

Prevalence of Malnutrition in Rural Kerala: Evidence from Thrissur and Ernakulam

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ABSTRACT

Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients (WHO). This is very much evident that maternal, infant, and child nutrition play significant roles in the appropriate growth and development. The rates of malnutrition among adolescent girls, pregnant and lactating women, and children are alarmingly high in India according to the reports of National Health and Family Survey, United Nations International Children's Emergency Fund, and WHO. This paper has discussed evidences based on two research studies conducted in rural geographies of Thrissur and Ernakulam, districts located in central part of Kerala, assessing nutritional status, dietary habits among the children in the age group of 1 to 5 years through WHO standards- height for age (HAZ), weight for age (WAZ) and weight for length/height (WHZ). These findings highlighted the prevalence of malnutrition through comparing Z score with the standard norms given by the WHO. An average of 66% of children are falling under normal standards, while 34% had malnutrition. Undernutrition in the form of underweight and stunting is more prevalent in the rural areas. The percentage calculation from WAZ for moderate ($\leq 2SD$) and severe ($\leq 3SD$) underweight in different age groups, total male, female and for the whole sample shows that 1% children have HAM (Hospital Acquired Malnutrition).

Key Words : HAM (Hospital Acquired Malnutrition), Height for Age (HAZ), Weight for Age (WAZ) and Weight for Height (WHZ)

INTRODUCTION

Nutrition is one of the foundations of human society and it is the indicator that related to nutritional status reflects in the development of the country. Preschool years are the most vulnerable period, during this period children have to get adequate nutrition for their proper growth and development. Nutrition plays a crucial role in ensuring the child's survival and healthy growth to full potential in early childhood and helps to have a productive adulthood. Nutrition imbalance can have both short and long-term effects on children and it is reflected by growth failure, poor cognitive development, frequent illnesses, poor school achievements etc. (United Nations Children's Fund, 2019). Malnutrition, which comprises both undernutrition and overnutrition, is one of the major health

challenges among children particularly in low- and middle-income countries (World Health Organization [WHO], 2020). Almost half of all deaths in under-five children are linked to undernutrition (United Nations Children's Fund [UNICEF], 2020). Globally, in 2020, 149.2 million children under the age of 5 years of age were stunted, 45.4 million wasted, and 38.9 million children were overweight. India is home to the largest number of undernourished children in the world (UNICEF, 2020). Prevalence of under-weight children in India is highest in the world, and it is almost double that of Sub-Saharan Africa (Sahu *et al.*, 2015 and Sundari *et al.*, 2017). In India as per the NFHS-5, 35.5% of children below five years were stunted and 32.1 per cent were underweight in 2019-21. Among the stunted children, 37.3% are in the rural areas and 30.1% in urban areas. According to

How to cite this Article: Jyothi H., Gupta, Garima, Mohanan, Aswathy and Pillai, Keerthi H. (2023). Prevalence of Malnutrition in Rural Kerala: Evidence from Thrissur and Ernakulam. *Internat. J. Appl. Home Sci.*, **10** (7 & 8) : 196-202.

the National Family Health Survey (NFHS – 4) Kerala has a high severity of underweight and a very high severity of wasting among children below 5 years.

Objectives :

– To assess the prevalence of malnutrition among the selected age group by using anthropometric measurements, nutritional assessment through WHO standards

METHODOLOGY

This research paper deals with the two survey based studies entitled ‘A study on nutritional status of preschool children in rural areas of Thrissur district (1-5 yrs)’ and ‘Nutritional Status of Pre-school Children 1-5 years in Rural Areas of Ernakulam’. Total Sample size was 100 preschool children of age group 1-5 years from Ernakulam district and Thrissur district. A well-structured questionnaire was framed to collect the data regarding the socio – economic status of the family, anthropometric measurement, personal characteristics and dietary surveys to collect details about the dietary habits, mainly food habits, and food frequency of use of different food groups. The collected data were subjected to statistical analysis by using appropriate statistical tools. Evaluation of malnutrition by calculating the Z- score for height for age (HAZ), weight for age (WAZ) and weight for length/ height (WHZ). For the assessment of prevalence of malnutrition the obtained Z score was compared with the standard norms given by the WHO.

