

Factors associated with overweight and obesity in preschool children

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ABSTRACT

Aim To determine factors associated with overweight/obesity in preschool children.

Methods This cross-sectional study was carried out in paediatric outpatient departments of the Public Institution Primary Health Care Centre of Canton Sarajevo, Bosnia and Herzegovina. The study included 300 preschool children who were divided into two groups: normal weight (n=150) and overweight/obese (n=150). Children were weighed and measured and body mass index was calculated. Data concerning potential childhood overweight/obesity risk factors (sociodemographic characteristics of child and mother, physical activity and sedentary behaviour of the child) were collected using a designed questionnaire filled in by the mothers. Logistic regression analysis was used to estimate the association between potential risk factors and overweight/obesity in preschool children.

Results Male gender of the children (p=0.043) and maternal overweight (p=0.000) were positively associated with child overweight/obesity. Male children were 1.6 times more likely to be overweight/obese than female (95% CI: 1.01-2.53). Children of overweight mothers were 3.34 times more likely to be overweight/obese than children with mothers of normal weight (95% CI: 1.77-6.28). Physical activity (<60 minutes/day) (p=0.014), screen time >180 minutes/day (p=0.020), regular snacking while watching television, using computer/tablet/mobile phones (p=0.000) were associated with overweight/obesity status of the preschool children.

Conclusion Public health programs that aim to reduce overweight/obesity in preschool children should mainly help mothers understand the serious risk of childhood obesity and the importance of them creating a healthy lifestyle in childhood.

Key words: paediatric obesity, screen time, exercise, mothers

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INTRODUCTION

The obesity epidemic in preschool children is on the rise and represents a serious public health challenge (1). Recent evidence suggests that in obese children most of their excess weight is gained before the age of five years (2). Studies have indicated that childhood obesity is associated with the development of noninsulin-dependent diabetes at an early age (3). Obese children are more likely to suffer mental health issues and psychosocial problems and even discrimination (4). Childhood obesity predicts obesity in adulthood (5) and later cardiovascular disease (6).

Studies have shown that many factors can potentially be associated with overweight/obesity in preschool children (7,8). From this, factors which are on the maternal side were marital status, level of education, employment and weight status (9). Some previous studies found that maternal characteristics had a stronger effect on children's weight status than paternal characteristics (10). This effect is mainly accounted for by a combination of genetic and behavioural factors, as mother has a strong influence on their children's eating and drinking habits, as well as on their activity levels (11).

One of the factors related to overweight and obesity in preschool children is insufficient physical activity (12). Today, young children are sedentary for a significant portion of the day (13). Most studies focused on screen time as an indicator of sedentary behaviour (14). There is solid evidence that increased screen time has been associated with overweight, obesity in preschool children within multiple cohorts and studies (15,16). Marsh et al. reported that there was strong evidence that screen time in the absence of food advertising was associated with increased dietary intake compared with non-screen behaviour (17).

Considering the rapid rise in prevalence of early-onset obesity in preschool children, and its links to later childhood and adult obesity, particular attention should be paid to identifying the early life risk factors for overweight /obesity.

No studies examined the factors associated with overweight and obesity (sociodemographic characteristics of child and mother, physical activity and sedentary behaviour of child) in preschool children in Bosnia and Herzegovina, but only those which examined obesity in elementary and secondary school students (18).

The aim of this study was to determine factors associated with overweight/obesity in preschool children in Sarajevo Canton.

EXAMINEES AND METHODS

Examinees and study design

This cross-sectional study was carried out at the Paediatric Outpatient Department of the Public Institution Primary Health Care Centre of Canton Sarajevo, Bosnia and Herzegovina (B&H) in the period March – July 2019.

The study included preschool children. According to Kail (19), preschoolers are defined as children between 4 and 6 years of age. A total of 300 children (150 of normal weight and 150 overweight/obese) were selected from patients who used health care services at the Primary Health Care Centre during the study period. It was combined overweight and obese children, based on previous research suggesting that children who are overweight are at risk of becoming obese (20).

The inclusion criteria were children aged 4-6 years who had a medical record in the Primary Health Care Centre of the Sarajevo Canton, without contraindications for physical activity. The exclusion criteria were children younger than 4 or older than 6 years, children who did not have medical records at the Primary Health Care Centre of the Sarajevo Canton, known contraindications for physical activity.

The Ethics Committee of the School of Medicine, University of Sarajevo, approved the study. For this research, a written consent of the General Director of the Primary Health Care Centre of the Sarajevo Canton was obtained. An informed consent for participation in the study was taken from all mothers.

Methods

A questionnaire was administered to mothers accompanying their children to the Primary Health Care Centre. The questionnaires were given to mothers while they were waiting for the appointment. The sociodemography section requested information on the child and mother. There were two items about the child (age, gender) and three items concerning the mother: marital status (living with a spouse/co-habiting subject), single, divorced and widowed), level of education (incomplete elementary school, completed elementary school, completed secondary school, com-

pleted high school/university) and employment status based on mothers' stated employment during an interview (employed or not employed).

