



ORIGINAL ARTICLE

Association between Sociodemographic Factors and Sleeping Patterns from Infancy to Four Years of Life in Saudi Community

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Abstract

Objective: Sleep is a prime factor of healthy development and has been associated with emotional, behavioural, and cognitive development. This study investigates sleep parameters and associated sociodemographic characteristics in a population-based online method in Saudi children from infancy to four years of life.

Methods: A Brief Infant Sleep Questionnaire (BISQ) for sleep assessment was made available to participants through the web link in Arabic language and were filled by the mothers. The target population were divided into three age groups: 0-11 months, 1-2 years, and 2-4 years. Questions related to demographic factors and sleep problems like bedtime resistance, sleep anxiety, nocturnal awakenings and daytime sleepiness were included. Data were evaluated by logistic regression analysis ($p \leq 0.05$) using software R.

Results: 1264 individuals participated in the study, which included 51.3% and 48.7% of male and female children respectively. Sleep disorders were significantly associated with age of child, mode of birth, mother's occupation, family type, parent's sleep time, sleep onset and sleep duration ($P < 0.05$). Inadequate bedtime habits and sleep duration below the recommended levels were observed in all age groups.

Conclusions: The present study showed the prevalence and association between sleeping patterns and different sleep parameters and could be used to inform future research on how to increase parental knowledge of healthy sleep practices and adequate sleep among young children.

Keywords

Sleep, Sleep patterns, Sleep duration, Child's age

Introduction

Children, during the entire first decade of their life, spend the majority of time in sleeping which makes it crucial to understand the role of sleep, particularly in early life. Healthy sleep is pivotal for the child's body and brain growth. It is also associated with physical health, memory and socio-emotional development [1,2]. Sleep problems has been associated both with current and future symptoms of emotional and behavioural problems, as well as cognitive development [2,3]. Children who have shorter sleep duration, insufficient sleep at night, and sleep onset problems have higher odds of social-emotional problems, even if taken into account the developmental problems and demographic factors [4]. Over the years, it may diminish the self-regulation abilities of young children, resulting in higher risk of behavioral and school problems [5].

Quantitative research on young children's sleep has shown that sleep duration is associated with behavioural and cognitive outcomes [6]. Language-based bedtime routines are associated with longer sleep duration and higher verbal scores [7] and longer nighttime sleep duration is associated with larger vocabulary among pre-schoolers [8]. A recent study conducted in the Middle East pictured that the toddlers and their mothers who had a delayed sleep time and very late waking up in the morning had negative effects on mood outcomes. This widespread sleep problems in both toddlers and their mothers suggests the need for sleep to be addressed by medical practitioners

[9]. Children strongly depend on their parents understanding of sleep needs and requirements. However, parents actually have poor knowledge about sleep problems, and this is one of the leading causes for seeking professional help in the early stages of childhood development. Suggesting a need for educating them about the signs of sleep problems and sleep requirements to ensure a healthy sleep regimen is followed [10,11].

The aim of the present study was to report sleep parameters from infancy to four years of life and identify associated sociodemographic factors in a relatively large group of children born in the period of 2015 to 2018 in the Kingdom of Saudi Arabia. We examined a range of sleep parameters like sleep duration, sleep onset, child's sleep time, parent sleep time, siblings sleep time etc., to the sleeping disorders (bedtime resistance, sleep anxiety, nocturnal awakening, daytime sleepiness) which contributed to the predominant development of a child.

Materials and Methods

Participants

Mothers of 1264 infants and toddlers from Saudi Arabia participated in this study.

The age of the children ranged from birth to four years evenly distributed across boys (51.3%) and girls (48.7%).

Procedure

All data were collected online. The questionnaire was prepared using google form and completion of the questionnaire was voluntary, there were no exclusionary criteria, and this study was approved by the Institutional Review Board at Shaqra University. The complete sample was collected in January 2019 to February 2019. All participants completed the expanded Brief Infant Sleep Questionnaire (BISQ), and demographic information (e.g., parental age, education, race, and employment status). All questionnaires were translated into Arabic and back-translated to ensure accuracy.

The study included all births which took place from 1 January 2014 to 31 December 2018 in the various region of Saudi Arabia and were divided into three age groups: From 0 to 11 months, 1-2 years and 3-4 years.

The questionnaire consisted of two parts: The first part included demographic information, and the second part comprised 20 questions regarding the sleep patterns and sleep habits of children. This part was divided into 6 subsections: 1) Bedtime resistance; 2) Sleep onset; 3) Sleep duration; 4) Sleep anxiety; 5) Nocturnal waking; 6) Daytime sleepiness.

