RESEARCH REPORT

NUTRITIONAL STATUS OF CHILDREN UNDER FIVE YEARS AND FACTORS ASSOCIATED IN MAHOTTARI DISTRICT, NEPAL, 2010.

SUBMITTED TO
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SUMMARY

Protein energy malnutrition (PEM) is chronic public health problem in Nepal. The population of under five children in Nepal constitutes more than ten per cent of total population. Socio-economic and environment factors are found to be significant for malnutrition among children under five. In the mid-southern Terai including Mahottari district has protein energy malnutrition and micronutrient deficiencies problem due to behavioral and socio-cultural problems. The study was conducted to assess the nutritional status of under five children in Mahottari district of Nepal by considering socioeconomic and demographic factors and taking anthropometric measurements.

The study was cross sectional and descriptive. The study included 400 children selected randomly 9 from each 45 wards which in turn selected from 15 sample village development committees (VDCs) selected from of 77 VDCs three clusters which comprised two electoral   constituencies each from 6 electoral constitutions of   Mahottari district. All clusters were designed on the basis of population and sample was fixed proportionally from each cluster.

The socio-cultural and household indicators of people of Mahottari district showed poor in relation to nutrition. The mid upper arm circumference (MUAC) showed half of the children were protein energy malnourished. Among PEM children, 11% were severely malnourished. According to Gomez classification, the two third of children were malnutrition which comprised of 16% severe, 25% moderate and 28% mild malnutrition. The Waterlow's classification revealed that two-third of children were suffering from acute and chronic malnutrition which comprised of 22% stunted indicating chronic malnutrition, 29% wasted indicating acute malnutrition and 14% wasted and stunted showing chronic and acute malnutrition.

The bivariate analysis showed not significant (p=0.07 for underweight and p=0.79 for stunting) relationship of sex, ethnicity (p=0.46 for underweight and p=0.23 for stunting), and household economic status (p=0.69 for underweight and p=0.35 for stunting) with nutritional status of children. Significant association was observed between age of the children (p=0.00 for both underweight and stunting), mothers' education (p=0.004 for underweight and p=0.002 for stunting), and use of rice scum at household (p=0.04 for underweight and p=0.04 for stunting) and nutrition status of children.

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Mr. Shravan Kumar Mishra

Dr. Rosy Sharma

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LIST OF ABBREVIATIONS

PEM	Protein Energy Malnutrition
DPT	Diphtheria Pertussis Tetanus
BCG	Bacille Calmette Guerine
NHRC	Nepal Health Research Council
BMI	Body Mass Index
NDHS	National Demographic Health Survey
CI	Confidence Interval
OR	Odds Ratio
SPSS	Statistical Program on Social Science
TU	Tribhuvan University
IoM	Institute of Medicine
MUAC	Mid Upper Arm Circumference
PI	Principal Investigator
SLC	School Leaving Certificate
WHO	World Health Organization

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1. INTRODUCTION

Nutritional status of children is the important public health indicator which helps to assess the general health condition of the population. Nutritional condition of the children does not only serve as a health indicator, but it is also vital for the children susceptibility to many other diseases. The national census 2001 indicated that the 0-4 year children population was 13 per cent of the total population. Likewise other some indicators are as: infant mortality rate more than 60 per thousand, literacy rate 41.8 per cent, life expectancy at birth 62.5 years[1].

Annual Report 2063-2064 stated that malnutrition remains a serious obstacle to child survival; growth and development in Nepal, many of the cases are moderate acute malnutrition while some children suffer from severe acute malnutrition and micronutrient deficiencies[2]. There are varying degree of malnutrition in different ecological zones and regions of Nepal. Protein energy malnutrition being a most common form of nutritional problem reported in Nepal. An important cause of PEM in Nepal is low birth weight as weight below 2.5 kg. Low birth weight also leads to an intergenerational cycle of malnutrition[3]. In the Terai region most of the districts are affected from PEM and micronutrient deficiencies. From observing the district profile of Nepal, Mahottari district is seen below the average level of others Terai district of the mid development region.

Malnutrition is chronic public health problem in Nepal. The population of under five children in Nepal constitutes more than ten per cent of total population. The 2006 Nepal Demographic and Health Survey (NDHS) survey found 45% and 43% of children below the age of 5 years to be underweight and stunted, respectively. Aggregates mask very wide disparities across Socio-economic groups and ecological regions. For example, almost 54% of children under five years old from household in the poorest quintile were found to be underweight compared to around 24% in the wealthiest quintile (NDHS 2006). About 37% of children from the Eastern region of Nepal were underweight compared to 53% from the Mid-western region.

Malnourished under three year children (Weight/Age) in 2001 was 12.1 and chronic malnourishment among under five year children (stunting) is more than fifty percent.[2] The National micronutrient survey, 1998 showed that Protein Energy Malnutrition is one of the major public health problems in Nepal. About 45 per cent under five children are identified as stunted, 47 per cent and 7 per cent were underweight and wasted respectively. Children between 12 months to 23 months of age are identified as most vulnerable group for malnutrition.[4] Annual report; Department of Health Service Nepal (2007/8) reported that Forty nine percent of children below five years affected by stunted a sign of early malnutrition. 39 % of children <5 Years are wasted, an indicator of acute malnutrition. All these indicators are poor even in central Terai region of Nepal[5]. From the different studies socio-economic and environment factors were found to be significant factors for malnutrition among children under five. In the southern Terai including the Mahottari district has PEM and micronutrient deficiencies problem due to behavioral and socio-cultural problem.

Research Questions:

For conducting the research work in expected direction following research questions are developed as follows:

1. What are the demographic characteristics of under five year children of Mahottari district?

2. What is existing nutritional status of the under five year children regarding the weight-for-height, height-for-age, weight-for-age, MUAC measurement in Mahottari district?

3. What are the factors associated with the nutritional status of the under five year children of Mahottari district?

2. LITERATURE REVIEW

A study was carried out by Ghosh et al. to determine the prevalence of under nutrition among the Nepalese children of Kathmandu Valley which showed that prevalence of stunting and underweight (below -2 Z-score) was similar in both boys (45.57% stunting and 52.46% underweight) and girls (43.42% stunting and 46.09% underweight). Likewise, it revealed that a high prevalence of under nutrition exists in Nepalese children, although the magnitude of under nutrition is similar in both boys and girls[6].

