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Original Research

THE CORRELATION OF SLEEP QUALITY ON NUTRITIONAL STATUS AND THE INCIDENT OF ANEMIA IN STUDENTS AT MTS AL-MUKHSIN

HUBUNGAN KUALITAS TIDUR TERHADAP STATUS GIZI DAN KEJADIAN ANEMIA PADA SISWI DI MTS AL-MUKHSIN

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Abstract: *Anemia is a condition where the hemoglobin value is <12 g/dL and often occurs in adolescent girls due to many factors such as lack of nutritional intake which can also affect the nutritional status of adolescents. The purpose of this study was to analyze the relationship between sleep quality, protein intake, vitamin C and iron to nutritional status and the incidence of anemia in female students at MTs Al-Mukhsin. The study was conducted at MTs Al-Mukhsin in July 2023 with a sample size of 55 subjects from classes VIII and IX using simple random sampling technique through a cross sectional approach and analyzed using the Spearman rank correlation test. Based on descriptive analysis 54,5% had good nutritional status, 67,3% of subjects had poor sleep quality, 45,5% had anemiat. The results of Spearman rank correlation analysis between sleep quality and nutritional status showed no relationship (p = 0,143). The results of the analysis of sleep quality with the incidence of anemia showed no relationship (p = 0,215). The conclusion of this study is that there is no significant relationship between sleep quality and nutritional status and the incidence of anemia in female students at MTs Al-Mukhsin.*

Key word: Anemia, Sleep Quality, Nutritional Status, Adolescents

1. INTRODUCTION

Adolescence is the phase of life between childhood and adulthood from the ages of 10-19 years, where the transition from childhood to adulthood involves dramatic changes in physical, sexual, psychological and social development. Everything happens at the same time so that during this period, adolescents often experience several health problems(1). One of the physical changes that occurs will affect health status and nutritional needs. An imbalance between nutritional intake and needs will cause nutritional problems, both in the form of over-nutrition and under-nutrition. Currently, nutritional problems that are often found among teenagers include obesity, lack of protein energy, disorders due to iodine deficiency, and anemia, especially iron anemia in young women(2).

The need for nutritional intake increases during adolescence. Excessive nutrient intake that is not balanced with consumption causes weight gain which directly affects the nutritional status of adolescents. Good nutritional status is achieved when there is a balance between nutritional intake and body needs. Human nutritional needs vary based on gender, age, physical activity level, body weight and height(3). Based on prevalence data, nutritional status (BMI/U) in children aged 11-14 years consists of very thin 1.4%, thin 6.7%, normal 78.3%, fat 9.5%, obese 4.0%(4).

Sleep quality is the degree of satisfaction where a person does not feel tired when waking up(5). Sleep is an important component of mental and physical development in children and adolescents(6). However, sleep deprivation and disturbed sleep patterns are common in childhood, with prevalence increasing throughout adolescence(7).

Quality sleep does not depend on how much or how long they sleep, but on how sleep needs can be met. Approaching the age of 12-18 years, teenagers need 8-9 hours of sleep. Research shows that teenagers who don't get enough sleep have more difficulty concentrating and perform worse at school. Factors that influence poor sleep quality include health conditions, psychological stress, diet, lifestyle, environment, and medications. One of the problems resulting from poor sleep quality is low hemoglobin levels, or anemia(8). Anemia is one of the main nutritional problems in Indonesia. Anemia is a deficiency of macronutrients (protein) and micronutrients, especially iron, which can cause symptoms such as paleness, lethargy/tiredness, decreased appetite and failure to grow(9). Globally, it is known that the prevalence of anemia is estimated at 30% of the world's total population and based on 2018 Riskesdas data(4), the prevalence of anemia in adolescents is 32%, meaning that 3-4 out of 10 adolescents suffer from anemia.

The group that is vulnerable to anemia attacks young women, namely those aged 10-19 years. Young women have a greater risk of developing anemia compared to young men because they experience a menstrual cycle every month so they lose a lot of iron(10). The short-term risk of anemia can cause delays in physical growth and sexual maturity. The long-term effect of anemia on young mothers-to-be is the inability to meet the nutritional needs of both themselves and the fetus in the womb, which causes complications in pregnancy and childbirth and the risk of maternal death. prematurity, low birth weight, and perinatal death(11).

