Research Article

Composite index of anthropometric failure and its important correlates: a study among under-5 children in a slum of Kolkata, West Bengal, India

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Abstract

Background: In India, undernutrition remains a major public health problem despite several national programs targeting vulnerable groups, especially children.

Objectives: To assess the nutritional status and morbidity profile of under-5 children and to elicit the explanatory and contextual factors of this malady.

Materials and Methods: An observational, cross-sectional, descriptive study was conducted among under-5 children in a slum area of Kolkata, West Bengal, India. Anthropometric measurements were made following standard operative procedures and recall period of morbidity profile of last 2 weeks was recorded.

Results: Of total 100 under-5 children assessed, the mean (standard deviation) of the sample was 23.52 (15.65) months. About 55% children were found to have anthropometric failure using composite index of anthropometric failure. However, with standard anthropometric indices such as weight for age, weight for height, height for age, and mid upper arm circumference prevalence of malnutrition were 42% (underweight), 30% (wasting), 28% (stunting), and 48% (undernutrition), respectively. About 48% children had some kind of morbidity of which acute respiratory infection accounted for 9%, diarrhea 11%, fever 9%, and skin infection 6%. Age [OR = 5.17 (2.09–12.76)], family type [OR = 4.11 (1.77–9.49)], literacy of mother [OR = 15.79 (5.98–42.35)], birth weight [OR = 4.2 (1.74–10.13)], birth order [OR = 5.25 (1.41–19.51)], and morbidity profile [OR = 6.35 (2.62–15.36)] are significantly associated with nutritional status.

Conclusion: Accelerating the reduction in under-5 mortality is possible by expanding effective preventive and curative interventions that target the main causes of undernutrition. All efforts must be made to improve the nutritional status of the children. This will in the long run help in making this nation healthier, stronger, and more prosperous.

KEY WORDS: Composite index of anthropometric failure, morbidity, under-5 children

Introduction

Under-5 children represent the vulnerable and the most important target group where malnutrition contributes to their mortality and morbidity along with delayed mental and motor development during these formative years. In the long run, malnutrition decreases the educational achievement, labor productivity, and economic growth of a country. The various risk factors identified for undernutrition are related to the child, mother, and largely their environment. Adequate nutrition during infancy and childhood is fundamental to a child's full developmental potential[1] whereas poor quality of infant and young child feeding practices are the major cause of malnutrition among the under-5 children of any society.[2]

As per UNICEF, under-5 mortality rate is the best single indicator of social development and well-being rather than gross national product per capita, as it reflects income, nutrition, health education, and basic education.[3] A study of childhood mortality in the Americas showed that no less than

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50% children who died before the age of 5 years were found to have malnutrition as the underlying or associated cause of death, the peak of this mortality being in the postneonatal period.[3] In India, common morbidities among children are fever, acute respiratory infection (ARI), diarrhea, and malnutrition.[3]

It is an established fact that malnutrition and infection form a vicious cycle, and they share important sociodemographic and biological determinants such as maternal education, family income, family type, gender, birth order, and birth weight.[3,4] Worldwide, almost 7 million children die each year before they reach their fifth birthday[5] whereas India (24%) and Nigeria (11%) together account for more than one-third of all under-5 deaths. Globally, undernutrition is responsible, directly or indirectly, for at least 35% deaths in under-5 children.[6] To eliminate the burden caused by this major public health problem, the global community has designated halving the prevalence of underweight children by 2015 as a key indicator of progress toward the Millennium Development Goal-1 (MDG-1) of eradicating extreme poverty and hunger and to reduce by two thirds, between 1990 and 2015, the under-5 mortality rate for achievement of MDG-4 of reducing child mortality.[7]

The prevalence of underweight among children in India is among the highest in the world, and nearly double that of sub-Saharan Africa where approximately 60 million children are underweight.[8] Of three malnourished children in the world, one lives in India.[9] According to National Family Health Survey 3 (NFHS-3), the prevalence of stunting, wasting, and underweight among under-3 children in West Bengal is 41.8%, 19.2%, and 37.6%, respectively.[4]

