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Magnitude and factors associated with malnutrition in children 6–59 months of age in Shinille Woreda, Ethiopian Somali regional state: a cross-sectional study

Abdibari Ma'alin[1], Dereje Birhanu[2], Samuel Melaku[3], Daniel Tolossa[4*], Yusuf Mohammed[5] and Kiros Gebremicheal[1]

Abstract

Background: Malnutrition among children remains common in many parts of the world, particularly in developing countries. In Ethiopia, it is one of the most important health and welfare problems among infants and young children. Ethiopian Somali regional state is one of the most underserved regions in terms of access to essential services and characterized by a high level of child malnutrition, food insecurity, and vulnerable livelihoods. Therefore, the current study was undertaken to assess the magnitude and factors associated with malnutrition among children aged 6–59 months in Shinille Woreda, Ethiopian Somali regional state.

Methods: Community-based cross-sectional survey, involving 694 study participants selected by multistage sampling technique, was conducted in Shinile Woreda from February to March, 2014. Data were collected using structured questionnaire and anthropometric measurement. Anthropometric indices were calculated using ENA for SMART software 2011, and SPSS V.16 was used for data analysis. Associations were computed using the OR and 95 % CI. P-value less than 0.05 were considered as statistically significant.

Results: The overall prevalence of stunting, underweight and wasting were 33.4 %, 24.5 % and 20 %, respectively. The main associated factors of stunting and wasting were family size, child's sex and monthly income of the households. Immunization status was the only variable associated with all forms of malnutrition. Non-immunized children were 2.5 times more likely become underweight than their counterparts. The prevalence of stunting was 3. 8 times higher in households with large family size. Female children were 1.5 times more likely become wasted than their counterparts.

Conclusion: Prevalence of malnutrition among under five children in Shinile Woreda is still high. Our finding highlighted the importance of childhood vaccination, family planning and poverty alleviation as potential targets for intervention.

Keywords: Malnutrition, Shinille Woreda, Ethiopia

* Correspondence: danieltolossa@yahoo.com
[4]Department of Medical Laboratory Technology, Jig-jiga Health Science College, Jig-jiga, Ethiopia
Full list of author information is available at the end of the article

Ma'alin *et al. BMC Nutrition* (2016) 2:44

Page 2 of 12

Background

Malnutrition among children remains common in many parts of the world [1]. It is the underlying cause of death in an estimated 45 % of all deaths among children under 5 years of age [2]. The prevalence of worldwide stunting, underweight and wasting in children under 5 years of age were 24.7 %, 15.1 % and 7.8 %, respectively [3]. Malnutrition is particularly prevalent in developing countries [4]. For example, in Africa, chronic malnutrition affected about 39.9 % of children in the same age group [3]. In South-East Asia, the prevalence rate of underweight was estimated to be at around 26.6 % [3].

The effects of malnutrition on human performance, health and survival have been the subject of extensive research for several decades [5, 6]. In the long term, early nutritional deficits are linked to impairments of intellectual performance; work capacity, reproductive outcomes and overall health during adolescence and adulthood [6–11]. The immediate consequences of poor nutrition during the early formative years include significant morbidity and mortality and delayed mental and motor developments [11]. Malnutrition at the early stages of life can lower child resistance to infections [12]. Moreover, the potential negative impact of child malnutrition goes beyond the individual, affecting society and future generations [13, 14].

Several factors which are associated with malnutrition have been identified, including poor breastfeeding and child feeding practices [15–18], lack of access to enough nutritious food [19], low levels of parental education [20–22] and belonging to the low-income group [23–25]. In addition, lack of access to health services [19, 22] and poor follow up of antenatal services [15] were also recognized as a key determinant of child malnutrition. Furthermore, nutritional status is clearly compromised by diseases [26], such as HIV-infection [27], parasitic infection (e.g. giardia) [28], diarrhea and other illness (including fever, cough, common cold, pneumonia, ear infection, and/or skin diseases) [16, 22, 29, 30].

In Ethiopia, child malnutrition rate is one of the most serious public health and welfare problems for many years (Fig. 1) [31–33]. Currently, Ethiopia is responding to an El Niño-caused drought emergency that has driven food insecurity, malnutrition and water shortages in affected areas of the country. Sitti Zone of the Ethiopian Somali Regional State (ESRS) is one of the highly impacted areas with more than 400,000 people exposed to shortage of food and water. The drought has also resulted in loss of livestock and hence livelihoods that are already vulnerable have been stretched further. To mitigate the problem of child malnutrition, micro level studies on its cause and status of prevalence are needed. Therefore, this study was conducted in Shinile Woreda, the largest of seven Woredas in Sitti Zone, to assess the status of malnutrition and its associated risk factors among children aged 6 to 59 months.

