

**Sleep Disturbances in Children with Autism - A Cross-Sectional Study**A. Geetha Jyothy<sup>1</sup>, Vaidyanath Gottumukkula<sup>2\*</sup>, Ravi Prakash Rangam<sup>3</sup>, Anil Kumar.  
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Conflict of interest: Nil

**Abstract:****Background:** Sleep is a fundamental component of human biology, and any disruption in sleep impacts an individual's cognitive, emotional, and physical well-being. The prevalence of sleep-related diseases in children and adolescents was estimated to be between 25 and 40%. Furthermore, more than 40% of autistic children have sleep issues. The current study intends to investigate sleep impairment and disturbances in autistic children living in Anantapur District in Andhra Pradesh.**Objectives:** In this study, we aimed to explore sleep disturbances in children with autism.**Materials and Methods:** It is a Cross-sectional study. The study participants aged 3 -18 with autism who visit the District Early Intervention Centre (DEIC), Psychiatry Outpatient Department at Government Medical College, Anantapur in Andhra Pradesh. In this investigation, we evaluated 111 participants (children with autism). Children were diagnosed with Childhood Autism using ICD10 criteria. We measured the severity of autism using the Childhood Autism Rating Scale (CARS-2ST) and assessed sleep disturbances with the Sleep Disturbances Scale for Children (SDSC). The data were analysed using version 25.0 of SPSS. ANOVA and the Independent T-test were used to analyse the data.**Results:** The results revealed a high prevalence of sleep impairment, affecting approximately 70% of the participants. Furthermore, nearly half of the children exhibited modest intellectual disability, and around 40% had mild to moderate autism severity. Notably, a significant correlation was observed between SDSC scores and intellectual disability, indicating that higher IQ scores were associated with improved sleep patterns.**Conclusions:** The prevalence of sleep problems in our study is 70%. The most common sleep disturbances reported were sleep-onset insomnia and nocturnal awakenings.**Keywords:** Autism, Sleep Disturbances, Intellectual Disability, Children.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Autism is a severe neurodevelopmental disorder characterized by restricted repetitive behaviors, impaired social interaction, and communication deficits.

Autistic children have numerous co-morbidities like epilepsy, intellectual disability, attention problems, sleep problems, etc. Sleep disturbances are commonly seen in children with neurodevelopmental disorders and especially in children with autism ranging from 40% to 80% compared to 50% in normally developing children [1-2].

Sleep disturbances may affect children's daily functioning, affecting behavior, learning, memory regulation, and cognition [3]. All these problems impact the quality of life and effective intervention. Common sleep problems are trouble falling asleep,

decreased sleep duration; sleep onset delay, and nocturnal awakenings.

Studies have suggested that children with mild to moderate autism have an increased likelihood of sleep problems and can worsen the severity of the disease if not addressed in the early stages [1].

Our review of the literature found that there is a significant correlation between sleep disturbances and intellectual disability in children with autism.

Disturbed sleep not only impacts family but also negatively influences core features of autism leading to maladaptive behaviors that are common in children with autism [4-7].

**Materials and Methods**

**Study setting:** Government Medical College, Anantapur

**Study design:** cross-sectional study

Duration of study: 6 months from ethical committee approval

**Study population:** 111 participants aged 3 - 18 years old with autism who visit the District Early Intervention Centre (DEIC), Psychiatry Outpatient Department at Government Medical College, Anantapur in Andhra Pradesh.

**Inclusion criteria**

1. Diagnosis of autism according to ICD-10
2. Age group between 3-18 years of age of either sex
3. Those whose parents gave informed consent.

**Exclusion criteria**

1. Comorbid psychiatric illness, substance dependence, medical disease, neurological disease
2. Those who refused to give informed consent.

**Sampling method:** convenient sampling

**Data collection:**

Data was collected by the principal investigator using standardized objective questionnaires.

**Study tools:**

1. Childhood autism rating scale (CARS-2ST)
2. Sleep Disturbances Scale for Children
3. Standardized developmental screening test.

