Original Research Article

PREVALENCE OF UNDERNUTRITION AND ITS ASSOCIATED FACTORS AMONG UNDER-FIVE CHILDREN IN GONDAR CITY, NORTHWEST ETHIOPIA 2014.

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Abstract: Introduction: - Malnutrition specifically under-nutrition is still devastating public problem in developing countries particularly in Sub-Saharan Africa including Ethiopia.

Objective: -To assess the prevalence and associated factors of under-nutrition among under-five children in Gondar city, Northwest Ethiopia, 2014.

Method:- Community based cross-sectional study was conducted from March to April 2014. Multistage sampling technique was used. Data was collected using pre-tested interview based questionnaire and standardized anthropometric equipment. Data was entered into Epi-info version 3.5.1 and transported to SPSS version 20 software package for analysis. Bivariate and multivariate logistic regressions were used to identify factors associated with Under-nutrition among under-five children.

Result:-This study showed that, 47%, 17.7% and 7.7 % of under-five children had stunting, underweight and wasting problem respectively. The main contributing factors of under-nutrition were found to be; monthly income of families (AOR=4.46; 95%CI: 1.43-13.87), birth order of under five children (AOR=2.02, 95% CI: 1.06- 7.70), sex of children (AOR=2.02; 95% CI: 1.06- 7.70) and maternal educational status (AOR=1.97; 95% CI: 1.15- 3.35).

Conclusion: - Prevalence of under-nutrition was found to be high and maternal educational status, monthly incomes of the family and birth order of under-five children were found to be important factors of under-nutrition among under-five children.

Key words: Under-nutrition, Malnutrition, Underweight, wasting, stunting, Gondar city, Ethiopia.

Introduction: Under-nutrition is state of inadequacy in macro and micronutrients, which result in significant negative effects on human body structures and function causing particular physical and clinical outcomes[1]. It is a nutritional status of children when weight for age (WAZ), length/height for age(L/HAZ) and weight for length/height(WL/HZ) or Middle upper Arm circumferences for age (MUACAZ) indices are below-2 Z-score of WHO standard

reference[2]. Under-nutrition has great impact on health, wellbeing and productivity of community at large and managing this problem is very critical to achieve all millennium Development Goals(MDG) , particularly MDG1, MDG4, and MDG5[3].

Worldwide in 2010, 27% (171 million) of children younger than 5 years were estimated to be stunted, 16% (104 million) were underweight, and 9% (55.5 million) wasted[4]. Poor nutrition is an underline cause of more than 2.6 million children deaths every year, a third of total children death[5].In the year 2011, 6.9 million under-five children loss their live and one third of them have raised susceptibility to illnesses because of under-nutrition[6].

In developing world including Ethiopia, it is responsible for nearly 3.5 million deaths (54% of under-five mortality[7]. Thirty-five percent of disease burden in this age categories, and eleven percent of the total global disability adjusted life years lost (DALYs) was accounted due to under-nutrition[8].In Ethiopia even though there is some success in reduction of prevalence of under-nutrition or poor nutritional status among under-five children, still there is high prevalence of under-nutrition in this country. Ethiopian Demographic Health Survey of 2011 (EDHS 2011) showed that prevalence of stunting, underweight and wasting among under-five children were 44.4%, 28.7% and 10% respectively[9]. Moreover Under-nutrition is an important contributing factors for the death of many children, 51% of all deaths which occurs before age of five in Ethiopia was related to under-nutrition[10]. Regardless of this, there was no evidence that showed level of under-nutrition and its associated factors. Therefore this study had identified the prevalence of under-nutrition and its associated factors in Gondar city northwest Ethiopia. Moreover findings of this study had an important input for national and regional policy maker.

Methods and Materials:
Study Design.
Community based quantitative cross-sectional study was conducted.

Study Setting and Period: The study was conducted from March to April 2014 in Gondar city. Gondar city is one of ancient city in Ethiopia. It is in North of Tana Lake on the lesser Angereb River and southwest of the Semien Mountain. It has a Latitude and Longitude of $12^0$36'N $37^0$28'E with an elevation 2133 meters above sea level. And located 727 km Northwest from Addis Ababa a capital city of Ethiopia. Administratively the city has 24 kebeles. According to the Bureau of Finance and Economic Development (BoFED) report Gondar city had 62,316 House Holds (HHs) with an estimated population of 267,959 and 36,174 (13.499%) under five children[11].

