

# THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

## Prevalence of Malnutrition among the Children Residing in India and Ethiopia

**Preeti Ghate**

Food and Bioprocess Technology Program, College of Engineering and Technology  
Wollega University, Nekemte Ethiopia

**Deepali Kotwal**

Department of Food Science and Nutrition, Lady Amritbai Daga College and  
Smt. Ratnidevi Purohit College for women, Nagpur University, Nagpur India

### **Abstract:**

*The present cross sectional study was conducted to assess the nutritional status and the prevalence rate of malnutrition of 4 to 6 year-old children of India[Nagpur] and Ethiopia[Nekemte]. Nutritional status of children was assessed in terms of dietary assessment, anthropometric measurement, biochemical assessment and clinical assessment of signs and symptoms of various nutrient deficiency diseases. Anthropometric survey of children was carried out and compared against the NCHS/WHO reference standards to determine their nutritional status. The results of the study revealed that food and nutrient intake was inadequate and consumption of all the nutrients by the children was comparatively less than the recommended dietary allowances. Data on anthropometry revealed that out of total children screened (N=200), mean height and weight in all the age group was significantly less than the National Center for Health Statistics standards. According to Gomez's classification of weight for age shows that 10.5%, 54%, and 35.5% fall under mild, moderate and severe malnourished, whereas according to Waterlow classification of weight for height (wasting) 76.5% of the children were severe malnourished. Waterlow's classification Height for age (stunting) depicts 3 % of the children as normal. According to BMI-for-Age Table (WHO 2007), 28% of the children were below -3SD score. 75 % and 60% of anaemia prevalence rate was observed among the children of Nagpur and Nekemte. It is concluded that poor anthropometric indices, undernutrition and iron deficiency anemia may be due to lower intake of food and nutrients than recommended.*

**Key words:** malnutrition; nutritional status, height; body-weight

### **1. Introduction**

Malnutrition (measured as poor anthropometric status) of children is an important public health problem which is one of the major killers of children in developing countries. About 35% of under-five deaths in the world are associated with malnutrition. Malnutrition continues to be a significant public health problem throughout the low income countries, particularly in South Asia and Sub-Saharan Africa. The alarming prevalence of malnutrition is not only a challenge for South Asia or Sub-Saharan Africa, but also a challenge across individual countries, individual societies as well as individual families. Although there is a perception that the situation of malnutrition among children is worst in Africa, the problem of malnutrition is actually much higher in South Asia, for instance, the prevalence of underweight among pre school children is almost double in Bangladesh compared to Somalia or Mozambique and equal to that of Ethiopia. Although the proportion of under-five children with malnutrition declined from 27% in 1990 to 20% in 2005 but the progress is not enough in developing countries and continues to be a serious problem. Half of the world's malnourished children are to be found in just three countries, Bangladesh, India and Pakistan. (Balgir, 2004).

Ethiopia is the second-most populous country in Africa, at nearly 84 million. Malnutrition is the underlying cause of 57% of child deaths in Ethiopia, with some of the highest rates of stunting and underweight in the world. As of 2011 the under-five mortality rate was 88 per 1000, stunting prevalence was 44.4%, and underweight prevalence was 28.7%. These rates have decreased quite a bit in the past decade, most notably with mortality almost halving. Additionally, at the current rate of 1.22 percentage points per year, Ethiopia is finally on track to meet the first Millennium Development Goal (MDG1) target of halving the number of underweight children under five years of age. However, Ethiopia still needs a concerted effort to accelerate reductions in under nutrition.

#### *1.1. Child Malnutrition Trends*

In Ethiopia, child malnutrition remains an acute and widespread challenge. A recent UNICEF study describes malnutrition as “a major threat to the survival and development of Ethiopian girls, boys and women”. According to the latest Demographic and Health Survey (DHS) data, 29% of Ethiopian children are underweight and 9% are severely underweight. The same data indicate

that nearly 45% are stunted and 10% are wasted. These figures are among the highest in the world and are severe even by African standards. Micronutrient deficiencies among children are also widespread: 44% of children age 6–59 months are anaemic, with 3% suffering severe anaemia. In 2009, the World Health Organization found Ethiopia's progress towards Million Development Goal (MDG ) to be "insufficient" and off track. Given that over half the deaths of children under five are the result of malnutrition, these trends are worrisome [ Getahun and Arthurin 2011]

The principal aim of the nutritional assessment of a community is to map out the magnitude and geographical distribution of malnutrition as a public health problem, to discover and analyze the ecological factors that are directly or indirectly responsible, and, where possible to suggest appropriate corrective measures, preferably capable of being applied with continuing community participation. The present study was therefore designed to understand the nutritional status and prevalence rate of malnutrition of children , one of the vulnerable groups of India (Nagpur ) and Ethiopia (Nekemte) .

