Original Article

Prevalence of obesity in students with specific learning disorder in a metropolitan city of India

Santosh Kondekar[1], Varun Anand[2], Pawan Mundada[3], Surbhi Pravin Rathi[4], Heenal Shah[5]

From [1]Associate Professor, [2]Assistant Professor, [3]Post Graduate Student, [4]Professor, Department of Pediatrics, [5]Associate Professor, Department of Psychiatry, Topiwala National Medical College Mumbai, Maharashtra, India

Correspondence to: Dr. Santosh Kondekar, Department of Pediatrics, Topiwala National Medical College, Mumbai - 400 008, Maharashtra, India. E-mail: drkondekar@gmail.com

Received - 29 August 2018 Initial Review - 16 September 2018 Accepted - 07 October 2018

ABSTRACT

Background: Obesity is common in urban school children. Learning disability (LD) prevalence is also growing, primarily in cities. **Objective:** The objective of this study is to find the prevalence of obesity in students with specific LD (SLD). **Materials and Methods:** This observational cross-sectional study carried out at a tertiary care center attached to a medical college in Maharashtra, after obtaining permission from the institutional ethics committee. Consecutive 150 students with SLD between the ages of 8 and 18 years were studied over 18 months. Obesity was classified as per body mass index. Descriptive statistics and subgroup analysis were done by unpaired t-test. **Results:** Prevalence of obesity in students with SLD was 22.7% without gender predisposition and family history correlation. Of total students with SLD, 44 (29.3%) had attention-deficit hyperactivity disorder (ADHD) without any association with the obesity. **Conclusions:** Family history, ADHD, gender, other medical conditions, and drug history have no correlation with regard to obesity in SLD. There is a further requirement of research with large population control size.

Key words: *Attention deficit hyperactivity disorder, Obesity, Specific learning disability*

As per Diagnostic and Statistical Manual classification, specific learning disability (SLD) requires a multidisciplinary approach which comprises heterogeneous group of neurodevelopmental disorders manifested by considerable, definite, and persistent difficulties in speaking, reading (dyslexia), writing (dysgraphia), mathematical reasoning, or calculations (dyscalculia) and their sub-skills after exclusion of visual, hearing or motor handicaps, subnormal intelligence, emotional disturbances, or sociocultural disadvantages [1,2]. SLD affects 80% of all those identified as learning disabled, with a prevalence of 10% with equal predilection in male and female [3,4]. The prevalence of SLD in school children is found out to be 6.6% [5]. The incidence of dyslexia in primary school children of India has been reported to be 2–18%, dysgraphia 14%, and dyscalculia 5.5% [5,6]. About one-third of SLD also have attention-deficit hyperactivity disorder (ADHD) [7].

In many studies around the world, the prevalence of obesity was found to be higher among those with SLD than in the general population [2]. According to the World Health Organization, within the intellectual disability (ID) population, obesity and cholesterol levels are generally higher than in the general population [8]. Many factors, including genetic predisposition, culture, environment, metabolism, lifestyle preferences, and eating habits, are believed to play a role in the development of obesity [9]. Yamaki reported a prevalence of 34.60% of obesity in SLD, from 1997 to 2000 in the United States (US), while Emerson in 2005 reported the same as 27% in 1304 residential service users of England from 1998 to 2001 [10,11]. The overweight prevalence in SLD changed dramatically between 1980 and 2006 for children 2–19 years of age, increasing from 5.5% to 16.3% [12]. Reinehr *et al*. reviewed 38 articles and found the prevalence of obesity in SLD, autism spectrum disorder (ASD), and ADHD as 19.3%, 23.4%, and 18.9%, respectively [13].

The dearth of knowledge among the educated populace of society such as school teachers and educators who play a foremost and primary role in the sensitization of such children leads to delayed help and poor outcome in terms of prognosis [14]. Special education such as learning stratagem instruction, using a sequential, synchronized structured multisensory approach, pervasive influence of cognitive strategy, and direct instruction models are essential for remediating the academic snags for children with SLD and should be started at an early age [15].

MATERIALS AND METHODS

This observational cross-sectional study was carried out at a tertiary care center attached to a medical college at a metropolitan city in Maharashtra, after obtaining permission from the institutional ethics committee. The sample size was calculated with Medcalc software with type I error (alpha) of 0.05 and

type II error of 0.20 which came out to be a minimum of 47. A sample size of 150 was taken to increase the strength of the study. Consecutive 150 children being certified as SLD enrolled after assent from the enrolled children and written consent from their parents. All the sequential cases with SLD certified during the study period were enrolled; hence, no special sampling method was applicable. Exclusion criteria were visual handicap (>60%), hearing handicap (>60%), physical handicap, and borderline intellectual functioning/mental retardation documented by the specialists.

