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An Assessment of Nutritional Status in Relation to Anthropometric Measurements in Malnourished Pre-School Children

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Abstract: Malnutrition remains a major threat to the survival, growth and development of Indian children. India is home to more than one-third of the world's under-nourished children. In 2010, one in five children was estimated to be underweight in developing countries. The WHO Health Statistics of 2012 for India showed the Alarming proportion of stunting as 47.90 per cent and that of underweight as 43.50 per cent. The evaluation of prevalence of malnutrition and its complication is the need of the hour to prevent and monitor them. Moreover, most of the children with malnutrition suffer from preventable complications and early diagnosis of malnutrition can help manage these successfully. The present study aims at evaluating the nutritional status of malnourished preschool children using the IAP classification and assessing the severity of malnutrition in relation to the mothers educational level. About 400 children in the age group of 1-5 years were studied for their Anthropometric indices. The anthropometric measurements were performed using the standard WHO anthropometric measuring tools. Standardized methods were used in all measurements and were compared with standard HARVARD classification of IAP. According to IAP criteria among underweight (67.5%), preschool children, Grade I were 55.9%, Grade II 23.7%, Grade III- 16.2% and Grade IV were 4.07%. Literacy of mother was observed to have significant impact ($p<0.01$) over the prevalence of under nutrition. In the present study high prevalence of the under nutrition and its relation with age, sex, low literacy status of mother and associated nutritional deficiencies were documented among the under five children.
Keywords: Malnutrition, IAP, Anthropometric, Anemia, etc.

INTRODUCTION

The nutritional status of a community particularly of its vulnerable groups comprising of children, expectant mother and lactating mothers has been recognized as an important indicator, of national development which in turn depends on social development indices. The "Nutrition" emerges as an important prerequisite for national development. The term malnutrition signifies an imbalance between the supply of protein and energy and the body's demand for them to ensure optimal growth and function [1]. This imbalance includes both inadequate and excessive energy intake; the former leading to under nutrition in the form of wasting, stunting and underweight, and the latter resulting in overweight and obesity [2]. In the present context malnutrition is synonymous with protein-energy malnutrition/ under-nutrition [3]. A number of studies carried out during emergency and non-emergency situations have demonstrated the association between increased mortality and increasing severity of anthropometric deficits [4]. There is strong evidence that poor growth or smaller size is associated with impaired development, and a number of studies have also demonstrated a relationship between growth status and school performance and intellectual achievement [5]. However, this cannot be regarded as a simple causal relationship because of the complex environmental or socioeconomic factors that affect both growth and development. In children normal growth and development are sings of good health and nutrition, one of the best ways to measure child's health is to measure growth. One of the easiest ways to do so is to weigh child regularly and to note his body weight increment with age in comparison with standard weight to the healthy children of the same age. Since childhood is the period of active growth, a well-nourished child can be expected to have a growth patterns characterized by predictable increments in both height and weight. Physical growth has become a readily available standard to assess the nutritional status. Of all population groups affected by malnutrition, young children need the most attention. Protein energy malnutrition and sometimes vitamin A deficiency among the young children are still severe problems in many developing countries [6, 7]. Measuring weight and height is the most common way

of assessing malnutrition in populations [8]. One out of every three children under five in developing countries is malnourished [9]. The World Health Organization estimates that approximately 150 million children (26.7%) younger than 5 years in developing countries are malnourished based on their low weight in relation to their age. An additional 200 million children have stunted height secondary to poor nutrition [10]. The number of malnourished children in the developing world has remained fairly constant. However, while experience varies by 5 regions the prevalence of malnutrition has been progressively declining: in 1970, the percent of underweight children under age five in developing countries was 46.5 percent; by 1995, this share had dropped to 31 percent [9]. In developing countries, about 206 million children (38%) were stunted, and about 49 million (9%) wasted. Mortality rates in children under five are 2.5 times higher in those that are moderately underweight, and 5 times higher in the severely underweight, children associated with malnutrition [11]. The worldwide variation of the prevalence of low height-for-age is considerable, ranging from 5% - 65% among the less developing countries [1]. Malnutrition in all its forms increases risk of disease and early death. Protein energy malnutrition for example, plays a major role in half of all under five deaths each year in developing countries [12].

