

Association between Enuresis and Body Mass Index in Schoolchildren

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Abstract

Background

Automatic release of urine at any time of a day during sleep beyond the age of five years defined enuresis as a health disorders in children. The etiology of enuresis is still not clearly understood. Body Mass Index (BMI) is an indicator to evaluate the growth trend of individuals in a population for any specific age group. Evaluation of obesity in children is important and provides an opportunity to identify the problem and prevent disease progression. The purpose of this study was to determine the prevalence of enuresis and the association with BMI.

Materials and Methods

The study was a cross-sectional survey based on specific age group population to determine the prevalence of enuresis conducted on the schoolchildren in Zahedan, Iran during December 2015 and February 2016. A random, multistage sample of 2,000 students was taken from fifty schools in five districts of Zahedan city and filled out some easy questions such as age and gender along with measuring weight and height. Body Mass Index categorized after calculation accordance with the formulae of $BMI = \text{Height (kg)} / \text{Weight (m)}^2$. The classification of BMI was accordance with percentiles of underweight in less than the 5th percentile, healthy level from the 5th to less than 85th percentile, overweight from the 85th to less than the 97th percentile and obese equal to or greater than the 97th percentile.

Results

The prevalence of enuresis was 17.18% for boys and 11.82% for girls, and the overall prevalence was 140 in 1000. Enuresis and non- enuresis population were different in mean of BMI (15.51 ± 3.92 versus 17.69 ± 5.11), so that this differential were statistically significant ($P < 0.001$). In two overweight and obesity status can be observed the differences in BMI values, but not significant. In normal status with (22.63 ± 1.096) and without (22.742 ± 1.096) enuresis, there was a significant difference ($P < 0.001$) and in the underweight status with (11.28 ± 0.80) and without (10.53 ± 2.08) enuresis there also was a significant difference ($P = 0.010$).

Conclusion

Our findings revealed that enuresis was a problem among schoolchildren, especially with smaller age and lower body mass index.

Key Words: BMI, Children, Enuresis prevalence, Iran.

*Please cite this article as: Boryri T, Noori NM, Teimouri A. Association between Enuresis and Body Mass Index in Schoolchildren. Int J Pediatr 2016; 4(12): 3969-76. DOI: **10.22038/ijp.2016.7703**

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Received date Aug.29, 2016; Accepted date: Sep. 22, 2016

1- INTRODUCTION

Involuntary and without control urination at any time of a day during sleep beyond the age of five years defined enuresis (1), and it is an health disorders in children (2). Enuresis disorder has been diagnosed in three types that are as follow: Diurnal Enuresis (DE), Nocturnal Enuresis (NE) and Nocturnal/Diurnal Enuresis (N/DE) in which meaning of day-time, night time and combined (3, 4). Enuresis is also defined as uncontrolled emptying of urine that is occurring for 3 months in respect of two times each week. Also, NE is defined as periodic un-controlling urine during sleep in a 5 years old child. The prevalence of enuresis has been reported up to 200 in 1000 in five year old children and it is more common in boys whereas DE is more common in girls (4). Varied enuresis prevalence's have been reported from country to country, causes and reasons of enuresis not clarified and enough evidences not presented for a specific cause in confident. Most studies have consistently found that enuresis risk factors are gender, low age, family history, living in a household with divorced parents and some socio-economic-demographic factors (1, 5-6). In the other side, dietary intake status of the children is an important index of health and quality of life. Anthropometric indices such as weight and height are universally using to characterize the nutritional status of this population. Amongst these indicators there are indices that are obtained from the combined uses of anthropometric variables such as weight / height (W/H), weight for age (W/A), height for age (H/A) and body mass index (BMI) to assess the pattern of the children growth (7). BMI is one of the most valuable indexes for this matter and is an indicator that calculated from weight and height. BMI is a reliable measure of body fatness. Furthermore, it is a simple method to monitor and categorize weight based on height that may lead to health bad

conditions (8). The growth charts presenting the classification of BMI status that are using to show under, normal, overweight status, and obese. These levels of BMI are helping researchers to identify the progression of preventable disease especially in obesity children. Several studies have shown that overweight children are increasing in the developed societies. About 14-15% of 15 year old children are obese in the United States of America (8, 9). Many studies have been conducted to evaluate the relationship between enuresis and the trends of body mass index by age. Nocturnal enuresis has been found to be related to obesity so that around 31% of children with nocturnal enuresis are obese (8-10). In this study we aimed to estimate the prevalence of enuresis and to determine its association with BMI among school children population in Zahedan, a city of Iran.

