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Original Research Article

Nutritional status assessment of 6-59 months age children in rural Yadgir, Karnataka state, India

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ABSTRACT

Background: Childhood undernutrition contributes to childhood diseases and is a major cause of child mortality in India. According to National Family Health Survey (NFHS-5), 32% under-five children in India were under-weight, and 36% were stunted. In Karnataka, the prevalence of underweight among under-five children was 33% and stunting 35%. The objective of the study was to assess the nutritional status of under five-years children in rural communities.
Methods: A community based cross sectional study was conducted among 1887 under-five children from rural Yadgir, Karnataka. Weight and height of children were measured using standard protocols. The World Health Organization (WHO) Anthro software version 3.2.2.1 was used for analyzing data. Children whose Z-scores on weight-for-age, height-for-age and weight-for-height indices were below -2SD from the median of the WHO reference population were considered as underweight, stunted, and wasted respectively.
Results: The result revealed that 53.6% of children were stunted, 39.4% were underweight and 15.3% were wasted. Severe forms of underweight, stunting and wasting were observed among 9.4%, 24.2% and 4% children respectively. The frequency of being underweight and stunted has increased with age, which was accelerated after 6 months and about 34% and 52% of children were underweight and stunted by the age 12-23 months. While wasting was higher among children aged 6-11 (24.2%) months than their counterparts.
Conclusions: Special attention is required to reduce nutrition vulnerability among young children (12-24 months). An appropriate strategy needs to be implemented to educate rural mothers on the importance of exclusive breastfeeding and complementary feeding practices.

Keywords: Nutritional status, Malnutrition, Stunting, Wasting, Underweight, Rural Yadgir

INTRODUCTION

Adequate nutrition during infancy and early childhood is the key for the development of each child to reach his/her full human potential.[1] Poor nutrition during the first 1000 days of a child's life leads to stunted growth which is irreversible. It is also seen to be associated with impaired cognitive ability and reduced school performance.[2] Childhood malnutrition results in eloquent losses later in adolescence and adulthood. When considering the advancement of human growth, excellent health and nutrition are fundamentally desirable because they contribute to developing physical and cognitive abilities. Child malnutrition increases a child's vulnerability to several infections and retards recovery, resulting in a significant disease burden in underdeveloped nations.[3] Inadequate nutrition also raises the incidence of non-communicable diseases, driving up the cost of health care. Malnutrition is responsible for about half of all child deaths under five worldwide.[4]

Malnutrition among under-five children is a major public health problem in India. This is reflected by the fact that the prevalence of under-weight children in India is among the highest in the world and is nearly double that of Sub-Saharan Africa.[5] It is also observed that the malnutrition problem in India is a concentrated phenomenon that is, a small number of states, districts, and villages account for a large share of the malnutrition burden only 5 states and 50% of villages account for about 80% of the malnutrition burden.[5] The National Family Health Survey (NFHS-5, 2019-21) report shows that, India has more than one-third of children under five years age (36%) stunted (too short for their age), 19 per cent are wasted (too thin for their height) and 32 per cent are underweight with marginal improvement if the nutritional status since NHFS-4 (2015-16).[6]

Even during the first six months of life when almost all babies are breastfed, 20 percent of children are stunted, 27 percent are wasted, and 25 percent are underweight.[7] Similar trend was observed in Karnataka. The percentage of children who are stunted decreased marginally from 36 percent to 35 percent in the 4 years between NFHS-4 and NFHS-5. The percentage of children who are wasted has decreased substantially from 26 percent to 20 percent and children who are underweight decreased from 35 to 33 percent since NFHS-4.[8] However, the continuing high levels of undernutrition are still a major course for concern if it compared with other its southern neighboring states such as Andhra Pradesh. Telangana, Tamil Nadu, and Kerala.