Malnutrition can be assessed in a number of ways, among which composite index of anthropometric failure (CIAF) is the most recent, relatively robust because it envisages all the parameters for estimation of nutritional status of a child. The conventional indices such as underweight, wasting, and stunting reflect distinct biological processes and individually cannot measure the overall prevalence of undernutrition, as they overlap; an underweight child may also be stunted and/or wasted. This model initially proposed by Svedberg[10] and further modified by Nandy et al.[11] counts all children with wasting and/or stunting and/or underweight. The new WHO Z-score (obtained from the Multicentre Growth Reference Study)[12] depict normal early childhood growth under optimal environmental conditions and can be used to assess children everywhere, regardless of ethnicity, socioeconomic status, and type of feeding.[3]

This study uses the WHO Z-score system[12] and CIAF[10,11] to assess the nutritional status and integrated management of neonatal and childhood infections (IMNCI) guidelines for morbidity profile. Although numerous studies are available regarding prevalence of undernutrition among under-5 children, not many researches were conducted in recent times in this part of the country, especially among children living in slums. Also determining the magnitude of malnutrition and morbidity profile along with its determinants specifically in slums will help the health administrators and policy makers to work on all the modifiable factors for effective prevention and control of this malady among the under-5 children. The study was conducted with the following objectives.

Objectives

1. To assess the nutritional status using CIAF and morbidity profile of under-5 children in a slum of Kolkata, West Bengal, India.
2. To study the covariates associated with the nutritional status and morbidity profile of the study subjects.

Material and Methods

Study Settings

The study was conducted in a slum area of Kolkata, West Bengal, India, where the health-care service was provided by the Urban Health Centre, Chetla, under the purview of All India Institute of Hygiene and Public Health, Kolkata, West Bengal.

Study Variables

- Socioeconomic factors (education and occupation of the parents, and monthly income of the family)
- Demographic factors (age and gender of the child, and religion, caste, and type of family the child belongs to)
- Biological factors (age of mother during the child birth; birth order of the child; birth spacing; significant maternal medical, surgical, gynecological, and obstetric illness; birth weight of the child; and gestational age of the child at birth)

Nutritional status of under-5 children was assessed using different indices of growth:

1. The anthropometric measurements, that is, height, weight and mid upper arm circumference of each subject, weretaken.
   - Weight for age (WZA): Underweight for age is defined for Z-score < –2.0 SD of the WHO (2006) reference standards.
   - height for age (HFA): Stunting is defined for Z-score < –2.0 SD of the WHO (2006) reference standards.
   - Weight for height (WFH): Wasting is defined for Z-score < –2.0 SD of the WHO (2006) reference standards.
   - Mid upper arm circumference (MUAC): The cutoff points for MUAC of 13.5 cm was used for identifying children undernutrition, an MUAC of between 12.5 and 13.5 cm denoting moderate undernutrition, and less than 12.5 cm severe undernutrition.
2. For measuring prevalence of malnutrition in children, CIAF was followed. According to CIAF classification children can be divided into following seven groups:

   I. Group A: No failure
   II. Group B: Wasting only
   III. Group C: Wasting and underweight
   IV. Group D: Wasting, stunting, and underweight
   V. Group E: Stunting and underweight
   VI. Group F: Stunting only
   VII. Group Y: Underweight only

From the above classification, total prevalence of undernutrition is measured by summation of all the groups except group A.

In this study, morbidity profile of under-5 children was assessed by frequencies and duration of morbidity in last 2 weeks from day of study. The 2-week recall period was thought to be the most suitable for ensuring that there will be an adequate number of cases to analyze and that recall errors will not be too serious.[4]

Sample Size

According to NFHS-3 report, prevalence of undernutrition (underweight for age) among under-5 children was 43%. Considering this prevalence, sample size was calculated using the equation $4pq/L2$ [where p is the prevalence, q is 1 - p, and L is the allowable error (10%)]. The sample size was found to be 100.

Sampling Unit

Under-5 children: After line listing the under-5 children of the names of which was obtained from the records of Urban Health Centre, Chetla, the desired sample (i.e., 100 children) was selected by simple random sampling method.

