Comparative Analysis of Sleep Behavior in ASD Children: A Taif City Perspective

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ABSTRACT

Background

Sleep habits in children with Autism Spectrum Disorder (ASD) are poorly understood despite their significant impact on overall well-being. This study aimed to comprehensively assess sleep behaviors and challenges faced by children diagnosed with ASD in Taif City, targeting individuals under 15 years old.

Methodology

A cohort of 130 participants, including 41 autistic children and 89 typically developing controls, was recruited using convenience and snowball sampling. Data collection involved analyzing bedtime and wake-up patterns, sleep duration, and specific sleep-related issues. Statistical analyses compared findings between the two groups.

Results

Autistic children exhibited distinct sleep behavior patterns compared to controls. They showed earlier bedtimes, consistent wake-up times—often earlier than controls—and notably shorter sleep durations ($p<0.05$). Additionally, autistic children reported significantly higher incidences of snoring and waking up with headaches, indicative of potential sleep disturbances ($p<0.05$).. Heightened daytime fatigue and a propensity to fall asleep during activities were also observed among autistic children.

Conclusion

The results show that youngsters in Taif City with autism spectrum disorder (ASD) and their normally developing classmates have very different sleeping habits. In order to enhance the overall quality and well-being of people with ASD, it is necessary to implement focused treatments that address particular difficulties linked to sleep.

Keywords

Autistic Disorder, Sleep Apnea, Child Development Disorder

INTRODUCTION

Disabilities in social interaction, limited interests, and repetitive actions make up the Autistic Spectrum Disorder (ASD), a complicated neurodevelopmental disorder [1]. Those who suffer from autism spectrum disorder (ASD) often display a fixation on one thing or activity. These characteristics show themselves as an intense fixation on certain things or patterns. (2, 3). This trait may restrict the individual's participation in larger social interactions, but it may be a strength in other situations, enabling them to become an expert in specific niches. A wide variety of activities fall under the umbrella term "repetitive

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behaviours," including things like flapping one's hands repeatedly, insisting on strict routines, or using the same words over and over again [1]. People with autism spectrum disorder (ASD) often use these activities to control their anxiety or sensory stimuli. Social interaction and communication abilities are impacted by ASD. Keeping eye contact, recognising social signals, and participating in two-way discussions may be difficult for certain people [4]. They could also have trouble understanding and responding to the feelings of others or making friends [5]. Autism spectrum disorder (ASD) has become more common in recent decades. There may be a gender difference in the risk of autism, and most genetic studies support the idea that women are more protected. Autism spectrum disease (ASD) is thought to be a highly heritable, multi-genetic condition [6]. More and more people are starting to take notice of the high rate of autism spectrum disorder (ASD) among Saudi youngsters. Research on the frequency of autism spectrum disorder (ASD) among Saudi youngsters has shown conflicting results. The prevalence rates, according to research done in various locations of Saudi Arabia, range from around 1% to 3%. [7-9]. Diagnosing ASD in Saudi Arabia faces challenges due to various factors, including limited awareness, cultural beliefs, and variations in accessing healthcare services [9]. These challenges might contribute to underdiagnosis or delayed identification of ASD in some children.

ASD is a lifelong disease that has significant effects on both the individual with ASD and their families' quality of life, placing a heavy burden on the public health and educational system [10]. The difficulties associated with autism spectrum disorder (ASD) start showing up in a child's development at a young age and have a major influence on important parts of their functioning clinically [11]. Children with ASD are more likely to have sleep disruptions, according to research [12–14]. Irregular sleep patterns, trouble getting to sleep, trouble staying asleep, and early morning awakenings are all examples of these disruptions. Studies have shown varying prevalence rates, which raises the possibility that variables including age, comorbid diseases, and individual variances within the ASD spectrum impact the precise degree of sleep disruptions [13]. Both ASD and sleep problems may affect and worsen each other, since the link between the two is two-way [15]. Core