Methods

Study area

The current study was conducted in Shinile Woreda, ESRS, between February and March, 2014. The ESRS is one of the nine regional states that constitute the federal democratic republic of Ethiopia [34]. Geographically, the region occupies a large area and falls in the eastern and southeastern part of the country with land mass area of about 350,000 km^2 and an estimated total population of 4,445,219 people [34]. 86.1 % of the population resides in rural areas while only 13.9 % reside in urban areas [34]. Shinille Woreda has a latitude and longitude of 09° 41′N and 41°51′E with an elevation of 1079 m above sea level. Based on figures published by the Central Statistical Agency, the Woreda has an estimated total
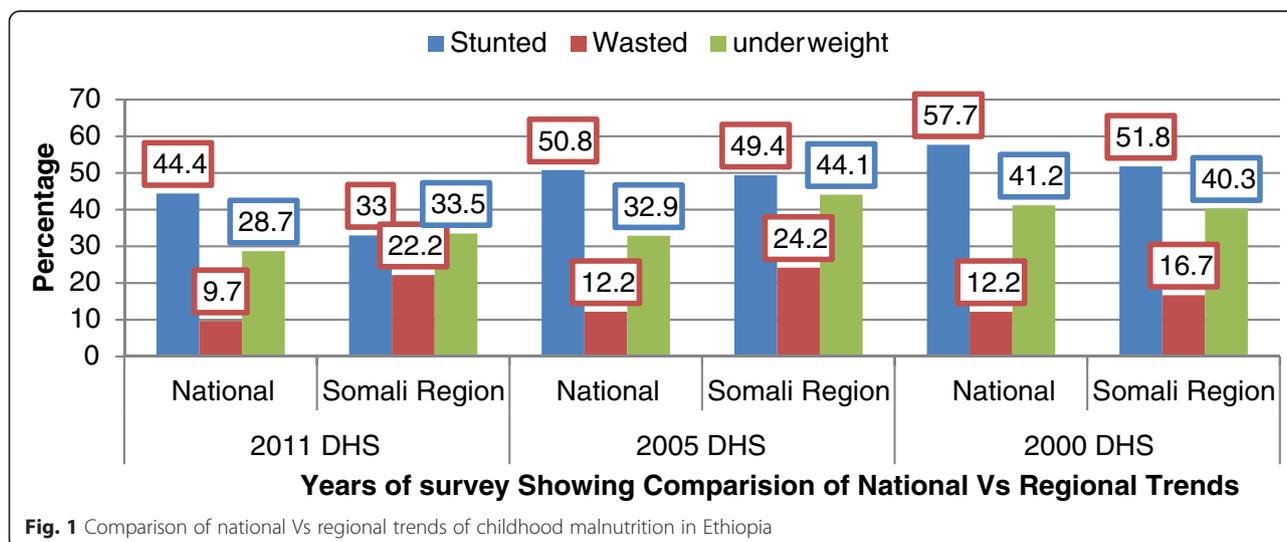
Fig. 1 Comparison of national Vs regional trends of childhood malnutrition in Ethiopia

Ma'alin et al. BMC Nutrition (2016) 2:44

Page 3 of 12

Table 1 Household and mothers'/care takers' characteristics in Shinille Woreda, Somali region, Ethiopia February-March, 2014 (n = 694)

Variable	Frequency	Percent
Household characteristics		
Head of the household:		
Male	654	94.2
Female	40	5.8
Family size:		
≤ 5	196	28.2
> 5	498	71.8
Educational level of mother:		
Illiterate	503	72.5
Literate	191	27.5
Educational level of father:		
Illiterate	236	34
Literate	458	66
Occupation of mother:		
House wife only	375	54
Merchant/Trade	139	20
Private Organization	20	2.9
Government	37	5.3
Daily laborer	75	10.8
Other (specify)	48	6.9
Ethnicity:		
Somali	651	93.8
Others	43	6.2
Religion:		
Muslim	689	99.3
Others	5	0.7
Monthly income:		
≤ 750	546	78.7
> 750	148	21.3
Mothers'/care takers' characteristics		
children ever born:		
≤ 3	186	26.8
4-5	329	47.4
≥ 6	179	25.8
Know about family planning:		
Yes	57	8.2
No	637	91.8
Place of delivery:		
Home	557	80.3
Health institution	137	19.7
ANC visit:		
Yes	150	21.6

Table 1 Household and mothers'/care takers' characteristics in Shinille Woreda, Somali region, Ethiopia February-March, 2014 (n = 694) (Continued)

No	544	78.4
Extra food During pregnancy:		
Yes	148	21.3
No	546	78.7

population of 113,630, of which 46.6 % are men and 53.4 % are women; 23.91 % of its population is urban dwellers, and the Woreda is composed of 30 kebeles. In this Woreda, 80 % of the inhabitants are pure pastoralists, while 15 % agro pastoralists and 5 % of the community engaged in petty trading and other activities in urban town. The Woreda is characterized by arid and semi arid climate with an annual rain fall ranges between 450 to 550 mm/year. The annual temperature is varying from 30 to 37° centigrade.