The data from baseline study conducted in Yadgir revealed that among children aged 6-35 months, about 64.5% are either stunted, or wasted or underweight. Among children aged 3-5 years about 72.79% are either stunted or wasted or underweight. The proportion of children from 6 months to 5 years (both boys and girls) who are not stunted, not wasted and not underweight decreases as age increases, implying that the nutritional status/health of the children is deteriorating as they grow older.[9]

In this context, the present study focusses its attention on the assessment of nutritional status of children aged 6-59 months using the WHO child growth standards (WHO standards) and to assess common morbidities in the same.[10] Yadgir district is one among the most backward districts in the country in many aspects including public health. The district is considered for overall development under the aspirational districts programme and hopes that this study will help to optimize preventive and promotive strategies to address the problem of under-five malnutrition in this area.

METHODS

Study design

It was a community based descriptive cross-sectional study.

Study period

The duration of the study was from April 2021 to March 2022.

Study area and study population

The study was undertaken in twenty intervention villages of Yadgir district of Karnataka state covering all the children between 6-59 months.

Sampling technique

The study subjects include all the children between 6-59 months enrolled in 61 Anganwadi centers of intervention villages. Among 2103 children listed, a total of 1887 children nutrition status was assessed after getting written informed consent from the parents and excluded 216 children due to some health issues among children and parents' unwillingness to participate in the study.

Data collection

The parents were interviewed using a pretested semi structured interview schedule. Questions on gender, date of birth (DOB), social category, mother's level of education, household size and occupation were obtained from the respondents through one-on-one interview by trained village health workers (VHWs). For assessing nutritional status, clinical examination and anthropometric measurements of the children were performed. Weight was measured using an electronic weighing machine (Salter scale for children less than two years) to the nearest of 0.1 kg. Height/length was measured using stadiometer to the nearest 0.1 cm.

Data was entered in Microsoft excel and analyzed using the database Epi Info 7.0. The z scores for the different nutritional indices –weight for age, height for age, and weight for height were calculated based on the WHO child growth standards using WHO Anthro software.

RESULTS

A total of 1887 children were studied in the age group 6-59 months. Out of them 931 (49%) were boys and 956 (51%) were girls.

Table 1: Age and gender wise distribution of children.

Age in months	Number of children (%)	Girls (%)	Boys (%)
6-11	182 (9.6)	91 (50.0)	91 (50.0)
12-23	427 (22.6)	209 (48.9)	218 (51.1)
24-35	501 (26.6)	257 (51.3)	244 (48.7)
36-47	427 (22.6)	205 (48.0)	222 (52.0)
48-59	350 (18.5)	194 (55.4)	156 (44.5)
Grand total	1887 (100)	956 (50.6)	931 (49.3)

Among the subjects, 182 belonging to 6-11 months, 427 belonging to 12-23 months, 427 belonging to 36-47 months and 350 children belonging to the age group of 48-60 months (Table 1).

Table 2: Demographic characteristics of children.

Particulars	Number	Percentage
Caste		
Upper caste	76	4.0
OBC	979	51.9
SC	480	25.4
ST	352	18.7
Education of parents		
Illiterate	973	51.6
Literate/primary	536	28.4
Upper primary	257	13.6
PUC/diploma	64	3.4
Graduation	57	3.0
Occupation of parents		
Own cultivation	736	39.0
Agricultural laborer/wage laborer	912	48.3
Service at shops/petty business	106	5.6
Private service/self-employee	122	6.5
Government service	11	0.6
Socio economic status		
Upper middle	26	1.4
Lower middle	52	2.7
Poor middle	1809	95.9

Table 2 indicates the demographic characteristics of the children's family while the education and occupation of the parents is considered. Regarding caste, majority of them (51.9%) belonged to other backward communities (OBC) followed by 25.4 per cent were from scheduled caste, 18.7 per cent were from scheduled tribe category and only four per cent belonged to general category indicating 96% of population were from backward classes. While in the case of education of the parents, about half (51.6%) were illiterate. and 28.4 per cent had their primary education; 13.6 percent completed high school education. Only 3.4 percent had competed 12th standard/diploma and merely 3 percent were graduated. Regarding occupation of the parents, 39 per cent of homes had their own cultivation and about half (48.3%) were laborers. About 5.6 percent had petty business or service at shops; 6.5 percent were self-employed or were in private service. Only 0.6% of families were in government services.