In 2006 by Wamani et al. had carried out a Cross-sectional survey to assess predictors of poor anthropometric status among infants and young children in rural Uganda. Seven hundred and twenty children aged 0-23 months with their mothers/care takers were participated in the study. The result showed that wasting was independently associated only with a history of fever in the 2 weeks prior to the survey while underweight was associated with a history of fever. Similarly stunting was positively associated with a wider range of factors, including: history of a fever episode, lack of a latrine in the household, failure to de-worm children 12 months or older and being born to a non-formally educated mother compared with mothers educated above primary school[7].

In 1995, Mazinggira had conducted a study on secondary information in order to investigate the factors which determine the nutritional status of children under age five years in Zimbabwe. The information showed that 29% of Zimbabwean children aged 3-60 months were short in relation to their age when compared with an international reference population. Analysis of the height-for-age measure showed a positive correlation between malnutrition and rural residence, birth status (infants in multiple births are more likely to be malnourished), lower birth weight, shorter birth interval, and suffering from diarrhea. Weight-for-age measures revealed the protective importance of maternal education, urban residence, higher birth weight, better diarrhoeal status, single birth, and better breast feeding status. Using weight-for-height as the dependent variable revealed duration of breast feeding as the sole

significant variable. Thus, it appeared that birth status, birth weight, diarrheal status, duration of breast feeding and resident was the most significant determinants of malnutrition. It was concluded that a multi-disciplinary approach be needed to combat the socioeconomic factors which determined malnutrition[8].

A study was conducted by Hein and Kam in 2008, to assess the nutritional status and characteristics related to malnutrition in children less than five years of age in Nghean, Vietnam. Six hundred fifty (650) child-mother pairs were selected using a two-stage cluster sampling methodology. The result showed that children included in this study, 193 (31.8%) were underweight, 269 (44.3%) were stunting and 72 (11.9%) were wasting. Region of residence, the mother's level of education and occupation, household size, number of children in the family, weight at birth and duration of exclusive breastfeeding were found to be significantly related to malnutrition[9].

UNICEF had stated that nutrition is an important determinant of immunological status; and under nutrition can impair immuno-competence and increase susceptibility and vulnerability to infections. The immediate cause of over half of South Asia's under five mortality was the synergistic effect of inadequate dietary intake and frequent episodes of diseases. Not only severe malnutrition, but also even mild to moderate malnutrition increased the risk of a child dying due to common infections by over 59 per cent[10].

A study on PEM at Kanti Children hospital, the educational status of parents of children with PEM was found to be significantly less (p<0.05) as compared to their non-PEM counterparts. Occupations of parents whose children were in PEM group include mainly housewives and labourers. Larger proportions of children in the study were born at home and exact birth weights of children were not known. Most of the children were colostrums fed. Most of the children in our study were immunized. Almost equal proportion of children belonged to nuclear family type and joint family type[11].

A meta-analysis on 18 published and unpublished individual studies up to 2008, showed males were 5% less likely to be malnourished compared with their female counterparts[12].

Children from families who did not discard rice scum were more advantageous to be well nourished. Colostrums feeding and suffering from diarrhoea had significant effect on underweight but not on stunting[13].

A study conducted in a rural community of Sarlahi, Nepal, measurement of Mid-upper Arm Circumference (MUAC) revealed that the percentages of severely and moderately malnourished children were 35 and 37 respectively[14].

A study conducted in Jirel children, the MUAC measurement among 309 children, 51.13 percent were found to be normal and 12.62 percent were severely malnourished, according to Gomez classification, 37 percent children were normal but no one was found to be severely malnourished. 64 percent were found to be having mild to moderate malnutrition. According to Waterlow's classification 71 percent were found to be normal and 29 percent were stunted while no one was found to be wasted[15].

3. RATIONAL OF STUDY

- Malnutrition is regarded as public health problem in Nepal and significant figure of morbidity and mortality can be reduced by applying nutritional intervention and awareness programmes in the community level.

- Acute and chronic malnutrition and underweight are major nutritional problems among under five years children so this study will give some extent of ideas for designing and implementing the nutritional programme in the community.

- Children assessment of growth has been the single most important measurement that best defines their health and nutritional status of the under five children.

- True extent of the burden of malnutrition is still not fully known in Nepal.

- Therefore study exploring understanding and awareness of heavy burden of malnutrition and its influencing factors among children is necessary to recommend intervention for corrective measures.

4. RESEARCH OBJECTIVES

4.1 General objective

- To assess the nutritional status of under five children in Mahottari district of Nepal

4.2 Specific objectives

The specific objectives of the study are:

- To find out socioeconomic and demographic factors associated with the nutritional status of under five year children in Mahottari district

- To measure mid upper arm circumference of 1-5 years children in Mahottari district of Nepal.

- To assess the weight-for-height of under five children in Mahottari district of Nepal.

- To assess the height-for-age of under five children in Mahottari district of Nepal.

- To assess the weight-for-age (under weight) of under five children in Mahottari district of Nepal.

5. MATERIALS AND METHODS

5.1 Research Method:

This study was quantitative and based on Primary data

5.2 Study Variables:

Study variables were categorized into two groups: dependent and independent. In this study dependent variable was nutrition as well as health status of the under five year children. Likewise independent variables were listed as below:

- Availability of food in family
- Feeding and supplementary food practices regarding the cultural norms and values
- Sex of child
- Parity of child
- Age of previous child (immediate child)
- Age of the mother's at child birth
- Growth monitoring of child.
- Educational status of parents
- Weaning period and supplementary food
- Diarrhea and measles episode within one year
- Water supply and toilet in household
- Immunization status/ measles immunization

5.3 Type of Study:

This was descriptive cross-sectional study

5.4 Study Site and its Justification

This study was conducted in Mahottari district of Nepal. It constituted 581,976 populations with 0-4 years children constitute 69,072. Population growth rate was 2.8, which exceeded national average and average housed size is 6.2.   Urban

population was only 5.6% .Ethnic composition of the district shows that Brahman/Chhetri Groups occupies 14.66, highly marginalized, disadvantaged and dalit groups cumulatively accounts for more than 32% of total population of the district. There was only one hospital and two Primary health care centers, six health posts and one sub health posts in each VDCs in the districts. In Mahottari district, the health indicators were seen below the national average and having low human development index as compared to other districts of the region.