Study design, source population and study participants
A community-based cross-sectional study design was used. The source population was all children under five years of age residing in three kebeles, which were selected by simple random sampling. Study participants were all children 6–59 months of age who were selected by simple random sampling from eligible children in the selected households. Children were not included if they were guests, if they were seriously ill for sickness and if their mothers did not consent to participate in the survey.

Sample size and sampling technique
The required sample size was calculated using the formula required for determination of sample size for estimating single proportion. Based on the prevalence of malnutrition among under five children (29 %) [31], and with additional assumption of 95 % confidence interval, 5 % margin of error, a design effect of 2 due to multistage sampling and 10 % non-respondent rate in our estimate, a total sample of 697 were needed. During sampling, 3 out of the 30 kebeles in the woreda were selected using simple random sampling technique and the calculated sample was proportionally distributed to the selected kebeles based on their number of households. Then, from each of the selected kebeles, households were selected using systematic random sampling technique. Finally, from all the eligible children in a household, only one was selected by simple random sampling for the anthropometric measurement. In addition, the mothers of all selected children were interviewed. But in the absence of eligible child in a given household, a substitution was made by a child in the next household.

Ma'alin *et al. BMC Nutrition* (2016) 2:44

Page 4 of 12

Table 2 Child and environmental health characteristics in Shinille Woreda, Somali region, Ethiopia February-March, 2014 (n = 694)

Variable	Frequency	Percent
Child characteristics		
Child's sex:		
Male	364	52.4
Female	330	47.6
Child's age in months:		
6–11	331	47.7
12–23	171	24.6
24–35	90	13
≥ 36	102	14.7
Child weighed at birth:		
Yes	137	19.7
No	557	80.3
Immunization:		
Yes	175	25.2
No	519	74.8
Diarrhea in the last two weeks		
Yes	132	19
No	562	81
Respiratory disease		
Yes	205	29.5
No	489	70.5
Child caring practice		
Initiation of breast feeding:		
Immediately	225	32.4
After 1 h after birth	469	67.6
Pre-lacteal feeding:		
Yes	435	62.7
No	259	37.3
Total duration of breast feeding:		
< 12	593	85.4
≥ 12	101	14.6
Environmental Health characteristics		
Source of drinking water:		
Pond/River	62	8.9
Well/Tap	632	91.1
Availability latrine		
Yes	512	73.8
No	182	26.2
Type of latrine		
Private pit/wooden slab	351	68.6
Private slab/cement slab	138	27
Shared latrine/woodenslab	23	4.5

Table 2 Child and environmental health characteristics in Shinille Woreda, Somali region, Ethiopia February-March, 2014 (n = 694) (Continued)

Separate room for Kitchen		
Yes	468	67.4
No	226	32.6

Data collection and quality control

Data were collected using structured questionnaire and anthropometric measurement (Additional file 1). Twelve data collectors and two supervisors were recruited from health centers and health posts in the woreda. Training was provided for data collectors and supervisor for two days.

The questionnaire was used to collect quantitative data on variables pertaining to the socioeconomic and demographic characteristics of the participants. It was first designed in English based on information from other literatures developed for similar purpose [25, 31]. After adopting to the local context, the questionnaire was translated to Somali (the local language of the study area) (Additional file 2). Moreover, the questionnaire was pre-tested on randomly selected individuals from the survey area and these individuals were not participated in the main study. During the pre-test, the questionnaire was assessed for its clarity/understandability, reliability, sensitivity of the subject matter and for cultural acceptability in the area.

The mothers/care takers of the children were interviewed to provide answers to questions other than child anthropometry. Each face to face interview was made by a house-to-house visit and the participants were interviewed in their local language. All the interviews, measurements and testing were conducted at the residences of the study participants. On daily basis, collected information was reviewed and possible errors were returned to the collectors for correction.

To assess the physical growth and nutritional status of the children, measurements of height and weight were taken of all of the children and these measurements were taken during the home visit. These anthropometric data were collected using the procedure stipulated by the WHO [35] for taking anthropometric measurements. Before taking anthropometric data for the children, their age was determined in order to ensure the target population. Local events were used to establish the birth period. The mothers were asked whether the child was born before or after certain major events until a fairly accurate age is pinpointed. If age couldn't be determined accurately, a height of 65–110 cm was considered as proxy indicators.