The socio-economic status (SES) data shows that the study community was predominantly (95.9%) belonged to poor middle class. Only 2.7 percent belonged to lower middle SES and only few (1.4%) belonged to upper middle SES.

Distribution of nutritional status as per WHO categories provided in Table 3. 53.6% were stunted, 39.4% were underweight and 15.3% were wasted. Severe forms of underweight, stunting and wasting were observed among 9.4%, 24.2% and 4.0% children respectively.

Table 3: Nutritional status of children aged 6-49 months.

Indices	Normal (%)	Mild (%)	Moderate (% (≤2SD to -3SD)	Severe (%) (≤3SD)
Underweight	24.2 (456)	36.4 (687)	30.0 (567)	9.4 (177)
Stunting	21.1 (398)	25.3 (477)	29.4 (555)	24.2 (457)
Wasting	56.2 (1061)	28.5 (537)	11.3 (213)	4.0 (76)

Age wise trend in nutritional status of children – underweight

An analysis of the age wise prevalence rate of undernutrition (Figure 1) showed that about 34% of children were underweight by the age 12-23 months similarly children with normal nutritional status declined to 29.7% from 48.4%.

Age wise trend in nutritional status of children – stunting

Stunting is an indicator of chronic malnutrition among children (Figure 2). In terms of age wise nutritional status 62.6% of children in the age group of 6-11 months were normal with sharp decrease to 25.3% between 12-23 months. Prevalence of stunting was 20.3% in the 6-11 months with a sharp increase nearly three-fold to 52% between 12-23 months. Figure 2 apparently shows that the rate of stunting increased up to the age of 12-23 months before declining very slowly. Higher prevalence of Severe form of stunting was observed in the age group of 12 to 47 months.

Age wise trend in nutritional status of children – wasting

Age wise analysis examined that wasting was higher among children aged 6-11 (24.2%) months than those aged 24-60 months (13.4% to 15.4%). Figure 3 clearly shows wasting is higher in the age of 6-11 months before declining very slowly.

Frequency distribution of anthropometric indices

The study attempts to explore how distribution of WAZ, HAZ and WHS for the Yadgir children were far from normal distribution. It is recognized that in a well-nourished society, the proportion of children below -2 Z-scores is expected to be 2.5 per cent and that below -3 Z-scores is expected to be about 0.1 per cent. Therefore, the proportion of children below a cut-off point (-2.0 or -3.0 Z-score) in a population can be compared with the

proportion of the WHO reference population. Figure 4 shows that the proportion of children under -2 WAZ was found to be 39.4 per cent. About 95 per cent of children should lie within the range ±2.0 Z-score but in case of WAZ for the Yadgir children the proportion was found to be only 60 per cent. These findings indicate that the distribution of WAZ for Yadgir children was far from the normal distribution.