5.5 Target Population:

The target population of the study was children under five years for nutritional status assessment and parents were the targets for the assessment of factors associated with nutritional status of children. In this study, under five year children of the Mahottari district were involved as study population.

5.6 Sampling Methods

This study was based on probability sampling method. There were 77 VDCs and 6 electoral constituencies in the Mahottari district. Each constituency was divided into 3 clusters. From each constituency out of three clusters, 3 VDCs were selected by using simple random method from respective clusters. From selected cluster one VDC from was selected by using simple random sampling method and selected VDC also divided in three clusters having 3 wards in each cluster. Thus, one electoral constituency in an average consisted of 15 VDCs, each cluster consist of five VDCs. From each ward, 9 children were selected randomly. All clusters were designed on the basis of population and sample was fixed proportionally from each cluster. Thus in total the study included 15 sample VDCs, 45 wards, and 400 children in the study.

5.7 Sample Size

According to DHS -2006, nearly one in two children was underweight in Nepal. Children whose weight-for-age was below minus two standard deviations from the median of the reference population were considered underweight. The measure reflected the effects of both acute and chronic under nutrition. The sample size was

calculated based on the available data which suggests that in 45 percent of the children below five years of age under weight was prevalent.

Mathematically,

$$n = z^2pqN/e^2(N-1) + z^2pq$$

Where, n= sample size,

z= confidence level

p= prevalence of stunting

q=1-p

e= permissible error.

N= Study Population

Here,

z = 1.96,   p= .45,   q=1-p=.55   e=.05   N=63072

Therefore the sample size will be fixed by adding 10% of the calculated sample size. From the calculation the sample size was 400 under five children from the fifteen VDCs.

5.8 Sampling Frame:

All the under five year children were included in the sampling frame from each cluster of the selected VDCs.

5.9 Tools and Techniques for Data Collection

There were two sets of tools to gather the information. Part I is the structured interview schedule to generate data pertinent to factors associated with nutritional status of children and Part II is a Performa consisting of child information anthropometric measurements was recorded in it. Performa was developed to record the measurements of height, weight, Mid Upper Arm Circumference and structured pre-tested interview schedule was used to collect information from the respondents.

In order to measure physical measurements, standardized weighing machine (Salter balance, measuring tape and MUAC tape was used during the data collection. Data was collected by house to house survey method. For reliability and validity of the information, all the enumerators were trained before field visit. Height, weight and Mid Upper Arm Circumference were measured twice and average of two was recorded as per information.

5.10 Pre-testing the Data Collection Tools

Pre- testing of the developed Performa and interview schedule were done to identify the consistency of tools. Pre-testing was done in 10 % of the sample size in any one VDC of the Mahottari District which was not be selected for study but however the population composition of the pre-tested population somehow resembled the study population.

5.11 Validity and Reliability of the Research

Validity and reliability of the study was ensured by pre-testing of the tools, using standardized instruments and trained enumerators. Instruments was set at 0 reading before taking measurements with standardized reference one. Pair enumerators were sent for data collection and on the basis of the pre-test sufficient time was provided for data collection. Close supervision was done in the field.

5.12 Supervision and Monitoring

For the safety of all the collected data enumerators was kept in sequential order. At the completion of data collection all the data was arranged in different record files on the basis of the clusters. These collected data was entered in SPSS sequentially. For the reliability and validity of the data double entry of the data was done. Some trained supervisors were appointed for the monitoring and supervision of the data collection activities in the field. Likewise principal investigator and co-principal investigators were involved for supervision and monitoring activities. There was conduction of short term workshop for investigators and supervisors to develop their competency in supervision and monitoring activities.

5.13 Data Management

Collected data was managed carefully and safety of raw information had a paramount importance. All collected data was kept cluster-wise. Thus collected data by individual enumerators was kept in separate record file and then files were coded. All coded files was again be given numbers starting from 001 and end at 400 then these were stored in safe cupboard. One to 5 numbers was given cluster identification, 1-3 codes for selected VDCs and a,b,c notations are given for selected wards. Thus stored data was utilized for the purpose of analyses.

5.14 Data Analysis

All the data was entered computer software SPSS and EPI Info and analyzed regarding the objectives of the study. The results of the study were presented by tables, charts, figures and statistical tools to assure the result of the study.

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6. RESEARCH FINDINGS

The study included 187 (47%) female and 213 (53%) male children randomly selected from 77 VDCs and 6 electoral constituencies in the Mahottari district. Each electoral constituency divided into 3 clusters. From each constituency out of three clusters, 3 VDCs was selected by using simple random method from respective clusters. From selected cluster one VDC was selected by using simple random sampling method and selected VDC also divided in three clusters having 3 wards in each cluster. Thus, one electoral constituency in an average consists of 15 VDCs, each cluster consist of five VDCs. From each ward, 9 children were selected randomly. All clusters were designed on the basis of population and sample was fixed proportionally from each cluster. Thus in total there was included 15 sample VDCs, 45 wards, and a round figure of 400 children in the study.

6.1 Households characteristics:

Two third of the households were Hindu and one third were Muslim. The caste distribution showed mixed composition which comprised of upper, religious minority, disadvantaged non Dalit (DND), Janajati, and Dalit. In family type, the joint type was slightly greater than nuclear type.

Among fathers of children, 32% were illiterate. The education level in father (68% literate) of children was superseded by non formal education (22%) followed by primary (16%), SLC (14%), secondary (12%), and higher education (4%). Among mothers of children, 46 % were illiterate. The education level in mothers (54% literate) of children was non-formal education (30%) followed by primary (12%), secondary (6%), SLC (4%), and higher education (2%). The occupation of father was labourer (33%) followed by foreign labourer (27%), farmer (21%), business (10%), and service (9%). The occupation of mother was housewife (84%) followed by labourer (9 %), business (3%), farmer and service (2%).

Annual income of family on the basis of food supply store was approximately half of the family whose food store didn't meet year round supply. The houses were mostly of Kachha type (85%), among which 35% were ill ventilated. The number of members in

houses (more than 6) was 52%, followed by 27% were with family member number ranging from 3-4, and 21% were with family member ranging from 5-6. 60% of households did not have toilet. Among the households who used toilet, half of them were water seal type and rest was pit type. Sources of drinking water comprised of 68% own hand pipe and 32% were dependent on public hand pipe.

