A cross-sectional study of anthropometry and immunization coverage of Anganwadi children in a rural area of Karnataka

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ABSTRACT

Background: Children are a supreme asset to a nation. Beginning six years of life is pivotal for the social, emotional, cognitive, physical, motor, and psychological upbringing of the child. National Family Health Survey (NFHS) 5 data shows 41.9% of children die before the age of five years, with greater mortality in the rural areas (45.7%). The present study was conducted to assess the anthropometric profile and immunization status of children in Anganwadi centers. **Materials and Methods:** A community-based cross-sectional study was conducted in 21 Anganwadi centers in a rural area in South India. The anthropometry (height, weight, mid-upper arm circumference), morbidity profile, and immunization status of the enrolled and available children were assessed with the help of WHO growth charts, Salter scale, clinical examination, immunization cards, and data from Anganwadi registers. Statistical analysis: Data were compiled and analyzed using SPSS software version 20. Descriptive data were interpreted as mean and percentages and associations were tested with the Chi-square test, and Fisher's exact test. A *P* value of <0.05 was considered to be statistically significant. **Results:** Around 400 children, aged 0-6 years, participated in the study. The mean age of the study population was 42.08 ± 12.55 months. The overall prevalence of underweight, stunting, and wasting was 52%, 54%, and 47.5% respectively. The most common morbidity was upper respiratory tract infection (11.5%). A majority (97.5%) of children were found to be immunized appropriately as per age. **Conclusion:** The prevalence of malnutrition was alarmingly high which warrants urgent referral and follow-up. The ICDS services, although substantially beneficial, need focal strengthening with regard to the nutritional status of enrolled children.

Keywords: Anganwadi, anthropometry, immunization, nutrition, stunting, wasting

Introduction

Census 2011 reports that 13.1% of India's population is less than six years. The first six years of life are pivotal for the social, physical, emotional, psychological, and motor upbringing of the children. However, most of the children in our country reside in deprived economic and social environments which hinders their physical and mental development.[1] NFHS 5 reports 41.9% of children die before reaching five years, with rural areas reporting worse findings (45.7%). Around 23.2% of children, aged 12-23 months, fail to achieve full immunization status, exposing them to deadly vaccine-preventable diseases. The nutritional profile shows 32.1% of children are underweight,

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35.5% stunted, and 19.3% wasted, with higher prevalence in rural areas.[2] The government of India declared children as the most important asset in its National Policy on Children, launched in August 1974. Following the framework of this policy, the Integrated Child Development Service (ICDS) was launched on October 2, 1975, with the objective to meet the holistic needs of children below 6 years, adolescent girls, and expectant and nursing mothers.[3] ICDS is a very unique program that represents India's commitment to the development of her children. It not only prepares the children for future formal education but also tries to break the vicious cycle of morbidity, malnutrition, mortality, and reduced learning capacity by providing supplementary nutrition, nonformal preschool education, immunization services, health checkups, essential medicines, and referral services.[4] These services are provided through a network of Anganwadi centers. Around 500 calories and 12-15 grams of protein are given under the supplementary nutrition service of ICDS. Growth is regularly monitored by measuring weight, height, and mid-upper arm circumference and also by maintaining weight for age growth charts at the Anganwadi centers. This provides information about the growth faltering and the nutritional status of the enrolled children. Immunization history is also recorded and maintained in a register to monitor the immunization status of the children as appropriate for age. Karnataka with the majority of its population being rural (61.3%) and around 12.05% of this population under 6 years of age, also accounts for the high incidence of mortality, morbidity, and malnutrition amongst children, pregnant, and lactating mothers.[5] This study was conducted to further assess the nutritional status and immunization coverage among under-five children attending the Anganwadi centers, which are the primary and grassroot delivery point for providing optimum health care.