MATERIALS AND METHODS

The present work "A cross sectional study on nutritional status and associated nutritional deficiencies in malnourished preschool children in relation to anthropometric measurements" was carried out at Index Medical college Hospital and Research centre, Indore (M.P.) between Jan 2016 to Dec 2017, a cross sectional study was conducted amongst children attending both indoor and outdoor of Paediatrics Department. 400 children in the age group of 1-5 years were studied for their Anthropometric indices. All children aged 1-5 years attending indoor outdoor clinic at Index Hospital and of nearby areas of Index hospital were included in the study. Non-consenting children diagnosed with congenital disorders, major illness and non-consenting parents were excluded from the study. The anthropometric measurements were done to assess the nutritional status wherein age was the only criteria used. Age was recorded by interviewing the parents or by the birth record of the child. Growth pattern of children were worked out for boys and girls separately, in respect of different body Measurements are compared with international and national standards.

Methodology (Material & Methods) Materials (Tools)

METHODOLOGY

• Complete nutritional status and clinical status has been assessed using the questionnaire and clinical examination. The anthropometric measurements were performed using the standard WHO anthropometric measuring tools. For Anthropometric measurement Electronic weighing machine, WHO recommended measuring tape and Infant meter / stadiometer were used.

Standardized methods were used in all measurements

- Height was measured for children (24-60 months). The child was made to stand on the measuring board which was kept vertical. Shoulder blades and buttocks of the child were placed against the board. With the right hand, the headpiece on top of the child's head was lowered down and pushed through the child's hair. Once the position was achieved the measurement was recorded to the nearest 0.1cm.
- Length was measured for children (6 - 23 months). The child was made to lie flat, on the center of the board. The investigator then placed his left hand on the child's knees and pressed them firmly against the board. With the right hand, the foot piece was placed firmly against the child's sole. The measurement was made to the nearest 0.1cm.
- Weight was measured after minimizing clothing on the child using standard electronic weighing machine. After the value was stable for about 3 seconds, the weight of the child was recorded.

- Head Circumference

Head circumference was measured by a fibre glass tape passing firmly over the supra-orbital ridge in front and that part of the occiput which gave the maximum diameter. The child head was made steady by holding at the side of the neck [13]. It was recorded nearest to 0.1 cm.

- Chest Circumference

Chest circumference was measured by a fibre glass tape. In standing position, the girth of the chest was taken at the level of Xiphisternum upto the point of nipple in a plane at right angle to the vertebral column and just below the inferior angle of scapulae – midway between inspiration and expiration. Only enough tension was applied to enable the tape to rest against the perimeter of the thorax without slipping. Measurements were taken by cross tape technique to the nearest of 0.1 cm.

Left Upper Mid-arm circumference

The left upper arm was measured, while hanging freely on the side of the trunk, at its midpoint with no cloth over it. The midpoint of upper arm was assessed by measuring the distance between the acromin process of the scapula and the olecranon process of the ulna and taking the midpoint of that distance. The tape was placed gently but firmly, around the midpoint, avoiding compression of 75 the soft tissues. The reading was recorded by cross tape technique to the nearest of 0.1 cm. The

anthropometrics data in present study were compared with the National growth data and HARVARD Standard for IAP classification.

STATISTICS

The data generated from the study was entered into SPSS, Epi info software and anthroplus software. Assessment of the children's nutritional status was done using the Nutritional Anthropometry software (Epi Info 2002 system) from the division of Nutrition, CDC, and Atlanta. Univariate, bivariate and multivariate analyses were done to infer from the study data and anthroplus software.

