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Assessment of Undernutrition using Z-scores and Conventional System among the Under-five Children in a Slum of Kolkata

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Abstract **Original Research Article**

Introduction: Malnutrition does not mean only undernutrition. It manifests in different forms like undernutrition, overnutrition, and micronutrient malnutrition. Health and physical consequences of prolonged states of malnourishment among children include delays in their physical growth and motor development, lower intelligence quotient (IQ) scores, greater behavioral problems and social skill deficiencies, susceptibility to contracting diseases etc. WHO recommendation is to use the z-score or standard deviation (SD) system to grade undernutrition. Children who are more than 2 SD below the reference median (i.e., a z score of less than −2) are considered to be moderately underweight. Children with measurements below 3 SD (a z score of less than −3) are considered to be severely underweight. ***Objectives:*** This study was undertaken to assess the nutritional status of under-5 children in a slum of Kolkata according to the z-score system of classification and to compare these results with the conventional IAP classification. ***Materials & Methods****:* Sample size was calculated based on prevalence. Data collection was done over a period of 3 months. Separate growth charts were used for boys and girls as per the WHO guidelines. Data were collected using pretested proforma and were analyzed using Microsoft Excel and other statistical softwares. ***Results & Analysis:*** The overall prevalence of underweight was 52.3%.The prevalence of female underweight was higher in all the age groups in comparison to male. Among the female participants, at least half or more than half were always remained underweight in any age group. The prevalence of normal children was higher according to z score system (47.7 vs 40.9), it measured four times higher prevalence of severely underweight than the IAP system. The IAP system identified 6.8% more children as underweight, whereas the z-score system identified 13.7% more children as severely underweight. ***Conclusion:*** The z-score system cannot measure the exact prevalence of undernutrition in a community.
Keywords: Undernutrition, IAP, z-score, under-five.

INTRODUCTION

Malnutrition does not mean only undernutrition. It manifests in different forms like undernutrition, overnutrition, and micronutrient malnutrition [1]. Health and physical consequences of prolonged states of malnourishment among children include delays in their physical growth and motor development, lower intelligence quotient (IQ) scores, greater behavioral problems and social skill deficiencies, susceptibility to contracting diseases, and others[2,3]. In India, the nationwide Integrated Child Development Services (ICDS) program used the IAP criteria to grade undernutrition earlier [4]. The World Health Organization (WHO) recommendation is to use the z-score or standard deviation (SD) system to grade undernutrition. Children who are more than 2 SD below the reference median (i.e., a z score of less than −2) are considered to be moderately underweight. Children with measurements below 3 SD (a z score of less than −3) are considered to be severely underweight [5]. India adopted the WHO Child Growth Standards (April 2006) in February 2009 for monitoring the growth and development of young children within the National Rural Health Mission and the ICDS program [6]. With this background, the present study was undertaken to assess the nutritional status of under-5 children in a slum of Kolkata according to the Z score system of classification and to compare these results with the conventional IAP classification.

MATERIALS & METHODS

A cross-sectional study was conducted among the children less than 5 years of age (up to 59 completed months) residing in an urban slum of Kolkata. Data collection was done over a period of 3 months from January 2019 to March 2019. Based on

the prevalence of malnutrition (P) in slums as 68% from the previous study, 7 and allowable error (d) of 10%, the estimated sample size was 88. A slum was chosen by stratified random sampling. The required numbers of children were selected by simple random sampling after preparing a sampling frame properly. Children who were not resident of the slum, but were visiting and children of families who had moved into the slum within the past 1 month were excluded from the study population. The exact age of the child was computed from the child's date of birth written on the immunization card. Separate growth charts were used for boys and girls as per the WHO guidelines. Data were collected using pretested proforma and were analyzed using Microsoft Excel and other statistical softwares.

RESULTS & ANALYSIS

Table-1: Prevalence of Undernutrition among the Study Population according to Age Group and Sex (n = 88)

Age group (months)	No. of male children	No. of underweight males	No. of female children	No. of underweight females	Total no. of studied children	Total no. of underweight children
0-11	8	3 (37.5)	6	3 (50)	14	6 (42.9)
12-23	10	7 (70)	7	4 (57.1)	17	11 (64.7)
24-35	6	3 (50)	11	6 (54.5)	17	9 (52.9)
36-47	10	4 (40)	8	5 (62.5)	18	9 (50)
48-59	14	6 (42.9)	8	5 (62.5)	22	11 (50)
Total	48	23 (47.9)	40	23 (57.5)	88	46 (52.3)

Figures in parentheses indicate row percentages on the particular group

Table-2: Comparison Between the IAP System and the z Score System of Grading Undernutrition (n = 88)

IAP System of Grading Under nutrition	z Score System of Grading Under nutrition			Total
	Normal	Moderately underweight (< -2SD)	Severely underweight (<-3SD)	
Normal	36	00	00	36 (40.9)
Mild undernutrition (grade I)	06	21	00	27 (30.7)
Moderate undernutrition (grade II)	00	09	12	21 (23.9)
Severe undernutrition (grade III, IV)	00	00	04	04 (4.5)
Total	42 (47.7)	30 (34.1)	16 (18.2)	88 (100)

Figures in parentheses indicate total percentages

Table 1 shows the prevalence of underweight among the under 5 children in both sexes separately according to some specified age-groups. The overall prevalence of underweight was 52.3%.The prevalence of female underweight was higher in all the age groups in comparison to male. Among the female participants, at least half or more than half were always remained underweight in any age group.

Table 2 attempts to compare two different grading system of under nutrition, namely IAP system and Z score system. Although the prevalence of normal children was higher according to Z score system (47.7 vs. 40.9), it measured four times higher prevalence of severely underweight than the IAP system (4.5 vs. 18.2). In this study, among 16 severely underweight children as per z score, 12 (three-fourth) were moderately underweight as per IAP system.

In this study, more than half (52.3%) of the participants were underweight, although the prevalence was much higher among girl child. This is due to differential child-rearing practices observed, including feeding and health care–seeking behavior in our society.

DISCUSSION

In India, studies from Haryana [7] and Punjab [8] using the Z score system reported comparable prevalence levels. As per NFHS 3, at the national level, the prevalence of underweight was 40% and the corresponding values for West Bengal were 38% [9].

The IAP system identified 6.8% more children as underweight, whereas the z-score system identified 13.7% more children as severely underweight. This has high practical significance, in light of the fact that priorities for nutritional supplementation through ICDS are inclined more toward "severely undernourished" children—grades III and IV of the IAP system. A similar study done earlier in West Bengal comparing the IAP and the z score systems demonstrated comparable results—61% of the children were undernourished (3.9% severely undernourished) as per the IAP criteria, whereas 46.6% were undernourished

(6.9% severely undernourished) as per the z score system[10].

CONCLUSION

The z-score system described here cannot measure the exact prevalence of undernutrition in a community. The z-score may overestimate the prevalence of undernutrition. To overcome this problem, several new aggregate indicators were proposed at different times.

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