Based on the background above, it is known that iron anemia in adolescents is still a major nutritional problem in Indonesia, especially in adolescent girls because they experience the menstrual cycle and is influenced by several other factors such as inadequate nutritional intake and poor sleep quality. Therefore, researchers are interested in analyzing the relationship between sleep quality, protein intake, vitamin C and iron on nutritional status and the incidence of anemia among female students at MTs. Al-Mukhsin.

2. METHODS

This type of research uses analytical observational research to determine the relationship between the dependent variable, namely nutritional status and the incidence of anemia, and the independent variables, namely sleep quality, protein intake, vitamin C and iron in class VIII and IX female students at MTs Al-Mukhsin using a cross research design. sectional because in this study data collection was carried out at one time. The research was conducted offline in July 2023. This research has passed ethical approval with number Un.01./F.10/KP.01/KE.SP/07.08.13/2023.

The sampling technique used a simple random sampling technique with inclusion criteria, namely active female student status at MTS Al-Mukhsin, aged 13-15 years, willing to be a respondent, not menstruating, not taking sleeping pills, physically and spiritually healthy. The exclusion criteria in this study were female students not willing to be respondents, female students not present at the time of the research, female

students who were menstruating, female students taking sleeping pills. Subject determination was carried out by determining the minimum number of subjects from the total population, namely 102 female students using the Slovin (1960) formula, namely 50 female students with an estimated drop out of 10% to 55 female students.

The data collected in this research consists of primary data and secondary data. The type of primary data in this study consists of subject characteristics data obtained by filling out a questionnaire by the subject based on the researcher's guidelines, anthropometric data obtained through direct measurements of body weight using a digital step scale with an accuracy of 0.1 kg and the subject's height measured using a measuring instrument. digital body height with an accuracy of 0.1 cm, sleep quality data was obtained by filling in a standard questionnaire from previous research, namely the Pittsburgh Sleep Quality Index (PSQI), and the hemoglobin value was obtained through direct examination using an Hb meter carried out by the researcher because the researcher has an active Phlebotomy certificate and can be used to carry out hemoglobin examinations. Secondary data in this research is attendance data for class VIII and IX female students obtained from MTs Al-Mukhsin.

The data processing stage includes editing, coding, entry, cleaning and saving. Data processing used the Microsoft Excel 2010 program, then the data was analyzed using the Statistical Product and Service Solution (SPSS) version 26 program. Data analysis consisted of univariate and bivariate analysis. Univariate analysis was carried out to describe the characteristics of each variable, both independent variables in the form of sleep quality, protein intake, vitamin C and iron and dependent variables in the form of nutritional status and anemia status. After carrying out the univariate analysis, bivariate analysis was then carried out to test the relationship between the independent variables and the dependent variable using the Spearman Rank test with a significance limit of 0.05. If the p-value is <0.05 then there is a significant relationship between the variables being tested, but if the p-value is >0.05 then there is no significant relationship between the variables being tested.

3. RESULTS

Subject Characteristics

Based on table 1, the distribution of subjects is mostly 13 years old (50.9%) with 28 female students, 14 years old (45.5%) with 25 female students and 15-year-olds (3.6%) with 2 female students. All subjects in this study were female, namely 55 female students. The distribution of nutritional status of the subjects shows the nutritional status category (BMI/U) of female students with a distribution of status categories of undernutrition (27.3%), good nutrition (54.5%), overnutrition (12.7%), and obesity 5.5 %). The average body weight was 48 kg with the lowest weight being 35.4 kg and the highest being 76.8 kg. The average height is 153 cm with the lowest height being 141 cm and the highest being 165 cm.

Table 1. Distribution of Subject Characteristics

Characteristics	n	%
Age		
13 years old	28	50,9
14 years old	25	45,5
15 years old	2	3,6
Total	55	100

Characteristics	n	%
Nutritional status		
Underweight	15	27,3
Normal	30	54,5
Overweight	7	12,7
Obesity	3	5,5
Total	55	100

Sleep Quality

Subjective sleep quality is the subject's assessment of the quality of their sleep whether it is classified as very good, quite good, rather bad or very bad. Based on the research data in table 2, it is known that the majority of 39 female students (70.9%) had quite good subjective sleep quality. Sleep latency is the time it takes a subject from lying down to reaching deep sleep, where the normal sleep latency is 0-15 minutes. Based on table 2, the majority of subjects had rather poor sleep latency and were able to fall asleep soundly since being in bed for a duration of 30-60 minutes, 18 female students (32.7%). Sleep duration is how long the subject sleeps from when he falls asleep until he wakes up in the morning. It is known that the majority of subjects' sleep duration was very good, namely >7 hours, 20 female students (36.4%).

