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Assessment of Nutritional Status and Anthropometry of Pre-School Children

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Abstract

Child growth is internationally recognized as an important indicator of nutritional status and health in populations. Nutritional status of children is a proxy indicator for assessing the entire population health status and one of the major predictors of child survival. Anthropometry is the scientific study of body measurements and in expensive and non-invasive methods for assessing children's developing patterns. The literature found relationship between the age, gender, and anthropometric measures of young children. The present study was conducted to understand the relationship among the age, gender, and anthropometric indices across age and gender of pre-school children. The study sample was pre-school children attending Anganwadi in Tirupati town of Chittor district of Andhra Pradesh who were selected randomly. The results revealed that there was association between age, gender, and anthropometric data of pre-school children.

Keywords: Age, Anthropometry, Gender, Nutritional status, Pre-school children

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Introduction

Childhood is a period of rapid growth and development and nutrition is one of the influencing factor in this period.[1]

Anthropometry has a long tradition of assessing nutritional and health status of an individual as this is an inexpensive, non-invasive method that provides detailed information on different components of body structure especially muscular and fat components.[2]

Child health nutritional indicators are used to assess the quality of available health service as well as general health conditions of the entire populations.[3]

Severe acute malnutrition is defined as a weight -for- height measurements of 70% or less below the median, or three SD or below the median.[4]

Stunting is defined as low height-for-age children and it measures the (chronic) children under nutrition. Children with Z-scores < −2.00 are said to be stunted and those < −3.00 severely stunted.[5]

Child nutrition is positively influenced by urbanization female literacy access to health care, safe water and sanitation.[6]

Poor nutritional status among children is a wide spread public health problem having international consequences because good nutrition is an essential determinant for their well-being. The most neglected form of human deprivation is under nutrition, particularly among pre-school children in developing countries including. India poor nutritional status among preschool children is detrimental to their health outcome.[7]

Anthropometric examination is an almost mandatory tool in any research to assess health and nutritional condition in childhood, physical measurements such as body weight, height, circumference of arm and calf, and triceps skin fold of children have been extensively used to define health and nutritional status of communities.[8] Based on the age, body weight, and height, a number of indices such as height-for-age and weight-for-height have been suggested (WHO 1977).[9]

According to the World Health Organization (WHO), nutritional status indicators such as wasting, stunting, low birth weights, and Vitamin A deficiency are also high in India compared to the USA and China (WHO 1995).[10] Stunting is defined as low height-for-age children and it measures the (chronic) child's under nutrition.[5] Children with Z-scores < −2.00 are said to be stunted and those < −3.00 severely stunted. Wasting is defined as low weight-for-height for children and it is a measure of current or acute under nutrition. Children with Z-scores < −2.00 are said to be wasted. Underweight is defined as low weight-for-age and it reflects past (chronic) and present (acute) undernutrition. Children with Z-scores < −2.00 are said to be underweight.[11,12]

More than median are considered to be an overweight and obesity.

Pre-school age (3–6 years) is considered as important for growth and development of children. Because they are rapid during this stage.

To assess the relationship among the anthropometry indices age and gender of pre-school children, the present study was conducted with the following objectives.

Objectives

The objectives of the study are as follows:

- To assess the anthropometry measurements of sample

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pre-school children according to the age and gender.
- To assess whether the anthropometry data of children differs according to their age.
- To assess whether the anthropometry data of children differs according to their gender.

Based on the above objectives, the following null hypotheses were framed

1. There was no significant difference in the mean height of sample pre-school children, according to their age.
2. There was no significant difference in the mean height of sample pre-school children, according to their gender.
3. There was no significant difference in the mean weight of sample pre-school children, according to their age.
4. There was no significant difference in the mean weight of sample pre-school children, according to their gender.
5. There was no significant difference in the mean MUAC of sample pre-school children, according to their age.
6. There was no significant difference in the mean MUAC of sample pre-school children, according to their gender.

Materials and Methods

Tools

- General information schedule (Developed by Investigator)
- Anthropometric Data (standard procedures).

Sample

The samples of the study were pre-school children studying in government schools (Anganwadi) of Tirupati Town of Andhra Pradesh. The sample of pre-school children was identified using multistage systematic stratified random sampling techniques. Fifty children (25 boys and 25 girls) in the age group of 3–6 years were identified randomly from two Anganwadies in Tirupati. The sample children's anthropometric measurements like height, weight, head circumference and mid arm circumference were measured using standard procedures for measurements Weight was measured to nearest 100 g using digital scale. Height was measured to nearest 1 mm using a non-stretchable tape. MUAC was measured using a flexible non-stretch tape. Tape was passed over the supracilliary ridges in front and maximum occipital protuberance at the back in such a way as to get maximum MUAC.

