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 ≤ 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.
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 awakening; 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%)         |
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

| 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.

| Sleep onset | 0-1 year (N = 54) | 1-2 years (N = 330) | 2-4 years (N = 880) |
|-------------|-------------------|---------------------|---------------------|
| 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%) |
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 wakening (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 = 0.03) whereas the sleep time of the parent also has an influence over the nocturnal wakening 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 wakening 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 wakening (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

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**Table 3:** Sleeping pattern compared with different sleep parameters.

| Characteristics | N = 1264 | Bedtime Resistance | Sleep Anxiety | Night Wakening | Daytime Sleepiness |
|-----------------|---------|--------------------|---------------|----------------|--------------------|
| **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 -         |
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.

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Conflict of Interest

The authors report no conflicts of interest.

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

|                        | 0-11 year (N = 54) | 1-2 years (N = 330) | 2-4 years (N = 880) |
|------------------------|--------------------|--------------------|--------------------|
| 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].
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