symptoms of autism spectrum disorder (ASD), such as repetitive behaviors and social difficulties, may be worsened by sleep disruptions, and sleep problems may be contributed to by ASD-related features, such as sensory sensitivity or anxiety [16–18]. The quality of life for families and people with ASD is greatly affected by sleep disruptions. When people with ASD don't get enough sleep, it may worsen their behavioral problems, affect their ability to function throughout the day, impair their cognitive abilities, and make carers feel even more stressed out [19,20]. It is crucial to treat sleep-related disorders as part of ASD care due to the complex effects of sleep disruptions on many parts of functioning. While the effects are well-known, further study is required to design effective treatments. The purpose of this research was to collect detailed information on the sleeping patterns and difficulties experienced by children in Taif City who have been diagnosed with autism spectrum disorder (ASD). The goal was to shed light on how ASD interacts with sleep behavior in this specific setting.

Materials and Methods:

The effects of Autism Spectrum Disorder (ASD) on children's sleeping habits in Taif city were examined in a cross-sectional research. The study commenced on 22nd July 2022 and concluded on 20 September, 2022. The study settings were finalized and encompassed various areas within Taif city.

The study included children under the age of 15 diagnosed with autism. A minimum sample size of 106 autistic children were calculated based on the findings of pilot study , where the effect size of 20% and the desired level of statistical power of 80% at 95% confidence interval. The final samplehad 130 autistic children that comprised of both genders, was selected. The experimental group included 41 autistic children, whereas the control group included 89 generally developing youngsters. The participants for this research were recruited using a combination of snowball sampling and convivence sampling. Additional testing using the DSM-IV-TR checklist, the Asperger Syndrome Diagnostic Scale (ASDS) [21], or the Autism Diagnostic Observation Schedule (ADOS) [22] confirmed the diagnosis of ASD, which was first identified by a developmental paediatrician. To screen

the children who were included as controls, researchers used the Social Communication Questionnaire (SCQ) and developmental history [23].

Inclusion Criteria

- Children under 15 years of age, both male and female.
- Diagnosed with autism according to established criteria.
- Children with other neurodevelopmental issues.
- Typically developing children as control subjects.

Exclusion Criteria

- Children above 15 years of age.
- Parents or guardians who didn't give consent to participate.

Tools and Data Collection Procedure

A structured pretested questionnaire was distributed to parents of children diagnosed with autism. The questionnaire contained a Likert scale with questions categorized into three sections:

- Sleeping Schedule:Information regarding the child's morning wake-up time and bedtime routine was collected, including details on the child's sleep onset and duration.
- Sleep Behavior:Questions assessed various aspects of sleep behavior related to autism, such as bedtime resistance, sleep onset delay, night awakenings, and overall sleep quality.
- Night Wakings:Details about the frequency, duration, and reasons for night wakings in children with autism were captured.

Data Collection Process: Parents (mother/father), or guardians of eligible children with autism received the questionnaire either electronically or in a printed format. Participants were asked to complete the questionnaire, providing information on their child's sleep habits and behaviors.Confidentiality and anonymity of participants were ensured throughout the data collection process.

Ethical Considerations:Informed consent was obtained from participating families.The study adhered to ethical guidelines, ensuring the confidentiality and privacy of participants' information.

Data Analysis: Utilising SPSS ver.26, the gathered data was examined. Children with autism had their sleeping habits and behaviours summarised using descriptive statistics.In order to find out whether there were any variations in sleep habits or behaviours, researchers compared the control group with the autistic group. The categorical variables of sleep behaviours were compared between the two groups using Pearson's chi-square test. To compare the two groups' continuous variables, including the kids' ages and the amount of sleep they had, we used a students' t test.

