The Prevalence and Associated Factors of Protein Energy Malnutrition among under Five Year Children in Pediatric OPDs of Public Health Institution in Yirgalem Town, Southern Ethiopia, 2017

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Abstract: *Introduction*: Protein energy malnutrition is one of the leading causes of morbidity and mortality in children under the age of five in developing countries. Ethiopia being one of these countries malnutrition is an important public health problem and among the highest in the world

Objectives: The main objective of this study is to assess the prevalence and associated factors of protein energy malnutrition among under-five children in pediatric OPDs of public health institutions at Yirgalem town, Dale woreda, Sidama zone, SNNPR, Ethiopia from September 18-26, 2017.

Methodology: Institutional based cross sectional study was conducted in pediatric OPDs of public health institutions in Yirgalem town, on a total of 204 children age less than five years from September 18-26, 2017. Study subjects were selected by using quota sampling technique. Interviewer administered structured questionnaire and anthropometric measurements were used to collect data. Data was analysed using SPSS version 20.0statistical software.

Result: This study indicated that the prevalence of stunting wasting and Under-weight was 41.2%, 1.7% and 25% respectively. Factors showed statistically significant association in multivariate analysis were family planning use by mother, children eat together with older siblings and exclusive breast feeding with P-value (0.02), (0.036) and (0.002) respectively.

Conclusion: This study reviled that the prevalence of stunting, wasting and under-weight were higher among under-five children participated in this study. Thus children are at a higher risk of under nutrition related morbidity and mortality. Further progress in under nutrition prevention can be achieved by specifically targeting children at their early age and conducting tailored public education to improve the nutritional status of the study subjects.

Keywords: Malnutrition, stunting, wasting, underweight, paediatrics OPD.

1. INTRODUCTION

Child malnutrition is one of the measures of health status that the World Health Organization (WHO) recommends for equity in health. According to (WHO) the term malnutrition is the "cellular imbalance between supply of nutrients and energy and body's demand for them to ensure growth, maintenance and specific functions." Stunting, wasting, and underweight are among those. Anthropometric indicators are commonly used to measure malnutrition in a population of under-five children [1].

Children under five year of age are most vulnerable and high risk group, who need special health services. Around 12-15% of world population is in this age group. 25-30% of mortality in developing countries occurs in this age group**.** Malnutrition is a serious problem because it is causing the deaths of 3.5 million children under 5 years old per- year in the world, as well as it is at third level in the world of the disease burden in this age group [2].

More than 25% under five children in the developing world are malnourished which accounts about 143 million children. Among these 143 million malnourished children, nearly three quarters live in just 10 countries in Sub-Saharan Africa region and more than one-quarter of children under five are malnourished (in Nigeria and Ethiopia alone accounts more than 33%) [3].

Under nutrition, which is focus of this study, conversely has been estimated to be an underlying cause for around half of all child deaths worldwide [2].

In the developing world, one out of every five persons is chronically undernourished and about 200 million children less than five years of age suffer from protein energy malnutrition. Geographically, over two-thirds (72%) of the world's malnourished children live in Asia (especially South Asia). This figure compares with the 25.6% found in Africa and only 2.3 in Latin America. An estimated 182 million children under 5 years of age, representing 32.5% of all preschool children in developing countries, are malnourished when measured in terms of height for age (i.e. stunted). Despite the general worldwide reduction in food insecurity Africa's food security and nutrition security is growing worse [4-6].

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In Ethiopia, child malnutrition is one of the most serious public health problem and among the highest in the world. This high malnutrition rate in the country poses a significant obstacle for achieving better child health outcomes [7]. According to Ethiopia demographic health survey of 2016 in Ethiopia 38 percent of children under 5 are stunted (below -2 SD), and 18 percent are severely stunted (below -3 SD). Overall, 10 percent of children in Ethiopia are wasted, and 3 percent are severely wasted (below -3 SD). The results show that 24 percent of all children are underweight (below -2 SD), and 7 percent are severely underweight (below -3 SD).