## 2. Materials and Methods

The schools were selected from the Nagpur (India ) and Nekemte (Ethiopia). A total of 200 children were selected. Children between 4- 6 years of age were selected for the study, and was interviewed by using a structured questionnaire. Each group consisted of equal number of males and females. The selection of sample was done by purposive stratified random sampling method.

### 2.1. Survey Schedule

The schedule was used to collect the information on general profile, anthropometric status, dietary intake, biochemical assessment and clinical assessment.

### 2.2. Diet Survey

Food and nutrient intake of 200 children was recorded by using twenty four hours dietary recall method. It was used to assess the dietary intake for three consecutive days. Quantitative dietary assessment was done through actual weighing of food item. Cooked food consumed, was converted into their raw equivalents. The food intakes were compared with the balanced diets recommended by the ICMR (1981) and nutrient intakes were compared with the recommended dietary allowances for Indians (ICMR, 2010).

### 2.3. Anthropometric Measurements

Anthropometric measurements of weight and height of boys and girls were taken as per the IBP recommendation. The reading was taken to the nearest 0.1mm, and weighing machine was used to weigh of the boys and girls wearing minimum clothing and it was recorded to the nearest 0.5 kg. Body Mass Index (BMI) was subsequently computed by dividing the weight in kilograms by the square of height in metres (kg/m<sup>2</sup>). Mean weight, height and BMI were calculated for different age categories. The anthropometric nutritional status was assessed by 'BMI for age' and 'height for age' as per National Centre for Health Statistics (NCHS)/WHO standards. The heights and weights of each child were compared with National Center for Health Statistics (NCHS) reference data for age and sex of children. For analytical purpose, classifications of Waterlow's height for age and weight for height, Gomez's weight for age were used for children (aged 4 to 6 years) using NCHS reference data. Ht/Age and Wt/Ht were expressed as SD scores (z-scores) using the reference data of the National Centre for Health Statistics (NCHS) (Hamill et al., 1979). The cut-off points for mild, moderate and severe malnutrition for the z-scores of these indices were -1.1 to -2.0 SD, -2.1 to -3.0 SD, and -3.1 to -4.0 SD, respectively.

### 2.4. Clinical Survey

All the children were examined clinically by a medical epidemiologist for clinical signs of nutritional deficiencies and other morbidities.

### 2.5. Biochemical Investigation

The haemoglobin concentration was measured using Sahli's method. Children were classified into different grades of nutritional anaemia as per the WHO criteria.

### 2.6. Statistical Analysis

Statistical Analysis was done by using Statistical Package for Social Sciences (SPSS) software. Frequency distribution, percentages, means and standard deviation and 'Z' value were calculated for the parameters expressed numerically. All the data were evaluated statistically by two tail 't' test and was used to compare statistical significance between the different group. All the tests were considered significant at 5 % and 1 % level.

## 3. Results and Discussion

### 3.1. Food and Nutrient Intake

Rice and Wheat formed the staple grain in Nagpur. Enjera is a thin, pancake-like, sour, leavened bread, which can be made of red teff, maize and jowar and eaten along with shiro wat which was the staple grain formed in Nekemte. Food consumption pattern revealed that the daily mean intake of the food groups i.e. cereals, pulses, fats and oils, sugar and jaggery, milk and milk products, green leafy vegetables, other vegetables, roots and tubers and fruits, was found to be significantly lower than the recommended dietary intake. The diets were cereals based and very low frequency of consumption of green leafy vegetables, fruits

and Meat/ fish /Egg i.e (19.4 % ) , (22.5 % and 17.5 %) and (18.4 % and 15.3 %) in Nagpur and Nekemte respectively. It is important to note that the milk intake was negligible in Nekemte i.e. 4.25% only. Similar were the findings of Khosla and Singh who reported that the diets were cereals based and very low frequency of consumption of protective foods including green leafy vegetables and fruits in the diet of children. [ Table and figure 1. a and 1. b ]

Regarding the intake of the nutrients viz. energy, protein, calcium, iron, zinc, vitamic C, β – carotene, thiamine, riboflavin, niacin and folic acid was found to be significantly lower than the recommended dietary allowances, in Nagpur and Nekemte. The intakes of micronutrients such as β carotene, riboflavin and calcium were woefully inadequate in Nekemte, i.e. about 9.15% , 47.5 % and 51% of RDA. The intakes of micronutrients such as β carotene , zinc and iron were woefully inadequate in Nagpur i.e , about 9.15% , 47.5 % and 51% of RDA. The present findings corroborate with those of Mishra and Handa . The mean intakes per day as well as how much this varies from RDA are given in table 2 . [ Table and figure 2. a and 2. b ]