6.2 Fertility, child care & mother knowledge:

3 % of mothers gave birth at age of 20-35 years, 36 % of mothers were teenagers, and 61% were mothers who gave birth in the age of 18-20 years. The birth order of children whose measurements were taken was 52 % second order, 25 % third order, 15 % first order.The   households having two children were 46% followed by three children (25%), four children (11%), and five children (3%).

The households having one son was 52% followed by two sons (29%), no son (15%), and three sons (4%). The households having one daughter was 44% followed by two daughter (28%), no daughter (22%), three daughters (5%) and four daughters (1%). The age gap between child births in 45 households was not applicable due to first child in family. The age gap between child (2-3 years) births was 53% followed by less than two years in 25%, 3-4 years in 15%, and 4-5 years in 7%.

Feeding practices of colostrums to the neonate was 88%. The age at which supplementary diet given was more than nine months in 36% followed by 6-9 months in 25%, 5-6 months in 23%, and 15% of the mother couldn't remember the age. Type of supplementary food given to children was same as adult food in half of children followed by jaulo in 23%, animal milk in 18%. Almost all used packed/iodized salt. The preference of health services was government health institutions (64%) followed by private health institutions (53%). 86% of mothers had knowledge of preparing oral rehydration solution (ORS).

6.3 General information of child

Frequency of food given to children was four times in 61%, three times in 23%, five or more times in 15%. The content of food given to children was mixed in 76%, single in

21% and mixed along with ghee was 3%. Discarding of rice scum practices was 68% and rest did not discard the rice scum. 6% of the children's weight at birth was below normal (less than 2.5 Kg). 45% of children suffered from diarrhea during last six months. 2-3 times of diarrhoeal episode was predominant among children who suffered from diarrhoea during last six month. 3% of children suffered from measles.

6.4 Disease related information:

44% of children suffered from ARI during last six month. 2-4 times of ARI episode was predominant among children who suffered from ARI during last six month. 11% of children suffered from worm infestation. Measles vaccination was not applicable in 88 (22%) children as their age was below nine months. Among eligible children 95% was vaccinated with measles. A single case of malaria was found and no case of tuberculosis   was detected.

6.5 Anthropometric measurement of child:

The MUAC showed half of the children were protein energy malnourished. Among PEM children, 11% were severely malnourished. According to Gomez classification, the two third of children were malnutrition which comprised of 16% severe, 25% moderate and 28% mild malnutrition. The Waterlow's classification revealed that two-third of children were suffering from acute and chronic malnutrition which comprised of 22% stunted indicating chronic malnutrition, 29% wasted indicating acute malnutrition and 14% wasted and stunted showing chronic and acute malnutrition.

The analysis found that older age children and children whose mothers are illiterate are more likely to be underweight and stunted. Children from families who do not discard rice scum are more advantageous to be well nourished. Colostrum feeding and suffering from diarrhoea have significant effect on underweight but not on stunting. The bivariate analysis showed not significant (p=0.07 for underweight and p=0.79 for stunting) relationship of sex, ethnicity (p=0.46 for underweight and p=0.23 for stunting), and household economic status (p=0.69 for underweight and p=0.35 for stunting) with nutritional status of children. Significant association was observed between age of the children (p=0.00 for both underweight and stunting), mothers' education (p=0.004 for

underweight and p=0.002 for stunting), and use of rice scum at household (p=0.04 for underweight and p=0.04 for stunting) and nutrition status of children.

The association between suffering from diarrhea last six month and malnutrition among children   was found significant (p=0.00) for weight-for-age (underweight) malnutrition but non-significant (p=0.59) for height-for-age (stunting). Similarly, association between colostrum feeding and nutrition status of children   was found significant (p=0.003) for weight-for-age (underweight) malnutrition but non-significant (p=0.18) for height-for-age (stunting).

Table No.1 Type of religion adopted in the households

Type of Religion	Frequency	Percent
Muslim	98	25
Hindu	302	75
Total	400	100

Two third of the household were Hindu and one third were Muslim.

Table No. 2. Caste distribution of family

Caste	Frequency	Percent
Upper	110	27
Religious minority (RM)	105	26
Disadvantaged non Dalit	79	20
Janjati	59	15
Dalit	47	12
Total	400	100

The caste distribution showed mixed composition which comprises of upper, Religious   Minority (RM) disadvantaged non Dalit, Janajati, and Dalit.

Table No.3 Type of family

Type of Family	Frequency	Percent
Joint	229	57
Nuclear	171	43
Total	400	100

In family type, the joint type is slightly greater than nuclear type.

Table No. 4. Education of father

Level of education	Frequency	Percent
Illiterate	128	32
Non formal	88	22
Primary	65	16
Secondary	50	12
SLC	54	14
Ten plus two and higher	15	4
Total	400	100

Among fathers of children, 32% were illiterate. The education level in father (68% literate) of children was superseded by non formal education (22%) followed by primary (16%), SLC (14%), secondary (12%), and higher education (4%).

Table No. 5 Education of mother

Level of education	Frequency	Percent
Illiterate	187	46
Non formal	119	30
Primary	47	12
Secondary	25	6
SLC	17	4
Ten plus two and Higher	5	2
Total	400	100

Among mothers of children, 46 % were illiterate. The education level in mothers (54% literate) of children was non-formal education (30%) followed by primary (12%), secondary (6%), SLC (4%), and higher education (2%).

Table No. 6. Occupation of father

Occupation	frequency	Percent
Business	40	10
Farmer	83	21
Foreign laborer	107	27
Laborer	132	33
Service	38	9
Total	400	100

The occupation of father was labourer (33%) followed by foreign labourer (27%), farmer (21%), business (10%), and service (9%).

Table No. 7. Occupation of mother

Occupation	Frequency	Percent
Housewife	337	84
Labourer	36	9
Bussiness	14	3
Service	7	2
Farmer	6	2
Total	400	100

The occupation of mother was housewife (84%) followed by labourer (9 %), business (3%), farmer and service (2%).

Table No. 8.Approximate annual income on the basis of food supply store in household

Annual income	Number	Percent
Less than 6 month	80	20
Between 6-12 month	114	29
More than 12 month	206	51
Total	400	100

Annual income of family on the basis of food supply store was approximately half of the family whose food store didn't meet year round supply.