Source and Study Population: The source populations were all under-five children living in Gondar city, and whereas study populations were all under-five children living in randomly selected six kebeles in Gondar city during the study period.

Study Subjects: The study subject was every under-five child who was randomly selected from households (HHs) during the study period.

Inclusion Criteria: The inclusion criteria of study participants were children aged 0-59 months who live in Gondar city.

Exclusion Criteria: Under-five children who had physical deformity (the kind of deformity that will make height measuring difficult, but it doesn't mean that babies having deformed finger or deformity of other organ or tissue)

Sample Size Determination: Sample size (n) was estimated by using single population proportion formula with consideration of 95% confidences interval (CI), 5% marginal error(d) and contingency of 5% for none responses rate. The study done in Ethiopia, West Gojam Zone Amhara region, on magnitude and determinates of stunting among under five children revealed that the prevalence of stunting, wasting and under-weight were found to be 43%, 15% and 49% respectively[12].

Prevalence	CI	Marginal error(d)	Sample size (n)= $\frac{Z^2 p(1-q)}{d^2}$
Stunting (P)= 0.43	95%	5%	$n_s = \frac{1.96^2 * 0.43(0.57)}{0.05^2} = 377$
Wasting (P)=0.15	95%	5%	$n_w = \frac{1.96^2 * 0.15(0.85)}{0.05^2} = 196$
Under-weight (P)=0.49	95%	5%	$n_{uw} = \frac{1.96^2 * 0.49(0.51)}{0.05^2} = 384$

Because proportion for under-weight provided the largest sample size which was 384 By adding contingency of 5% for non-response rate and considering design effect of two, total sample size (n) required for this study was found to be 806 under-five children.

Sampling Procedures: Multistage sampling technique was applied. First a total of six kebeles were selected from 24 keblels by using simple random sampling method (SRS). The study subjects were allocated to selected kebeles by proportional allocation based on population of under-five children of each selected kebele.

Total number under- five children and Households (HHs) in six selected kebeles were about 11,837 and 20,390 HHS respectively. An average number of under-five children per HHs were calculated as 11,837/20,390≈0.6 and a number of HHs need to be visited was calculated by using an average number of under-five children in selected kebeles (806/0.6≈1,343 HHs). Then by Systematic random sampling method with k-value of 15 (20,390/1343≈15) study participants were selected from households of each selected kebele. The first HH was selected within the sampling interval of (1-15) by drawing random number. Then the sample was taken every 15 house. For Households with more than one under five children, one child was selected by lottery method.

Variables Of Study
Dependent variable
Under-nutrition of under-five children
Independent variables
Socio-demographic characters: - (age and sex of child, birth order and interval of child, maternal educational status, paternal educational status, family size).

Socio-economic characters: - (Family income).
Environmental factor: - (place of residences, sources of drink water, toilet utilization types of households)
Health related factors: - (child illness, maternal health status, ANC utilization, child immunization status).
Dietary factors: - (child feeding practices, Exclusive breast feeding, and complementary feeding)
Operational Definition
Nutritional status:-is expressed by physical state of under- five children's weight, height and MUAC.
Under-nutrition: -is refers to nutritional status of under-five children which is expressed as stunting, wasting and under-weight.
Wasting: - is the state of under-five children whose Weight for height/length Or MUAC for age less than -2 Z-Score of international median of WHO reference values.
Stunting: -is the state of under-five children whose Height/length for age less than -2 Z-score of international median of WHO reference values.
Underweight: - is the state of under-five children whose weight for age less than -2 Z-score of international median of WHO reference values.
Anthropometry: Measurement of the variation of physical dimensions and the gross composition of under-five children at different age levels and degrees of nutrition by weight-for-age, height/length-for-age, weight-for-height/length and MUAC for Age.