Study Tools

1. Predesigned pretested schedule
2. Portable weighing machine (properly calibrated)
3. Baby weighing machine (properly calibrated)
4. Anthropometric rod
5. Nonstretchable measuring tape
6. Infantometer

Method of Data Collection

The mothers of these children were interviewed with the help of a predesigned, pretested, semi-structured schedule after obtaining clearance from the institutional ethics committee and informed verbal consent from the mothers who were assured of anonymity and confidentiality of information collected. Information was obtained regarding different demographic, socioeconomic, and biological factors of children and their family. For assessing nutritional status, clinical examination and anthropometric measurements were carried out following standard operating procedures. The data included were weight, recumbent length (if the child was not able to stand without support), standing height, and MUAC. Weight was measured to the nearest 0.1 kg using a Salter weighing machine and standard weighing (bathroom) scale. Height was measured using a nonstretchable tape fixed to a vertical wall, with the participant standing on a firm/level surface, and it was measured to the nearest 0.1 cm. Recumbent length was measured using an infantometer. Each measurement was taken twice and the mean of the two readings was recorded. Data thus collected were analyzed by simple frequency distribution tables, mean, standard deviation (SD), and multivariate analysis using SPSS software, version 22.

Results

Mean (SD) age of the under-5 children in the study was 23.52 months (SD = 15.65 months), of which 53% were females and 47% were males. Most of the study population belonged to class IV (71%) and class V (15%) according to modified BG Prasad Scale (2013), and 48% children were living in joint families. Only 43% of the mothers were educated till middle school and above. Around 40% of the children had birth weight £2.5 kg. About 61% children were on exclusively breast-feed and 18% had birth order of 3 or more [Table 1].

About 55% children were diagnosed with undernutrition according to CIAF whereas with standard anthropometric

Table 1: Background information of the study population (N = 100)

Variables	Frequency (n)[a]
Age (months)	
0–11	31
12–23	29
24–35	11
36–47	13
48–59	16
Gender	
Male	47
Female	53
Type of family	
Nuclear	52
Joint	48
Education of mother	
Illiterate	15
Primary (1–4)	42
Middle (5–8)	25
Ninth and above	18
Per capita income (modified BG Prasad Scale, 2013)	
2578–5156 (class II)	3
1547–2577 (class III)	11
773–1546 (class IV)	71
<773 (class V)	15
Birth weight (kg)	
≤2.5	40
>2.5	60
Birth order	
1	28
2	54
≥3	12
Feeding practice in first 6 months	
EBF	61
PBF	12
Mixed BF	27

EBF, exclusive breast feeding; PBF, predominant breast feeding; mixed BF, Mixed Breast Feeding.
[a]As total sample size was 100, so the frequency also corresponds to its respective %.

Table 2: Assessment of nutritional status of children according to different anthropometric indices (*n* = 100)

Anthropometric indices	Frequency (*n*)[a]
WZA	
Normal	58
Underweight (<-2 SD)	23
Severe underweight (<-3 SD)	19
HFA	
Normal	72
Stunting (<-2 SD)	18
Severe stunting (<-3 SD)	10
WFH	
Normal	70
Moderate wasting (<-2 SD)	12
Severe wasting (<-3 SD)	18
MUAC	
Normal	52
Moderate undernutrition (<-2 SD)	25
Severe undernutrition (<-3 SD)	17
CIAF	
Group A (no failure)	45
Group B (wasting only)	5
Group C (wasting and underweight)	16
Group D (wasting, stunting, and underweight)	9
Group E (stunting and underweight)	11
Group F (stunting only)	8
Group Y (underweight only)	6

WZA, Weight for age; HFA, height for age; WFH, weight for height; MUAC, mid-upper arm circumference; CIAF, composite index anthropometric failure.
[a]As total sample size was 100, so the frequency also corresponds to its respective %

indices such as WZA, WFH, HFA, and MUAC prevalence of malnutrition was found to be lower, that is, 42% (underweight), 30% (wasting), 28% (stunting), and 48% (undernutrition), respectively [Table 2]. Therefore, it is clear that standard anthropometric indices underestimate the prevalence of malnutrition when compared to CIAF.

About 48% children had some kind of morbidity, of which ARI accounted 19%, diarrhea 11%, fever 9%, and skin infections 6% [Table 3].

