

# Study of undernutrition and its risk factors using mid upper arm circumference (MUAC) in children aged 6 months to 59 months admitted in paediatric ward

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## Abstract

**Aim:** Study the undernutrition using MUAC in children aged 6 months to 59 months admitted in Paediatric Ward. **Objectives:** 1. To classify undernutrition using WHO guidelines of MUAC. 2. To find out the possible risk factors for undernutrition. **Results:** In this hospital based study, out of 761 admissions, 75 children (9.8%) had undernutrition as per WHO criteria using MUAC. So the frequency of undernutrition in our study was found to be 9.8%, of which 25 (33.3%) were at risk for undernutrition, 33 (44%) were moderate and 17 (22.6%) were severe undernutrition. Nutritional deficiency was found to be 40% in affected children as a high risk factor followed by systemic illnesses 27 (36%), recurrent infections 13 (17.3%) and Low Birth Weight babies 5 (6.7%). **Conclusion:** In this hospital based study, the frequency of undernutrition was found to be 9.8% of which severe undernutrition was seen in 22.6%. So MUAC is the simple and useful clinical tool to assess undernutrition in a hospital based study.

**Key Word:** Undernutrition, Mid Upper Arm Circumference.

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Cases with at risk for undernutrition and moderate undernutrition are likely to remain unrecognized because clinical criteria for their diagnosis are inaccurate and difficult to interpret precisely. Child growth is commonly used to assess adequate nutrition, health and development of children and in comparison with other health assessment tools, its measurement is a relatively inexpensive and easy to perform procedure. Therefore, anthropometric examination is a mandatory tool in any research on health and nutritional condition in childhood. Moreover, in community-based studies, mid upper arm circumference appears to be a superior predictor of childhood mortality than any other anthropometric indicators. Mid upper arm circumference yields a relatively reliable estimation of the body's muscle mass. During preschool age period, children have special nutrition needs because of their extensive growth and development. Undernutrition in children depends on various factors like poor food quality, socio economic status of the family, insufficient food intake, severe and repeated infectious diseases, birth history, postnatal period details, immunisation status, time of starting

## INTRODUCTION

A child is not a miniature form of adult. Growth is an indispensable feature in life of a child that distinguishes him from an adult. Under nutrition is widely recognized as a major public health problem in the developing countries like India. Based on UNICEF report, under nutrition early in children have serious, long term consequences because it causes motor, sensory, cognitive, social and emotional developmental delay. Severe undernutrition constitutes only proverbial tip of iceberg.

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complementary feeds or most of the time the combination of all factors. Assessment of growth, not only serves as a mean for evaluating the health and nutritional status of children, but also provides an indirect assessment of the quality of life of an entire population.

## METHODOLOGY

This observational, cross sectional study was conducted in children admitted in paediatric ward of Bharati Hospital, Sangli which was approved by Institutional Ethical Committee (IEC). This study was done over a period of 6 months (Dec 2017 to May 2018). All patients admitted in paediatric ward fulfilling the inclusion (1.All patients admitted in paediatric ward between the age of 6 months – 59 months. 2. Patients transferred out of PICU to paediatric ward) and exclusion (Critically ill children) criteria were chosen for this study. Informed and written consent was taken. In this study a detail history was taken involving chief complaints, History of presenting illness, past history regarding previous illness, recurrent infections and previous hospital admissions. Detail history regarding birth, antenatal history, breast feeding establishment was taken. Special attention was given to the nutritional history and complementary feeding practices, dietary history using 24 hours recall technique, immunisation status (Inj measles, syp Vitamin A – number of doses taken), socio economic status using Modified Kuppuswamy classification, mother’s literacy, toilet hygiene were also taken. Mid upper arm circumference was measured to the nearest millimetre, using a non-stretchable fibre optic measuring tape. It was measured on the non dominant arm. Elbow was flexed at 90 degrees. An anatomical midpoint was marked between the acromion process and olecranon process, elbow was fully extended and left loose by the side of the body and MUAC was measured at this point. The severity of under

nutrition in children on the basis of mid upper arm circumference according to WHO<sup>7</sup> guidelines is as follows

- >13.5 cms –normal
- 13.4 -12.5 cms- at risk for undernutrition
- 12.4 – 11.5 cms – moderate undernutrition
- < 11.5 cms –severe undernutrition

The etiology and its risk factors were detected on the basis of the patient’s history and systemic examination. Data was transferred to Microsoft Excel, SPSS 22.0 windows software was used for analysis. Significant correlation between the variables was derived using chi square test with the help of a statistician.

