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Association of Overweight and Obesity with Monosymptomatic Nocturnal Enuresis in 5-15 Years Old Children

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Abstract

***Background*:** Monosymptomatic nocturnal enuresis (MNE) has increasingly been reported as a challenging issue for families and children due to its impact on the psychological aspects of children and on reducing their concentration at school the next day. Obesity might serve as a risk factor for voiding dysfunction in children. Our study aimed to evaluate the relationship between excess body mass index (BMI) in children and MNE.

Methods and Results: This case-control study included 60 children diagnosed with MNE (the main group [MG]) and 60 children without MNE (the control group [CG]) aged 5-15 years. Proper matching between the two groups concerning age and sex was adopted. Age, weight, family history, and complete medical history were recorded for each participant. In the MG, 18(30%) children had excess BMI, and 42(70%) had normal BMI. In contrast, 9(15%) children in the CG had excess BMI, and 51(85%) children had normal BMI, indicating a statistically significant association between increased BMI and MNE (P=0.049). The frequency of positive family history was significantly higher among the MG than the CG (P=0.0001). The findings of this study showed no significant relationship between gender and a family history of enuresis with excess BMI in children with MNE (P=0.679 and P=0.234, respectively).

Conclusion: Obesity and overweight in children have an influence on the development of MNE. **(International Journal of Biomedicine. 2024;14(1):30-35.)**

Keywords: monosymptomatic nocturnal enuresis • bedwetting • children • obesity • overweight

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Abbreviations

BMI, body mass index; **MNE**, monosymptomatic nocturnal enuresis; **UTI,** urinary tract infection

Introduction

Nocturnal enuresis is a common disorder affecting children and adolescents worldwide. It is described as the involuntary leakage of urine while sleeping in children at least five years old.[1] Enuresis can be classified as monosymptomatic enuresis (MNE) and non-monosymptomatic enuresis. Monosymptomatic nocturnal enuresis is referred to as enuresis in children with no other symptoms of the lower urinary tract or history of bladder dysfunction. Non-monosymptomatic enuresis is enuresis in children with additional symptoms of the lower urinary tract, such as urgency, hesitancy, and postmicturition non-monosymptomatic.[2] In addition, monosymptomatic nocturnal enuresis can be classified as primary enuresis - when the child has never achieved a satisfactory period of night dryness; or secondary enuresis - when the child has had at least six months of dry nights and has begun to experience nighttime enuresis again.[3]

Monosymptomatic nocturnal enuresis has increasingly been reported as a challenging issue for families and children due to its impact on the psychological aspects of children and on reducing their concentration at school the next day. Spontaneous resolution of primary monosymptomatic nocturnal enuresis is expected as prevalence decreases from about 15% at age 5 to 5% at age 10 and finally to 1%-2%

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at age ≥15 years.[2] Numerous factors have been proposed to contribute to the etiology of monosymptomatic nocturnal enuresis, including genetic factors, sleep arousal disorder, nocturnal polyuria, maturational delay, psychological factors, detrusor overactivity, and small bladder capacity.[4]

Nocturnal enuresis hurts the child and the entire family. Children experience guilt and low self-esteem, which might lower their confidence or prevent them from participating in social activities like camping and sleepovers. Additionally, enuresis might worsen their sleep quality and cause stress and conflict within the family.[5-8]

Furthermore, there have been some indications in the research that monosymptomatic nocturnal enuresis might be related to obesity and overweight, which are defined as an increase in body fat content to the extent that it negatively impacts a child's health and which are other significant pediatric problems that have increased over the past few decades.[9] Obesity in children and adolescents can contribute to a variety of comorbid conditions, including cardiovascular diseases such as hypertension and dyslipidemia; psychological disorders such as anxiety, depression, and social isolation; gastrointestinal conditions such as fatty liver and cholelithiasis; respiratory diseases such as asthma and obstructive sleep apnea; and hormonal disorders such as metabolic syndrome and diabetes mellitus. Furthermore, it can predispose the child to obesity in later adult life.[10-12]

Studies on the relationship between childhood obesity and voiding disorders, particularly enuresis, have been conducted by many researchers.[13-16] Some of these studies have posited that obesity might serve as a risk factor for voiding dysfunction in children;[17-21] however, other studies have failed to find evidence of a direct correlation between excess body mass and lower urinary tract symptoms.[22-27]

Considering the inconclusive and contradictory findings of these studies, the current study was conducted aiming to evaluate further the relationship between excess BMI in children and monosymptomatic nocturnal enuresis.

Materials and Methods

This case-control study was conducted at Al-Khansaa maternity and pediatric hospital. Over 6 months, 60 children aged 5-15 years diagnosed with MNE were enrolled in the main group (MG) according to the International Children's Continence Society criteria.[28] The control group (CG) included 60 children without MNE who were present for routine check-ups or treatment for minor illnesses. To ensure unbiased sampling, every second child who presented to the center was selected for the main or the CG. Furthermore, proper matching between the two groups concerning age and sex was adopted.