Food groups	RDI (gm)	Daily mean intake (g) for 4-6 years		% RDI	Z
		Nagpur	deficit %		
Cereals <sup>NS</sup>	210	148.6±37.30	-29.24	70.76	4.07
Pulses <sup>NS</sup>	45	21±9.58	-53.33	46.66	1.52
G L V <sup>NS</sup>	50	9.7±11.79	-80.60	19.4	1.67
Other Veg <sup>*</sup>	50	26.5±16.29	-47.00	53	1.20
Root & Tubers <sup>NS</sup>	100	46±9.25	-54.00	46	1.28
Fruits <sup>**</sup>	100	22.8±7.57	-77.20	22.8	1.18
Milk Products <sup>**</sup>	500	226±44.30	-54.80	45.2	3.75
Meat/ fish /Egg <sup>NS</sup>	50	9.2 ±11.29	-81.60	18.4	1.25
Fats & Oils <sup>**</sup>	25	17.1±2.49	-31.60	68.4	0.50
Sugar & Jaggery <sup>NS</sup>	30	20.4±1.37	-32.00	68	0.29

Table 1a: Average daily intake of food groups of 4-6 years children in Nagpur

Note (\*\* Significant at both levels ) ( NS =Insignificant )

( \* Significant at 5% level and In Significant at 1% level Value are mean ±SD. )

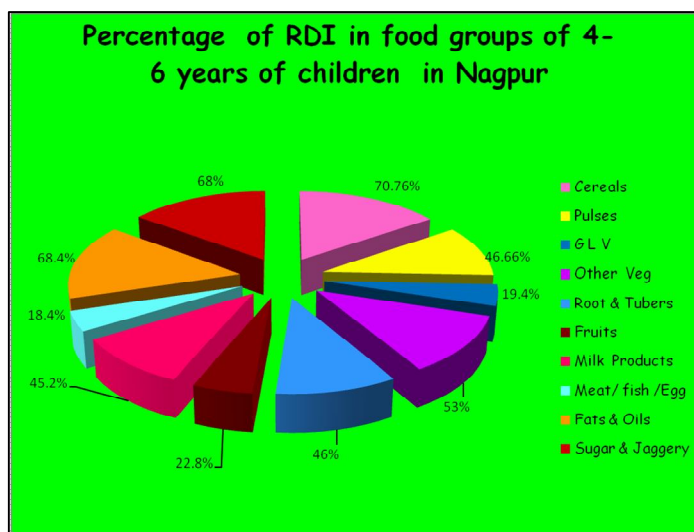


Figure 1a: Percentage of RDI of food groups of 4-6 years children in Nagpur

Food groups	RDI (g)	Daily mean intake (g)		% RDI	Z
		Nekemte	deficit %		
Cereals <sup>NS</sup>	210	147.8±28.81	-29.62	70.38	4.07
Pulses <sup>NS</sup>	45	21.2±10.76	-52.89	47.11	1.52
G L V <sup>NS</sup>	50	9.7±11.79	-80.60	19.4	1.67
Other Veg <sup>*</sup>	50	30.3±8.71	-39.40	60.6	1.20
Root & Tubers <sup>NS</sup>	100	46.1±9.05	-53.90	46.1	1.28
Fruits <sup>**</sup>	100	17.5±7.64	-82.50	17.5	1.18

		Nekemte	deficit %	Nekemte	value
Milk Products**	500	21.2±21.88	-95.76	4.24	3.75
Meat/ fish /Egg <sup>NS</sup>	50	7.65±11.51	-84.70	15.3	1.25
Fats & Oils**	25	16.1±3.51	-35.60	64.4	0.50
Sugar & Jaggery <sup>NS</sup>	30	20.8±2.33	-30.67	69.33	0.29

Table 1b: Average daily intake of food groups of 4-6 years children in Nekemte

Note (\*\* Significant at both levels ) ( NS =In significant )

( \* Significant at 5% level and Insignificant at 1% level.) Value are mean ±SD.