Body length of children aged up to 23 months were measured without shoes and the height was read to the

Ma'alin et al. BMC Nutrition (2016) 2:44

Page 5 of 12
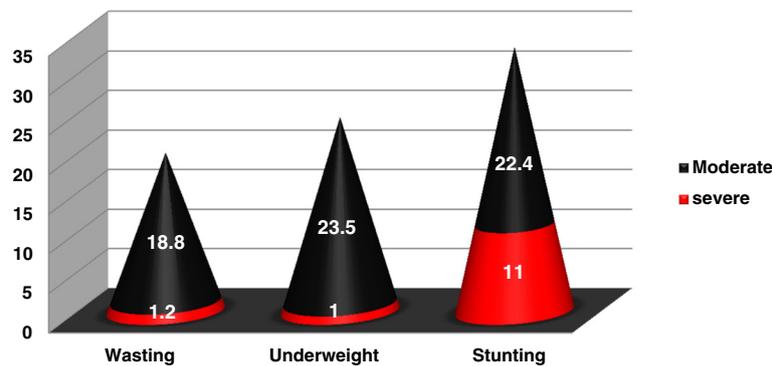
Fig. 2 Overall prevalence of malnutrition among 6–59 months old children in Shinille Wereda, Somali region, February, 2014 (n = 694)

nearest 0.1 cm by using a horizontal wooden length board with the infant in recumbent position. However, height of children aged 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 board. The child's head, shoulders, buttocks, knees and heels touching the board.

Weight was measured by electronic digital weight scale (salter model 235-6 s) with lightly clothing and no shoes. Calibration was done before weighing every child by setting it to zero. In case of children aged below two years, the scale was allowed weighing of very young children through an automatic mother-child adjustment that were eliminated the mother's weight while she standing on the scale with her baby.

Edema was checked and noted on data sheet because children with edema were severely malnourished. In order to determine the presence of edema, normal thumb pressure was applied to the two feet for three seconds whether a shallow print or pint remains on both feet when the thumb is lifted.

To identify retrospective morbidity of children, mothers were asked about any occurrence of illness during the past two weeks. Enumerators probe to confirm nature of illness based on operational case definition and was asked to identify occurrence of measles in the past one year. In addition, vaccination status of children was 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.

Variables of the study

The main outcome variables were: prevalence of stunting, wasting and underweight as determined by anthropometric measurements of weight and height taking age and sex into consideration. Five categories of independent variables were included in the data analysis. 1) *Socio-economic and demographic variables*; such as head of the family (father or mother), family size, income, ethnicity, religion, parental literacy (able to read or write) and occupation. 2) *Child characteristics*; Age, Sex, birth order, place of delivery, types of birth, birth size/weight, breastfeeding status, gestational age and morbidly status (fever, measles, diarrhea). 3) *Child caring practices*; feeding, hygiene, health care seeking and immunization. 4) *Maternal characteristics*; age, number of children ever born, antenatal care (ANC) visits, health status during pregnancy, use of extra food during pregnancy/lactation and autonomy in decision-making on use of money. 5) *Environmental health condition*; Water supply, sanitation and housing conditions.

Data processing and analysis

First, the data were checked manually for completeness and consistency. Then, it was coded and entered in the computer using EPI-INFO3.5.1 software and then sex, age, height and weight transferred to ENA for SMART 2007 software to convert nutritional data into Z-scores of the indices; Height-for-Age Z-scores (HAZ), Weight-for-Height Z-scores (WHZ) and Weight-for-Age Z-scores (WAZ) using the National Center for Health Statistics reference population standard of WHO. A child was considered stunted, wasted or underweight if the corresponding HAZ, WHZ and WAZ -scores were less than −2. When the measures of HAZ, WHZ and WAZ were less than −3, the child was considered severely stunted, severely wasted and severely underweight, respectively. Then, the data were exported to SPSS V.16 for analysis. Descriptive summary using frequencies, proportions, graphs and cross tabs were used to present study results. Bivariate analysis was computed to determine the association of malnutrition and associated factors. Statistical association was checked by 95 % confidence interval (CI) and crude odd ratio (OR) and the significant variables (*p*-value < 0.25) observed in bivariate analysis were subsequently included in multivariate analysis. Finally, results were reported as statistically

Ma'alin *et al. BMC Nutrition* (2016) 2:44

Page 6 of 12

Table 3 Bivariate and Logistic regression analyses showing the impact of selected variables On malnutrition as measured by stunting, Shinille woreda, Ethiopia Somali region, February, 2014 (n = 694)

