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Research Article

# A Survey of the Nutritional Status of Children Aged Between 12 to 23 Months Registered at Anganwaadi Centres in Pune District, Maharashtra, India.

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## Abstract

The extent of malnutrition in India is high where 43% children are underweight. Undernutrition in the critical age has adverse consequences throughout adulthood. There are few studies that report the nutritional status of the children between 12 to 23 months. The objective of the study was to assess the nutritional status and risk factors of undernutrition among children aged 12 to 23 months registered at anganwaadi centres in Pune district, Maharashtra, India. A random sample of 360 children from 35 Anganwaadi centres was selected from a total of 147 anganwaadi centres of Pune District. Nutritional status was assessed using anthropometric techniques and categorised using the WHO Z-score standards. Data on the feeding practices and mothers' knowledge on malnutrition were collected using a pretested questionnaire. The overall prevalence of stunting was 45.6 %( n=164), underweight was 33.6 %( n=121) and wasting was 28.6% (n=103). Risk factors of undernutrion were identified and given in table: 2, 3 and 4.Prevalence of undernutrition among children was significantly high in12 to23 month's age group. Monthly family income, poor education and knowledge of mothers, poor 'Infant and Young Child Feeding Practices" (IYCF) were found to be significantly associated with undernutrition among children in this age group. To address the problem of malnutrition and restrain its consequences interventions need to cater to the specific growth requirements of those children in this critical age group. A dedicated programme on nutrition and child care during the first two years of life is urgently required.

**Key words:** Nutritional Status, Prevalence, Stunting, Wasting, Underweight, MUAC (Mid upper arm circumference), Risk Factors of undernutrition, Cross sectional survey, WHO-Anthro-software, Multiple logistic regression

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## 1. Introduction

Under nutrition among children is of public health concern as the prevalence is high among developing countries. Globally the prevalence of underweight, stunting and wasting in 2011 was 16%, 26% & 8% respectively [1]. Sub-Saharan Africa and South Asia are home to three fourths of the world's stunted children. Time trends showed the global prevalence of stunting among children under the age of five has declined from 40% percent to 36% over the last two decades. [1] Undernutrition among preschool children is still a major public health problem in India. According to National family health survey-3(NHFS-3) data, the prevalence shows that 48% children under the age of five years are stunted, 43% children are underweight and nearly 20% children are wasted in India. In Maharashtra, about 46.3% children are stunted, 16.5% children are wasted, and 37% children are underweight. The NFHS-3 data for Maharashtra indicate that, the state is home to 560,150 children with Severe Acute Malnutrition (SAM) (NFHS-3, 2006). [4]

Maternal and child undernutrition is highly prevalent in low- and middle-income countries, resulting in substantial increase in mortality and overall disease burden. [3] India is among the countries where child mortality rate is high as a consequence of undernutrition. Nutrition during the first five years has an impact not only on growth and morbidity during childhood, but also acts as determinants of nutritional status in adolescent and adult life. Malnourished children are more susceptible to recurring infectious disease episodes. According to the International Institute for Population Sciences (IIPS) 2014, a child's age has an inverted U-shaped relationship with the prevalence of wasting. It is shown that children in age 12 to 23 months were more likely to be wasted than children in age 24 to 47 months. [5]

Although reductions in rates of underweight were observed between the NFHS-1 and NFHS-2, there is no such difference observed between NFHS-2 and NFHS-3. [4] With high prevalence rates and slow reduction in prevalence, the situation in India is serious and requires immediate attention. Further, literature review identified a paucity of data on the nutritional status of children in the age group of 12 -23 months. This being the critical period in growth and development there is a need to study the prevalence in this specific age and to understand the risk factors to plan specific interventions

**Objectives**

The present study aimed to

1. Asses the nutritional status of a random sample of children in the age group 12-23 months, registered with the Integrated Child Development Scheme (ICDS) at anganwaadi
2. Study the risk factors for undernutrition.

## 2. Methodology

This cross-sectional descriptive survey was conducted in February 2014. During the study period the population of Pune districts was 9,402,408 (2011 census). The required sample size was calculated using the formula $n=Z^2 P (1-P)/ d^2$ , Where n = sample size, Z = Z statistic for a level of confidence = 95%,P = expected prevalence or proportion = 37% (in proportion of one; if 37%, P = 0.37),d = precision = (in proportion of one; if 5%, d = 0.05).

