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RELATIONSHIP BETWEEN SLEEP HABITS AND SLEEP DISORDERS FOR 1-3 YEARS OLD CHILDREN AT POSYANDU LAWEN, PANDANARUM

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Abstract: Sleep is a basic need that is very important for humans, especially at the age of children to support the achievement of optimal growth and development. However, the age of children is the age where a person often experiences sleep disturbances. External factors in the form of sleeping habits such as the application of children's sleeping hours, the use of shady lights when sleeping at night, and the use of electronic goods can cause sleep disturbances in children. Therefore, this study is aimed to describe the incidence of sleep disorders and to determine the relationship between sleep habits and sleep disorders in children aged 1-3. This research used an observational analytic study with a cross sectional design. The sample used was selected based on inclusion criteria with 55 consecutive sampling. Data were collected using the guided interview method and children's sleep disturbances were measured using the Brief Screening Infant Sleep Questionnaire (BISQ) form. Children aged 1-3 years who experience sleep disorders were 36.4%. Based on the bivariate test, there was no significant relationship between the application of sleeping hours and children's sleep disorders (p-value = 0.102), there was a significant relationship between the use of shady lights when sleeping at night with children's sleep disorders (p-value = 0.010), and there was a significant relationship between the use of electronic goods before bed with sleep disturbances in children (p-value = 0.004). This study shows that there is no relationship between the application of sleeping hours and children's sleep disorders. However, use of shady lights at night and the use of electronic goods before bed have a relationship with children's sleep disorders.

Keywords: sleep, sleep habits, sleep disorders, brief screening infant sleep questionnaire

Introduction

Sleep is a basic need that is very important for humans, especially for children (Moturi and Avis, 2010). Quality sleep can affect the growth and development of children, because 75% growth hormone is released when the child is sleeping (Hense et al, 2011, Mardiana and Martini, 2014). Growth hormones also renew and repair cells in the body ranging from skin cells, blood cells to nerve cells (Sekartini, 2012). Sleep also affects central nervous system maturation and brain plasticity and

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plays a role in memory consolidation (Wilhelm et al, 2008). Therefore, children's sleep quality needs to be taken into account because sleep disorders can lead to less optimal child development.

According to Yasmine et al (2020), sleep disorders most often occur in children. In 2012 data from the World Health Organization (WHO) stated that the incidence of children experiencing sleep disorders was 33% (Abdurrahman, 2015). Based on the American Academy of Pediatrics, around 25% of children under the age of 5 years have sleep disorders (Bathory and Tomopoulos, 2017). In the United States, 46.4% of children aged 1-3 years experiences sleep disorders in the form of frequent awakenings at night (Mindel et al, 2009). Meanwhile in Indonesia, the prevalence of sleep disorders in toddlers is 44.2% (Sekartini and Adi, 2006). No study, however, have examined sleep habits before bed in children age 1-3 years old, the focus of this study.

Sleep disorders in children can cause several problems. The problems can be that the child gets sleepy during the day, gets tired easily, decrease in physical activity, becomes more sensitive, impulsive, often disturbing, can reduce memory, become irritable, sometimes gets cranky and can even cause children to have temper tantrums (Mindell, 1999, Owen, 2011, Maski and Kothare 2013).

Factors that can affect children's sleep disorders are internal factors and external factors. Internal factors such as the presence of chronic diseases in children, such as asthma, allergies, and atopic dermatitis (Diette et al, 2000). Meanwhile, external factors consist of environmental conditions and sleeping habits. Environmental conditions that can affect the occurrence of sleep disturbances include crowded houses and loud noises (Tanjung and Sekartini, 2004). Various sleep habits associated with sleep disturbances such as having or not applying bedtime, using shaded lights at bedtime, and not using electronic devices before going to bed (Lukmasari et al, 2017).

The application of bedtime for children aims to make children accustomed to a predetermined bedtime (Hannan and Hiscock, 2015). Implementing bedtime for children to get used to the child sleeping and waking up at the same time every day, so that the child's body will form a good sleeping regulation. Applying bedtime to children has also been shown to improve the quality of children's sleep (Mindell and Williamson, 2018). The use of shady lights when sleeping at night should be done because bright light can suppress the release of the hormone melatonin which plays a very important role in the sleep process and sleep quality. The use of electronic goods such as smartphones, tablets, computers, and television cause a person to be exposed to blue spectrum rays. The blue light spectrum emitted from electronics causes the brain to delay the release of the hormone melatonin so that sleep time becomes longer (Cain and Gradisar, 2010, Wood et al, 2013).

