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The Cut-Off Point of Obesity among Under-Five Children and Analyse the Trend in Bangladesh

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Abstract

Obesity causes many complicated health conditions and diseases. None of the studies concerned the obese group among under-five children. The paper aims to determine the cut-off point of obesity among under-five children and analyze the trend in Bangladesh. Secondary data of sample size 6016, 5300, 7647, 6965, and 7849 were extracted from Bangladesh Demographic and Health Survey (BDHS) 2004, 2007, 2011, 2014, and 2018 respectively. The percentage has been computed to analyse the trend. In this paper, it has been proposed that Z-score 3SD or above and Z-score above or equal to 2SD and less than 3SD weight-for-height is the cut-off-point for obese and overweight among under-five children. Using the cut-off-point it has been found that 0.60%, 0.38%, 0.56%, 0.36%, and 0.61% under-five children were obese in 2004, 2007, 2011, 2014, and 2018, respectively. This paper has revealed that Bangladesh is going to experience significantly another arm of under-five child malnutrition which is over-nutrition. Therefore, Government and policymakers should reform their strategy to manage under-five child malnutrition in Bangladesh.

Keywords: Childhood obesity, Under-five child malnutrition, Cut-off-point, BDHS, Bangladesh.

AMS Classification: 65C60.

1. Introduction

Malnutrition refers to deficiencies, excesses, or imbalances in a person's energy intake and/or nutrients. The term malnutrition covers two broad groups of conditions. One is 'undernutrition'—which is caused due to micronutrient deficiency or insufficiency (a lack of important vitamins and minerals). The other is the overconsumption of certain nutrients, such as protein, calories, or fat, can also lead to malnutrition. This usually results in overweight or obesity. Overweight and obesity, a key issue in health research, is defined as abnormal or excessive fat accumulation that presents a risk to health. A crude population measure of obesity is the body mass index (BMI), a person's weight (in kilograms) divided by the square of their height (in meters). A person with a BMI of 30 or more is generally considered obese. A person with a BMI equal to or more than 25 is

deemed to be overweight. Overweight and obesity are major risk factors for many chronic diseases, including diabetes, cardiovascular diseases, and cancer. Once thought a problem only in high-income countries, overweight and obesity are now dramatically on the rise in low- and middle-income countries, particularly in urban settings [1].

Childhood obesity is also identified as a severe public health problem, with more than a billion-children affected worldwide [2]. Childhood obesity leads to the risk of obesity in adulthood and long-term health consequences such as type II diabetes, cardiovascular disease (CVD), hypertension, hyperlipidemia, certain forms of cancer, a respiratory and skin problems [3]. These non-communicable diseases (NCDs) cause premature mortality and long-term morbidity. Moreover, overweight and obesity in children are associated with significant reductions in quality of life and a greater risk of teasing, bullying, and social isolation [4].

In developing countries, policymakers and researchers are rushing to how to minimize under-nutrition among children. On the other hand, over-nutrition among children is neglected as a research topic. As a result, in developing countries, there is a growing recognition of the emergence of a "dual problem" of malnutrition, with under and over nutrition co-occurring among children, particularly allied with the improvement of economic conditions [5]. The nutritional status of under-five children is the most sensitive and priority topic of public health issues. However, if a developing country like Bangladesh faces 'overweight and obesity' among under-five children severely, it will be tough to control in near future along with under-nutrition. Therefore, this study aims to determine the cut-off point of the obesity group among under-five children in Bangladesh and analyse the trend.

2. Proposed Cut-Off point for Obesity

Secondary data collected by the Bangladesh Demographic Health Survey (BDHS) 2004, 2007, 2011, 2014, and 2018 have been used in this paper. According to WHO, child malnutrition indicators are categorized on z-score value with comparing to the Standard deviation, which is given below:

Nutritional Status	Indicator
Well-nourished	$-2sd \leq$Z-score $\leq +2sd$
Moderately malnourished	-3sd $\leq$ Z-scores < -2sd
Severely malnourished	Z-scores < -3sd
Over nourished	Z-scores > +2sd

The prevalence of malnutrition is calculated according to the report of the WHO working group (World Health Organization, 1986).