Variables	Stunting				
	Yes	No	OR (CI)	AOR (CI)	P
Family size					
≤ 5	36	160	1	1	
> 5	196	302	2.88 (1.92, 4.31)	3.82 (2.20, 6.60)	0.01
Edu. level of mother					
Illiterate	191	312	0.44 (0.30, 0.65)	4.95 (2.87, 8.52)	0.01
Literate	41	150	1	1	
Occup of mother					
House wife only	112	263	1	1	
Merchant/Trade	54	85	1.49 (0.99, 2.24)	0.81 (0.46, 1.44)	0.48
Priv. Organization	10	10	2.34 (0.95, 5.79)	0.93 (0.24, 3.49)	0.91
Gove. employee	17	20	1.99 (1.00, 3.95)	1.74 (0.60, 5.01)	0.30
Daily laborer	18	57	0.74 (0.41, 1.31)	0.55 (0.22, 1.36)	0.20
Other (specify)	21	27	1.82 (0.99, 3.36)	2.49 (1.05, 5.89)	0.03
Monthly income					
≤ 750	210	336	3.58 (2.20, 5.18)	3.48 (1.99, 6.06)	0.01
> 750	22	126	1	1	
Extra food During preg.					
Yes	48	100	1	1	
No	184	362	1.05 (0.71, 1.56)	0.90 (0.41, 1.95)	0.79
Health during preg.					
Good	116	227	1	1	
Not good/sick	116	235	0.96 (0.70, 1.32)	1.42 (0.89, 2.29)	0.14
Visited H. facility for ANC					
Yes	58	92	1	1	
No	174	370	0.76 (0.51, 1.08)	0.49 (0.30, 0.80)	0.004
Child's sex					
Male	91	273	1	1	
Female	141	189	2.23 (1.62, 3.089)	2.54 (1.69, 3.83)	0.01
Child's age					
6–11	113	218	1	1	
12–23	72	99	1.40 (0.96, 2.05)	0.79 (0.45, 1.36)	0.40
24–35	35	55	1.22 (0.75, 1.98)	1.55 (0.79, 3.02)	0.19
≥ 36	12	90	0.25 (0.13, 0.49)	0.15 (0.07, 0.31)	0.13
Immunization					
Yes	23	152	1	1	
No	209	310	4.45 (2.77, 7.14)	9.20 (5.03,16.84)	0.01
Initiation of CF					
≤ 6	202	388	1	1	
> 6	30	74	0.77 (0.49, 1.23)	1.44 (0.70, 2.93)	0.31
Total duration of breast feeding					
< 12	222	371	5.44 (2.77, 10.68)	0.12 (0.05, 0.27)	0.01
> 12	10	91	1	1	

Ma'alin *et al. BMC Nutrition* (2016) 2:44

Page 7 of 12

Table 3 Bivariate and Logistic regression analyses showing the impact of selected variables On malnutrition as measured by stunting, Shinille woreda, Ethiopia Somali region, February, 2014 (n = 694) (Continued)

Source of drinking water					
Pond/River	21	41	1		
Well/Tap	211	421	0.97 (0.56, 1.69)	0.57 (0.26, 1.23)	0.15
Availability latrine					
Yes	178	334	1	1	
No	54	128	0.79 (0.54, 1.14)	1.92 (1.14, 3.22)	0.01

significant whenever *p*-values were less than 0.05 at 95 % CI. OR was used to report strength of association between background variables and the target outcome variables.

Results

Socio demographic characteristic

In this study, the final analysis included 694 mother-child pairs for which a complete data were obtained making the response rate 100 %. Most (94.2 %) of the households were male headed, 71.8 % had more than five family members, 93 % belongs to the Somali ethnic group and almost all (99 %) were Muslims (Table 1). The prevalence of illiterate parents was higher (72.5 %) for mothers than fathers (34 %). Majority (54 %) of the mothers were house wife, 47.4 % gave birth of four to five children, 82 % did not ever used family planning, 80.3 % delivered at home and 78 % did not attend ANC. Regarding consumption of extra food during pregnancy and/or lactation of the index child, only 21.3 % of mother reported consumption of extra food than when they were not pregnant or lactating. Only about one-third of the mothers initiated breastfeeding practice immediately after birth but 67.6 % started within an hour after birth (Table 2). More than 62 % of the mothers reported giving pre-lacteal feed to their newborn and 85.4 % continued breast feeding their children for about less than 12 months. Of the 694 children aged 6–59 months, 52.4 % were boys, 47.7 % were in the age range of 6–11 months and only 19.7 % were weighed at birth. Regarding vaccination and illness status of the children, only 25.2 % were immunized, and 19 % and 29.5 % had diarrhea and respiratory disease respectively in the previous two weeks before the survey. Majority (91.1 %) of the households used well/tap as a source of water, about 73.8 % of the households had latrine, of which two third (68.6 %) were privately owned pit latrine. 67.4 % of Households had separate room for kitchen.