Fully vaccinated: - Under-five children who complete all vaccines based on expanded program of immunization schedule (under-five children who take BCG, OPV0, OPV1, OPV2, DPT-HepB-Hib1, DPT-HepB-Hib2, and DPT-HepB-Hib3 and measles vaccine)

Data Collection Procedures: To collect quantitative data on variables related to socio-demographic, children and maternal characteristics, Dietary factors, Health and environmental related factors of participants, we adopted pre-tested interview based structured questionnaire from similar study. Mothers or care givers of under-five children were interviewed to give answer for questions except anthropometric measurements. All the interviews and measurements were conducted at the residences of the study participants.

Data was collected by six Diploma nurses who had previous experiences on the same activity. For data collectors two day intensive training was given on the content of questionnaire and general approach of data collection. Prior to interviewing and measuring anthropometric measurements, Verbal informed consent was obtained from each child's Mother or care giver. Anthropometric measurements of children aged 0-59 months were measured by using standard equipment and procedure. Weight of children was measured with minimum clothing and no shoes by using UNICEF's SECA portable digital scale with a capacity of 150 KG to the nearest of 0.1kg. Measurement of Height /Length was taken in a lying position with wooden board for children of less than 24 months age (below 85 cm) and for children aged 24 months and above, stature was measured in standing position to the nearest of **0. 1cm**. The ages of children were obtained from birth card or Mother/care giver of under-five child was questioned to ascertain age of child using detail seasonal calendar.

MUAC was measured for children aged six months and above on left mid-upper arm to the nearest of 1mm.

Bilateral edema was considered being an indicator of sever acute malnutrition (kwashiorkor). In order to determine the presence of edema, normal thumb pressure was applied to both feet for three seconds and identified whether a shallow print or pint remains on both feet when the thumb was lifted. To identify retrospective morbidity of children, mothers were asked about any occurrence of illness within the last one year for two/more episodes and any illness during the past two weeks. Vaccination status of children were checked by observing immunization card and if not available mothers were asked to recall it. BCG vaccination was checked by observing scar on right (also left) arm.

Data Quality Control: Questionnaire was prepared in English and translated into Amharic language by independent translator for a purpose of field work and back to English language for analysis. Weight scales was calibrated with known weight object regularly and scale indicators were checked against Zero reading after weighing every child and Height of children was measured by two individuals. Data collectors were given two days intensive training and data was collected with supervision. Pre-test was carried at different study area on 40(5%) randomly selected under-five children to check for quality of data collection tools .Daily collected data was reviewed and possible errors were returned to data collectors for correction.

Data Processing and Analysis:

First data were checked for completeness and consistence. Then it was coded and entered into a computer using EPi-info3.5.1software and with WHO Anthro version 3.2.2 program nutritional data were converted into Z-score of indices; WAZ, HAZ , WH/LZ and MUACAZ taking age and sex into considerations and by using standard set of WHO reference population. Children, whose WAZ, HAZ, WH/LZ and / or MUACAZ below -2 Z-score were considered as underweighted, stunted and wasted respectively. Then data was transported to SPSS version 20 for analysis. After clearing data for internal consistency, descriptive statistics such as frequencies, proportions, Graph and table were used to present the results. The Analysis was carried out at two levels. Bivariate and multivariate logistic regressions were used to identify factors which were

significantly associated with under-nutrition of under-five children. Significance of association was determined based on P-value less than 0.05, AOR and 95%CI for the explanatory variables.

Ethical Consideration: Ethical clearance was obtained from Ethical Review committee of University of Gondar, College of Medicine and Health sciences, Department of Nursing. Formal letter was sent to Gondar city Administrative Health offices and Kebeles administrative offices to get their co-operation. The interviewers had explained the Objective, benefit and risk of the study to get consent from parents of study participants prior to data collection. Two children with mild under-nutrition (MUAC=11.5cm or yellow) were referred to nearby health facilities and health/nutritional advice was also given to parents/care giver. The respondents were also told as they have the right to refuse or with draw from the study at any time without any form of prejudice were made. The study participants were informed about their confidentiality and information they give was not used for any other purpose than study and it did not contain their names and a child's name or any identifications which refers to them.

Result: Socio-demographic characteristics

A total of 796 study subjects were included in the analysis with 99% of response rate. Of total Households 603 (75.8%) were male headed and 704 (88.4%) of mothers were married. About 760(95.5%) and 736(92.5%) were Amhara Ethnic groups and Orthodox Christian respectively (Table1).

Table 1: Socio-demographic characteristics of under-five children families in gondar city, north west ethiopia, march to april2014.