Based on this description, researchers are interested in examining the relationship between sleep habits such as applying bedtime, using shaded lights while sleeping, and using electronic goods before going to bed with sleep disorder in children aged 1-3 years.

Materials and Methods

Design and samples

This study was conducted at Posyandu Lawen Pandanarum by using an observational analytic study with a cross sectional design. The population in this study is mothers who have children aged 1-3 years are 299. Sampling was carried out by consecutive sampling. The number of samples was 55 which was calculated using the Lemeshow formula, according to the inclusion and exclusion criteria. The inclusion criteria were respondents had to sleep with their children and as the primary caregiver. The exclusion criteria were mothers who have children aged 1-3 years who are sick, taking drugs (class I antihistamines or pseudoephedrine), and with a history of asthma, allergies, and atopic dermatitis.

Research instrument and data collection

Data collected was carried out using Brief Screening Infant Sleep Questionnaire (BISQ) form by the guided interview method with mother recalling on children's sleep pattern and sleep behavior (e.g., method falling asleep, sleep duration, and night waking). The BISQ is a validated instrument used to asses child's sleep problem. Sleep problem were defined when one or more conditions are found such as night waking of more than 3 times, wakefulness duration of more than 1 hour, and sleep duration of less than 9 hours a day. The data were collected in December 2021.

Data analysis

The collected data were analyzed using a univariate analysis to determine the frequency distribution. The relationship between the sleep habits (application of children sleeping hours, use of shady light when sleeping at night, and use electronic goods before bed) and sleep disorder determined using bivariate analysis the chi-square test and fisher's exact test. Multivariate analyses were used to determine the most influential variable, using multiple logistic regression tests.

Ethical consideration

This study was approved by the Ethics Committee of Faculty of Medicine, University of Muhammadiyah Semarang, with ethical clearance No. 126/EC/FK/2021.

Result

Characteristics of samples

Table 1 shows that the most respondents were junior high school education (69%). The characteristics of children are mostly male (63.6%) and the most children aged 2 years (50.9%). It is also known that 42 parents (76.4%) do not apply sleeping hours to their children, 33 children (60%) slept using shaded

lights at night, and 37 children (67.3%) used electronic goods before going to bed. The table below shows that there are 20 children (36.4%) who experience sleep disorders.

Table 1: The characteristics of samples

Characteristics	n	%
Respondent's educations		
Elementary school	11	18.1
Junior high school	38	70.9
Senior high school	3	5.5
S1/S2/S3	3	5.5
Child gender		
Male	35	63.6
Female	20	36.4
Child age		
1 years old	16	29.1
2 years old	28	50.9
3 years old	11	20
Application of children sleeping hours		
No	42	76.4
Yes	13	23.6
Use of shady lights when sleeping at night		
No	22	40
Yes	33	60
Use of electronic goods before bed		
Yes	37	67.3
No	18	32.7
Sleep Disorder		
Yes	20	36.4
No	35	63.6

Result of BISQ

The BISQ results presented in Table 2. All children sleep in the same place as their parents (bed sharing) with the most sleeping position was supine position (45,5%). A small percentage of children falling asleep at 06.00 pm and 12.00 pm (n=2, 3.6%). Of all the children, majority did not wake up at night (85.5%) and majority were awake for less than 60 minutes (96.4%). The most sleep duration of the child at night was 10 hours (25.5%) and the most spend nap was 2 hours (40%). The total duration of children's sleep in a day is mostly more than 9 hours (65.5%) while other children have a total sleep of duration in a day less than 9 hours (34.5%). All respondents thought that sleep disorders in children are not a problem at all.

Table 2: Results of the Brief Screening Infant Sleep Questionnaire (BISQ).

BISQ	n	%
Child sleep arrangements		
Children sleep in separate room	0	0
Child sleeps in his own place in the parent's room	0	0
Children sleep in the same place as their parents	55	100
Child sleeps in his own bed in the same room as the sibling	0	0
Others	0	0
Child sleep position		
On his/her belly	7	12.7
On his/her side	23	41.8
On his/her back	25	45.5
Child bedtime		
06.00 pm	2	3.6
07.00 pm	15	27.3
08.00 pm	13	23.6
09.00 pm	6	10.9
10.00 pm	10	18.2
11.00 pm	7	12.7
12.00 pm	2	3.6
Long put the child to sleep		
5 minutes	12	21.8
10 minutes	15	27.3
15 minutes	5	9.1
30 minutes	16	29.1
60 minutes	7	12.7
The way children fall asleep		
Fall asleep while breastfeeding	22	40
Fall asleep when alone	3	5.5
Fall asleep when rocked	1	1.8
Fall asleep near parents	29	52.7
Falls asleep when carried	0	0
Frequency of night wakings		
0	47	85.5
1 time	3	5.5
2 times	1	1.8
3 times	4	7.3
> 3 times	0	0
Duration of night wakings		
≤ 60 minutes	53	96.4
> 60 minutes	2	3.6
Total time child spends sleeping during the night		
6 hours	5	9.1
7 hours	10	18.2
8 hours	11	21
9 hours	12	21.8
10 hours	14	25.5
11 hours	2	3.6
12 hours	1	1.8