Stunting

The prevalence of stunting among children of the study areas was 33.4 %, of which 11 % of children were severely stunted (Fig. 2). In the bivariate analysis family

size, child sex, maternal education, maternal occupation, monthly income, extra feeding during pregnancy/lactation, health status of mother during pregnancy, ANC visit, child sex, initiation of breast feeding, immunization status, continuation of breast feeding, source of drinking water and availability of latrine have significant association to stunting. However, the final multivariate analysis showed that vaccination status, maternal literacy, child sex, family size and monthly income were the significant risk factors of childhood malnutrition as measured by stunting (Table 3). The prevalence of stunting was 9.2 times higher in children who did not receive any vaccine than those who received vaccine (AOR = 9.20, with 95 % CI: 5.03 to 16.84), 4.9 times higher in children of illiterate mothers than their counterparts (AOR = 4.95, 95 % CI: 2.87 to 8.52), 2.5 times higher in children who were female than those who were male (AOR = 2.54, with 95 % CI: 1.69 to 3.83), 3.8 times higher in households with large family size than those households with small family size (AOR = 3.82, 95 % CI: 2.20 to 6.60) and 3.5 times higher in households having monthly income of less than 750 birr than those households having monthly income of greater than 750 birr (AOR = 3.48, 95 % CI: 1.99 to 6.06).

Wasting

The result of Fig. 2 reveals that 20 % of the children were wasted, of which 18.8 % of children were moderately malnourished. Results from bivariate analysis showed that family size, immunization status, maternal education, monthly income, extra feeding during pregnancy/lactation, ANC visit, continuation of breast feeding, birth order, how long after birth did you first put the child to breast feed and availability of latrine have significant association to wasting. However, the final multivariate analysis shows that family size (AOR = 2.01; 95 % CI = 1.13 to 3.57), monthly income of the household (AOR = 1.78; 95 % CI: 1.03 to 3.04), sex of child (AOR = 1.50; 95 % CI = 1.00 to 2.26) and immunization status (AOR = 7.57; 95 % CI = 3.65 to 15.70) were the significant risk factors of childhood malnutrition as measured by wasting (Table 4). Children from large family size were 2.0 times more likely to be wasted than

Ma'alin et al. BMC Nutrition (2016) 2:44

Page 8 of 12

Table 4 Bivariate and Logistic regression analyses showing the impact of selected variables on malnutrition as measured by wasting Shinille woreda, Ethiopia Somali region, February, 2014 (n 694)

Variables	Wasting				
	Yes	No	OR (CI)	AOR (CI)	P
Family size					
≤ 5	22	174	1	1	
> 5	117	381	2.42 (1.48, 3.963)	2.01 (1.13, 3.57)	0.01
Edu. level of mother					
Illiterate	107	396	1.34 (0.86, 2.07)	1.43 (0.91, 2.24)	0.11
Literat	32	159	1	1	
Monthly income					
≤ 750	120	426	1.91 (1.13, 3.22)	1.78 (1.03, 3.04)	0.03
≥ 750	19	129	1	1	
Extra food During preg.					
Yes	22	126	1	1	
No	117	429	1.56 (0.95, 2.56)	0.90 (0.41, 1.95)	0.79
Visited H. facility for ANC					
Yes	25	125	1	1	
No	114	430	1.32 (0.82, 2.13)	1.07 (0.82, 1.96)	0.82
Place of delivery					
Home	112	445	1	1	
Health institution	27	110	0.97 (0.61, 1.55)	1.48 (0.83, 2.62)	0.17
Child's sex					
Male	64	300	1	1	
Female	75	255	1.37 (0.94, 2.00)	1.50 (1.00, 2.26)	0.05
Child's age					
6–11	65	266	1	1	
12–23	36	135	1.09 (0.69, 1.72)	0.64 (0.39, 1.07)	0.09
24–35	22	68	1.32 (0.76, 2.29)	1.15 (0.62, 2.12)	0.64
≥ 36	16	86	0.76 (0.41, 1.38)	0.70 (0.37, 1.31)	0.26
Immunization					
Yes	9	166	1	1	
No	130	389	6.16 (3.06, 12.40)	7.57 (3.65, 15.70)	0.01
How long after birth did you first put the child to breast feed					
Immediately	35	190	0.64 (0.42, 0.98)	0.77 (0.48,1.22)	0.27
After 1 h of birth	104	365	1	1	
Total duration of breast feeding					
< 12	123	470	1.39 (0.78, 2.45)	1.36 (0.74, 2.50)	0.31
> 12	16	85	1	1	
Birth order between the current baby and his elder					
< 2 years	26	163	1	1	
3–4 years	52	166	0.59 (0.35, 0.97)	1.38 (0.63, 3.04)	0.41
> = 5 years	61	226	1.16 (0.76, 1.76)	1.42 (0.67, 3.04)	0.35

children from small family size, children from households having monthly income of less than 750 birr were 1.8 times more likely to be wasted than children from households having monthly income of less than 750 birr, non-immunized children were 7.6 times more likely to be wasted than their counter parts and female were 1.5 times more wasted than boys.