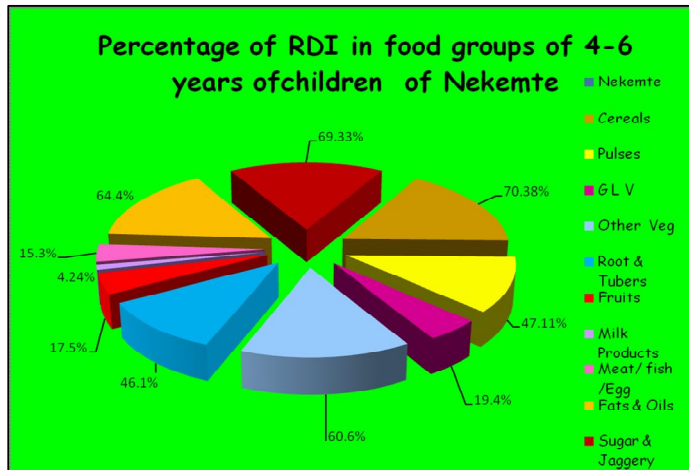


Figure 1b: Percentage of RDI of food groups of 4-6 years of children in Nekemte

Nutrients	Daily mean intake of nutrients of 4-6 years children				
	RDA	Nagpur	Excess or deficit %	% RDA	Z value
Energy <sup>NS</sup>	1350	1064.29±75.48	-26.85	78.83	7.09
Range		1222.9-1117.3=105.6			
Protein <sup>NS</sup>	20.1	18.45±3.13	-8.94	91.79	0.44
Range		18.93-13.99=4.94			
Calcium**	600	423.08±116.34	-41.82	70.51	21.55
Range		549.45-542.35=7.1			
Iron**	13	8.06±3.79	-61.29	62.00	0.11
Range		10.33-7.77=2.56			
Zinc**	7	3.96±0.59	-76.77	56.57	0.61
Range		5.08-2.81=2.27			
Vitamin C**	40	35.15±20.59	-13.80	87.87	1.14
Range		35.6-21.55=14.05			
β carotene**	3200	292.91±50.85	-992.49	9.15	9.02
Range		275.7-136.3=139.4			
Thiamine**	0.7	0.5±0.12	-40.00	71.42	0.48
Range		0.57-0.05=0.52			
	RDA	Nagpur	Excess or deficit %	% RDA	Z value
Riboflavin**	0.8	0.54±0.12	-48.15	67.5	0.41
Range		0.61 -0.40=0.21			
Niacin**	11	6.34±0.81	-73.50	57.63	0.11
Range		9.35-7.87=1.47			
Folic acid**	100	67.95±4.15	-47.17	67.95	0.56
Range		94.51-84.38=10.13			

Table 2a: Average daily intake of nutrients of 4-6 years children in Nagpur

Note(\*\* Significant at both levels )( NS =Insignificant )

(\* Signifiacnt at 5% level and In Significant at 1% level.)

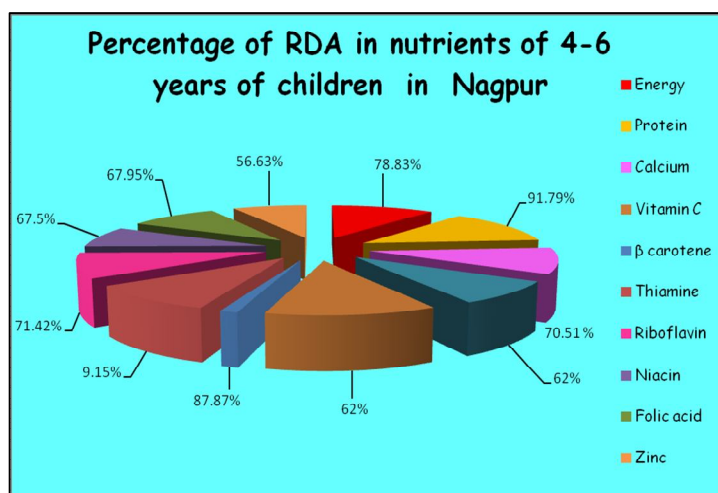


Figure 2a: Percentage of RDA in nutrients of 4-6 years of children in Nagpur

Nutrients	Daily mean intake of nutrients (g) for 4-6 years children				
	RDA	Nekemte	Excess or deficit %	% RDA	Z value
Energy <sup>NS</sup>	1350	1045.47± 50.14	-29.13	77.44	7.09
Range		1243.95-1140.96=102.99			
Protein <sup>NS</sup>	20.1	17.53±3.06	-14.66	87.21	0.44
Range		18.38-14.03=4.35			
Calcium <sup>**</sup>	600	306.10±149.08	-96.01	51.00	21.55
Range		482.75-177.97=304.78			
Iron <sup>**</sup>	13	10.00±1.53	-30.00	76.92	0.11
Range		11.83-7.38=4.45			
Zinc <sup>**</sup>	7	4.86±0.71	-44.03	69.42	0.61
Range		5.75-5.66=0.09			
Vitamin C <sup>**</sup>	40	32.29±7.88	-23.88	80.72	1.14
Range		39.85-26=13.85			
β carotene <sup>**</sup>	3200	307.73 ±64.05	-939.87	9.61	9.02
Range		395.7-236.3=159.4			
Thiamine <sup>**</sup>	0.7	0.44±0.06	-59.09	62.85	0.48
Range		0.48-0.32=0.16			
Riboflavin <sup>**</sup>	0.8	0.38±0.16	-110.53	47.5	0.41
Range		0.42-0.10=0.32			
Niacin <sup>**</sup>	11	5.12 ±0.51	-114.84	46.54	0.11
Range		8.655-7.625=1.03			
Folic acid <sup>**</sup>	100	58.42±3.86	-71.17	58.42	0.56
Range		84.51-74.38=10.13			

Table 2b: Average daily intake of nutrients of 4-6 years children in Nekemte

Note(\*\* Significant at both levels ) ( NS =Insignificant )  
 (\* Signifiacnt at 5% level and In Significant at 1% level.)