RESULTS AND DISCUSSION

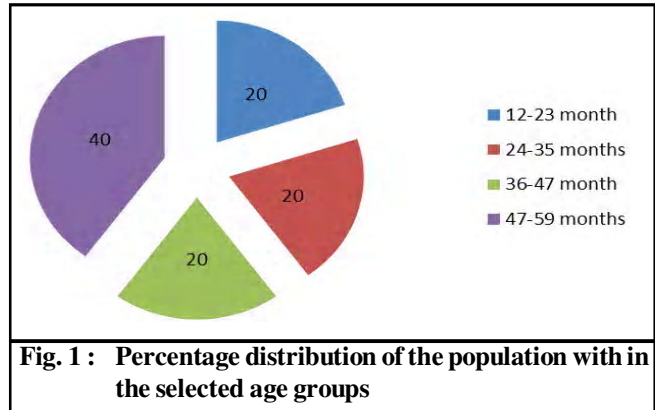
Socio-economic status of the samples:

Details of the socio-economic status of the samples which comprised age in months, gender, and order of birth, types of family, education levels and occupation of parents, monthly income, and source of water supply were collected and are given in the following tables.

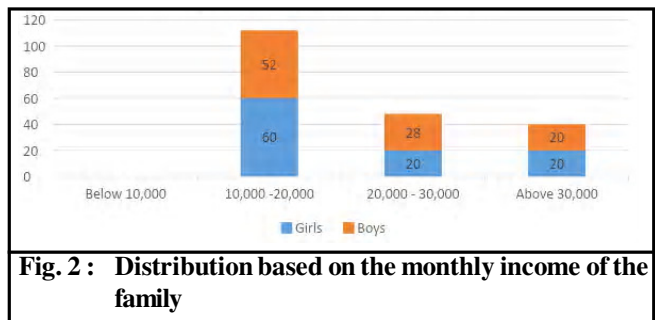
Fig. 1 shows the percentage of distribution of samples based on their age groups. Among the 100 samples, 20 % of the children belong to the age group of 12-23 months, 20 % belong to 24-35 months, where remaining samples belong to the age group 36 -47 months and 48- 49 months were also 20% and 40%, respectively.

Socio -economic status of the family :

Economic status of the samples were analyzed by

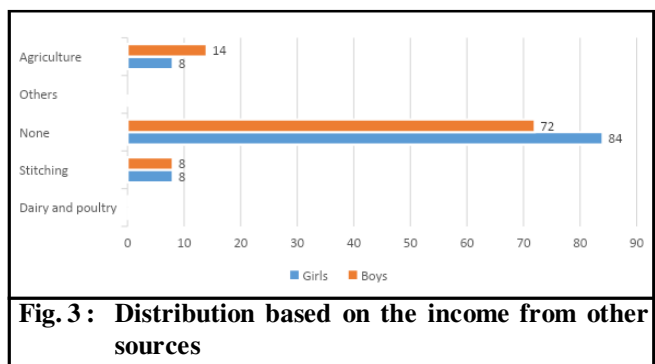


using the data like monthly income and income from the other sources. The details are presented in the following Fig. 2.



Regarding the family income of parents of girls, the majority of them (60%) had a monthly income between Rs. 10000 – Rs. 20000. Both 20% falls in the category of Rs. 20000 – Rs. 30000 and above Rs. 30000, respectively. Among boys the majority falls in the category of Rs. 10000 – Rs. 20000 as girls, then follows Rs. 20000 – Rs. 30000.

From the Fig. 3 most of the respondents do not have any other means of income. As represented above 84% for girls and 72% for boys do not have any other income. 14% of girls and 8% girls get income from agriculture. Both girls and boys get 8% income from stitching.



Dietary assessment :

Dietary assessment follows the details regarding food habits, number of meals, frequency of eating out, meal skipping pattern, common dietary patterns of the children, consumption pattern of food item, and preference of eating of the children.

The Table 1 indicates frequency score percentage distribution of families and it shows that about 65% of the samples eat cereals daily. 45% of them consume pulses twice a week, 55% of them consume nuts, 45% consume fruits and 35% consume green leafy once a week. Fresh foods were used by 25% both daily and once a week. Majority of them use milk and milk products daily (45%). About 35% of the families use sugar and jaggery occasionally.