The mothers reported average minutes that their child spent in moderate to vigorous intensity physical activity (that makes him/her out of breath or warmer than usual) daily. According to the World Health Organization (WHO) physical activity guidelines, preschool children who are physically active for at least 60 minutes of moderate-to-vigorous intensity physical activity (MVPA) daily were considered as compliant with the WHO physical activity recommendations (21).

The mothers reported average minutes per day their child sat and watched television, and also the time the child used a computer/ tablet/ mobile phones. The specific questions asked were, "Over the past 30 days, for how many minutes on average per day did the child sit and watch TV?" and "Over the past 30 days, for how many minutes on average per day did the child use a computer/tablet/mobile phone?" We summed up average minutes of television and computers/ tablet/ mobile phones to estimate "screen time." We defined high screen time as greater than 120 minutes (2 hours) per day (22).

Variables "snacks in front of TV" and "snacks in front of computers/tablet/mobile phones" were grouped in "snacks in front of screens", with three options of answers: never, sometimes, and always eats snacks in front of screens.

The mothers were asked to indicate their own height and weight. Maternal body mass index (BMI) was calculated as underweight (BMI <18.5), normal-weight (18.5 < BMI <24.9), overweight (BMI ≥25-29.9), and obese (BMI ≥30). Children were weighed and measured, and BMI was calculated. Weight was measured with the child in light clothing, to the nearest 0.1 kg. Standing height was recorded without shoes to the nearest 0.1 cm. The BMI was calculated as weight (kg) divided by height in square meters (m²). The BMI categories were defined according to the WHO reference curves for different age and gender groups (23): normal weight (BMI between 5th-85th percentiles), overweight (BMI between 85th-95th percentiles), and obese (BMI ≥85th-95th percentiles). The mothers were also asked to report their weight and height.

Statistical analysis

Testing of the difference in the distribution of potential childhood overweight/obesity risk factors

between normal weight and overweight/obese group was performed by χ^2 test.

The individual effects of potential childhood overweight/obesity risk factors on the presence of child overweight/obesity were obtained by logistic regression analysis through the calculation of the odds ratio (OR). The level of significance was set at $p < 0.05$, and the confidence level of 95%.

RESULTS

The study evaluated 300 children in two groups of 150 each (i.e. normal weight and overweight/obese).

More male children were in the overweight/obese than in the normal weight group, 82 (55.0%) and 65 (43.3%). More female children were in the normal weight group than in the overweight/obese, 85 (56.7%) and 67 (45.0%).

Most of the children in the normal weight and overweight/obese group, 124 and 123 (82.7% and 82.0%, respectively) resided in 2-parent households, with both their biological mother and father.

Maternal education level in the normal weight and overweight/obese group was not significantly different ($p = 0.448$). Maternal education level included mainly high school/ university education, 86 (57.3%) in the normal weight group and 92 (61.3%) in the overweight/ obese group.

Maternal employment in the normal weight and overweight/obese group was not significantly different ($p = 0.803$). Slightly more children of employed mothers were in the overweight/obese group than in the normal weight, 105 (70.0) and 102 (68.0), respectively.

Among normal weight children, 16 (10.7%) lived with an overweight mother, and five (3.3%) lived with a mother who was obese. Among overweight/obese children, 43 (28.7%) lived with an overweight mother, and six (4.0%) lived with a mother who was obese.

A total of 87 (58.0%) children in the normal weight group and 65 (43.3%) in the overweight/obese group spent at least 60 minutes each day in MVPA.

A total of 14 (9.3%) children in the normal weight group and eight (5.3%) in the overweight/obese group achieved screen time recommendations (<2 hr per day).

Four times more children with regular snacking while watching television, using computer/tablet/mobile phones was in the overweight/obese group

Table 1. Distribution and association of risk factors and overweight/obesity in preschool children

Potential risk factor	No (%) of children		P	Logistic regression analysis	
	Normal weight	Overweight / obese		OR (95% CI)	p
Child gender					
Female	85 (56.7)	67 (45.0)	0.049	1	
Male	65 (43.3)	82 (55.0)		1.6 (1.01-2.53)	0.043
Family status					
Two-parent family (married)	124 (82.7)	123 (82.0)	0.582	1	
Single parent family (divorced)	25 (16.7)	27 (18.0)		1.09 (0.59-1.98)	0.780
Single parent family (single)	1 (0.7)	0 (0.0)		0.34 (0.01-8.33)	0.505
Maternal education level					
Completed high school /university	86 (57.3)	92 (61.3)	0.448	1	
Completed secondary school	64 (42.7)	57 (38.0)		1.2 (0.46-1.91)	0.437
Incomplete/completed elementary school	0 (0.0)	1 (0.7)		0.36 (0.01-8.87)	0.529
Maternal employment					
Yes	102 (68.0)	105 (70.0)	0.803	1	
No	48 (32.0)	45 (30.0)		1.09 (0.68-1.79)	0.7081
Maternal body mass index status					
Normal weight	123 (82.0)	99 (66.0)	0.001	1	
Underweight	6 (4.0)	2 (1.3)		0.41 (0.08-2.09)	0.286
Overweight	16 (10.7)	43 (28.7)		3.34 (1.77-6.28)	0.000
Obese	5 (3.3)	6 (4.0)		1.49 (0.44-5.03)	0.519
Physical activity (minutes/day)					
≥60	87 (58.0)	65 (43.3)	0.039	1	
30-59	59 (39.3)	79 (52.7)		1.79 (1.12-2.86)	0.014
< 30	4 (2.7)	6 (4.0)		2.01 (0.54-7.41)	0.295
Sedentary behaviour					
Screen time (minutes/day)					
< 120	14 (9.3)	8 (5.3)	0.022	1	
120-180	118 (78.7)	107 (71.3)		1.59 (0.64-3.93)	0.318
> 180	18 (12.0)	35 (23.3)		3.40 (1.20-9.61)	0.020
Snacks in front of screens					
Never	49 (32.7)	14 (9.3)	0.000	1	
Always	14 (9.3)	56 (37.3)		3.22 (1.65-6.27)	0.000
Sometimes	87 (58.0)	80 (53.3)		1.14 (0.49-2.63)	0.753