Materials and Methods

This was a community-based cross-sectional study that included a total of 400 children under the age of 6 years, enrolled in 21 Anganwadi centers under the rural field practice area of a private medical college in South India. This study was conducted as a part of postdoctoral thesis. Ethical clearance was obtained from the Institutional Ethics Committee. and written permission was taken from the child development project officer of the district, the Anganwadi supervisor, and Anganwadi workers. Informed consent was taken from the mothers of the enrolled children. Children not available in the Anganwadi centers during the entire study period were excluded. Data was collected by visiting the Anganwadi centers between 10 am and 2 pm, using a prevalidated and semistructured questionnaire. Information regarding the socio-demographic profile of the children and parents, birth order, age, height, weight, and mid-upper arm circumference (MUAC) was recorded. The weight (in kilograms) of the child was recorded by a calibrated stand on weighing apparatus. The weight was rounded up to the nearest 100 grams. The height and MUAC were measured using a non-stretchable measuring tape and rounded up to the nearest centimeters. The nutritional status of the child was also assessed by the weight for age growth charts

available at the centers. The morbidities were assessed by clinical examination. Grading of nutritional status: As per WHO, Z-score for weight for age (underweight) and weight for height (stunting) was calculated for each child, which is calculated as Z-score = (Observed value-median value of the reference population)/ standard deviation (SD) value of reference population. Weight for age (WFA) Z-score of <-1SD, between -2 and -3SD and <-3SD were classified as mild, moderate, and severe degrees of underweight, respectively. Height-for-age (HFA) Z-score of <-1SD between -2 and -3SD and <-3SD was classified as mild, moderate, and severe degrees of underweight, respectively. Weight-for-height (WFH) Z-score of <-1SD between -2 and -3SD and <-3SD was classified as mild, moderate, and severe degrees of underweight, respectively MUAC was measured on the left upper arm at the mid-point between the acromion (tip of the shoulder) and the olecranon process (tip of the elbow) with a nonstretchable measuring tape. MUAC measurement of >13.5 cm, 11.5-13.5 cm, and <11.5 cm was classified as normal, moderate, and severe malnutrition, respectively.[6,7]

Immunization coverage: The immunization status of the enrolled children was assessed using the immunization records maintained by the Anganwadi workers under Rashtriya Bal Swasthya Karyakram (RBSK) scheme. The child was defined to have full immunization coverage as one who had received the Bacillus Calmette–Guérin; three doses of Diphtheria, Pertussis, and Tetanus; at least three doses of polio vaccine; and one dose of measles vaccine.[8] Partial immunization coverage was considered in children who had received vaccine doses between complete and nonimmunization. Nonimmunization was the failure of an infant of 12-23 months old to receive a single dose of the vaccines listed. Data were analyzed using statistical software SPSS trial version 20 and presented in the form of tables, figures, and graphs, wherever necessary. Statistical methods used include descriptive statistics (percentages and mean), Chi-square test, and Fisher's exact test. A *P* value <0.05 was considered to be statistically significant.

Results

Profile of children enrolled in AWCs

A total of 400 children were included in the study.

Mean age: 42.08 ± 12.55 months.

Distribution of children according to age and gender

The majority (55.5%) of the study population belonged to 3-6 years of age who regularly attended the Anganwadi centers [Figure 1]. Our study included 51.8% (207) female and 48.3% (193) male children [Figure 2].

Profile of children according to socioeconomic status*

The majority of study participants belonged to lower class socioeconomic status as per the latest BG prasad classification, as seen in 312 (78%) [Figure 3].

Profile of children: The mean anthropometry findings are mentioned in Table 1. The majority of children, that is, 390 (97.5%) had been immunized completely as per age [Table 2].

Profile of children according to morbidity status

The majority of the children, i.e. 327 (81.8%) did not report any sort of morbidity. Common morbidities detected were URTI and dental caries [Figure 4].

Nutrition status profile of children

The association between underweight and wasting with gender was found to be statistically significant ($P = 0.024$, 0.0005) [Table 3]. Underweight, stunting, and wasting were not associated with the immunization status of the children.
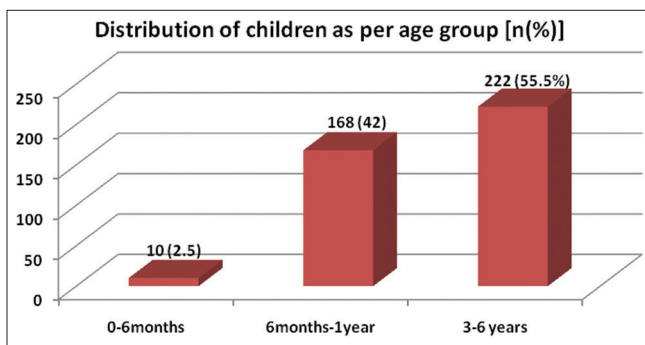