Variables	Frequency (N=796)	Percent (%)
Head of Households		
Male	603	75.8
Female	193	24.2
Ethnicity		
Amhara	760	95.5
Tigre	31	3.9
Others[a]	5	0.6
Religion of mothers		
Orthodox	736	92.5
Muslim	42	5.3
Others[b]	18	2.3
Number of under-five children in HHS		
One child	706	88.7
Two or more children	90	11.3
Total number of family size		
2-4	462	58.0
≥5	334	42.0
Marital status of mothers		
Married	704	88.4
separated/divorced/Widowed/single	92	11.6
Maternal Educational status		
Had no formal education	315	39.6
Had formal education	481	60.4
Maternal occupation		
House wife	492	61.8
Merchant/trading	107	13.4
Government employed	59	7.4
Private employed	38	4.8
Daily laborer	74	9.3
Others[c]	26	3.3
Educational status of father		

Had no formal education	172	24.2
Had formal education	540	75.8
Occupation of Father		
Farmer	171	24.0
Merchant/trading	151	21.2
Government employed	109	15.3
Private employed	70	9.8
Daily laborer	163	22.9
Others[d]	48	6.7
Monthly income of family		
<500	20	2.5
500-2500	583	73.2
>2500	193	24.2

a-Israel,Gurage, b- Bethaisreal,Protestants and Catholics.c-students, CSW,farmers.d-drivers, popes, tailor, students.

Prevalence of under nutrition

The current study showed that the prevalence of stunting 47%, underweight 17.7% and wasting 7.7%. (Figure 1)
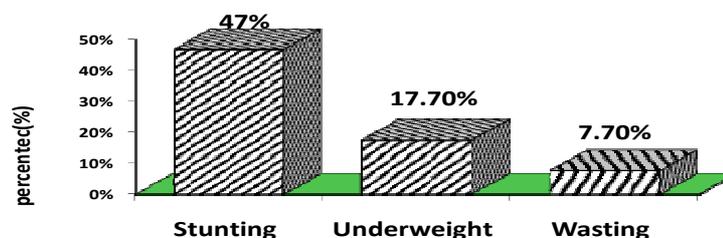

Figure 1: Prevalence of under-nutrition among under-five children in Gondar city Northwest Ethiopia, MARCH to April 2014.

Prevalence of under nutrition comparing with sex

We compared the prevalence of under nutrition with respect to sex of the child; slightly higher prevalence was detected among males as compared to female child in all of the three catagories. (Figure 2)
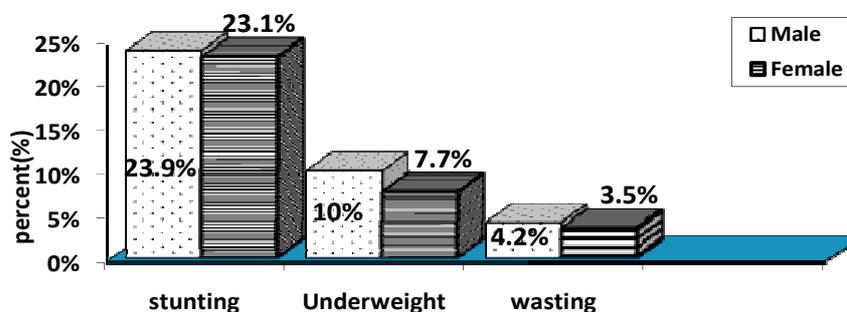

Figure 2: Distribution of Under- nutrition among under-five children by sex in Gondar city Northwest Ethiopia, March to April 2014.