Sleep efficiency is a comparison of actual sleep time with the time the subject is in bed. It is known that the majority of sleep efficiency is quite good, as many as 31 female students (56.4%). Sleep disorders are causes that may occur to the subject so that it affects the quality of sleep at night, including waking up in the middle of the night to urinate, stones, snoring, cold, heat, nightmares, pain, and so on. It is known that the majority of subjects experienced sleep disturbances at night with a frequency of once a week, 36 female students (65.5%). It is known that 0 students (0%) took sleeping pills and the final assessment was dysfunction during the day, such as the subject feeling unenthusiastic when carrying out activities or often feeling sleepy during the day because he experienced sleep disturbances at night. It is known that the majority of female students who experience dysfunction during the day experience dysfunction during the day with a frequency of 2x a week as many as 23 female students (41.8%).

Table 2. Components of Subject Sleep Quality Assessment

Components of Sleep Quality	n	%
Subjective Sleep Quality		
Very Good	3	5,5
Good	39	70,9
Bad	12	21,8
Very Bad	1	1,8
Total	55	100
Sleep Latency		
Very Good	12	21,8
Good	16	29,1
Bad	18	32,7
Very Bad	9	16,4
Total	55	100
Sleep Duration		
Very Good	20	36,4
Good	20	36,4
Bad	10	18,2

Components of Sleep Quality	n	%
Very Bad	5	9,1
Total	55	100
Sleep Efficiency		
Very Good	21	38,2
Good	31	56,4
Bad	3	5,5
Very Bad	1	1,8
Total	55	100
Sleep Disorders		
Very Good	0	0
Good	36	65,5
Bad	18	32,7
Very Bad	1	1,8
Total	55	100
Drug Use		
Very Good	55	100
Good	0	0
Bad	0	0
Very Bad	0	0
Total	55	100
Daytime Dysfunction		
Very Good	1	1,8
Good	16	29,1
Bad	23	41,8
Very Bad	1	1,8
Total	55	100

Based on the 7 components assessed for sleep quality in table 3, if the score obtained is <5, it means the sleep quality is good, but if the score is >5, the sleep quality is poor. The following are the results of the distribution of female students' sleep quality at MTs Al-Mukhsin:

Table 3. Distribution of Subjects' Sleep Quality

Sleep Quality	n	%
Good	18	32,7
Bad	37	67,3
Total	55	100

Anemia Status

The results of measuring the anemia status of class VIII and IX students at MTs Al-Mukhsin obtained through checking hemoglobin levels are as follows:

Table 4. Frequency Distribution of Subjects' Anemia Status

Anemia Status	n	%
Anemia	25	45,5
Not Anemia	30	54,5
Total	55	100

Table 4 shows that 25 female students (45.5%) while 30 female students (54.5%) were not anemic with the lowest Hb values. Hb measurements were carried out using the Easy Touch CGHB brand hemoglobin checker with interpretation if the hemoglobin value was <12 g/dL then it indicates anemia and if the hemoglobin value is >12 g/dL then it indicates not anemia. The average Hb value for female students is 12 g/dL with the lowest Hb being 7.5 g/dL and the highest being 16.6 g/dL.

Correlation between Sleep Quality and Nutritional Status

Bivariate analysis was carried out to determine the correlation between sleep quality and the nutritional status of class VIII and IX female students at MTs Al-Mukhsin. Results can be seen in the following table:

Table 5. Analysis of the Relationship between Sleep Quality and the Subject's Nutritional Status

Sleep Quality	Status Gizi								Total		*r*	*p*
	Underweight		Normal		Overweight		Obesity					
	n	%	n	%	n	%	n	%	n	%		
Good	2	11,1	12	66,7	4	22,2	0	0,0	18	100	-	0,143
Bad	13	35,1	18	48,6	3	8,1	3	8,1	37	100	0,200	

Based on table 5, the results between sleep quality and nutritional status in class VIII and IX female students showed that 18 students had good sleep quality, where 2 students (11.1%) had poor nutritional status, 12 students (66.7%) had poor nutritional status. good nutrition, and 4 female students (22.2%) had more nutritional status. There were 37 female students with poor sleep quality, of which 13 female students (35.1%) had poor nutritional status, 18 female students (48.6%) had good nutritional status, 3 female students (8.1%) had over-nourished status and 3 female students (8.1%) had poor nutritional status. .1%) have obese nutritional status. Based on this research, there are female students who have good sleep quality but have less, good nutritional status and higher obesity compared to female students who have good sleep quality and normal nutritional status.