**Ethical consideration:** The study protocol has been presented and discussed with the institutional ethics committee. Clearance was obtained from the Institutional Ethics Committee and permission was taken from the college authority of Government Medical College, Anantapur. Before beginning the study, written informed consent was taken from the parents of the participants.

**Statistical methods:**

Continuous variables were presented as mean +/- SD or medians if unevenly distributed. Categorical variables were expressed as frequencies (%). Independent t-tests were used for comparison of SDSC scores and mean IQ scores. ANOVA test was used for comparing MR with SDSC. P<0.001 was considered statistically significant. Statistical analysis was performed with SPSS version 25.0 software.

**Results**

A total of 111 participants aged between 3 and 18 years were included in the final analysis. The mean age of the participants is 9.43 years with an (SD of 4.10) with 35.1% females and 64.9% male participants. The majority of them were between the ages of 11 and 18 years.

According to the modified Kuppaswamy socioeconomic scale children belonging to the upper lower class (40.5%) and lower middle class (37.9%) are affected more when compared to upper middle class (18.9%) and lower class (2.7%) (Table 1). 80% of the study population was consanguineous (Figure 1).

**Table 1: Demographic variables of the study**

Variable	Number (n=111)	Percentage (%)
Gender		
Male	72	64.9%
Female	39	35.1%
Age category		
3 to 5 years	24	21.6%
6 to 10 years	39	35.1%
11 to 18 years	48	43.3%
Socio-economic status		
Upper class (Class I)	0	0%
Upper middle (Class II)	21	18.9%
Lower middle (Class III)	42	37.9%
Upper lower (Class IV)	45	40.5%
Lower (Class V)	3	2.7%
Birth History		
With congenital malformations	22	19.8%
Without congenital malformations	89	80.2%

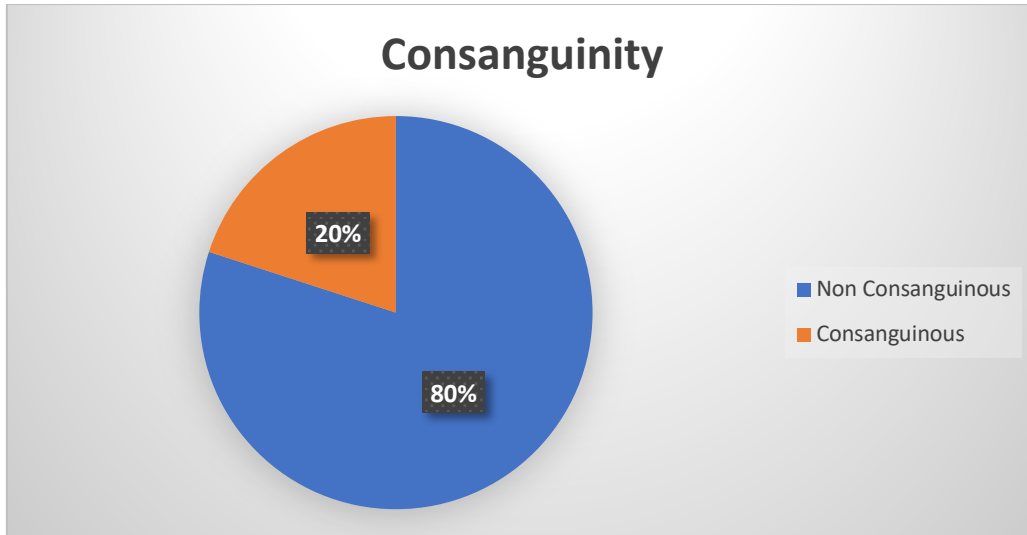


Figure 1: Consanguinity

Table 2: MR classification of the study population

MR Classification	Frequency	(%)
Borderline	12	10.8
Mild	57	51.4
Moderate	32	28.8
Severe	9	8.1
Profound	1	0.9
<b>Total</b>	<b>111</b>	<b>100</b>

It is noticed that children with mild and moderate MR are affected more by sleep disturbances than children with borderline and severe MR (Table 2). Table 3 depicted the ASD cars-2 classification and the frequency of mild to moderate was high 39.6%. The sleep disturbances were present in 69.4% of study individuals (Table 4). The results of one-way analysis showed that it was significant association between MR and SDSC (Table 5) (Figure 2).