Table 1: Distribution of sample according to the gender and age

Variables	*Number*	*Percentage*
Gender		
Boys	25	50.00
Girls	25	50.00
Age of Children (Months)		
36–47	18	36.00
48–60	32	64.00

Results and Discussion

The data collected were pooled and statistical analysis was conducted.

The mean age of total sample pre-school children in months was 49.22 ± 6.92.

Table 1 shows the distribution of sample children according to the gender and age.

The samples were divided into two groups, namely, 36–47 months and 48–60 months for conducting statistical analysis. Thus, 36% of sample children were in the age range of 36–47 months and 64% were in the age group of 48–60 months. An equal percentage of boys and girls were selected to enable comparison.

When the height of sample children was observed as shown in Table 2, it is clear that comparatively girls were taller in both age groups (100.400 ± 13.049 and 82.885 ± 12.692) than boys (93.606 ± 17.432 and 81.180 ± 11.786) in both the age groups of 36–47 months and 48–60 months. With regard to weight in the age group of 36–47 months, boys were observed to have more weight (20.235 ± 6.98) than girls of that age group (19.300 ± 3.199). Whereas the difference between boys and girls was reversed in the age group of 48–60 months, where girls were comparatively having more weight (16.923 ± 2.84) than boys (12.500 ± 1.58).

When the anthropometric data of sample children were compared against the NHM standards, the sample children were below the standard in almost all indicators except for the indicator of weight by girls of weight for both of 36–47 months and 48–60 months age groups and weights of girls. Girls were found to have more weight than standard in 36–47 months age group (19.300 ± 3.199) and 48–60 months (12.500 ± 1.581).

Anuradha *et al.* (2014)[1] also reported that prevalence of poor nutrition was higher among male children when compared to female children.

The first hypothesis was framed was "there was no significant difference in the mean height of sample preschool children according to the gender."

To test the hypothesis, *t*-test was conducted and presented in Table 3.

Table 2: Mean height weight and mid arm circumference of sample children across age (months)

Age (Months)	*Gender*		*Anthropometric measurements*			*NHM standards*
			Minimum	*Maximum*	*Mean+std*	
36–47	Boys	Height (cm)	61.70	120.0	93.606±17.432	96–102 cm
	Girls	Weight (kg)	11.00	29.00	20.235±6.978	14–16 kg
	(*n*=18)	MUAC (cm)	10.30	15.90	13.829±1.516	15–16 cm
		Height (cm)	74.00	120.00	100.400±13.049	95–102 cm
		Weight (kg)	15.00	24.00	19.300±3.199	13–15 kg
		MUAC (cm)	12.00	16.00	14.00±1.155	15–16 cm
48–60	Boys	Height (cm)	66.40	96.50	81.180±11.786	103–121 cm
	Girls	Weight (kg)	10.0	15.00	12.500±1.581	15–18 kg
	(*n*=32)	MUAC (cm)	14.20	19.50	16.520±1.907	16–16.5 cm
		Height (cm)	65.00	109.00	82.885±12.692	102–120 cm
		Weight (kg)	12.00	22.00	16.923±2.842	16–18 kg
		MUAC (cm)	10.0	16.00	12.615±1.710	16–16.9 cm

**Source; NHM (2014)[15]

From Table 3, it is clear that there was no significant difference in the mean heights of boys and girls across two groups of children, that is, 36–47 months and 48–60 months. The *P*-values were not significant. Hence, the hypothesis was accepted. However, the data show that comparatively girls were having more height than boys in both groups.

Srivastava *et al.* (2012),[11] also reported that there was no significant association between gender and nutritional status of young children.

Next hypothesis framed was that "there was no significant difference in the mean weight of sample preschool children according to the gender."

To test the hypothesis, *t*-test was conducted and presented in Table 4.

From Table 4, it is clear that boys and girls did not differ significantly in the mean weight in the age group of 36–47 months ($t = 0.5167$ P = NS). However, boys and girls differed significantly in their weights in the age group of 48–60 months. The *t*-value was 7.963 which was highly significant. The null hypothesis was partially rejected and can be said that children in the age group of 48–60 months differed significantly in their weights according to the gender. The data shown that the difference between boys and girls was reversed in the age group of 48–60 months. Girls were comparatively having more weight (16.923 ± 2.842) than boys (12.500 ± 1.587).

