

**ASSOCIATION BETWEEN BREASTFEEDING AND OVERWEIGHT/OBESITY IN  
BULGARIAN CHILDREN AGED 3-6 YEARS**

**Penka Gatseva<sup>1</sup>, Adolf Alakidi<sup>2</sup>, Victoria Atanasova<sup>1</sup>, Georgi Kavlakov<sup>3</sup>, Anelia Bivolarska<sup>4</sup>**

<sup>1</sup>*Department of Hygiene, Faculty of Public Health, Medical University - Plovdiv, Bulgaria*

<sup>2</sup>*Department of Epidemiology and Hygiene, Faculty of Medicine, Medical University – Sofia, Bulgaria*

<sup>3</sup>*Medical College, Medical University - Plovdiv, Bulgaria*

<sup>4</sup>*Department of Medical Biochemistry, Faculty of Pharmacy, Medical University - Plovdiv, Bulgaria*

**Abstract**

Obesity has dramatically increased worldwide, and this is linked to lifestyle. Childhood overweight is a precursor to obesity in adulthood. The benefit of breastfeeding in infancy, especially in the first 6 months of life, has been proven, although with ambiguous conclusions from some authors. The aim of this study was to investigate the association between breastfeeding and frequency of overweight and obesity in kindergartners. The parents of 1116 kindergartens aged 3 to 6 in the city of Plovdiv were surveyed. Anthropometric measurements of height and weight and body mass index were determined according to WHO criteria, 2006. The results showed that 73.8% of the children were of normal body weight and the majority (74.1%) of the children had been breastfed during the first year of life. 75.8% of parents reported sufficient health knowledge. A statistically significant negative relationship was found between breastfeeding and the incidence of overweight children. In conclusion, breastfeeding is associated with low odds of overall obesity and high body fat in 3- to 6-year-old Bulgarian children. Greater health care and a high health culture towards promoting and supporting breastfeeding can benefit children and adolescents by reducing their chances of being overweight and obese.

**Key words:** *breastfeeding, overweight, childhood, health education*

**Introduction**

Obesity has dramatically increased worldwide, and this is linked to lifestyle [1]. Between 1980 and 2013, childhood obesity increased by 47.1% globally [2]. Childhood overweight is a precursor to obesity in adulthood [3]. Obesity risk factors are associated with the development of type 2 diabetes and cardiovascular disease in both adolescence and adulthood [4, 5]. Therefore, the main place should be allocated to prevention. The benefit of breastfeeding in infancy, especially in the first 6 months of life, has been proven, although with ambiguous conclusions from some authors. According to some studies the effect is significant [6, 7, 8, 9], according to others it is weak or absent [10, 11]. The different findings are related to factors other than breastfeeding, such as genetics, socioeconomic status, and lifestyle factors (eg, activity and dietary habits) as important predisposing factors [12]. In addition, mothers with gestational diabetes, birth weight, children's moderate to vigorous physical activity, diet, sedentary behavior, and sleep duration may confound the association between breastfeeding and the risk of later childhood obesity. The aim of the present study was to investigate a relation between breastfeeding as a preventive factor regarding the frequency of overweight in children. The report is the third part of a larger study on the subject and includes 9 kindergartens in the city of Plovdiv.

**Materials and methods**

The study was conducted in nine kindergartens situated in the town of Plovdiv. The parents of 1116 children (536 boys and 580 girls) aged from 3 to 6, attending 9 kindergartens in Plovdiv, were interviewed anonymously. The anthropometric measurements of height and body weight of children and their body mass index (BMI) were determined on the basis of international criteria of WHO, 2006 [15, 16]. The distribution of children in kindergartens is as

follows: kindergarten "Chervena Shapchitsa" (KG 1) - 222 children (19.9%); kindergarten "Velimira" (KG 2) - 118 children (10.6%); kindergarten "Desislava" (KG 3) - 122 children (10.9%); kindergarten "Slantse" (KG 4) - 128 children (11.5%); kindergarten "T. Savicheva" (KG 5) - 141 children (12.6%); kindergarten "Dr. E. Borou" (KG 6) - 83 children (7.4%); kindergarten „Edelvais" (KG 7) - 101 деца (9.1 %); kindergarten „Kremena" (KG 8) - 101 деца (9.1 %) kindergarten „Luliak" (KG 9) - 100 деца (8.9%). For the purposes of the study, a corresponding questionnaire was used, which included questions about social status, level of health knowledge of parents, health status of children, breastfeeding, immunizations and etc. The answers of the questionnaire were taken to constitute informed consent. Alternative analysis,  $\chi^2$  criterion, Pearson correlation coefficient were used for statistical data processing.