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The results of this calculation indicated that the minimum sample size required was approximately 358 children. Children were selected using multistage random sampling technique. Pune district comprises of 13 talukas of which 3 talukas are in tribal areas. Of the tribal talukas, one (Khed-taluka) was randomly selected by lottery method. Of the two Primary health Centres (PHC) in Khed, one (Kude-PHC) was selected. From the five anganwaadi centres under Kude PHC, 32 children matched the age criteria to be included in the study.

Similarly, of the 10 talukas under non tribal areas, four were selected that included Haveli, Maval, Purandar and Shirur taluka, using lottery method. For each taluka, one PHC was selected which were (Fursungi, Talegoan dabhade, Valhe and Talegaon damdhere PHCs), and 328 children, from 30 anganwaadi centres, were recruited in the study. Thus, the final study population included 360 children in the age of 12 to 23 months along with their mothers. Figure No. 1.

Ethics clearance was obtained from the Institutional ethics committee of Pune University, Maharashtra. Permission from the authorities was taken to work in the various PHCs .Written consent was obtained from the parents of children who participated in the survey.

A semi-structured questionnaire was used to collect information on sociodemographic data, child feeding practices and mothers knowledge of malnutrition. The impact of child feeding practice, as well as socioeconomic and demographic factors on the nutritional status of children was then evaluated. This study was conducted in February 2014 in Anganwaadi centres of Pune district, India.

Measurements of length/height, weight and mid upper arm circumference were measured using standard equipments in duplicates to determine the nutritional status of children aged 12 to 23 months. At the community level, due to methodological difficulties faced in measuring children during the pre-test using an infantometer, at the community level the height of children was measured using a stadiometer. The measurements were recorded nearest to 0.1 cm. A correction factor of 1.02cm was applied to the height measurements after measuring 30 children of the same age group who did not belong to the sample, using two different instruments i.e, a stadiometer and an infantometer. The technical error of measurement was kept within standard limits. Weight was recorded using standard digital scales. Mid-Upper-Arm Circumference was measured after marking the midpoint of the child's left upper arm between the acromion and olecrenon process, when the fore arm was positioned at right angles to the upper arm. The circumference of the mid upper arm was measured using an inextensible tape on bare skin keeping the upper and fore arm in a straight line.

Data was analyzed by using WHO, Anthro software & SPSS software to determine the prevalence of underweight (weight-for-age), wasting (weight-for-height) and stunting (height-for-age) based on reference data from the National Centre for Health Statistics (NCHS)/World Health Organization (WHO). Logistic regression analysis was then used to describe the hierarchical relationships between potential risk factors of undernutrition. [14]

## 3. Results

The category wise prevalence of undernutrition among boys and girls are shown in Table 1. Prevalence of underweight, stunting and wasting was high, with 33.7% (121) 45.6% (207), and 28.6% (103) respectively. Almost equal percent of prevalence was observed

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among both sexes except for prevalence of stunting. It was found to be more prevalent among boys as compared to girls. Multiple logistic regression analysis was used to identify the factors that were associated to undernutrition. The variables that were found to be significantly associated to undernutrition are presented in Tables 2, 3 and 4. Table 2 shows the association between socioeconomic variables and the nutritional status of children. Multiple logistic regression analysis revealed that the geographic area i.e., in this study tribal area as the place of residence increased the risk of stunting by 3.4 times among children in this age group. Also the level of the mother's education was significantly associated with undernutrition. Children whose mothers received education <8th standard were found to be 1.8 times more likely to be severely malnourished. Monthly family income was found to be significantly associated with increased risk of undernutrition. It was observed that, those families whose monthly family income was <Rs. 11,000, the risk of underweight was found to be 0.5 times more than the higher income group.

Table 3 describes the association between a child's feeding practices and the nutritional status of children.

