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3 **Sleep disturbances in children with autism spectrum disorder in**
4 **Lahore, Pakistan; a cross-sectional study**

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10
11 **Abstract**

12 **Objective:** To assess the frequency of insomnia and other sleep disturbances
13 among children with autism spectrum disorder.

14 **Methods:** The descriptive cross-sectional study was conducted in Lahore,
15 Pakistan, from May to August 2019, after approval from the ethics committee
16 of Sharif Medical and Dental College, Lahore. It comprised children aged 6-12
17 years pre-diagnosed with autism spectrum disorder who were enrolled from 3
18 institutions and an out-patient department of a tertiary care hospital. Sleep
19 disturbance scale for children was used for data-collection, and the parents
20 were asked to fill it out. Data was analysed using SPSS 23.

21 **Results:** Of the 93 subjects, 71(76.3%) were boys and 22(23.7%) were girls,
22 and 58(62.4%) were aged 6-8 years. Overall, 37(39.8%) children had at least
23 one type of sleeping disorder; the most common being insomnia 24(25.8%),
24 and the least common being sleep breathing disorders 4(4.3%).

25 **Conclusion:** Nearly 40% children with autism spectrum disorder had sleep
26 disorders, and insomnia was the most common.

27 **Key Words:** Autism spectrum disorder, Insomnia, Sleep disorders, Children.

28

29 **Introduction**

30 Autism spectrum disorder (ASD) is a persistent illness characterised by a wide
31 range of deficiencies in social communication as well as restricted and
32 repetitive behaviours in children.¹ Diminishing social communication deprives
33 the child of pragmatics, social cognition, non-verbal communication and
34 language processing. Restrictive and repetitive behaviours include ritualistic
35 behaviours, sensory sensitivities and circumscribed interests. Other common
36 associated behavioural symptoms in ASD are intellectual disability, irritability,
37 mood swings, inattention and insomnia.²

38 The global prevalence of ASD is 1:160 with male-to-female predominance of
39 3:1.^{3,4} It is one of those unfamiliar neuro-developmental syndromes that have
40 also been targeting children in Pakistan for decades. Due to increase in
41 awareness and improvement of diagnostic criteria, it is now diagnosed at an
42 earlier stage in children.

43 Insomnia in simple words is a difficulty in initiating or maintaining sleep.⁵
44 Children with ASD often present with complaints of insomnia and 40-80% of
45 them suffer from it⁶. Other sleep disturbances, such as parasomnias, night
46 awakenings and poor sleep routines, have also been reported by the parents of
47 ASD children. The assessment of sleep problems can be done through
48 objective or subjective methods. Subjective methods refer to parental
49 questionnaire and sleep diaries whereas objective methods include
50 actinography and polysomnography.⁷

51 Certain variables, if positively reinforced and properly looked after, can
52 significantly improve the sleep hygiene in autistic children. These variables
53 include environmental variables, such as proper temperature of room,
54 comfortable bedding and clothes, and establishing bedtime routines and
55 providing sleep training.⁸

56 The current study was planned to assess the frequency of insomnia and other
57 sleep disturbances among ASD children.

58 **Subjects and Methods**

59 The descriptive cross-sectional study was conducted in Lahore, Pakistan, from
60 May to August 2019, after approval from the ethics committee of Sharif
61 Medical and Dental College, Lahore. It comprised children aged 6-12 years
62 pre-diagnosed with ASD, according to Diagnostic and Statistical Manual of
63 Mental Disorders version 5 (DSM-5) criteria, who were enrolled from 3
64 institutions and an out-patient department (OPD) of a tertiary care hospital
65 using non-probability consecutive sampling.¹ Those using medication to aid
66 sleep were excluded.

67 The questionnaire was distributed along with consent form with the help of
68 school authorities. Parents were requested to fill up the questionnaire and
69 return it to the focal point from where they were collected. The sleep
70 disturbances scale for children (SDSC) was applied as a method of assessment
71 of sleep disturbances. SDSC has 26 items scored on 1-5 Likert scale for the
72 evaluation of sleep in the preceding 6 months.⁹ The total score is calculated by
73 adding score of all items ranging 26-130. Higher score reflects higher
74 frequency of sleep disturbances. The 26 items are categorised as disorders of
75 initiating and maintaining sleep (DIMS), sleep breathing disorders (SBD),
76 disorders of arousal (DA), sleep-wake transition disorders (SWTD), disorders
77 of excessive somnolence (DOES) and sleep hyperhidrosis (SHY). The cut-off
78 values used for DIMS was raw score 19, SBD 6, DA 6, SWTD 14, DOES 15
79 and for SHY 7.

80 the sample size was calculated with the help of WINPEPI statistical
81 programme with confidence level 95% and acceptance difference 0.08 and
82 assumed proportion 0.80.¹⁰

83 Data was analyzed using SPSS 23.

84 **Results**

85 Of the 97 children assessed, 93(96%) were enrolled. Of them, 71(76.3%) were
86 boys and 22(23.7%) were girls; 58(62.4%) were aged 6-8 years; and 76(81.7%)

87 were part of households with income >50,000 Pakistan Rupee (PKR) (Table 1).
88 Overall, 37(39.8%) children had at least one type of sleeping disorder; the most
89 common being insomnia 24(25.8%), and the least common being sleep
90 breathing disorders 4(4.3%) (Table 2).

