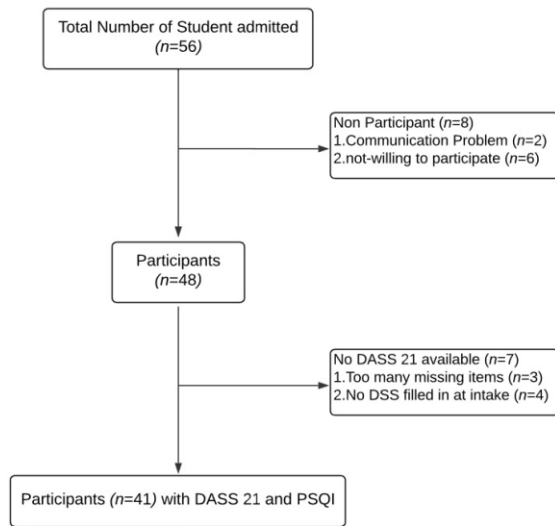


Figure.2 Flowchart showing the participants included in the study

Sleep Assessment

Students' subjective sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI); it is a widely used tool with 19 instruments and seven subscales. Each item is scored on a three-point scale, and the sum of subscales yields a global PSQI score ranging from 0 to 21. Scores higher than 5 are considered to be indicative of poor sleep quality (11).

The PSQI has a high degree of internal consistency, as evidenced by an overall reliability coefficient (Cronbach's) of 0.83 in the original article. The global cutoff score of 5 has a sensitivity of 86.9% and a specificity of 86.5% for distinguishing between poor and good sleep quality. Even though these figures are based on studies with varying sample characteristics (52 controls, 34 sleep-deprived individuals with major depression, and 62 sleep-deprived physicians referred, with mean ages of 59.9, 50.9, and 44 years, respectively), the PSQI has been used to assess the sleep quality of medical students in a number of studies. Farrahi Moghaddam et al. confirmed the reliability and validity of the Persian version of the PSQI (PSQI-P). The reliability coefficient of the questionnaire in the study by Farrahi Moghaddam et al. was 0.73 (12).

Table1. PSQI cut off points (13)

	Score
Safe	0 - 5
Mild insomnia	5 - 10
Moderate insomnia	10 - 15
Severe insomnia	15 - 21

Assessment of Depression, Anxiety, and Stress Symptoms

The Depression, Anxiety, and Stress-21 Scale were used to assess students' mental health (DASS-21). Depression, anxiety, and stress are indeed the recommended cut points for every variable (normal, mild, moderate, severe, and very severe with the cut of points more than 28 for

depression, more than 20 for anxiety, and more than 37 for stress). Jiang *et.al.* performed a study to evaluate and validate the DASS-21's validity and reliability among Chinese hospital workers (14).

Table1. DASS 21 cut off points (13)

	depression	Anxiety	Stress
Normal	0 - 9	0 - 7	0 - 14
Mild	10 - 13	8 - 9	15 - 18
Moderate	14 - 20	10 - 14	19 - 25
Severe	21 - 27	15 - 19	26 - 33
Extremely Severe	28+	20+	37+

Assessment of Blood Glucose and Uric Acid

The examination was conducted at the Wadi Mubarak Islamic Boarding School after the respondent had fasted for 8 hours. Using the EasyTouch glucose monitoring system (easytouch,US), a trained technician measures capillary blood glucose and uric acid according to the manufacturer's instructions. Fasting blood glucose levels should be between 70 to 99 mg/dL. Uric acid normal levels should be measured between 3 to 7mg/dL.

Statistical Analysis

All analyses were performed using SPSS 21.0 statistical software package. Characteristic data were analyzed and presented as mean and confident intervals. Sleep quality, stress, anxiety, and depression data were analyzed and presented as numbers (N) and percentages (%). The relationship between the two variables was determined using a Spearman's correlation test. The p-value was used to determine whether or not there was a statistically significant difference between the two variables. The r value was used to calculate the strength of their bond.