Correlation between Sleep Quality and Anemia Status

Analysis of the correlation between sleep quality and anemia status of class VIII and IX female students at MTs Al-Mukhsin can be seen in the following table:

Table 6. Analysis of the Correlation between Sleep Quality and Subjects' Anemia Status

Sleep Quality	Anemia Status				Total		*r*	*p*
	Anemia		Not Anemia					
	n	%	n	%	n	%		
Good	6	33,3	12	66,7	18	100	-0,170	0.215
Bad	18	48,5	19	51,4	37	100		

Based on table 6, it is known that the cross tabulation results between sleep quality and anemia status are 6 female students with good sleep quality and anemia (Hb <12 g/dL) (33.3%), female students with good sleep quality and not anemic (Hb>12 g/dL) as many as 12 female students (66.7%), 18 female students with poor sleep quality and anemia (48.5%), 19 female students with poor sleep quality and anemia (51.4%)). The results of the Spearman correlation test obtained a correlation coefficient of -0.170 with a p-value = 0.215 (>0.005), which means there is no significant relationship between sleep quality and anemia status in class VIII and IX female students at MTs Al-Mukhsin.

4. DISCUSSION

The characteristics of the respondents in this study were young women aged 13-15 years and all of them were female. According to WHO (2023)(1), adolescence is a transition period from children to adults with an age range of 10-19 years. At this age, adolescents tend to experience various health and nutritional problems, especially adolescent girls who will experience accelerated growth as they enter reproductive age, so that if nutritional needs are not met properly, this will lead to poor nutritional status in adolescents, which in the long term can be at risk of causing CED, anemia, Vitamin A deficiency, as well as other health problems, then teenagers with over-nutritional status or obesity will be at risk of developing cardiovascular diseases such as diabetes mellitus, dyslipidemia. One assessment that can be carried out to measure the nutritional status of adolescents is using the BMI/U index. Apart from being easy, it can also be used to identify subjects with obese nutritional status and who are at risk of medical complications.

The subject's sleep quality is assessed based on the PSQI questionnaire which consists of 9 questions regarding the subject's sleep quality which is then divided into 7 components with each component having a score of 0-3, where 0 means very good, 1 means quite good, 2 means somewhat poor and 3 means means very bad. These 7 components consist of subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disorders, medication use and daytime dysfunction. Furthermore, from these 7 components, a final score will be obtained which describes the subject's sleep quality as good or bad. In this research, it is known that female students experience poor sleep quality because every day the female students do many activities during the day such as school, playing, reciting the Koran, and doing many assignments until the evening, then when they go to bed the female students are used to playing with gadgets until late at night and You have to wake up in the morning to perform morning prayers and prepare for school so that the students don't get enough sleep, therefore when they wake up their bodies still feel tired and sleepy during their activities during the day. However, many female students feel that their sleep quality is good, so they still maintain their sleep patterns.

The results of the analysis using the Spearman correlation test showed a correlation coefficient of -0.200 with a p-value of 0.143 (>0.05) which means there is no significant relationship between sleep quality and the nutritional status of class VIII and XI female students at MTs Al-Mukhsin. The results of this research are in line with research by Nabawiyah, et al (2021) which shows that there is no relationship between sleep quality and the nutritional status of students at Pondok Modern Darussalam Gontor Putri 1 with a p-value of 0.411(12). This research is also in line with research by Rodhiyah (2022) which shows that there is no significant relationship between sleep quality and the nutritional status of students at the Tarbiyah Islamiyah Tanjung Agung Islamic Boarding School with a p-value = 1,000 because nutritional status can be influenced by many factors(13). Other factors that can cause changes in nutritional status apart from sleep quality are physical activity, stress factors, the environment, and disease infections(14).