## RESULTS

Out of a total admissions of 761 over a period of 6 months, 75 (9.8%) children were found to have undernutrition using WHO criteria for Mid Upper Arm Circumference (MUAC). Female 43 (57.3%) predominance was noted as compared to males 37 (42.6%). Severe undernutrition was seen in 22.6%. As the age increased the frequency of undernutrition increased, maximum undernutrition was noted in the age of 3 years to 5 years. Dietary inadequacy was more common in ‘at risk for undernutrition’ and ‘moderate undernutrition’ category, whereas, chronic systemic illness was in severe undernutrition category. Undernutrition was more common in lower socio economic class. 13.3% of children with undernutrition were incompletely immunised. Early initiation i.e on day 1 of life, exclusive breastfeeding for 6 months definitely reduced the risk of undernutrition. Lesser was the literacy of the mother more was the frequency of undernutrition (less than 5th std education 40%). 2.6% of undernourished children had open toilet facilities.

**Table 1:** Classification of undernutrition

|                            | Observations | Percentage |
|----------------------------|--------------|------------|
| At risk for undernutrition | 25           | 33.3%      |
| Moderate undernutrition    | 33           | 44%        |
| Severe undernutrition      | 17           | 22.6%      |

**Table 2:** Age wise distribution

|                        | Observations | Percentage |
|------------------------|--------------|------------|
| 6 months to 12 months  | 12           | 16%        |
| 13 months to 36 months | 23           | 30.6%      |
| 37 months to 60 months | 40           | 53.3%      |

**Table 3:** Etiology of undernutrition

|                          | At risk for undernutrition | Moderate undernutrition | Severe undernutrition | Total |
|--------------------------|----------------------------|-------------------------|-----------------------|-------|
| Dietary inadequacy       | 12(16%)                    | 14(18.5%)               | 4(5.3%)               | 30    |
| Chronic systemic illness | 7(9.3%)                    | 8(10.5%)                | 12(16%)               | 27    |
| Recurrent infections     | 4(5.3%)                    | 9(12%)                  | 0                     | 13    |
| Preterm/LBW babies       | 2(2.6%)                    | 2(2.6%)                 | 1(1.3%)               | 5     |
|                          | 25                         | 33                      | 17                    | 75    |

Table 4: High risk factors

| FACTORS                                      | Observations | Frequency |
|--|--------------|-----------|
| Socio-economic status                        |              |           |
| Upper class                                  | 0            | 0         |
| Upper middle class                           | 1            | 1.3%      |
| Lower middle class                           | 7            | 9.3%      |
| Upper lower class                            | 28           | 37.3%     |
| Lower lower class                            | 39           | 52%       |
| Breast feeding and undernutrition            |              |           |
| Breast feeding initiated on day of life 1    | 15           | 20%       |
| Breast feeding initiated after day of life 1 | 60           | 80%       |
| Exclusively breast fed till 6 months         | 13           | 17.3%     |
| Mixed feeding                                | 67           | 89.3%     |
| Age of starting complementary feeds          |              |           |
| Before 3 months                              | 2            | 26%       |
| 3 months to 6 months                         | 40           | 53.3%     |
| After 6 months                               | 33           | 44%       |
| Immunisation status                          |              |           |
| Immunised till date                          | 65           | 86.6%     |
| Incomplete immunisation                      | 10           | 13.3%     |
| Mother's literacy                            |              |           |
| Less than 5 <sup>th</sup> standard           | 30           | 40%       |
| 5 <sup>th</sup> to 10 <sup>th</sup> standard | 25           | 33.3%     |
| More than 10 <sup>th</sup> standard          | 20           | 26.6%     |
| Toilet hygiene                               |              |           |
| Closed toilet                                | 73           | 97.3%     |
| Open toilet                                  | 2            | 2.6%      |