RESULTS

Table 2 displays the results of the average age of the sample, which is 25 years, with 41 male samples. The fasting blood glucose levels average was 118mg/dl, and the uric acid levels average was 5.54mg/dl.

Table 2. Characteristic parameters for study subjects

Characteristic	Description	Confidence Interval 95%
Age, Year	24.8±1.08	22.6-27.1
Blood Glucose	118.1±4.03	109.9-126.2
Blood Uric Acid	5.54±0.24	5.05-6.02

Table 3 provides a description of respondents with good sleep quality (24 people, or 58.5%), and respondents with poor sleep quality (17 people, or 41.5%). The stress component was normal in 29 people (70%), mild in 8 people (19.5%), and moderate in 4 people (9.8%). Stress levels were normal, mild, and severe in 34 people (82.9%), with 2 (4.9%) and 3 (7.3%) being moderate. The assessment of depression appeared normal for 27 people (65.9%); for mild and moderate depression, it appeared normal for 7 people each (17.1%).

Table 3. Frequency distribution for study subjects

Characteristic	n (people)	n (%)
Sleep Quality		
Good	24	58.5%
Bad	17	41.5%
Stress		
Normal	29	70.7%
mild	8	19.5%
moderate	4	9.8%
Anxiety		
Normal	34	82.9%
mild	2	4.9%
moderate	3	7.3%
severe	2	4.9%
Depression		
Normal	27	65.9%
Mild	7	17.1%
Moderate	7	17.1%

Table 4 shows the results of the analysis using the rank Spearman correlation test; it reveals an important association between sleep performance with anxiety and depression. Since the data were not normally distributed, Spearman's rank correlation has been used. According to the findings of the study, there is a link between anxiety levels and poor sleep quality. The correlation coefficient between sleep quality with levels of anxiety and depression is 0.394 for anxiety and 0.341 for depression, indicating that the relationship is strong enough (0.26-0.50). The correlation between the level of anxiety or depression and the level of poor sleep quality is positive, so as the level of anxiety or depression rises, so does the value of poor sleep quality. The correlation between anxiety levels and poor sleep quality was 0.029 ($p < 0.05$), and the correlation between depression and poor sleep quality was 0.004 ($p < 0.005$), indicating that there was a significant relationship between anxiety levels and insomnia severity.

Table 4. Correlation analysis between sleep quality with depression and anxiety

Characteristic	Sleep Quality	
	r	p
Depression	0.341	0.029
Anxiety	0.437	0.004

DISCUSSION

The research showed a statistically significant relationship between participants' quality of sleep and their levels of depression and anxiety. Wu et al. discovered that poor sleep quality was positively associated with depression and anxiety symptoms in a study of 4,747 college students. 4747 Chinese students provided gender, age, residence, BMI, and family economic perceptions. Results included self-reported physical activity, anxiety, depression, psychopathological symptoms, and sleep quality (15). Furthermore, poor sleep quality was not linked to an increased risk of depression in a study conducted by Lau et al., (16). Lau's study investigate the link between mood and sleep quality in 930 Chinese students (aged 18-25) from Hong Kong and Macau. The

Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality, psychological health with depression, anxiety, and stress scales, the Rosenberg Self-Esteem Scale, and academic functioning with an average score. Sleep duration and quality have both direct and indirect effects on academic performance as well as students' physical and psychological health. Silva et al. conducted a study to investigate the connection between anxiety, quality of sleep, and chronotype in 103 undergraduate students. The Morningness-Eveningness Questionnaire (MEQ), State and Trait Anxiety Inventory (STAI), and Pittsburgh Sleep Quality Index (PSQI) instruments were utilized in this cross-sectional study with a quantitative approach. The findings of this study indicate a link between anxiety and poor sleep quality as a result of academic demands on students (17). There are a number of theories, even though it is unclear what mechanisms underlie the association between poor sleep quality and depressive symptoms. First, sleep deprivation has been associated with chronic inflammation, which has been associated with melatonin dysregulation, leading to the onset of depressive disorder and mood disturbances (18,19). Second, people who sleep for short periods may feel less rested and have higher levels of perceived stress (20). This stress response has been linked to depressive symptoms. Third, research on animals demonstrates that major depressive disorder-like changes in neurotransmitter receptor function occur when subjects experience prolonged sleep deprivation (21). College students in a cross-sectional study were found to have shorter sleep cycles and more depressed moods if they had two low-expression alleles of a serotonin transport gene polymorphism (22). Fourth, sleep and mental health are signs of a healthier life (20). Our study's findings are consistent with previous research by Wu et al. and Silva et al., which found a link between anxiety levels and sleep quality. This is explained by a theory that says mental health problems can turn on the HPA axis, which causes a rise in fasting blood glucose levels, as the participants found (23).

Poor sleep quality can cause disruptions in the body's homeostasis. According to the findings of this study, poor sleep quality causes mental disorders such as stress, anxiety, and depression (24). The hypothalamus-pituitary-adrenal axis and the central sympathetic nervous system have been presumed to be activated by impairment. Stress-related substances, such as catecholamines and glucocorticoids, can also inhibit insulin action and secretion. When a person is threatened, the sympathetic nervous system is activated, as is the hypothalamus-pituitary-adrenal (HPA) axis, which causes the adrenal cortex to release more cortisol (25). Stress-induced hypothalamic corticotropin-releasing hormone activates the HPA axis, causing the pituitary gland to produce cortisol hormone into the systemic circulation. Cortisol mobilizes stored energy during times of stress, resulting in the release of glucose and lipids. Cortisol reduces inflammation while also stimulating the cardiovascular system and raising blood pressure via the sympathetic nervous system (26). The sympathetic nervous system sends nerve impulses throughout the body and causes the adrenal medulla to release adrenaline. It raises blood pressure and heart rate while decreasing variability, transferring energy, and producing pro-inflammatory cytokines. In a cross-sectional study of people with type 2 diabetes, Wang et al. discovered a link between stress and higher blood sugar levels. Several studies have linked poor sleep quality to

elevated glucose levels in diabetics (27). Cunha *et al.*, investigated the sleeping habits of 31 people with type 2 diabetes in Sao Paulo; they discovered that up to 52% of patients slept poorly (24). In another study, Purwono *et al.*, investigated the relationship between type 2 diabetes mellitus patients' blood glucose levels and the quality of their sleep, finding that this relationship exists (28). These findings are consistent with those of our study. When compared to normal glucose levels, it seems that the glucose level data in our study started to increase. This description illustrates the impact of anxiety disorders or depression caused by sleep quality disturbances. We, therefore, propose that the correlation between sleep and mental health is caused by disturbances in the body's homeostasis.

There are several limitations to this study that need to be agreed upon. Data on sleep duration and quality are derived from participants' memories, which are subject to human error. Second, as it is a cross-sectional study, deciding causality is difficult. Third, it's not inconceivable that other sleep-related factors influence depressive symptoms. Finally, because our data came from a single Islamic boarding school, it is likely that they only represent a subset of the population. The cross-sectional design of our study prevents us from drawing definitive conclusions about risk factors and their role in mental health. Education, ethnicity, nutrition, and physical activity are all important factors to consider. Furthermore, daily stress is a risk factor for physical health development. Administrative professionals are frequently under physical and mental duress. Students who have high

expectations may be stressed and anxious at school. Another issue with the study is that there is no social or demographic data to back up the findings. It is one of the recommendations that will be researched further.

