

## Anthropometric Measurement of Weight for Assessment of Nutritional Status of Anganwadi Children in Urban Mangalore - A Cross Sectional Study

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### Abstract

#### Background and objectives

Anthropometry is the part of anatomy used to do external measurement of human body to assess underlying disease, like assessing the nutritional status of a child.

#### Methods

The 254 Anganwadi children between age group 1 to 6 years of urban Mangalore during 2013 year, measurements are calculated using WHO growth standard in assessing weight.

#### Interpretation and conclusion

The underweight denotes in respect to age but doesn't pin point whether acute or chronic, but the stunting is due to chronic malnutrition, the axial skeletal growth is stunted. Concludes that lower socioeconomic status and malnutrition are interrelated, which hampers the normal physical, intellectual, psychological development of children, there by affects the progress of the country.

**Keywords:** Anthropometry; Anganwadi children; Growth; Socioeconomic status; Urban mangalore

### Introduction

Malnutrition [1,2] continues to be the biggest health problem of our country today despite efforts by the government of India and voluntary health agencies towards eradication of the same. There is a growing realization that adequate nutrition is a necessary first step in the improvement of quality of life. Malnutrition and infection are connected by a vicious cycle. It is one of the greatest international health problem and the biggest challenges. World health organization is facing today, its association with infection family size, parental education, nutritional taboos, economic status of the family has been repeatedly proved.

The nutritional problem [3] cannot be estimated just by assessing prevalence of easily recognized syndromes like Marasmus or Kwashiorkor. These are tips of the Iceberg; biggest part of it is hidden. Most effective and simplest way of detecting hidden malnutrition is by anthropometric assessment.

The growth rate is maximal during first six years of life; hence malnutrition has a direct impact on infant mortality rate under 5 mortality rates, which are prime indicators of health status of a country [4]. Poverty, feeding habits, sex discrimination, large family and economic income of the family are contributing factors for malnutrition [1]. The proverb "sound mind in a sound body" stress

direct correlation of malnutrition and intelligence, since children are future citizens of any country, a well-nourished intelligent child are asset for the country.

Maternal health and child health are directly linked [5]. Well-nourished well fed mothers will give to a well-nourished baby. So the problem of malnutrition starts right from the day of conception. "It starts in the womb ends in the tomb". Hence any program aimed at eradication of malnutrition has to include both these segments of population. Government of India, realizing this fact has initiated various programs covering mother and child viz., integrated child development scheme, child survival and safe motherhood nutritional supplementation programs [6]. Baldwin [7] prepared standard height and age charts in metric units for America children. They first used their term Nutritional anthropometry which is now employed for all such children. Gadra [8] reported anthropometric data on 1,814 children between 6-36 months of age in CARE project in Madhya Pradesh and reported average measurement. The weight being 80% of ICMR and 70% of Harvard scale. The length was 81% of Harvard standard, Head circumference was 100%. The chest circumference was 90% of ICMR standard and mid arm circumference was 98%.

Prahlad Rao [9] surveyed the nutritional status of 1,093 rural children in Hyderabad. The mean height and weight of these children from low socio economic group was 5th percentile of data obtained from belonging to higher socio-economic group. Srivastava [10] did a random cross sectional study of 1,000 pre-school children from Jabalpur. They observed that average weight of boys exceeded that of

girls; at all ages except between 31-33 months. Boys appeared to be more average of 3-6 months advance of girls. The rates of growth between boys and girls did not differ materially, though boys tend to grow faster than girls around 9th year of life. OP Ghai [11] surveyed 3,029 preschool children in Haryana state 39.3% of children in 2nd year of life weighed less than 80 percent reference weight for age standard. They observed that 17.8% pre-school children weighed less than 80% of reference standards (ICMR1968). Prevalence of malnutrition based on low body weight was highest in the age group 12-17 months, but was also significant between ages of 18-29 months.

## Materials and Methods

As per World health organization [12,13] weight loss can be both stunting and acute underweight is a composite index, which is difficult to interpret. So following indicators represent international status and health in population.