Table 3: ASD Cars-2 Classification

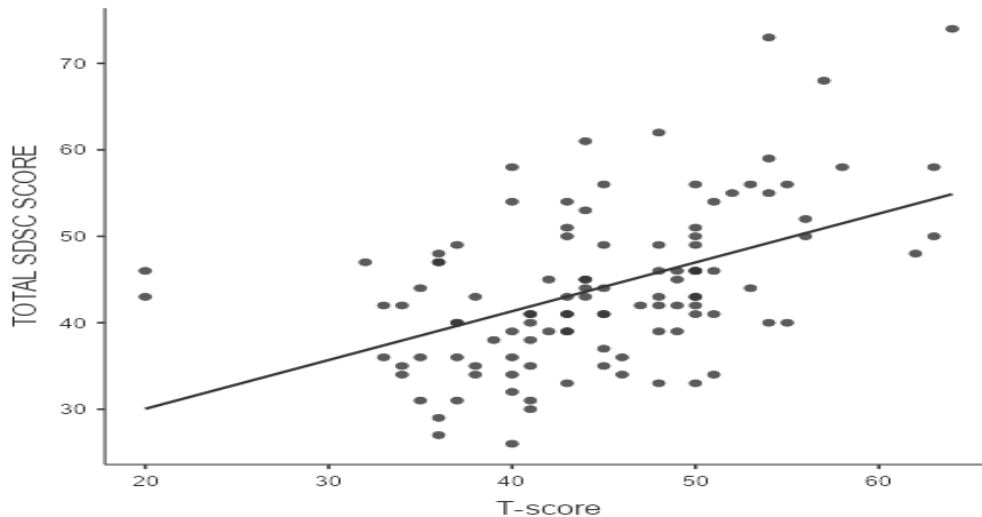
ASD Cars-2 Classification (Cut-off 28)	Frequency	(%)
Below Cut-off	25	22.5
Mild to Moderate	44	39.6
Severe	42	37.9
<b>Total</b>	<b>111</b>	<b>100</b>

Table 4: SDSC

SDSC (Cut-off 39)	Frequency	(%)
Sleep Disturbance Present	77	69.4
Sleep Disturbance Absent	34	30.6
<b>Total</b>	<b>111</b>	<b>100</b>

Table 5: ANOVA test comparing categories of MR with SDSC

ASD-CARS2 Score	Frequency	Mean SDSC (SD)	p-value
Below Cut off	25	38.60 (6.1)	<0.001
Mild to moderate	44	42.14 (7.8)	
Severe	42	49.12 (9.3)	



**Figure 2: Total SDSC score curve**

The differences between the mean scores in SDSC are statistically significant.

The lower mean score is observed in the below cut-off group and the higher mean score in the Severe group. This implies as the T-score increases, the possibility of sleep disturbances also increases (Table 6). The absence of sleep disturbance in children with SDSC scores less than 39

corresponds with better IQ scores. The difference in IQ between the two groups is significantly different.

As the severity of autism increases sleep disturbances like the disorder of initiating and maintaining sleep, sleep-wake transition disorder, and disorder of excessive somnolence also have significantly increased (Table 7).