Prediction of prevalence of malnutrition and data analysis:

Many reports based on malnutrition in India underlines that malnutrition is a major curse across the country. According to the National Family Health Survey (NFHS-4, 2015-2016), 35.7% of children under the age of five years are underweight; 38.4% are stunted and 21% are wasted. At the same time 7.5% are severely wasted. An overview of data from Rapid Survey On

Children (RSOC-2014) in India, 38.7% of children under five years old are stunted, 19.8% are wasted and 42.5% are underweight. According to the data from NFHS -4 the prevalence of underweight in the State of Kerala is 22.9% and is comparatively less than the other States (Bihar around 60%, Madhya Pradesh 60%, Jharkhand 56%). The study strictly aims at the prevalence analysis based on the Z scores. Thus the prevalence of underweight, stunting and wasting in reference with WHO and IAP (Indian Association of Pediatrician) standards are evaluated. The sample contains selected children randomly from rural areas of Thrissur district and Ernakulam district with a sample size of 100. There were 50 male and 50 female children between the age 12 – 60 months.

The prevalence of malnutrition based on HAZ scores of WHO standard recorded for the sample was shown in Table 2. Around 6% of the population suffers severe malnutrition while 11% had moderate malnutrition. Within the age groups 12-23, 24-35, 36-47 and 49-60 months were separately 10%, 30%, 15% and 0% of moderate malnutrition with respect to their HAZ scores. 8% of male children and 4% of females come under severe malnutrition category, from the analysed sample.

According to Table 3, 20% of female children from

Table 1 : Food use frequency score of families								
Food groups	Daily	Thrice/ week	Twice/ week	Once/ week	Fort nightly	Monthly	Occasionally	Never
Cereals	13 (65%)	6 (30%)	1 (5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Pulses	4 (20%)	4 (20%)	9 (45%)	3 (15%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Nuts and oilseeds	1 (5%)	1 (5%)	3 (15%)	11 (55%)	0 (0%)	3 (15%)	1 (5%)	0 (0%)
Fruits	2 (10%)	1 (5%)	5 (25%)	9 (45%)	0 (0%)	3 (15%)	0 (0%)	0 (0%)
GLV	0 (0%)	1 (5%)	1 (5%)	7 (35%)	1 (5%)	6 (30%)	3 (15%)	1 (5%)
Other vegetables	6 (30%)	7 (35%)	5 (25%)	1 (5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Roots and tubers	1 (5%)	1 (5%)	2 (10%)	7 (35%)	0 (0%)	1 (5%)	7 (35%)	1 (5%)
Fats and oils	5 (25%)	1 (5%)	1 (5%)	4 (20%)	0 (0%)	4 (20%)	5 (25%)	0 (0%)
Sugar and jaggery	3 (15%)	1 (5%)	1 (5%)	4 (20%)	0 (0%)	3 (15%)	7 (35%)	1 (5%)
Milk and milk products	9 (45%)	2 (10%)	2 (10%)	6 (30%)	0 (0%)	0 (0%)	1 (5%)	0 (0%)
Flesh food	5 (25%)	0 (0%)	1 (5%)	5 (25%)	0 (0%)	7 (35%)	2 (10%)	0 (0%)

Table 2 : Distribution based on the nutritional status for height for age (HAZ)

Nutritional status table (Prevalence of Malnutrition)					
Height – for- age					
Age group	Weighted Number	-3SD n, (%)	-2SD n, (%)	Z- Score mean	Z-Score SD
12-23 months	20	1, (5.0%)	2, (10.0 %)	-0.6	1.42
24- 35 months	20	3, (15.0 %)	6, (30.0 %)	-1.6	1.23
36- 47 months	20	2, (10.0 %)	3, (15.0 %)	-0.8	1.69
48-59 months	40	0, (0.0 %)	0, (0.0 %)	0.2	1.04
Sex: Female	50	2, (4.0 %)	4, (8.0 %)	0.6	1.37
Sex: Male	50	4, (8.0 %)	7, (14.0 %)	-0.5	1.53
All	100	6, (6.0 %)	11, (11.0 %)	-0.5	1.44

age groups 12- 23 and 24- 35 had HAZ ≤ 2SD and 10% in each of the above groups with HAZ ≤ 3SD. But in the age groups of 36-47 and 48-59 for females had no prevalence of malnutrition characterized on HAZ. No male children from age groups 12-23 and 48-59 significance of malnutrition based on HAZ. But within the groups 24-35 and 36-47; 40% and 30% respectively had HAZ ≤ 2SD, 20% had HAZ ≤ 3SD in each of the same groups.