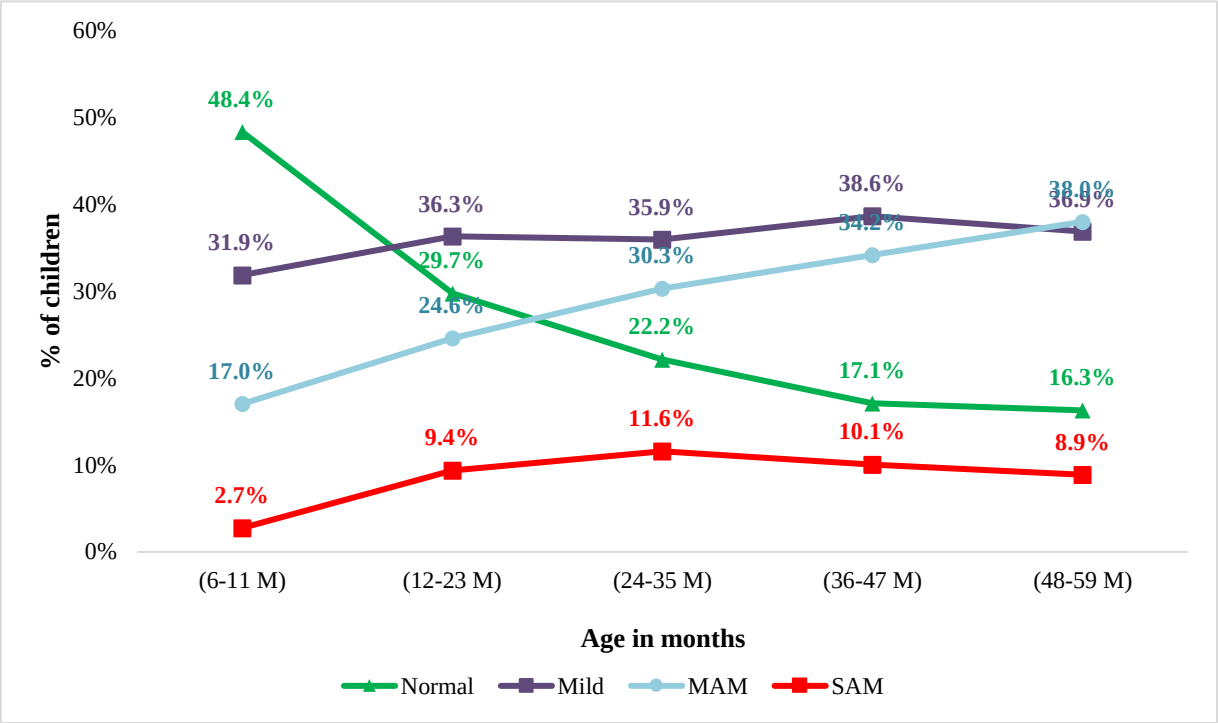

Figure 1: Nutritional status of children according to weight-for-age (underweight).