Prevalence of under nutrition comparing with child age

The current study also compared the prevalence of under nutrition (stunting, under weight and wasting) with respect to the child age; highest prevalence of stunting (15.1%) and under weight (6.5%) was detected in the age group of 25-36 months old child, where as the highest prevalence of wasting (3%) was also detected among age group of 37-59 months old child. (Figure 3)
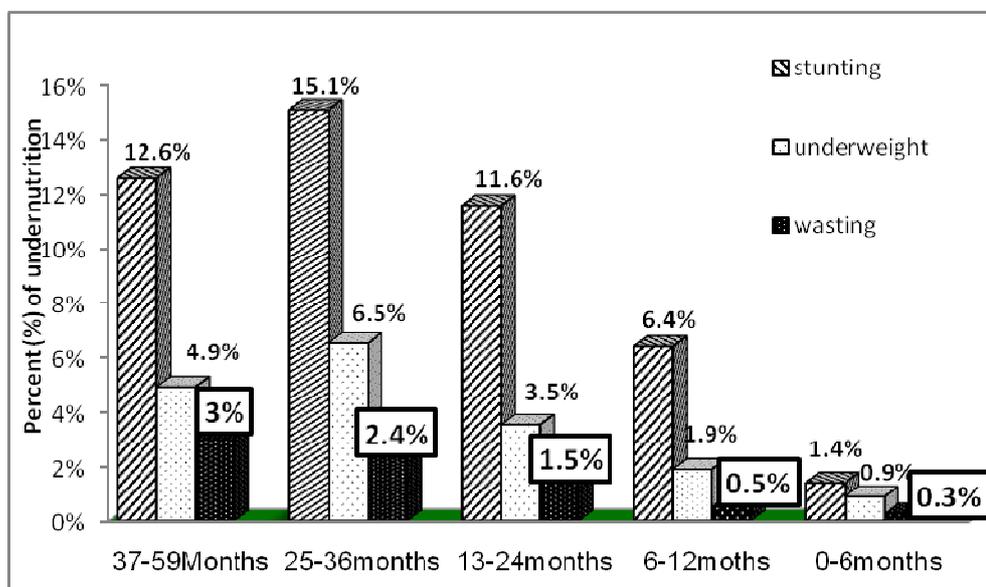

Figure 3: Distribution of Under-nutrition among under-five children by age in Gondar city Northwest Ethiopia, MARCH to April 2014

Factors Associated With Under-Nutrition: In multivariate Logistic regression analysis monthly income of HHS [AOR=4.46; 95% CI: 1.4-13.9), birth order of children (AOR=2.02; 95% CI: 1.1-7.7) and maternal educational status (AOR=1.97; 95% CI: 1.2-3.4) were significantly associated with stunting, underweight and wasting respectively (Table 2, 3 & 4).

Table 2: Bivariate and multivariate logistic regression analysis showing selected factors associated with stunting among under-five children in Gondar city north west Ethiopia, March to April2014.

Explanatory variables	*Stunting*		COR (95% C.I)	AOR (95% C.I.)
	No	Yes		
Head of family				
Female	106	87	1	1
Male	316	287	1.11(0.8,1.52)	0.79(0.56,1.12)
Maternal educational status				
Have formal education	258	223	1	1
Have no formal education	164	151	1.06 (0.81,1.42)	1.04(0.78,1.39)
Maternal occupation				
House wife	261	231	1	1
Merchant/trading	68	39	**0.65(0.42, 0.99)***	0.68(0.43, 1.06)
Government employed	28	31	1.25(0.73, 2.15)	1.31(0.74, 2.31)
Private employed	21	17	0.92(0.47,1.78)	0.97(0.49, 1.91)
Daily laborer	33	41	1.4(0.86, 2.3)	1.35(0.8, 2.25)
Others[a]	11	15	1.64(0.7, 3.42)	0.68(0.63, 3.43)
Father educational status				

Have formal education	297	243	1	1
Have no formal education	82	90	1.3(0.95,1.9)	0.86(0.62,1.18)
Occupation of father				
Farmer	98	73	1	1
Merchant/trading	97	54	0.75 (0.48, 1.17)	0.72 (0.36, 1.41)
Government employed	55	54	1.32 (0.81, 2.14)	1.28 (0.63, 2.59)
Private employed	39	31	1.07 (0.61,1.87)	1.02 (0.47, 2.20)
Daily laborer	67	96	**1.92 (1.25, 2.97)***	1.66 (0.88, 3.12)
Others[b]	23	25	1.46 (0.77, 2.77)	1.314 (0.59, 2.94)
Monthly income of HHs				
≥500ETB	418	358	1	1
<500ETB	4	16	**4.67 (1.55,14.1)**	**4.46(1.43,13.87)****

a- students, arts, farmers, b- Farmers, drivers, Students popes, tailors *-significant at P-value <0.05, **significant at p-value <0.001

Table 3: Bivariate and multivariate logistic regression analysis showing selected factors associated with Underweight among under-five children in Gondar city Northwest Ethiopia, March to April 2014.