According to the same report in SNNPR 38.6 percent of children under 5 are considered short for their age or stunted (below -2 SD), and 20.2 percent are severely stunted (below -3 SD). Overall, 6 percent of children in SNNPR are wasted, and 1.7 percent are severely wasted (below -3 SD). The results show that 21.1percent of all children are underweight (below -2 SD), and 6.7 percent are severely underweight (below -3 SD) [8].

2. SUBJECTS AND METHODS

2.1. Study Area and Period

This study was conducted in public health facilities found in Yirgalem town by using institutional based cross sectional study design. Yirgalem town is one of the two city administration in Sidama zone and also capital city of Dale woreda. The study area is 47 km south of Hawassa, the regional capital of the south region and 317 km south of the capital, Addis Ababa along Addis Ababa-Moyale high way study design.

Institutional based cross sectional study design was conducted in public health institutions found in Yirgalem town, SNNPR region on a total of 204 under-five year children from September 18 -26, 2017.

2.2. Study Population

All Children less than 5 years of age who visited pediatric OPDs of public health institutions in Yirgalem town during the study period.

2.3. Inclusion and Exclusion Criteria

2.3.1. Inclusion

Children under five years of age who brought to pediatric OPD of public health institutions of Yirgalem town during the study period were included in the study.

2.3.2. Exclusion Criteria

Critically sick and grossly deformed child

Mothers or care givers who were not willing to give required information

2.4. Sample size and Sampling technique

The sample size was determined by using single population proportion formula by the fallowing assumption for prevalence of under-weight as 20.5% in Wonsho woreda, Sidama zone, southern Ethiopia [9], desired precision (**d**) as 5% and 95% as confidence interval.

Therefore sample size is calculated as;

$$n = \frac{(z - a/2)2(p)(1-p)}{d^2}$$

Where

n= sample size

P=proportion

d= margin of error

z= standard normal curve of respective confidence interval

$$n = \frac{(1.96)2(0.205)(1-0.205)}{(0.05)2} = 250$$

Population correction formula was required since the average monthly patient flow of paediatrics OPDs in public health institutions (924) was less than 10,000.

nf = ni/[1 + ni/*N*] = 251/[1+251/924]= 197

Where

nf = final sample size after correction

ni = initial sample size before correction

N= Number of children visiting paediatrics OPD per month

Considering a 10% non-respondent rate the required sample was become 197 + 197x10% = 197+20=217. Therefore the final sample size was **217**.

Study subjects were selected from public health institutions found at Yirgalem town by using quota sampling technique. The calculated sample size (217)

was proportionally allocated among the health institutions based on their patient flow experience (135 for hospital and 82 for the health center). All children under 5 year of age who visited the paediatrics OPD of the health institutions during the study period and fulfil the inclusion criteria were selected as study subjects consecutively until the calculated sample size was attained.

2.5. Data Collection Procedures

Interviewer administered structured questionnaire adapted from different literature was used to collect socio demographic and other variables. The first questionnaire was prepared in English then translated to Amharic for field work purpose and back to English for checking language consistency. Then the questionnaire was pretested on 5% mothers or care givers in under-five OPD of Halaba health canter before three days of actual data collection to see the consistency of contents of the instrument; then correction and modification was done on the gap identified during interview.

Anthropometric measurement equipment's such as weighing Scales, Length/height board and MUAC tape were obtained from respective health institutions and used. Both data collection and supervision was undertaken by five members of principal investigators, who partially completed their post-basic education on public health. Two data collectors were assigned to each under-five year OPD (one interview the mother or care giver and fill the questionnaire while the other was taking anthropometric measurements). The data collection was conducted in private rooms to ensure confidentiality.

2.6. Data Quality Assurance

The data quality was maintained by clearly informing the data collectors' about how to fill the questionnaires and how to take the anthropometric measurements. During data collection and at the end of each day, regular follow up was under taken and the way of filling the questionnaires was reviewed and checked for completeness, accuracy and consistency.

