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NUTRITIONAL STATUS OF PRESCHOOL CHILDREN OF DHARWAD BY ANTHROPOMETRY

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ABSTRACT
A study was been carried out to assess the nutritional status of preschool children of Dharwad. A total of 565 preschool children (boys=252 and girls=313) of 3 to 6 years attending anganwadis were selected from rural and urban areas of Dharwad during 2013-14. Nutritional status was assessed by anthropometry. The measurements including height, weight, circumferences of mid upper arm, head and chest were recorded. Results indicated that the height of rural and urban boys ranged from 89.78 to 105cm and 92.08 to 113.50cm respectively and weight was 11.80 to 15.20kg and 13.98 to 15.951kg respectively at 3 to 6 years. The height and weight of rural girls ranged from 89.40cm and 11.69kg to 100.20cm and 14.70 kg respectively, while that of urban girls varied from 89.74cm and 11.62kg to 100.43cm and 14.03kg respectively at 3 to 6 years. According to IAP (2006) classification nearly 40 per cent of rural and 47 per cent of rural and urban boys, 44.96 and 42.39 per cent of rural and urban girls respectively were moderately malnourished and more than 20 per cent of them were severely malnourished. When MUAC was considered, 70.80 per cent of children were normal as only 4.42 per cent were at risk of severe malnutrition. Based HC/CC ratio 77.70 per cent were normal and with nearly 23 per cent were malnourished. The results revealed that there were no significant differences in rural and urban children of all anthropometric measurements recorded, though they were below the NCHS standards.

KEY WORDS: Preschool children, Anthropometric measurements, Nutritional status.

INTRODUCTION
Children are wealth of any nation as they constitute one of the important segments of the population. Childhood is a critical period in which dietary and lifestyle patterns are initiated, and these habits can have important immediate and long-term implications (Murphy, 1998). The foundation of good health and sound mind is laid during preschool, so it is a basic milestone in life of an individual and responsible for many changes that may take place during later life. Nutrition of preschool child is of paramount importance, because foundation for life time health, strength, and intellectual abilities are laid down during this period. Preschool age is in between stages of infancy and school age, when rapid physical, mental and emotional developments take place. Nutritional status is the condition of health of a person that is influenced by the intake and utilization of nutrients. Anthropometry reflects both health and nutritional status directly and predicts performance, and survival. Anthropometric measurements such as weight, height, mid upper arm circumference, head and chest circumferences are easy to collect, reliable and cost effective means to assess the nutritional status of large population. Studying the nutritional status of preschool children will help to plan strategies for combating macro and micro deficiencies. Hence the present study was planned with an objective to assess the nutritional status of preschool girls and boys of Dharwad by anthropometry and to study the variations in nutritional status of rural and urban preschool children.

MATERIALS & METHODS
Preschool children attending *anganwadis* from rural and urban areas were selected for the study, with the prior written permission of Women and Child Welfare department. A total of 13 rural *anganwadis* were contacted from five selected villages. Similarly, from urban Dharwad, preschool children attending 22 *anganwadis* were selected from north, south, east and western parts of the city. A total of 565 preschoolers (both gender) of 3 to 6 years were selected from both areas of Dharwad. Nutritional status was assessed by anthropometry. The measurements including height, weight, arm, head and chest circumference, head circumference and chest circumference were recorded using standard procedure (Jelliffe, 1966) and they were compared with NCHS standards. The children were classified using indices namely Weight for age (IAP, 2006) and head to chest ratio. Data were analyzed using t-test by SPSS (Statistical Packages for Social Sciences) software version 16.0.

RESULTS & DISCUSSION
Demographic profile of preschool children is presented in Table 1. Among the 565 preschool children enrolled for the study, 252 (44.60 %) were boys and 313 (55.40 %) were girls. In rural area, around 50 per cent of study subjects were girls (51.60 %) compared to boys (48.4 %) among the total of 250. Similarly in urban area slightly higher per cent of girls (58.45 %) than boys (41.59 %) were included in the study among the total of 315.