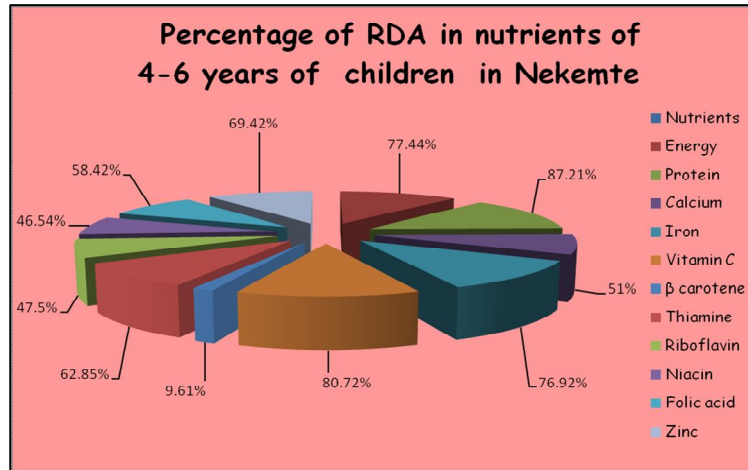


Figure 2b: Percentage of RDA in nutrients of 4-6 years of children in Nekemte

3.2. Anthropometric Measurements

3.2.1. Weight measurements of children with NCHS standards

The mean weight of younger children (4 - 6 years) was significantly lower than the NCHS standard value. The mean weight of older boys and girls (5 years) was lower up to [63.30 and 69.59 percent] and [68.23 and 73.92 percent] than NCHS standard in Nagpur and Nekemte. The mean weight of older boys and girls (6 years) was lower up to [66.22 and 66.36 percent] and [67.62 and 67.28 percent] than NCHS standard in Nagpur and Nekemte. [Table 3]

Place	Age in years	Sex	Mean Weight measurements of children			
			Number	Weight (Kg)	NCHS	Percentage
Nagpur	5+	M	21	12.47 ± 1.32	19.7	63.30
		F	21	12.69 ± 1.31	18.6	68.23
	6+	M	29	14.37 ± 1.11	21.7	66.22
		F	29	13.93 ± 1.43	20.6	67.62
Nekemte	5+	M	28	13.71 ± 1.15	19.7	69.59
		F	28	13.75±1.07	18.6	73.92
	6+	M	22	14.40 ± 1.09	21.7	66.36
		F	22	13.86±1.08	20.6	67.28

Table 3: Weight measurements of children with NCHS standards  
Height measurements of children with NCHS standards

Mean height of 5 years of male was 106.80 cm and 106.60 cm, which was 94.43 and 94.25 per cent of the reference value in Nagpur and Nekemte. In females of the same age group, mean height was 98.14 and 99.39 cm, which was also lower than the reference value, i.e. 87.94 and 89.06 per cent of the reference value in Nagpur and Nekemte. Mean height of 6 years of male was 105.48 cm and 105.13 cm, which was 88.64 and 88.34 per cent of the reference value in Nagpur and Nekemete. In females of the same age group, mean height was 103.55 and 103.63 cm, which was also lower than the reference value, i.e. 88.05 and 88.12 per cent of the reference value in Nagpur and Nekemte.

Place	Age in years	Sex	Mean Height measurements of children			
			N	Height (cm)	NCHS Stds	Percentage
Nagpur	5+	M	21	106.80 ± 3.23	113.1	94.43
		F	21	98.14 ± 5.08	111.6	87.94
	6+	M	29	105.48 ± 3.80	119.0	88.64
		F	29	103.55 ± 4.78	117.6	88.05
Nekemte	5+	M	28	106.60 ± 53	113.1	94.25
		F	28	99.39±5.59	111.6	89.06
	6+	M	22	105.13 ± 3.66	119.0	88.34
		F	22	103.63±4.39	117.6	88.12

Table 4: Height measurements of children with NCHS standards

**4. Prevalence pf Malnutrition**

*4.1. Gomez classification (weight for age)*

It exhibits the nutritional status classified according to Gomez (weight for age). Wt/Age classification of Gomez et al. (1956) of the children showed some degree of malnutrition. In the age group of 4-6 years, 12 % of the children suffered from mild malnourished, 59% of the children suffered from moderate malnourished, 29 % of the children suffered from severe malnourished in Nagpur. In the age group of 4-6 years, 9 % of the children suffered from mild malnourished, 49% of the children suffered from moderate malnourished, 42 % of the children suffered from severe malnourished in Nekemte. [Table 5]