91

92 **Discussion**

93 The phenomenon of sleep is greatly affected by social, cultural and
94 psychological factors. In the current study, most parents had either graduated
95 or had done post-graduation, showing that parents with higher level of
96 education were sufficiently aware about ASD. The findings correlate with
97 those of previous studies.^{6,11,12} The prevalence of sleeping disorders in the
98 current study was almost 40% which was greater than that found in typically
99 developing children 25%.¹³ It has been proposed that these sleep problems
100 result from imbalance of certain neurotransmitters, such as serotonin, **gamma-**
101 **aminobutyric acid** (GABA) and melatonin.^{14,15,16}

102 Mean scores and percentages for insomnia/DIMS, SWTD and DOES were
103 close to those of earlier studies^{12,17,18}. The results, however, were lower
104 compared to some other studies^{19,20}. It was due to differences in questionnaires
105 and cut-off values used. The questionnaire used in the current study was SDSC,
106 while the questionnaire used in the other studies^{19,20} was children's sleep habit
107 questionnaire (CSHQ). A longer sleep latency was observed in the current
108 study which also correlates with literature.^{21,22}

109 The result of parasomnias, which includes disorders of arousal that are sleep
110 terrors, night-walking and nightmares, was found to be less than those reported
111 previously.^{18,19} This can be due to the fact that parasomnias often present as
112 night-wakings.²³ It is difficult to diagnose because parental questionnaires have
113 a drawback that night awakenings related to insomnia may not be easily
114 differentiated from parasomnias. Other sleep disorders SHY and SBD, were
115 not significant enough to be compared with literature. This can be due to the

116 small sample size, under-reporting by parents, and recall bias in the current
117 study. Other sophisticated techniques such as polysomnography should be used
118 to diagnose these sleep disorders in future studies.

119 The limitations of the current study include being restricted to Lahore city and
120 a small sample size. More schools/centres could have been explored if the
121 study had been extended to other cities.

122

123 **Conclusions**

124 Nearly 40% ASD children suffered from sleep disorders, and the particular
125 domain of sleep disorder which was seen in majority of children was
126 insomnia/disorder of initiating and maintaining sleep. Every ASD child should
127 also be screened for sleep disorders. Strategies should be developed and further
128 researches should be conducted to investigate other associated co-morbidities.

129

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131 **Conflict of interests:** None.

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133

134 **References**

- 135 1. American Psychiatric Association. Diagnostic and Statistical Manual of
136 Mental Disorders-5. American Psychiatric Publishing; Washington, DC,
137 USA: 2013.
- 138 2. Mannion A, Leader G. Comorbidity in autism spectrum disorder: A
139 literature review. Research in Autism Spectrum Disorders. 2013 Dec
140 1;7(12):1595-616.
- 141 3. Elsabbagh M, Divan G, Koh Y.-J, Kim Y.S, Kauchali S, Marcín C, et al.
142 Global Prevalence of Autism and Other Pervasive Developmental
143 Disorders. Autism Res. 2012;5(3):160–179.

144 4. Loomes R, Hull L, Mandy WPL. What Is the Male-to-Female Ratio in
145 Autism Spectrum Disorder? A Systematic Review and Meta-Analysis. *J*
146 *Am Acad Child Adolesc Psychiatry*. 2017;56(6):466-474.

147 5. Sadock BJ, Sadock VA, Ruiz P. Normal Sleep and Sleep-Wake
148 Disorders. In: Pataki CS, Sussman N, editors. *Kaplan and Sadock's*
149 *Synopsis of Psychiatry: Behavioral Sciences/Clinical Psychiatry*.
150 Philadelphia: Wolters Kluwer; 2015. p. 537.

151 6. Cortesi F, Giannotti F, Ivanenko A, Johnson K. Sleep in children with
152 autistic spectrum disorder. *Sleep Med*. 2010;11:659–64

153 7. Imes CC, Kline CE, Mendez DD, Sun R, Yang Y, Chasens ER, et al.
154 Abstract P276: Subjective versus Objective Measures of Sleep: Results
155 From an Ecological Momentary Assessment Study. *Circulation*. 2019
156 Mar 5;139(Suppl_1):AP276-.

157 8. Devnani PA, Hegde AU. Autism and sleep disorders. *J Pediatr Neurosci*.
158 2015 Oct-Dec;10(4):304-7.

159 9. Bruni O, Ottaviano S, Guidetti V, Romoli M, Innocenzi M, Cortesi F, et
160 al. The Sleep Disturbance Scale for Children (SDSC). Construction and
161 validation of an instrument to evaluate sleep disturbances in childhood
162 and adolescence. *J Sleep Res*. 1996 Dec;5(4):251-61.

163 10. Abramson JH. WINPEPI (PEPI-for-Windows): computer programs for
164 epidemiologists. *Epidemiologic Perspectives & Innovations*. 2004 Dec
165 1;1(1):6.

