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Original Research Article

A cross sectional study on nutritional status and dental caries among rural preschool children of Sullia taluk, Karnataka

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ABSTRACT

Background: A double burden of malnutrition in children, in the form of undernutrition and obesity exists in our world. Poverty and various other sociocultural factors act as important determinants of malnutrition. There exist varying prevalence rates in different places. Under nutrition has also a role in dental caries. The objective of this study was to find the prevalence of malnutrition and dental caries among children going to Anganwadi's in rural Sullia taluk of Karnataka.
Methods: Line listing of Anganwadi children was done and by random sampling method, 205 children were selected for study. Nutritional status was assessed by anthropometric measurements and dental examination done according to WHO standards.
Results: The prevalence of underweight, wasting and stunting were 27%, 11% and 40% respectively. 49% of children studied had dental caries.
Conclusions: According to the classification for assessing severity of malnutrition by prevalence ranges among children, the study area is classified as a high prevalence area for malnutrition according to WHO. Dental caries was present in 49.27% of the children.

Keywords: Malnutrition, Rural children, Anganwadi, Dental caries

INTRODUCTION

Malnutrition is a silent emergency as it contributes to a major portion of the risk factor for burden of diseases especially among preschool children.[1,2] A double burden of malnutrition exists in the world in the form of under nutrition and obesity. Poverty is a major contributor to this problem of malnutrition in India, but there are also other factors like sociodemographic, sociocultural and lifestyle practices which have a role to play.

Asia and Africa contribute to highest share of malnutrition globally. In 2015, more than half of all stunted children under 5 lived in Asia and more than one third lived in Africa. More than two thirds of all wasted children under 5 lived in Asia and more than one quarter lived in Africa. Almost half of all overweight children under 5 lived in Asia and one quarter lived in Africa.[3] About 21% of global death and DALYs (Disability Adjusted Life Years) in children younger than 5 years are attributed to stunting, severe wasting and intrauterine growth retardation.[4]

The NFHS 4 data for 15 states in India shows that 37% of children under the age of five in these states are stunted, a fall of just five percentage points in a decade. The proportion of underweight children has also reduced equally slowly from 39% as per NFHS 3 to 34% as per NFHS 4. But there has been a success in reducing child wasting. The states for which data is available have more that have halved their proportion of wasted children from 48% to 22%.[5]

Growth assessment best defines the health and nutritional status of the children. Anthropometric assessment is widely used and often regarded as single best measure for health and nutritional status in children.[6]

Dental caries is one of the most prevalent dental diseases and children are one of the most affected groups.[7] The individual growth of the child is influenced by both genetic and environmental factors.[8] Many of these factors can give rise to dental caries, thus growth /development and dental caries are thought to share a common pathogenesis.[9] Oral health and nutrition have a synergestic bidirectional relationship.[10] Undernutrition in children not only delay the teeth development and affect the age distribution of dental caries, but also result in high number of carious primary teeth.[11] Tooth decay and early loss of teeth leads to malnutrition.[12] Thus this study attempts to assess the nutritional status through anthropometric measurements and dental caries by a dental examination, among rural preschool children going to Anganwadi's in Sullia Taluk of Karnataka.

METHODS

A cross sectional study was conducted between August 2016 and October 2016 among children going to Anganwadi's in rural part of Sullia taluk, Karnataka. Line list of all students in Anganwadi's belonging to rural part of Sullia taluk was prepared and a simple random sampling was done to select the actual sample. Since the prevalence of malnutrition varied across regions, a pilot study was done which showed a prevalence of 15%. Using the formula $4pq/L^2$, and with L as 5%, the minimum sample size was calculated to be 204 which was rounded off to 205. Before the start of the study, institutional ethical clearance and permission from Child Development Project Officer was obtained.

The nutritional status was assessed by anthropometric measurements. Height, weight, skin fold thickness and mid arm circumference were measured and from the above measurements, weight for age, height for age and weight for height were calculated.

Weight measurement

Using electronic weighing scale subjects were made to stand on the platform without touching anything. Shoes and heavy clothing were removed. Readings were taken to the nearest 0.1 kg. Weighing was not done after a full meal or when the stomach was virtually empty.[13]

Height measurement

The children were made to stand without shoes on the horizontal platform of the stadiometer with their feet parallel. Their heels, buttocks, shoulders and back of the head were made to touch the upright part of the meter. The head was held comfortably erect in the same horizontal plane as the external auditory meatus. The arms were made to hang on the sides in a natural manner.

