

Clinical Comparison of Age and Gender on the Eight Domains of Sleep-related Difficulties in Tabuk City, Saudi Arabia

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Keywords:

Sleep patterns, Sleep-related Difficulties, children, Saudi Arabia

ABSTRACT

Sleep is an essential indicator of overall health, physical, behavioral, emotional, and cognitive development, especially in children and adolescents. Studies used the sleep domains Bedtime Resistance, Sleep Onset Delay, Sleep Duration, Sleep Anxiety, Night Waking, Parasomnias, Sleep-Disordered Breathing, and Daytime Sleepiness as a tool to explore the disparities in gender and age. A cross-sectional study for children aged 1-11 years held in the pediatric outpatient clinic at Maternity and Children Hospital, Tabuk City, Kingdom of Saudi Arabia. The study used a structured. A questionnaire of the children's sleep habits was distributed to the parents via one-to-one interview while recalling their child's behavior for the recent week's sleep pattern. 184 children were enrolled; male and female children were 54.4% and 46.6%, respectively. The three age groups are toddler, age 1 to 3 years (16.3%); pre-school, age 4 to 5 years (22.3%); and primary school, age 6 to 11 years (61.4%). The study showed clinical significance with $P < 0.01$ for age and sex in sleep duration, total sleep-related difficulties, bedtime resistance, and parasomnia. However, there was a clinical significance in age but not sex when waking after 5 a.m. There is no significant difference in sleep onset delay, sleep-disordered breathing, and night walking for both genders and ages. This study concluded that variable rates of sleep patterns and problems among children are due to multiple intrinsic and extrinsic factors, such as developmental progress concerning each gender- and group and the potential socioeconomic and lifestyle surrounding the child. Parental awareness of standard sleep patterns and related problems may provide ideal guidance in healthy sleep. Future studies are warranted to replicate these classes and to identify associated factors with each class.



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1. INTRODUCTION

There is no doubt that sleep plays an important role in a child's health, physical, behavioral, and emotional development, as well as in the cognitive domain, activity, learning, and attention [1]. Poor sleep and insufficient sleep time and quality can lead to significant short- and long-term sequelae such as excessive

daytime sleepiness, poor academic performance [2], hyperactivity, and increased risk of an accident or injury [3]. Sleep problems are common in children, especially school-age children, and are reported to be 30-62%. A pediatrician should predict, recognize, and treat most sleep problems and entrust them to a specialist if necessary [4].

Sleep patterns such as insomnia, sleepwalking, talking during sleep, and awakening tend to occur mainly in the early night. At the same time, Nightmares happen late at night—behavioral insomnia characterized by the inability to fall asleep. Delayed sleep time is also a sleep behavior defined as difficulty falling asleep and is common in adolescence. Differences in sleeping behaviors in children may be due to cultural or genetic differences [5]. Parents often underestimate their children's sleep difficulties worldwide. Sleep problems range from mild transient behavioral problems to more severe and persistent conditions such as sleep apnea syndrome [6], [7].

The relationship between age, sex, and sleep discussed controversially; some reported no gender difference, and conversely, some reviewers reported sleep problems more often in girls than in boys [8], [9].

In Saudi Arabia, studies on sleep problems among children lack. A recent study showed that the most common sleep problems in children were difficulty getting out of bed in the morning (63.1%), sleeping too little (40.2%), and restless sleep (34.4%) in which a conclusion raised that sleep problems are prevalent among 94.4% of 5-13 age school-aged children [10]. Our study is one of the few studies to assess sleep problems in children in Tabuk City, Saudi Arabia.

The present study aims to compare the differences in age and gender and their effects on sleep-related problems among children aged 1 to 11 years.

2. Research design and Methodology

2.1 Study population

A total of 184 children aged 1-11 years, of Saudi origin, and living in Tabuk City recruited from the waiting area in the pediatric outpatient clinic at Maternity and Children Hospital (MCH), Tabuk City, Kingdom of Saudi Arabia, our hospital. The study excluded those with medical or psychiatric problems and who are on chronic medications. Parents instructed to involve their healthy children, avoiding those visiting the clinic during recruitment.

The questionnaire introduced to the parent (mother or father) or guardian after their acceptance to participate in the study. A meeting of one-to-one methods used via assistance trained medical students every day (from 8-12 PM and 1-4 PM) over one month. Two types of questionnaires used: a multiple choice of always (5-7), sometimes (3-5), and never (zero) that have the score marks of 1, 2, and 3, respectively. The second question was an open question.

