Original Research Article

Prevalence of underweight among preschool children attending anganwadi in Kannur district, Kerala, India

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ABSTRACT

Background: Child malnutrition is an important indicator of the nutritional and health status of a country. Preschool children call for focused attention in India because India has the highest percentage of undernourished children in the world. The objective of this study was to estimate the prevalence of underweight among preschool children attending Anganwadi centers (AWC) in Kannur district, Kerala.

Methods: Cross-sectional study done during July 2013- June 2014 among pre-school children (3-6 years) attending 44 AWC spread over eleven revenue blocks in the district. AWC were selected using multistage random sampling technique. Body weight of the children were measured and compared with WHO Growth standards. Mothers were interviewed using a pilot-tested semi-structured questionnaire. Data was entered in EpiData version 3.1 and analysis was done using the SPSS version 12.

Results: The total number of 3-6 year old children included in the study was 456. The prevalence of underweight in the study population was found to be 17.3%. In this study, nutritional status of the child was found to have significant association ($p < 0.05$) with the child's birth weight and maternal educational status.

Conclusions: Maternal educational status has a major role in prevention of underweight among preschool children. Child's birth weight also influences their nutritional status.

Keywords: Underweight, Preschool children, Anganwadi

INTRODUCTION

Underweight is a weight-for-age measurement. Underweight is a condition which results from inadequate consumption, poor absorption or excessive loss of nutrients.¹ It is a measurement of acute and chronic malnutrition.² Child malnutrition is an important indicator of the nutritional and health status of a country. Preschool children call for focused attention in India because India has the highest percentage of undernourished children in the world. Malnutrition makes the child more susceptible to infection, recovery is slower and mortality is higher. Undernourished children do not grow to their full potential of physical and mental abilities.² Preschool

children constitute an appropriate group for assessing underweight so that timely interventions can be applied.

This study was done with the objective to assess the prevalence of underweight among preschool children attending Anganwadi centre (AWC) in Kannur district and to study the factors associated with underweight.

METHODS

This was a cross-sectional study done during July 2013-June 2014 in Anganwadi centres in Kannur district, Kerala to assess the prevalence of underweight among preschool children and to identify the factors associated with it. Children of 3-6 years constitute the preschool age

group. Sample size was obtained as 383 using the formula for cross-sectional studies taking the prevalence of underweight as 22.9% (NFHS III), with 20% relative precision and 10% non-response rate.

In order to get the representation of the whole district AWCs were selected from all the eleven blocks of the district. The average number of children attending an Anganwadi center was found to be 10 from the records of District ICDS Office. To achieve the sample size, four AWCs were selected from each block.

Multistage random sampling technique was used to select 44 AWC. From the eleven Block Panchayats in Kannur district, one Panchayat each was selected by simple random technique using lottery method. All the Anganwadi centers in these selected eleven Panchayats were listed serially and four Anganwadi centers were randomly selected from each of the selected Panchayats in Blocks without municipalities and two Anganwadi centers from each of the selected Panchayats in Blocks with municipalities using the random number table. The AWC in the municipalities were listed serially and two Anganwadi centers were selected from each using random number table. In total, four AWC were selected from each block and a total of 44 Anganwadi centers were selected for the study. All preschool children attending the selected AWC and whose mothers gave consent for the study were included.

Permission for conducting the study was obtained from District Integrated Child Development Services Programme Officer, and Child Development Project Officer of the corresponding ICDS Projects. The purpose of the study was explained to the mothers and their written informed consent taken. The general health status of the children was assessed by clinical examination and the necessary measures including referral were advised. After the study, nutrition education was given to the mothers. Health education was given to mothers on breast feeding, immunization, antenatal care, environmental sanitation etc.

Digital weighing machine (Maximum weight up to 150 kilograms, minimum difference of 100 grams) was used for measuring the body weight of children and mothers. The questionnaire for interviewing the mothers was standardized after conducting a pilot study in three Anganwadi centers. The factors associated with underweight were studied using this semi-structured questionnaire, and it was filled by interviewing the mothers.

The body weights of the children were compared with WHO weight-for-age standards (separate for boys and girls), and interpreted as follows:¹¹

Weight more than or equal to -2 standard deviation (SD) and less than or equal to +2 SD of WHO median weight-for-age was classified as normal weight. Weight less than

-2 SD and more than or equal to -3 SD of WHO median weight-for-age was classified as moderately underweight. Weight less than -3 SD of WHO median weight-for-age was classified as Severely underweight.

Data was entered in EpiData version 3.1 and analysis was carried out using the Statistical Package for the Social Sciences (SPSS) version 12 software. Statistical measures like mean with standard deviation, frequencies and proportions were used to describe the results. Inferential statistics Chi-square, Fisher's Exact test, Mann Whitney U test and Students t-test were used to find the association. P value less than 0.05 was considered significant. Ethical clearance was obtained from the Institutional Ethics Committee and Research Committee.