Weighing scales were calibrated with known weight object regularly. The scales indicators were checked against zero reading before weighing every child and the measurement was approximated to the nearest 100 gram. Children were weighed with minimum/light/ clothing and no shoes. Length was measured in recombinant position using sliding board by two data

collectors for children age up to 23 months, However height of children 24 months and above was measured using a vertical wooden height board by placing the child on the measuring board, and child standing upright in the middle of the board. The child's head, shoulders, buttocks and heels touching the board and the readings were taken to the nearest 1 mm.

2.7. Data Processing and Analysis

SPSS version 20.0 statistical software was used for data analysis. National & WHO standards was utilized to convert height and weight measurements into Z-scores of the H/A, W/H and W/A indices considering age and sex of the children. Bivariate and multivariate logistic regression analysis was used to identify determinants of nutritional status and to account for potential confounding factors. Statistical association was declared significant if p-value is less than 0.05.

2.8. Operational Definition

Anthropometry: Is the measurement of the variation of physical dimensions of the human body at different age levels which is used to assess the nutritional status of individuals and population groups

Colostrum depletion: Emptying the first and thickest portion of the breast milk before initiating breast feeding to the new born.

Complimentary food: Foods which are required by the child, at six months of age, in addition to sustained breast feeding.

Diarrhoea: a child having three or more loose or watery stools per day.

Fever: A child with elevated body temperature than normal.

Income: periodic monthly earning from one's business, lands, work, investment, etc.

Latrine condition: The presence or absence of latrine in the household.

Meal pattern: is a set of food components, food items and minimum quantities required for a breakfast, snack, or lunch or supper for specific age group of children

Method of feeding: Utensils used by the mother or care giver for feeing of complimentary food to the children.

PEM: A child was labelled to have PEM if any of the nutritional assessment indices, Wt/age, Ht/age and Wt/Ht is less than normal (Z-score less than -2SDof WHO reference population)

Prelacteal feeding: Any food except breast milk provided to a child before initiating breast feeding

Stunting: height-for-age Z-score less than <−2 SD, from the median of NCHS/WHO reference population.

Underweight: Weight-for-age Z-score less than -2SD, from the median of NCHS/WHO reference population.

Wasting: Weight -for- height Z-score below -2SDfrom the NCHS/WHO median value

2.9. Ethical Considerations

Ethical clearance was obtained from Ethical Review Committee of Hawassa College of Health Sciences. Then officials at different levels in the study area were communicated through letters from the College. Written informed consent was taken from each respondent prior to the interview after the purpose of the study was explained to them. Confidentiality of the information was assured and privacy of the respondents' was maintained. Children's found to have severe malnutrition was linked to inpatient or out-patient therapeutic feeding programs

3. RESULTS

3.1. Socio- Economic and Demographic Characteristics of the Children Involved in the Study

A total of 204 children age <5 years from pediatric OPDs of public health institutions in Yirgalem town took part in this study (which is 94% response rate). From which 96 (47.1%) of children were male and the rest 108 (52.9%) were female. The average age of the children was 22 months (SD±13.4) and the average size of the family was 5 (SD ±1.48).

The average ages of mothers were 22 years with ± 13.4 SD. Majority (75%) of the mothers were housewives and 45.1% of the fathers were farmers. 40.7% of the mothers were illiterate and 33.3 attended only first cycle education (see Figure **1**). The mean monthly income of the household was 1749 birr with ±1467 SD. When we see the study participants 68.6% 0f were Sidama in ethnicity and were protestant