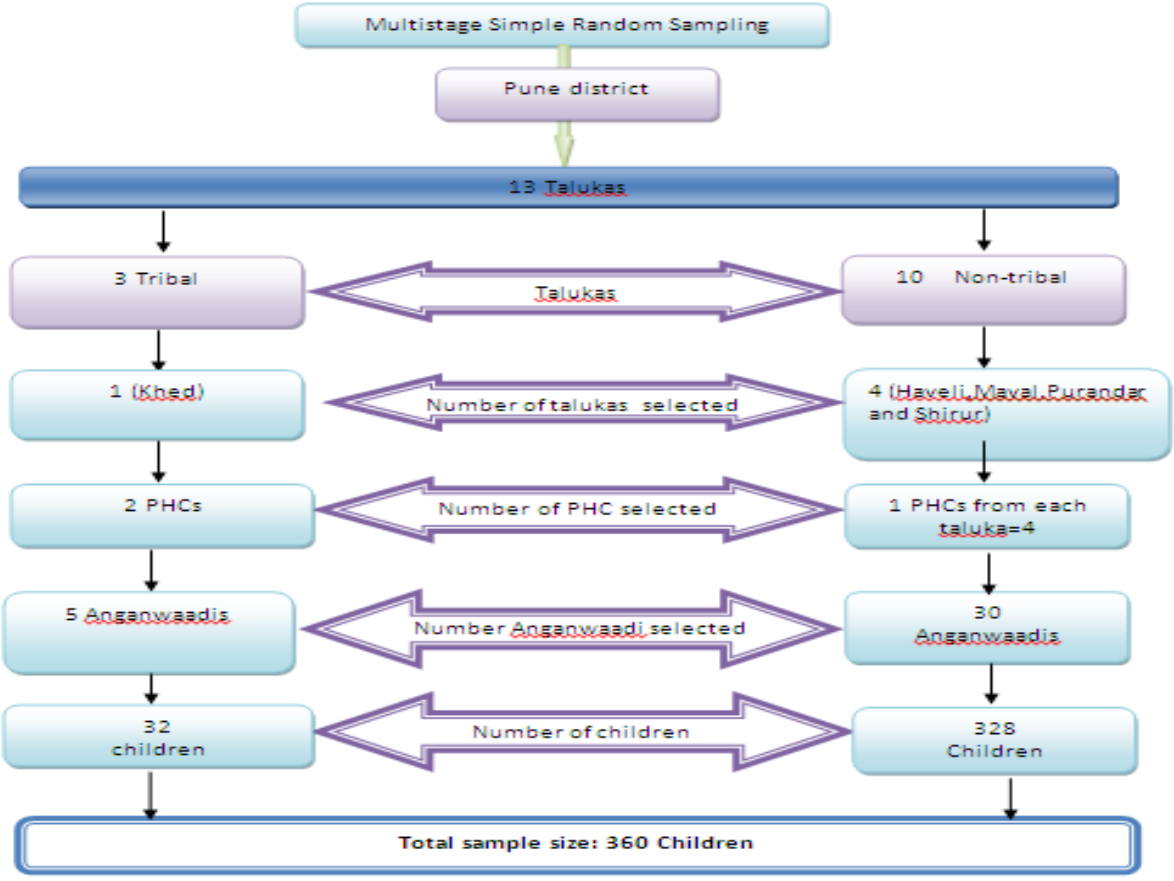


Figure 1 : Schematic presentation of sample size selection methodology

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Table No.1 Prevalence of undernutrition among children aged between 12-23 months

| **Categories of Undernutrition** | **Boys N=200(%)** | **Girls N=160(%)** | **All N=360(%)** |
|---|---|---|---|
| Wasting | 50(13.9) | 53(14.7) | 103(28.6) |
| Stunting | 91(25.3) | 73(20.3) | 164(45.6) |
| Underweight | 64(17.8) | 57(15.9) | 121(33.7) |

Table No.2 Association between socioeconomic variables and the nutritional status of children

| **Characteristics** | N=360 (%) | Undernutrition | | | |
|---|---|---|---|---|---|
| | | Stunting | Underweight | Wasting | MUAC(SAM/MAM) |
| **Region** | | | | | |
| Non-Tribal | 328 (91.1) | 1 | 1 | 1 | 1 |
| Tribal | 32 (8.9) | **3.441 (1.39-8.50)** | 1.127 (0.50-2.49) | 1.415 (0.62-3.18) | 2.223 (0.88-5.59) |
| **Sex** | | | | | |
| Boys | 200 (55.6) | 1 | 1 | 1 | 1 |
| Girls | 160 (44.4) | 1.042 (0.67-1.60) | 0.822 (0.52-1.29) | 0.665 (0.41-1.06) | 0.982 (0.55-1.73) |
| **Monthly Family Income** | | | | | |
| Less than 11000 | 192 (53.3) | 1.001 (0.64-1.55) | **0.592 (0.37-0.93)** | 0.802 (0.49-1.29) | 1.444 (0.79-2.62) |
| More than 11000 | 168 (46.7) | 1 | 1 | 1 | 1 |
| **Mother's education** | | | | | |
| Less than 8$^{th}$std | 128 (35.6) | 1.480 (0.92-2.35) | 1.336 (0.82-2.16) | 0.900 (0.537-1.50) | **1.807 (1.003-3.24)** |
| More than 8$^{th}$std | 232 (64.4) | 1 | 1 | 1 | 1 |
| **Mother's occupation** | | | | | |
| Worker | 40 (11.1) | 0.715 (0.36-1.41) | 0.843 (0.40-1.74) | 0.872 (0.41-1.85) | 1.087 (0.45-2.60) |
| Unemployed | 320 (88.9) | 1 | 1 | 1 | 1 |