**Table 6: Independent t-test to compare the presence of Sleep Disturbance by SDSC score and the mean IQ score**

Category by SDSC	Mean IQ (SD)	Mean Difference (95% CI)	p-value
Presence of Sleep Disturbance	49.66 (12.4)	-9.191 (-13.991 to - 4.390)	<0.001
Absence of sleep Disturbance	58.85 (10.1)		

**Table 7: Comparison of ASD with overall and factor score of SDSC scores.**

SDSC factors	Severity of Autism			p-value
	Minimal	Mild to Moderate	Severe	
DIMS	13.4 ± 3.32	14.6 ± 4.79	17.7 ± 5.43	0.001; S
SBD	4.0 ± 1.80	3.9 ± 1.17	4.2 ± 1.99	0.698; NS
DA	3.1 ± 0.59	3.2 ± 0.47	3.8 ± 1.54	0.011; S
SWTD	9.0 ± 2.15	11.0 ± 3.19	12.2 ± 3.14	<0.001; S
DOES	6.2 ± 1.44	6.8 ± 1.98	8.5 ± 3.01	<0.001; S
SHY	2.7 ± 1.38	2.8 ± 1.74	2.8 ± 1.47	0.943; NS
Total scores	38.4 ± 6.14	42.3 ± 7.81	49.1 ± 9.31	<0.001; S

S = Significant; NS = Not Significant

**Discussion**

The findings of this study indicate a significant prevalence of sleep abnormalities in autistic children in India, as assessed by the SDSC. The observed prevalence rate is consistent with previous studies conducted in Western countries that utilized the same instrument [1]. However, it is noteworthy that other Indian studies using different sleep questionnaires reported higher prevalence rates, potentially influenced by variations in questionnaire selection and sampling techniques. The prevalence of sleep problems in autistic individuals has been a subject of investigation in

previous research, with estimates ranging between 50% and 80%. In the current investigation, a prevalence rate of 70% was observed, which is consistent with previous Western studies that utilized the SDSC. However, it is noteworthy that two other Indian studies, conducted by Athira et al. [2] and Tyagi et al. [1], reported higher prevalence rates of 75% and 95%, respectively. The variations in prevalence rates across studies can be attributed to several questionnaire- and sampling-related variables. The aforementioned Indian studies employed the Children's Sleep Habits Questionnaire (CSHQ), which assesses sleep problems based on the previous week. In contrast,

the SDSC evaluates sleep problems over six months [1]. The different time frames of assessment may lead to variations in the reported prevalence rates, as sleep patterns can fluctuate within shorter time frames. Moreover, questionnaire selection and cultural differences may also contribute to the disparities in prevalence rates [8]. In our study, the most prevalent sleep problem among children with autism was the 'Disorder of Initiating and Maintaining Sleep', which was observed in 35% of the participants. This sleep disorder was characterized by increased bedtime resistance, prolonged sleep latency, and nocturnal awakenings, ultimately resulting in a significant reduction in total sleep duration [9,3]. The high prevalence of insomnia in these children can be attributed to the core behavioral deficits associated with autism, which disrupt bedtime routines and hinder the establishment of a proper sleep routine [8]. Children with autism often struggle with transitioning from stimulating activities to sleep, and they may also be hypersensitive to light or sounds, making it challenging for them to fall asleep at night and leading to daytime sleepiness [9]. The second most common sleep problem identified in our study was 'Sleep-Wake Transition Disorder', which affected 25% of the participants. Many of these children exhibited repetitive behaviors such as rocking or head-banging while trying to fall asleep [9]. Additionally, kicking or jerky limb movements were observed during sleep, indicating disrupted sleep architecture and potentially affecting sleep quality [1].

Another notable sleep problem in our study was 'Disorders of Excessive Somnolence', which had a higher prevalence compared to most published studies. Chronic sleep deprivation during the night and habitual snoring were identified as contributing factors to excessive daytime sleepiness and fatigue, leading to difficulties in waking up in the morning. These findings emphasize the significance of addressing sleep abnormalities in children with autism, as they can have a substantial impact on their overall well-being and daily functioning [8,9, 10-16].

Interventions targeting sleep initiation and maintenance sleep hygiene practices, and environmental modifications may be necessary to improve sleep quality and alleviate daytime sleepiness in this population. Future research should explore the underlying mechanisms and potential interventions to address sleep problems in children with autism, ultimately improving their overall sleep health and quality of life [17-19].

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