

# SLEEP DISTURBANCES AND BEHAVIOURAL PROBLEMS IN CHILDREN AND ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

## Abstract

**Objectives:** To explore the parent reported sleep disturbances in children and adolescents with Autism Spectrum Disorder (ASD) and to compare it with the typically developing children (TYD). Another objective was to understand the relationship between sleep disturbances and behavioural problems in children with ASD.

**Methods:** The participants of the study were parents of 30 children and adolescents diagnosed with ASD who had attended IP/OP services in NIMHANS, Bangalore and parents of 30 typically developing children studying at various schools in and around Bangalore. The participants were frequency matched based on the age of their children and their socio-economic background. Level of ASD was measured using Childhood Autism Rating Scale (CARS). Child Sleep Habits Questionnaire was administered. A range of other scales were also administered for understanding the behavioural problems in children with ASD.

**Results:** Children with ASD had more sleep disturbances than TYD. Sleep problems led to behavioural issues such as hyperactivity. The sleep disturbances are positively correlated to the severity of autism and social responsiveness deficits in children and adolescents with ASD.

**Conclusion:** Even though it is a preliminary effort, the study suggests the need for intervention tending to the disturbances in sleep among children and adolescents with ASD. Implications and scope for future research also discussed.

**Keywords:** Sleep disturbances, behavioural problems, Autism Spectrum Disorder

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## I. INTRODUCTION

Autism Spectrum Disorder (ASD) is regarded as having continual deficits in social communication and interaction, restricted and repetitive patterns of behaviour, interests or activities during the developmental period of a child (American Psychiatric Association, 2013). In addition to the major symptoms; children may also have speech and psychomotor disturbances or deficits. It includes a group or range of disorders with varying severity and deficit levels such as childhood autism, atypical autism, Rett's syndrome, Asperger's syndrome and childhood disintegrative disorder.

Parents reported that their children had difficulties in falling asleep as well as maintenance of the sleep [1][2]. Higher prevalence of these sleep difficulties may have many consequences. Some of them are changes in day time behaviour, impact on memory and learning in children and also significant stress in caretakers. These consequences were usually caused by irregular melatonin synthesis, sensitization of environmental stimuli, REM sleep disorder etc, [2].

Research has suggested that about two third of the children with autism spectrum disorder have sleep related problems [3]. It does not only affect the individuals but other children and their family members as well. Sleep problems involve the interaction of biological, familial and environmental factors [4]. Sleep related problems were comparatively less observed in typically developing children than that of children with ASD. Younger children were more likely to have sleep problems noted by parents (particularly bedtime struggles and night waking), as well as by teacher and self-report. Children tended to identify more sleep problems by self-report, particularly sleep-onset delay and night waking, than did their parents [5].

Recent research review summarized the explorations of the behavioural, cognitive, and emotional correlates of sleep disturbance in children with PDDs. The review included 38 sleep studies that used either subjective or objective sleep measures. Only, 17 met criteria for inclusion. Studies were analysed for their attempts at matching their study samples and adjusting for possible confounding variables. The results revealed that the combined effects of autism symptom severity, internalizing behaviour, and externalizing behaviour, were the main predisposing factors for the development of sleeplessness in children. There were other factors which possibly caused sleep disturbances such as medical conditions, epilepsy, and medication use [6].

Cross-cultural studies [7] [8] evaluated the sleep problems across many countries. One of the finding is that children in Asia have noticeably go to bed late and have shorter night time sleep. Many parents perceived that their children who are at pre-schooler age had a sleep problem (15% in Korea and 44% in China). Sharing of room and bed are common in Asian countries especially in India [7]. In the Indian context, there are not many studies systematically investigating sleep problems of children with ASD. Studies have explored sleep disturbances in the context of behaviour problems in typically growing preschoolers in the community. Studies have documented that child sleeping with parents is a common practice in Indian households [9][10][11].

In the present study an attempt was made to study the sleep problems in autistic children and adolescents and whether in any way there is an association with behavioural problems like anxiety, social difficulties, hyperactivity and impulsivity. The interest in this particular area in western countries and Asia-oceanic countries is also very recent, say a decade or so. There are only a few studies in this area done in the Indian context. Overall there is a lack of research in the area of sleep and anxiety related problems in ASD children.

