



Assessment of Risk Factors and Prevalence of under Nutrition Using Composite Index of Anthropometric Failure (CIAF) among under 5 Children in a Tertiary Care Center

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Under nutrition is a major health problem in the developing countries especially India. It has a significant impact to child morbidity and mortality.

Objective: To assess the risk factor and prevalence of under nutrition among children under 5 years of age, using conventional indices and the Composite Index of Anthropometric Failure (CIAF), and then comparing their estimated results.

Materials and Methods: This cross-sectional study was carried out in the pediatrics department (outpatient and inpatient) from January 2021 to March 2021 using sample size of 300. Attendants of Toddler's were interviewed with semi structured proforma and height and weight of toddler were measured by measuring tape and weighing machine respectively. Informed consent was obtained. MS excel was used for data analysis after compilation.

Results: CIAF identified 96% of childrens to have under nutrition. By using conventional indices it was seen that 62.8% of the children were underweight, 50% were stunted and 44.4% were wasted.

Conclusion: CIAF gives a better estimate of under nutrition than currently used conventional indices; and identifies more children with multiple anthropometric failures.

Keywords: Malnutrition; underweight; wasted; stunted.

1. INTRODUCTION

There has been an effort to develop an alternative indicator of under nutrition, which can be used to measure the burden of under nutrition among children under five years old. The concept of the composite index of failure (CIAF) was proposed to provide a more comprehensive analysis of the under nutrition burden in a community.

Malnutrition is a major public health issue in the developing countries especially India. In developing countries, about 2.3 million children die yearly due to malnutrition [1]. A study conducted in 53 countries revealed that the prevalence of mild underweight has a strong correlation with child mortality [2].

The three most commonly used anthropometric indicators are stunting (low height-for-age), underweight (low weight-for-age) and wasting (low weight-for-height) [3]. Underweight is used as a composite of stunting and wasting, but it does not distinguish between the two. In a population, there is always a degree of overlap between each indicator – i.e. some underweight children will also experience stunting and/or wasting, and some children might simultaneously experience all three forms of anthropometric failure – stunting, wasting and underweight. As a result none of these conventional indicators used can truly reflect the overall burden of undernutrition. An alternative indicator – the composite index of anthropometric failure (CIAF) – has been proposed by Svedberg, [4] and used successfully by Nandy et al [5]. This study was taken up to assess the risk factors and prevalence of under nutrition among children below the age of five years using Composite Index of anthropometric failure.

2. MATERIALS AND METHODS

This cross sectional study was carried out in the pediatric department (outpatient and inpatient) of Saveetha Medical College, Thandalam, Chennai from January 2021 to March 2021 after getting Institutional Human Ethical Committee (IHEC) clearance. Sample size was 300. Attendants of toddler's were interviewed with semi structured proforma. Height and weight of the children were measured by measuring tape and weighing machine respectively. An informed consent was obtained. The collected data was converted into

z score. Svedberg's model identifies six groups of children. This model, further modified by Nandy et al., counts all children with wasting and/or stunting and/ or underweight sub-grouped in six different categories (Group B-F and Y) and excludes children with no anthropometric failure (Group A) [4]. Group B, F, and Y consisted of children with only wasting, stunting, and underweight, while group C, D, and E composed of children with multiple anthropometric failures.

Eligibility criteria- All children under the age of 5.

Exclusion criteria-Those who were not interested to participate in the study.

The data was checked thoroughly and analyzed by using MS excel.

3. RESULTS

From this study it is seen that about 68 % of children fall under group D, 20.7% in group C followed by 4% in both group A and E, 2% in group F and 1.3% in group B (Fig 1).Overall CIAF identifies 96% of childrens have under nutrition. By using conventional indices it was seen that 62.8% of the children were underweight, 50% were stunted and 44.4% were wasted .

It was seen that among the children with anthropometric failure, 80% of them belong to lower middle class (calculated by using modified BG Prasad scale).