Students were diagnosed as SLD on the basis of DSM-V criteria by the team of experts. The standard psychoeducational battery, which included tests of academic excellence (Woodcock–Johnson test) and tests of intelligence (e.g., Wechsler Intelligence Scale for Children) performed to aid the diagnosis. The diagnosis of comorbid conditions (e.g., ADHD) was confirmed by the consultant pediatricians and psychiatrists on clinical grounds and with DSM-V criteria.

A detailed clinical examination of the cases carried out along with the physical parameters such as height, weight, occipitofrontal head circumference, and waist circumference. Students were classified into obese and non-obese based on markings of body mass index (BMI) percentiles for age- and gender-specific norms of the Indian Academic of Pediatrics Charts (adult equivalent 27 cutoff BMI lines) of children above 5 years [16,17]. Association between qualitative variables was assessed by Chi-square test with continuity correction. The study statistics were charted and analyzed for the prevalence and tests of significance using Microsoft Excel with Windows 2007.

RESULTS

Of the 150 students studied, 34 (22.7%) were obese and 116 (77.3%) non-obese. Thus, the prevalence of obesity in students with SLD was 22.7%. The mean age of students presenting for evaluation and diagnosis of SLD along with obesity was 13.35±1.71 years and for SLD without obesity was 12.72±1.99 years. Of 150 students with SLD, 40 were female and 110 were male. Among the 34 students diagnosed to have SLD with obesity, 6 (17.6%) were females while 28 (82.4%) were males with male:female ratio of 2.8:1. Of 116 students diagnosed to have SLD without obesity, 34 (29.3%) were females and 82 (70.7%) males. The association was not significant, and hence, there was no sex predilection in both the groups (Table 1).

Only 12 (8%) of total SLD cases had medical illnesses, of which 2 (17%) were obese and 10 (83%) were non-obese. Among these 12 students, 5 had seizure disorder, of which only 1 was obese and others were non-obese. The rest included one case each of asthma, febrile convulsion, head injury, heart disease, lymph node tuberculosis, and migraine all of whom were non-obese and one case of typhoid was obese.

Among two students (1.3%) having a family history of obesity, 1 (50%) was obese and the other (50%) was non-obese. Among all the SLD cases, 50 (33.33%) were on some form of medication, of which 21 were on oral atomoxetine (42%), but only 4 among them had obesity (19%) and almost equal number of children were on oral methylphenidate, wherein again 4 children were found to be obese. Six were on oral atomoxetine and risperidone both, but none was obese. Of the 3 cases who were on oral valproate, 1 was obese (33%). The other four students were on oral atomoxetine and phenytoin dual therapy, antituberculosis drugs, antiasthmatic drug, and sumatriptan, and none of whom were obese. Although we found a maximum number of students with SLD and obesity to be on oral atomoxetine and oral methylphenidate, there was no significant association.

Among all the study cases of SLD, 44 (29.3%) had ADHD with 8 children being obese (18%). Out of 106 SLD without ADHD, 26 (24.5%) were obese and 80 (75.4%) were non-obese (Table 1). The association is not significant and hence, ADHD were found to be equally occurring in both the groups.

DISCUSSION

Since obesity *per se* shrinks the life expectancy by 5–20 years, it becomes essentially crucial to seek out in a child who is already suffering from an added medical illness [18]. The prevalence of obesity among students with SLD in this study was found to be 22.7%, which was quite similar to that found in a study by Chen *et al* (19.3%) [19]. The analysis of the National Health And Nutrition Examination Survey 1992–2002 carried out in the US showed that the prevalence of being overweight was significantly higher in children and young people aged 6–17 years with SLD compared to those without SLD (21.9% compared to 15.7%), and this was consistent with another study [20]. No Indian studies have been carried out in this respect so far. This study had limited objective of the prevalence of obesity, and the study population and subpopulation were inadequate for in-depth analysis of subgroups. However, it seems that children with SLD may be prone to obesity due to various factors including temper tantrums, concern of parents, lack of stimulation, indoor games and restricted physical activity, exposure to medications that are appetite altering, and deformed eating habits [21]. However, no such inference could be concluded from this study. Since discrepancies of about 10% are found in the prevalence of obesity if different reference percentile charts are used at same population, local BMI percentile charts (Indian academy of pediatrics) were used in the current study [22].