Table 4 shows the prevalence estimate based on WAZ (weight for age z score). 1% and 8% of the considered sample had this score lesser than – 3SD and

– 2SD, respectively. Within the age groups 12-23; 24-35;36-47; 48-59 the WAZ score, less than – 2SD are 8%, 15%, 20%, 0% and 2.5%, respectively. 6% of the females and 10% of male had WAZ ≤ 2SD.

From Table 5, it is noticeable that no females from age groups 12-23, 36-47, 48-59 had significant malnutrition because they lie in the normal category. Within the female age group 24-35, the WAZ score lesser than – 2SD is 30%. In male category; within the age group of 12-23 there were 30% and in the next group 24-35 had 10% of children with WAZ lesser than – 2SD.

Table 6 depicts the prevalence of malnutrition with

Table 3 : Prevalence of malnutrition based HAZ through gender and age groups

Age Group	Weighted N	≤ 3SD	≤ 2SD	Z-Score mean	Z-Score SD
		n, %	n, %		
12-23 month. Female	10	1, 10 %	2, 20 %	-1.6	0.82
24-35 month. Female	10	1, 10 %	2, 20 %	-1.6	0.97
36-47 month. Female	10	0, 0 %	0, 0 %	-0.3	1.51
48-59 month. Female	20	0, 0 %	0, 0 %	0.2	1.08
12-23 month. Male	10	0, 0 %	0, 0 %	0.3	1.28
24-35 month. Male	10	2, 20 %	4, 40 %	-1.6	1.51
36-47 month. Male	10	2, 20 %	3, 30 %	-1.3	1.81
48-59 month. Male	20	0, 0 %	0, 0 %	0.1	1.01

Table 4 : Distribution of nutritional status of sample based on weight for age (WAZ)

Nutritional status table (Prevalence of Malnutrition)					
Weight – for- age					
Age group	Weighted Number	-3SD n, (%)	-2SD n, (%)	Z- Score mean	Z-Score SD
12-23 months	20	1,5%	3,15%	-0.9	1.06
24- 35 months	20	0, 0%	4, 20%	-0.9	1.05
36- 47 months	20	0, 0%	0, 0%	-0.5	0.84
48-59 months	40	0, 0%	1, 2.5%	-0.3	1.02
Sex: Female	50	0, 0%	3, 6%	-0.5	0.97
Sex: Male	50	1, 2%	5, 10%	-0.6	1.09
All	100	1, 1%	8, 8%	-0.5	1.03

Table 5 : Prevalence of malnutrition based WAZ through gender and age groups

Age Group	Weighted n	≤ 3SD		≤ 2SD		Z-Score mean	Z-Score SD
		n, %	n, %	n, %	n, %		
12-23 month. Female	10	0, 0%	0, 0%	0, 0%	0, 0%	-0.6	0.62
24-35 month. Female	10	0, 0%	0, 0%	3, 30%	3, 30%	-1.3	0.92
36-47 month. Female	10	0, 0%	0, 0%	0, 0%	0, 0%	-0.1	0.99
48-59 month. Female	20	0, 0%	0, 0%	0, 0%	0, 0%	-0.3	0.96
12-23 month. Male	10	1, 10%	1, 10%	3, 30%	3, 30%	-1.2	1.33
24-35 month. Male	10	0, 0%	0, 0%	1, 10%	1, 10%	-0.4	1.03
36-47 month. Male	10	0, 0%	0, 0%	0, 0%	0, 0%	-0.8	0.52
48-59 month. Male	20	0, 0%	0, 0%	1, 5%	1, 5%	-0.2	1.09

respect to the weight for height Z scores (WHZ). From the whole sample 5% of children had WHZ ≤ 3SD indicates severe wasting. 18% of them had WHZ ≤ 2SD suffering moderate wasting. 4% female and 6% male were suffering severe wasting.

Table 7 gives the percentage of wasting in different age groups separately for male and female categories. 50% of males in the age group 12-23, 10% from both the gender in the group 24-35 months, 20% males in 36-47 months and 35% females and 10% males in the group 48-59 months had WAZ less than - 2SD.