32.6% of these children were preterm babies. Out of this 75.5% of children were stunted, wasted and underweight, 18.3% had underweight and wasting, 4% had only wasting. 2% of normal children were also found to be preterm.

Out of 300 mothers 58(19.3%) of them had anaemia, in this 10 (3.3%)of them had a normal child without failure ,16(5.3%) of them had children underweight and wasting ,and 40(13.3%) of them had underweight , wasting and stunting.

Out of the 300 mothers 36 (12%)of them had PIH (hypertension in pregnancy),of which 8(0.3%) of them had children with underweight and wasting and 30(10%) of them had children with underweight ,wasting and stunting.

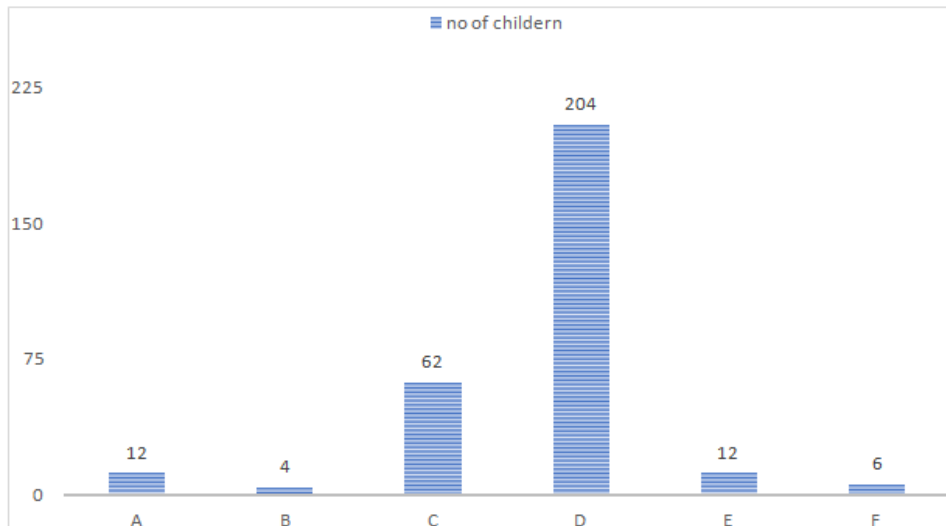


Fig. 1. CIAF grouping

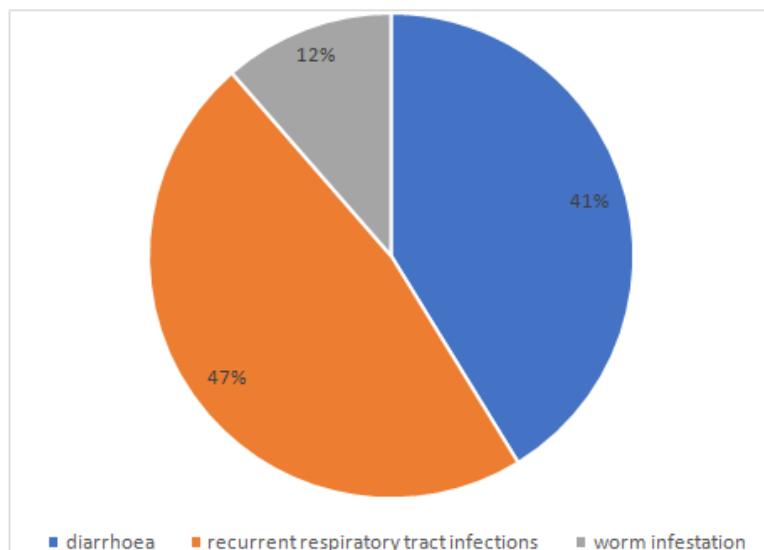


Fig 2. Illness in the past

Among the children with under nutrition, 12% of them had a past history of worm infestation, 47% had recurrent respiratory infection and 41% had diarrhoea (Fig 2).