Weight for Age	Age (years)	Percentage distribution of children by Gomex classification					
		Sex	No	Normal	Grade I: mild malnutrition	Grade II: moderate malnutrition	Grade III: severe malnutrition
<b>Nagpur</b>				>90	75-89	60-74	60-50
4-6years	5+	M	21		2( 09.52 )	6( 28.57 )	13( 61.90 )
	5+	F	21		6( 28.57 )	11( 52.38 )	4( 19.05 )
	6+	M	29		00	23( 79.31 )	6(20.69 )
	6+	F	29		4( 13.79 )	19( 65.52)	6( 20.69 )
	Total				12	59	29
<b>Nekemte</b>							
4-6years	5+	M	28		2( 07.14 )	10( 35.71 )	16( 57.14 )
	5+	F	28		3( 10.71 )	11( 39.29 )	14(50.00 )
	6+	M	22		00	16(72.73 )	6( 27.27 )
	6+	F	22		4(18.18 )	12( 54.55 )	6(27.27 )
	Total				9	49	42

Table 5: Prevalence of malnutrition by sex in Nagpur and Nekemte children by Gomex classification weight for age

Note : Figures in parenthesis indicate percentages

*4.2. Wasting (weight for height) Waterlow classification*

It exhibits the nutritional status according to Waterlow classification, weight for height (wasting). In the age group of 4-6 years, 26% of the children suffered from moderate wasting, 74 % of the children suffered from severe wasting in Nagpur. In the age group of 4-6 years, 21% of the children suffered from moderate wasting, 79 % of the children suffered from severe wasting in Nekemte . [Table 6]

Weight for height (wasting)	Age (years)	Percentage distribution of children by Waterlow classification					
		Sex	No	Normal	Grade I: mild malnutrition	Grade II: moderate malnutrition	Grade III: severe malnutrition
<b>Nagpur</b>				>90	80-90	70-80	<70
4-6years	5+	M	21			3(14.28)	18(85.71)
	5+	F	21			9(42.85)	12(57.14)
	6+	M	29			02(6.89)	27(93.10)
	6+	F	29			12(41.37)	17(58.62)
	Total					26	74
<b>Nekemte</b>							
4-6years	5+	M	28			5(17.85)	23(82.14)
	5+	F	28			9(32.14)	19(67.85)
	6+	M	22			1(4.54)	21(95.45)
	6+	F	22			6(27.27)	16(72.72)
	Total					21	79

Table 6: Prevalence of malnutrition by sex in Nagpur and Nekemte children by

Waterlow classification weight for height (wasting)

Note: Figures in parenthesis indicate percentages

*4.3. Stunting (height for age) Waterlow classification*

In the age group of 4-6 years 6 % of the children were normal, 24 % of the children suffered were mild stunting, 42% of the children suffered from moderate stunting, 28 % of the children suffered from severe stunting in Nagpur . In the age group of 4-6 years 8 % of the children were normal, 32 % of the children suffered were mild stunting, 33% of the children suffered from moderate stunting, 27 % of the children suffered from severe stunting in Nekemte. [Table 7 ]

Stunting Height for age	Age (years)	Percentage distribution of children by Waterlow classification					
		Sex	No	Normal	Grade I: mild malnutrition	Grade II: moderate malnutrition	Grade III: severe malnutrition
<b>Nagpur</b>				>95	90-95	85-90	<85
4-6years	5+	M	21	3 ( 14.29 )	7 (33.33 )	11 ( 52.38 )	00.00
	5+	F	21	2( 9.52 )	4( 19.05)	5( 23.81 )	10 ( 47.62 )
	6+	M	29	00.00	9( 31.03 )	11( 37.93)	9 (31.03 )
	6+	F	29	1( 3.45 )	4( 13.79 )	15( 51.72 )	9( 31.03 )
	Total			06	24	42	28
<b>Nekemte</b>							
4-6years	5+	M	28	4(14.29 )	13( 46.43 )	9( 32.14 )	2 ( 7.14 )
	5+	F	28	3(10.71 )	5( 17.86 )	8( 28.57 )	12 ( 42.86 )
	6+	M	22	1( 4.55 )	6(27.27 )	9(40.91 )	6 (27.27 )
	6+	F	22	00.00	8( 36.36 )	7( 31.82 )	7 ( 31.82 )
	Total			08	32	33	27

Table 7: Prevalence percentage of malnutrition by sex in Nagpur and Nekemte children by Waterlow classification stunting (height for age)  
 Note : Figures in parenthesis indicate percentages