RESULTS

In our study, it was found that out of the 400 children studied, 270 children were malnourished. Overall prevalence of malnutrition was found to be 67.5% according to the IAP Classification. Prevalence of underweight was more among girls (51.8%) than boys (48.1%). All the anthropometric measurements were lower in malnourished children in comparison to their normal counterpart children. Again, boys had marginally better anthropometric measurements than girls. Among the 67.5% underweight children according to the IAP classification Grade I were 55/9%, Grade II 23.7%, Grade III 16.2% and Grade IV were 4.07%. In the present study it was found that literacy status of mother affects prevalence of malnutrition. The highest prevalence (80.86%) was observed when mother was illiterate whereas the lowest prevalence (0.33%) was observed when mother's qualification was up to graduation. The comparative assessment using different anthropometric parameters i.e. hight, chest circumstances, weight, LMAC, head circumference was made and observations were recorded as depicted in Figure 1-8.

TABLE AND FIGURES

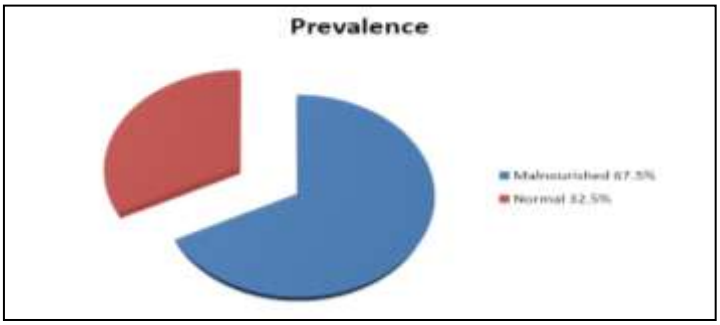

Fig-1: Pie chart showing prevalence of malnutrition according LAP

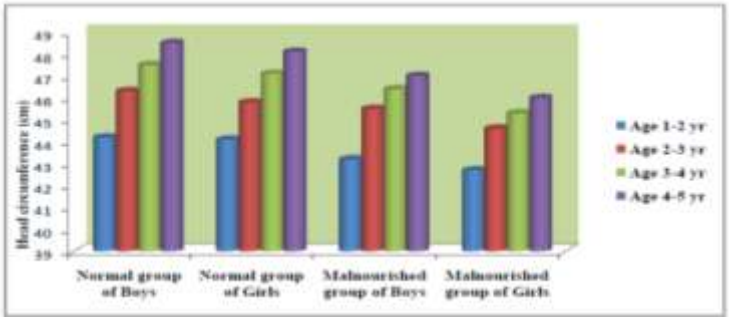

Fig-2: Comparison of anthropometric parameter (Head circumference) between Normal studied group and malnourished group in all age groups. There was significant lower value of all measurements than their normal counterpart children (P<0.05)

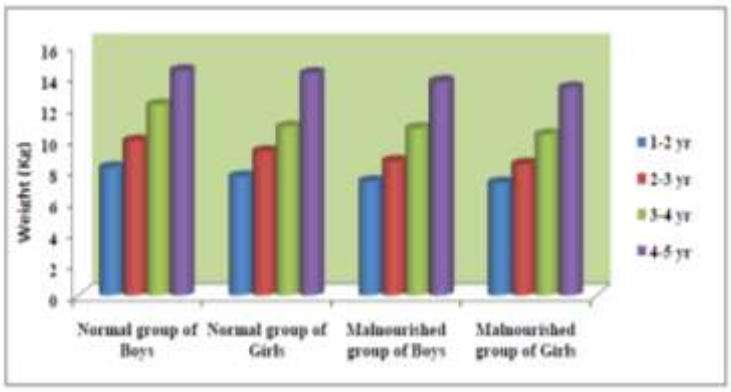

Fig-3: Comparison of anthropometric parameter (Weight) between Normal studied group and malnourished group in all age groups. There was significant lower value of all measurements than their normal counterpart children (P<0.05)