It was observed that higher per cent of study subjects were of four years (37.70%) followed by three (32.92 %) years, few were of age five (26.73 %) and very less per cent were of age six years (2.83 %). In rural area, nearly equal per cent of children were in the age of three (34.80) and four (34.40) years and few children were in the age group of six years (2.80 %). Similarly in urban area, 40.33 per cent of children were four years old followed by 31.43 per cent in three years and very few children were six (2.86 %) years old.

Variables	Classification	Rural (n=250)		Urban (n=315)		Total	
		n	%	n	%	n	%
Gender	Boys	121	48.40	131	41.59	252	44.60
	Girls	129	51.60	184	58.41	313	55.40
Age (years)	3	87	34.80	99	31.43	186	32.92
	4	86	34.40	127	40.33	213	37.70
	5	70	28.00	81	25.71	151	26.73
	6	07	2.80	9	2.86	16	2.83

TABLE 1. Demographic profile of pre-school children   N= 565

The anthropometric measurement of preschool boys of rural and urban areas is indicated in Table 2. The mean height of rural boys varied from 89.78 (3years) to 105 cm (6years) and urban counterparts from 92.08 (3years) to 113.50 cm (6years). The rural and urban boys were shorter than NCHS standards. With respect to weight, rural boys weighed 11.80 (3years) to 15.20 kg (6years) and urban boys weighed 13.98 (3years) to 15.95 kg (6years) and were lighter than the NCHS standards at 50th percentile. The MUAC of boys ranged from 14.09 (3years) to 14.25cm (6years) in rural and 14.18 (3years) to 14.75 cm (6years) in urban locality. The head circumference of boys varied from 47.52 (3years) to 48.75 (6years) in rural and 47.60 (3years) to 47.50cm (6years) in urban. The chest circumference of boys ranged from 48.65 (3years) to 50.0 cm (6years) in rural and 49.64 (3years) to 53.00 cm (6years) in urban. There was a steady increase in all body measurements with advancement of age. However, during preschool years (3 to 6 years) rural and urban boys were statistically on par with each other in all the measurements recorded, though slight numerical variations were observed.

Table 3 indicated the anthropometric measurements of girls. The mean height of rural girls varied from 89.40 (3years) to 100.20 cm (6years) and urban counterparts varied from 89.74 (3years) to 100.43 cm (6years). With respect to weight, rural girls weighed 11.69 (3years) to 14.70 kg (6years) and urban girls weighed 11.62 (3years) to 14.03 kg (6years). Both urban and rural girls were shorter and lighter than the NCHS standards at 50th percentile though there was no significant difference amongst them. The MUAC of girls ranged from 14.16 (3years) to 15.20 cm (6years) in rural and 14.00 (3years) to 14.50 cm (6years) in urban area. The head circumference of girls varied from 47.16 (3years) to 47.40 (6years) in rural and 46.36 (3years) to 47.29 cm (6years) in urban counter parts. The chest circumference of girls ranged from 48.47 (3years) to 50.20 cm (6years) in rural and 48.17 (3years) to 49.22 cm (6years) in urban.

The lower values of anthropometric measurements could be reasoned to reduced consumption of foods like pulses, visible fat, sugar and milk which has resulted in reduced intake of energy and other body building nutrients. Despite the fact that children were attending anganwadi and were provided with supplementary foods, it was disheartening to note that the anganwadi foods had become a substitute rather than supplement. Though the amount of protein consumed was meeting the RDA, the quality of protein was poor as the diet was cereal based with less of animal foods (Tables not given), besides lower intake of energy results in diversion of protein to meet energy needs rather than body building. Similar studies indicating lower anthropometric measurements of preschool children were reported (Amosu *et al.*, 2011 in Ipokia of Nigeria, Indu *et al.*, 2013 in Bihar, and Bant., 2013 in Hubli, Karnataka).