Explanatory variables	UNDERWEIGHT		COR(95% CI)	AOR [96% CI]
	No	Yes		
Age of children in months				
0-12months	123	22	1	1
13-24months	152	28	1.03 (0.56, 1.89)	0.31 (0.08, 1.3)
25-36months	163	52	**1.78 (1.03, 3.09)***	0.97 (0.32, 2.88)
37-59 months	217	39	1.01(0.57, 1.77)	0.82 (0.28, 2.37)
Vitamin A supplementation				
Yes	587	122	1	1
No	46	12	1.26 (0.65,2.44)	0.66 (0.17, 2.48)
Sex of children				
Female	327	61	1	1
Male	328	80	1.31(0.91,1.9)	**2.23 (1.06, 4.70)***
Birth order of children				
First	283	55	1	1
Second	142	30	1.09 (0.67, 1.77)	1.11 (0.67, 1.84)
Third	86	31	**1.86(1.12, 3.06)**	**2.02 (1.06, 7.70)**[*]
Fourth or more	144	25	0.9(0.54, 1.49)	0.8(0.53,1.52)
Birth interval of children				
<2 years	12	3	1	1
2-3 years	187	51	1.09(0.20, 4.01)	1.48 (0.25, 8.81)
≥4years	170	32	0.75(0.29, 2.82)	1.22 (0.55, 2.68)
planed and wanted birth				
Yes	497	98	1	1
No	158	43	1.38 (0.93,2.06)	0.56 (0.25, 1.25)
Any disease within the last two weeks				
No	552	122	1	1
Yes	103	19	0.84(0.49, 1.41)	0.42(0.10, 1.70)
Diarrhea with last two weeks				
No	91	17	1	1
Yes	564	124	1.18(0.68,2.05)	0.94(0.23, 3.89)

* Significant at p-value <0.05, **significant at p-value <0.01

table 4: bivariate and multivariate logistic regression analysis showing selected factors associated with wasting among under-five children in Gondar city northwest Ethiopia, march to April 2014.

Explanatory variables	Wasting		COR (95% C.I)	AOR (95% C.I.)
	No	Yes		
Maternal educational status				
Had formal education	454	27	1	1
Not had formal education	281	34	**2.04 (1.20,3.45)***	**1.97 (1.15, 3.35)***
Maternal occupation				
House wife	459	33	1	1
Merchant/trading	101	6	0.82(0.42, 2.70)	0.29 (0.53, 1.56)
Government employed	57	2	0.49(0.11, 2.13)	0.96(0.21, 4.4)
Private employed	36	2	0.77 (0.07, 8.37))	1.05(0.23, 4.72)
Daily laborer	58	16	**3.84(1.99, 7.60)***	0.53(0.06, 4.94)
Others[a]	24	2	1.16(0.29, 5.92)	1.54 (0.25, 9.40)
Father educational status				
Had formal education	509	31	1	1
Not had formal education	152	20	**2.16 (1.19,3.90)***	1.69(0.89,3.22)
paternal Occupation				
Farmer	151	20	1	1
Merchant/trading	144	7	**0.37(0.15, 0.89)***	0.48(0.18, 1.25)
Government employed	105	4	**0.29(0.09, 0.87)***	0.33(0.11, 1.00)
Private employed	66	4	0.46(0.15, 1.39)	0.47(0.15, 1.43)
Daily laborer	152	11	0.55(0.25, 1.18)	0.53(0.24, 1.16)
Others[b]	43	5	0.88(0.31, 2.48)	0.88(0.31, 2.50)
Monthly income of HHs				
≥500ETB	719	57	1	1
<500ETB	16	4	**3.15 (1.02,9.75)***	1.71 (0.19,14.92)

a- students, arts, farmers. b- Farmers, drivers, Students, popes, tailor**.** *-significant at P-value <0.05

Discussion

The level of stunting, underweight and wasting were 47%, 17.7% and 7.7% respectively.