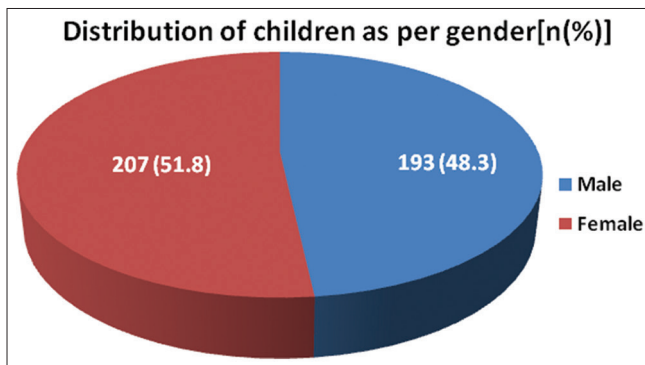**Figure 1:** Distribution of children according to age

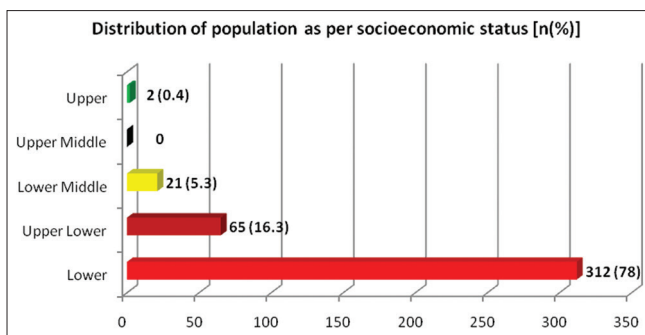**Figure 2:** Distribution of children according to gender

Figure 3: Distribution of children as per parent's socioeconomic status in percentage. *Latest BG Prasad classification[9]

MUAC grading of malnutrition in the children

Moderate acute malnutrition is more prevalent in the 4-5 years age group and among females [Table 4].

Relationship between nutritional status of children with different variables

The nutritional and morbidity status of children were found to be significantly associated with parents' literacy status and the socioeconomic status of the family [Table 5].

Discussion

A total of 400 children were included as the study population, with a mean age of 42.08 ± 12.55 months. The majority of 222 (55.5%) of the children belonged to 3-6 years of age. In our study population, females constituted around 51.8% (207), whereas males were around 48.3%.(193) Similar findings were reported by Das SR *et al.*, where the majority (61.8%) was between the age group of 37-42 months. But the study reported a greater number of males (50.34%) than females (49.66%).[10] Children less than 6 months of age, who are still breastfeeding, are usually not present in the Anganwadi centers. Mothers of these registered children used to visit the anganwadis only to collect take-home rations.

The majority (78%) of the study population belonged to lower socioeconomic status as per BG Prasad's classification. A similar study done by Kaleeswaran S in Chennai had more population (48.3%) belonging to upper lower socioeconomic status as per the same classification.[11]

Maximum children (97.5%) in our study had received full immunization, which provides protection against deadly vaccine-preventable diseases. Inferior findings were reported by Singh M *et al.*, where 72% of children were completely immunized.[12] A study by Thaher MA *et al.* in Telangana reported similar findings to our study, where 90.6% of children had complete immunization.[13]

Assessment of the morbidity profile showed no abnormality in the majority (81.8%) of the study population. The most common

Table 1: Quantitative assessment of Anthropometry of children

Parameter	Mean±S. D.
Weight (kilograms)	12.77±2.21
Height (centimeters)	92.55±9.09
Body Mass Index (kilogram/meter square)	14.91±1.75
Mid-upper arm Circumference (centimeters)	14.53±1.15

Table 2: Distribution of children according to immunization coverage

Parameter	Frequency (*n*=400)	Percentage
Full immunization	390	97.5
Partial immunization	10	2.5