Under weight:  $<-2SD$  WAZ (z-score for weight for age)

Stunting:  $<-2SD$  HAZ (z-score for height for age)

Thinning (wasting):  $<-2SD$  WHZ (z-score for weight for height)

Over weight:  $>+2SD$  WHZ (z-score for weight for height)

Cut off values for public health by WHO (Table 1):

Severity of malnutrition	Low prevalence (%)	Medium (%) prevalence	High prevalence (%)	Very High prevalence (%)
Underweight	<10	Sep-17	20-29	=/>30
Stunting	<20	20-29	30-39	=/>40
Thinning/wasting	<5 (acceptable)	5-9 (poor)	10-14 (serious)	=/>15 (critical)

**Table 1:** Cut off values for public health by WHO.

A total of 254 children between the ages of 1-6 years, belonging to 21 Anganwadis of urban ICDS project were studied (Table 2). The study was conducted by visiting individual Anganwadis between 9 AM to 1 PM, the working hours of Anganwadis.

The Anganwadis are selected at Random covering all geographic areas of Mangalore.

Indicators of malnutrition			
Indicators	Interpretation		Reason
Stunting	Low height for age	Indicator of chronic malnutrition, the result of prolonged food deprivation and or disease or illness.	Slowing in skeletal growth
Wasting	Low weight for height	Suggests acute malnutrition, the result of more recent food deficit or illness.	Deficit in tissue and fat mass
Underweight	Low weight for age	Combined indicator to reflect both acute and chronic malnutrition	

**Table 2:** Indicators of malnutrition.

## General Information

General information consisted of name of the Anganwadi, name, age and sex of child, address, mother's name, literacy status, occupation, father's name, literacy status, occupation, income of the family. Age of the child was taken to the nearest month.

Each angnawadi consist of one Anganwadi worker, who is familiar with the child's family and one assistant to help her in preparation and distribution of food.

Anthropometric measurement [12] included weight, taken carefully in front of anganwadi workers, after obtaining written permission. There are 111 urban Anganwadis in and around Mangalore. Each Anganwadi consisted of 30-50 children on an average. Measurement were taken personally to avoid inter observer variation. Children showing the following sign and symptoms were excluded from the study.

- Those who are were bedridden for more than 15 days, during the past 6 months preceding the date of examination
- Children diagnosed to be having chronic illness like tuberculosis, recurrent malarial attacks.
- Those with past history of low birth weight and physical deformities.

Care was taken to obtain accurate measurement by using standard equipment all recording were taken by a single and by the use of same equipments. All measurement were taken as per the specification of ICMR which lay down for its cross sectional survey of growth and development of Indian children. All measurement was taken in SI Units.

## Weight

Each child was weighed without footwear and minimal clothing. Hence no deduction was made for this. All children asked to empty their bladder before Weighing. Digital electronic weighing machine was used, hence, accuracy of the scale was checked by standard weight before visiting Anganwadi, Care was taken to see that child does not lean forward or holds any other support nearby, which may alter the reading weight as recorded to the nearest 0.1 kg. There are 111 urban Anganwadis in and around Mangalore. To be statistically significant at least 20% of these i.e. 21 or more have to be visited. Study period started from August 2012 up to 2013, over a span of 1½ years. Totally 21 Anganwadis were visited during this period. All data's are from the records maintained by ICDS officials in each Anganwadi (Figure 1).



Figure 1: Weight measurement technique.

Kuppuswamy's classification (Modified) for Socio-economic status of urban population (Tables 3 and 4) [13].