OR, odds ratio; CI, confidence interval

up, 56 (37.3%), than in the normal weight group, 14 (9.3) (Table 1).

Male gender of the children ($p=0.043$) and maternal overweight ($p=0.000$) were positively associated with child overweight/obesity. Male children were 1.6 times more likely to be overweight/obese as female (95% CI: 1.01-2.53). Children of overweight mothers were 3.34 times more likely to be overweight/obese than children with mothers of normal weight (95% CI: 1.77-6.28).

Family status, maternal education level and maternal employment were not significantly associated with overweight/obesity status of the preschool children.

Physical activity <60 minutes/day ($p=0.014$), screen time >180 minutes/day ($p=0.020$), regular snacking while watching television, using computer/tablet/mobile phones ($p=0.000$) were associated with overweight/obesity status of the preschool children. Regular snacking in front of the screens is a practice that triples children's risk of becoming obese (95% CI: 1.65-6.27). (Table 1).

DISCUSSION

This study investigated the factors associated with overweight/obesity in preschool children in Sarajevo Canton. The results of this study showed that maternal overweight had a significant association with child overweight/obesity. Similar to our finding, Janjua et al. found that children of overweight and obese mothers were more likely to be obese and overweight at the age of 5 (24). Those results match previous studies and suggest that maternal excess weight has an important role on child's BMI (25,26). This relationship can be explained through both genetic and lifestyle factors passed on from mothers to their children (27).

In this study, male children are found more likely than female to be overweight/obese. Overweight and obesity rates in preschool children in the European Union are generally higher in boys than in girls (28). This may be attributable to different body standards for boys and girls. For example, mothers may think that boys should eat more to grow faster, which encourages overeating and can lead to obesity. In addition, the prevalence of overweight and

obesity in Turkish children aged less than 7 years was without gender difference (29).

Research on relationship between maternal education level and overweight /obesity in preschool children has not provided a definite answer. Some studies, as well as this one, have not found a statistically significant relationship (30). Previous studies across 11 European countries have indicated that low maternal education could yield a substantial risk of early childhood obesity (31). Interestingly, the association between maternal education and children's weight status in China is different from that in western countries. In China, the obesity rate among children with high maternal education is higher than that of lower maternal education (32).

A growing research literature has explored the relationship between maternal employment and children's body mass index (BMI) (33,34). A systematic review using six studies from the United States of America, the United Kingdom, Germany and Japan, concludes that maternal employment is associated with an increased risk of overweight /obesity for children (35). The employed mothers spent less time on meal preparation and healthy weight management than unemployed mothers as documented by Savage et al. (36). In this study maternal employment was not significantly associated with overweight/obesity status of the preschool children. Regarding other risk factors for overweight / obesity, our results fit into known patterns; as in other studies, screen time viewing was positively (37,38), whereas physical activity was inversely associated with childhood overweight or obesity in preschool age children (39).

The number of hours in front of TV is directly

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related to consumption of unhealthy food throughout the day (40). Studies have revealed that children consume a large proportion of their daily calories and meals while watching screen media (41). In this study, regular snacking in front of screens is a practice that triples children's risk for becoming obese.

This study aimed to focus on the role of sociodemographic characteristics of child and mother, physical activity and sedentary behaviour of the child, but many other factors of the family environment might influence children's obesity. Therefore, future research is needed to explore other potential factors associated with overweight/obesity in preschool children that were not included in the present study.

In conclusion, this study demonstrated a significant association between maternal overweight and children's weight status. This suggests that early interventions for childhood obesity should focus on children of overweight or obese mothers. In addition, factors including screen time viewing and physical activity are also associated with children's weight status. Educating parents, specially mothers on the screen-use recommendations and the negative health risks of excessive screen use, as well recommendations for physical activity may improve parental awareness and monitoring of their children's sedentary behaviour and physical activity.

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