RESULTS

The purpose of the research was to compare the sleeping and waking habits of children with ASD to those of normally developing youngsters. One hundred thirty-one participants were evaluated for a variety of sleep-related indicators; among them were forty-one (31.0%) children with an autism diagnosis and eighty-nine (68.5%) healthy controls. The average age of the children with autism was 8.8 ± 3.8 years, while the average age of the control group was 7.2 ± 4.1 years. The bedtime patterns among the participants showed that autistic children had a lower proportion of bedtime after 12 am (13.9%) compared to control (86.1%). Also, the control group showed more undefined/irregular bedtime than autistic children. Both these associations showed a statistical significance (p=0.018). In terms of waking patterns, autistic children varied in their wake-up times, with 52.9% waking before 7 am and 38.1% between 7 am and 9 am, which was significantly more than the control group. At the same time, the control group showed a significantly higher proportion of undefined/irregular wake-up time compared to autistic children (p=0.002). The mean sleep duration for autistic children was 8.1 ± 1.9 hours, which was significantly lesser compared to controls (9.4 ± 3.8 hours) (p<0.001) [Table 1].

Table 1: Comparison of sleep time and wake up time between autistic children and controls

			Autism	No autism	Total	P value
	Age (years)		8.8 ± 3.8	7.2 ± 4.1	7.2 ± 4.1	0.051
Bed time	7 pm- 9 pm	N	8	9	17	0.018
		%	47.1%	52.9%	13.1%	
	10 pm-12 am	N	24	35	59	
		%	40.7%	59.3%	45.4%	
	after 12 am	N	5	31	36	
		%	13.9%	86.1%	27.7%	
	Irregular/ undefined	N	4	14	18	
		%	22.2%	77.8%	13.8%	
Morning wakes up	Before 7 am	N	18	16	34	0.002
		%	52.9%	47.1%	26.2%	
	7 am -9 am	N	16	26	42	
		%	38.1%	61.9%	32.3%	
	9 am-12 pm	N	1	15	16	
		%	6.3%	93.8%	12.3%	
	after 12 pm	N	1	10	11	
		%	9.1%	90.9%	8.5%	
	Undefined	N	5	22	27	
		%	18.5%	81.5%	20.8%	
	Sleep duration (hours)		8.1 ± 1.9	9.4 ± 3.8	9.0 ± 2.1	<0.001

The summary of Sleep Behavior Comparison between Autistic Children and Controls is given in Table 2.

Table 2: Comparison of sleep behavior between autistic children and controls

			Never	Rarely	Sometimes	Usually	Always	P value
The child goes to bed at the same time at night	Autism	N	1	9	9	17	5	0.178
		%	2.4%	22.0%	22.0%	41.5%	12.2%	
	No autism	N	6	11	31	25	16	
		%	6.7%	12.4%	34.8%	28.1%	18.0%	
Baby falls asleep within 20 minutes after going to bed	Autism	N	4	10	18	7	2	0.265
		%	9.8%	24.4%	43.9%	17.1%	4.9%	
	No autism	N	5	19	29	22	14	
		%	5.6%	21.3%	32.6%	24.7%	15.7%	
The child sleeps alone in his bed	Autism	N	4	5	5	6	21	0.871
		%	9.8%	12.2%	12.2%	14.6%	51.2%	
	No autism	N	13	7	13	13	43	
		%	14.6%	7.9%	14.6%	14.6%	48.3%	
The child sleeps in the bed of a parent or sibling	Autism	N	14	6	5	8	8	0.482
		%	34.1%	14.6%	12.2%	19.5%	19.5%	
	No autism	N	35	8	20	12	14	
		%	39.3%	9.0%	22.5%	13.5%	15.7%	