Total time child spend nap		
No naps	12	21.8
1 hour	15	27.3
2 hours	22	40
3 hours	6	10.9
Total duration of child sleep		
< 9 hours	19	34.5
≥ 9 hours	36	65.5
Parents perception of child sleep disorders		
A very serious problem	0	0
A Small problem	0	0
Not a problem at all	55	100

Characteristic of children with sleep disorders

This study found that were 20 children (36.4%) who experienced sleep disorder. Most of them were male (75%). Based on Table 3, the most age who experienced sleep disorder is 2 years old (55%), 18 children (90%) did not apply bedtime hours, 13 children (65%) did not use shade lights at night, and 18 children (90%) used electronic goods before going to bed.

Table 3: The characteristic of children with sleep disorders.

Characteristics	n	%
Child gender		
Male	15	75
Female	5	5
Child age		
1 years old	4	20
2 years old	11	55
3 years old	5	25
Application of children's sleeping hours		
No	18	90
Yes	2	10
Use of shady lights when sleeping at night		
No	13	65
Yes	7	35
Use of electronic goods before bed		
Yes	18	90
No	2	10

The relationship between application of children's sleeping hours, use of shady lights when sleeping at night, and use electronic goods before bed and sleep disorder

The analysis result has a relationship if the p-value <0.05. Based on Table 4, show that there is no relationship between the application of sleeping hours and children's sleep disorders (p-value = 0.102;

PR = 2.786; CI = 0.743-10.447). Meanwhile the use of shaded lights during sleep (p-value = 0.010; PR = 2.786; CI = 1.324-5.861) and use of electronic goods before bed (p-value = 0.044; PR = 4.378; CI = 0.743-0.447) have a relationship with sleep disorders children aged 1-3 years.

Table 4: Results of Bivariate Analysis.

Variable	Sleep disorders				Total		PR	95%Cl		*p-value*
	Yes		No					Upper	Lower	
	N	%	n	%	n	%				
Application of children's sleeping hours										
No	18	42.9	24	57.1	42	100	2.786	0.743	10.447	0.102
Yes	2	15.4	11	84.6	13	10				
Use of shady lights when sleeping at night										
No	13	59.1	9	40.9	22	100	2.786	1.324	5.861	0.0010
Yes	7	21.2	26	78.8	33	100				
Use of electronic goods before bed										
Yes	18	48.6	19	52,4	37	100	4.378	0.743	10.447	0.016
No	2	11.1	16	88.9	18	100				

The results of the tabulation between the application of sleeping hours and sleep disorders obtained 18 children (42.9%) did not apply sleeping hours and experienced sleep disorder. There were 13 children (59.1%) who did not use shaded lights at night and experienced sleep disorders (59.1%). There were 18 children (48.6%) who used electronic goods before going to bed and had sleep disorders (48.6%).

The most influential variable in children's sleep disorders

Based on Table 5, it shows that the most influential variable in child's sleep problem is the use of shaded lights while sleeping at night (p-value = 0.004 <0.05).

Table 5: Multivariate Analysis Results.

Variable	B	Wald	Sig.	OR	95% Ci for EXP(B)	
					Lower	Upper
Use of shady lights when sleeping at night	2,009	8,136	0,004	7,564	1,875	29,649
Use of electronic goods before bed	2,387	6,917	0,009	10,882	1,837	64,479

Discussion

The result of this study indicate that 20 children (36.4%) have sleep problem. Most of them did not have sleep schedule, did not use shade light during sleep at night, and use electronic goods before bed.

Application of children's sleep hours

Implementing a bedtime for children aims to ensure that children get enough sleep every day. The application of bedtime can affect duration of night sleep, morning wake-up time, and nap time. In this study, the application of sleep hours was not statistically related to sleep disorders (p-value >0.05). This is because the children at Posyandu Lawen have enough sleep a day. Most of them have 10 hours of sleep at night and 2 hours of nap time during the day. Whereas one of the criteria sleep problem is sleep less than 9 hours a day. Beside of that, mostly sleep on or before 9 pm which is optimal time for children to sleep (Sambo, 2016).