166 11. Souders MC, Mason TB, Valladares O, Bucan M, Levy SE, Mandell DS,
167 et al. Sleep behaviors and sleep quality in children with autism spectrum
168 disorders. *Sleep*. 2009 Dec 1;32(12):1566-78.

169 12. Fadini CC, Lamônica DA, Fett-Conte AC, Osório E, Zuculo GM,
170 Giacheti CM, et al. Influence of sleep disorders on the behavior of
171 individuals with autism spectrum disorder. *Front Hum Neurosci*.
172 2015;9:347.

- 173 13.Maski K, Owens JA. Insomnia, parasomnias, and narcolepsy in children:
174 clinical features, diagnosis, and management. *The Lancet Neurology*.
175 2016 Oct 1;15(11):1170-81.
- 176 14.Mazzone L, Postorino V, Siracusano M, Riccioni A, Curatolo P. The
177 Relationship between Sleep Problems, Neurobiological Alterations, Core
178 Symptoms of Autism Spectrum Disorder, and Psychiatric Comorbidities.
179 *J Clin Med*. 2018 May 3;7(5):E102.
- 180 15.Kulman G, Lissoni P, Rovelli F, Roselli M.G, Brivio F, Sequeri P.
181 Evidence of pineal endocrine hypofunction in autistic children. *Neuro*
182 *Endocrinol. Lett*. 2000;21:31–34.
- 183 16.Bruni O, Alonso-Alconada D, Besag F, Biran V, Braam W, Cortese S, et
184 al. Current role of melatonin in pediatric neurology: Clinical
185 recommendations. *Eur. J. Paediatr. Neurol*. 2015;19:122–133.
- 186 17.Tyagi V, Juneja M, Jain R. Sleep Problems and Their Correlates in
187 Children with Autism Spectrum Disorder: An Indian Study. *J Autism*
188 *Dev Disord*. 2019 Mar;49(3):1169-81.
- 189 18.Taylor BJ, Siegel M. 0783 Characterization Of Sleep Disturbance
190 Profiles In Hospitalized Children With Autism Spectrum Disorder.
191 *Sleep*. 2019 Apr 12;42(Supplement_1):A314-5.
- 192 19.Liu X, Hubbard JA, Fabes R, Adam JB. Sleep disturbances and
193 correlates of children with autism spectrum disorders. *Child Psychiatry*
194 *and Human Development*. 2006 Dec;37(2):179-191.
- 195 20.Aathira R, Gulati S, Tripathi M, Shukla G, Chakrabarty B, Sapra S, et al.
196 Prevalence of Sleep Abnormalities in Indian Children With Autism
197 Spectrum Disorder: A Cross-Sectional Study. *Pediatr Neurol*. 2017
198 Sep;74:62-7.
- 199 21.Humphreys JS, Gringras P, Blair PS, Scott N, Henderson J, Fleming PJ
200 et al. Sleep patterns in children with autistic spectrum disorders: a
201 prospective cohort study. *Arch Dis Child*. 2014 Feb;99(2):114-8.

202 22. Buckley AW, Rodriguez AJ, Jennison K, Buckley J, Thurm A, Sato S, et
 203 al. Rapid eye movement sleep percentage in children with autism
 204 compared with children with developmental delay and typical
 205 development. Arch Pediatr Adolesc Med. 2010 Nov;164(11):1032-7.
 206 23. Veatch O.J, Maxwell-Horn A.C, Malow B.A. Sleep in Autism Spectrum
 207 Disorders. Curr. Sleep Med. Rep. 2015;1:131–140.

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209 **Table 1: Demographic characteristics.**

	F re q ue nc y	Pe rc en ta ge (%)
Age group of children in years 6-8 9-10 11-12	58 23 12	62 .4 24 .7 12 .9
Gender Male Female	71 22	76 .3 23 .7
Father's educatio n level Seconda ry Post- seconda ry Graduat ion/High er	10 13 70	10 .8 14 .0 75 .3
Mother' s educatio n level Seconda	8 12 73	8. 7 12 .9

ry Post- seconda ry Graduat ion/High er		78 .5
Total family income (In PKR) <50,000 >50,000	17 76	18 .3 81 .7

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213 **Table 2: SDSC scores in different types of sleep disturbances**

	DIMS	SBD	DA	SWTD	DOES	SHY
Score range	7-35	3-15	3-15	6-30	5-25	2-10
Score	16.6±4.3	3.74±0.9	3.7±1.2	10.2±3.1	8.9±3.2	2.5±1.3
Normal Sleep	69 (74.2%)	89 (95.7%)	83 (89.2%)	78 (83.9%)	86 (92.5%)	88 (94.6%)
Pathological sleep	24 (25.8%)	4 (4.3%)	10 (10.8%)	15 (16.1%)	7 (7.5%)	5 (5.4%)

214

215 SDSC: Sleep disturbance scale for children

216 DIMS: Disorders of initiating and maintaining sleep

217 SBD: Sleep breathing disorders

218 DA: Disorders of arousal

219 SWTD: Sleep-wake transition disorders

220 DOES: Disorders of excessive somnolence

221 SHY: Sleep hyperhidrosis

222