The head piece was then gently, crushing the hair and making contact with the top of the head. Readings were taken to the nearest 0.5 cm. Height measured in centimetres using a stadiometer and weight using an electronic weighing scale was validated on a daily basis with known weights and heights.[13]

Triceps skin fold thickness was measured using Harpenden's skin fold callipers.[14]

Mid upper arm circumference (MUAC) was measured in the Left Upper Arm at the midpoint between the tip of the shoulder and tip of the elbow.[14]

Measurements of dental caries

Oral examination was performed according to the standard procedures described by World Health Organisation.[15] Children were seated on a chair and the examiner sat in front of them. Cotton pellets were used for drying the teeth, and natural day light and torch light were used for proper visibility. Sherpards probe 23 was used as examination tool to score caries according to standards suggested by WHO. Caries with primary dentition was measured by the number of decayed, extracted and filled primary teeth (DMFT). International caries detection and assessment system (ICADS) codes were used. The DMFT values were interpreted according to DMF scoring scale. According to this scale, a DMFT value between 0-4 was considered low caries, the value in the range of 5-9 was moderate caries and values greater than 9 were high caries.[16]

Statistical analysis

The data was entered in Microsoft Excel Office 2007 and analysis was done using IBM SPSS statistics 20. WHO Anthro software V 3.2.2 was used for anthropometric calculations

RESULTS

Among the 205 children, who were selected from the rural area of Sullia Taluk by simple random sampling, 49.27% were boys and 50.73% were girls. Most of them belonged to 55-60 months age group and were of Hindu religion and OBC caste. 87.8% of them belonged to

nuclear family and in 2.43% of them, their parents were not staying together either because they were dead or divorced. 25.85% of the families possessed a BPL card (Table 1). Most of the children's parents were educated till High school and were daily wage workers. 60% of the mother's were housewives (Table 2). More than 50% of the children who were examined was either first born or second born. Less than 3% of them were of the birth order of more than 3. 12.20% of children had illness in the previous two weeks before they were examined.

Table 1: Sociodemographic characteristics of the study population.

Sociodemographic characteristics	No. of children	
Age in months	**Male No. (%)**	**Female No. (%)**
< 25	0 (0)	0 (0)
25-30	1 (0.49)	1 (0.49)
31-36	8 (3.90)	5 (2.44)
37-42	9 (4.39)	16 (7.80)
43-48	16 (7.80)	23 (11.22)
49-54	25 (12.20)	10 (4.88)
55-60	42 (20.49)	49 (23.90)
Total	101 (49.27)	104 (50.73)
Religion	**No. (%)**	
Hindu	189 (92.20)	
Muslim	13 (6.34)	
Christian	3 (1.46)	
Caste		
SC	13 (6.34)	
ST	4 (1.95)	
OBC	185 (90.24)	
Others	3 (1.46)	
Possession of a BPL card		
Absent	171 (83.41)	
Present	34 (16.59)	
Marital status of parents		
Living together	200 (97.56)	
Divorced/dead	5 (2.43)	
Family size		
≤4	180 (87.80)	
5 – 7	24 (11.70)	
>7	1 (0.48)	

3.4% of the boys and 4.3% of girls of the total population studied, had moderate wasting. 1.95% of the boys and less than 1% (0.97%) of the girls belonged to severe wasting category. 2.34% of boys and 1.46% of girls were in the overweight category. Out of 205 children, 22 of them had decreased weight for height, suggesting that 10.73% had wasting (Table 3).

13.65% of the boys and 11.21% of girls of the total children, had moderate stunting. 8.29% of the boys and 6.82% of the girls belonged to severe stunting category. Out of 205 rural children, 82 of them had decreased height for age, suggesting that 40% had stunting (Table 3).

Table 2: Distribution of study population according to education and occupation of their parents.