Age [OR = 5.17 (2.09–12.76)], family type [OR = 4.11 (1.77–9.49)], literacy of mother [OR = 15.79 (5.98–42.35)], birth weight [OR = 4.2 (1.74–10.13)], birth order [OR = 5.25 (1.41–19.51)], and morbidity profile [OR = 6.35 (2.62–15.36)] were significantly associated with nutritional status.

The variables already found significant in bivariate analysis were entered into a multivariate logistic model (binary logistic:link function = Logit), by "Enter" method. Strength of association of variables such as family type, birth order, birth weight, and age were attenuated, when adjusted with other variables in the multivariate analysis. But variables such as education of mother [AOR = 9.89 (2.52–38.34)] and morbidity profile [AOR = 10.65 (2.84–39.9)] stayed significant in the multivariate analysis as found in bivariate analysis [Table 4].

Table 3: Morbidity profile of study subjects (recall period 2 weeks; *n* = 100)

Morbidity pattern	Frequency (*n*)[a]
Pneumonia	3
Diarrhea	11
ARI	19
Fever	9
Skin infection	6
No morbidity	52

ARI, acute respiratory infection.
[a]As total sample size was 100, so the frequency also corresponds to its respective %.

Discussion

In this study, prevalence of underweight among under-5 children was 42% and that of wasting was 30%, as compared to 42.5% underweight and 19.8% wasting in India (NFHS-3).[8] However, the proportion of stunting in this study was 28%, and considerably lower than that reported by NFHS3 in India (48%) and West Bengal (44.6%). Similarly, the prevalence of undernutrition using CIAF was found to be 55%, which is much less than that observed by Mandal and Bose[13] (73.1%) in Hooghly district of West Bengal, Mukhopadhyay and Biswas[14] (69.1%) and Shit et al.[15] (80.3%) in Bankura district of West Bengal, Das and Bose[16] (66.3%) in Purulia district of West Bengal, and Sen and Mondal[17] (63.6%) in Darjeeling district of West Bengal to have anthropometric failure. Shit et al.[15] also observed similar findings regarding education level of mother, type of family, and number of siblings in the family [higher birth order (³3) taken into consideration in this study]. Nandy and Miranda[18] analyzed the NFHS-2 data and observed an overall prevalence of 59.8% anthropometric failure in our country. Prevalence of CIAF in other countries were 38.7% in Bahawalpur region of Pakistan,[19] 33.3% in Nyanza Province of Kenya,[20] and 55.5% in Zambia.[21]

In this study, children who were of higher age group, male child, or with less educated mothers were more likely to have anthropometric failure. Similar findings were observed in the study by Anjali et al.[22]

From this study the prevalence of childhood morbidities was found to be 48%. This finding emphasizes the role of infections in the causation of malnutrition. Similar findings shown by Dhone et al.[22] and Joshi et al.[23] in their longitudinal study in three slums of Pune, Maharashtra, India, found that fever, gastrointestinal, and respiratory illness were the major illnesses. The combined prevalence of all the morbidities was 57.5%. Mishra[24] in his study in Orissa found that 19.8% children had diarrhea, 17.40% had upper respiratory tract infection, and 2.40% had skin infection. In this study, 19% children had ARI, 11% had diarrhea, and 9% had fever

Table 4: Bivariate and multivariate logistic regression of undernutrition assessed by CIAF

C0-Variates	CIAF no. (%)	OR (CI)	AOR (CI)
Age (months)			
>23.52	31 (71)	5.17 (2.09–12.76)	3.14 (0.863–11.46)
£23.52 (mean)	24 (40)	1	1
Type of family			
Nuclear	37 (71.2)	4.11 (1.77–9.49)	0.86 (0.25–2.99)
Joint	15 (37.5)	1	1
Mother's literacy status			
£Primary	46 (80.7)	15.79 (5.98–42.35)	9.89 (2.52–38.34)**
>Primary	9 (21)	1	1
Birth weight			
£2.5	30 (75)	4.2 (1.74–10.13)	1.76 (0.50–6.01)
>2.5	25 (41.7)	1	1
Birth order			
³3	15 (83.3)	5.25 (1.41–19.51)	3.25 (0.59–17.79
1 and 2	40 (48.8)	1	1
Morbidity			
Present	37 (77.1)	6.35 (2.62–15.36)	10.65 (2.84–39.9)**
Absent	18 (34.6)	1	1