This study showed that the presence or absence of obesity in students with SLD did not affect the age of presentation for the evaluation and diagnosis of SLD. Mean age of presentation of the students for the evaluation of SLD with and without obesity was 13.35±1.71 years and 12.72±1.99 years, respectively. Of the 40 girls who had SLD, 6 were found to be obese (15%) versus 28 of 110 boys having SLD (25.45%). Thus, more number of boys with SLD were found to be obese as compared to girls, without any statistical significance which might be explained by the fact that latest studies had no gender predisposition in relation to the occurrence of SLD.

Studies of comorbid medical illnesses in SLD children and adolescents with obesity are lacking. However, in general,

Table 1: Factors related to obesity with statistical co-relation

Factors	Present/absent	Total number (n=150)%	Obese%	Non-Obese%	p-value
Females	+	40 (26.6)	6 (15.0)	34 (85.0)	0.176
Males	+	110 (73.3)	28 (25.4)	82 (74.5)	
Family history	+	02 (1.3)	01 (50.0)	01 (50.0)	0.353
	-	148 (98.6)	33 (22.2)	115 (77.7)	
ADHD	+	44 (29.3)	08 (18.1)	36 (81.1)	0.398
	-	106 (70.6)	26 (24.5)	80 (75.4)	
Drug history	+	50 (33.3)	09 (18.0)	41 (82.0)	0.888
	-	100 (66.7)	25 (25.0)	75 (75.0)	
Medical history	+	12 (8.0)	02 (16.6)	10 (83.3)	0.735
	-	138 (92.0)	32 (23.1)	106 (76.8)	

(+) Present; (-) absent; statistically insignificant distribution. ADHD: Attention-deficit hyperactivity disorder

Khaodhiar *et al*. had found that obese patients are at an increased risk for developing many medical problems including insulin resistance and type 2 diabetes mellitus, hypertension, dyslipidemia, cardiovascular disease, stroke, sleep apnea**,** gallbladder disease, hyperuricemia, gout, asthma, and osteoarthritis [23]. In the current study, only two cases were obese who had SLD and medical illness. Medical illnesses found in the current study were seizure disorder, asthma, febrile convulsion, head injury, heart disease, lymph node tuberculosis, and migraine.

Studies of the family history of obesity in SLD children and adolescents are lacking, and hence, association has not yet been established. Stewart *et al*. studied 150 children from birth to 9.5 years of age and found that, of the total, 38 (25.3%) were above the 85th percentile of BMI at 9.5 years of age, including 14 (9.0%) above the 95th percentile, with strongest relation to parental BMI [24,25]. In the current study, two students had a family history of obesity, of which 1 (50%) was obese; however, the presence of obesity in this student with SLD is attributable more to the strong family history of obesity than to the strong association with SLD *per se*. However, no such conclusion can be made from a single case. Other researchers also found a link between frequent temper tantrums and childhood obesity with the fact that persistent tantrums over food from ages 2 to 5 years results in children being three times more overweight than those without a history of tantrums. This may be indirectly related to the kids with SLD where bribe was given by parents to the kids to keep them calm [24]. In this study, students with SLD were found to be on medication for various reasons almost equally in obese and non-obese group. History of drug intake for medical illnesses was obtained in 50 of 150 SLD students (33.33%). Of those 50, nine were obese (6%) and were on some form of psychotropic drugs.

Seizure disorder was found to be the most common medical illness in students with SLD. De Gaspari found that weight gain associated with antiepileptic drugs is frequent, chiefly with drugs such as valproate, carbamazepine, gabapentin, and tricyclic antidepressants [26,27]. Megan Brooks found that ADHD children treated with stimulants demonstrated slower BMI growth early in childhood, but they rebounded later in adolescence with higher BMI that was higher than in children without a history of ADHD or stimulant use [28]. Diagnoses of ADHD have been found to be more prevalent in obese children than in their normal weight peers [29].