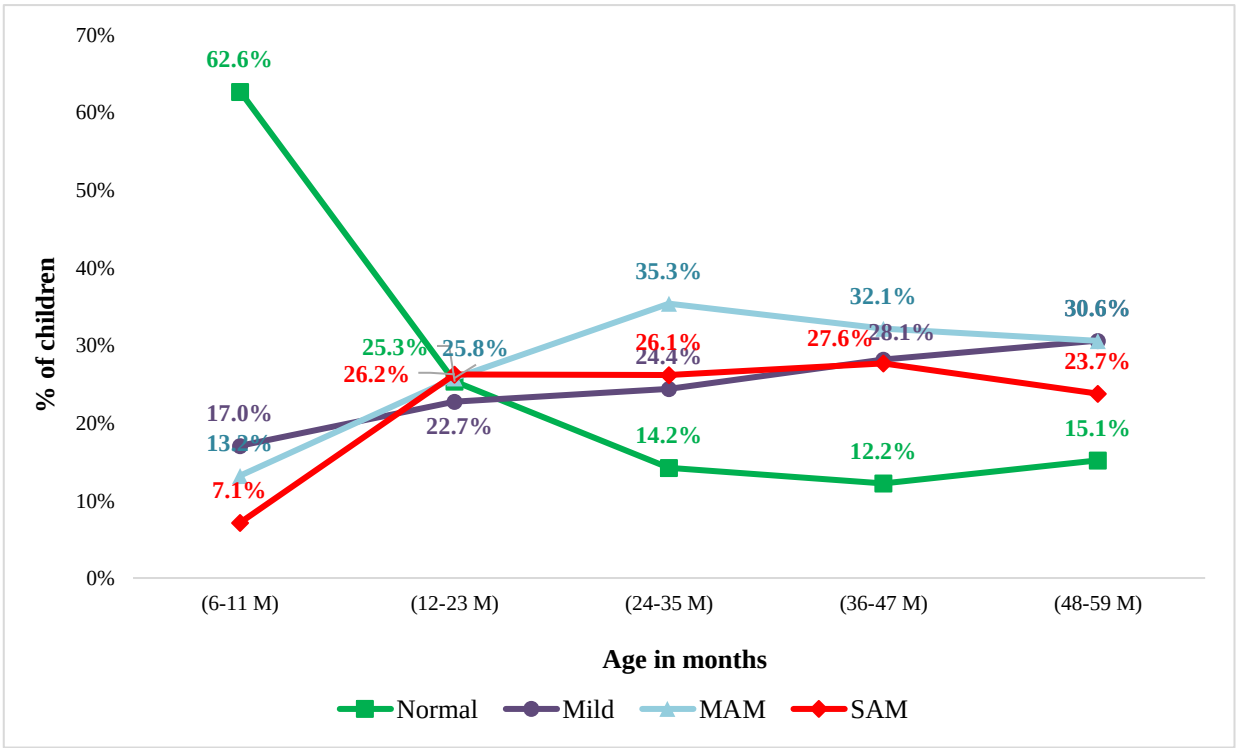

Figure 2: Nutritional status of children according to height-for-age (stunting).

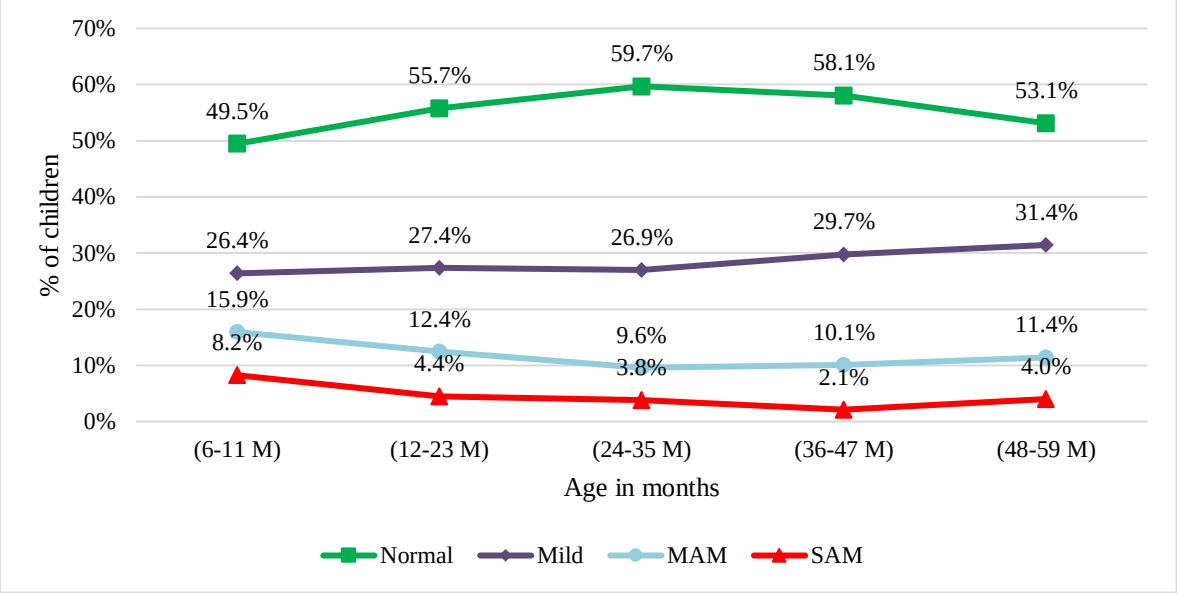

Figure 3: Nutritional status of children according to weight-for-height (wasting).

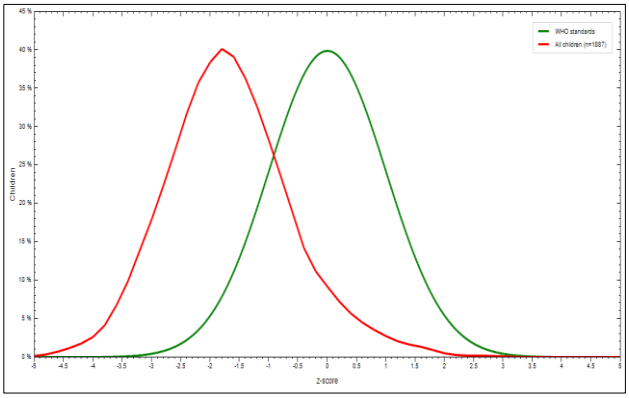

Figure 4: Frequency distribution of weight-for-age Z-score (WAZ).