S no.	Parent's education	no. (%)
	Father's education	
1	Non formal education	56 (27.32)
2	Lower primary	14 (6.82)
3	Upper primary	28 (13.65)
4	High school	57 (27.80)
5	Puc/diploma	35 (17.07)
6	Degree/ professional	15 (7.31)
	Father's occupation	
1	Unemployed/dead	2 (0.97)
2	Daily wage worker	106 (51.70)
3	Agriculturist/ self employed	54 (26.34)
4	Non professional	31 (15.12)
5	Professional	12 (5.85)
	Mother's education	
1	Non formal education	46 (22.43)
2	Lower primary	25 (12.19)
3	Upper primary	46 (22.43)
4	High school	49 (23.90)
5	Puc/diploma	26 (12.68)
6	Degree/ professional	12 (5.85)
	Mother's occupation	
1	Unemployed/dead	1 (0.48)
2	House wife	122 (59.51)
2	Daily wage worker	54 (26.34)
3	Agriculturist/self employed	9 (4.39)
4	Non professional	4 (1.95)
5	Professional	15 (7.31)

9.26% of the boys and 13.17% of girls of the total rural population studied, had moderate underweight. 2.43% of the boys and 1.95% of the girls belonged to severe underweight category. Out of 205 rural children, 55 of them had decreased weight for age, suggesting that 26.82% were underweight. None of the rural children had an increased weight for age suggesting that there are no overweight children (Table 3).

Most of the male and female children were normal when MUAC, triceps fold thickness and BMI was used as a measure of malnutrition (Table 3).

The mean Z scores of almost all the parameters of nutrition are towards the negative side except triceps fold thickness. A mean Z score lower than zero usually means that the entire distribution has shifted downwards, suggesting that most, if not all, individuals have been affected (Table 4). The mean z scores were compared between boys and girls. There was no statistically significant difference between boys and girls in any parameter (Table 5).

Table 3: Distribution of wasting, stunting, underweight, mid arm circumference, triceps fold thickness and BMI in the study population.

	Male (%)	Female (%)	Total (%)
Weight for height			
< - 2 SD to + 2SD	85 (41.46)	90 (43.90)	175 (85.36)
< - 2 SD to > -3SD	7 (3.41)	9 (4.39)	16 (7.80)
< -3SD	4 (1.95)	2 (0.97)	6 (2.92)
> + 2 SD	5 (2.43)	3 (1.46)	8 (3.90)
Total	101 (49.26)	104 (50.73)	205 (100)
Height for age			
< - 2 SD to + 2SD	56 (27.31)	67 (32.68)	123 (60)
< - 2 SD to > -3SD	28 (13.65)	23 (11.21)	51 (24.87)
< -3SD	17 (8.29)	14 (6.82)	31 (15.12)
> + 2 SD	0 (0)	0 (0)	0 (0)
Total	101 (49.26)	104 (50.73)	205 (100)
Weight for age			
< - 2 SD to + 2SD	77 (37.56)	73 (35.60)	150 (73.17)
< - 2 SD to > -3SD	19 (9.26)	27 (13.17)	46 (22.43)
< -3SD	5 (2.43)	4 (1.95)	9 (4.39)
> + 2 SD	0 (0)	0 (0)	0 (0)
Total	101 (49.26)	104 (50.73)	205 (100)
Mid-arm circumference			
< - 2 SD to + 2SD	75 (74.25)	72 (69.23)	147 (71.70)
< - 2 SD to > -3SD	16 (15.84)	25 (24.03)	41 (20)
< -3SD	10 (9.90)	7 (6.73)	17 (8.29)
> + 2 SD	0 (0)	0 (0)	0 (0)
Total	101 (100)	104 (100)	205 (100)
Triceps fold thickness			
< - 2 SD to + 2SD	101 (100)	101 (97.11)	202 (98.53)
< - 2 SD to > -3SD	0 (0)	0 (0)	0 (0)
< -3SD	0 (00	0 (0)	0 (0)
> + 2 SD	0 (0)	3 (2.88)	3 (1.46)
Total	101 (100)	104 (100)	205 (100)
BMI			
< - 2 SD to + 2 SD	90 (76.92)	71 (80.68)	161 (78.53)
< - 2 SD to > -3 SD	24 (20.51)	15 (17.04)	39 (19.02)
< -3 SD	3 (2.56)	2 (2.27)	5 (2.43)
> + 2 SD	0 (0)	0 (0)	0 (0)
Total	117 (100)	88 (100)	205 (100)

Table 4: Mean z scores with respect to wasting, stunting, underweight, MUAC, triceps fold thickness and BMI in the study population.