In the current study, ADHD was diagnosed in 44 students (29.3%), of which 8 (18.18%) were obese and 36 (81.81%) were non-obese, which is supported by similar results of many studies [19,30-32]. Cortese *et al*. found the increased joint prevalence of obesity by 40% in children with ADHD (10.3%, 95% CI=7.9–13.3) compared with those without ADHD (7.4%, 95% CI=5.4–10.1) probably due to not considering SLD as a compounding factor [33]. In a meta-analysis, a significant association between ADHD and obesity was found in 41 studies over 4 years, from 2012 to 2016, regardless of possible confounding factors such as psychiatric comorbidities, medications, and population character [34]. The obesity in SLD with ADHD is not ascribed to ADHD *per se* and seems to be more related to sedentary lifestyle, lack of stimulation, and poor dietary habits. Inattention, reward sensitivity, and impulsivity determine the extent of problems associated with obesity and/or interfere with the ability to lose weight [35]. We need to have stern concern related to derived comorbidities allied to SLD to have a good quality of life.

None of the SLDs with obesity had evidence of hypothyroidism/thyroid function disorder. Thus, investigation for hypothyroidism in every child and adolescent of SLD with obesity should be avoided, especially in resource-limited settings. There was no significant statistical correlation found in relation to family history of obesity in ASD. It may be important to plan a large-scale study to understand the prevalence of obesity in children with SLD which is limitation of the current study also.

CONCLUSION

Percentage of obesity as a comorbidity in students with SLD was 22.7%. The presence or absence of obesity in students with SLD did not affect the age of presentation and gender predisposition for evaluation and diagnosis of SLD. Seizure disorder was found as a common medical illness in SLD students. Prevalence of ADHD was 29.3% in SLD students, and the obesity was found equally prevalent in SLD students with or without ADHD.

ACKNOWLEDGMENT

The authors would like to thank Dean TNMC Mumbai, for permission to study and publish.