			Never	Rarely	Sometimes	Usually	Always	P value
Baby sleeps with rocking or rhythmic movements	Autism	N	24	6	6	1	4	0.675
		%	58.5%	14.6%	14.6%	2.4%	9.8%	
	No autism	N	52	13	10	8	6	
		%	58.4%	14.6%	11.2%	9.0%	6.7%	
Baby needs a special sleeping item (doll, special blanket, stuffed animal, etc.)	Autism	N	20	10	3	3	5	0.367
		%	48.8%	24.4%	7.3%	7.3%	12.2%	
	No autism	N	55	11	10	4	9	
		%	61.8%	12.4%	11.2%	4.5%	10.1%	
Baby needs a parent in the room to sleep	Autism	N	8	7	4	5	17	0.847
		%	19.5%	17.1%	9.8%	12.2%	41.5%	
	No autism	N	20	11	14	10	34	
		%	22.5%	12.4%	15.7%	11.2%	38.2%	
The child resists going	Autism	N	4	6	17	5	9	0.651
		%	9.8%	14.6%	41.5%	12.2%	22.0%	
	No autism	N	14	12	26	12	25	
		%	15.7%	13.5%	29.2%	13.5%	28.1%	
The child is afraid of sleeping in the dark	Autism	N	13	10	9	3	6	0.454
		%	31.7%	24.4%	22.0%	7.3%	14.6%	
	No autism	N	33	11	18	7	20	
		%	37.1%	12.4%	20.2%	7.9%	22.5%	
The child sleeps the same amount every day	Autism	N	1	4	16	14	6	0.203
		%	2.4%	9.8%	39.0%	34.1%	14.6%	
	No autism	N	1	4	29	25	30	
		%	1.1%	4.5%	32.6%	28.1%	33.7%	
The child is restless and moves a lot during sleep	Autism	N	4	8	11	7	11	0.232
		%	9.8%	19.5%	26.8%	17.1%	26.8%	
	No autism	N	19	23	22	13	12	
		%	21.3%	25.8%	24.7%	14.6%	13.5%	
The child moves to someone else's bed during the night (parent, sibling, etc.)	Autism	N	18	5	4	5	9	0.858
		%	43.9%	12.2%	9.8%	12.2%	22.0%	
	No autism	N	39	10	14	7	19	
		%	43.8%	11.2%	15.7%	7.9%	21.3%	
The child grinds his teeth during sleep (your dentist may have told you this)	Autism	N	22	6	6	3	4	0.423
		%	53.7%	14.6%	14.6%	7.3%	9.8%	
	No autism	N	56	17	5	5	6	
		%	62.9%	19.1%	5.6%	5.6%	6.7%	

			Never	Rarely	Sometimes	Usually	Always	P value
The child snores loudly	Autism	N	15	11	6	5	4	0.004
		%	36.6%	26.8%	14.6%	12.2%	9.8%	
	No autism	N	61	11	11	5	1	
		%	68.5%	12.4%	12.4%	5.6%	1.1%	
The child wakes up during the night, sweating, screaming and restless	Autism	N	23	7	5	4	2	0.963
		%	56.1%	17.1%	12.2%	9.8%	4.9%	
	No autism	N	54	15	11	6	3	
		%	60.7%	16.9%	12.4%	6.7%	3.4%	
Baby takes a nap at night	Autism	N	9	9	11	9	3	0.057
		%	22.0%	22.0%	26.8%	22.0%	7.3%	
	No autism	N	38	19	16	7	9	
		%	42.7%	21.3%	18.0%	7.9%	10.1%	
During sleep, the child sweats heavily or notices a bluish change in the color of the lips	Autism	N	26	8	2	4	1	0.068
		%	63.4%	19.5%	4.9%	9.8%	2.4%	
	No autism	N	69	9	5	1	5	
		%	77.5%	10.1%	5.6%	1.1%	5.6%	
Waking up during the night baby wakes up once during the night	Autism	N	3	13	16	5	4	0.674
		%	7.3%	31.7%	39.0%	12.2%	9.8%	
	No autism	N	9	30	30	16	4	
		%	10.1%	33.7%	33.7%	18.0%	4.5%	
Waking up during the night the child wakes up more than once during the night	Autism	N	14	10	7	3	7	0.560
		%	34.1%	24.4%	17.1%	7.3%	17.1%	
	No autism	N	39	21	14	8	7	
		%	43.8%	23.6%	15.7%	9.0%	7.9%	
The child wakes up by himself	Autism	N	0	4	11	9	17	0.704
		%	0.0%	9.8%	26.8%	22.0%	41.5%	
	No autism	N	3	11	18	18	39	
		%	3.4%	12.4%	20.2%	20.2%	43.8%	
The child wakes up very early in the morning (or earlier than necessary or desired)	Autism	N	1	7	13	11	9	0.028
		%	2.4%	17.1%	31.7%	26.8%	22.0%	
	No autism	N	8	20	41	8	12	
		%	9.0%	22.5%	46.1%	9.0%	13.5%	
The child feels a headache when he wakes up	Autism	N	17	8	11	4	1	0.009
		%	41.5%	19.5%	26.8%	9.8%	2.4%	
	No autism	N	59	17	9	1	3	
		%	66.3%	19.1%	10.1%	1.1%	3.4%	