Z scores	Wasting	Stunting	Under weight	MUAC	Triceps fold thickness	BMI
Mean Z score	-0.49	-1.67	-1.33	-1.51	0.3	-0.35
Standard deviation	1.29	1.25	1.04	1.22	0.84	1.32
No. of children	205	205	205	205	205	205

49.20% of children in the study population had varying degrees of caries (Table 6). Pearson correlation was used to find out, if there was any relationship between malnutrition and dental caries. There was no correlation between malnutrition and dental caries in the studied population with R value of 0.041119 and p value of 0.406257.

Table 5: Difference in mean Z scores between boys and girls.

Rural children	Weight for height		Height for age		Weight for age	
	Male	Female	Male	Female	Male	Female
Z score	-0.40	-0.56	-1.67	-1.68	-1.25	-1.40
S.D.	1.41	1.17	1.33	1.16	1.05	1.01
No. of children	101	104	101	104	101	104
T value	0.8852		0.0574		1.0426	
P value	0.3771		0.9543		0.2984	

Table 6: Composite DMFT scores in the study population.

DMFT scores	Male (%)	Female (%)	Total (%)
Score 0	45 (21.95)	59 (28.78)	104 (50.73)
Score 1-4	36 (17.56)	28 (13.66)	64 (31.22)
Score 5-9	20 (9.76)	17 (8.29)	37 (18.05)
Score >9	0 (0)	0 (0)	0 (0)

DISCUSSION

Severe acute malnutrition can be a direct cause of death in a child. It can also increase the case fatality rates in children suffering from common childhood illnesses like pneumonia and diarrhoea.[14] Though malnutrition is in a decreasing trend, it is still a public health problem in Asia.[15]

In the present study, 27% of the children were underweight, 11% of children were wasted and 40% of the children were stunted. When the study results are compared with that of NFHS 4 data, the study area has fewer children with wasting.[5] The number of children with underweight is almost similar to that of NFHS 4 data. But children in this study area are much more stunted when compared to the NFHS 4 data. It can be seen that there is wide variations in the prevalence of malnutrition. This can be attributed to variations in availability of food items, illiteracy rate, poverty, access to medical facilities and time period of data collection. This statement is supplemented by the work of Gulati on child malnutrition.[16]

The prevalence of caries in the study population was 46.59% which is close to a study done by Gupta et al where the prevalence was stated as 46%.[17] There are differences in the caries status among different populations. The plausible explanation for such discrepancy can be inequality in economic conditions and resources, effective fluoridation policy, efficiency of healthcare system, availability and consumption of refined sugars, standard of oral health awareness among public, dietary and oral hygiene lifestyles, as well as motivational status of parents and children.

The present study did not show any relationship of dental caries with malnutrition, which is contrary to a study done by Fawaz where there was a positive relationship of dental caries with BMI for age.[18] In contrast, a cross-sectional study of Iranian children showed no association between weight, height and dental caries.[19] This result corroborates the finding of the present study where no association was found between BMI and dental caries. A possible explanation is that although both obesity and dental caries are often attributed to the high intake of carbohydrates and sugar, the true etiology of these diseases is much more complex and multifactorial.[20,21]

There are many ways of assessing under-nutrition. Weight for age, height for age, BMI for age and weight for height are the commonly used measures. Weight for age (underweight) cannot distinguish between current or past energy deficits. Stunting is an index of cumulative past energy deficit, but does not reflect current energy status. But BMI measures current energy deficit. Early detection of low BMI for age and its correction is likely to be the most effective intervention to prevent stunting.

CONCLUSION

According to the classification for assessing severity of malnutrition by prevalence ranges among children, the study area is classified as a high prevalence area for malnutrition according to WHO.[22]

Dental caries was present in 49.27% of the children belonging to rural anganwadis. It is recommended that the service component be strengthened with respect to exclusive breast feeding, supplementary feeding practices, regular growth monitoring, prevention of infections, immunization, health education and nutritional education to mothers so as to overcome malnutrition. At the grass root level, integration of Anganwadi workers, ASHAs and active community participation will result in better delivery of services to target group. Better delivery of services also requires adequate manpower with periodic capacity building, infrastructure development, and regular supply of locally acceptable and quality food items. Principles of equitable distribution should be followed so that the underprivileged section of the community like slum dwellers, tribal population, and

those in rural remote areas can also get access to these services. Factors like poverty, illiteracy, lack of awareness regarding quality of food items, large family, poor sanitary environment and political commitment are some other factors which should be managed in the long run.

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