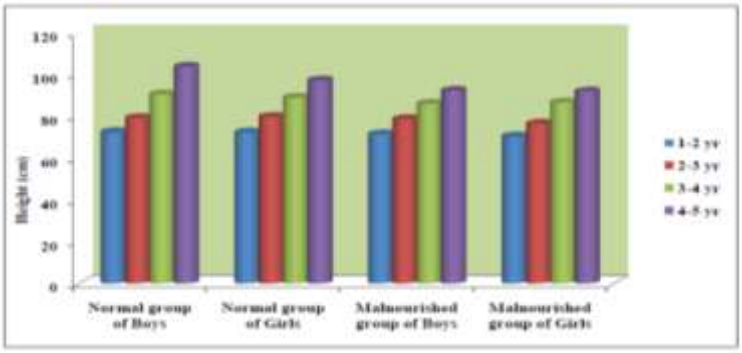

Fig-4: Comparison of anthropometric parameter (Height) between Normal studied group and malnourished group in all age groups. There was significant lower value of all measurements than their normal counterpart children (P<0.05)

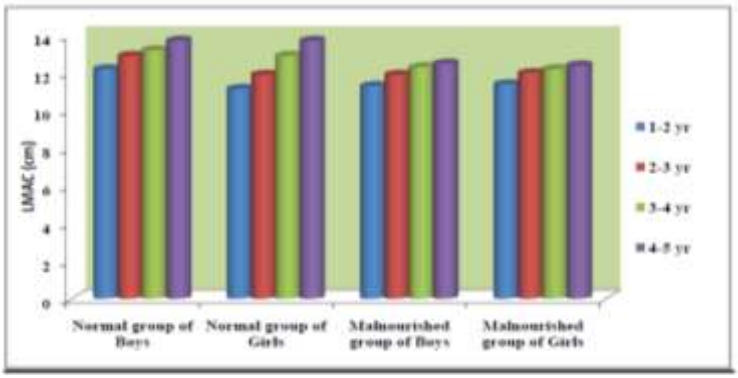

Fig-5: Comparison of anthropometric parameter (LMAC) between Normal studied group and malnourished group in all age groups. There was significant lower value of all measurements than their normal counterpart children (P<0.05)

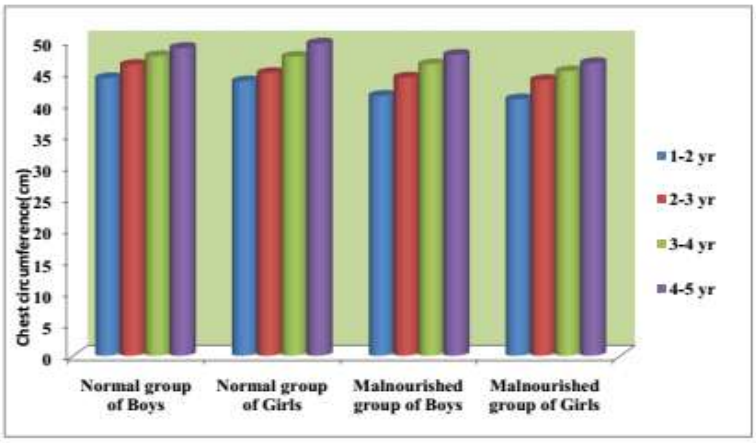

Fig-6: Comparison of anthropometric parameter (Chest circumference) between Normal studied group and malnourished group in all age groups. There was significant lower value of all measurements than their normal counterpart children (P<0.05)

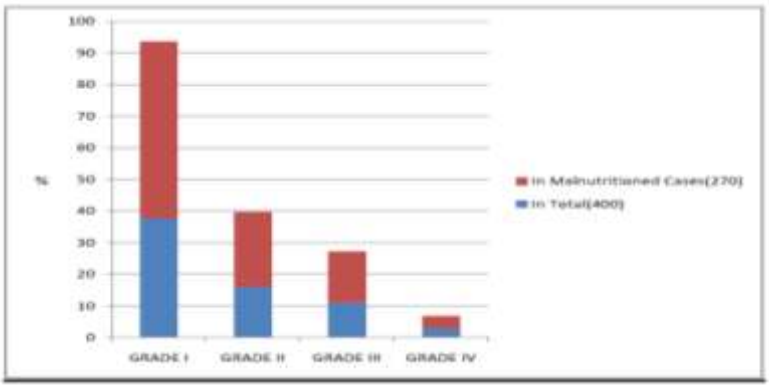

Fig-7: Bar Diagram Showing Grading of Malnutrition (Using IAP Classification)