			Never	Rarely	Sometimes	Usually	Always	P value
The child seems tired during day time	Autism	N	11	9	11	5	5	0.002
		%	26.8%	22.0%	26.8%	12.2%	12.2%	
	No autism	N	42	26	18	1	2	
		%	47.2%	29.2%	20.2%	1.1%	2.2%	
The child falls asleep while participating in activities	Autism	N	16	15	4	4	2	0.005
		%	39.0%	36.6%	9.8%	9.8%	4.9%	
	No autism	N	59	15	12	1	2	
		%	66.3%	16.9%	13.5%	1.1%	2.2%	

The consistency in bedtime showed no statistically significant difference between autistic children and controls (p=0.178). There were no significant differences between the two groups on the following measures: difficulty falling asleep, sleeping arrangement, specific sleeping behaviours (such as rocking or rhythmic movements), need for parental presence, help, fear during sleep, duration of sleep, and restlessness (p>0.05). In terms of nighttime bed sharing (p = 0.858) and teeth grinding (p=0.423), both autistic children and controls showed comparable behaviours. Although, snoring was shown to be substantially more common among autistic children when compared to the control group (p=0.004). Sweating and changes in skin tone during sleeping were not significantly different among autistic children and controls (p = 0.068). A larger percentage of autistic children reported headaches upon awakening compared to the control group (p=0.009). Also, autistic children were reportedly tired during the daytime (p=0.005) and fell asleep while participating in activities compared to controls (p=0.005).

DISCUSSION

Numerous variables, including those of a biological, psychological, social, and cultural nature, influence the patterns and quality of children's sleep [24]. The importance of a child's sleep patterns and quality of sleep should be carefully considered within the context of their family, residence, school, and community. The findings revealed a notable disparity in bedtime patterns between autistic children and typically developing controls. Autistic children exhibited a lower proportion of bedtime after midnight compared to the control group. This tendency towards earlier bedtimes among autistic children aligns with existing literature highlighting sleep issues in ASD [25-27]. The preference for earlier bedtimes in autistic children might be attributed to sensory sensitivities or routines established to cope with sensory overload [17,28]. Autistic children displayed variability in their wake-up times, with a substantial percentage waking before 7 am and between 7 am and 9 am. This contrasts with the control group, which showed a significantly higher percentage of undefined or irregular wake-up times. The consistent wake-up times observed in autistic children might be attributed to routine adherence or sensory sensitivities influencing their sleep-wake cycle [29]. The difference in average sleep time between children with autism and healthy controls was a noteworthy discovery. The average amount of time that children with autism slept was far lower than that of their usually developing classmates. This is in line with other studies that found that children with ASD often have trouble falling asleep or staying asleep, which results in less time spent sleeping overall [30-32]. Anxiety, sensory sensitivity, or co-occurring disorders are common in the autism spectrum disorder (ASD) population and may contribute to sleep disruptions in this group [33,34].