This research is different from research by Damayanti (2016) which showed that there was a relationship between sleep quality and the nutritional status of female students at Adhikawacana Vocational School with a p-value = 0.011(15). This was then supported by research by Tsania (2022) entitled the relationship between eating patterns, sleep quality and physical activity with nutritional status in elementary

school children during limited face-to-face learning which showed significant results with a p-value <0.005(16). This happens if someone who has a short sleep duration of <6 hours a day will experience an increase in the hormone ghrelin which functions to stimulate appetite and a decrease in the hormone leptin which functions to suppress appetite so that it affects a person's eating pattern which then affects nutritional status such as malnutrition or overnutrition(16).

Palawe's research (2014) showed that there was no relationship between sleep quality and hemoglobin value with a p-value = 0.754. This is because there are many factors that can affect the sleep quality of each individual, including psychological stress, disease infections, poor diet, environment, temperature, side effects of certain drugs, habits of consuming caffeine, alcohol(17). Kalsum's research (2023) regarding the relationship between Fe intake and sleep quality with the incidence of anemia in adolescent girls at SMAN 2 Wawotobi, Konawe Regency also showed a p-value = 0.102, which means that there is no relationship between sleep quality and the incidence of anemia because the incidence of anemia in adolescent girls apart from can be caused by sleep quality but can also be influenced by other factors such as menstrual patterns, eating habits, infectious diseases and physical activity(18).

In contrast to research conducted by Mawo, et al. (2019) where the results of research regarding the relationship between sleep quality and hemoglobin levels of Undana medical faculty students obtained a p-value = 0.000, which means there is a relationship between sleep quality and hemoglobin levels of students at Undana Medical Faculty. This is because the majority of respondents experience sleep disorders which are characterized by poor PSQI assessments, but respondents still think that their sleep quality is good so they maintain this sleep pattern. If a poor sleep pattern continues in the long term, it will trigger oxidative stress which causes the lysis of erythrocytes if it continues for more than 12 hours, causing low Hb levels(19). Sari's (2019) research also shows that there is a relationship between sleep quality and the incidence of anemia in young women at Islamic High School 1 Surakarta with a p-value = 0.039. It is important to pay attention to the depth of sleep that occurs in the NREM (non-rapid eye movement) phase, where hormone secretion occurs for the repair and formation of body cells, including new blood cells, and lasts for 70-100 minutes(20).

In this study, female students had more difficulty sleeping at night because there were a lot of school assignments that had to be done, then before going to sleep, female students were used to playing on their cellphones until late at night and had to get up early every day so that during the day they often experienced sleepiness and were not enthusiastic about their activities. However, the results show that there is no relationship between sleep quality and the incidence of anemia in female students at MTs Al-Mukhsin because there are many other factors that trigger anemia beyond the reach of researchers apart from sleep quality.

5. CONCLUSION

The research was conducted at MTs Al-Mukhsin in July 2023 with subjects totaling 55 female students from classes VIII and IX, all subjects were female, the majority had good nutritional status and were not anemic. However, most have poor sleep quality. Based on the data obtained, it was concluded that there was no significant relationship between sleep quality and the nutritional status of class VIII and IX female students at MTs Al-Mukhsin, there was no significant relationship between sleep quality and the incidence of anemia in class VIII and IX female students at MTs Al-Mukhsin. Suggestions

for further research are expected to be able to compare other variables that have the potential to be related to this research, such as menstrual cycles, intake of macro and micro nutrients that have not been studied in this research, and other variables.