Christianity followers. Majority of the study participants were residing in rural areas.
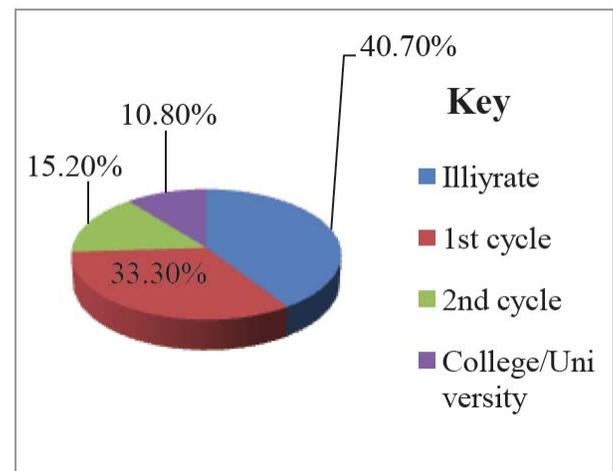

Figure 1: Educational status of the mothers' of children involved in the study at public health institutions of Yirgalem, September, 2017.

3.2. Behavioral and Environmental Characteristics of the Parents of the Children

From the study participants 92.2% have latrine and majority (96%) mothers/care givers wash their hand before feeding their child. 57(27.9%) children eat together with older siblings from which 39(68.4%) were stunted and 15(26.3%) were wasted. Mothers who not use any type of family planning method were 55(27%) and 11(20%) children whose mother was not using FP were wasted and 48(87.3%) were stunted. 96(47.1) mothers responded to use bottle to give complimentary food to their child. Among those who used bottles 15(15.6%) children were wasted and 50(52%) were stunted.

3.3. Child Health and Caring Practices

Regarding the presenting illness, majority (33.4%) of the children participated in our study were presented with the complaint of fever followed by diarrhoea (28.9%) and cough (25%). Among children presented with diarrhoea more than half (51%) were found to have PEM. 37.8% of children with fever and 37.2% of children presented with cough were also found to have PEM.

Children who had at least one episode of diarrhoea within the last two weeks of the study were 63(30.9%) from which 57.1%, 30.1% and 50.7% found to be stunted, wasted and underweight respectively. Only 33.8 % of children were received medication for intestinal worms.

Table 1: **Socio-Economic and Demographic Characteristics of Study Participants at Public Health Institutions of Yirgalem September, 2017, n=204**

Variable	Category	Frequency	Percent
Sex of the children	Male	96	47.1
	Female	108	52.9
Age of the children	< 12 months	59	28.9
	12-23 months	68	33.3
	24-35 months	37	18.1
	36-47 months	22	10.8
	48-59 months	18	8.8
Fathers occupation	Farmer	92	45.1
	Employee	59	28.9
	Merchant	35	17.2
	Other	18	8.8
Mothers occupation	House wife	153	75
	Employee	43	21.1
	Other	7	4
Residence	Rural	108	52.9
	Urban	96	46.6
Religion	Protestant	126	61.8
	Orthodox	60	29.4
	Muslim	18	8.8

Table 2: **Behavioural and Environmental Characteristics of the Study Participants at Public Health Institutions of Yirgalem Town September, 2017, n =204**

| Variable	Category	Frequency	Percent
Wash hand before child feeding	Yes	196	96.1
	No	8	3.9
Child eat together with older siblings	Yes	57	27.9
	No	147	72.1
Mother use FP	Yes	149	73
	No	55	27
Give other food before breast feeding	Yes	30	14.7
	No	173	84.8
What is used to give complimentary food to the child	Bottle	96	47.1
	Spoon	39	19.1
	Cup	68	33
Duration of exclusive breast feeding	<4 months	30	14.7
	4-5 months	76	37.3
	$\geq$ 6 months	98	48
Latrine	Yes	188	92.2
	No	16	78
Water source of the family	Pipe water	56	27.5
	protected well	116	59.6
	Unprotected well	20	9.8
	Spring	12	5.9
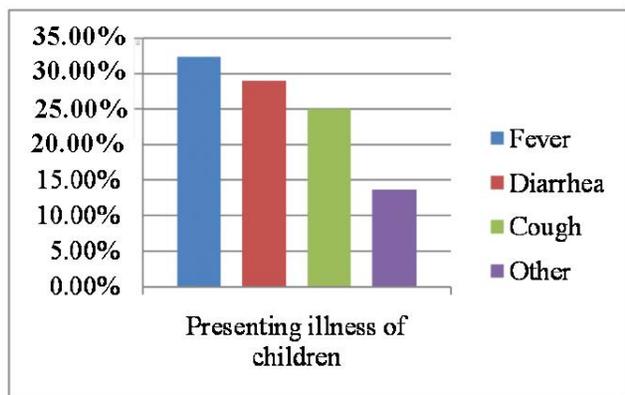
Figure 2: Presenting illness of children in paediatrics OPDs of public health institutions of Yirgalem town September, 2017.