Proposed categories:

Nutritional Status	Indicator
Well-nourished	$-2sd \leq$ Z-score $\leq +2sd$
Moderately malnourished	$-3sd \leq$Z-score<-2sd
Severely malnourished	Z-scores < -3sd
Moderate over nourished	2sd <Z-score $\leq +3$sd
Severe Over nourished	Z-score>+3sd

The classification for each of the indices is made according to the report of the WHO working group (World Health Organization, 1986). Malnutrition is thus classified as severe under nourished and moderate under nourished if children with Z-scores below minus 3 standard deviations (-3SD) and if children with Z-scores between minus 3 standard deviations (-3SD) and below minus 2 standard deviation (-2SD) from the median of the WHO's reference population respectively. In a normal distribution, most values are grouped around the middle and the distribution of measurements around the median form a bell shape, as shown in Figure 1. On a standard bell-shaped curve, a Z-score indicates how far a child is from the median. Notice that most of the heights are in the middle, with very few at the extreme ends. Each segment on the horizontal axis represents one standard deviation or Z-score.

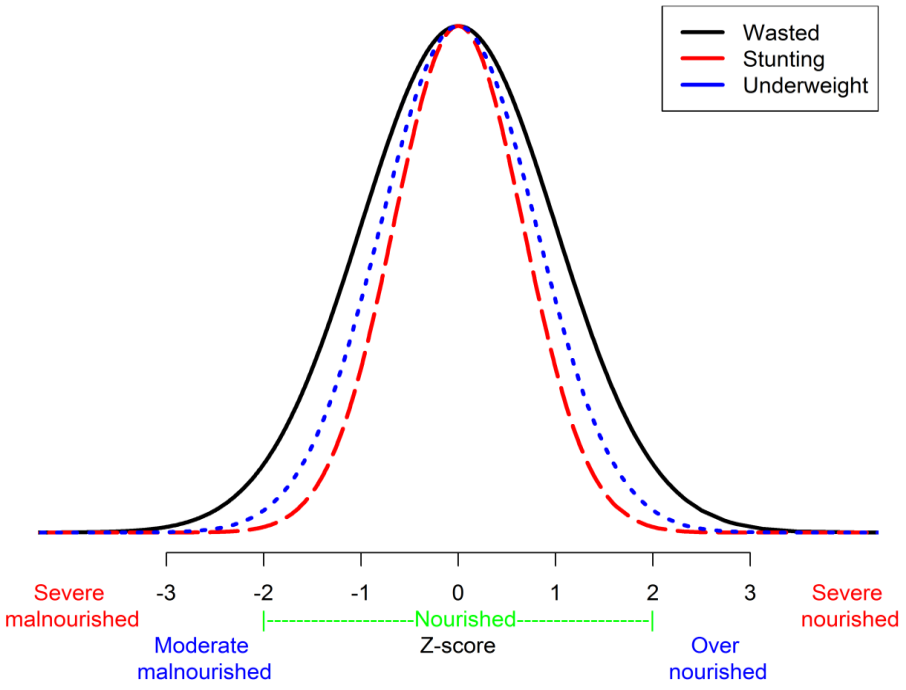

Figure 1: Distributions of Z-scores for nutritional status of under-five children.

In this normal distribution, the Z-scores are -1 to 1 are at equal distances in opposite direction from the median. The distance from the median to 1 is half of the distance to 2. Since the distributions of Z-scores for nutritional status of under-five children of Bangladesh is bell-shaped (Figure 1), therefore, it can be said that child is severe over nourished and over nourished if children with Z-scores over 3 standard deviations (3SD) and if children with Z-scores between 2 standard deviations (2SD) and below 3 standards deviate on (3SD) from the median of the WHO's reference population respectively.

However, keeping similarity to measuring BMI, among the three nutritional indicators, this paper proposes that Z-score 3SD or above weight-for-height as a standard cut-off-point to use as the basis for obese for under-five children and Z-score above or equal to 2SD and less than 3SD weight-for-height is the cut-off-point for overweight.

3. Trend analysis

Based on proposed Z-score classification of weight-for-height, analytical results are summarized in Table 1. From Table 1 and from Figure 2 it has been found that 0.55%, 0.66%, 1.00%, 0.95%, and 1.39%, were overweight and 0.60%, 0.38%, 0.56%, 0.36%, and 0.61% under-five children were severe overweight or obese in 2004, 2007, 2011, 2014, and 2018, respectively.

Table 1: Distribution of weight-for-height among under-five children in Bangladesh.