## DISCUSSION

Nutrition is one of the important social determinants of health. Myatt *et al*<sup>1</sup> in their review study in 2006 concluded that mid upper arm circumference is the best case detection method for severe undernutrition and that it is also simple, inexpensive and acceptable. MUAC can be taken by minimally trained health workers with fewer and smaller errors as compared to other anthropometric measurements (weight for age and weight for height). Given the situation that undernutrition is a major public health problem in India, we can train our grass root level workers (especially the Anganwadi workers) in mid upper arm circumference measurement and assess the health status. Many studies have proved that MUAC is an important tool in assessing the nutritional status of children, but in this study we have tried to know the nutritional status of the children who are hospitalised for any reasons. In a study done by Agrawal KH *et al*<sup>2</sup>, they found the overall prevalence of malnutrition was 40%, while, the prevalence of severe undernutrition was 13%. More number of females were malnourished than males in his study, with statistical significance in pertinence to severe undernutrition. This could be due to gender bias particularly with respect to intra familial food distribution prevalent in Indian society. In our study we found that the prevalence of undernutrition as 9.8% among the children admitted in paediatric ward with a female predominance

of 57.3% as compared to male 42.6%, but was not statically significant ( $p>0.05$ ). He also stated that the prevalence of severe undernutrition was 13.3%, whereas in our study it was found to be 22.6%, both the studies showed higher frequency of children in moderate undernutrition category 60 % and 44% respectively. In our study it was also noted that the frequency of undernutrition was highest in children aged 3 years to 5 years, cause might be due to the birth of the younger sibling, who gains all the attention. Mangala S *et al*<sup>3</sup> observed that, better educational status of parents had a positive impact on the nutritional status of children. Educated parents are more aware about their child's health and have a better chance of utilizing the health services as compared to the illiterate ones. This finding was suggestive of a strong association between parental literacy and nutritional status of children. One of the main highlight of the study was the significant association of social category of the child and his/her nutritional status. The proportion of undernourished children was extremely high in lower socio economic status children. Low education on the other hand is the result of lack of schools. Previous studies have found undernutrition rate to be higher among household with low socioeconomic status. Similar findings were observed in our study where the frequency of undernutrition was more in mothers who have gained education below 5<sup>th</sup> std (40%) and undernutrition was also found to be more common

children belonging to lower socio economic status families (80%). Parental education is also associated with better nutritional status for preschool children. Lesser was the literacy of the mother more was the frequency of undernutrition, this was found to be statistically positive in our study ( $p < 0.05$ ). Children who received 1<sup>st</sup> breast feed in the first hour of life and were exclusively breast fed till 6 months of age, showed the frequency of undernutrition lower than the ones who received top feeds and were started with complementary feeds before the 6 months of age. In our study it was noted that early initiation of breast feeding i.e. within the first 1 hour of life reduced the risk of undernutrition, this was also found statistically significant ( $p < 0.01$ ). A study done by Sathyanath M *et al*<sup>4</sup> in a rural community, stated that high female education status with 100% immunisation and higher proportion of exclusive breast feeding reduced the risk for undernutrition, thus attributing the major factor leading to undernutrition as defective complementary feeding. Dietary inadequacy was found to be the leading cause for undernutrition in our study which was also found to be statistically significant ( $p < 0.05$ ). Anusya *et al*<sup>5</sup> studied high risk factors leading to undernutrition in children under five and found the prevalence of undernutrition among children in developing countries was very high with low parental education, childhood illness, short birth interval, open defecation, type of weaning and complimentary food given to children were some of the significant risk factors for undernutrition. Studies also showed the prevalence of under nutrition more in states with higher number of low birth weight or premature births than in states with more number of babies being in full term and normal birth weight babies. We thus attribute the major factor leading to under nutrition as defective complementary feeding. Hence we recommend proper maternal education on the right time of initiation and the right type of complementary feeds.

## CONCLUSION

Most of the studies have been done on a community level, to assess the undernutrition. This is a hospital based study which proves that MUAC can also be used in a hospital level to assess undernutrition. So MUAC is the simple and useful clinical tool to assess undernutrition in a hospital based study.

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