This study showed that lower prevalence of under-nutrition as compared to study report from India [13, 14]. This variation might be due to a difference in healthy policy, under-five children care practices, study area or geographical differences and study period as compared to current study.

prevalence of stunting (47%) and wasting (7%) were comparatively consistent with research report from Siaya western Kenya [15].However current study showed that prevalence of underweight(17.7%) and wasting(7.7%) were lower than the research report from Nigeria Kwara state [16]. The main reason for this difference might be health policy, study area` and socio-economic status as compared to prior study which was conducted on poorest community in Nigeria with regard of undernourishments and income poverty as compared to the current study.

The prevalence of stunting in this study was consistent with the study report from Ethiopia, North shewa zone, Oromia region (47.6%), but prevalence of underweight(30.9%) and wasting(16.8%) were lower than this report[17]. A possible reason for this discrepancy might be related to seasonal change, that means there are times where the prevalence of malnutrition is high or low. For instance in rainy season of Ethiopia the prevalence of under nutrition is relatively high as compared to the seasons where the crop production is really begins.

The finding of this study was contradicted with report from Ethiopia, west Gojam zone, Amhara region which showed that level of stunting,

underweight and wasting were 43.2%, 49.2% and 14.8% respectively [12]. As it was shown in this study chronic under-nutrition (stunting) (47%) was higher than previous finding whereas acute under-nutrition (7.7%) and underweight (17.7%) were much lower than prior finding. This difference might be due to improvements in health care delivery serves, role of health extension worker and study period as compared to the previous finding.

The finding of this study also revealed that level of under-nutrition rise as the age of children increase and male children had experienced slightly more under-nutrition than female children. This finding was in line with previous study done in India Maharashtra state and Ethiopia North shewa zone Oromia region. Main reason of an increase in level of under-nutrition among under-five children as their age increase might be related to an increase of their nutritional need and reduction of breast milk nutritional value. But a cause of difference of under-nutrition by sex is not well established; however there was an opinion that said boys are more influenced by environmental stress than girls.

The prevalence of stunting was slightly higher than EDHS 2011 national reports (44%), but the prevalence of underweight (29%) and wasting (10%) were lower than this report. This variation might be related to health extension program impose some change on maternal health service utilization, Improvement of Ethiopian health policy, improvement of under-five children feeding and care practices in the study area [18].

This study revealed that, under-five children of families/HHS with monthly income of less than 500 ET Birr were 4.7 times more likely to develop stunting than the comparative group. This finding is supported with other study from India Tribal and Ethiopia North shewa zone Oromia region which showed that monthly income of HHS was significantly associated with stunting[13,19].Monthly income of HHs is an indicator of socio-economic developments that affect food purchasing capacity of families in kind and amounts, increase risk of inadequate personal and environmental hygiene, reduces

health care services utilization and cause HHs food insecurity, thus increase risk of under-nutrition.

The finding of this study also indicated that, male under-five children were 2.23 times more likely to experiences underweight as compared to Female children. This finding is consistent with what was reported from Indian Maharashtra state and Nigeria Kwara state, which showed being female is protective [14,16]. The cause of this difference was not well established, but there was opinion that said boys are more influenced by environmental stress than girls[20]. And children with birth order of third were 2.02 times more likely to develop underweight as compared to children with birth order of first. This finding was supported by report from Bangladesh[21,22]. The more number of children in the households the more sharing of problems among sibling and the less care of children in the family.

Children of mothers with no formal education were 1.97 times more likely to experiences wasting as compared to children of mothers with formal education. This was supported by study from Nigeria kwara state and Rural Bangladesh[16,23]. Maternal education is very important for improvement of child care practices; by increasing an awareness about appropriate child feeding practices, moreover educated mothers can understand a good child care practice by reading and from other source of information on care of under-five children and they are also better in awareness of health care services utilization. Hence reduce risk of under-nutrition among under-five children.

Limitation of Study

Independent variables such as households' food security, maternal condition like body mass index and weight of mothers were not included in this study.

Study design (cross-sectional) which determine exposure and out come at the same time, and cannot measure the cause and effect relationship.

Conclusion

This study revealed that, the prevalence of under-nutrition is high and it is the top list

health problem of under-five children in Gondar city.

Generally after controlling for effect of other variables, maternal educational status, monthly income of households/families and birth order of children were significantly associated with under-nutrition of under-five children.

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