Underweight
The prevalence of underweight among the under five children was 24.5 %. Around 23.5 % of children were moderately malnourished. Variables like family size, maternal occupation, extra feeding during pregnancy/lactation, health status of mother during pregnancy, birth order, immunization status, initiation of complementary feeding, continuation of breast feeding, source of drinking water and availability of latrine were variables significantly associated to underweight using binary logistic regression model. From all tested variables, only immunization status (AOR = 2.47; 95 % CI = 1.374 to 4.439) and total duration of breast feeding (AOR = 2.16; 95 % CI = 1.11 to 4.20) were significantly associated with malnutrition as measured by underweight in final multivariate analysis (Table 5). Accordingly, non-immunized children were 2.5 times more likely become underweight than their counterparts and children who breast feed less than 12 months were 2.2 times more likely become underweight than those who feed more than 12 months.

Discussion
The findings of this study indicate that 33.4 %, 25.5 % and 20 % of the sample children were stunted, underweight and wasted, respectively, which is similar to previous studies done in the northwest part of Ethiopia [24, 36], in Jimma zone, south west of the country [37], and in Shinile zone, ESRS [38]. However, in accordance with the EDHS report [31] and earlier studies in Afar region [39] and northern part of Ethiopia [40] as well as in India [15], Bangladesh [16, 25] and Uganda [27], the prevalence of stunting and underweight in the current study is low. On the other hand, the prevalence of wasting is high compared to the national report [31] and other similar studies [23, 24, 36, 38, 41, 42]. The differences in the prevalence of malnutrition among children could be attributed to the difference in the method of data collection, sample size, study subjects or may be due to socioeconomic and seasonal variation as compared with the present study.

The regression analysis of this study indicated immunization status of children as an important risk factor for all the three categories of malnutrition (stunting, wasting and underweight). Similarly, undernourished children from rural Bangladesh [16] and Northwest Ethiopia were less likely to have received

Ma'alin et al. BMC Nutrition (2016) 2:44

Page 9 of 12

Table 5 Bivariate and Logistic regression analyses showing the impact of selected variables on malnutrition as measured by underweight, Shinille woreda, Ethiopia Somali region, February, 2014 (n = 694)

Variables	Underweight				
	Yes	No	OR (CI)	AOR (CI)	P
Family size					
≤ 5	32	164	1	1	
> 5	138	360	1.96 (1.28, 3.01)	1.37 (0.65, 2.88)	0.40
Children <5 years in the households					
< 2	147	477	1	1	
>= 2	23	47	1.58 (0.93, 2.70)	0.81 (0.36, 1.77)	0.60
Occupat of mother					
House wife only	90	285	1	1	
Merchant/Trade	38	101	1.19 (0.76, 1.85)	1.79 (0.95, 3.37)	0.06
Priv. Organization	5	15	1.05 (0.37, 2.98)	3.14 (0.94, 10.54)	0.06
Gove. employee	20	17	3.72 (1.87, 7.41)	2.13 (0.69, 6.59)	0.18
Daily laborer	6	69	0.27 (0.11, 0.65)	0.90 (0.33, 2.45)	0.83
Other (specify)	11	37	0.94 (0.46, 1.92)	1.36 (0.54, 3.39)	0.50
Extra food During preg.					
Yes	28	120	1	1	
No	142	404	1.50 (0.95, 2.37)	1.77 (0.98, 3.19)	0.05
Health during preg.					
Good	76	267	1	1	
Not good/sick	94	257	1.28 (0.90, 1.81)	1.11 (0.70, 1.77)	0.63
Place of delivery					
Home	125	432	1	1	
Health institution	45	92	1.69 (1.12, 2.54)	1.19 (0.58, 2.47)	0.62
Birth order					
< 2 years	39	150	1	1	
3–4 years	71	147	1.85 (1.18, 2.91)	1.41 (0.76, 2.62)	0.26
>= 5 years	60	227	1.01 (0.64, 1.59)	0.65 (0.35, 1.20)	0.17
Immunization					
Yes	31	144	1	1	
No	139	380	1.69 (1.10, 2.62)	2.47 (1.37, 4.43)	0.01
Initiation of CF					
≤ 6	153	437	1	1	
> 6	17	87	0.55 (0.32, 0.96)	0.72 (0.33, 1.53)	0.39
Total duration of breast feeding					
≤ 12	158	435	2.69 (1.43, 5.05)	2.16 (1.11, 4.20)	0.02
> 12-24	12	89	1	1	
Availability latrine					
Yes	137	375	1	1	
No	33	149	0.60 (0.39, 0.927)	1.18 (0.66, 2.14)	0.56

vaccination [43]. Non-immunized children are more likely to be frequently infected with vaccine preventable diseases such as diarrhea and respiratory infections, which are known in depleting nutrients from the body.