## II. METHODS

**1. Participants:** Parents of sixty children and adolescents, including boys and girls, aged 4 to 16 years, had participated in this study. One group involved parents of 30 children and adolescents with a provisional diagnosis of autism spectrum disorder (ASD). Other group involved parents of 30 children and adolescents with typical development. Data was collected from schools and training centres in and around Bangalore and those who were attending the IP/OP services at Child and Adolescent Psychiatry department, in NIMHANS, Bangalore. Children and adolescents with a diagnosis of Severe to Profound Mental Retardation (i.e.IQ/SQ less than 35), childhood onset psychosis, chronic physical illness and those with sensory motor disability were excluded from the study.

### 2. Tools Used

- **The Strengths and Difficulties Questionnaire (SDQ):** SDQ is a behavioural screening questionnaire utilized with children of 3-16 years. It has five different scales like emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and pro-social behaviour. It is made of 25 statements with YES/NO answer. In this study, the purpose was to administer it only with the typically developing children in order to screen them for the problems listed above. The scale possesses good psychometric properties across the globe [12].
- **Vineland Social Maturity Scale (VSMS):** measures social competence, self-help skills, and adaptive behaviour from infancy to adolescence. Raw scores were converted to an age equivalent score (expressed as social age) as a social quotient (SQ) was calculated [13].
- **Childhood Autism Rating Scale, 2nd Edition (CARS2-ST):** CARS2-ST is a 15 item behaviour rating scale intended to help diagnose autism. The scale has very strong psychometric properties in Indian population as well [14].
- **Social Responsiveness Scale (SRS):** SRS is made of 65-items primarily used to assess social awareness, capacity for reciprocal social communication, social information processing, social anxiety and avoidance, and autism preoccupations among children aged 4 to 18 years. It has acceptable levels of internal consistency and test-retest reliability [15].
- **Conners Abbreviated Parent Rating Scale:** The Scale has 10-items that measures attention deficit hyperactivity disorder symptoms in a child based on DSM-IV-TR

criteria [16]. It also has a reliable psychometric property like the above mentioned tools.

- **The Children’s Sleep Habits Questionnaire (CSHQ):** CSHQ has 33 items and uses a 3-point scale to screen for the most common types of sleep difficulties in children. In the current study duration of one month sleep pattern was reported by parents. It contains eight subscales: bedtime resistance (6 items), sleep onset delay (1 item), sleep duration (3 items), sleep anxiety (4 items), night waking (3 items), parasomnias (7 items), sleep-disordered breathing (3 items), and daytime sleepiness (8 items). The total CSHQ score can be used as a screening device, with scores above 41 indicating sleep disturbance; this cut-off point is found to have a sensitivity of .80 and a specificity of .72 [17].
- 3. Procedure:** The study was conducted in two phases. After explaining the nature and confidentiality of the study, participants were required to give written consent. Due consent was taken from all the parents who participated in the study.
- **Pilot Study:** It was conducted by collecting data from parents of four children and adolescents. Two typically developing children and two children with autism spectrum disorder were selected and their parents were administered with the tools. All the tools were administered for data collection. After the pilot study, decision was taken about the tools to be used in the main study. Time taken for administration and scoring was also calculated. All the items in the tools were well understood by the researcher and no difficulties were faced while administering them. Based on the findings, the decision was taken to use all the scales for the main study after discussing with the guide.
  - **Main Study:** It was conducted with parents of 30 children and adolescents with a diagnosis of autism spectrum disorder attending IP/OP services in NIMHANS as well as children studying in special schools and training centres in and around Bangalore. Out of 30 children, 4 were selected from special schools whereas all other children were selected from IP/OP at NIMHANS. 30 typical children attending regular schools age and gender matched with previous group was selected and their parents were also administered the scales selected.