Table 3: Health Condition of Children Participated in this Study at Public Health Institutions of Yirgalem Town September, 2017, n =204

Variable	Category	Frequency	Percent
Presenting illness	Fever	66	32.4
	Diarrhoea	59	28.9
	Cough	51	25
	Other	28	
Diarrhoea in the last two weeks	Yes	63	30.9
	No	14.1	69.1
Deworming in the last 6 months	Yes	69	33.8
	No	135	66.2

3.4. Nutritional Status of the Children

According to our study the prevalence of stunting (Ht/Age below -2 SD) among children visiting under-five OPDs of public health institutions at Yirgalem town was 41.2% of this 20.1% were severely stunted (below -3 SD). 12.7% of children were wasted (Wt/Ht below -2 SD), from which 6.9% were severely wasted (below -3 SD). Underweight prevalence was 25% and from this 11.8% were found to be severely underweight (Wt/age below -3 SD). Almost all (96%) wasted children were also found to have stunting. 13.2% of children were found to be MUAC < 12.5 cm from which 6.4 were MUAC<11 cm and 6(2.9%) children found to have oedema.

3.5. The Prevalence of PEM in Relation to Associated Factors

When we see the age distribution of PEM among study participants, the prevalence of stunting and

wasting were higher among age groups between one to two years of age but the prevalence of wasting is higher in children age less than one year (see Figure **4**).
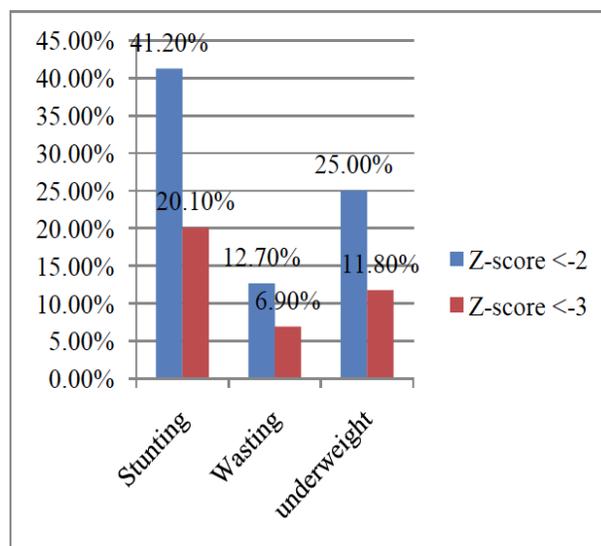

Figure 3: Prevalence of different forms of PEM among children participated in this study in public health institutions of Yirgalem town, South Ethiopia, September, 2017.
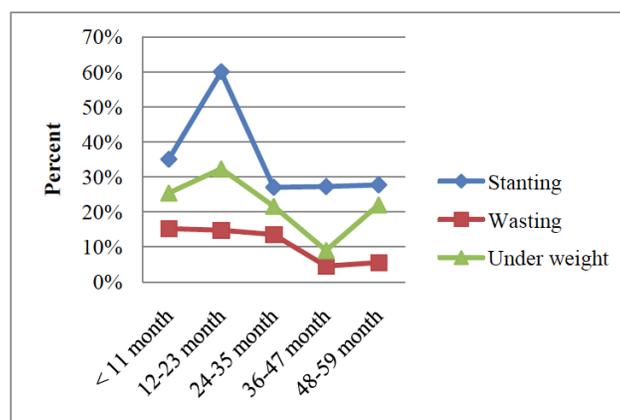

Figure 4: Age distribution of various forms of PEM in children participated in this study in public health institutions of Yirgalem town, South Ethiopia, September, 2017.