2- MATERIALS AND METHODS

2-1. Study Design and Population

This cross-sectional study was performed on school children population to determine the prevalence of urinary incontinence and its association with BMI in the city of Zahedan, Sistan and Baluchestan province which is the largest province with the worst factors in health conditions, socioeconomic and demographic aspects in Iran.

2-2. Sampling

The multi-stage random sampling performed to collect 2000 schoolchildren aged from 5 to 18 years randomly, between December, 2015 and February, 2016 after approving the study protocol by Research and Ethics Committee of the Zahedan University of Medical Sciences. Sample size was calculated according to: $n = k^2 (pq)/d^2$. Where: n is the sample size, k is the value for the selected alpha level, e.g. 1.96 for (0.25 in each tail) a 95 percent confidence level; P is the estimated

proportion of an attribute that is present in the population and considered 0.2.

Estimate of variance considered as pq and d is the acceptable margin of error for proportion being considered 2%. Using the above parameters with specific values gave us 1,536 samples. To assume having more accurate 30%, so the sample size (n) was increased to $1536 + 461 = 1997$ and finally we considered 2,000 children for the study. Fifty schools were selected randomly from North, South, West, East and Central of Zahedan city; ten schools from each area, five school boys and five school girls. In each selected school, forty students were selected randomly from class registry notebook by systematic random method accordance with grade ratio. Selected children gave constant letter attached with a written letter that had been explained the goals of the study to be signed by parents. If one of parents rejected to sign the constant form replaced with one new student in the same circumstances and conditions.

2-3. Measures

The questions were answered by the parents at home and returned accordance with the questions consisted of background data of the children such as age, gender and whether they are suffering from bedwetting disorder or not. The second sets of measures were weight and height that performed with trained nurses at schools with digital scales and nonexpanding tapes after primary questions. The tools and method to measure weight and height were standard. Weight was measured with bare feet and minimum clothing, height was measured in standing position with bare feet against the wall as the buttocks, back of shoulders and heels were touching the wall with head forward. Body mass Index categorized after calculation accordance with the formulae of $BMI = \text{Height (kg)} / \text{Weight (m)}^2$. The classification of BMI was accordance with percentiles of

underweight in less than the 5th percentile, healthy level from the 5th to less than 85th percentile, overweight from the 85th to less than the 97th percentile and obese equal to or greater than the 97th percentile.

2-4. Data analysis

Analyses of data were done by the SPSS software (version 16, SPSS Inc, Chicago, Ill, USA), using Independent t-test and Chi-square. P- Value less than 0 .05 was considered significant. T-test applied for comparing quantitative variables between two groups of population and Chi-square test applied for measuring the amounts of correlation between categorized.

3- RESULTS

From 50 schools 2,000 students were selected for the study with the sex ratio of 1:1. Mean age was 10.80 ± 3.38 years for all participants. Sex distribution was 202(20.0%) and 121(12%) for girls and boys respectively in the specific age group of 15-18. In age group of 12-14 boys were more than girls. The prevalence trend of enuresis was decreased by age and it was 172 for boys and 118.2 for girls in 1000, and the overall prevalence was 140 in 1000 (14%).

This trend of prevalence distributed for different kind of enuresis based on age groups. In all types of enuresis the prevalence was lower for girls. This low prevalence was significant for age group 5-11 for nocturnal enuresis and overall enuresis as well as for all age group combined. The prevalence of enuresis according to age group declined from 21.01% at 5-11 years to 2.79% at 15-18 years (**Table.1**).