4.4. Body Mass Index [BMI-for-Age (WHO 2007)]

The nutritional status according to BMI-for-Age (WHO 2007). It exhibits that in the age group of 4-6 years in Nagpur, 33% of the children were normal and had z scores between  $\geq 1$  to  $< 1$ SD, 25% of the children were mild impaired had z scores between  $\geq 2$  to  $< 1$  SD, 19 % of the children were moderate impaired had z scores between  $\geq 3$  to  $< - 2$  SD, 29% of the children were severe impaired had z scores between  $< - 3$  SD. In Nekemte, 24% of the children were normal and had z scores between  $\geq 1$  to  $< 1$ SD, 25% of the children were mild impaired had z scores between  $\geq 2$  to  $< 1$  SD, 24 % of the children were moderate impaired had z scores between  $\geq 3$  to  $< - 2$  SD, 27% of the children were severe impaired had z scores between  $< - 3$  SD. [Table 8]

BMI	Age (years)	Percentage distribution of children for BMI classification (WHO 2007)					
		Sex	No	Normal	Grade I: mild malnutrition	Grade II: moderate malnutrition	Grade III: severe malnutrition
<b>Nagpur</b>				$\geq 1$ to $< 1$ SD	$\geq 2$ to $< 1$ SD	$\geq 3$ to $< - 2$ SD	$< - 3$ SD
4-6years	5+	M	21	5(23.81)	1(4.76)	2( 9.52 )	13( 61.90 )
	5+	F	21	9(42.86)	5( 23.81 )	1( 4.76 )	6( 28.57 )
	6+	M	29	7(24.14)	7( 24.14 )	11( 37.93 )	4( 13.79)
	6+	F	29	6(20.69)	12(41.83 )	5( 17.24 )	6(20.69 )
	Total			33	25	19	29
<b>Nekemte</b>							
4-6years	5+	M	28	3( 10.71 )	4( 14.29 )	8(28.57 )	13( 46.43)
	5+	F	28	9( 32.14 )	9(32.14 )	6( 21.43 )	4( 14.29 )
	6+	M	22	6( 27.27 )	4( 18.18 )	7( 31.82 )	5( 22.73 )
	6+	F	22	6( 27.27 )	8(36.36 )	3( 13.64 )	5(22.73 )
	Total			24	25	24	27

Table 8: Prevalence percentage of malnutrition by sex in Nagpur and Nekemte children by BMI-for-Age Table (WHO 2007)  
 Note : Figures in parenthesis indicate percentages

4.5. Prevalence of anemia among children in Nagpur and Nekemte

It exhibits the prevalence rate of anemia among children in Nagpur and Nekemte . Anaemia prevalence rate 75 per cent was observed among the children of Nagpur .25 % of children were normal, 54 %, of children were mild anaemia and 21% of children were moderate anaemia. 60 per cent of anaemia prevalence rate was observed among the children of Nekemte. 40 % of children were normal, 36 % of children were mild anaemia and 24% of children were moderate anaemia in Nekemte . [Table 9 ]



S.No.	Age group	Sex	Prevalence of anemia among children		
			Normal	Mild	Moderate
	<b>Nagpur</b>		11.5or more	10-11.49g/dl	7-9.99g/dl
I	4-6 years	Male	11	29	10
		Female	14	25	11
		Total	25	54	21
	<b>Nekemte</b>				
II	4-6 years	Male	21	18	11
		Female	19	18	13
		Total	40	36	24

Table 9: Prevalence of anemia among children in Nagpur and Nekemte

4.6. Clinical Examination

4.6.1. Morbidity Distribution Of Children

The morbidity suffered by the Nagpur children is reflected in table 10. 9 % of children had cough, 21% of children had running nose,18% of children had calcium deficiency,23% had dental caries, 19% of children had fever,3 % of children had diahorrea,5% of children had tonsils and 4% of children had stomach pain in Nagpur city.

The morbidity suffered by the Nekemte children.19 % of children had cough, 41% had running nose,19 % of children had calcium deficiency,20% of children had dental caries, 20% of children had skin infection,14% of children had intestinal parasites, (Ascaris lumbricoides) 10% of children had fever, 16% of children had diahorrea,20% of children had tonsils and 8 % of children had stomach pain in Nekemte. [Table 10]