Table No. 9. Type of house

Type of house	Frequency	Percent
Kacha ill ventillated	141	35
kacha ventillated	201	50
Pucca(RCC)	58	15
Total	400	100

The houses were mostly of Kachha type (85%), among which 35% were ill ventilated.

Table No. 10 Number of family member in a house

Family member	Frequency	Percent
3—4	107	27
5—6	86	21
More than 6	207	52
Total	400	100

The number of members in houses (more than 6) was 52%, 27% were with family member number ranging from 3-4, and 21% were with family member ranging from 5-6.

Table No. 11 Household using toilet

Toilet	Number	Percent
Yes	164	41
No	236	59
Total	400	100

60% of households did not have toilet.

Table No. 12. Type of toilet

Type of tiolet	Frequency	Percent
Water seal	83	51
Pit	81	49
Total	164	100

Among the households who used toilet, half of them were water seal type and rest was pit type.

Table No. 13 Source of drinking water used by household

Source of drinking water	Frequency	Percent
Own hand pipe	272	68
Public hand pipe	128	32
Total	400	100

Sources of drinking water comprised of 68% own hand pipe and 32% were dependent on public hand pipe.

Table No. 14 Age at which mother gave birth to first child

Age of mother	Frequency	Percent
Less than 18 years	144	36
18-20 Years	245	61
20-35 Years	11	3
Total	400	100

3 % of mothers gave birth at age of 20-35 years, 36 % of mothers were teenagers, and 61% were mothers who gave birth in the age of 18-20 years.

Table No. 15 Birth order of child whose measurements were taken

Birth order	Frequency	Percent
First	61	15
Second	209	52
Third	99	25
Fourth	21	5
Fifth	10	3
Total	400	100

The birth order of children whose measurements were taken was 52 % second order, 25 % third order, 15 % first order.

Table No. 16 Number of child from a parent in a household

No of child	Frequency	Percent
One	58	15
Two	184	46
Three	100	25
Four	44	11
Five	14	3
Total	400	100

The households having two children were 46% followed by three children (25%), four children (11%), and five children (3%).

Table No. 17 No of sons from a parent in households

No of son	Frequency	Percent
Zero	62	15
One	206	52
Two	117	29
Three	15	4
Total	400	100

The households having one son is 52% followed by two sons (29%), no son (15%), and three sons (4%).

Table No 18. No of daughters from a parent in a household

No of daughter	Frequency	Percent
Zero	86	22
One	177	44
Two	111	28
Three	22	5
Four	4	1
Total	400	100

The households having one daughter was 44% followed by two daughter (28%), no daughter (22%), three daughters (5%) and four daughters (1%).

Table No. 19. The age gap between child births

Age of previous child	Frequency	Percent
less than 2 year	90	25
2--3 year	187	53
3--4 year	52	15
4--5 year	26	07
Total	355	100

The age gap between child births in 45 households was not applicable due to first child in family. The age gap between child (2-3 years) births was 53% followed by less than two years in 25%, 3-4 years in 15%, and 4-5 years in 7%.

Table No. 20 Feeding practices of colostrums to the neonate

Colostrums fed	Frequency	Percent
Yes	353	88
No	47	12
Total	400	100

Feeding practices of colostrums to the neonate was 88%.

Table No 21. Age at which supplementary diet was given to children

Age at which supplementary diet given	Frequency	Percent
less than 5 month	3	1
5--6 month	91	23
6--9 month	100	25
more than 9 month	146	36
can't remember	60	15
Total	400	100

The age at which supplementary diet given was more than nine months in 36% followed by 6-9 months in 25%, 5-6 months in 23%, and 15% of the mother couldn't remember the age.

Table No 22. Type of supplementary food given to children

Type of supplementary food	Frequency	Percent
Animal milk	73	18
Bottle milk	10	4
Jaulo	94	23
Same as adult food	202	50
Super floor	21	5
Total	400	100

Type of supplementary food given to children was same as adult food in half of children followed by jaulo in 23%, animal milk in 18%.

Table No 23. Type of salt used in households

Type of salt used	Frequency	Precent
Dhika (crystal non iodized salt)	2	1
Packed/iodized	398	99
Total	400	100

Almost all used packed/iodized salt.

Table No 24. Preference of health services when child suffered from illness

Preference of health services	Frequency	Percent
Govt. health institution	258	64
Private health clinic	140	35
Traditional healer	2	1
Total	400	100

The preference of health services was government health institutions (64%) followed by private health institutions (53%).

Table No 25. Knowledge of preparing oral rehydration solution (ORS)

Knowledge of preparing ORS solution	Frequency	Percent
Yes	335	86
No	65	14
Total	400	100

86% of mothers had knowledge of preparing oral rehydration solution (ORS).

Table No. 26 Frequency of food given to child per day

Frequency of food	Frequency	Percent
Two times	4	1
Three times	90	23
Four times	245	61
Five or more times	61	15
Total	400	100

Frequency of food given to children was four times in 61%, three times in 23%, five or more times in 15%.

Table No. 27. Content of food given to children

Content of food	Frequency	Percent
Single	85	21
Mixed	302	76
Mixed along with ghee	13	3
Total	400	100

The content of food given to children was mixed in 76%, single in 21% and mixed along with ghee was 3%.

Table No. 28. Practices of discarding rice scum after cooking

Rice scum discard	Frequency	Percent
Yes	272	68
No	128	32
Total	400	100

Discarding of rice scum practices was 68%

Table No. 29. Sex of children included in the study

Sex of child whose measurement is taken	Frequency	Percent
Female	187	47
Male	213	53
Total	400	100

Table No.30 Weight of child at birth

Weight of child at birth	Frequency	Percent
Normal	375	94
Below normal	25	6
Total	400	100

6% of the children's weight at birth was below normal (less than 2.5 Kg)

Table No. 31. Diarrhoea in children during last six months

Diarrhoea episode in child	Frequency	Percent
No	220	55
Yes	180	45
Total	400	100

45% of children suffered from diarrhea during last six months.

Table No. 32. No of diarrhoeal episodes suffered by children during last six month

Frequency of diarrhoea in past six month	Frequency	Percent
Once	35	20
two times	65	36
three times	61	34
four times	14	7
Fifth times	5	3
Total	180	100

2-3 times of diarrhoeal episode was predominant among children who suffered from diarrhoea during last six month.