RESULTS

The total number of children included in the study was 456. The age group of children studied was 36- 72 months (3-6 years). The mean age of children in the study (in months) was 46.47 ± 7.406 . Among the study population, 54.4% were females and 45.6% were males. In this study, 13% of the children had low birth weight (birth weight less than 2.5 kg). On evaluating the maternal educational status it was found that 95% of mothers had education of high school or above.

The prevalence of underweight in the study population was found to be 17.3%. The prevalence of moderately underweight was 16.66% and severely underweight 0.65% (Figure 1).

Figure 1: Nutritional status of the children attending Anganwadi centres in Kannur district, Kerala (N =456).

The nutritional status of children was found to have statistically significant association ($p < 0.05$) with their birth weight and maternal educational status (Table 1). In the present study, the prevalence of underweight among children of mothers with underweight was 22.9% compared to children of mothers with normal BMI (18.5%) and significant association was found between

nutritional status of mothers and that of children ($p=0.013$, Student's *t*-test). Prevalence of underweight was high (25%) among children of employed mothers compared to children of unemployed mothers (16.5%) but the association was not statistically significant. There

was no statistically significant association between nutritional status of the child and sex, religion, socio-economic status, type of family, area of residence, paternal education, paternal occupation, maternal age at pregnancy and birth order.

Table 1: Factors associated with nutritional status of preschool children attending Anganwadi centers in Kannur district, Kerala.

Maternal education (N=456)	Underweight N (%)	Normal weight-for-age N (%)	Total	P value
Middle school and below	8 (38.1)	13 (61.9)	21	0.017* [#]
High school and above	71 (16.3)	364 (83.7)	435	
Birth weight (N = 456)				
Low birth weight	18 (29.5)	43 (70.5)	61	0.007* [#]
Normal birth weight	61 (15.4)	334 (84.6)	395	

*[#] Statistically significant by Pearson Chi-square test.

Table 2: Crude and adjusted odd's ratio for risk factors.

Variables	Crude odd's ratio (95% confidence interval)	Adjusted odd's ratio (95% confidence interval)	P value
Low birth weight	2.292 (1.240-4.236)	2.165 (1.114-4.208)	0.023*
Maternal education middle school and below	3.155 (1.261-7.891)	2.906 (1.049-8.054)	0.040*
Maternal BMI (kg/m ²)	0.922 (0.864-0.984)	0.917 (0.856-0.982)	0.014*

* Significant association.

Logistic regression was done using all the factors found to be significantly associated with underweight and crude odd's ratio and adjusted odd's ratio calculated. Then it was found that child's birth weight and maternal education influenced the child's nutritional status (Table 2).

DISCUSSION

Underweight is the most widely used indicator for assessment of under nutrition. Underweight is increasingly recognized as a prevalent and important health problem in many developing countries including India. Under-nutrition is the most important single cause of illness and death globally, accounting for 12% of all deaths and 16% of disability-adjusted life years lost.³ In 2012, 67 percent of all underweight children lived in Asia and 29% in Africa.⁴ Underweight is the most common nutritional problem in the UN regions of Southern Asia (30%), followed by Western, Eastern, and Middle Africa (20%, 19% and 16%, respectively) and South-Eastern Asia (16%).⁵ According to Family Welfare Statistics in India 2011, 42.5% of children in India were underweight; and in Kerala 22.9% were underweight.⁶ Levels of malnutrition vary widely across Indian states. Punjab, Kerala, Jammu & Kashmir, and Tamil Nadu account for the lower proportions of underweight children (22.9-29%); whereas Sikkim, Manipur, and Nagaland report lowest proportions (19.7-22.1%). Bihar, Chhattisgarh, Jharkhand, and Madhya Pradesh report the maximum proportion (47-60%) of underweight children. Childhood malnutrition is an underlying cause in an estimated 35%

of all deaths among children under five. Under-five mortality (U5MR) in India coincides with the prevalence of underweight, the highest being in Madhya Pradesh (89/1000) and lowest in Kerala (14/1000). The U5MR in India is 64/1000.⁶ In Hungama report-2011, malnutrition in under five children is 42% and below 24 months of age it is 42% and percentage of underweight newborn (<2.5 kg) is 50%.³ Children of 3-6 yrs constitute the preschool age group.⁷ Preschool children constitute the most vulnerable segment of any community. Their nutritional status is a sensitive indicator of community health and nutrition.⁸ Preschool children call for focused attention in India because India has the highest percentage of undernourished children in the world.⁹

The prevalence of underweight in children is an indicator to monitor the Millennium Development Goal 1 (MDG-1), which is to "Eradicate extreme poverty and hunger". The MDG 1 target 2 is 'to halve the proportion of people who suffer from hunger between 1990 and 2015'. The indicator to monitor the progress towards MDG 1 target 2 is the prevalence of underweight children (under-five years of age) which is defined as 'Proportion of children under-five years with low weight-for-age'. It is measured by percentage of children in moderate and severe malnutrition- those falling below 80% of median weight for reference value or below two standard deviations of national or international reference populations, such as growth charts of US National Center for Health Statistics.¹⁰