2.2 Measure

The demographic data were recorded, including age, gender, and socioeconomic status. The children classified into three age groups according to the Center for Disease Control and Prevention (CDC): toddler, age 1 to 3 years; preschool, age 4 to 5 years; and primary school, age 6 to 11 years [11]

The eight domains of children's Sleep Habits Questionnaire (CSHQ) used in this study were 1) bedtime resistance, 2) sleep onset delay, 3) sleep duration, 4) sleep anxiety, 5) night walking, 6) sleep-disordered

breathing, 7) parasomnias, and 8) daytime sleepiness, all of which reflected in the subscale. CSHQ checklist involved a 45-item parent questionnaire that focused on sleep behavior in children implemented in many studies [12]. Some score values indicated more disturbed sleep, some when high scores were obtained (items 1, 2, 3, 10, 11, and 26). Other domains are Bedtime Resistance subscales (Q 1, 3, 4, 5, 6, and 8), Sleep Onset Delay (Q 2), Sleep Duration (Q 9, 10, and 11), Sleep Anxiety (Q 5, 7, 8 and 21), Night Waking (Q 16, 24 and 25), Parasomnias (Q 12,13, 14, 15, 17, 22 and 23), Sleep-Disordered Breathing (Q 18, 19 and 20) and Daytime Sleepiness (Q 26, 27,28, 29, 30, 31, 32 and 33). Parents instructed to answer the questions while recalling their children's sleep patterns over one month. In addition, the habitual bedtime, the morning wake-up time, and the usual sleep duration (day and night) also registered.

2.3 Ethics approval

Ethical permission for this study was granted by the Ethics Committee of the ministry of health at Tabuk city (IRB Protocol No: TU-077/022/172). The approval included the research protocol data, collection sheets that constitute the consent for participant agreement progress, and the final report submitted at the end of the study.

2.4 Statistical analysis

The frequency distributions of the scores for the sleep-related difficulties examined using ANOVA to compare the mean scores \pm 95% CI for the eight sleeping difficulty domains between two factors: gender (male and female) and age group (toddler, preschool, and primary). The gender and age group interactions examined to determine the extent to which the changes in sleeping difficulties with age were the same or different in males and females. The unstandardized partial regression coefficients were assumed to represent strong predictors if their 95% CI did not capture zero; however, a confidence interval that captured zero did not imply that the regression coefficient was insignificant. The effect sizes estimated the proportion of the variance in the sleep-related difficulties explained by gender and age. The interpretation of the effect size in the context of healthcare research was .04 = recommended minimum value to reflect an effect with clinical or practical significance; .25 = moderate effect; and .64 = strong effect.

3. Results

The total number of respondents was N = 184. The proportion of male children (n = 100, 54.4%) slightly exceeded the proportion of female children (n = 84, 46.6%). The children ranged in age from 1 to 11 years (Mean = 6.13, 95% CI = 5.78, 6.47). The ages of the male children (Mean = 5.95, 95% CI = 5.47, 6.43) overlapped with those of the female children (Mean = 6.33, 95% CI = 5.83, 6.83). The children classified into three age groups: toddler, age 1 to 3 years (n = 30, 16.3%); preschool, age 4 to 5 years (n = 41, 22.3%); and primary school, age 6 to 11 years (n = 113, 61.4%).

Table 1 presents the mean scores \pm 95%, and Table 2 presents the results of two-way ANOVA to compare the domains of sleep-related difficulties by gender and age group. The mean sleep duration per day, including naps, was higher in female and male toddlers (10.20h and 10.50h, respectively) than in female and male primary school children (8.59h and 8.79h, respectively). The effect size (partial eta² = .11). Many parents appeared to be aware that their children did not sleep enough. Nearly half of the respondents (n = 86, 46.8%) replied “never,” “once per week,” or “two to four times a week” to the question “How often will the child’s sleep be sufficient and well (the right amount?)”. The other respondents (n = 98, 53.2%) believed that their children had enough sleep, indicated by the reply “five to seven times per week.”

Table 1 Comparison of Sleep Related Difficulties (Mean \pm 95% CI) by Gender and Age Group