### III. RESULTS

**Table 1: Socio-demographic characteristics of the sample (N= 60)**

Variables	Study group	Control group	p-value
	Mean $\pm$ SD	Mean $\pm$ SD	
Age (in months)	117 $\pm$ 56.6	122.6 $\pm$ 39.7	0.65
Gender	N (%)	N (%)	$\chi^2$ Value
Male	27 (90 %)	23 (77 %)	1.00*
Female	3 (10 %)	7 (23 %)	

Socio-Economic Background			
Middle	23 (77 %)	27 (90 %)	1.00*
Upper	7 (23 %)	3 (10 %)	

- 1. At 0.05 Level of Significance:** The above table shows the socio-demographic characteristic of two groups. In the study, majority of the samples were parents of male children. Most of the participants are from the middle socio-economic background. There is no significant difference between both the groups in terms of their age as well as the gender.

**Table 2: Emotional and behavioural development of children in control group (N=30)**

Domains	Mean	SD	Possible Range for Caseness
Conduct Problems	1.4	1.47	4-10
Hyperactivity	2.6	2.29	7-10
Emotional problems	1.3	1.2	6-10
Peer problems	1.8	1.2	6-10
Pro-social behaviour	8.2	2.03	0-4
Total difficulties score	7.33	4.27	20-40

The above table shows that overall the children from the control group have very low emotional and behavioural disturbances since the mean and SD of the sub-domains is well below the possible range for caseness. Some children may be in the borderline range i.e. 10-20 for the total difficulty score.

**Table 3: Adaptive functions (IQ/SQ) of the study group (N=30)**

IQ/SQ range	N (%)
Average	4 (13.3)
Dull Normal	4 (13.3)
Borderline	8 (26.3)
Mild MR	10 (33.3)
Moderate MR	3 (10)
Severe MR	1 (3.3)

Table-3 shows the adaptive functions (IQ/SQ) of children and adolescents from the study group. The mean IQ/SQ of children in this group was found to be 69.3 with a standard deviation of 18.5 which indicates that most of the children were in the borderline level of social and adaptive functioning or having mild retardation in social and adaptive/intellectual functioning.

**Table 4: Severity of Autism in study group (N=30)**

<b>Severity</b>	<b>N (Percentage %)</b>
Minimal symptoms	21 (70)
Mild to Moderate symptoms	9 (30)

Possible range for mild to moderate level of autism is 30 and above. The above table shows that majority of the children have minimal symptom severity of autism. About 1/3 of them have mild to moderate severity.

**Table 5: Social Responsiveness deficits of the study group (N=28)**

<b>Domains</b>	<b>Mean</b>	<b>SD</b>
Social Awareness	9.78	3.71
Social Cognition	13.29	5.53
Social Communication	26	9.1
Social Motivation	13.75	6.18
Restrictive & Repetitive Behaviour	12.6	6.7
Total Score	75	27.9

Possible range of the deficits in social responsiveness are 59 and below is within the normal limits, 60-65 will be mild level, 66-75 will be moderate level and above 76 is severe range. The above table shows that overall the group has moderate level of social responsiveness deficits with individual scores ranging from normal limits to severe level of deficits.

**Table 6: Presence of ADHD in study group (N=30)**

<b>ADHD</b>	<b>N (Percentage %)</b>
Present	9 (30)
Absent	21 (70)

Cut-off score- 11 and above

The table above presented shows that the majority of the children did not have co-morbid ADHD in this group

**Table 7: Sleep disturbances in study group in comparison with control group**

Variables	Group	Mean	SD	p-value (Mann Whitney – U test)
Bed time resistance	Study	10.77	3.01	<b>0.001*</b>
	Control	8.07	2.61	
Sleep onset delay	Study	1.03	0.18	0.297
	Control	1.13	0.43	
Sleep duration	Study	3.13	0.43	0.277
	Control	3.33	0.84	
Sleep anxiety	Study	7.7	3.2	<b>0.004*</b>
	Control	5.63	1.99	
Night waking	Study	4.07	2.05	0.955
	Control	3.93	1.3	
Parasomnias	Study	7.73	0.82	0.55
	Control	7.8	1.29	
Sleep disordered breathing	Study	3.27	0.78	0.92
	Control	3.13	0.34	
Daytime sleepiness	Study	10.93	2.99	0.858
	Control	11.07	2.81	
Total score	Study	48.83	7.08	<b>0.005*</b>
	Control	43.93	7.58	

