SHORT ARTICLE

Concomitant prevalence of severe wasting, stunting and underweight amongst under five children in Meerut district, India

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Abstract

Background: National Family Health Survey (NFHS) documented that nearly 5.8 million children (6.4%) are undernourished in India which is 1/3rd of the world's share. **Objective**: i) To assess the concomitant prevalence of severe wasting, severe stunting and severe underweight among children 6-59 months in a rural population of Northern India. **Methods**: A cross-sectional study was conducted in 2 blocks of district Meerut, Uttar Pradesh during 2013-2015. A total of 70 villages were included and all children in the age group of 6–59 months were covered by house to house visits. Data on socio-demographic profile and anthropometry was collected utilizing standards methods and equipment's. The Z-scores for weight-for-height (WFH), height-for-age (HFA), and weight-for-age (WFA) were calculated using WHO child growth standards. **Results**: A total of 19449 children in the age group of 6-59 months from house to house survey were approached. Out of 19449 children, 464 children were excluded due to erroneous age estimation; knock knees; physically handicapped and spinal deformities. Thus, 18985 children were enrolled for the present study. The weight, height and age were available for 18474, 18595 and 18983 children. The prevalence of severe wasting, severe stunting and severe underweight was found to be 2.2%, 16.2% and 12.2%, respectively. Concomitant presence of severe wasting, severe stunting and severe underweight was found in 0.9% (171/18,463) children. **Conclusion**: High prevalence of severe wasting, severe stunting and severe underweight was found in children from district Meerut indicating poor nutritional status.

Keywords

Severe Wasting; Severe Stunting; Severe Underweight; Under Five Children

Introduction

High prevalence of undernutrition as indicated by stunting (38.7%) and wasting (15.1%) exists amongst under 5 children in India (1). Undernutrition has been associated with adverse health consequences amongst under five children. Undernutrition has shown to increase the risk of death from infectious diseases such as diarrhoea, pneumonia, and measles. It is also associated with severe, irreversible physical and cognitive damage. These undernourished children have poorer cognitive and educational outcomes in later childhood and adolescence (2-3). Undernutrition during childhood has long term effects including reduced productive capacity, poor health, and an increased risk of degenerative diseases which continue till adulthood (4). Under five children suffering from severe malnutrition have a higher risk of mortality (5-6).

India has seen significant improvements in household incomes, agricultural productivity and child survival in the past two decades. Despite economic growth and development in India the prevalence of severe wasting among children continued to be high (7).

We do not have data on the percentage of under five children in the community who concomitantly suffer from severe wasting, severe stunting and severe underweight. This scientific data is important to establish the number of children who are at higher risk of suffering from mortality in a community. These children are priority group for initiating health and nutrition intervention for preventing mortality in under five children.

Aims & Objectives

To assess the concomitant prevalence of severe wasting, severe stunting and severe underweight among children 6-59 months in a rural population of Northern India.

Material & Methods

A community based cross sectional study was conducted during 2013-2015 in district Meerut, Uttar Pradesh, India. Two adjoining rural blocks were identified. A list of 70 contiguous villages were selected for the study. The research team members (RTMs) were trained for undertaking survey. All the RTMs were trained by second author and experts from National Institute of Nutrition, Hyderabad, India, in methodology of assessment of anthropometric measurements.

Total number of children in 6-59 months likely to be present in each village was estimated from the total population of the village (As per National census, 2011). House to house visits were undertaken to locate the children in the 6-59 months of age. Research Team Members visited every household in the selected villages to enroll children in the 6-59 months age group. Children who had gone away temporarily were visited again for enrollment in the study. Mopping of each village was done for 2-3 days, to cover remaining eligible children before completing the survey of the village. This step was done to ensure maximum inclusion of eligible children in the study from each village.

The village level health and nutrition functionaries Anganwadi workers (AWWs), Auxiliary Nurse Midwife (ANMs) and Accredited Social Health Activist (ASHA) facilitated the identification of households with under five children. However, these functionaries did not participate in any process of data collection including anthropometric measurements. The parent/ guardian of the child were informed about the objectives and details of the study. A signed consent was obtained from parent/guardian of each eligible child.

Inclusion criteria: i) children in the age group of 6-59 months; ii) permanent resident of study area; iii) expected to remain in the area during the study period; and iv) consent of parents.

Exclusion criteria: i) children who are likely to move away from the study area during the study period; ii) non-consent of the parents; iii) children less than 6 months and more than 59 months of age and iv) children with physical deformities like spinal bifida, bow legs, spinal deformities, knock knees.

Socio-demographic profile: The socio-demographic profile of each child was assessed. Age of children was determined by: i) birth certificate; ii) Horoscope; and iii) any other valid document. If any such documentation of child's date of birth was not available, then the age of child was assessed using Local Event Calendar (LEC). Age was computed in complete months. Children who were born on any date of the month, were counted as born on first day of the month. This was followed by procedure of anthropometric measurements.