Dependent variable	Gender	Age Group	Mean	95% CI
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Sleep duration (h)	Female	Toddler	10.20	9.10	11.30
		Pre-school	9.39	8.66	10.12
		Primary	8.59	8.10	9.08
	Male	Toddler	10.50	9.72	11.28
		Pre-school	9.61	8.79	10.43
		Primary	8.79	8.35	9.23
Time of waking after 5 a.m. (h)	Female	Toddler	3.60	2.23	4.97
		Pre-school	2.52	1.62	3.42
		Primary	1.79	1.16	2.42
	Male	Toddler	4.05	3.06	5.04
		Pre-school	3.78	2.76	4.80
		Primary	2.50	1.93	3.07
Total sleep-related difficulties	Female	Toddler	0.93	0.72	1.14
		Pre-school	1.00	0.86	1.14
		Primary	0.91	0.82	1.00
	Male	Toddler	1.29	1.14	1.43
		Pre-school	0.95	0.79	1.11
		Primary	1.06	0.98	1.14
Bedtime resistance	Female	Toddler	1.15	0.74	1.56
		Pre-school	0.96	0.69	1.24
		Primary	1.07	0.88	1.25
	Male	Toddler	1.44	1.15	1.73
		Pre-school	1.22	0.92	1.53
Parasomnia	Female	Toddler	0.93	0.72	1.14
		Pre-school	1.00	0.86	1.14
		Primary	0.91	0.82	1.00
	Male	Toddler	1.29	1.14	1.43
		Pre-school	0.95	0.79	1.11
		Primary	1.06	0.98	1.14
Sleep-related anxiety	Female	Toddler	1.58	1.27	1.90
		Pre-school	1.45	1.24	1.66
		Primary	1.38	1.24	1.52
	Male	Toddler	1.61	1.38	1.83
		Pre-school	1.31	1.07	1.54
		Primary	1.38	1.25	1.50
Sleep-disordered breathing	Female	Toddler	0.27	-0.17	0.70
		Pre-school	0.44	0.15	0.72
		Primary	0.47	0.28	0.66
	Male	Toddler	0.70	0.39	1.01
		Pre-school	0.43	0.10	0.75
		Primary	0.70	0.53	0.88
Night waking	Female	Toddler	1.13	0.70	1.57

		Pre-school	0.96	0.67	1.25
		Primary	0.95	0.75	1.14
	Male	Toddler	1.15	0.84	1.46
		Pre-school	1.11	0.79	1.44
		Primary	0.95	0.77	1.12
Sleep onset delay					
	Female	Toddler	0.70	0.25	1.15
		Pre-school	1.04	0.75	1.34
		Primary	0.79	0.59	0.99
	Male	Toddler	1.12	0.80	1.43
		Pre-school	0.63	0.30	0.96
		Primary	0.99	0.81	1.17
Daytime sleepiness					
	Female	Toddler	0.50	0.06	0.94
		Pre-school	0.26	-0.03	0.55
		Primary	0.56	0.37	0.75
	Male	Toddler	0.70	0.39	1.01
		Pre-school	0.69	0.37	1.02
		Primary	0.57	0.40	0.75

CI: confidence interval; h: hour; a.m.: At morning

Table 2 Comparison of Sleep Related Difficulties by Gender and Age Group with ANOVA

Dependent variable	Factors	p-value	Partial eta ²
Sleep duration (h)	Gender	.45	<.01
	Age group	<.01	.11*
	Gender x Age group	.99	.00
Time of waking after 5 a.m. (h)	Gender	.04	.02
	Age group	<.01	.08*
	Gender x Age group	.73	<.01
Total sleep-related difficulties	Gender	.01	.04*
	Age group	.21	.02
	Gender x Age group	.05	.04*
Bedtime resistance	Gender	.03	.04*
	Age group	.47	<.01
	Gender x Age group	.91	<.01
Parasomnia	Gender	<.01	.07*
	Age group	.17	.02
	Gender x Age group	<.01	.06*
Sleep-related anxiety	Gender	.66	<.01
	Age group	.13	.02
	Gender x Age group	.72	<.01
Sleep-disordered breathing	Gender	.08	.02
	Age group	.43	.01
	Gender x Age group	.43	.01

Night waking	Gender	.65	<.01
	Age group	.40	<.01
	Gender x Age group	.83	<.01
Sleep onset delay	Gender	.60	<.01
	Age group	.90	<.01
	Gender x Age group	.03	.04*
Daytime sleepiness	Gender	.09	.02
	Age group	.73	<.01
	Gender x Age group	.26	.02

Note: * Effect size indicates clinical or practical significance

ANOVA: analysis of variance; h: hour; a.m.: At morning; Partial eta2: measures of effect size

The mean time of waking after 5 a.m. was high in female and male toddlers (3.60h and 4.05h, respectively, equivalent to 8.36 a.m. and 9.03 a.m. The shortest time of waking after 5 a.m. was in female and male primary school children (1.79h and 2.50h respectively, equivalent to 6.47 a.m. and 7.30 a.m.). The effect size (partial eta2 = .08)

Among the females, the scores for the total sleep-related difficulties were highest in the preschool children (mean = 1.00) and lowest in the primary school children (mean = 0.91). Among the males, the scores for the total sleep-related difficulties were highest in the toddlers (mean = 1.29) and lowest in the preschool children (mean = 0.95). Therefore, the changes in sleeping difficulties with age differ in males and females. The effect size (partial eta2 = .04).