Table No. 33 Children suffered from measles

Measles in child	Frequency	Percent
Yes	13	3
No	387	97
Total	400	100

3% of children suffered from measles.

Table No 34. Acute respiratory infection (ARI) episode among children

ARI episode in children	Frequency	Percent
NO	222	56
Yes	178	44
Total	400	100

44% of children suffered from ARI during last six month.

Table No. 35.   No of ARI episodes suffered by children during last six month

ARI Episode	Frequency	Percent
One	34	19
Two	49	28
Three	42	23
Four	53	30
Total	178	100

2-4 times of ARI episode was predominant among children who suffered from ARI during last six month

Table No. 36. Worm infestation in children

Worm infestation	Frequency	Percent
Yes	45	11
No	355	89
Total	400	100

11% of children suffered from worm infestation.

Table No. 37. Measles vaccination among children

Measles vaccination	Frequency	Percent
Vaccinated	297	95
Not Vaccinated	15	5
Total	312	100

Measles vaccination was not applicable in 88 (22%) children as their age was below nine months. Among eligible children 95% was vaccinated with measles.

Table No. 38. Mid Upper Arm Circumference (MUAC) of children

Mid Upper Arm Circumference(MUAC)	Frequency	Percent
Green (Normal)	200	50
Yellow (Mild to moderate malnutrition)	157	39
Red (Severe malnutrition)	43	11
Total	400	100

The MUAC showed half of the children were protein energy malnourished. Among PEM children, 11% were severely malnourished.

Table No. 39. Gomez classification of nutritional status of children

Wt. for age	No. of children			Percentage	Reference
	Male	Female	Total		
>90%	70(34%)	58(31)	128	32	Normal
75-90%	50(23%)	60(32)	110	28	Mild Malnutrition
60-74%	50(23%)	48(26)	98	25	Moderate Malnutrition
<60%	43(20%)	21(11)	64	16	Severe malnutrition
Total	213	187	400	100	

The two third of children were malnutrition which comprised of 16% severe, 25% moderate and 28% mild malnutrition.

Table No. 40. Waterlow's classification of nutritional status based on height-for-age and weight-for-height of children

Parameter	Value	Male	Female	Total	Percent	Nutritional status
Weight-for-height Height-for-age	>80% >90	76(35%)	62(33%)	138	35	Normal
Weight-for-height Height-for-age	>80% <90%	42(20%)	45(24%)	87	22	Stunted
Weight-for-height Height-for-age	<80% >90%	61(29%)	57(31%)	118	29	Wasted
Weight-for-height Height-for-age	<80% <90%	34(16%)	23(12%)	57	14	Wasted and stunted
Total		213	187	400	100	

Two-third of children were suffering from acute and chronic malnutrition which comprised of 22% stunted indicating chronic malnutrition, 29% wasted indicating acute malnutrition and 14% wasted and stunted showing chronic and acute malnutrition.

7. DISCUSSION:

The study included 400 children comprised of 187 (47%) female and 213 (53%) male children randomly selected from Mahottari district, Nepal. The population composition comprised of Hindu and Muslim by religion and caste distribution showed mixed composition which comprised of upper, religious minority, disadvantaged non Dalit (DND), Janajati, and Dalit. Regarding parent education, one third fathers were illiterate where as approximately half of the mothers were illiterate. Among educated parent non formal education, followed by primary, secondary, SLC and higher education in decreasing order. The education level in parent was in the favour of the malnutrition among the children.

The result of study was similar to study carried out by Mishra SK. et. al.[11] which found that the educational status of parents of children with PEM was found to be significantly less as compared to their non-PEM counterparts. The result showed higher rate of illiteracy among mothers in PEM group than control group (p<0.05). Illiterate mothers in PEM group were twice than mothers in control group. Mothers in control group were more literate than PEM group. The result showed that education was key factor in determining the nutritional status of children especially under five. Similar types of results were obtained in two studies done in India by Aryan A, et al[16] and Gupta MC et al. [17] In the study conducted by Arya A. and Devi R., the impact of maternal literacy status on the nutritional status of pre-school children was studied. Two hundred children of both the sexes aged between 1-5 years were randomly selected for the study. Results revealed that the children of literate mothers had better anthropometric measurements than children of illiterate mothers.

Annual income of family on the basis of food supply store was approximately half of the family whose food store didn't meet year round supply, the houses were mostly of Kachha type (85%), among which 35% were ill ventilated which favored increased episode of ARI among children. Half of the households had family members more than six which also contributed to increased malnutrition. Two third of households did not have toilet and among the households who used toilet, half of them were pit

type adding to increased diarrhoeal episode and other water born diseases contributing to malnutrition. The teenagers' mothers (below twenty years) were ninety seven percent which alarmingly contributed to malnutrition. The age at which starting of supplementary diet to the children was later than recommended. Type of supplementary food given to children was same as adult food in half of children. The content of food as mixed food along with ghee was very less due to lack of awareness among the parent. More than two third of households was discarding of rice scum. Among the individual attributes sex and age of the child, the analyses showed significant effect of age on underweight and stunting status. More proportion of children of older age were found underweight and stunted than 6 months and below children, however, the stunting was also high in this age group. The evidence of wide spread of discrimination against girls in Terai region, the proportions of underweight were identical for boys and girls, whereas stunting the proportion was higher for boys. Under the family attributes, the ethnicity showed slight effect, the economic status of household had negative effect.

Despite high level of caste untouchability and deprivation among Dalits in Nepal, the ethnicity of the children showed mild effect on their nutritional status. The proportion of underweight and stunted was slightly higher for Dalit children. Despite the high level of economic disparity in the areas, the analysis showed direct effect of economic sufficiency on nutritional status of children among baby less than six month. The adjusted proportions of underweight and stunted were identical for both children from households with economic sufficiency and insufficiency. But another variable mothers' education status had prominent effects on both underweight and stunting of children. Children whose mothers were literate were less likely to be underweight or stunted than children whose mothers were illiterate. Under the attributes related to health and care and feeding practices, colostrum feeding had noticed effect on underweight but less on stunting; use of rice scum had noticed effect on both underweight and stunting; suffering from diarrhea last six month had effect on underweight but opposite in stunting.