WHO classifies moderate underweight as weight 2 standard deviation (SD) less than the median weight for

age and severe underweight as weight 3 SD below the median weight for age. Severe acute malnutrition in infants and children is defined by WHO and UNICEF as weight-for-age below -3 standard deviation (-3SD) of WHO standards. The rationale behind choosing this indicator is that children below this cut-off has high risk for mortality; these children have a higher weight gain when receiving therapeutic diet; in a well-nourished population, there are virtually no children below -3SD (<1%); and there are no known risks associated with therapeutic feeding of these children applying recommended protocols.¹¹

In the present study, the prevalence of underweight among preschool children was found to be 17.3% (moderate underweight 16.66%, and severe underweight 0.65%, Figure 1). The present study shows that children attending Anganwadi centres in Kannur district have a lower prevalence of underweight. According to Evaluation study on Integrated Child Development Schemes (ICDS) March 2011, at the national level, the prevalence of underweight among children attending AWC was 52.7%. In the same study it was found that in Kerala the prevalence of underweight among the children attending AWC was 36.4%.¹² A community-based cross-sectional study conducted among Hindu low socio-economic preschool children of a gram panchayat in West Bengal found that the overall prevalence of undernutrition among the preschool children was underweight 47% and severe underweight 13.7%.⁸ A study conducted in 2007 among 3-5 year old children attending Anganwadi in West Bengal showed a prevalence of underweight as 31%, and that the rate of underweight and wasting was higher among girls compared with boys.¹³ A study conducted in Kasaragod District in 2009, compared underweight among preschool children with household deprivation status-HDS (i.e., economic status, assets, and household infrastructure, HDS-I being the maximum deprived, and HDS-III the least). On the basis of weight-for-age classification, 52.27%, 46.93% and 21.14% of preschool children were moderately underweight in HDS-I, HDS-II and HDS-III groups respectively.¹⁴ While comparing with these statistics, the present study shows that the preschool children attending AWC in Kannur district have a much better nutritional status.

Factors associated with underweight

Major determinant of child health is the health of the mother. Child health is adversely affected (the risk begin to appear even before birth) if the mother is malnourished, if she is under 18 years or over 35, if her last child was born less than two years ago, if she already has delivered more than 4 children and if she is deprived of basic pregnancy care.² In the present study, the prevalence of underweight among children of mothers with underweight was 22.9% compared to children of mothers with normal BMI (18.5%) and significant association was found between nutritional status of mothers and that of children ($p=0.013$, Student's *t*-test). In this study, no association was found between

underweight and birth interval or birth order. Protein-energy malnutrition and micronutrient deficiency leading to early growth failure often results due to poor maternal nutritional status and inadequate health care before pregnancy, which results in intrauterine growth retardation and low birth weight.¹⁵

In the present study the maternal educational status was found to have a significant effect on the nutritional status of children ($p=0.017$, Pearson Chi-square test, Table 1). The prevalence of underweight among children of mothers with education of middle school and below was 38.1%, whereas it was only 16.3% among children of mothers with education of high school and above. In a community-based cross-sectional study carried out in tribal areas of India by Meshram et al to assess trends in nutritional status, nutrient and food intake among children, it was found that the risk of underweight and stunting was significantly higher among children of illiterate mothers and children from lowest and middle households wealth index.¹⁶ Another community-based cross-sectional study undertaken by Meshram et al in the tribal areas of Odisha state, India, to assess the nutritional status of preschool children in terms of underweight, stunting, and wasting found that the risk of underweight and stunting was respectively, 1.9 and 2.4 times higher among children of illiterate mothers.¹⁷ An ICMR study in 2012 on prevalence of underweight among tribal preschool children in West Bengal compared children's body weight with maternal literacy. The study found that the prevalence of underweight was about 64%, and that the prevalence of underweight was 1.7 times higher in children of illiterate women.¹⁸ The present study also supports previous studies that maternal educational status is a very important determinant for nutritional status of children.

LBW is associated with underweight in preschool children.¹⁸ The present study shows that birth weight influences the nutritional status of preschool children and that low birth weight is associated with underweight in preschool children. The study done by Bhutta and Salam reports that the risk factors for under-nutrition include low birth weight, inadequate breastfeeding, improper complementary feeding, and recurrent infections.¹⁹

Abuya et al. found that maternal education is a strong predictor of child undernutrition and other factors like birth weight and gender; parity, and health seeking behaviour; and household level socio-economic status are also independently significantly associated with undernutrition.²⁰ In contrast to previous studies, the present study did not find any significant association between underweight among preschool children and gender; household level socioeconomic status; birth order and maternal age at pregnancy.

CONCLUSION

The present study shows that the nutritional status of preschool children is strongly influenced by the educational status of their mothers. Hence to improve the

nutritional status of children, female literacy has to be improved. The study also shows that birth weight also influences nutritional status.

Limitations of the study

The study population was children attending Anganwadi centers in Kannur district. Hence the result is applicable only to children attending Anganwadi centers and not to the general population. Hence the prevalence obtained is not representative of all the preschool children in Kannur district.

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