Therefore, in selected respondents, poor sleep effectiveness and a short sleep duration period were correlated with increased depression and anxiety. Our research also reveals intriguing information about sleep quality among students in Islamic boarding schools. Poor sleep is common among students and is linked to poor mental health, which can cause the body to leave homeostatic conditions, one of which is an increase in blood glucose levels due to HPA axis activation. Bilateral interactions occur through a variety of physiological and psychological pathways. The findings of this study are sufficient to support ongoing efforts to recommend the cottage management system to improve time management for students so that, even though a significant amount of time is required to fulfill the learning outcomes of their studies, the quality of sleep is not compromised. It is hoped that their health will continue to improve, resulting in increased learning achievement.

CONFLICT OF INTEREST

The authors have none to declare.

ACKNOWLEDGEMENTS

Authors would like to thank Pondok Pesantren Wadi Mubarak Bogor and LPPM UHAMKA with contract number 1065/H.04.02/2022, for supporting this study.

REFERENCES

- Adwas AA, Jbireal JM, and Azab AE. *Anxiety: Insights into Signs, Symptoms, Etiology, Pathophysiology, and Treatment*. East African Scholars Journal of Medical Science. 2019; 2(10): 580–591.
- Thibaut F. *Anxiety Disorders: A Review of Current Literature*. Dialogues in Clinical Neuroscience. 2017; 19(2): 87–88.
- Shao R, He P, Ling B, *et al.* *Prevalence of Depression and Anxiety and Correlations between Depression, Anxiety, Family Functioning, Social Support, and Coping Styles among Chinese Medical Students*. BMC Psychology. 2020; 8(1): 1–19.
- Proudman D, Greenberg P, and Nellesen D. *The Growing Burden of Major Depressive Disorders (MDD): Implications for Researchers and Policy Makers*. Pharmacoeconomics. 2021; 39(6): 619–625.
- Wu Y, Jin S, Guo J, Zhu Y, Chen L, and Huang Y. *The Economic Burden Associated with Depressive Symptoms Among Middle-Aged and Elderly People with Chronic Diseases in China*. International Journal of Environmental Research and Public Health. 2022; 19(19): 1-11.
- Worley SL. *The Extraordinary Importance Of Sleep And Public Safety Drives An Explosion Of Sleep Research*. Pharmacy and Therapeutics. 2018; 43(12): 758–763.
- Bik A, Sam C, de Groot ER, *et al.* *A Scoping Review of Behavioral Sleep Stage Classification Methods for Preterm Infants*. Sleep Medicine. 2022; 90: 74–82.
- Hackett RA and Steptoe A. *Type 2 Diabetes Mellitus and Psychological Stress-A Modifiable Risk Factor*. Nature Reviews. Endocrinology. 2017; 13(9): 547–560.
- Sulastri T, Dewi EMP, and Nurdin MN. *Effectiveness of Psychoeducation to Reduce Homesickness in Islamic Boarding School Students*. 2020; 481: 183–188.
- Machmud A and Adi GS. *Hubungan Kualitas Tidur Dan Tingkat Stres Dengan Nyeri Kepala Primer (Migrain) Pada Santri Kelas 2 SMA Pondok Pesantren Walisongo Sragen*. [Thesis]. Universitas Kusuma Husada, Surakarta. 2022.
- Smyth C. *The Pittsburgh Sleep Quality Index*. Dermatology Nursing. 2003; 15(2): 195–196.
- Moghaddam JF, Nakhaee N, Sheibani V, Garrusi B, and Amirkafi A. *Reliability and Validity of the Persian Version of the Pittsburgh Sleep Quality Index (PSQI-P)*. Sleep Breathing. 2012; 16(1): 79–82.
- Brumby S, Chandrasekara A, McCoombe S, Torres S, Kremer P, and Lewandowski P. *Reducing Psychological Distress And Obesity In Australian Farmers By Promoting Physical Activity*. BioMed Central Public Health. 2011; 11: 1-7.
- Jiang LC, Yan YJ, Jin ZS, *et al.* *The Depression Anxiety Stress Scale-21 in Chinese Hospital Workers: Reliability, Latent Structure, and Measurement Invariance Across Genders*. Frontiers Psychology.