The current study also revealed that family size and child sex become associated with stunting and wasting. With this regards, children living in a family of five or more were more stunted than their counterparts. The

Ma'alin et al. BMC Nutrition (2016) 2:44

Page 10 of 12

finding corroborates previous studies in Sudan [44], Pakistan [45], Ethiopia [43] and elsewhere [46]. Logically, as family size increases, the chance of becoming malnourished also increase probably due to other factors that may contribute to nutritional status, such as income of the family become less when there is increased family size. Female children were having higher risk of being stunted and wasted as compared to male children, which agrees with previous studies in Bangladesh [16], india [15, 47], Iran [48] and as well as Ethiopia [47]. On the contrary, malnutrition was significantly higher among boys than among girls in Botswana [4], Karaikal District of India [49] and Ecuador [22] and as well as in Ethiopia, the national data reported that male children were slightly more likely to be stunted and wasted than female children [31]. In the current study area, the care for children is closely linked with cultural and gender issues where in the region family are usually fevering to males than female children.

It was also found out that the prevalence of stunting and wasting had a significant relationship to family income. Chronic malnutrition and acute malnutrition were 3.5 times and 1.78 times, respectively, higher among children from households having monthly income of less than 750 birr than those from households having monthly income of greater than 750 birr. This is in accordance with previous studies conducted in Serbia [21], India [15], and as well as in Ethiopia [23–25, 31, 38, 46] and elsewhere [45]. Families with enough monthly income can access enough nutritious foods and as well as health care and educational facilities.

Mother's education has been identified in other populations as a predictor of childhood malnutrition [19, 20, 25, 31, 44, 48, 50]. We also found mother's education to be a predictor of stunting. Ahmed et al. [16] also reported that undernourished children were more likely to have illiterate/less educated mother. Similarly, Indian children of the mothers who studied up to higher secondary and graduation were less malnourished [15]. Educated mothers are more aware about the kinds and the amounts of food appropriate for their children.

The risk of having poor nutrition condition was found significantly higher for the children with poor feeding practices compared to those having better feeding practices [50]. For instance, in agreement with our study, breastfeeding was found to reduce the occurrence of underweight among children [4]. The Odds of underweight among children's of mothers not breast feeding was 2 times higher when compared with children of mothers still beast feeding during the survey [37]. Therefore, there is need to educate mothers on the protective effect of breast milk and safe breastfeeding practices as well.

Limitations

A number of limitations can be identified that might have affected our findings. As the study is cross-sectional in design, it neither represents seasonal variation of nutritional outcomes particularly to the wasting status nor establishes causal relationship. Dietary aspect which is the immediate determinant of nutritional status is not included in this study. Some measurements may not be accurate due to subjective responses and recall biases from answers based on the memories of the mothers. Excluding sick children would have excluded those with malnutrition, who are more likely to be sick.

Conclusion

Prevalence of malnutrition among under five children in Shinile Woreda is still high. Factors contributing to malnutrition were diverse; including immunization status of the child, family size, child's sex, monthly income of the household, maternal education and total duration of breast feeding. Our finding highlighted the importance of childhood vaccination, family planning, poverty alleviation and extensive nutrition education programmes as potential targets for intervention.

Additional files

Additional file 1: Questionnaire for the study of the magnitude and factors associated with malnutrition in children 6–59 months of age in Shinille Woreda, ESRS, February to March, 2014.doc, 28.0. kb. (DOCX 26 kb)

Additional file 2: Somali version of the questionnaire for the study of the magnitude and factors associated with malnutrition in children 6–59 months of age in Shinille Woreda, ESRS, February to March, 2014.doc, 28.0. kb. (DOCX 26 kb)

Abbreviations
ANC, Antenatal care; BCG, Bacillus Calmate Guerin; CI, Confidence Interval; ESRS, Ethiopian Somali Regional State; HAZ, Height-for-Age Z-scores; OR, Odds ratio; WAZ, Weight-for-Age Z-scores; WHZ, Weight-for-Height Z-scores.

Availability of data and materials
All the data supporting our findings is contained within the manuscript and additional files.

Authors' contributions
AM: conception of the research idea, study design, coordination of data collection, data entry and analysis, interpretation of the data and drafting the manuscript; DB, SM: proposal revision and approval, study design, data entry and analysis, interpretation of the data and review of the manuscript; DT, YM, KG: data analysis, interpretation of data and review of the manuscript. All authors have read and approved of the final version of the manuscript.

Ma'alin *et al. BMC Nutrition* (2016) 2:44

Page 11 of 12

Author details
[1]Department of Public Health, Jig-jiga Health Science College, Jig-jiga, Ethiopia. [2]School of Public Health, College of Medicine and Health Science, Bahir Dar University, Bahir Dar, Ethiopia. [3]Department of Clinical Nursing, Jig-jiga Health Science College, Jig-jiga, Ethiopia. [4]Department of Medical Laboratory Technology, Jig-jiga Health Science College, Jig-jiga, Ethiopia. [5]Public Health Emergency Management, Ethiopian Somali Regional Health Bureau, Jig-jiga, Ethiopia.

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Ma'alin *et al. BMC Nutrition* (2016) 2:44

Page 12 of 12

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