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Risk factors for severe acute malnutrition in under-five children: a case-control study in a rural part of India

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ABSTRACT

Objectives: The present study was planned to identify some of the risk factors of severe acute malnutrition (SAM) in under-five children in a rural part of India.
Study design: Case-control study.
Methods: The study was carried out in rural areas of Yavatmal district. A total of 737 cases (under-five SAM children) and an equal number of normal controls were included in the study. Data were collected using a structured questionnaire. Binary logistic regression was used for multivariate analysis using a hierarchical model.
Results: The odds of a child being in the SAM category increased significantly if the family: was below the poverty line, have a kuccha house, have more children in the family, have less rooms in the house, have a working mother, has a mother with a lower level of education, have an unemployed father, did not use any water purification measure, did not always ensure parents washed their hands before feeding a child, did not wash hands with soap and water after defecation, have a father with any addictive habit like tobacco or alcohol consumption, have a maternal height <145 cm, have a maternal weight <45 kg, have a lower age at marriage for mothers, had an institutional delivery, have the same food utilized more than once in a day, have no age-appropriate vaccination, give prelacteal feeds, have a lower frequency of breast feeding, do not use semisolid food during the weaning period, exclusively breast feed for less than four months or more than six months, had low birth weight, have five or more episodes of illness in the previous year, have ≤3 feeds per day apart from breast milk, and not initiation of breast feeding within 30 min of birth.
Conclusion: Risk factors identified in the present study can be addressed through health system interventions. The strongest association was observed with child feeding practices; thus, more emphasis is required in nutritional education and counselling in strategies to fight undernutrition.

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Introduction

The alarming magnitude of undernutrition is one of the driving factors in India for initiating various health and nutrition supplementation schemes. All these schemes including ICDS (integrated child development scheme) have been effective in reducing undernutrition to certain extent.[1,2] Among the undernourished children in India, 8.1 million children were estimated to suffer from severe acute malnutrition (SAM), i.e. severe wasting according to WHO growth standards.[3] The disease burden attributable to stunting and severe wasting is one of the highest in south central Asia, where India alone had 0.6 million deaths and 24.6 million DALYs (disability adjusted life years) attributable to these conditions,[4] so there is an urgency to preventing and/or treating SAM or undernourished children.

The complexities of factors leading to undernutrition have been summarized by a conceptual framework developed by UNICEF.[5] The framework showed that causes of malnutrition were multisectoral, embracing food, health and caring practices. But despite of available knowledge and formulation of various strategies to combat undernutrition, it remained one of the important challenges of public health in India to resolve. These factors may have different effects on the prevalence of undernutrition in varying socio-geographical areas depending on their relative presence. Understanding of factors affecting SAM, moreover, in local context shall contribute to more focused strategies for tackling it. In this regards, it was observed that there were relatively fewer case-control studies specifically looking at risk factors for SAM in the Indian setup. Thus, this study was planned to identify some of the risk factors associated with SAM in under-five children in rural areas of Yavatmal district in the state of Maharashtra, India.

Methods

The present case-control study was carried out in rural areas of Yavatmal district in the state of Maharashtra, India. Yavatmal district is geographically one of the largest districts in Maharashtra and also covers both tribal (seven blocks) as well as non-tribal (nine blocks) populations in significant proportions. Also, as per HDI (human development index), there were eight blocks which are ranked poor on HDI. Thus, the rural area of Yavatmal district can represent other affluent as well as not so affluent rural areas in India. For the study, cases were defined as severe acute malnourished (SAM) children in the age group of 6–60 months based on weight for height Z score (WHZ) of <−3 SD as per WHOs growth standards of 2006.[6] An equal number of controls were selected from normal children (weight for height Z score [WHZ] of ≥−2 SD) matched for age, gender and geography. All study children were selected from children enrolled with ICDS centres in a village. All enrolled children had their weight and height measured by a health worker female (HWF) from the department of public health and ICDS workers. SAM children identified in the rural areas of Yavatmal district in July–August 2011 were considered for inclusion in study. Inclusion criterion were children aged between six months and 60 months, weight for height Z score (WHZ) <−3 SD for cases and WHZ ≥−2 SD for controls, willing to participate, no severe/chronic diseases like heart disease, kidney, cancer, congenital problems, etc. Sample size was estimated using open EPI software for a case-control study with 95% confidence interval and 85% power. The minimum sample size required was 633 in each group. HWFs identified 784 SAM children in 6–60 months age group. Out of these, those having chronic health ailments (8), those who may not be available in village due to migration during follow-up, i.e. from migrant families who were about to leave the village in the next few months (10) and those not willing to participate (29) were excluded, and 737 (94%) SAM children were identified as eligible to be included in the study. Due to ethical consideration, all eligible SAM children (737) were included in the study. An equal number of controls were identified from normal children, i.e. weight for height Z score (WHZ) ≥−2 SD of WHO[6] growth standards of 2006. Weight was measured using Salter's spring balance scale and the reading was noted to the nearest of 0.1 kg; length and height were taken to the accuracy of 0.1 cm.

Data were collected using a structured questionnaire. The questionnaire was prepared in English as well as in Marathi, a local language. Questionnaires were completed by trained medical officers through personal interview. Medical officers were trained by the investigator in filling up the questionnaire. The questionnaire was pilot tested. For pilot testing and hands-on training, medical officers were accompanied by an investigator for at least one interview. Approximately 45–60 min were required to collect the data. Data on various socio-economic, demographic and nutrition variables were collected, usually from the mothers. Seventy (10%) of completed questionnaires were randomly verified by an investigator during a field visit.

The WHZ scores were generated according to World Health Organization (WHO) 2006 growth standards using ENA for SMART software. Analysis was done with SPSS (version 15). Chi-squared test and t-tests were used in univariate analysis. Binary logistic regression was used for multivariate analysis as the dependent variable was dichotomous, and the independent variables were categorical or continuous. The logistic regression model took into account the hierarchical relationships between the proposed risk factors as per conceptual framework of UNICEF[5] and used by previous authors.[7,16] Considering the large number of factors included in the study, the power of study was calculated for individual risk factors using Open EPI software. It ranged from 80% up to 100% thus giving satisfactory reliability to the study outcome.

Results

The average weight in cases was 8.81 kg and in controls was 11.11 kg, while average height was 85.72 cm and 88.42 cm in cases and controls, respectively. The average weight for height Z score (WHZ) was −3.6 and −1.4 for cases and controls, respectively. Average age of cases was 34.03 months and of controls was 33.83 months; the distribution was similar as cases and controls were matched for age and gender; 38% of study subjects were female, and 62% were male.