As shown in Table 4, in 136 (45.3%) children weaning was started less than 6 months out of this 134 of them had under nutrition.

4. DISCUSSION

In this study CIAF was utilized to provide an overall estimate of undernourished under five children attending Saveetha Medical College. The prevalence of 96% by CIAF was evidently

higher than those estimates by conventional indices (stunting 50%, wasting 44.4% and underweight 62.8%). The main merit of CIAF is that it reveals additional dimensions of the malnutrition “iceberg” and it could have potential implications for policy-makers, resource allocation and trend monitoring of undernutrition at the community level [5].

Few studies have shown a lower CIAF compared to our study, CIAF was found to be 62.1% by S Nandy et al., while the prevalence of underweight of Indian toddlers was found to be 47.1% in the year 2005 while CIAF was only 59.9% for under three children [5]. CIAF was found to be 65.25%

Table 1. Gestation

| | Normal | Underweight and wasting | Underweight, wasting and stunting | Only wasting | Only stunting | Stunting and wasting | Total |
|----------|--------|-------------------------|-----------------------------------|--------------|---------------|----------------------|-------|
| Pre term | 10 | 18 | 74 | 4 | 0 | 0 | 164 |
| Term | 2 | 44 | 130 | 0 | 12 | 6 | 136 |
| Total | 12 | 62 | 204 | 4 | 12 | 6 | 300 |

Table 2. Anaemia

| | Normal | Underweight and wasting | Underweight, wasting and stunting | Only wasting | Only stunting | Stunting and wasting | Total |
|-----------------|--------|-------------------------|-----------------------------------|--------------|---------------|----------------------|-------|
| With anaemia | 10 | 16 | 40 | 0 | 0 | 0 | 58 |
| Without anaemia | 2 | 46 | 164 | 4 | 12 | 6 | 242 |
| Total | 12 | 62 | 204 | 4 | 12 | 6 | 300 |

Table 3. PIH

| | Normal | Underweight and wasting | Underweight, wasting and stunting | Only wasting | Only stunting | Stunting and wasting | Total |
|-------------|--------|-------------------------|-----------------------------------|--------------|---------------|----------------------|-------|
| With PIH | 0 | 8 | 30 | 0 | 0 | 0 | 164 |
| Without PIH | 12 | 54 | 174 | 4 | 12 | 6 | 136 |
| Total | 12 | 62 | 204 | 4 | 12 | 6 | 300 |

Table 4. Complementary feeding

| Age of Complementary feeding initiation | Normal | Underweight and wasting | Underweight, wasting and stunting | Only wasting | Only stunting | Stunting and wasting | Total |
|---|--------|-------------------------|-----------------------------------|--------------|---------------|----------------------|-------|
| 6 months | 10 | 40 | 104 | 2 | 8 | | 164 |
| Less than 6 months | 2 | 22 | 100 | 2 | 4 | 6 | 136 |
| Total | 12 | 62 | 204 | 4 | 12 | 6 | 300 |

for toddlers in a study by N Seetharaman et al., and underweight was found to be 46.6% [6]. In a study by GC mandal et al., showed 71.7% CIAF which is lesser compared to current study while prevalence of Underweight was found to be 60.9% [7]. A cross sectional study conducted in Bankura, West Bengal, S Shit et al., showed 78.1% CIAF among Toddlers lesser compared to current study while Underweight were only 38.5% which is lesser compared to that of current study [8]. In study by S das et al., Underweight (41.25%) was found to be less than CIAF (48.3%) [9]. Dasgupta et al., showed CIAF of 32.7% which is far low compared to current study while Underweight weight was few (17.7%) as well for under 5 children [10]. A study by GS Boregowda et al., Underweight was found to be 45.2% while CIAF was 62.1%[11].This drastic increase in CIFA maybe due to the ongoing COVID-19 pandemic.