Fig. 4 is the distribution of various Z scores (HAZ, WAZ, WHZ) of the sample compared with the Who's

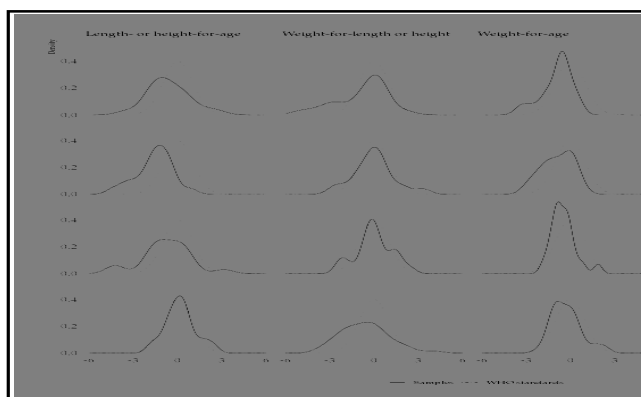


Fig. 4 : Z score distribution for HAZ, WAZ and WHZ in age groups

Table 6 : Prevalence status – Height for age with WHZ scores

Nutritional status table (Prevalence of Malnutrition)
Height for age with WHZ scores

Age group	Weighted Number	-3SD n, (%)	-2SD n, (%)	+2SD n, (%)	+3SD n, (%)	Z- Score mean	Z-Score SD
12-23 months	20	2, 10%	5, 25%	1, 5%	0, 0%	-0.8	1.75
24- 35 months	20	0, 0%	2, 10%	2, 10%	1, 5%	0.0	1.4
36- 47 months	20	0, 0%	2, 10%	1, 5%	0, 0%	0.0	1.24
48-59 months	40	3, 7.5%	9, 22.5%	2, 5%	1, 2.5%	-0.6	1.64
Sex: Female	50	2, 4%	8, 16%	2, 4%	1, 2%	-0.4	1.44
Sex: Male	50	3, 6%	10, 20%	4, 8%	1, 2%	-0.4	1.68
All	100	5, 5%	18, 18%	6, 6%	2, 2%	-0.4	1.56

Table 7 : Prevalence of malnutrition based WHZ through gender and age groups

Age Group	N	- 3 SD	-2SD	+2SD	+3SD	Z-Score mean	Z-Score SD
12-23.Female	10	0, 0%	0, 0%	1,10%	0, 0%	0.2	0.91
24-35.Female	10	0, 0%	1, 10%	0, 0%	0, 0%	-0.6	1.13
36-47.Female	10	0, 0%	0, 0%	0, 0%	0, 0%	0.1	0.81
48-59 .Female	20	2, 10%	7, 35%	1, 5%	1, 5%	-0.8	1.89
12-23 .Male	10	2,20%	5, 50%	0, 0%	0, 0%	-1.8	1.82
24-35 .Male	10	0, 0%	1, 10%	2, 20%	10%	0.5	1.48
36-47 .Male	10	0, 0%	2, 20%	1, 10%	0, 0%	-0.1	1.61
48-59 .Male	20	1, 5%	2, 10%	1, 5%	0, 0%	-0.4	1.01

standard distribution. The deviation of the curves explains how the sample elements differ from the normal children.

Fig. 5 shows the Z score distribution for height for age and weight for age of the males and females in the whole sample. This distribution is compared with the normal distribution given by WHO.

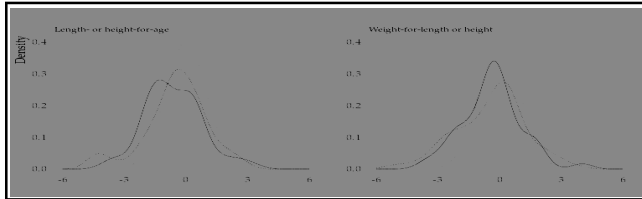


Fig. 5 : Z score distribution curve for HAZ and WAZ for gender category

Fig. 6 shows the Z score distribution for height for age and weight for age of the males and females in the whole sample. This distribution is compared with the normal distribution given by WHO.