Among the females, the scores for sleep onset delay were highest in the preschool children (mean = 1.04) and lowest in the toddlers (mean = 0.70). Among the males, the scores for sleep onset delay were highest in the toddlers (mean = 1.12) and lowest in the preschool children (mean = 0.63). The effect size (partial eta2 = .04).

The scores for bedtime resistance were highest in the males, with the group means ranging from toddler to primary = 1.44, 1.22, and 1.25, respectively, and lowest in the females, with the group means ranging from toddler to primary = 1.15, 0.96, and 1.07 respectively. There was no systematic change in bedtime resistance across the age groups. The effect size (partial eta2 = .04).

The scores for parasomnia were consistently highest in the males, with the group means declining between toddler and primary (1.14, 0.71, and 0.74, respectively) and consistently lowest in the females, with the group means increasing between toddler and primary (0.44, 0.73, and 0.52 respectively). Therefore, the changes in parasomnia with age were not the same in males and females. The effect size (partial eta2 = .06).

Table 3 presents the predictions estimated using the multiple linear regression coefficients (b). Five of the regression models exhibited practical or clinical significance, indicated by $R^2 > .04$. Sleep duration predicted to decline with age ($b = .83$). However, there was little difference in sleep duration between males and females ($b = .22$), and the effect size was small ($R^2 = .12$). The time of waking after 5 a.m. predicted to be longest among males ($b = 0.78$) and to decline with age ($b = -0.85$). However, the effect size was small ($R^2 = .11$).

Table 3 Prediction of Sleep Related Difficulties by Gender and Age with Multiple Regression

Dependent variable	Predictors	b	95% CI	p-value	R ²
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Sleep duration (h)	Constant	11.07	10.15	11.99	<.01	.12*
	Gender	.22	-.29	0.74	.39	
	Age (Years)	-.83	-1.17	-0.49	<.01	
Time of waking after 5 a.m. (h)	Constant	4.31	3.15	5.47	<.01	.11*
	Gender	0.78	0.13	1.44	.02	
	Age (Years)	-0.85	-1.27	-0.42	<.01	
Total sleep-related difficulties	Constant	1.11	0.92	1.28	<.01	.06*
	Gender	0.14	0.04	0.24	.01	
	Age (Years)	-0.07	-0.13	0.00	.05	
Bedtime resistance	Constant	1.17	0.83	1.52	<.01	.04*
	Gender	0.23	0.04	0.43	.02	
	Age (Years)	-0.05	-0.18	-0.18	.44	
Parasomnia	Constant	0.87	0.63	1.10	<.01	.10*
	Gender	0.24	0.10	0.37	<.01	
	Age (Years)	-0.12	-0.21	-0.03	<.01	
Sleep-related anxiety	Constant	1.66	1.39	1.92	<.01	.02
	Gender	-0.02	-0.17	0.13	.80	
	Age (Years)	-0.09	-0.19	.01	.06	
Sleep-disordered breathing	Constant	0.30	-0.06	0.67	.10	.03
	Gender	0.22	0.02	0.42	.80	
	Age (Years)	0.05	-0.08	0.19	.06	
Night waking	Constant	1.21	0.84	1.57	<.01	.01
	Gender	0.04	-0.17	0.24	.71	
	Age (Years)	-0.09	-0.23	0.04	.17	
Sleep onset delay	Constant	0.91	0.53	1.29	<.01	.01
	Gender	0.10	-0.11	0.31	.36	
	Age (Years)	-0.02	-0.16	0.12	.75	
Daytime sleepiness	Constant	0.48	0.11	0.85	.01	.01
	Gender	0.15	-0.06	0.36	.15	
	Age (Years)	-0.01	-0.14	0.13	.97	

Note: * Effect size indicates clinical or practical significance

CI: confidence interval; R^2 : measures of effect size

Total sleep-related difficulties predicted to be greatest among males than females ($b = 0.14$) and to decline with age ($b = -0.07$) but the effect size was small ($R^2 = .06$). Bedtime resistance predicted to be greatest among males ($b = 0.23$), but there was little decline in bedtime resistance with age ($b = -0.05$), and the effect size was small ($R^2 = .04$). Parasomnia predicted to be greatest among males ($b = 0.24$), and there was a decline in parasomnia with age in both males and females ($b = -0.12$). However, the effect size was small ($R^2 = .10$). The small effect sizes ($R^2 = .01$ to $.03$) indicated that multiple regression analysis was not able to generate models exhibiting practical or clinical significance to predict sleep-disordered breathing, night waking, sleep onset delay, or daytime sleepiness.