### Results and Discussion

The analysis of the social status of the parents shows that in 89.07% of the cases both parents work; in 7.97% only the father works, and in only 2.06% of the children the parents are unemployed. Parents with higher education predominate (61.56%), followed by those with secondary education (36.6%), and only 17 (1.57%) have primary education. The children who are the subject of this study are from the first (52.15%) and second consecutive pregnancies (42.3%), and in 3.9% - from the third and fourth pregnancies and in 88.4% the pregnancy was normal without complications. Most of the studied families have one (42.5%) or two (51.7%) children, and the remaining 5.7% have three or more children. In the assessment of the children body weight on the basis of the indicator body mass index the following results were obtained (**Fig. 1**):

Fig.1

The figure shows that the percentage of children with normal weight prevails, as it is in the range of 67.80% for children from kindergarten Edelvais (KG 7) to 82.90% for kindergarten Dr. E. Borou (KG 6). A total of 824 (73.8%) of the studied children were with normal body weight. There is a higher percentage of overweight children in kindergarten Luliak (KG 9) - 17% and of obesity in kindergarten Edelvais (KG 7) – 14.4%. It is of particular interest that a total of 7.08% (n = 79) of the children are with underweight.

About 2/3 of the children (76.5%) are breastfed during the first year after birth, which is a proof of a good health culture of the parents, in particular the mothers. The duration of breastfeeding varies from 3 to more than 12 months, with the largest percentage of mothers (20.9%) who breastfed their children for 6 months, followed by those who breastfed for 3 months (20.61%). The duration of breastfeeding in 17.38% of the studied parents amounts to more than 12 months. As a main reason for stopping breastfeeding, most mothers indicate a shortage or cessation of breast milk (**Fig. 2**).

Fig.2

The figure shows that the percentage of children who are breastfed varies from 70.92% to 87.40% in different kindergartens. The percentage of those who are not breastfed is in the range of 12.60% to 29.08%. **Fig. 3** shows the percentage of children who are breastfed for different periods of time - most often they are breastfed until the sixth month, but it is interesting that in children from kindergarten Kremena (KG 8), kindergarten Desislava (KG 3) and kindergarten T. Savicheva (KG 5) increases the frequency of breastfed children up to the age of one and after one year. The percentage of children from kindergarten Dr. E. Borou (KG 6) and kindergarten Kremena (KG 8), who are breastfed after the age of one, is relatively higher.

Fig. 3

In our study, a statistically significant negative association was found between breastfeeding and the risk of more frequent illness of children ( $\chi^2 = 174.55$ ,  $P < 0.0001$ ,  $r = -0.40$ ). To the question "Are you familiar with the method of "exclusive breastfeeding"?" 33.78% of the parents answered positively, but more than half (50.63%) did not have information about it.

The association between breastfeeding and the frequency of overweight was assessed, in children attending different kindergartens. The results show a statistically significant negative relation between breastfeeding and children overweight for all studied kindergartens ( $\chi^2 = 167.41$ ,  $P < 0.0001$ ,  $r = -0.42$ ).

The role of health education and parental culture in this direction is crucial. The results of a survey on the level of health education among parents of children show that 75.7% of parents have sufficient health knowledge; 19.71% define their knowledge as insufficient, and a minimal percentage (2.06%) declare that they have no health knowledge [17]. There is a statistically significant association between the level of education of parents and their health knowledge and culture ( $\chi^2 = 32.21$ ,  $P < 0.001$ ).

The contemporary significance of breastfeeding is associated with reducing the risk of the development of obesity and chronic non-communicable diseases, receptivity to infectious diseases, the risk of malnutrition and, last but not least, the proper growth and development of children [13]. According to WHO, child obesity is one of the global health problems of the 21st century [18, 19]. Improving the health of the nation is a major strategic goal set out in the National Health Strategy of Bulgaria 2021-2030 with a focus on children's health. The fulfilment of the set goals could not be accomplished without the support of the family doctor, who has a significant contribution for promoting health culture of the parents. It is no coincidence that the parents of the children point out the general practitioner as the preferred source of health information [17].

In a number of large-scale studies on the issue of "breastfeeding and overweight in children" have shown that premature infants are at risk [13, 14]. In our study, their percentage is minimal and would not have a particular importance.

The level of education and qualification, income and profession become determining criteria for the lifestyle and the number of children born in the family [20]. It is closely related to the level of health literacy of parents, including the importance of breastfeeding in protecting the health of their child. According to current recommendations of WHO and leading pediatric associations, breastfeeding should continue as long as the mother and baby want it [19]. The role of breastfeeding is extremely important in protecting the children health, including from chronic non-communicable diseases [13]. The results of our study show that children who are breastfed are less likely to get sick.