Possible cut-off score for sleep disturbances is 41 and above of the total score

- 2. Significant at 0.05 Level (2-tailed):** The above table shows that the sleep disturbances are significant in children with autism spectrum disorders. Their mean score is 48.83 and SD is 7.08 indicating that majority of the children qualified for sleep disturbances. Both the groups differ significantly in terms of the bed time resistance, sleep anxiety and also the overall sleep disturbances.

**Table 8: Relationship between sleep disturbances, autism severity and behavioural problems**

Variables	CSHQ	CARS	SRS
<b>CSHQ</b>	1	0.46*	0.54*
<b>CARS</b>	--	1	0.61*
<b>SRS</b>	--	--	1

- 3. Significant at 0.01 Level (2-tailed):** The above table shows that sleep disturbances also have a high positive correlation with Autism severity as measured in CARS as well as SRS ( $r=0.46$  &  $r=0.54$ ) in this particular group. Connor's and SRS scores are also highly positively correlated ( $r= 0.61$ ).

**Table 9: Relationship between age, autism severity, adaptive functions and sleep disturbances**

Variables	Age	CSHQ	IQ/SQ	CARS
Age	1	-0.098	0.015	-0.083
CSHQ	--	1	<b>-0.425*</b>	0.466
IQ/SQ	--	--	1	<b>-0.81**</b>
CARS	--	--	--	1

- 4. Significant at 0.05 Level \*\* Significant at 0.01 Level (2-tailed):** The above table shows that adaptive functions (IQ/SQ) is negatively correlated with severity of autism and sleep disturbances.

#### IV. DISCUSSION

The present study aimed at examining the sleep disturbances and behavioural problems among children with the autism spectrum disorder (ASD) and to compare them with the typically developing children. The results presented in the previous chapter are interpreted and discussed here with reference to the objectives of this study and in the light of research done in this area.

**Socio-Demographic Characteristics of the Sample:** As it has been presented in the table-1, socio-demographic characteristics of the two groups are presented in frequencies and percentages. The total sample size was 60. In the study, majority of the samples in both the groups (Study group and control group) were parents of male children i.e. 90% in the ASD group and about 77% in the normal children. On the other hand, the predominant socio-economic background of the samples in both the groups is Middle socio-economic background. 77% from the study group as well as 90% from control group were from Middle socio-economic background. Rest of them were from Upper socio-economic background. None of the children and adolescents was from lower socio economic strata.

These findings are also strongly suggested in earlier epidemiological studies as well. A study done in US had shown a higher incidence of autism in boys than girls, ratios ranging between 3.5 or 4 to 1. Contrary to the initial conceptualization of association between higher socio economic status and autism diagnosis, PDD is seen in all social classes and in all countries [18].



The average age of the children and adolescents in the study group is 117 months i.e. 9 years and 9 months whereas it is 122 months in the control group i.e. 10 years and 2 months. The t- test was used to analyse the significance of difference between groups. The p value was found to be 0.65 hence there is no considerable difference between both the groups in terms of their age as well as the gender. The sample characteristics in terms of age and gender make the groups comparable in terms of the variables under study.

While discussing about the control group, table-2 shows the emotional and behavioural development of children and adolescents as assessed on SDQ. The sub-domains are conduct problems, hyperactivity, emotional problems, peer related problems and pro-social behaviour. Their total difficulties score was calculated by adding up the sub-domains except for pro-social behaviour to determine the caseness i.e. whether the children need specialist inputs and interventions. Overall the children from the control group have very low emotional and behavioural difficulties as well as high level of pro-social behaviour since the mean and SD of the sub-domains is well below the possible range for caseness which is also mentioned in the table.