Results

Demographic factors

Complete demographic data for the sample are provided in [Table 1](#).

Table 1: Demographic characteristics.

	Age Group of Child		
	0-1 year (N = 54)	1-2 years (N = 330)	2-4 years (N = 880)
Sex			
Male	30 (55.6%)	158 (47.9%)	461 (52.4%)
Female	24 (44.4%)	172 (52.1%)	419 (47.6%)
Occupation of Mother:			
Employee	17 (31.5%)	123 (37.3%)	361 (41.0%)
Housewife	29 (53.7%)	168 (50.9%)	465 (52.8%)
Married student	8 (14.8%)	39 (11.8%)	54 (06.1%)
Mode of Delivery:			
Caesarean	11 (20.4%)	90 (27.3%)	231 (26.3%)
Vaginal	43 (79.6%)	240 (72.7%)	649 (73.8%)
Mother's age at the birth of a child:			
18-29 years	37 (68.5%)	222 (67.3%)	542 (61.6%)
30-39 years	13 (24.1%)	98 (29.7%)	278 (31.6%)
40-49 years	4 (07.4%)	10 (03.0%)	60 (06.8%)
Mother's education level			
Middle school	7 (13.0%)	30 (09.1%)	109 (12.4%)
High school	13 (24.1%)	57 (17.3%)	207 (23.5%)
BA	34 (63.0%)	243 (73.6%)	564 (64.1%)

Child's siblings			
He has no brother	26 (48.1%)	131 (39.7%)	145 (16.5%)
one brother/sister	8 (14.8%)	56 (17.0%)	211 (24.0%)
Two	3 (05.6%)	41 (12.4%)	148 (16.8%)
More than two	17 (31.5%)	102 (30.9%)	376 (42.7%)
Housing independence			
Nuclear	45 (83.3%)	284 (86.1%)	710 (80.7%)
Extended	9 (16.7%)	42 (12.7%)	139 (15.8%)
Joined	0 (00.0%)	4 (01.2%)	31 (03.5%)

Table 2: Sleep parameters vs. age group of the child.

	0-1 year (N = 54)	1-2 years (N = 330)	2-4 years (N = 880)
Sleep onset			
Within 20 minutes	30 (55.6%)	184 (55.8%)	390 (44.3%)
More than 20 minutes	24 (44.4%)	146 (44.2%)	490 (55.7%)
Child's sleep duration			
Less than 10 hours	29 (53.7%)	128 (38.8%)	323 (36.7%)
10-12 hours	18 (33.3%)	159 (48.2%)	479 (54.4%)
12-14 hours	3 (05.6%)	37 (11.2%)	71 (08.1%)
More than 14 hours	4 (07.4%)	6 (01.8%)	7 (00.8%)
Child's sleep time			
8:00 pm	17 (31.5%)	55 (16.7%)	112 (12.7%)
at 10 or 11 pm	27 (50.0%)	173 (52.4%)	506 (57.5%)
at 12 or later	10 (18.5%)	102 (30.9%)	262 (29.8%)
Parent's sleep time			
8:00 pm	5 (09.3%)	3 (00.9%)	14 (01.6%)
at 10 or 11 pm	21 (38.9%)	113 (34.2%)	310 (35.2%)
at 12 or later	28 (51.9%)	214 (64.8%)	556 (63.2%)
Sibling's sleep time			
8:00 pm	10 (18.5%)	58 (17.6%)	123 (14.0%)
at 10 or 11 pm	33 (61.1%)	179 (54.2%)	520 (59.1%)
at 12 or later	11 (20.4%)	93 (28.2%)	237 (26.9%)

A total of 1264 individuals participated in the study. Of these, 54 were in the 0-11 months age group (30 males, 24 females), 330 in the 1-2 years age group (158 males, 172 females), and 880 in the 3-4 years age group (461 males, 419 females). Sex distribution was homogeneous among the three age groups (51.3% males and 48.7% females).

The majority of mothers (65.8%) were between 18 and 29 years old, most had a college degree (67%), and the majority were not employed outside the home (52.5%). Nearly 82.2% of children lived in independent family.