The children from families where rice scum was extracted and discarded are more likely to be underweight and stunted than children from families who did not discard. The proportions of children underweight and stunted were higher from families who extract and discard rice scum. The children who had suffered from diarrhea last six month were more likely to be underweight whereas it had no effect on stunting. Proportions of underweight children were higher for children suffered from diarrhea but on contrary it was for stunting with slightly less proportions of stunted children who had suffered from diarrhea in last six month.

The result of study was similar to study carried out by Ghosh et al. to determine the prevalence of under nutrition among the Nepalese children of Kathmandu Valley which showed that prevalence of stunting and underweight (below -2 Z-score) was similar in both boys (45.57% stunting and 52.46% underweight) and girls (43.42% stunting and 46.09% underweight). Likewise, it revealed that a high prevalence of under nutrition exists in Nepalese children, although the magnitude of under nutrition was similar in both boys and girls[6].

In 2006 by Wamani et al. had carried out a Cross-sectional survey to assess predictors of poor anthropometric status among infants and young children in rural Uganda. Seven hundred and twenty children aged 0-23 months with their mothers/care takers were participated in the study. The result showed that wasting was independently associated only with a history of fever in the 2 weeks prior to the survey while underweight was associated with a history of fever. Similarly stunting was positively associated with a wider range of factors, including: history of a fever episode, lack of a latrine in the household, failure to de-worm children 12 months or older and being born to a non-formally educated mother compared with mothers educated above primary school[7]. The education of mother and lack of toilet for nutrition of children in present study was found similar to above study.

In 1995, Mazinggira has conducted a study on secondary information in order to investigate the factors which determine the nutritional status of children under age five years in Zimbabwe. The information showed that 29% of Zimbabwean children

aged 3-60 months were short in relation to their age when compared with an international reference population. Analysis of the height-for-age measure showed a positive correlation between malnutrition and rural residence, birth status (infants in multiple births were more likely to be malnourished), lower birth weight, shorter birth interval, and suffering from diarrhea. Weight-for-age measures revealed the protective importance of maternal education, urban residence, higher birth weight, better diarrhoeal status, single birth, and better breast feeding status. Using weight-for-height as the dependent variable revealed duration of breast feeding as the sole significant variable. Thus, it appeared that birth status, birth weight, diarrheal status, duration of breast feeding and resident was the most significant determinants of malnutrition. It was concluded that a multi-disciplinary approach be needed to combat the socioeconomic factors which determine malnutrition[8]. The findings of this study were similar to study conducted in Zimbabwe.

The effect of education, household size, and number of children in the family on nutrition was well in line with study conducted by Hein and Kam in 2008, to assess the nutritional status and characteristics related to malnutrition in children less than five years of age in Nghean, Vietnam. Six hundred fifty (650) child-mother pairs were selected using a two-stage cluster sampling methodology. The result showed that children included in this study, 193 (31.8%) were underweight, 269 (44.3%) were stunting and 72 (11.9%) were wasting. Region of residence, the mother's level of education and occupation, household size, number of children in the family, weight at birth and duration of exclusive breastfeeding were found to be significantly related to malnutrition[9].

UNICEF had stated that nutrition was an important determinant of immunological status; and under nutrition can impair immuno-competence and increase susceptibility and vulnerability to infections. The immediate cause of over half of South Asia's under five mortality was the synergistic effect of inadequate dietary intake and frequent episodes of diseases. Not only severe malnutrition, but also even mild to

moderate malnutrition, increased the risk of a child dying due to common infections by over was 59 percent[10].

The MUAC showed half of the children were protein energy malnourished. Among PEM children, 11% were severely malnourished. According to Gomez classification, the two third of children were malnutrition which comprised of 16% severe, 25% moderate and 28% mild malnutrition. The Waterlow's classification revealed that two-third of children were suffering from acute and chronic malnutrition which comprised of 22% stunted indicating chronic malnutrition, 29% wasted indicating acute malnutrition and 14% wasted and stunted showing chronic and acute malnutrition. A similar finding was found in study conducted in Lele, Lalitpur, Nepal by Poudel S.[18] anthropometric measurement of 153 under five children showed 48% mild nutrition, 24% moderate malnutrition. Waterlow's classification showed 27% wasted and 12% stunted

The education of parent had significant effect on nutrition of children which was well correlated with study done at Kanti Children hospital, which found that the educational status of parents of children with PEM was found to be significantly less (p<0.05) as compared to their non-PEM counterparts. Occupations of parents whose children were in PEM group include mainly housewives and labourers[12]. The study did not show any difference between male and female child nutrition as described by meta-analysis study on 18 published and unpublished individual studies up to 2008, showed   males were 5% less likely to be malnourished compared with their female counterparts[12].

The study showed similar findings in relation to practice of throwing rice scum as shown in the study conducted by Sah N done in Dhanusha, Nepal. Children from families who did not discard rice scum were more advantageous to be well nourished. Colostrums feeding and suffering from diarrhoea had significant effect on underweight but not on stunting[13]. The proportion of severely malnutrition was better than the study conducted in a rural community of Sarlahi, Nepal, measurement of

Mid-upper Arm Circumference (MUAC) revealed that the percentages of severely and moderately malnourished children were 35 and 37 respectively[14].

The study found similar findings as the study conducted in Jirel children, the MUAC measurement among 309 children, 51.13 percent were found to be normal and 12.62 percent were severely malnourished, according to Gomez classification, 37 percent children were normal but no one was found to be severely malnourished. 64 percent were found to be having mild to moderate malnutrition. According to Waterlow's classification 71 percent were found to be normal and 29 percent were stunted while no one was found to be wasted [15].

More proportions of older age children were found underweight and stunted. Only a tiny proportion of children of six months and lower age were underweight but it drastically increased for 7-12 months and higher age group. The similar finding was reported in the NFHS carried out in India[19]. NMIS reports high level of malnutrition among children who were reported to have had liquids and solids added to the diet relatively later[21]. Evidences showed late initiation of supplementary feeding in Terai, which results in increased underweight in this region[20]. Although there was evidence of wide spread of discrimination against girls in Terai region, there was no differences in proportions of underweight for boys and girls, but the proportion of stunting was slightly higher for boys. This finding was similar to other studies NMIS in Nepal and NFHS in India report the same[19, 21].