From our study it is seen that 12% of them had a past history of worm infestation, 47% had recurrent respiratory infection and 41% had diarrhoea. This might be due to poor hygiene and living conditions. It is seen that 80% of this children belong to lower middle socioeconomic group. This suggest that poverty might have caused malnutrition and predisposed these children to these infections. A vicious cycle exists through which both poverty and malnutrition fuel and reinforce each other [12].

In 45.3% of children weaning was started earlier than 6 months. A study done in China shows that introduction of other diets before the age of 6 months increases the prevalence of pneumonia and diarrhoeal disease [13].

From this study it was also seen that 32.6 % of children where preterm babies and out of this 97.8 % were found to be malnourished. In a study conducted by Korkmaz A et al., the incidence of fetal malnutrition in preterm infants was found to be 54.8%, which was much greater than the incidences that have been reported for term infants [14] .A study by P Christian et al., showed that there is 1.9 increase odds of shunting, wasting and underweight in preterm babies [15]. This could be explained by the high incidence of prenatal risk factors such as maternal or obstetric diseases like anaemia, pre-eclampsia, and placental disorders, leading to both prematurity and fetal malnutrition in preterm infants.

Limitations of our study is that it was a hospital based study so more of sick children were

recruited which may have contributed to a very high CIAF we found. Similarly the percentage of preterms was also high.

5. CONCLUSION

CIAF gives a far better estimate of undernutrition than currently used conventional indices; identifies more children with multiple anthropometric failures. These findings reinforce the importance of proper sanitation and hygiene, infant and child feeding practices and appropriate maternal care in prevention of under-nutrition among under-five children. More community based studies should be planned to understand the actual burden of undernutrition using CIAF which can be used for better understanding for current situation of malnutrition and appropriate policy, planning and intervention programmes should be implemented.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

We conducted our research after obtaining proper IEC approval.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

PROFOMER

Assessment of risk factors and prevalence of under nutrition using Composite Index of Anthropometric Failure (CIAF) among under 5 children in Saveetha Medical College

NAME: AGE: SEX:
 HOSPITAL ID NO:
 HEIGHT: WEIGHT:
 HEAD CIRCUMFERENCE:- MID ARM CIRCUMFERENCE:
 Joint family-YES/NO

MATERNAL HISTORY

Mother education: NIL/10th/12th/Degree
 Maternal age at marriage:
 Weight gain: >10kg/<10kg
 Anaemia: yes/no
 PIH: yes/no
 Diabetes: yes/no

BIRTH HISTORY

Birth order: 1st/2nd/3rd/4th
 Birth weight: >2.5kg /<2.5kg
 Gestation: term/preterm
 Exclusive breast feeding: yes/no
 Colostrum feeding: yes/no
 Age at which complementary feeds was started:
 Social class according to modified BG Prasad scale
 TOTAL MONTHLY INCOME: NO. OF FAMILY MEMBERS:
 Past H/O significant illness: (diarrhoea/recurrent respiratory tract infection/worm infestation)
 H/O illness in the past 15 days: yes/no

| Group name | Description | Wasting | Stunting | Underweight |
|------------|---|---------|----------|-------------|
| A | No failure: Children whose height and weight are above the age-specific norm (i.e. above – 2 z-scores) and do not suffer from any anthropometric failure. | NO | NO | NO |
| B | Wasting only: Children with acceptable weight and height for their age but who have subnormal weight for height | YES | NO | NO |
| C | Wasting and underweight: Children with above-norm heights but whose weight for age and weight for height are too low. | YES | NO | YES |
| D | Wasting, stunting and underweight: Children who suffer from anthropometric failure on all three measures. | YES | YES | YES |
| E | Stunting and underweight: Children with low weight for age and low height for age but who have acceptable weight for their height. | NO | YES | YES |
| F | Stunting only: Children with low height for age but who have acceptable weight, both for their age and for their short height. | NO | YES | NO |
| Y | Underweight only: Children who are only underweight. | NO | NO | YES |

Weight /age:
Height/age:
Weight/height:
CIAF group:

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