The variables already found significant in bivariate analysis were entered into the multivariate logistic model.
For the multivariate model, the Hosmer–Lemeshow test gave a χ^2-value of 5.23 (p = 0.630, not significant) indicating good model fit.
**Significant variables in multivariate analysis.

whereas in NFHS-3 these morbidities accounted for 6% for ARI, 9% for diarrhea, and 15% for fever overall in India, respectively, and prevalence of ARI in West Bengal 13%.[8]

Study by Patnaik et al.[25] showed ARI (12.9%) was the most common morbidity followed by fever (4.84%) and diarrhea (4.03%) in last 3 months. Different standardized methods are available for assessing nutritional status such as WZA, WFH, HFA, and MUAC. CIAF consolidates all methods of assessment of nutritional status and, therefore, it is felt that it gives the true measurement and complete picture of malnutrition of the under-5 population.

Our study had certain strength, namely, (1) this was a community-based study, (2) standard operative procedures followed for all measurements, and (3) it focused simultaneously on assessment of undernutrition using CIAF and morbidity profile and their association.

Certain limitations in our study were the following: (1) small sample size and (2) limited study period, so the children were not followed up. A longitudinal study may prove more useful in this regard.

Conclusion

The prevalence of undernutrition was high among under-5 children of the urban slum surveyed. Every endeavor should be made to combat this problem through multipronged approach such as growth monitoring, nutritional supplementation, and nutritional rehabilitation, early diagnosis and treatment of morbidity and last, but not the least, nutrition education for parents. This marginalized population is being served by the field health staff of Urban Health Centre. Immediate steps must be taken to goad these health workers to impart comprehensive health services to these children including health education on correct child bearing and child rearing practices and to lower the rates of infection and morbidity among the children. All these in the long run will improve the nutrition status of children of this deprived group.

References

1. Dewey K. *Guiding Principles for Complementary Feeding of the Breastfed Child*. Geneva: World Health Organization, 2003. Available at: http://whqlibdoc.who.int/paho/2003/a85622.pdf (last accessed on September 24, 2014).
2. World Health Organization. *Complementary Feeding: Report of the Global Consultation, and Summary of Guiding Principles for Complementary Feeding of the Breastfed Child*. Geneva, Switzerland: World Health Organization, 2001. Available at: http://www.who.int/nutrition/publications/Complementary_Feeding.pdf (last accessed on September 24, 2014).
3. Park K. *Textbook of Preventive and Social Medicine*, 22nd edn. Jabalpur: Banarsidas Bhanot, 2013. pp. 500–510, 530.
4. International Institute for Population Sciences. *National Family Health Survey (NFHS-3), 2005–06: India, Volume I*. Mumbai, India: IIPS, 2007. Available at: http://www.rchiips.org/nfhs/report.shtml (last accessed on September 24, 2014).
5. You D, New JR, Wardlaw T. *Levels and Trends in Child Mortality. Report 2012: Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation, 2011*. Available at: http://www.who.int/maternal_child_adolescent/documents/levels_trends_child_mortality_2012.pdf (last accessed on September 24, 2014).