Difficulty sleeping may be one of the main symptoms of autism spectrum disorder (ASD), which includes difficulties with social communication and repetitive behaviours. People on the autism spectrum may have trouble falling asleep or staying asleep at night due to repeated behaviours or increased anxiety [12,19]. Additionally, comorbid conditions like anxiety or attention deficits, often present in children with ASD, could contribute to sleep disturbances, affecting both bedtime routines and sleep duration [32,35]. In the current study snoring was significantly higher among autistic individuals and this might be attributed to

the anatomical or physiological differences in their airways. This could involve factors like enlarged tonsils, adenoids, or variations in upper airway structure, which are known contributors to snoring [36-38].Also, children with ASD often exhibit differences in muscle tone or control, which might impact the functioning of the upper airway during sleep [39,40]. Reduced muscle tone can contribute to airway collapse or obstruction, leading to snoring [41]. Obstructive sleep apnoea and other sleep-disordered respiratory disorders are often accompanied with snoring. Research has shown that people with autism spectrum disorder (ASD) are more likely to have sleep apnoea and other breathing problems, which may lead to snoring [42,43]. Some medications prescribed such as sedatives for managing ASD symptoms might indirectly contribute to increased snoringdue to their impact muscle tone could potentially exacerbate snoring tendencies [44]. The higher incidence of headaches upon waking among autistic children compared to controls as observed in this study might stem from a combination of disrupted sleep patterns, sensory sensitivities, pain perception differences, comorbidities, and potential sleep disorders commonly associated with ASD [34-36].

Healthcare professionals working with children with ASD should routinely assess sleep patterns and associated problems like snoring and headaches. Early identification can lead to timely interventions. Developing and implementing targeted interventions tailored to address the specific sleep-related challenges in ASD is crucial, aiming to enhance sleep quality, mitigate issues such as increased snoring, and effectively manage waking headaches, thereby significantly improving the overall well-being of individuals on the spectrum.Offering comprehensive guidance and ongoing support to parents or caregivers of children diagnosed with ASD is essential, providing them with practical advice on implementing effective sleep hygiene practices and strategies specifically tailored to manage and alleviate sleep disturbances commonly experienced by individuals on the spectrum.

Limitations

While the sample size exceeded the minimum calculated requirement, a larger and more diverse sample might have enhanced the study's robustness. Including a broader age range or more varied demographics could provide a more comprehensive understanding of sleep habits in children with ASD. The study relied on previously diagnosed cases of ASD, but there might have been variations in diagnostic criteria or methods used across different healthcare providers or specialists. Inconsistent or varied diagnostic approaches could affect the homogeneity of the autistic group. The control group comprised typically developing children, but matching them with autistic children based on various factors such as age, gender, and socio-economic status might have strengthened the comparison. Without stringent matching criteria, differences might be confounded by unrelated variables. The research may have depended on information that parents or guardians provided about their children's sleeping patterns. Because of the inherent subjectivity of the reports and the potential effect of factors like memory bias and perceptions, the reliability of the data collected is compromised. The inference of causation or the tracking of changes in sleep behavior over time were both hindered by the study's cross-sectional methodology. Sleep habits and difficulties experienced by children with autism spectrum disorder (ASD) may be better understood via longitudinal research.

CONCLUSION

The study's findings revealed that autistic children exhibited earlier bedtimes, a consistent wake-up routine with earlier timings, and notably shorter sleep durations compared to their peers. Moreover, they experienced significantly higher instances of snoring and waking up with headaches, indicating potential sleep disturbances. Additionally, the findings highlighted increased daytime fatigue and a tendency to fall asleep during activities among autistic children compared to controls. Collectively, these observations underscore the multifaceted nature of sleep challenges in ASD, emphasizing the need for targeted interventions to address specific issues like shorter sleep duration, increased snoring, headaches upon waking, and daytime fatigue, aiming to enhance the overall sleep quality and well-being of children with autism.

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