The prevalence of PEM in children whose mother was literate is markedly lower compared to illiterate mothers, which is 33% and 56% respectively. Compared to urban residents the prevalence of PEM is higher in rural residents, which is 35% and 49% respectively. This study also reviled an increased prevalence of PEM among children used bottle for complimentary feeding (92%) compared to children not used bottle. The prevalence of PEM in children who fed breast milk exclusively for six month and above was 34% which is lower compared to children started

complimentary feeding before six months which was 93%. The prevalence of PEM among children given other food before breast milk was 66% which is high compared to the prevalence in children not given other food prior to breast milk (45%). The prevalence of PEM among children eat together with older siblings was 70% which is very high compared to children not eat together with older siblings (32%). The prevalence of PEM among children who had at list one episode of diarrhoea in the last two weeks of study was 60% which is very high compared to children not had any episode of diarrhoea (35%).

3.6. Factors Associated with Protein Energy Malnutrition

In order to investigate the association of independent variables with protein energy malnutrition, both bivariate and multivariate logistic regression analysis were used. Those variables showed association with outcome variables at p-value of less than or equal to 0.05 in the bivariate analysis were selected as candidate variables for multivariate logistic regression analysis

3.7. Results of Multivariate Logistic Regression Analysis

The multivariate logistic regression analysis was used by taking all factors that showed association in bivariate logistic regression into account simultaneously. Eight independent variables showed association in bivariate logistic regression and only three contributing factors such as child eating with older siblings, mother not using family planning and exclusive breast feeding remained to be significantly and independently associated with protein energy malnutrition.

Those children whose mother not use family planning were 2.5 times more likely to have protein energy malnutrition as compared to those children whose mother use family planning with [AOR=2.55, 95% CI (1.16, 5.58)] (P-value=0.02). Children eat together with older siblings showed statistically significant association with outcome variable. Those children who eat together with older siblings were 2.4 times more likely to have protein energy malnutrition as compared to those children who does not eat together

Table 4:   Variables Shoed Association in Bivariate Logistic Regression=204

S. No	Variables	P. value	COR	95% confidence interval	
				Lower	Upper
1	Family Size ≥5	0.003	0.413	0.231	0.739
2	Educational status of the Mother	0.001	0.378	0.213	0.673
3	Absence of latrine	0.036	0.308	0.103	0.923
4	Child eating With older Siblings	0.000	0.200	0.103	0.388
5	Mother not use FP	0.000	0.246	0.127	0.476
6	Exclusive BF for less than 6 months	0.000	0.037	0.008	0.159
7	Giving other Food Before BF	0.005	0.313	0.138	0.710
8	Diarrhoea in the last two weeks	0.001	0.350	0.190	0.646

Table 5:   Result for Multivariate Logistic Regression Analysis, n =204

Variable entered	P.V		AOR	95% C.I. for EXP(B)
			Lower	Upper
Family Size ≥5	.348	1.393	.697	2.783
Educational status of the Mother	.121	1.731	.865	3.465
Absence of latrine	.509	1.574	.410	6.049
Child eating With older Siblings	.036	2.376	1.058	5.334
Mother not use FP	.020	2.546	1.160	5.589
Exclusive BF for less than 6 months	.002	5.275	3.161	20.083
Giving other Food Before BF	.290	1.772	.614	5.117
Diarrhoea in the last two weeks	.545	.787	.363	1.707

with older siblings with [AOR=5.33, 95%CI (1.06, 5.33)] (p-value 0.036). Duration of exclusive breast feeding was showed statistically significant association with protein energy malnutrition. Children who did not exclusively fed breast milk for at least six months were 5 times more likely to have protein energy malnutrition as compared to those children who exclusively fed breast milk for six months and above with [AOR=5.27, 95% CI (3.16,20.08)] (p-value=0.002).