REFERENCES

1. Somale A, Kondekar SV, Rathi S, Iyer N. Neurodevelopmental comorbidity profile in specific learning disorders. Int J Contemp Pediatr 2016;3:355-61.
2. Al-Mamari WS, Emam MM, Al-Futaisi AM, Kazem AM. Comorbidity of learning disorders and attention deficit hyperactivity disorder in a sample of Omani school children. Sultan Qaboos Univ Med J 2015;15:e528-33.
3. Schulte-Körne G. Specific learning disabilities - From DSM-IV to DSM-5. Z Kinder Jugendpsychiatr Psychother 2014;42:369-72.
4. Sahoo MK, Biswas H, Padhy SK. Psychological co-morbidity in children with specific learning disorders. J Family Med Prim Care 2015;4:21-5.
5. Bandla S, Mandadi GD, Bhogaraju A. Specific learning disabilities and psychiatric comorbidities in school children in South India. Indian J Psychol Med 2017;39:76-82.
6. Kulkarni M, Karande S, Thadhani A, Maru H, Sholapurwala R. Educational provisions and learning disability. Indian J Pediatr 2006;73:789-94.
7. Candace C, Sheldon HH. The State of Learning Disabilities: Facts, Trends and Emerging Issues. New York: National Center for Learning Disabilities; 2014. P. 1-46.
8. World Health Organization. Ageing and Intellectual Disabilities - Improving Longevity and Promoting Healthy Ageing: Summative Report. Geneva, Switzerland: World Health Organization; 2000. p. 1-21. Available from: http://www.apps.who.int/iris/bitstream/10665/66367/1/WHO_MSD_HPS_MDP_00.3_eng.pdf. [Last accessed on 2017 Dec 16].
9. Sahoo K, Sahoo B, Choudhury AK, Sofi NY, Kumar R, Bhadoria AS. Childhood obesity: Causes and consequences. J Family Med Prim Care 2015;4:187-92.
10. Yamaki K. Body weight status among adults with intellectual disability in the community. Ment Retard 2005;1:1-10.
11. Emerson E. Underweight, obesity and exercise among adults with intellectual disabilities in supported accommodation in Northern England. J Intellect Disabil Res 2005;49:134-43.
12. Nguyen DM, El-Serag HB. The epidemiology of obesity. Gastroenterol Clin N Am 2010;39:1-7.
13. Reinehr T, Dobe M, Winkel K, Schaefer A, Hoffmann D. Obesity in disabled children and adolescents an overlooked group of patients. Dtsch Arztebl Int 2010;107:268-75.
14. Kamala R, Ramganesh E. Knowledge of specific learning disabilities among teacher educators in Puducherry, Union Territory in India. Int Rev Soc Sci Humanit 2013;6:168-75.
15. Swanson HL, Hoskyn M. Experimental intervention research on students with learning disabilities: A meta-analysis of treatment outcomes. Rev Educ Res 2016;3:277-321.
16. Khadilkar V, Yadav S, Agrawal KK, Tamboli S, Banerjee M, Cherian A. Revised IAP growth charts for height, weight and body mass index for 5- to 18-year-old Indian children. Indian Pediatr 2015;52:47-55.
17. Khadilkar VV, Khadilkar AV. Revised Indian academy of pediatrics 2015 growth charts for height, weight and body mass index for 5-18-year-old Indian children. Indian J Endocr Metab 2015;19:470-6.
18. Fontaine KR, Redden DT, Wang C, Westfall AO, Allison DB. Years of life lost due to obesity. JAMA 2003;289:187-93.
19. Chen AY, Kim SE, Houtrow AJ, Newacheck PW. Prevalence of obesity among children with chronic conditions. Obesity 2010;18:210-3.
20. Taylor N, Stoddart L, Kurup B. Obesity in children and young people with learning disability – Are we following NICE guidance? Arch Dis Child 2016;101:A67-8.
21. Purcell H. Cardiovascular consequences of obesity: How will the UK cope? Drugs Context 2013;212247:1-3.
22. Ogden CL, Yanovski SZ, Carroll MD, Flegal KM. The epidemiology of obesity. Gastroenterology 2007;132:2087-102.
23. Grondhuis SN, Aman MG. Overweight and obesity in youth with developmental disabilities: A call to action. J Intellect Disabil Res 2014;58:787-99.
24. Stewart AW, Hammer LD, Mc Nicholas F, Kraemer HC. Risk factors for childhood overweight: A prospective study from birth to 9.5 years. J Pediatr 2004;145:20-5.
25. Brandt ML. Obese Parents Increase Kids' Risk of Being Overweight Stanford Report; 2004. Available from: https://www.news.stanford.edu/news/2004/july21/med-obesity-721.html. [Last accessed on 2017 Dec 16].
26. De Gaspari CN, Guerreiro CA. Modification in body weight associated with antiepileptic drugs. Arq Neuropsiquiatr 2010;68:277-81.
27. Kanemura H, Sano F, Maeda Y, Sugita K, Aihara M. Valproate sodium enhances body weight gain in patients with childhood epilepsy: A pathogenic mechanisms and open-label clinical trial of behavior therapy. Seizure 2012;21:496-500.
28. Megan Brooks. Stimulants Likely Behind ADHD - Obesity; 2014. Available from: https://www.medscape.com/viewarticle/822055. [Last accessed on 2017 Dec 16].
29. Pulgarón ER. Childhood obesity: A review of increased risk for physical and psychological comorbidities. Clin Ther 2013;1:A18-32.
30. Yang R, Mao S, Zhang S, Li R, Zhao Z. Prevalence of obesity and overweight among Chinese children with attention deficit hyperactivity disorder: A survey in Zhejiang Province, China. BMC Psychiatry 2013;13:133.
31. Gruss B, Mueller A, Horbach T, Martin A, de ZM. Attention-deficit/hyperactivity disorder in a prebariatric surgery sample. Eur Eat Disord Rev 2012;20:e103-7.
32. Racicka E, Hanć T, Giertuga K, Bryńska A, Wolańczyk T. Prevalence of overweight and obesity in children and adolescents with ADHD. J Atten Disord 2015;22:1095-108.
33. Cortese S, Moreira-Maia CR, St Fleur D, Morcillo-Penalver C, Rohde LA, Faraone SV. Association between ADHD and obesity: A systematic review and meta-analysis. Am J Psychiatry 2016;173:34-43.
34. Cortese S, Tessari L. Attention-deficit/hyperactivity disorder (ADHD) and obesity: Update 2016. Curr Psychiatry Rep 2017;19:l4.
35. Pagoto S, Curtin C, Appelhans BM, Alonso-Alonso M. Attention deficit/hyperactivity disorder and the clinical management of obesity. Curr Obes Rep 2012;1:80-6.

Funding: None; Conflict of Interest: None Stated.

How to cite this article: Kondekar S, Anand V, Mundada P, Rathi SP, Shah H. Prevalence of obesity in students with specific learning disorder in a metropolitan city of India. Indian J Child Health. 2018; 5(10):622-625.

Doi: 10.32677/IJCH.2018.v05.i10.005