4. Discussion

The study focused on age and gender as confounders to interpret sleep-related difficulties in children. This may provide some evidence for the interpretation of sleep problems.

In both genders, the mean sleep duration was approximately 10 hours with little difference in primary school children, 8-9 hours, and it is consistent with previous reports that Sleep duration among young children tends to decline with age [13]. However, within each age, the sleep duration was less than recommended for optimal health. As per the endorsement of the American Academy of Pediatrics, the Sleep Research Society, and the

American Association of Sleep Technologists, children 1 to 2 years of age should ideally sleep 11 to 14 h per day; children 3 to 5 years of age should ideally sleep 10 to 13 h per day; and children 6 to 12 years of age should ideally sleep 9 to 12 h per day [14] and nearly half of the parents appeared to be aware that their children did not have enough sleep. Data demonstrated that sleep duration in children affected by numerous factors, including age, sex, lifestyle, social and cultural influences, and diseases. Children tend to sleep less as they age [15], [16]. Daily behaviors such as watching television more than the recommended time may also lead to shorter sleep duration [17].

Concerning wake-up time, the study found that the mean time of waking after 5 a.m. in female and male toddlers is equivalent to 8.36 a.m. and 9.03 a.m., while in female and male primary school children, it was observed to be between 6.47 a.m. and 7.30 a.m. The result may be explained by the socio-cultural background of late bedtime and late wake-up in toddlers and regular school and parental work schedules in older age groups [18], [19]. Looking at the gender aspect, neither the bedtime nor wake-up time showed a significant difference, and this proved in similar studies [20- 22].

Interestingly, the total sleep-related difficulties were higher in the younger age group with a partial gender difference. Previous studies show that boys have more frequent sleep-related difficulties than girls. Similar studies in children focused on gender differences were also inconsistent [23- 25]. One explanation relied on parental reports rating sleep and behavioral difficulties worse in boys than girls [26], [27].

The sleep onset delay was not the same in both genders and ages. However, preschool-age sleep onset was delayed more in females compared to males. On the side, male toddlers' children showed more delayed sleep onset than females. Similar studies confirmed that delay in sleep onset is common in children, specifically in preschool ages, with no differences regarding sex. Factors such as maternal age, educational level, and presence of siblings in the household observed. Moreover, rhinitis and allergy diagnoses found in children with delayed sleep onset. Social behaviors such as longer screen-based media use is a risk factors [28].

It is proven that bedtime resistance is the most common sleep problem in children worldwide and Saudi Arabia [29], [30]. The scores for bedtime resistance were highest in the males and lowest in the females. Correlating this with age groups, we found that the younger the age, the higher the bed resistance. Some toddlers cry more and climb out of their crib, while others may make specific verbal demands depending on language, motor, and cognitive skills [31]. Concerning parasomnia, it is known that most parasomnias present in early childhood regardless of gender difference. Parasomnia was highest in the males, declined from toddler and primary school age groups, and consistently lowest in the females. The result correlated with a study [19] that showed that boys scored higher than girls, with a tendency to decrease with age. However, there is little significance regarding sleep-related anxiety, sleep-disordered breathing, night waking, and daytime sleepiness concerning age group and gender.

The main limitations of this study are the threats to external validity associated with the small sample size (N = 184), which was too small to obtain accurate results using multiple regression analysis. Threats to internal validity were alleviated by aggregating specified groups of multiple items in the CSHQ to measure the eight domains of sleep difficulties.

Being a cross-sectional study, a reverse causality could not be excluded, such as physical activity, which plays a role in good sleep. Further, the use of self-report answers considered as a query error due to the recall bias and social desirability effect.

5. Conclusion

Sleep schedule interferes with sleep patterns, as children who study in the morning or full-time are more prone to sleep less. It is important to give information to parents and teachers about the recommended hours of sleep for children of different ages and the consequences of lack of sleep in order to improve the sleep quality of school-aged children. Early interventions can promote adequate sleeping patterns, with gains in children's development.

6. Consent for publication

All patients agreed individually indicated via a written consent form

7. Availability of data and material

All raw data are available as Excel sheets that are uploaded as supplementary files for review, if needed

8. Conflict of interest

The author stated that they have no conflict of interest

9. Funding

No funding body played a role in this study design, analysis, or writing of the manuscript the final manuscript

10. Acknowledge

The author thanks Abrar Alatawi and Wedad Albalawi for assistance with data collection and study design.

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