Table.2 showed the results derived from independent t-test for mean differences of BMI in enuretic and non- enuretic population. It can be evaluated that enuretic and non- enuretic population were different based on mean of BMI (15.51 ± 3.92 vs. 17.69 ± 5.11) so that this

differential ($t=6.821$, $P<0.001$) was statistically significant. In two overweight and obesity status can be observed the differences in BMI values but not significant. In normal status with (22.63 ± 1.096) and without (22.742 ± 1.096)

enuresis there was a significant difference ($P<0.001$) and in the underweight status with (11.28 ± 0.80) and without (10.53 ± 2.08) enuresis there was also a significant difference ($P=0.010$).

Table-1: Distribution of Enuresis prevalence based on type, age groups and gender for the population in study

Variables	categories	Nocturnal Enuresis			Enuresis status		
		Yes	No	Prevalence in 1000	Yes	No	Prevalence in 1000
Age group	5_11	166	948	149.0	235	879	210.95
	12_14	21	542	37.3	36	527	63.943
	15_18	5	318	15.5	9	314	27.864
	Total	192	1808	96.0	280	1720	140
	X ²	89.559			107.362		
	P- value	0.000			0.000		
Gender	Male	120	880	120	172	828	172
	Female	72	928	72	108	892	108
	Total	192	1808	96	280	1720	140
	Chi-square test	13.274			17.01		
	P- value	0.000			0.000		

Table-2: Prevalence of Overweight and Obesity among the School Population, Zahedan, Iran

BMI categories	Enuresis status	N	%	Prevalence	Mean \pm SD	P-value
BMI < 5% (underweight)	No	72	74	3.64	10.53 \pm 2.08	0.010
	Yes	25	26	1.26	11.28 \pm 0.80	
	Total (4.9% from all population)	97		4.90		
5% \leq BMI <85% (Healthy)	No	1353	85	68.37	16.44 \pm 2.28	<0.001
	Yes	236	15	11.93	15.12 \pm 0.44	
	Total (80.3% from all population)	1589		80.29		
85% \leq BMI<97% (Overweight)	No	181	93	9.15	22.72 \pm 1.22	0.788
	Yes	13	7	0.66	22.63 \pm 1.10	
	Total (9.80% from all population)	194		9.80		
BMI \geq 97% (Obese)	No	93	94	4.70	31.66 \pm 9.44	0.642
	Yes	6	6	0.30	33.18 \pm 7.20	
	Total (5% from all population)	99		5.00		
BMI for the population in study	No	1699		85.85	17.69 \pm 5.11	<0.001
	Yes	280		14.15	15.51 \pm 3.92	
	Total	1979		100		

SD: Standard deviation.

4- DISCUSSION

Many studies have been conducted to identify the prevalence of enuresis in various conditions in different societies. The present study was performed on school age population in Zahedan city of Sistan and Baluchestan province, Iran to detect the prevalence of enuresis and its relationship with BMI. In the present study resulted that the prevalence of enuresis without considering the type, was 14%. Most of school children were suffered from NE compared with other types of enuresis. The prevalence of enuresis was higher for males compared with females and decreased by age. In the level of underweight, mean BM was higher for enuretics and in the healthy level of BMI was higher for controls. The prevalence of enuresis was reported of 1.4-28% in many societies that is varied in the different age groups and different gender (1-3). Accordance with the American Psychiatric Association survey the prevalence of enuresis is 5% to 10% for the age of 5 years old, 3%-5% for children with 10-year-old and 1% for the age of 15 years old and older (8).

Sarici conducted a study in turkey on school age children to detect the prevalence of enuresis and its association with the quality of life. From the study resulted that the prevalence of enuresis in children was 9.52% (189/1984), when in sex distributed the prevalence's were 12.4% and 6.5% in boys and girls respectively. They estimated that the prevalence of enuresis according to age group declined from 45% at 6-7 years to 4.8% at 12-13 years. The results of the study by Sarici revealed that the prevalence of enuresis is lower than the present study in Zahedan and confirmed the results related to gender and age (9). Bakhtiar reported a prevalence of NE lower (8%) than our finding (9.6%) in khorramabad (10). The prevalence of enuresis was reported of 10.6% by

Torkashvand in Rafsanjan that was lower than our results (14%) (11). Paul performed a study on the prevalence of enuresis among primary schoolchildren in Port Harcourt and found that the prevalence of enuresis was 23.2% much higher than the prevalence of enuresis resulted from the present study. From the Paul's study can also resulted that the male prevalence of enuresis was higher than females in which was similar to the resent study results (12). Srivastava et al. conducted a study to assess the prevalence of monosymptomatic NE in schoolchildren in Lucknow, India and found 12.6% lower than our prevalence. In addition, similar to our result, Srivastava et al. found that males had higher rate of prevalence than females. In the mentioned study the trends of prevalence were decreased by age same our trends (13).