No child fell under the nonimmunization category

Table 3: Nutritional status of children as per WHO growth standards with respect to weight for age (underweight status) and weight for height (Stunting status)						
Grading of underweight (weight for age) [n (%)]				χ^2	**P**	
Mild (Z < -1SD)	**Moderate** (-2SD < Z < -3SD)	**Severe** (Z < -3SD)	**Normal**		**(95% CI)**	
Female (*n*=193)	52 (26.9)	35 (18.1)	05 (2.6)	101 (52.3)	9.436	0.024
Male (*n*=207)	64 (30.9)	21 (10.1)	15 (7.2)	107 (51.7)		(0.019-0.025)
Grading of stunting (Height for age) [n (%)]				χ^2	**P**	
Mild (Z < -1SD)	**Moderate** (-2SD < Z < -3SD)	**Severe** (Z < -3SD)	**Normal**		**(95% CI)**	
Female (*n*=193)	69 (35.75)	34 (17.60)	04 (2.10)	86 (44.55)	2.202	0.532
Male (*n*=207)	87 (42.02)	38 (18.40)	04 (1.90)	78 (37.68)		(0.524-0.543)
Grading of wasting (Weight for height) [n (%)]				χ^2	**P**	
Mild (Z < -1SD)	**Moderate** (-2SD < Z < -3SD)	**Severe** (Z < -3SD)	**Normal**		**(95% CI)**	
Female (*n*=193)	60 (31.08)	10 (5.18)	33 (17.10)	90 (46.64)	17.69	0.0005
Male (*n*=207)	41 (19.81)	26 (12.56)	20 (9.66)	120 (57.97)		(0.0002-0.0007

Table 4: Nutritional grading as per MUAC			
Age (in years)	**Well-nourished [n (%)]**	**MAM [n (%)]**	**SAM [n (%)]**
1-2	6 (24)	19 (76)	Nil
2-3	42 (29.4)	101 (70.6)	
3-4	18 (13.8)	112 (86.2)	
4-5	6 (6.6)	85 (93.4)	
Gender	**Well-nourished [n (%)]**	**MAM [n (%)]**	
Female (*n*=189)	24 (12.7)	165 (87.3)	Nil
Male (*n*=200)	48 (24)	152 (76)	

MUAC=Mid-upper arm circumference, MAM=Moderate acute malnutrition, SAM=Severe acute malnutrition, *n*=389 (MUAC measured for 1-5 years)

Table 5: Association between nutritional and morbidity status of children with different variables		
Variables	χ^2	**P** (95% CI)
Mother's literacy status* Underweight	22.38	0.033 (0.041-0.049)
Father's literacy status* Underweight	37.16	0.0002 (0.0003-0.0004)
Socioeconomic status of family* Underweight	22.18	0.001 (0.003-0.006)
Mother's occupation status* Underweight	09.81	0.02 (0.019-0.025)
Mother's literacy status* Stunting, Wasting	14.77	0.022 (0.024-0.031)
Father's literacy status* Stunting, Wasting	09.64	0.140 (0.138-0.152)
Socioeconomic status of family* Stunting	13.01	0.022[†] (0.019-0.025)

[†]Fisher's exact test

Figure 4: Distribution of children as per morbidity status

morbidity found amongst other children was upper respiratory tract infection which was 11.5%. A study by Carolin A *et al.* in Andhra Pradesh reported anemia (32.08%) as the most prevalent morbidity in Anganwadi children followed by upper respiratory tract infection in 20.48% of children.[14] Similar findings were also reported by Patel PP *et al.* in their study in Jamnagar where more than half of the study population suffered from pallor
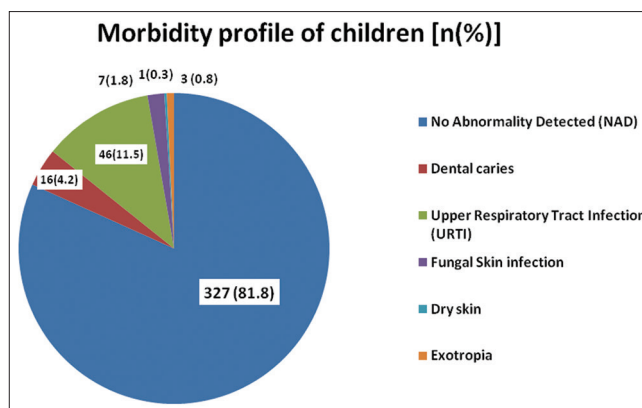
and upper respiratory tract infection.[15] Other morbidities found in our study were dental caries, fungal skin infection, and dry skin. Similar findings were also reported by Molugiri A *et al.* in Karimnagar with similar morbidity profiles in their study population.[16]