Mahmood *et al.* (2012)[12] also reported that the gender difference has effect on the mean weight of children. Males are more weight than females that is the rate of malnutrition among boys is consistently higher than among girls.

Next hypothesis framed was that "there was no significant difference in the mean MUAC of sample preschool children according to the gender."

To test the hypothesis, *t*-test was conducted and presented in Table 5.

The third anthropometric measure was MUAC the data from Table 4, it is clear that comparatively girls had more MUAC (14.00 ± 1.155) than boys (12.615 ± 1.710) in the age groups of 36–47 months. As the age increased, that is, during 48–60 months, the MUAC of boys was found to be more (16.520 ± 1.907) than girls (13.829 ± 1.907). The null hypothesis was partially rejected and can be said that children in the age groups of 48–60 months differed significantly in their MUAC according to their gender.

NFHS Standards includes low birthweight, stunting of growth, increasing trends of underweight, poor maternal nutritional status and higher rate of anaemia among women and children.[5]

According to DLHS-RCH-3 survey there was significant assosiciation between age and anthropometric measurements.[6]

Bose *et al.* (2010)[13] also reported that there was a significant association between gender nutritional statuses of young children.

Form Table 6, it is evident that nearly one-fourth of boys (24%) and 14% girls were found to be obese. Followed by 30% of girls and 10% of boys were overweight. An equal percent of boys (6%) were in the category of normal and –1 SD. Very few percent of boys (4%) were in the range of <1 SD and no girls in the sample were found to be in the range of –1 SD.

Very few sample children were in the normal range according to the NHM standards, in spite of Government taking more care of pre-school children in Anganwadies.

This is calls for attention to focus more on malnutrition among pre-school children.

Table 3: Mean height of sample pre-school children according to the age, gender, and *t*-values

Age	*Mean of Height (cm)*			
Months	*Boys* $\bar{x}$±*SD*	*Girls* $\bar{x}$±*SD*	*t-value*	*P value*
36–47 (*n*=18)	93.606±17.432	100.400±13.049	1.32370	0.1944 NS
48–60 (*n*=32)	81.180±11.786	82.885±12.692	0.55680	0.5796 NS

NS: Not Significant

Table 4: Mean weight of sample pre-school children according to the age, gender, and *t*-values

Age	*Mean of Weight (kg)*			
Months	*Boys* $\bar{x}$±*SD*	*Girls* $\bar{x}$±*SD*	*t value*	*P value*
36–47 (*n*=18)	20.235±6.978	19.300±3.199	0.5167	0.6087 NS
48–60 (*n*=32)	12.500±1.581	16.923±2.842	7.693440	0.00**

** Significant at 0.01 level. NS: Not Significant

Table 5: Mean MUAC of sample pre-school children according to the age, gender, and *t*-value

Age months	*Mean MUAC (cm)*			
	Boys $\bar{x}$±*SD*	*Girls* $\bar{x}$±*SD*	*t value*	*P value*
36–47	13.829±1.516	14.00±1.155	0.3340	0.7404 NS
48–60	16.520±1.907	12.615±1.710	8.6242	0.00**

**Significant at 0.01 level. NS: Not Significant

Table 6: The Z-score of children for weight according to the gender

S. No.	*Category*	*Boys*		*Girls*	
		Number	*Percentage*	*Number*	*Percentage*
1.	–1 SD	3	6	-	-
2.	<1 SD	2	4	-	-
3.	NORMAL	3	6	3	6
4.	OVERWEIGHT	5	10	15	30
5.	OBESITY	12	24	7	14

Source: NHM-2011.[14] –1 SD: Mild malnutrition, <–1 SD: Up to tip of mild malnutrition, Median: Normal range of malnutrition

Conclusion

- Comparatively girls were taller than boy in both age groups of 36–47 and 48–60 months.
- Boys and girls did not differ significantly in mean height according their age.
- Comparatively, girls exceeded in weight than boys more in both age groups and differ significantly in mean weight according to their age.
- Comparatively, girls had more MUAC than boys in the age groups of 36–47 months and in age group of 48–60 months the MUAC of boys who were found to be more than girls and there was significant difference in mean MUAC according to their age.
- When sample children were compared against the NHM standards, they were found to be below the standard in almost all indicators except that of weight for both of 48–60 months age groups.
- The majority of sample children in Z-score were prone to overweight both male and female children simultaneously second category is obese in both boys and girls but in boys

are in less prone to −1 SD and <1 SD tip of malnutrition and mild malnutrition.

Implications

The data helped to understand the prevalence of malnutrition among pre-school children attending Anganwadi center. However, the sample size is small. A study on a larger sample may help for generalization.

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