In a study in North Western Nigeria the prevalence of enuresis reported as 26.3% that was higher than our overall prevalence of enuresis. This study confirms our results related to the age and gender trends (North Western Nigeria). Another study in Nigeria reported a very high prevalence 37% (14) than founded for the Zahedan. Penbegül et al. conducted a study on this area and found the prevalence of enuresis of 25.9% in Diyarbakır, Turkey (15). According to the dissection above, the level of enuresis prevalence is in the average status, so that is lower or higher than resulted from other studies around the world. Recently, many studies have been performed on the association between BMI and enuresis. Sarici et al. compared the BMI between enuretic and non-enuretic children and found that BMI has the same values in these two groups (9).

Some concentrated to describe the association between nocturnal enuresis and overweight or obesity. It has many complications such as insulin resistance, diabetes II, sleep apnea, psychological problems and nocturnal enuresis along

with fatty liver disease, gallstones, and hyperlipidemia (16). Bakry et al. performed a study with the aim of relationship between obesity and nocturnal enuresis and resulted that among total number of 114 examined children, 90 children had enuresis disorders, representing 16.7% of the whole sample such that 13 (24.5%) of the overweight children (above +2 standard deviation [SD] BMI/age) suffered from nocturnal enuresis, compared to 6 (9.8%) of the normal weight children (below +2 SD BMI/age and above -2 SD BMI/age). It revealed that children with higher body mass index suffering more from nocturnal enuresis significantly (17).

Wagner reported that the majority of overweight or obese children had enuresis disorders compared with normal that had lower prevalence of enuresis (18). The results of the present study showed that the value of BMI was higher among enuretic children in the level of obesity. Regarding to non-significant results in our study concluded that our results confirming by Wagner (18). Merhi et al. carried out a study on Lebanese children regarding to prevalence of enuresis, relation with obesity, and psychological effect on nocturnal enuresis. They received to similar results with our findings that there was not relationship between obesity and enuresis (19).

Weintraub et al. (20) expressed that enuresis was a major and complex of complications associated with obesity. Weintraub et al. resulted that the odds ratio of enuresis in obese children was 6.5 folds more than normal weight children. Esposito et al. resulted that the children with primary nocturnal enuresis had higher Z-score of BMI when it would be comparable with our results in different lines (21). The results by Hamsa Shaker Abdul-Nabi and Habeeb showed that the overall BMI was lower for children who suffering from enuresis compared to their

counterparts. Our results are comparatively similar to a study results done in Basra, Iraq (22). Another study carried out in Finland in 1991 and resulted that children with nocturnal enuresis suffered from slower growth in comparison with free of nocturnal enuresis (23); same results was concluded by Inoue and Akazai (24) in Japan.

4-1. Limitations of the study

We should take into account some limitations of this study; for example, our data related to child's enuresis were derived from parents that was brought us a low level of accuracy data related to enuresis.

5- CONCLUSION

Our findings suggest that enuresis was a problem among schoolchildren, especially with smaller age and lower body mass index. We conclude that nocturnal enuresis was more common in males in overall age groups. The differences in the reported prevalence's rate of enuresis from various countries can be attributed to the differences in some criteria such as: age, definition of enuresis, genetic predisposition, and traditional with cultural background. Primary health caregivers must be educated according to their society's condition to elicit a detailed history and explaining detrimental effects of enuresis and its association with many factors such as body mass index to present true information about the medications and cares to the parents. Longitudinal and follow up studies are needed to clarify further how the trends of enuresis changing with BMI.

6- CONFLICT OF INTEREST

The authors had not any financial or personal relationships with other people or organizations during the study. So there was no conflict of interests in this article.

7- ACKNOWLEDGMENTS

The authors would like to present their deep gratitude to the parents and schools' staff.

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