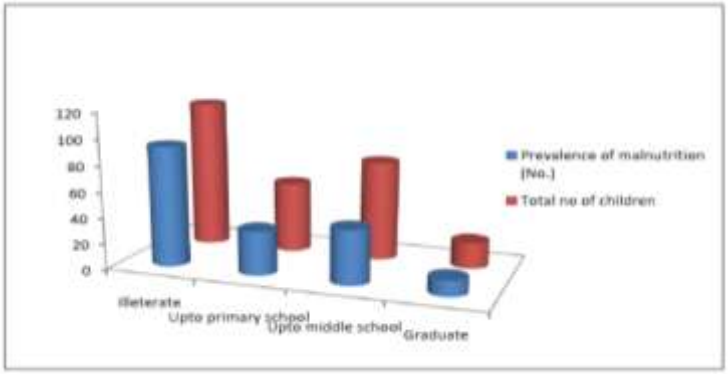

Fig-8: Prevalence of Malnutrition in relation to literacy of mother. An increase in prevalence of malnutrition with decrease in literacy status was observed. The association was highly significant statistically P≤ 0.001

DISCUSSION

The finding of the study is being discussed in the light of modern literature and the following studies showed similar findings. Vijayashree Mathad [14] assessed the nutritional status of under-five years of age as a cross sectional study conducted in Kakati-A sub-centre, under the Primary Health Centre at Vantamuri in Belgaum district. The sample size was 290. According to the Indian Academy of Paediatrics (IAP) classification, the prevalence of Grade I malnutrition was 121 (47.10%), Grade II was 29 (10.00%), and Grade III and IV were 4 (1.40%) [14]. Joshi et al. [15] assessed the prevalence of PEM in rural areas of Rithora, District Bareilly and reported that out of total 449 children, 248 (55.23%) were boys and 201 (44.77%) were girls and prevalence of under nutrition was 39.92 per cent (99 out of 248) in boys and 61.19 per cent (123 out of 201) in girls [15]. The degree of malnutrition i.e. grade I, II, III and IV malnutrition was found to be higher in girls (63.37%,

50.59%, 54.55% and 66.67% respectively) compared to boys (36.63%, 49.41%,45.45% and 33.33% respectively). Vinod *et al*. [16] assessed the nutritional status of children below five years of age. For the study 434 children were selected by random sampling method and subjected to anthropometric measurements using standard technique. Results revealed that 52.23 per cent were suffering from various grades of malnutrition. Among those 32.18 per cent children were in grade I, 16.09 per cent in grade II, 3.46 per cent in grade III and 0.5 per cent in grade IV malnutrition [16]. Nale *et al*. reported that as the educational level of mothers increased, improvement in nutritional status of the child was observed. Eleven (84.62%) children were malnourished whose mothers were illiterate as compared to four (12.12%) whose mothers completed 10th or more years of education. The association between education of mother and children's nutritional status was found to be statistically significant. Educational level of parents thus indicated a significant factor in determining nutritional status of children [17].

CONCLUSION

To conclude, in the present study high prevalence of the under nutrition and its relation with age, sex, low literacy status of mother and associated nutritional deficiencies were documented among the under five children. The finding of this study has been discussed in the light of modern literature. Also, Malnutrition has significant socioeconomic costs, particularly in developing countries [18]. The need for reduction of morbidity and handicaps, caused by under nutrition is essential. These objectives should be achieved through vigorous implementation of preventive measures.

The present study is limited by its small sample size being only from one area of India. These results may therefore only be representative of a small community and not representative of the state or country. These results will not only allow us to compare the rates of three conventional measures of under nutrition with IAP Classification but also help us to establish the improved effectiveness and use of malnutrition classification. Anthropometric parameters should be studied in field trials as a screening tool for assessment of malnutrition and the benefit obtain should be assessed so as to decide whether such screening should be incorporated in management protocols of malnutrition. The cost impact of measurements as effective screening measures would be phenomenal and this era of economic prudence such potential benefit warrants investment in further research in this field.

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