Table 4 provides data on classification of children into different degrees of malnutrition based on weight-for-age. According to IAP (2006), irrespective of age, among rural and urban boys, majority were moderately malnourished (39.67 and 46.56 %, respectively) with 70 to 79 per cent of weight for age compared to standard, followed by severe (28.93 and 22.90 %, respectively) and mild malnutrition (26.45 and 22.90 %, respectively). Only 4.96 and 7.63 per cent of rural and urban children were classified as normally nourished. The weight of preschool children of current study was lower than standard (Table 1 and 2), probably due to lesser intake of fuel nutrients and supporting vitamins and minerals

Classification of children into different degrees of malnutrition based on Mid Upper Arm Circumferences presented in Table 5. Around 30 per cent of children in the present study were having lower MUAC and 70 per cent were normal. This might be due to the fact that the deficiency of energy intake leads to utilization of body fat and muscles, thus resulting in reduction of arm circumference. Similar findings were reported by Indu *et al.* (2013) where in slightly lower per cent of children were normal (37%) and slightly higher per cent were moderately nourished (56%). Based on head to chest circumference ratio, irrespective age, gender and locality more than 70 per cent of children (77.70 %) were normal and 22.30 per cent were malnourished (Table 4).

TABLE 2. Anthropometric measurements of preschool boys   N=252

Anthropometric measurements	3 Years		4 Years		5 Years		6 Years	
	Rural (n=42)	Urban (n=47)	Rural (n=44)	Urban (n=52)	Rural (n=33)	Urban (n=30)	Rural (n=2)	Urban (n=2)
Height (cm)	89.78±4.98	92.08±11.94	98.04±7.43	95.73±6.18	102.91±4.99	103.80±6.23	105.00±4.23	113.50±4.95
t-value	1.160NS		1.660NS		0.630NS		1.844NS	
Weight (kg)	11.80±1.42	13.98±12.85	13.60±2.09	12.87±1.80	14.50±1.72	15.17±1.53	15.20±0.57	15.95±0.49
t-value	1.142NS		1.867NS		1.629NS		1.411NS	
MUAC (cm)	14.09±1.15	14.18±1.02	14.50±1.27	14.12±1.15	14.17±1.04	14.54±1.12	14.25±0.36	14.75±0.36
t-value	0.370NS		1.554NS		1.354NS		1.414NS	
Head circumference (cm)	47.52±1.43	47.60±2.43	48.48±2.27	48.33±3.99	47.89±2.64	48.02±2.03	48.75±1.06	47.50±0.71
t-value	0.220NS		0.220NS		0.206NS		1.387NS	
Chest circumference (cm)	48.65±2.29	49.64±2.31	50.35±2.95	49.88±2.49	50.23±3.09	51.62±2.39	50.00±0.00	53.00±1.42
t-value	0.513NS		1.032NS		0.278NS		0.447NS	

NS-non significant

TABLE 3. Anthropometric measurements of preschool Girls   N=313

Anthropometric measurements	3 Years		4 Years		5 Years		6 Years	
	Rural (n=45)	Urban (n=53)	Rural (n=43)	Urban (n=75)	Rural (n=36)	Urban (n=51)	Rural (n=5)	Urban (n=7)
Height (cm)	89.40±6.65	89.74±4.52	96.16±6.21	95.98±5.64	102.82±6.60	102.76±4.79	100.20±7.20	100.43±5.48
t-value	0.290NS		0.161NS		0.045NS		0.063NS	
Weight (kg)	11.69±1.31	11.62±1.29	13.11±1.79	12.88±1.88	14.62±1.86	14.39±1.68	14.70±1.74	14.03±1.74
t-value	0.246NS		0.661NS		0.626NS		0.662NS	
MUAC (cm)	14.16±1.17	14.00±1.10	14.37±1.19	14.36±1.26	14.73±1.17	14.62±0.96	15.20±1.16	14.50±1.00
t-value	0.676NS		0.039NS		0.459NS		1.125NS	
Head circumference (cm)	47.16±1.82	46.36±1.02	47.28±1.52	47.17±1.59	47.45±1.82	47.53±2.03	47.40±2.31	47.29±1.78
t-value	0.516NS		0.369NS		0.201NS		0.097NS	
Chest circumference (cm)	48.47±2.38	48.17±2.48	50.01±2.47	49.26±2.63	50.92±2.90	50.45±2.40	50.20±3.90	49.22±3.31
t-value	0.613NS		1.532NS		0.836NS		0.474NS	