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Table No.3 Association between a child feeding practices and the nutritional status of children

| **Characteristics** | N=360 (%) | Undernutrition | | | |
|---|---|---|---|---|---|
| | | Stunting | Underweight | Wasting | MUAC |
| **Age of introduction to weaning food** | | | | | |
| Before 6 months | 73 (20.3) | 0.839 (0.43-1.60) | 0.806 (0.43-1.48) | 1.359 (0.73-2.50) | **2.790 (1.44-5.38)** |
| After 6 months | 287 (79.7) | 1 | 1 | 1 | 1 |
| **Frequency of breastfed in one day in the first six months** | | | | | |
| Less than 4 times | 59 (16.4) | 0.983 (0.53-1.80) | 0.798 (0.42-1.98) | 0.762 (0.39-1.48) | **2.954 (1.50-5.80)** |
| More than 4 times | 301 (83.6) | 1 | 1 | 1 | 1 |
| **Initiation of breastfeeding** | | | | | |
| Immediately | 286 (79.4) | 1 | 1 | 1 | 1 |
| Not immediately | 74 (20.6) | 0.754 (0.43-1.31) | 0.645 (0.36-1.12) | 0.874 (0.48-1.58) | 1.087 (0.45-2.60) |
| **Introduction of any other food other than breast milk immediately after birth** | | | | | |
| Yes | 19 (5.3) | 1.144 (0.39-3.30) | 0.847 (0.27-2.62) | 1.359 (0.73-2.50) | 0.308 (0.55-1.73) |
| No | 341 (94.7) | 1 | 1 | 1 | 1 |

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Table No.4 Association between maternal variables and the nutritional status of children

| **Characteristics** | N=360 (%) | Undernutrition | | | |
|---|---|---|---|---|---|
| | | Stunting | Underweight | Wasting | MUAC |
| **Mother's knowledge** | | | | | |
| No knowledge | 158 (43.9) | 1.217 (.771-1.921) | 0.989 (.621-1.578) | 1.049 (.643-1.711) | **1.560 (1.86-2.83)** |
| With knowledge | 202 (56.1) | 1 | 1 | 1 | 1 |
| **Mother's age** | | | | | |
| <18 years | 16 (4.4) | 1.191 (0.407-3.48) | 1.841 (0.641-5.291) | 1.725 (0.582-5.111) | 2.169 (0.72-6.53) |
| 18-25 years | 331 (91.9) | 0.667 (0.135-3.29) | 1.868 (0.382-9.128) | 1.467 (0.295-7.294) | 2.276 (0.33-5.44) |
| >25 years | 13 (3.6) | 1 | 1 | 1 | 1 |
| **Mother's BMI** | | | | | |
| BMI <18.5 kg/$m^2$ | 114 (31.7) | 1.379 (0.852-2.23) | 1.112 (0.687-1.801) | 0.826 (0.492-1.387) | 1.559 (0.85-2.84) |
| BMI > 18.5 kg/$m^2$ | 246 (68.3) | 1 | 1 | 1 | 1 |
| **Mother's age at first pregnancy** | | | | | |
| 21 years and below | 222 (61.7) | 0.703 (0.458-1.080) | 1.033 (0.659- 1.619) | **2.027 (1.273-3.228)** | 0.857 (0.49-1.50) |
| 22 years and above | 138 (38.3) | 1 | 1 | 1 | 1 |
| **Number of children in family** | | | | | |
| 1 | 159 (44.2) | 1 | 1 | 1 | 1 |
| 2 | 161 (44.7) | **0.576 (0.362-.918)** | 0.887 (0.550-1.429) | 1.197 (0.729-1.965) | 1.092 (0.58-2.05) |
| >=3 | 40 (11.1) | 1.168 (0.56-2.408) | 0.800 (0.384-1.668) | 1.415 (0.633-3.162) | 0.646 (0.27-1.53) |