Weight-for-Height	BDHS (2004) N=6016 Frequency (%)	BDHS (2007) N=5300 Frequency (%)	BDHS (2011) N=7647 Frequency (%)	BDHS (2014) N=6965 Frequency (%)	BDHS (2018) N=7849 Frequency (%)
Severe stunted	240 (3.99)	164 (3.09)	289 (3.78)	213 (3.06)	122 (1.56)
Moderate stunted	655 (10.88)	734 (13.85)	895 (11.70)	792 (11.37)	545 (6.96)
Well nourished	5052 (83.98)	4347(82.02)	6344 (82.96)	5869 (84.26)	7007 (89.48)
Overweight	33 (0.55)	35 (0.66)	76 (1.00)	66 (0.95)	109 (1.39)
Obese	36 (0.60)	20 (0.38)	43 (0.56)	25 (0.36)	48 (0.61)

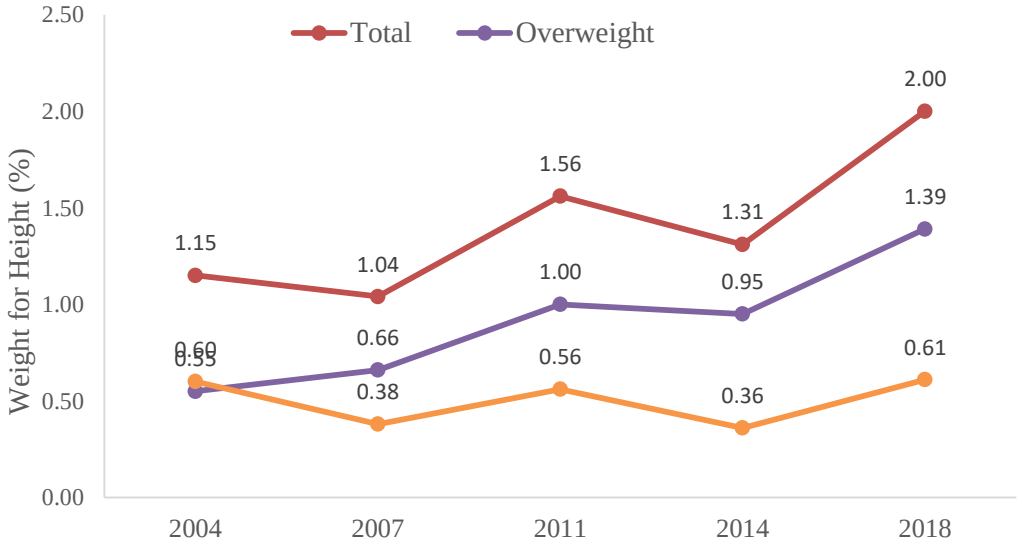

Figure 2: Trend of obese (Z≥ 3SD), overweight (2SD≤Z<3SD) and total (Z≥2SD) among under-five children in Bangladesh.

4. Discussion

Childhood overweight and obesity got attention among researchers and policymakers but under-five child 'overweight and obesity' are still neglected. However, obesity and overweight among under-five children partially might be the consequence of non-communicable diseases like gestational diabetes among mothers in pregnancy period [6,7]. Also, this obese and overweight under-five children group later will belong to the obese and overweight children group and then in adulthood. Differences in the prevalence, etiology, clinical presentation, complications, and outcome between well-nourished and malnourished individuals have been well described in the medical literature [8]. However, there was no clear information relating cut-off-point for under-five children those who are in overweight and obese. WHO (1986) defined the malnourishment indicators by categorizing the standard distribution curve (Figure 1). According to them, z-score> +2sd is over nourished. But, the obesity condition is not clearly indicated. In this paper, obesity condition and the overweight condition is clearly defined. Then using, the proposed cut-off-point trend analysis has been performed using BDHS 2004, 2007, 2011, 2014 and 2018. Analytical results have clearly visualized that the trend is upward with a bit zigzag pattern. It implies that the prevalence of overweight and obesity among under-five children is increasing year by year. On the other hand, in 2004 the ratio of "overweight and obesity" to stunted was about 3:40 and in 2008 it was about 4:17. Therefore, Bangladesh will face the serious 'overweight and obesity' problem of under-five child malnutrition in near future.

5. Conclusion

To combat the future dual burden of communicable diseases and non-communicable diseases as a consequence of being underweight and overweight, we need to understand the social perspective of overweight and obesity in the low-income countries to take appropriate measures by the Government and other stakeholders. The primary rationale of this paper is detection and prevention of obesity at an early stage may eliminate various non-communicable diseases at later stages of life of that children.

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