4. DISCUSSION AND CONCLUSION

As this study showed, the prevalence of stunting, wasting and under- weight was 41.6%, 12.7% and 25% respectively which is much higher compared to Ethiopia demographic health survey report of 2016 which reported 38% stunting 10% of wasting and 24% underweight [8]. The prevalence of wasting and under-weight was also higher compared to community based cross sectional study conducted at Haramaya district which observed 10.7% wasting and 21% under-weight, respect [10]. When we see the study done at Amhara Regional State, the prevalence of stunting and underweight were found to be 52%, and 33.4%, respectively which is much higher compared to our result [11]. This might be due to difference in study design and study area.

According to this study PEM was more common in children age less than two years (73%), compared to 2-5 years age group (54%), but the association between age and PEM was not statistically significant. This finding is contradicting with study done in Bangladesh, which found-out an increased risk of malnutrition as the age of the child increases [12]. This might be due to difference in study design.

Duration of exclusive breast feeding was showed statistically significant association with protein energy malnutrition. Children who feedbreast milk exclusively for less than six months were 5 times more likely to have protein energy malnutrition as compared to those children who exclusively fed breast milk for six months and above with [AOR=5.27, 95% CI (3.16,20.08)] (p-value=0.002). Similar study conducted in India was also showed statistically significant association between exclusive breast feeding and PEM with (p.v=0.007) [13].

As shown in the result of this study, those children whose mother not use family planning were 2.5 times more likely to have protein energy malnutrition as compared to those children whose mother use family planning with [AOR=2.55, 95% CI (1.16, 5.58)] (P-value=0.02). This finding is in consistent with study conducted in Northern Shewa, Oromia Region [14].

Children eat together with older siblings showed statistically significant association with outcome variable. Those children who eat together with older siblings were 2.4 times more likely to have protein energy malnutrition as compared to those children who does not eat together with older siblings with [AOR=5.02, 95%CI (1.06, 5.33)] (p-value 0.036). This finding is in consistent with similar study conducted in India which observed statistically significant associating with (p.v 0.003) [13].

The prevalence of PEM among children whose mother was literate is markedly lower compared to children of illiterate mothers, which is 33% and 56% respectively. But statistically significant association was not observed. This finding is consistent with similar study done in Bangladesh [12]. This is because educated mothers are more conscious about their children's health; and they tend to look after their children in better way [14].

This study revealed that place of residence makes a great difference in the prevalence of PEM. Compared to urban residents the prevalence of PEM was higher in rural residents, which was 35% and 49% respectively which is consistent with study conducted in Zambia [15].

The prevalence of PEM among children how had at list one episode of diarrhea in the last two weeks was 60% which is very high compared to children not had any episode of diarrhoea(35%). This might be because diarrhea causes dehydration and loss of appetite which is followed by decreased food intake and then malnutrition. And this finding was in agreement with the study conducted in North Gondar and Machakal woreda Northwest Ethiopia [16, 17].

This study revealed that the prevalence of stunting, wasting and under-weight were higher among under – five children at paediatrics OPDs of public health institutions of Yirgalem town. Thus children are at a higher risk of under nutrition related morbidity and mortality. The prevalence statistics in this study were higher than the regional and national figures of Ethiopia Demographic health survey 2016 national report. According to investigation of association of independent variables with dependent variable in multivariate analysis, eating with older siblings, family

planning use by mothers and exclusive breast feeding showed a significant association with dependent variable. Further progress in under nutrition prevention can be achieved by specifically targeting children at their early age and conducting tailored public education to improve the nutritional status of the study subjects.

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