Exclusion criteria were neurodevelopmental disorders, including autism spectrum disorder, intellectual disability, and global developmental delay; urological conditions such as UTI, history of recurrent UTI, chronic kidney disease and posterior urethral valve; diurnal enuresis; polyuria-related diseases such as diabetes insipidus and diabetes mellitus; seizure disorders; sickle cell disease and spinal dysraphism.

A semi-structured interview was conducted with both the children and their caregivers. Additionally, a structured questionnaire was employed, which requested the demographic data of the participants, neurological and endocrinological disorders, developmental milestones of the child, frequency of nocturnal enuresis within the past three months, recurrent UTI history, past medical history, and the attainment of night dryness for a minimum of six months. Subsequently, the children were given a thorough examination, encompassing a neurological assessment, anthropometric measurements, and an evaluation of developmental milestones. Afterward, the researchers requested a urine specimen for urine culture and instructed the family on the appropriate technique for obtaining a clean catch, midstream urine sample.

The weight of the children in the MG and CG was measured to the nearest 0.1kg, while they were wearing lightweight clothes, by using the Seca 700 weight scale (SECA, Hamburg, Germany). The weight scale also contains a measuring rod to measure the standing height of the children to the nearest 0.1 cm. The children were barefoot during the examination and looked straight ahead with their hands at their sides.

Thereafter, we calculated the BMI by dividing the children's weight in kilograms by the square of their height in meters, and to assign the children to weight categories, their parameters were entered into a web-based BMI percentile calculator designed by the Centers for Disease Control and Prevention. Children were categorized as overweight if their BMI was between the 85th and the 95th percentile and obese if their BMI was equal to or above the 95th percentile.[29]

Statistical analysis was performed using the statistical software package SPSS version 22.0 (SPSS Inc, Armonk, NY: IBM Corp). Baseline characteristics were summarized as frequencies and percentages for categorical variables and as mean (M) ± standard deviation (SD) for continuous variables. For data with normal distribution, inter-group comparisons were performed using Student's t-test. The frequencies of categorical variables were compared using a chi-square test, and a compare proportions test was applied. Pearson's correlation coefficient (r) was used to determine the strength of the relationship between the two continuous variables. A probability value of $P<0.05$ was considered statistically significant.

The study was conducted in accordance with the ethical principles of the WMA Declaration of Helsinki (1964, ed. 2013) and approved by the Ethics Committee at the Ninevah University/College of Medicine. Written informed consent was obtained from each research participant (or the participant's parent/guardian).

Results

We found non-significant differences between the MG and the CG regarding age, sex distribution, or BMI; at the same time, we found a predominance of boys in both groups (Table 1). The primary MNE accounted for the most significant percentage among the MG (93.3%).

In the MG, 18(30%) children had excess BMI, and 42(70%) had normal BMI. In contrast, 9(15%) children in

the CG had excess BMI, and 51(85%) children had normal BMI, indicating a statistically significant association between increased BMI and MNE (P=0.049) (Table 2). However, the boxplot showed no significant difference between the mean BMI between groups (Figure1). The frequency of positive family history was significantly higher among the MG than the CG (P=0.0001) (Table 3).

Table 1.

Demographic characteristics of control versus MNE patients.

	CG (n=60)	MG (n=60)
Age (years)	7.58±2.6	7.25±2.3
Sex (M/F)	39/21	39/21
BMI (kg/m^2)	16.8±2.1	16.9±2.6

Table 2.

The frequency of high BMI in the study groups.

Group	BMI		*P*-value
	Excess BMI n (%)	Normal BMI n (%)	
MG	18 (30)	42 (70)	0.049
CG	9 (15)	51 (85)	
Total	27	93	

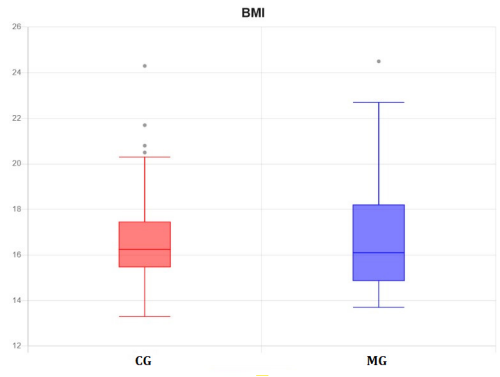

Fig. 1. *BMI in the control versus MNE patients.*

Table 3.

The frequency of family history in the study groups.

Group	-Family History	+Family History	Odds ratio	*P*-value
CG (n=60)	57 (95%)	3 (5%)	23.2	<0.0001
MG (n=60)	27 (45%)	33 (55%)		

The findings of this study showed no significant relationship between gender and a family history of enuresis with excess BMI in children with MNE (P=0.679 and P=0.234, respectively) (Table 4). A Pearson correlation coefficient was computed to assess the relationship between BMI/age percentile and weekly enuresis frequency in the MG. There was a non-significant weak correlation between the two variables (r =-0.1032, P=0.434). The coefficient of determination (R^2) was 0.011 (Figure 2).

Table 4.

Gender and family history as risk factors for excess BMI in children with MNE.