Sleep parameters vs. age group of the child

According to the revised recommended sleep duration as specified in the national sleep foundation, child of an age of 11 months should sleep for 12 to 15 hrs/day, while 1-2 years with a range of 11-14

hrs/day and 3-5 years with 10-13 hrs/day [12]. But in the study conducted, it was found that 53.7% of 0 to 11 months, 38.8% of 1-2 years and 36.7% of 3-4 years slept less than 10 hrs/day. In all age groups, the frequency of sleep duration was comparatively less than the values recommended by the National Sleep Foundation. On an average, 56% of children went to bed after 10 pm and 30% at about 12 am in the morning. The sleep onset was observed to be greater than 20 minutes for 52% of children. The parent's and sibling's sleep time too had a greater impact on the sleep time of the child which eventually reduced the sleeping duration which is very essential for the physical, mental and social development of the child (Table 2).

Comparison of sleeping pattern with different variables

Sleep onset: Sleep onset of the child has a significant

effect with the bedtime resistance (avg = 23.1, SD = 7.7, $p = 0.025$), sleep anxiety (avg = 17.2, SD = 7.6, $p < 0.001$) and nocturnal waking (avg = 12.8, SD = 6.2, $p = 0.015$).

Sleep duration: Sleep duration influences sleep anxiety (avg = 16.7, SD = 7.8, $p < 0.001$) and daytime sleepiness (avg = 21.4, SD = 6.5, $p = 0.036$).

Sleep time of the child is associated with bedtime resistance (avg = 23.1, SD = 7.7, $p = 0.039$) whereas the sleep time of the parent also has an influence over the nocturnal waking of the child (avg = 12.8, SD = 6.1, $p = 0.003$) and daytime sleepiness of the child (avg = 21.1, SD = 6.6, $p = 0.009$).

Age of child and mode of birth: A very interesting fact noted was that the mode of child birth was associated with daytime sleepiness (avg = 20.9, SD = 6.7, $p = 0.045$) and also the children of working mother had been associated with sleep anxiety (avg = 17.2, SD = 7.7, $p < 0.001$) and daytime sleepiness (avg = 21.0, SD = 6.6,

$p = 0.019$). Nocturnal waking of the child was more frequently influenced by the type of family (avg = 13.3, SD = 6.3, $p = 0.025$). It was found that age of children had a significant effect with sleep anxiety (avg = 17.0, SD = 7.4, $p = 0.006$), nocturnal waking (avg = 12.6, SD = 6.9, $p < 0.001$) and daytime sleepiness (avg = 21.7, SD = 6.6, $p = 0.001$) (Table 3).

The overall mean and SD of sleeping patterns against age of child (0-11 months, 1-2 yrs and 3-4 yrs) is given in the Table 4.

Discussion

The present study demonstrated that Saudi children were exposed to inadequate bedtime habits in all age groups, with total nocturnal sleep duration below the recommended level.

The National Sleep Foundation (NSF) recommends a daily sleep duration of 14-17 hours/day from birth to 3

Table 3: Sleeping pattern compared with different sleep parameters.

Characteristics	N = 1264	Bedtime Resistance			Sleep Anxiety			Night Wakening			Daytime Sleepiness		
		Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
Job Status of Mother													
Employed	501	23.7	7.7	0.122	18.3	7.4	< 0.001	12.9	5.9	0.374	21.8	6.5	0.019
Homemaker	662	22.8	7.7	-	16.5	7.7	-	12.7	6.2	-	20.7	6.7	-
Married student	101	22.6	7.7	-	16.4	7.9	-	12.0	6.9	-	20.5	6.6	-
Total	1264	23.0	7.7	-	17.2	7.7	-	12.5	6.3	-	21.0	6.6	-
Age of Child													
0-11 months	54	22.8	8.6	0.590	17.3	6.8	0.006	13.5	8.5	< 0.001	22.1	6.3	0.001
1-2 yrs	330	22.8	7.6	-	16.1	7.8	-	10.7	6.4	-	22.2	6.9	-
2-4 yrs	880	23.3	7.7	-	17.7	7.6	-	13.5	5.7	-	20.7	6.5	-
Total	1264	22.6	7.9	-	17.0	7.4	-	12.6	6.9	-	21.7	6.6	-
Mode of Childbirth													
C-section	332	22.9	7.6	0.635	16.7	7.7	0.153	12.6	5.8	0.621	20.5	6.8	0.045
Vaginal	932	23.2	7.8	-	17.4	7.6	-	12.8	6.3	-	21.4	6.5	-
Total	1264	23.0	7.7	-	17.0	7.7	-	12.7	6.0	-	20.9	6.7	-
Type of family													
Nuclear	1039	23.1	7.7	0.827	17.2	7.7	0.513	12.5	6.1	0.010	21.2	6.5	0.324
Extended	190	22.4	7.9	-	17.7	7.4	-	13.9	6.3	-	20.8	6.8	-
Joint	35	22.6	8.3	-	16.1	7.2	-	13.6	6.5	-	19.7	7.9	-
Total	1264	22.7	7.9	-	17.0	7.4	-	13.3	6.3	-	20.6	7.1	-
Sleep Onset													
Within 20 mts	604	22.6	7.4	0.025	16.1	7.5	< 0.001	12.3	5.8	0.015	21.3	6.2	0.437
> 20 mts	660	23.6	7.9	-	18.2	7.6	-	13.1	6.5	-	20.9	7.0	-
Total	1264	23.1	7.7	-	17.2	7.6	-	12.7	6.2	-	21.1	6.6	-
Sleep duration													
< 10 hrs	480	23.3	7.9	0.619	18.5	7.9	< 0.001	12.9	6.2	0.219	21.7	6.7	0.036
10-12 hrs	656	22.9	7.6	-	16.4	7.4	-	12.5	5.9	-	20.8	6.6	-
12-14 hrs	111	23.7	7.6	-	16.7	6.5	-	13.0	6.6	-	20.1	6.2	-
> 14 hrs	17	23.8	6.9	-	15.0	9.2	-	15.0	7.7	-	22.9	6.6	-
Total	1264	23.4	7.5	-	16.7	7.8	-	13.4	6.6	-	21.4	6.5	-