REFERENCES

1. World Health Organization (WHO) Adolescent Health. [(accessed on 01 Maret 2023)]. Available online: https://www.who.int/health-topics/adolescent-health#tab=tab_1.
2. Masthalina Hesta, Yuni Laraeni, Yuliana Putri Dahlia. 2015. Pola Konsumsi (Faktor Inhibitor Dan Enhancer Fe) Terhadap Status Anemia Remaja Putri. Jurnal Kesehatan Masyarakat.
3. Supariasa, D., Bakri, B., Fajar, I. 2016. Penilaian Status gizi, edisi 2. Buku Kedokteran EGC.
4. Ministry of Health. 2019. Laporan Hasil Riset Kesehatan Dasar (Riskesdas) Indonesia tahun 2018. In Badan Penelitian dan Pengembangan Kesehatan (pp. 1–627). Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan.
5. Wilkinson, JM. Treas, LS. Barnett, KL. Smith, MH. 2016. Fundamentals of Nursing: Theory, Concept, and Application. (Third Edition: Volume 1. Philadelphia: F.A Davis.
6. Hestetun I, Svendsen MV, Oellingrath IM. 2018. Sleep problems and mental health among young Norwegian adolescents. Nord J Psychiatry. 72:578-85
7. Carter B, Rees P, Hale L, Bhattacharjee D, Paradkar MS. 2016. Association between portable screen-based media device access or use and sleep outcomes: A systematic review and meta-analysis. JAMA Pediatr. 170:1202-8.
8. Petronela, R., Mawo, Su Djie To Rante, I Nyoman Sasputra. 2019. Hubungan Kualitas Tidur dengan Kadar Hemoglobin Mahasiswa Fakultas Kedokteran Undana. Cendana Medical Journal. Volume 17 Nomor 2.
9. Putri, R. Desita., Betty Yosephin Simanjuntak, & Kusdalinah. 2017. Pengetahuan Gizi, Pola Makan, dan Kepatuhan Konsumsi Tablet Tambah Darah dengan Kejadian Anemia Remaja Putri. Jurnal Kesehatan. Volume VIII, Nomor 3, November 2017, hlm 404-409.
10. Agustina. 2019. Analisis Pengetahuan terhadap Kepatuhan Remaja Putri dalam Mengkonsumsi Tablet Tambah Darah Untuk Pencegahan Dan Penanggulangan Anemia Gizi Besi. Jurnal Ilmiah Kesehatan Masyarakat, 11, hal. 269–276. Available online: https://jikm.upnvj.ac.id/index.php/home/article/view/51/34
11. Nuraeni, R., Sari, P., Martini, N., Astuti, S., & Rahmiati, L. (2019). Peningkatan Kadar Hemoglobin melalui Pemeriksaan dan Pemberian Tablet Fe Terhadap Remaja yang Mengalami Anemia Melalui " Gerakan Jumat Pintar ". 5(2), 200–221.
12. Nabawiyah, H., et al. 2021. Hubungan Pola Makan, Aktivitas Fisik, Kualitas Tidur dengan Status Gizi Santriawati di Pondok Modern Darussalam Gontor 1. Darussalam Nutrition Journal. Vol. 5, No.1:78-89.
13. Rodhiyah, W. 2022. Hubungan Kualitas Tidur dengan Status Gizi pada Santri Pondok Pesantren Tarbiyah Islamiyah Tanjung Agung. Program Studi Pendidikan Dokter Fakultas Kedokteran. UIN Syarif Hidayatullah. Jakarta.
14. Fibriana, Dwi. 2019. Hubungan Kualitas Tidur dengan Status Gizi pada Mahasiswa. Fakultas Kedokteran Universitas Brawijaya.

15. Damayanti, A. E. 2016. Hubungan Citra Tubuh, Aktivitas Fisik dan Pengetahuan Gizi Seimbang dengan Status Gizi Remaja Putri. Skripsi. Surabaya: Perpustakaan Universitas Airlangga.
16. Tsaniya R. 2022. Hubungan Pola Makan, Kualitas Tidur, dan Aktivitas Fisik dengan Status Gizi pada Anak Sekolah Dasar Selama Pembelajaran Tatap Muka Terbatas. Jurnal Gizi dan Kesehatan. Vol. 4, No.2.
17. Palawe, C. Prastika, Rotty, Linda W.A. 2016. Hubungan Kadar Hemoglobin dengan Fungsi Kognitif, Kualitas Tidur dan Lama Rawat inap Pasien Lanjut Usia di RSUP Prof. Dr. R.D. Kandao Manado. E-Clinic (eCl) Vol. 4, No.1.
18. Kalsum, U., et al. 2023. Hubungan Asupan Fe dan Kualitas Tidur dengan Kejadian Anemia pada Remaja Putri di SMAN 2 Wawotobi Kabupaten Konawe. Jurnal Ilmiah Gizi. Volume 10(1).
19. Mawo, Petronela R., et al. 2019. Hubungan Kualitas Tidur Dengan Kadar Hemoglobin Mahasiswa Fakultas Kedokteran Undana. Cendana Medical Journal. Volume 17, No.2.
20. Jackowska, Marta, et al. 2013. Sleep and Disturbance in The English Longitudinal Study of Ageing: Associations with Creactive Protein, Fibrinogen, Dehydropiandsterone Sulfate and Hemoglobin. The Official Journal of International Society of Psychoneuroendocrinology. Vol. 38, No. 9: 1484-1493