- 2020; 11: 1–9.
15. Wu X, Tao S, Zhang Y, Zhang S, and Tao F. *Low Physical Activity and High Screen Time Can Increase the Risks of Mental Health Problems and Poor Sleep Quality among Chinese College Students*. PLoS One. 2015; 10(3): 1–10.
 16. Wong ML, Lau EYY, Wan JHY, et al. *The Interplay between Sleep and Mood in Predicting Academic Functioning, Physical Health, and Psychological Health: A Longitudinal Study*. Journal of Psychosomatic Research. 2013; 74(4): 271–277.
 17. Silva VM, Magalhaes JEM, and Duarte LL. *Quality of Sleep and Anxiety are Related to Circadian Preference in University Students*. PLoS One. 2020; 15(9): 1–11.
 18. Wong PM, Hasler BP, Kamarck TW, Muldoon MF, and Manuck SB. *Social Jetlag, Chronotype, and Cardiometabolic Risk*. The Journal of Clinical Endocrinology and Metabolism. 2015; 100(12): 4612–4620.
 19. Levandovski R, Dantas G, Fernandes LC, et al. *Depression Scores Associate with Chronotype and Social Jetlag in a Rural Population*. Chronobiology International. 2011; 28(9): 771–778.
 20. Rezaei M, Khormali M, Akbarpour S, Sadeghniaat-Hagighi K, and Shamsipour M. *Sleep Quality and Its Association with Psychological Distress and Sleep Hygiene: A Cross-Sectional Study among Pre-Clinical Medical Students*. Sleep Science. 2018; 11(4): 274–280.
 21. Planchez B, Surget A, and Belzung C. *Animal Models of Major Depression: Drawbacks and Challenges*. Journal of Neural Transmission. 2019; 126(11): 1383–1408.
 22. Grilo A, Vieira L, Carolino E, et al. *Anxiety in Cancer Patients during 18 F-FDG PET/CT Low Dose: A Comparison of Anxiety Levels Before and After Imaging Studies*. Nursing Research and Practice. 2017; 2017: 1–9.
 23. Maenhout L, Peuters C, Cardon G, Compennolle S, Crombez G, and DeSmet A. *The Association of Healthy Lifestyle Behaviors with Mental Health Indicators among Adolescents of Different Family Affluence in Belgium*. BMC Public Health. 2020; 20(1): 1–13.
 24. Da Cunha MCB, Zanetti ML, Hass VJ. *Sleep Quality in Type 2 Diabetics*. Revista Latino-Americana de Enfermagem. 2008; 16(5): 850–855.
 25. Li W, Yin, Cai X, Cheng X, and Wang Y. *Association between Sleep Duration and Quality and Depressive Symptoms among University Students: A Cross-Sectional Study*. PLoS One. 2020; 15(9): 1–10.
 26. Çay M, Ucar C, Senol D, et al. *The Effect of Cortisol Level Increasing Due to Stress in Healthy Young Individuals on Dynamic and Static Balance Scores*. Northern Clinic of Istanbul. 2018; 5(4): 295–301.
 27. Wong H, Singh J, Go RM, Ahluwalia N, and Guerrero-Go MA. *The Effects of Mental Stress on Non-insulin-dependent Diabetes: Determining the Relationship Between Catecholamine and Adrenergic Signals from Stress, Anxiety, and Depression on the Physiological Changes in the Pancreatic Hormone Secretion*. Cureus. 2019; 11(8): 1–8.
 28. Purwono J, Ludiana, Fitri NL, Hasanah U, and Ayubbana S. *Effects of Sleep Quality Towards Blood Glucose Levels as at Type II Diabetes Mellitus Patients*. Systematic Review of Pharmacy. 2020; 11(11): 223–226.