Table 4: Sleep parameters vs. child's age.

	0-11 year (N = 54)	1-2 years (N = 330)	2-4 years (N = 880)
	Mean (SD)	Mean (SD)	Mean (SD)
Bedtime resistance	22.8 (8.56)	22.8 (7.65)	23.3 (7.71)
Sleep anxiety	17.3 (6.85)	16.1 (7.78)	17.7 (7.59)
Night Walking	13.5 (8.50)	10.7 (6.39)	13.5 (5.71)
Daytime Sleepiness	22.1 (6.34)	22.2 (6.97)	20.7 (6.45)

months, 12-15 hours/day from 4 to 11 months, 11-14 hours/day for infants aged 1-2 years, and 10-13 hours/day for pre-schoolers aged 3-5 years [12]. In the present study conducted, it was found that 53.7% of 0 to 11 months children slept less than 10 hours per day. The similar difference of sleep duration from the recommended value were noticed in children who fell in the category of 1-2 years and 2-4 years. Inadequate sleep hygiene can lead to delayed onset of sleep, which in turn can result in a child obtaining insufficient sleep [13]. Irregular sleep schedules can interfere with circadian sleep-wake rhythm among children and contribute to difficulties related to sleep onset latency. Children who slept fewer than 10 hours per night had an increase of 0.22 BMI score units in comparison to children getting more than 10 hours of sleep per night [14,15]. Critical to good sleep hygiene is also having an age-appropriate bedtime and wake time, as this can help ensure that a child receives sufficient sleep. Indeed, developmentally inappropriate bedtimes (later than 9:00 pm) for children under 10 years are associated with shorter sleep duration. Research suggests that young children who follow a consistent bedtime routine demonstrate shorter sleep onset latency, decreased wakefulness following sleep onset, and increased sleep consolidation as compared to a control group of children [16]. Nearly 56% of children participated in the study had a sleep time of later than 10.00 pm.

A new study which examined associations between a mother's level of education, prenatal depression, method of delivery and her infant's sleep duration which concluded that infants born to mothers without a university degree slept 23 minutes less than infant born to mothers with a university degree. Further, the researchers found that the method of delivery independently predicted infant sleep duration, with infants delivered by C-section slept approximately one hour less per day than infants born by vaginal delivery [17]. The present study also presents an evidence of the association of mode of childbirth with daytime sleepiness ($p = 0.045$) and employment of mother with sleep anxiety ($p < 0.001$) and daytime sleepiness ($p = 0.019$). Because the family system is a central part of a child's life, child sleep problems can have a significant impact on family functioning, in particular parent sleep and daytime functioning (e.g., mood, stress, and marital satisfaction). Likewise, family

functioning (e.g., parent stress, marital conflict) may impact child sleep [18].

The present study showed the prevalence and association between sleeping patterns and different sleep parameters. It was recognized that sleep is important in early childhood, and the potential for sleep to elicit better health outcomes remains a significant consideration for researchers, public health practitioners, and the wider community. Higher maternal education has been linked to higher socioeconomic status and increased parenting skills and knowledge [19]. Furthermore, higher education and socioeconomic status have been linked to higher adoption of bedtime routines and better sleep [20].