Furthermore, the infant feeding practices were studied to identify the risk factors. The results showed that the risk of being severely malnourished was 2.9 times higher among children who were breastfed for <4 times in a day during the first six months. Also, the risk of being severely undernourished was 2.7 times

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higher among children for whom weaning foods were introduced before six months of age. Among the other feeding practices studied, late initiation of breastfeeding(20%) and introducing other foods immediately after birth(5%) although practiced did not show statistical significance. Thus poor infant feeding practices emerge as a risk factor for undernutrition in this study.

The results shown in Table 4 describe the association between maternal variables and the nutritional status of children. Multiple logistic regression analysis revealed that children from families that had 2 children were found to be 0.5 times more likely to be stunted. Additionally mother's age at first pregnancy showed significant association with undernutrition. The children of mothers, whose age at first pregnancy was ≤ 21 years, were 2.02 times more likely to be wasted than those mothers whose age at 1st pregnancy was ≥22 years of age. Further it was observed that children of mothers, who had poor knowledge about malnutrition, were 1.5 times more likely to be severely undernourished.

## 4. Discussion

Literature evidence suggests a high prevalence of undernutrition among children under five years of age. In the absence of specific data of nutritional status of children aged 12 to 23 months a survey of children to assess the nutritional status and the risk factors of undernutrition would be a useful initial step. In this survey among a rural Maharashtrian sample of children between 12 and 23 months of age , the prevalence underweight was "very high" as per the WHO categorisation of severity of undernutrition in a population. The results also concur with the study carried out in Andhra Pradesh where the prevalence of underweight and stunting was significantly higher among 1 to 3 year old children. [13]

With respect to risk factors, this study further contributes to the evidence linking poor economic status and poverty. Children, who belong to families with monthly family income less than 11,000 rupees/month, were at a greater risk of underweight. This association has been supported by various studies. [12, 14] Household wealth index is influenced by family income, as household income decreases the prevalence of undernutrition increases. Therefore the key a holistic approach supporting income generation would possibly be key in tackling the multifactorial issue of undernutrition.

Also, geographical area of residence, specifically in this study tribal area as place of residence increased the risk of undernutrition. Review states that indigenous populations who have ancient agricultural and dietary practices are vulnerable to food insecurity. This predisposes them to undernutrition in tribal areas. [6, 7] Interventions should therefore aim at improved coverage to these inaccessible areas as a priority.

The present study also contributes to the association between mother's literacy levels and undernutrition. Similarly poor knowledge of mother regarding malnutrition, immunization, and nutritional services were found to increase the risk for undernutrition. The results were consistent with the association that poor knowledge among mothers increased the risk of undernutrition as reported in other studies. [2, 4, 11] Perhaps empowering women though education and life skill training would help to address these indirect factors contributing to undernutrition.

Among the infant and young child feeding practices studied around 82% children

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were exclusively breastfed, the results of the present study concurred with studies carried out in Ethiopia[9] but is much higher than the practices studied in Delhi [10] and national reports such as NFHS-3 and DLHS. However, there were about 16% who did not practice exclusive breastfeeding. Also introduction to weaning food before 6 months increased the risk of severe and moderate acute malnutrition. Therefore, nutrition education, communication (NEC) should form an important component of any intervention as it would help in further improving the infant and young child feeding practices.

Mothers BMI did not emerge as a risk factor in this study as the current BMI of mothers was used to study the association. Non- availability of the pre-pregnancy BMI of the mothers is a limitation to the study. With the reported high prevalence of undernutrition among mothers it is critical to improve the nutritional status of women in the reproductive age in India. Early interventions during the adolescent phase, prior to conception continued through pregnancy may ensure healthy birth outcome.

## 5. Conclusion and recommendations

Reduction in prevalence of undernutrition calls for comprehensive policies along with provision of food supplements for children in the critical age group. The results of this study may encourage further research to generate data on nutritional status of children between 12-23 months as they appear to be at a greater risk of stunting. Also the high prevalence of underweight and wasting during the critical period, calls for a tailored and targeted intervention, specific for this age group. Based on the finding of this study we suggest a dedicated intervention program where mothers are taught essentially of infant or child care after delivery.

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