Children who sleep at the same time every day (including consistent bedtimes and wake times) will form a good sleep regulation (Mindell and Williamson, 2018). Sleep regulation can be formed because body has a biological mechanism of sleep. The biological mechanism of sleep consists of two mechanisms, that is circadian rhythms and homeostasis. Circadian rhythm mechanisms play a role in regulating sleep time and causing sleepiness at night and waking up in the morning naturally. Meanwhile, the homeostasis mechanism plays a role in knowing the child's sleep needs and will remind the body to sleep and wake up at a certain time (Bethesda, 2019).

Use of shady lights when sleeping at night

The bright light has the great influence of sleep-wake cycle. It can suppress the release of the hormone melatonin and delay the sleep-wake cycle. Exposure to light can prevent body to fall asleep and return to sleep when awakened ("Brain Basics", 2023). Sleep latency, is duration of time to falling asleep after turning the light off, usually is less than 20 minutes (Zolovska and Shatkin, 2013). In this study, the use of shady lights when sleeping at night has a relationship with sleep disorders in children (p-value <0.05). From the collected data were mostly the time needed for children to fall asleep was 30 minutes or even 60 minutes. There are two children who need more than 60 minutes to fall asleep again after waking up. This study also shows that not using shaded lights at night has a 7,564 times chance of causing a child's sleep disorders.

According to research by Higuchi et al (2014), suppression of melatonin release due to light in children is 88.2% and in adults 46.3%. It shows that light can suppress the release of the hormone melatonin in children almost two times higher than in adults. The hormone melatonin plays a very important role in the sleep process and the sleep quality (Wood et al, 2013). The inhibition of the formation of the hormone melatonin can cause the body to ignore sleep orders and cause the body to be active longer at night so that it has an impact on the need for sleep (Bronsard and Bartolomei, 2013, Hubbard et al, 2013). Meanwhile, the circadian rhythm is a pattern of sleep and wake cycles

that regulates the body to wake up all day when the light is bright and sleep all night when it is dark, so changes in dark and light are important factors in the mechanism of circadian rhythms (Rahayu, 2009). Therefore, shady light during sleep plays an important role in releasing the hormone melatonin and circadian rhythms to work optimally, so that the body and brain are fully rested and get good sleep. It is line with research by Cho et al (2013) showed that the majority of respondents who slept using bright lights had less restful sleep and produced poor sleep quality.

Use of electronic goods before bed

The use of electronic goods before going to bed has a relationship with sleep disorders in children (p-value <0.05). This research is in accordance with research conducted by Mawitjere (2017) which stated that excessive use of gadgets often results in children having less sleep time and can interfere with good sleep patterns. This statement is also supported by research conducted by Syamsoedin (2015). From this research it is known that the light from gadgets will interfere with the release of the hormone melatonin so that it can cause poor sleep quantity in children. The child's inability to properly and correctly manage the time to use gadgets will also have an impact on irregular rest and sleep patterns so that a good child's sleep pattern is not fulfilled every night.

Use electronic devices before bed make children difficult to fall asleep. The blue light emitted from electronics is considered to resemble sunlight. Melatonin photoreceptors react as if it were daytime conditions. This causes the pineal gland to stop releasing the hormone melatonin as a trigger for drowsiness which results in a shift in circadian rhythms and causes sleep disorders (Tosini et al, 2016). In addition, the release of the hormone adrenaline in the body will also increase. This increase in adrenaline hormone will affect the brain to stay awake through the Ascending Reticular Activating System (ARAS). This system plays a role in the cycle of wakefulness and sleep. Increased activity of adrenergic nerves in binding adrenaline can inhibit serotonergic and cholinergic effects on increasing ARAS. This makes it difficult for children to relax and makes it difficult for the eyes to fall asleep (Siegel, 2006, Hidayat 2014).

Conclusion

This study showed that use shady light when sleeping at night and use electronic goods before bed have relationship with sleep disorder in children. Of the two factors, use of shades light during sleep at night is the most influential factor in child’s sleep disorder. This study reported that the parents though sleep disorder is not problem at all, so it is hoped that parents will be more aware of sleep habits. This study has limitations are the data collected by using questionnaire that required parent’s memories of their child’s sleep. This can cause bias. For further research, suggest to analysis other factors that may be related with child’s sleep problem and using different methods.

Declaration of Interest Statement

The authors declare that they have no conflict of interests.

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