6. WHO, UNICEF, IFPRI, UC Davis, FANTA, AED, et al. *Indicators for Assessing Infant and Young Child Feeding Practices Part III: Country Profiles*. Geneva, Switzerland: World Health Organization, 2010. Available from http://www.unicef.org/nutrition/files/IYCF_Indicators_part_III_country_profiles.pdf (last accessed on September 24, 2014).
7. Resolution A/55/2, The United Nations Millennium Declaration [United Nations (UN), New York, 8 September 2000]; (www.un.org/millennium/declaration/ares5552e.tm). Available at: http://www.un.org/millennium/declaration/ares552e.htm (last accessed on September 24, 2014).
8. Gragnolati M, Shekar M, Das Gupta M, Bredenkamp C, Lee YK. *India's Undernourished Children: A Call for Reform and Action*. Washington, DC: Health, Nutrition, and Population Division, World Bank, 2005. Available at: http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/2235461147272668285/IndiaUndernourishedChildrenFinal.pdf (last accessed on September 24, 2014).
9. UNICEF. *Malnutrition Is More Common in India than in Sub-Saharan Africa. One in Every Three Malnourished Children in the World Lives in India*. New Delhi, India: United Nations Children's Fund [Internet]. [Cited on December 26, 2012]. Available at: http://www.unicef.org/india/children_2356.htm (last accessed on September 24, 2014).
10. Svedberg P. *Poverty and Undernutrition: Theory, Measurement and Policy*. New Delhi: Oxford India Paperbacks, 2000.
11. Nandy S, Irving M, Gordon D, Subramanian SV, Smith GD. Poverty, child under nutrition and morbidity: new evidence from India. Bull World Health Organ 2005;83(3):210–6.
12. WHO. *The Multicentre Growth Reference Study Group: WHO Child Growth Standards: Length/Height-for-Age, Weight-for-Age, Weight-for-Length, Weight-for-Height and Body Mass Index-for-Age: Methods and Development*. Geneva: World Health Organization, 2006. Available at: http://www.who.int/childgrowth/standards/technical_report/en/index.html (last accessed on May 22, 2014).
13. Mandal G, Bose K. Assessment of overall prevalence of undernutrition using composite index of anthropometric failure (CIAF) among preschool children of West Bengal, India. Iranian J Ped 2009;19(3):237–43.
14. Mukhopadhyay DK, Biswas AB. Food security and anthropometric failure among tribal children in Bankura, West Bengal. Indian Pediatr 2011;48(4):311–4.
15. Shit S, Taraphdar P, Mukhopadhyay DK, Sinhababu A, Biswas AB. Assessment of nutritional status by composite index for anthropometric failure: a study among slum children in Bankura, West Bengal. Indian J Public Health 2012;56(4):305–7.
16. Das S, Bose K. Report on "anthropometric failure" among rural 2-6 years old Indian Bauri caste children of West Bengal. Anthrop Rev 2009;72:81–8.
17. Sen J, Mondal N. Socio-economic and demographic factors affecting the Composite Index of Anthropometric Failure (CIAF). Ann Hum Biol 2012;39(2):129–36.
18. Nandy S, Miranda JJ. Overlooking undernutrition? Using a composite index of anthropometric failure to assess how underweight misses and misleads the assessment of undernutrition in young children. Soc Sci Med 2008;66(9):1963–6.
19. Khan REA, Jamal WN. Determinants of under-nutrition of primary school-age children: a case study of urban Bahawalpur. Paper presented at Proceedings of the 5th International Conference on Statistical Sciences, Mathematics, Statistics and Applications; January 23–25, 2009; Lahore, Pakistan. Available at: http://www.isoss.net/downloads/Proc5thconf.pdf#page=291 (last accessed on September 24, 2014).
20. Berger MR, Fields-Gardner C, Wagle A, Hollenbeck CB. Prevalence of malnutrition in human immunodeficiency virus/acquired immunodeficiency syndrome orphans in the Nyanza province of Kenya: a comparison of conventional indexes with a composite index of anthropometric failure. J Am Diet Assoc 2008;108(6):1014–7.
21. Lekprichakul T, Umetsu C, Yamauchi T. *Child Growth as a Measure of Household Resilience: A Re-Examination of Child Nutrition Situation Using New Growth Reference Standard. Vulnerability and Resilience of Social-Ecological Systems*. FR3 Project Report, 2010; p. 98. Available at: http://www.chikyu.ac.jp/resilience/files/ReportFY2009/FullReport2009.pdf#page=10 (last accessed on September 24, 2014).
22. Dhone AB, Chitnis UB, Bhawalkar JS, Jadhav SL. Epidemiological study of under nutrition among under five years children in an urban slum. Med J DY Patil Univ 2012;5(2):110–3.
23. Joshi SB, Rao S, Kelkar RS. Changes in nutritional status and morbidity over time among preschool children from slums in Pune, India. Indian Pediatr 2000;37:1060–71.
24. Mishra S. Assessment of malnutrition and remedial measures to improve the quality of life of children of central Orissa. Indian J Prev Soc Med 2006;37:25–31.
25. Patnaik L, Pattnaik S, Kumar V, Sahu T. Morbidity pattern among under 5 children in an urban slum area of Bhubaneswar city, Odisha. Indian J Mater Child Health 2012;48:1–7.

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