A clearer picture from the distribution of HAZ (Figure 5) showed that the proportion of children having HAZ within ±2.0 was found to be only 44.2 per cent, while majority (52%) of children have below -2 HAZ scores.

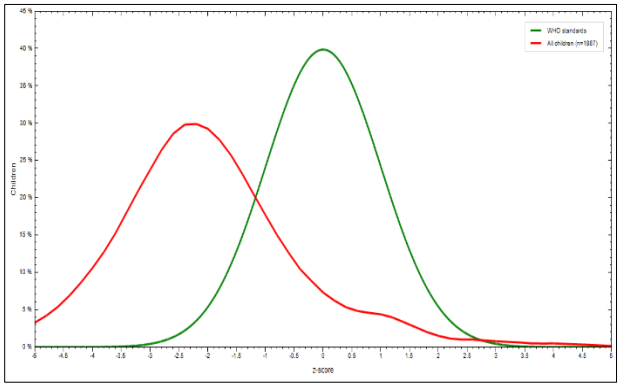

Figure 5: Frequency distribution of height-for-age Z-score (HAZ).

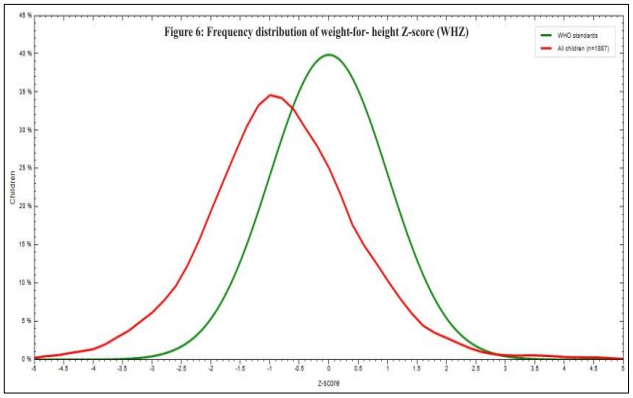

Figure 6: Frequency distribution of weight-for- height Z-score (WHZ).

Figure 6 shows that the proportion of children having WHZ within ±2.0 was found to be about 82.5 per cent, which is little closer to 95 percent. However, about 15.3 per cent of children had WHZ below -2.0, while very less proportion of children had WHZ within the range ±1.0 that was much lower than the expected 68.3 percent.

DISCUSSION

The study attempts to examine the levels and trends in malnutrition among 6-59 months of age children in terms of underweight, stunting and wasting. The study was performed in a rural setting, and it is characterized and listed down as one of the backward districts on various socio-economic indicators in the state - drought prone area, less job opportunities, low education, and health indicators.[11,12] The present study identifies the prevalence of children underweight are 38.6%, 52.1% stunted and 15.6% wasted. The result of present study is in parallel with study conducted by Das et al found that, prevalence

of underweight for all age groups except less than 6 month was above WHO threshold of "very high".[13] The NFHS-5 Karnataka report (2019) showed that the underweight percentage was 20% in the age group of 6-8 months while it raised to 33.6% in the 18-23 months children.[14] This supports the opinion of Jeyakumar et al who also found age above 7 months which marks the phase of weaning increased the risk of underweight and birthweight less than 2500 g, increases the risk of all three manifestations of undernutrition.[15] Studies have shown that children under 6 months of age are less malnourished/underweight because of continuous and exclusive breast feeding.[16-18] The transition period from exclusive breastfeeding to introduction of complementary feeding due to infants exceeding need for energy and nutrient is window for optimal growth and development. A two-fold increase in prevalence by the age 12-23 months might be because of underfeeding and poor complementary feeding practices of children aged under two years.