The fact that more than half of the interviewed parents are not familiar with the method of "exclusive breastfeeding" shows the need for health education of expectant mothers about the benefits of practicing this method of breastfeeding, which means that only breast milk is taken for a period of 6 months. Exclusive breastfeeding is recommended by WHO for 6 months [21] but this goal is difficult to achieve [22 23]. Exclusive breastfeeding protects the child from allergies, atopic dermatitis, intestinal infections, reduces the risk of overweight and diabetes, has a positive effect on the neuropsychological development of the child and increases his immunity [24].

**In conclusion**, breastfeeding is associated with low odds of overall obesity and high body fat in 3- to 6-year-old Bulgarian children. Greater health care and a high health culture towards promoting and supporting breastfeeding can benefit children and adolescents by reducing their chances of being overweight and obese.

### Conflict of Interest

Authors do not declare a conflict of interest.

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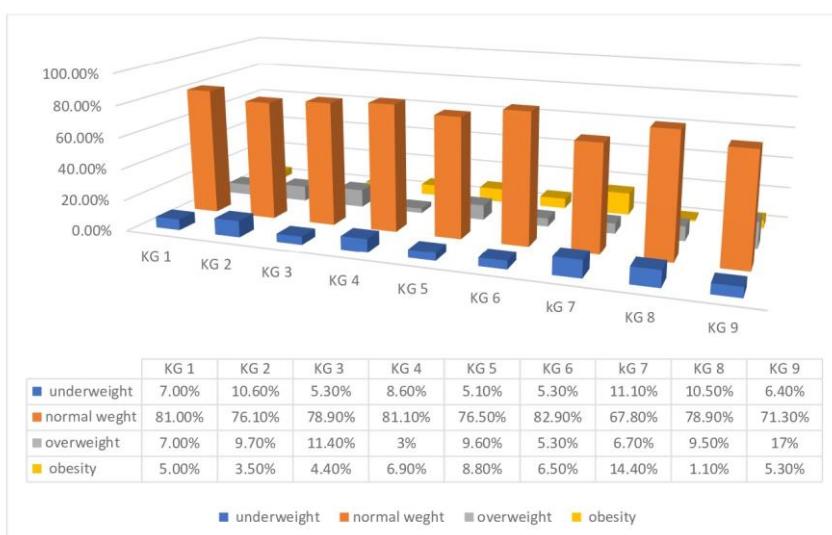
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### Legends to figures:

*Fig.1 Comparative assessment of the children body weight of from the studied kindergartens*



*Fig. 2 Relative part (%) of children who are breastfed and relative part of children (%) who are not breastfed*

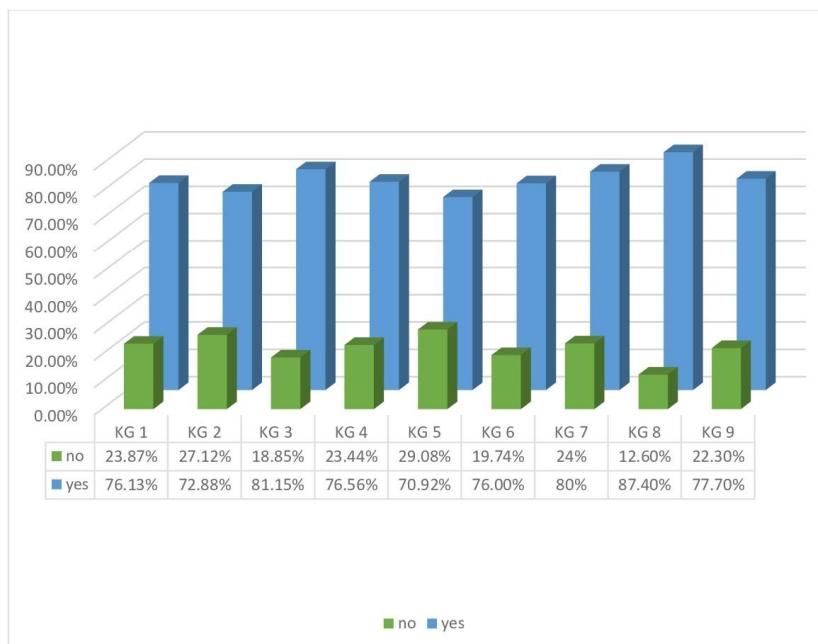


Fig.3 Relative part (%) of children breastfed for a different period of time