Anthropometric measurements: Children were brought to the fixed sites for their anthropometric measurements. Anthropometric measurements were conducted at the anganwadi centers/health sub-centers/schools/households where an adequate facility of light and hard flat surface was available. Hard flat surface was confirmed with the help of a water level meter.

Each child was first subjected for measurement of length/ height followed by weight. Length was measured in children in less than 24 months by the SECA infantometer and height was measured in 24 to 59 months of age by SECA stadiometer which could record variation up to 0.1 cm. Weight of the children with minimal clothing was measured on SECA weighing scale which could record variation upto 10 g.

Weight, height and age of the child were compared and corresponding z- scores was calculated as per WHO (2006) data (8). Children having WFH, HFA and WFA scores below -3SD were identified with severe wasting, severe stunting and severe underweight.

Quality Control Internal Quality Control Measures: The standard weights of 1 kg, 2 kg, 5 kg and 10 kg

were procured. The weighing scale instrument of each team were standardized and calibrated each week before the start of the data collection. For standardization, the standard weights were kept on the weighing balance and three readings were taken for each weight. The machine was calibrated if required similarly a standard meter rod made of steel of 100 cm was procured for standardisation. The stadiometer and infantometer were calibrated with help of this rod. A log book was maintained by each RTM for the standardization of the weighing balance and stadiometer/infantometer. The research officer appointed in the study verified and validated the results of standardization exercises undertaken by RTMs.

To minimize the variation in the anthropometric measurements all RTMs were subjected to inter and intra observer variation exercises, once in a month. This ensured accuracy of anthropometric measurements undertaken.

The internal quality control was also undertaken. A checklist of methodology of measurement for each anthropometric measurement was made. The investigators and research officer observed and made tick mark against the each of the specific steps performed by the RTMs. Subsequently, the check lists were thoroughly reviewed with RTMs. This step helped in determining missing steps, wrong steps, and incomplete steps undertaken by RTMs while they took anthropometric measurements of the child. The RTMs were made aware of errors. This step significantly improved quality of anthropometric data collection.

The videos of RTMs were made when they undertook anthropometric measurements of the child. These videos were shown subsequently to the RTMs. This step helped the RTMs to identify their deficiencies, if any, while undertaking anthropometric measurements. All the above steps undertaken made RTMs more vigilant, alert and more diligent in taking anthropometric measurements of children.

External Quality Control Measures: For external quality control, visits by the experts of the Clinical Development Services Agency (CDSA), Department of Biotechnology, Government of India, were made to evaluate the collected data. These experts critically examined and evaluated different steps of data collection during their field visit. These included age assessment and anthropometric measurements performed by RTMs. The suggestions provided by experts were shared with RTMs, to improve quality of the data collection.

***Data Management and Statistical Analysis*:**Data was recorded in a pre-designed proforma and managed on excel spread sheet. Double data entry was done to check the validity of data. The entire data was re-entered in excel sheet and compared with Master Excel sheet. Six children were found with incorrect entry of date of birth. These were verified from the hard copies of proforma and corrections were made in master excel sheet. The z-scores for three indices weight-for-height (WFH), height for age (HFA), weight for age (WFA), were calculated in reference to WHO growth charts. Stata 12.0 statistical software was used for data analysis (6 Stata Corporation, college station road, Houston, Texas, USA).

***Ethical Clearance and Informed Consent*:** The ethical clearance of the study was obtained from the ethics committees of All India Institute of Medical Sciences, New Delhi and Subharti Medical College, Meerut.

Results

A total of 19449 children in the age group of 6-59 months from house to house survey were approached. Out of 19449 children, 464 children were excluded due to erroneous age estimation; knock knees; physically handicapped and spinal deformities. Thus, 18985 children were enrolled for the present study.

In the present study, 409 children (2.2%) had WFH z-score <-3 SD (severe wasting), 13.7% had z- scores between < -3 to -2 SD (wasting), 38.8% had z-scores between <-2SD to -1SD and WFH z- scores < -1 SD were in 45.3% of children studied (Table 1).

Severe stunting (HFA z-score <-3SD) was found in 16.2% children, about 29.1% children had stunting (< -3 to -2 SD), 32.0% children had HFA z-score < -2 to -1 SD and 22.7% children had HFA z- score < -1 SD (Table 1).

A total of 2,254 children (12.2%) had severe underweight (WFA z-score <-3SD), 29.9% had z-scores between < -3 to -2SD (underweight), 36.9% had z-scores between <-2SD to -1SD and WFA z-scores < -1SD were in 21.0% of children studied (Table 1).

It was found that the concomitant prevalence of severe wasting and severe underweight was present in 1.9% (345/18,463) children. The concomitant prevalence of severe stunting and severe underweight is present in 8.6% (1593/18,471)

children. Concomitant presence of severe wasting, severe stunting and severe underweight was found in 0.9% (171/18,463) children (Table 1). Combination of severe wasting and severe stunting is not physically possible since a child cannot simultaneously experience stunting and wasting and not be underweight.