The trends in age specific malnutrition in our study indicated that children aged 12-23 months were at greater risk of being malnourished in terms of all the three indices. The age of the children emerged as the major factor for all three indicators of undernutrition. Maximum growth flattering has been evident in children less than 24-35 months. For developing countries like India, children are already born in disadvantaged setting whereby growth flattering begins from birth itself.[19] In the present study among the 0-5 years age group, risk of stunting was found to be higher in 12-23 month. In an analysis of data from 137 developing countries, concluded that fetal growth restriction was the main risk factor of stunting among <2 years of age including India.[20] Similar study conducted in Maharashtra, concluded that children above 7 months of age were at risk of stunting as this phase is marked by weaning and introduction of complementary foods.[15] A study conducted in Malawi reported that the prevalence of stunting was found significantly high in children with low birth weight, in children aged 36-47 months, in children born with less than 24-month birth interval, in children whose household had no access to improved water source.[21] Similarly, a study by Sarma et al observed that child age in months was statically associated with stunting where children aged 12-23 months were more likely to be stunted than those aged 0–11 months.[22] Stunting in India was 20% in children 0–5 months of age and was highest, at 58%, for children 18–23 months, with a slight decrease thereafter.[23] Low socio-economic status, home being place of delivery, small size at birth, no formal parents' education, birthweight less than 2500 g, poor hygiene and sanitation immunization status are risk factors of undernutrition among children.[15,24]

On the other hand, wasting was found to be higher in the 6-11 months age group similar to NFHS 5. Wasting at the early age group indicates poor maternal nutrition which fails to ensure optimum fetal growth. An analysis of Demographic health survey of five Asian countries factors associated with wasting by Wali et al showed that underweight mother's (BMI ≤18.5 kg/m^2), short statured mothers (<145 cm), narrow spaced pregnancies, no antenatal care visit during pregnancy and mothers poor diet diversity are factors associated with wasting in children under five years.[25] Yadgir district fact sheet of NFHS 4 report also showed that mothers who had at least 4 ANC visits were 59.5%, 41.2% of rural mothers had no ANC in the first trimester and anemic pregnant women aged 15-49 years were found 46.5%. Also looking at child feeding and immunization practices only 45.4 percent of children were exclusively breastfed and 38.7% of children aged 12-23 moths not fully immunized.[14] Martorell and Young study on patterns of stunting and wasting among Indian children showed that, prevalence of wasting was highest in 0-5-month children (30%) and decreased with age and was 16% among children 48-59 months.[22] The odds of wasting were 2.78 times higher among children who were grouped at the age of 6–11 months than their counterparts were found in Ethiopian children.[26] Correspondingly an analysis of Bhutan multiple indicator survey showed that, prevalence of wasting was almost double among infants 0–11 months old than among children aged 12–23 months while the prevalence of severe wasting was 2·4-fold higher among infants 0–11 months old than among children aged 12–23 months, suggesting that most wasting happens either prenatally or in the first year of life.[27] Similar findings were observed by Nira and coworkers with progressive increase of stunting above 6 month and maximum during 18-23 month of age.[28]

The major risk factor for all three indicators of malnutrition that emerged from the present study was the age of children. Thus, age is a biological factor and emphasis on the 1000 days of conception to two years of a child's life as critical window of opportunity where major impacts can be achieved on child's physical and brain development.[29]

Limitations

The study was limited to small geographic area covering 20 villages. The study used non-invasive growth assessment using standard protocols and confirmatory tests (Boi chemical examination) were not done due to lack of resources. Despite limitations of the critical child's birth weight, size of childbirth, lack of information on maternal nutrition status and health seeking behavior, the study provided valuable insight into patterns of malnutrition among critical age group in rural Yadgir.

CONCLUSION

Malnutrition is a common problem in children below 5 years of age, especially chronic malnutrition in rural India. Growth assessment is the single most useful tool for defining health and nutritional status at both the individual and population level. This is because disturbances in health and nutrition, regardless of their etiology, almost always affect growth. Growth monitoring strives to improve

nutrition, reduce the risk of inadequate nutrition, educate caregivers, and produce early detection and referral for conditions manifested by growth disorders. At the population health level, cross-sectional surveys of anthropometric data help define health and the nutritional status by improving awareness among mothers about feeding practices and strengthening public health interventions for mild malnutrition cases among the vulnerable groups with a focus on socioeconomic development and research on overweight, obesity and its etiological factors which are the prerequisites required to tackle malnutrition among under-five children in India.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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