As shown in table-3, adaptive functions (IQ/SQ) of children and adolescents from the study group were measured with the help of VSMS and for two children; their IQ was taken from the previous assessment using Binet Kamat Test of intelligence (BKT). The mean IQ/SQ of children in this group was found to be 69.3 with a standard deviation of 18.5 which indicates that most of the children were in the borderline level of social and adaptive functioning or having mild retardation in social and adaptive/ intellectual functioning. About 14 children had mental retardation in this group i.e. almost half of the sample. These findings suggest that children and adolescents who are primarily diagnosed with autism spectrum disorders tend to have co-morbid intellectual disability since Intelligence is a global concept that also includes adaptive functioning which seemed to be lacking in these children.

As shown in Table-4, the severity level autism in the study group shows that out of 30 children, only 9 of them had mild to moderate level of autism severity (30 %), whereas 21 children and adolescents (70%) had minimal symptoms of autism severity. The mean severity score was 26.9 with corresponding SD of 4.2. Most of the children (More than 15) had problems in the areas like expressive speech delay indicating difficulties in verbal communication, responding to others emotionally and repetitive or stereotypical behaviours, interests and activities.

Table-5 shows the social responsiveness deficits as assessed by SRS. However this scale was administered only to 28 children and adolescents' parents in the study group since two of them were found to be below 4 years of age. The possible range of the deficits in social responsiveness are 59 and below is within the normal limits, 60-65 will be mild level, 66-75 will be moderate level and above 76 is severe range. From the table it is seen that overall the group has moderate level of social responsiveness deficits with individual scores ranging from normal limits to severe level of deficits.

About 11 children (39%) had moderate level of autism features whereas 22% children had mild features of autism. About 25 % of children had very low level of autism features which was also observed in CARS as described earlier in table-3. About 14% i.e. 4 children had severe level of autism features. The children mainly had problems in the areas of Social

awareness i.e. ability to pick up on social cues, social cognition i.e. ability to interpret these social cues and also social communication.

The above findings suggest that both the scales are equally effective in identifying and diagnosing the children with autism spectrum disorder. However the sensitivity and the specificity scores are higher for Social responsiveness scale [15] and it has not been used much in the Indian population earlier and this study gives us an insight into the usage of SRS in the Indian clinical population.

As shown in the Table-6, the severity of Attention Deficit Hyperactivity Disorder (ADHD) symptoms is found to be low in this group. The cut-off score is above 10 and only thirty percentages of the children had a co-morbid ADHD in this group. Other children (70%) had one or two symptoms of ADHD mainly short attention span and distractibility which could also be seen in children with ASD.

In the present study, most of the children in the autism spectrum disorders group definitely seem to have sleep disturbances since their overall mean score is 48.83 which are well above the cut-off score of 41. They are shown to have more problems in bed time resistance and sleep anxiety. Children seemed to be having difficulties in sleeping alone and also in darkness. Most of the children needed the parent or sibling till they fall asleep. The parents also accommodate this by sleeping with the children or in other cases staying close to the children till they fall asleep. This is also seen in some of the typically developing children group as well however as the age increases, parents start separating from the children during bed time in this group. However, in the ASD group, the separation happens at a much later age of the child.

The above finding is supported by the studies done in the Indian context. Studies have documented that child sleeping with parents is a common practice in Indian households [9][10][11]. Only during middle childhood children are encouraged to sleep separately. However these findings do not include the children with autism spectrum disorders.

Table-8 shows the relationship between sleep disturbances and behavioural problems in children and adolescents with autism spectrum disorders. From the table, it is seen that the sleep disturbances overall and the behavioural problems in terms of social responsiveness deficits are positively correlated ( $r= 0.54$ ). It indicates that the presence of these deficits of social functioning i.e. awareness, cognition, communication and mannerisms may impact the sleep of ASD children. Children with the deficits such as being unable to express what they actually feel to others, non-verbal expressions being very poor, not able to understand the crux of the conversations, difficulty in socializing with peers and adults and an inability to form relationships with adults makes the job of the parents difficult in picking up whether the child is feeling sleepy. Mannerisms can sometimes indicate boredom as well. All these factors affect the initiation of sleep in these children. During sleep, these children may have difficulties such as constantly moving in the bed, awakening in the middle of the sleep because of night mares and dreams which are not picked up and generally considered as part of their mannerisms.