There are three variables

- Education
- Occupation
- Income

	Items	Score
<b>A</b>	<b>Education of the head of Household</b>	
1.	Profession or honours	7
2.	Graduates or post graduates	6
3.	Intermediate/post high school diploma	5
4.	High school Certificate	4
5.	Middle school Certificate	3
6.	Primary School Certificate	2
7.	Illiterate	1
<b>B</b>	<b>Occupation</b>	
1.	Profession	10
2.	Semi profession	6
3.	Clerical, Shop owner, Former	5
4.	Skilled worker	4
5.	Semi- Skilled worker	3
6.	Unskilled worker	2
7.	Unemployment	1
<b>C</b>	<b>Family income per month(in Rs) modified for 2007</b>	
1.	19,575	12
2.	9,788-19,575	10

3.	7323-9,787	6
4.	4,894-7,322	4
5.	2,936-4,893	3
6.	980-2,935	2
7.	<979	1

Table 3: Kuppuswamy's classification for socio-economic status of urban population.

According to total score	Socioeconomic class
26-29	Upper (I)
16-25	Upper middle (II)
11-15 (middle)	Lower middle (III)
5-10 (lower)	Upper Lower (IV)
<5	Lower (V)

Table 4: Different weightages are given for each scale.

## Results

Mean and standard deviation for weight of children (Table 5).

Age in months	Total		Male		Female	
	Mean (kg)	SD	Mean (kg)	SD	Mean (kg)	SD
12-18	NIL	NIL	NIL	NIL	NIL	NIL
19-24	11.6	0.84	12.2	-	11	-
25-30	11.6	1.21	11.89	1.17	11.19	1.22
31-36	12.18	1.7	12.52	1.5	11.89	1.83
37-42	12.75	1.43	13	1.45	12.43	1.38
43-48	13.61	2.07	14.21	2.15	12.96	1.82
49-54	14.35	1.97	14.45	2.27	14.23	1.66
55-60	14.8	2.42	15.21	2.34	14.24	2.5
61-66	14.53	1.18	13.82	1.65	14.85	0.8
67-72	14.88	2.35	-	-	14.88	2.35

Table 5: Mean and standard deviation for weight of children.

## Discussion and Conclusion

While Weight for age (WAZ) is loss of weight or Underweight due to under nutrition, it can be acute or chronic cause is 69 (27.16%) is High prevalence according to cut-off value of public significant by WHO, 31 (24.03%) boys and 38 (30.4%) girls are under weight. Gender wise girls are more affected (Table 6).

In weight for height (WHZ) is wasting or thinness helpful when age doesn't known; is due to acute under nutrition e.g. Infection or loose motion. Total thinness 27 (10.6%) is Serious according to cut-off

value of public significant by WHO, out of that, 13 (10.07%) are boys and 14 (11.2%) are girls. Gender wise girls are more affected (Tables 7 and 8).

Severity of malnutrition	Prevalence (%)
Underweight(WAZ)	27.16%
Thinning/wasting(WHZ)	10.60%
Stunting (HAZ)	30.70%

**Table 6:** Novel findings are as below as per Z-score.

According to total score	Socioeconomic class
5-10 (lower)	Upper Lower (IV)

**Table 7:** Kuppuswamy's classification (modified) for socio-economic status of urban population.

Population	No	Age group	WAZ	HAZ	WHZ	Study area
India	-	Under 5 years	43%	48%	20%	India by surveillance
World	-	Under 5 years	16%	27%	10%	World by surveillance
Anganwadi	235	Under 5 years	67%	49.36%	28.52%	Pune
Saharia tribal children	238	1-5 years	72%	68%	13%	Rajasthan India
Gonda Tribal children	1022	1-5 years	61.70%	51.70%	32.80%	MP, India
Kodaku children	182	1-5 years	59.80%	43%	35%	Chhatisgarh, India
Raj Gond	123	1-5 years	37.40%	46.30%	41.50%	MP India
ICDS children	673	1-5 years	39.40%	-	-	Chapra, WB, India
Dhodia children	306	0-5 years	-	15.30%	11.30%	Coastal, India

**Table 8:** Studies to know the impact of ICDS.

### Comparison with previous studies

The present study is compared with similar studies to know the impact of ICDS, project in Mangalore, India and International. The decrease weight for age (Underweight) is of 27.16%, the values are less than average value of India which is of 43%. The Weight for height (Thinning) is 10.6%, it is closer to values of UNICEF 2012 (10%), Punjab (10.8%) and Bangladesh (10%). Less than average prevalence in India (20%). Regarding overweight is 1.96% less research has been done as underweight is more common. But it is the best indicator for many non-communicable diseases, includes Diabetes mellitus, Coronary heart disease and increased risk for musculoskeletal disorders and respiratory symptoms.