Overall, 52% of children were adequately nourished, whereas 29%, 14%, and 5% of children fell under the mild (or at risk), moderate, and severe degree of underweight categories. With respect to stunting, 41% had adequate weight for height, whereas 34%, 18%, and 2% of children had mild, moderate, and severe degrees of stunting. With respect to wasting, 52.5% had adequate weight for height, whereas 25.25%, 9%, and 13.25% had mild, moderate, and severe degrees of wasting. A study by Singh M *et al.* reported that 49.78% of the study population was adequately nourished, while 17.31%, 16.45%, and 16.45% of children fell under at risk, MAM, and SAM categories, respectively.[12] Das SR *et al.* in their study found the prevalence of stunting, underweight, and wasting to be 45.52%, 34.14%, and 35.52%, respectively.[10] Studies from Gadag[17] and Mangalore[18] also reported the prevalence of stunting ranged from 35% to 55%, underweight ranged from 24% to 60%, and

wasting ranged from 11% to 60%. A study by Bhavsar reported 59.8% of children suffered from malnutrition. Among the malnourished children, the prevalence of MAM and SAM was 37.6% and 22.2%, respectively.[19]

The association between being underweight with mother's literacy status, father's literacy status, mother's occupation, and socioeconomic status of the family was found to be statistically significant [Table 5]. Similar findings were also reported by various other studies.[20-24] Stunting and wasting were also found to be significantly associated with the mother's literacy status and only stunting was associated with the socioeconomic status of the family. Contrast findings were however reported by certain other studies.[25,26] In our study no significant association was found between age with underweight and stunting, a finding similar to studies done in different parts of the country.[20-23] Gender was found to be associated with underweight and wasting in our study but not so with stunting. This was similar to a study done in Jaipur[20] but in contrast to findings by certain other studies.[21-23]

Assessment of malnutrition using MUAC measurement showed moderate acute malnutrition was more prevalent in the age group of 4-5 years and among females (189, 42.42%). A study by Singh M *et al.* reported SAM in 2.79% of children and MAM in 1.86% of children.[12] MUAC measurement is a cost-effective and easy tool that can be used in the field to measure the nutritional status of children.[27]

Conclusion

The present study showed there is still a worrisome prevalence of undernutrition among children registered in the Anganwadi centers. About 52% of the children were underweight, 54% were stunted, and 47.5% were wasted. This finding was quite alarming and needed urgent interventions. The most prevalent morbidity among the children was upper respiratory tract infection (11.5%) followed by dental caries (4.2%). The low morbidity prevalence may be because of good immunization coverage (97.5%) among the children. The socioeconomic variables like age, gender, mother's literacy, father's literacy, mother's occupation, and socioeconomic status of the family had a significant association with the nutritional status of the study population. Hence, planning gender-based and age-appropriate nutrition improvement measures, improving the literacy status of parents, and improving the socioeconomic status of the family ought to be focused on to combat malnutrition. Strengthening healthcare delivery at the grassroot level can be effective and sustainable in the long run.

Summary

About 52% of the children were underweight, 54% were stunted, and 47.5% were wasted. The most prevalent morbidity among the children was upper respiratory tract infection (11.5%) followed by dental caries (4.2%). The low morbidity prevalence may be because of good immunization coverage (97.5%) among the

children. The socioeconomic variables like age, gender, mother's literacy, father's literacy, mother's occupation, and socioeconomic status of the family had a significant association with the nutritional status of the study population.

Limitations of our study

Children under 6 months of age and not available during visits could not be included in our study. The inclusion could have made the findings better and more detailed.

Recommendations

Furthermore, research is warranted on the nutritional profile of the children to understand the existing child-feeding and child-rearing practices prevalent in the rural study area. Educating the parents and caregivers regarding optimum and correct nutrition in children can also be planned and implemented.

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Conflicts of interest

There are no conflicts of interest.

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