Despite the caste discrimination and untouchability in Nepal, there was some evidence of effect of ethnicity on the nutritional status of children though the bivariate analysis showed non-significant association between ethnicity and nutrition status of children, which was similar to the findings of NMIS 1995 and 1996 [20, 21] which report no differences in malnutrition by ethnic background. On the other hand, mothers' education status had prominent effect on nutritional status of children. This finding was also similar to the findings from other studies such as NMIS from Nepal and NFHS from India[19, 21]. The finding showed increased risk of children being

underweight or stunted who had suffered from diarrhea last year than children who had not. The effect was higher on being underweight than stunting.

The finding was similar to the finding of NMIS, which reported greater risk of being wasted, but no measurable association with stunting[21]. The finding suggested improvement in diarrhea management including feeding practices during diarrhea to improve the nutritional status of children. For assessing the nutritional status of the under five year children only anthropometry measurement was used. This study was focused on quantitative data rather than qualitative.

8. CONCLUSION:

The lower education level (one third father and half of the mother were illiterate) in parents especially mother education level was contributing factor for PEM. Annual income of family on the basis of food supply store was approximately half of the family whose food store didn't meet year round supply.

The bigger family size, unavailability of toilet in two third of household, teenage pregnancy, son preference, late start of supplementary food, supplementary food same as adult food, giving food not mixed with ghee, increasing trend of discarding rice scum, illness episode like diarrhea, ARI were the contributing factors for malnutrition.

Annual income of family on the basis of food supply store was approximately half of the family whose food store didn't meet year round supply was also important factor for malnutrition

The MUAC measurement found half of the children were protein energy malnourished. The Gomez classification showed the two third of children was malnutrition which comprised of more than half of children being mild to moderate malnutrition.

The Waterlow's classification revealed that two-third of children was suffering from acute and chronic malnutrition. The analysis found that older age children and children whose mothers are illiterate are more likely to be underweight and stunted. Children from families who do not discard rice scum were more advantageous to be well nourished.

9. RECOMMENDATION:

The education level in parent especially mother education as contributing factor for malnutrition of children level should be improved with health education.

Annual income of family on the basis of food supply store being lower as a factor for malnutrition need to be addressed and quantity , quality and frequency of food and proper content of food for children on nutrition aspect should be advocated in the region.

Timely introduction of complementary feeding and feeding/food behaviors should be advocated.

The importance of toilet in disease prevention and nutritional status improvement should be advocated by health workers and other stakeholders at local level.

Teenage pregnancy, son preference, late start of supplementary food, supplementary food quantity and quality, giving food not mixed with ghee, increasing trend of discarding rice scum should be discouraged.

The nutritional status of children should be periodically assessed using suitable nutritional indicators by respective stakeholders also with such type of health researches

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11.ANNEXES:

Data Collection Instruments:

Nutritional Status of Children under Five Years and factors Associated, a Study from Mahottari District, Nepal

A.GENERAL IN FORMATION

a. S.N. ……. Name of Household: …………Sex of the respondent: M / F

b. VDC: …………………………Ward No………..

c. Religion: 1. Hindu 2. Muslim 3. Buddhism 4. Others (Specify)

d. Caste: 1. Schedule cast   2. General 3. Backward 4. Tribe 5. Other (specify)

e. Type of Family: 1. Nuclear 2. Joint

f. Education of Father: 1. Illiterate   2. Non formal Education 3. Primary/Secondary
    4. SLC 5. 10+2 and Higher study

g. Education of Mother: 1. Illiterate 2. Non formal Education 3. Primary/Secondary
    4. SLC 5. 10+2 and Higher study

h. Occupation of father: 1. Laborers 2. Farmer 3. Service 4. Business 5. Foreign service

i. Occupation of Mother: 1. Housewife 2. Labour 3. Farmer 4. Business 5. Service

j. Affordability by income of family in a year
    1. < 6 months 2. > 6 months 3. 12 months or more

k. Type of House: 1. RCC   2. Kaccha but ventilated 3. Kaccha but ill-ventilated

l. What is the total number of House Hold members? 3 /4 /5 / >6

m. Do you have toilet? 1. Yes   a. Pit toilet b. Water seal   2. No

n. What is your source of drinking water?
    1. Tap water (home)   2. Handpipe (home)   3. Well (home)

    4. Public Handpipe or Well   6. Neighbour's handpipe

B. FERTILITY, CHILD CARE & MOTHER KNOWLEDGE

a.   What is the age of mother at birth of child (first pregnancy)?

1) < 18 yr 2) 18-20 yr   3) 20 – 35 yr   4) ≥ 35 yr

b.   What is the birth order of child (whose measurement is taken)

            1   2   3   4   5   6   7   8   9   10

c.   How many children the mother has born? 1. No. of sons   2. No. of daughter:

d.   Age of previous child:

            1: <2 year 2. 2-3 year   3. 3-4 year   4. 4-5 year 5. <5 year

e.   Had the child colostrums fed?   1. Yes   2. No

f.   When child had started supplementary diet?

      1. < 5 mon   2. 5-6 mon   3. 6-9 mon   4. >9 mon   5. Can't remember

g.   Types of supplementary food

      1. Bottle milk 2. Animal milk 3. Super floor 4. Jaulo 5. Same as adult food   6.

      Others

h.   Which salt do you use?   1. Iodized/Packet   2. Dhhikka

i.   Where do you take your child when sick?

            1. Traditional healer 2. Pvt. Health centre 3. Govt. health institution

j.   Do you know to prepare ORS?   1. Yes   2. No

k.   How many times you give food to child   2, 3, 4, >5 times

l.   What is the content of food   single,   mixed,   mixed with ghee

            m. Do you throw rice scum   Yes/ No

C. GENERAL INFORMATION OF CHILD

1. Name of child: …………   Sex: M / F   Age of child: in month

2. Birth order of Child: Birth weight of children: 1. Normal 2. Below normal

I. Disease related information

a. Did your child suffered from diarrohea within a year?

   1. Yes   If Yes how many times….   2. No

b. Measles: 1. Yes   2. No

c. ARI: 1. Yes   2. No   If how many times……………………

d. TB: 1. Yes   2. No

e. Malaria: 1. yes   2. No

f. Worm infestation: 1. yes   2. No

g. Did you immunize your child with measles vaccine? 1. Yes   2. No

II. Anthropometric measurement of child

1. Height: in centimeter (average of two near measurement values   :……………..)

2. Weight: in kg (average of two near measurement value :……………..)

3. MUAC Measurement: Green b. Yellow   c. Red

Thank You!