Discussion

The present study found the prevalence of severe wasting, severe stunting and severe underweight as 2.2%, 16.2% and 12.2%, respectively. Concomitant prevalence of severe wasting, severe stunting and severe underweight was found in 0.9% (171/18,463) children.

In the present study, the prevalence of severe wasting (2.2%), severe stunting (16.2%) and severe underweight (12.2%) was lower amongst under five children as compared to National Family Health Survey (NFHS-3) which documented severe wasting as 6.4%, severe stunting as 23.7% and severe underweight as 15.8%, respectively. Specifically, in Uttar Pradesh state NFHS documented that 5.1% children suffered from severe wasting, 32.4% severe stunting, and 16.4% severe underweight (7). The lower prevalence of severe forms of malnutrition in the present survey may possibly due to improvement in food availability, development and better health care facilities between years 2005-2015.

The Hungama Survey Report (2011) documented the prevalence of severe wasting, severe stunting and severe underweight as 3.3%, 34.0% and 16.4%, respectively (9). The Rapid Survey on Children (RSOC) (2013-2014), also documented the prevalence of severe wasting, severe stunting and severe underweight as 4.6%, 17.3% and 9.4%, respectively (1). The Hungama and RSOC surveys done recently have also documented reduction in severe forms of malnutrition amongst under five children (Table 2).

Studies have documented that children with multiple anthropometric failures (combination of wasting, stunting and underweight) were more likely to suffer from diarrhoea and acute respiratory infection than those with only a single growth failure (wasted only, stunted only and underweight only) (10). The findings of the present study revealed that 0.9% of under five children needs to be identified on priority basis to reduce the mortality rates amongst them.

We do not have data on mortality pattern amongst these 0.9% children suffering concomitantly with sever wasting, stunting and underweight and hence prospective studies are needed to collect evidence on this aspect.

Conclusion

High prevalence of severe wasting (2.2%), severe stunting (16.2%) and severe underweight (12.2%) was found in under five children from district Meerut indicating poor nutritional status. The present study also revealed that atleast 0.9% of under five children were suffering concomitantly from severe wasting, severe stunting and severe underweight, such children needs to be identified on priority for health and nutrition intervention to reduce the mortality rates amongst under five children.

Recommendation

We need to conduct prospective studies on mortality amongst children suffering concomitantly from severe wasting, severe stunting and severe underweight; so that we have evidence on how many times these children are at risk of mortality.

Limitation of the study

(i) As the exact date of birth was not recalled in a small proportion of subjects, approximation was required; (ii) A temporary discontinuation of data collection was necessitated due to severe winters in the month of January 2013. Both these limitations unlikely to affect the weight, height and mid arm circumference of children; and (iii) Mortality outcomes could not be evaluated.

Relevance of the study

The study documented first time that what percentage of children are suffering from severe wasting, severe stunting and severe underweight in a community. Also, the study documented that what percentage of children may suffer concomitantly from severe wasting, severe stunting and severe underweight.

Authors Contribution

RB: Concept and designed the study, acquisition, analysis, interpretation of data; final approval of the manuscript; UK: Concept and designed the study, acquisition, analysis, interpretation of data; drafted the manuscript, final approval of the manuscript; AG: interpretation of data, drafted the manuscript; NS: Neha Sareen: interpretation of data, drafted the manuscript

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Tables

TABLE 1 GROUPS OF ANTHROPOMETRIC FAILURE AMONGST UNDER FIVE CHILDREN

S. No.	Groups	Percentage of under five children
1.	Severe Wasting	2.2% (409/18,463)
2.	Severe Stunting	16.2% (3,017/18,592)
3.	Severe Underweight	12.2% (2,254/18,471)
	Concomitant prevalence	
4.	Severe Wasting + Severe Underweight	1.9% (345/18463)
5.	Severe Stunting + Severe Underweight	8.6% (1593/18471)
6.	Severe Wasting + Severe Stunting	0.9% (169/18463)
7.	Severe Wasting + Severe Stunting + Severe Underweight	0.9% (171/18463)

TABLE 2 PREVALENCE OF SEVERE WASTING, SEVERE STUNTING AND SEVERE UNDERWEIGHT IN COMPARISON TO OTHER STUDIES CONDUCTED IN INDIA

Survey	Year	Severe Wasting (WFH<-3SD) (%)	Severe Stunting (HFA<-3SD) (%)	Severe Underweight (WFA<-3SD) (%)
Present Study	**2013-2015**	**2.2**	**16.2**	**12.2**
NFHS-3 Survey	2005-2006	6.4	23.7	15.8
Hungama Survey report	2011	3.3	34.0	16.4
Rapid Survey on Children	2013-2014	4.6	17.3	9.4