Factors		Excess BMI n (%)	Normal BMI n (%)	*P*-value
Gender	Male	11(61)	28 (67)	0.679
	Female	7 (39)	14 (33)	
	Total	18 (100)	42 (100)	
Family history of enuresis	Positive	12 (67)	21 (50)	0.234
	Negative	6 (33)	21 (50)	
	Total	18 (100)	42 (100)	

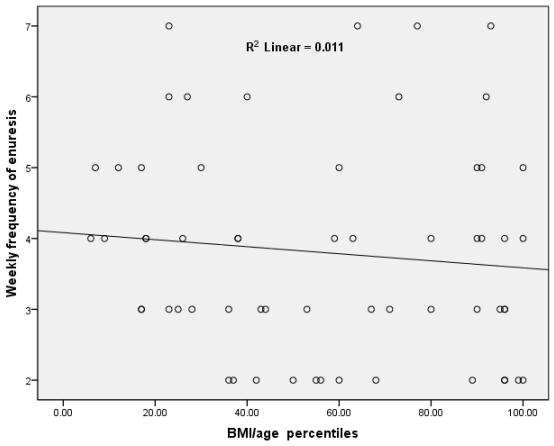

Fig. 2. *Correlation of BMI with the weekly frequency of enuresis.*

Discussion

Our study demonstrated that children with MNE had a higher prevalence of obesity and overweight than controls had, which is consistent with previous studies.[18,24,30] However, other studies reported no differences in the prevalence of MNE between obese or normal-weight children.[22,26]

The underlying pathogenesis of the increased prevalence of MNE in obese children is obscure; however, there have been reports about suggested explanations, including the impact of obesity on bladder pressure and reducing the bladder capacity to hold urine, causing bedwetting.[17,31]

Obesity is also known to alter the sleep pattern, resulting in fragmented sleep with association with frequent waking periods, resulting in bedwetting.[19,27] Moreover, mood alteration and psychological disturbances associated with obesity resulted in increased stress, which overburdened the child and resulted in bullying by peers and reduced self-esteem with subsequent increased chance of bedwetting.[32] Obese children are more susceptible to snoring, which is associated with difficulties in breathing during sleep, with subsequent frequent waking, resulting in sleep disturbances.[27] Sleep difficulties are usually related to next-day fatigue and reduced concentration with reduced mood; all of these increase the chance of nocturnal enuresis.[17] However, in contrast to our study, other studies did not find a significant association between overweight/obesity and monosymptomatic nocturnal enuresis.

A possible explanation for these contradictory findings is the study design and sample size variations. In particular, Zahra et al.[22] studied 180 children with monosymptomatic nocturnal enuresis in a retrospective review of patient records; a study by Uzan et al.[26] was an observational study with a cross-sectional design; Monkhouse et al.[27] conducted a retrospective review of the records of 1000 children; and Ibrahim et al.[34] conducted a community-based cross-sectional study which included 866 children.

The present study enrolled MNE children from 5-15 years old (with a mean age of 7.25±2.3 years), the frequently reported age for bedwetting. The evidence confirmed that MNE is typically highly prevalent in children under 10 years old,[35-37] declining in children older than 10 years.[37] The results demonstrated that MNE is distributed unequally in both sexes and is more prevalent in boys than girls, which disagreed with previous reports by Hamed et al.[37] and Karaci et al.,[17] who found equal distribution. Nonetheless, non-significant differences existed between boys and girls regarding the presence or absence of obesity and overweight among the 60 children with MNE. Conversely, Yeung et al.[38] confirmed a higher prevalence of MNE in girls than boys; however, Schum et al.[39] and Schum et al.[40] reported that MNE is more prevalent in boys than girls due to earlier development of successful toilet training in girls than boys.

Despite the impact of obesity on developing bedwetting, however, family history might also partially contribute to MNE, especially after the determination of several certain genetic links that might predispose to the hereditary development of MNE.[23] Obesity by itself has a genetic association with parents, which means that parents who have a family history of obesity will develop obesity in their childhood with subsequent development of MNE.

Nonetheless, in our study, non-significant differences (P=0.23) existed between participants' positive and negative family histories of enuresis regarding the presence or absence of obesity and overweight in the MNE children. Moreover, a non-significant correlation existed between BMI increments and weekly frequency of enuresis, indicating that obesity is only partially a risk factor for enuresis and that the etiology of MNE is multifactorial, involving family history,[23] sex,[40] age,[35-37] psychological situation,[19,23] and socioeconomic factors.[27,34]

Despite these explanations of the role of obesity and family history in developing MNE, social and family history shouldn't be ruled out due to their impact on children's psychology, considering that children react more sensitively toward their environment than adults.[17,19,23,27,34]

Conclusion

The findings of this study provide evidence that obesity and overweight in children have an influence on the development of MNE. The children under 10 years of age are more active in developing MNE with no impact of gender differences on increasing BMI among girls and boys with MNE. The present study found that a positive family history of enuresis has a significant impact on the development of MNE but no additional impact on the prevalence of overweight and obesity in those children suffering from MNE.

Competing Interests

The authors declare that they have no competing interests.

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