When it comes to ADHD, there was no noticeable correlation between the ADHD and the sleep disturbances which was contrasting to the earlier studies which showed that children

having attentional difficulties and hyperactivity seemed to have significant sleep related problems [19]. This could be understood because only 30% of the children and adolescents in the current study had co-morbid ADHD, hence the statistical significance could not be achieved. Another important finding of the study is that there is a negative correlation between the intelligence and the sleep disturbances as well as autism severity, which indicate that, lower the IQ/SQ more the sleep disturbances and the severity level of autism features in children and adolescents.

The differences between these two studies could be hypothesized as owing to the limited sample size in the current study. Sleep disturbances also have a high positive correlation with Autism severity in this particular group. Positive correlations were found between sleep disturbances as assessed in CSHQ and autism severity as assessed on CARS ( $r = 0.46$ ). The presence of autism features, especially communication problems, stereotypies in children and adolescents tends to increase the sleep related problems.

As the severity of autism increases, it is seen that the sleep disturbances overall also increase. Severity of autism could be referring to difficulties in interacting with the parents, more difficult behaviours and stereotypies, avoidance of others and lack of reciprocal communication. All these could play a role in maximising the sleep related problems. In conclusion, the sleep disturbances are significantly related to the social responsiveness deficits in children and adolescents with autism spectrum disorders. No significant correlation seen between sleep disturbances, anxiety and hyperactivity. There is a highly positive correlation between sleep disturbances with Autism severity. There is a negative correlation between the severity of sleep related problems and intellectual disability which could be inferred that there is an increase in sleep problems with the increase in severity of intellectual disability.

There are very few published studies from the Indian scenario which made the comparison of the findings of this study in Indian context with previous studies were not possible. Most of the western studies reviewed by the researcher included high functioning children as samples again which made the comparison with those studies difficult.

However the findings of this study, especially the sleep disturbances in Indian children and adolescents with autism spectrum disorder could be useful in terms of replicating the sleep based behavioural interventions which are already in place in countries like Australia (Sleeping Sound Intervention Program). These interventions mainly focus on the behavioural strategies that could be applied in making the child fall asleep even in the absence of parents, helping in the smooth prolongation of sleep till morning and also helps in improving conditions like enuresis and breathing problems.

## **V. IMPLICATIONS**

The sample for the study is more or less homogenous. An attempt has been made to control for age and gender of the samples in both the groups to an extent. In addition, an attempt was made to include both the parents while interviewing in the clinical group. Findings indicate that the sleep problems in Indian context are manifesting in a slightly different way as compared to the western context since children tend to sleep in the company of parents for most parts of their childhood which implies the importance of keeping the

cultural context in mind. A significant negative correlation had been found between the intellectual disability and the sleep problems which suggest that educating the parents about sleep disturbances and interventions to overcome these sleep related problems holds strong in the context of children who have a co-morbid intellectual disability than those who does not present with the same. The study shows that there is a significant relationship between sleep related problems and autism severity. The inclusion of education of about sleep related issues, early identification of the same in children with autism should be implied both the institute level as well as the community level.

## VI. LIMITATIONS

The conceptual and methodological limitations of the present study need to be addressed. The sample taken in the present study is small. Hence, the findings of the study should be viewed in caution. The sample mainly belonged to the middle socio-economic strata. Therefore, this may not be a true representation of the population and thus the generalise ability of the findings is restricted. Few children also had co-morbid medical disorders such as seizure disorder along with common co-morbidity of Intellectual disability which could have been ruled out since they can also impact the quality of sleep in the child. Children adolescents in the study group had a varying level of IQ/SQ but the differentiation between children with Mental Retardation and without the same was not done. The present study only focussed on children's problems whereas the parental distress was not taken into consideration. While interviewing the parents the researcher realized that most of the parents had significant distress levels because of their children's problems especially in the autism group.

- **Ethical Approval:** Ethical approval given by Department of Clinical Psychology, National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru to conduct the study.
- **Funding for the Study:** NIL

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