NS-non significant

TABLE 4. Categorization of pre-school children based on IAP classification   N=565

Boys (n=252)

IAP classification (2006)	3 Years Rural (n=42)	Urban (n=47)	4 Years Rural (n=44)	Urban (n=52)	5 Years Rural (n=33)	Urban (n=30)	6 Years Rural (n=2)	Urban (n=2)	Total Rural (n=121)	Urban (n=131)
Normal (>90)	1 (2.38)	5 (10.64)	4 (9.09)	4 (7.69)	1 (3.03)	1 (3.33)	-	-	6 (4.96)	10 (7.63)
Mild malnutrition (80-90)	12 (28.57)	14 (29.79)	13 (29.55)	8 (15.38)	7 (21.21)	8 (26.67)	-	-	32 (26.45)	30 (22.90)
Moderate malnutrition (70-79)	17 (40.48)	18 (38.30)	16 (36.36)	23 (44.23)	14 (42.42)	18 (60.00)	1 (50.00)	2 (100.00)	48 (39.67)	61 (46.56)
Severe (<70)	12 (28.57)	10 (21.28)	11 (25.00)	17 (32.69)	11 (33.33)	3 (10.00)	1 (50.00)	-	35 (28.93)	30 (22.90)

Girls (n=313)

	Rural (n=45)	Urban (n=53)	Rural (n=43)	Urban (n=73)	Rural (n=121)	Urban (n=131)	Rural (n=5)	Urban (n=7)	Rural (n=129)	Urban (n=184)
Normal (>90)	4 (8.89)	4 (7.55)	5 (11.63)	10 (13.33)	5 (13.89)	0 (0.00)	0 (0.00)	0 (0.00)	14 (10.85)	15 (8.15)
Mild malnutrition (80-90)	10 (22.22)	14 (26.42)	10 (23.26)	8 (10.67)	7 (19.44)	18 (35.29)	1 (20.00)	1 (14.29)	28 (21.71)	41 (22.28)
Moderate malnutrition (70-79)	23 (51.11)	23 (43.40)	16 (37.21)	34 (45.33)	18 (50.00)	20 (39.22)	1 (20.00)	1 (14.29)	58 (44.96)	78 (42.39)
Severe (<70)	8 (17.78)	12 (22.64)	12 (27.91)	21 (28.00)	6 (16.67)	12 (23.53)	3 (60.00)	5 (71.43)	29 (22.48)	50 (27.17)

Values in the parenthesis indicates percentage

TABLE 5. Classification of children based on Mid Upper Arm Circumference and Head to Chest circumference ratio   N=565

Classification	Rural (n=250) n	%	Urban (n=315) n	%	Total n	%
MUAC (cm)						
Normal (>13.5)	180	72.00	220	69.84	400	70.80
Moderate malnutrition (12.5-13.5)	54	21.60	86	27.30	140	24.78
Severe malnutrition (<12.5)	16	6.40	9	2.86	25	4.42
Head to Chest circumference ratio (cm)						
Normal (<1)	188	75.20	251	79.68	439	77.70
Malnourished (1)	62	24.80	64	20.32	126	22.30

CONCLUSION

It can be concluded from the above study that in general, nutritional status of the preschool of rural and urban locality was lower compared to NCHS standards. Less than ten per cent of rural and urban boys and girls having normal weight. Hence, there is an urgent need for nutrition intervention programmes for improving the nutritional status of the preschool children. Also there is need to educate mothers of preschool children about importance of nutrition at early childhood period.

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