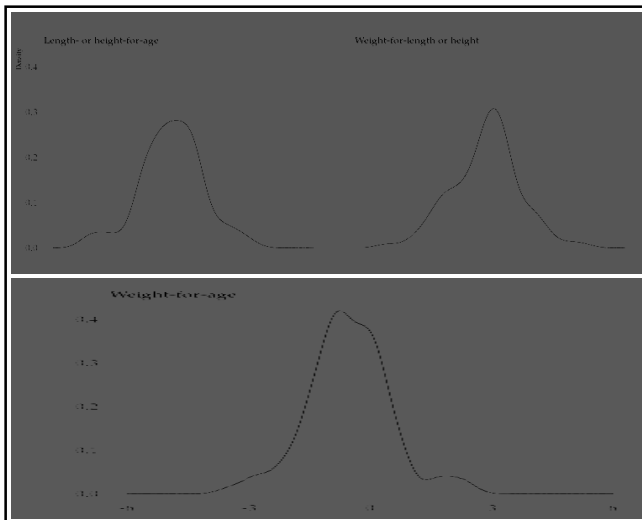


Fig. 6 : Comparison of Z score distribution for height for age and weight for age of the whole sample with the normal distribution given by WHO

Table 8 is an illustration of malnutrition conditions on the basis of underweight. The percentage calculation from WAZ for moderate ($\leq 2SD$) and severe ($\leq 3SD$) underweight in different age groups, total male, female and for the whole sample are given in the table. It shows that 1% of children have severe underweight. 18% had moderate wasting and 5% had severe wasting. 11% and 6% of the children suffer moderate and severe stunting respectively. An average of 66% of children are falling under normal standards, while 34% had malnutrition. This further shows that the overall prevalence of malnutrition is 34%. NFHS – 4 Kerala data sheet also providing almost the same kind of a result.

According to the NFHS -5 survey, children’s nutritional status in Kerala has worsened since NFHS – 4 by most measures. The percentage of children who are stunted increased marginally from 20% to 23% in the 4 years between NFHS – 4 and NFHS -5. Similarly, the percentage of children who are underweight (20%) has increased since NFHS – 4 (16%). The continuing high levels of undernutrition are still a major problem in Kerala.

Summary and Conclusion:

These results indicate that undernutrition is still an important health concern among under five children. Undernutrition in the form of underweight and stunting is more prevalent in the rural areas. The percentage calculation from WAZ for moderate ($\leq 2SD$) and severe ($\leq 3SD$) underweight in different age groups, total male, female and for the whole sample shows that 1% children have HAM (Hospital Acquired Malnutrition). 18% had moderate wasting and 4% had severe wasting. 11% and 6% of the children suffer moderate and severe stunting respectively. An average of 66% of children are falling under normal standards, while 34% had malnutrition. This further shows that the overall prevalence of malnutrition

Table 8 : Underweight, wasting and stunting percentages								
Age in months	N	% of normal children	Underweight % below		Wasting % below		Stunting % below	
			$\leq 2SD$	$\leq 3SD$	$\leq 2SD$	$\leq 3SD$	$\leq 2SD$	$\leq 3SD$
12 – 23	20	55.0	15.0	5.0	25.0	10.0	10.0	5.0
24 – 35	20	55.0	20.0	0.0	10.0	0.0	30.0	15.0
36 – 47	20	70.0	0.0	0.0	10.0	0.0	15.0	10.0
48 – 59	40	70.0	2.5	0.0	22.5	7.0	0.0	0.0
Female	50	70.0	6.0	0.0	16.0	4.0	8.0	4.0
Male	50	62.0	10.0	2.0	20.0	6.0	14.0	8.0
Total	100	66.0	8.0	1.0	18.0	5.0	11.0	6.0

is 34%. NFHS – 4 Kerala data sheet also providing almost the same kind of a result. The prevalence of moderate and severe underweight increases up to 12 -24 months and it gradually decreases and moderate wasting is also high in the age group of 12 – 23 months and 48 -59 months . Moderate and severe stunting is common at the age group of 24 -35 months of life. Prevalence estimate based on WAZ (weight for age Z- score). 1% and 8% of the considered sample had this score lesser than – 3SD and – 2SD respectively. The prevalence of malnutrition based on HAZ scores of WHO standard recorded for the sample, around 6% of the population suffers severe malnutrition while 11% had moderate malnutrition. HAM (Hospital Acquired Malnutrition) also occurs in these age groups, 6% of girls have both dry and angular stomatitis. For boys, the majority of them have normal lips (92%) but 8% have dry lips. In the age group of 36- 47 months, half of the girls have dental caries in their teeth. The cases of caries are common at the age of 36 – 59 months. Among boys 2% have pale and spoon shaped nails. Dietary choices of the families also leads to malnutrition in children. The percentage of each food group used by the families are different for different age groups, these differences also affect the nutritional status of the children. The consumption of green leafy vegetables, fruits, tubers are less compared to cereals and pulses.

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