Conclusion

Multiple factors within the home environment are associated with shorter sleep in early childhood. The results obtained in the present study suggest that there is a high prevalence of inadequate sleep habits and mean total nocturnal sleep time below the recommended values. The study also reveals that their exist significant association between sleep duration, sleep onset, mothers occupation, education level and sleep patterns like bedtime resistance, sleep anxiety, nocturnal awakening, daytime sleepiness. Future work would investigate how sleeping patterns contribute to child development in domains such as day-to-day functioning, cognitive development, and emotional and behavioural development.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors report no conflicts of interest.

Acknowledgement

The authors thank the women who volunteered their time to participate in this study.

References

- Alamian A, Wang L, Hall AM, Pitts M, Ikekwere J (2016) Infant sleep problems and childhood overweight: Effects of three definitions of sleep problems. *Preventive Medicine Reports* 4: 463-468.

2. Hysing M, Sivertsen B, Garthus-Niegel S, Eberhard-Gran M (2016) Pediatric sleep problems and social-emotional problems. A population-based study. *Infant Behavior and Development* 42: 111-118.
3. Sivertsen B, Harvey AG, Reichborn-Kjennerud T, Torgersen L, Ystrom E, et al. (2015) Later emotional and behavioral problems associated with sleep problems in toddlers: a longitudinal study. *JAMA Pediatrics* 169: 575-582.
4. Mindell JA, Leichman ES, DuMond C, Sadeh A (2016) Sleep and social-emotional development in infants and toddlers. *Journal of Clinical Child and Adolescent Psychology* 46: 236-246.
5. Miller AL, Seifer R, Crossin R, Lebourgeois MK (2015) Toddler's self-regulation strategies in a challenge context are nap-dependent. *J Sleep Res* 24: 279-287.
6. Cassandra L Pattinson, Simon S Smith, Sally L Staton, Stewart G Trost, Karen J Thorpe (2018) Investigating the association between sleep parameters and the weight status of children: Night sleep duration matters. *Sleep Health* 4: 147-153.
7. Hale L, Berger LM, LeBourgeois MK, Brooks-Gunn J (2011) A longitudinal study of preschoolers' language-based bedtime routines, sleep duration, and well-being. *J Fam Psychol* 25: 423-433.
8. Lam JC, Mahone EM, Mason TBA, Steven M Scharf (2011) The effects of napping on cognitive function in preschoolers. *J Dev Behav Pediatr* 32: 90-97.
9. Mindell JA, C Lee, A Sadeh (2017) Young child and maternal sleep in the Middle East. *Sleep Med* 32: 75-82.
10. McDowall PS, Galland BC, Campbell AJ, Elder DE (2017) Parent knowledge of children's sleep: A systematic review. *Sleep Med Rev* 31: 39-47.
11. Mona El-Sheikh, Avi Sadeh (2015) I. Sleep and Development: Introduction to the Monograph. *Monographs of the Society for Research in Child Development* 80: 1-14.
12. National Sleep Foundation (2015) National Sleep Foundation recommends new sleep times.
13. Meltzer LJ, Thomas JH, Williamson AA (2016) Sleep disturbances. In: Levesque RJR, *Encyclopedia of adolescence*. Springer, New York, 1-12.
14. Hirshkowitz M, Whiton K, Albert SM, Alessi C, Bruni O, et al. (2016) National Sleep Foundation's updated sleep duration recommendations: Final report. *Sleep Health* 1: 233-243.
15. Paruthi S, Brooks LJ, D'Ambrosio C, Hall AW, Kotagal S, et al. (2016) Recommended amount of sleep for pediatric populations: a consensus statement of the American Academy of Sleep Medicine. *J Clin Sleep Med* 12: 785-786.
16. Mindell JA, Telofski LS, Wiegand B, Kurtz ES (2009) A nightly bedtime routine: Impact on sleep in young children and maternal mood. *Sleep* 32: 599-606.
17. (2019) Infant sleep duration associated with mothers level of education and prenatal depression. University of Alberta Faculty of Medicine & Dentistry.
18. Lisa J Meltzer, Hawley E Montgomery-Downs (2011) Sleep in the Family. *Pediatr Clin North Am* 58: 765-774.
19. Carr A, Pike A (2012) Maternal scaffolding behavior: Links with parenting style and maternal education. *Dev Psychol* 48: 543-551.
20. El-Sheikh M, Bagley EJ, Keiley M, Elmore-Staton L, Chen E, et al. (2013) Economic adversity and children's sleep problems: multiple indicators and moderation of effects. *Health Psychol* 32: 849-859.