Underweight 69 (27.16%) children as per this study] indicates acute or chronic malnourishment. Stunting 78 (30.7%) children as per this study] indicates chronic malnutrition causing reduced skeletal growth. Thinning/wasting (10.6%) children in this study] indicates muscle wasting due to acute with chronic cause(less food intake) [27]. Both underweight and stunting come under high prevalence and wasting comes under Serious as per WHO standard for public health significance.

Weech's formula [14-19] was used to calculate the expected weight and height (wasting is not possible) of the children given their age in years. It is helpful where the WHO growth chart is not available and mother doesn't know exact age of the child.

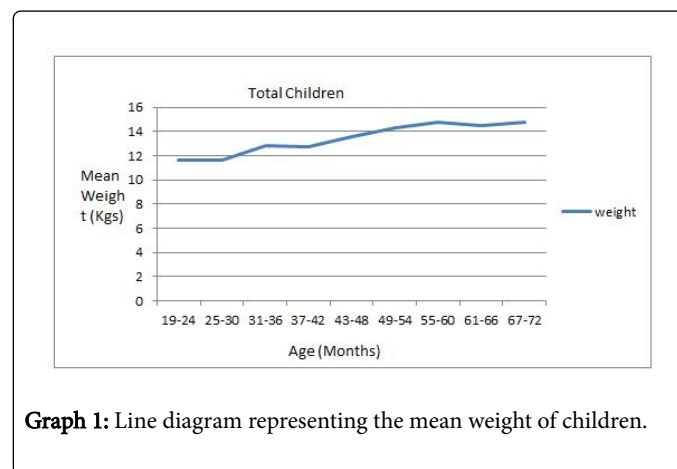
Weight for age:  $2x+8$ = Reference weight

Height for age:  $6x+77$ =Reference height

(Generally "x" is age in completed year) [20].

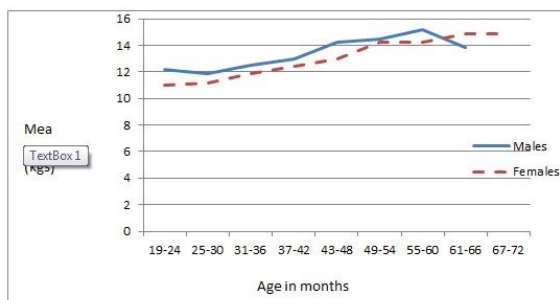
As per normal growth spurt; the child weight gain 2kg and height gain 6 cm in every year [21-23]. After the completed 1 year average weight taken as 8 kg and height as 77 cms.

The study concludes with the hope that a healthy mother can give a healthy baby with improved socio-economic status and equal care for both boys and girls at home. The anthropometry is a set of methods in assessing the nutritional status of a growing child both physically and mentally between the 1 to 6 years age group which decide the future intellectuality and personality of the citizen in a country (Graph 1).



**Graph 1:** Line diagram representing the mean weight of children.

The weight was calculated using the arithmetic formulas against age and correlated using standard deviation (Z-score) and with socioeconomic status of the family using Kuppuswamy modified socioeconomic status method was stage IV. The 30.7% are stunted, 23% impaired head circumference; these two indicate chronic malnutrition. The 10.6% are thinning indicates acute malnourishment due to low food intake (infection-excluded criteria). All these parameters are predominantly affected in girls than boys (Table 8). The Weech's formula is more sensitive and specific, compared to z-score, but can't be compared with international standard (Graph 2).



**Graph 2:** Line diagram representing mean weight among males and female children.

The present study shows higher percentage of lower socioeconomic population in comparison with anthropometric data, suggestive of the poor status of family affecting the 3 to 6 years age group of children causing chronic associated with acute malnourishment.

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