S.No	Place	Morbidity	Morbidity pattern of children			
			Age group	4-6 years		Percentage
				M	F	
I	Nagpur	Cough	04	05	9	
		Running nose	11	10	21	
		Calcium Deficiency	11	07	18	
		Dental	15	08	23	
		Skim Infection	00	00	0	
		Intestinal Parasites	00	00	0	
		Fever	12	07	19	
		Diahorrea	01	02	3	
		Tonsil	02	03	5	
		Stomach pain	02	02	4	
II	Nekemte	Cough	12	07	19	
		Running nose	20	21	41	
		Calcium Deficiency	11	08	19	
		Dental	9	11	20	
		Skim Infection	11	09	20	
		Intestinal Parasites	06	08	14	
		Fever	06	04	10	
		Diahorrea	08	08	16	
		Tonsil	08	12	20	
		Stomach pain	05	03	8	

Table 10: Morbidity distribution pattern of children of Nagpur and Nekemte

5. Conclusion

The extent of malnutrition expressed by the above indices is predictive of the future risk situations such as the disease or morbid condition, poor health and poor nutritional conditions at the population level. Malnutrition may also be associated with factors such as morbidity, maternal employment patterns, child care-giving arrangements and education level etc. Hence it may be concluded that the consumption of foods was inadequate and nutrients were found to be limiting in the diets of children. So there is an urgent need to educate mothers of children about the importance of balanced diet and promote the consumption of foods like cereals, pulses, green leafy vegetables, roots and tubers, sugar and jaggery, fats and oil, milk and milk products, fruits etc. in the

children's diet to improve their nutritional status so that children contribute in the well-being of the nation as children are the future of the nation's prosperity.

## 6. References

1. Alam Md Ariful , M. A. Hakim , M. A. Rouf , Md Obidul Haque , M. E. Ali and S. M. Zaidu Nutritional status of urban slum children below five years. Department of Food Technology, Thakurgaon Polytechnic Institute, Bangladesh. *Journal of health sciences* Vol 9 pg 23-32 2010.
2. Balgir R. S, Health Scenario of Major Tribals of Northern Orissa in Relation to Human Growth, Development and Nutrition and the Role of Genetic Factors in Smell and Tasting Abilities in Children. *Journal Health Allied Science*. 2010;9(4):2 pg 7-15.
3. Beka Teshome, Wambui Kogi-Makau, Zewditu Getahun, Girum Taye Magnitude and determinants of stunting in children under five years of age in food surplus region of Ethiopia: The case of West Gojam Zone [Ethiop. J. Health Dev. 2009;23(2):98-106
4. Dagnew Tadesse Report of WHO, UNICEF Rapid assessment of drinking water quality in the federal democratic Republic of Ethiopia. 2010 pg 1-86.
5. Ejaz Muzamil Shabana , Imran Rasheed Ahmed Huma Zehra Clinical Pattern Of Infections In Malnourished Children Vol. 16, No. 3 July - September 2010 352- 356
6. Espié Emmanuelle , Carme Roure Pujol, Maria Masferrer Jean-François Saint-Sauveur, Pedro Pablo Palma Urrutia Rebecca F. Grais Acute Malnutrition and Under-5 Mortality, Northeastern Part of India. *Journal Tropical Pediatric* (2010) pg 93-112.
7. Ethiopian Health and Nutrition Research Institute (EHNRI), Addis Ababa, Ethiopia . Action Against Hunger, ACF-USA, Republic of South Sudan. *Ethiopian Journal Health Development* 2008;9(12):25-32.
8. Getahun and Arthurin Nutritional assessment of Ethiopian Beta-Israel children *Ethiopian Journal Health Development* 2011(16):28-37.
9. Ghosh S and Shah D Nutritional problems in urban slum children. *Indian Pediatr.* 2004 Jul;41(7):682-96... Source Department of Pediatrics, University College of Medical Sciences and GTB Hospital, Dilshad Garden, Delhi 110 095, India.
10. Girmay Child Malnutrition in Ethiopia: Can Maternal Knowledge Augment The Role of Income ? *Africa Region Paper series No 22 2001*, pg 34-45.
11. Joseph Bobby, Aaron Rebello, Poonam Kullu, and Vimal D. Raj Prevalence of Malnutrition in Rural Karnataka, South India: A Comparison of Anthropometric Indicators *Journal Health Population Nutrition* 2002 Sep;20(3):239-244 2002 ICDDR.
12. Joshi HS, Gupta R, Joshi MC, Mahajan Vipul, Determinants of Nutritional Status of School Children - A Cross Sectional Study in the Western Region of Nepal. *Journal of health Science* 2010, Vol 6, 122 -133.
13. Luxmi Yumnam, Sachdeva Mohinder Pal and Prevalence of malnutrition among the Chiru children of Manipur, India Volume: 9 Issue: 2 Year: 2012
14. Mekonnen Tackling Malnutrition in Ethiopia Young lives working paper no19 Young lives 2010 pg 1 to 55
15. Sati and Dahiyai Nutritional Assessment of Rural School-Going Children (7-9 Years) of Hisar District, Haryana. 2012 India *Indian Pediatrics* ;47