

Determinants of under nutrition among the elderly in South Gondar Zone, Ethiopia

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Abstract

Background: The number of the elderly population is expected to become the largest demographic group. Malnutrition in older adults is related with complications and premature death. The progression to malnutrition is often insidious and often undetected. No study has been ever conducted or documented to explore the nutritional status of elderly in south Gondar Zone . Hence, this study was aimed to assess the determinants of under nutrition among the elderly people aged ≥ 65 years. A cross-sectional study was conducted from October 1 to December 15, 2020. A community based study was conducted in south Gondar Zone, Ethiopia. A total of 290 elderly aged greater or equal to 65 years of age selected by systematic random sampling technique were included in the study. Pretested and structured questionnaire adapted from different literature was used to collect data. Anthropometric measurements; weight and height were measured following standard procedures. Mini-Nutritional Assessment (MNA) tool was used to assess nutritional status of elderly. Descriptive and summary statistics were employed. Multiple logistic regression was fitted to identify determinants of under nutrition. Odds ratios and their 95% confidence intervals were computed to determine the level of significance.

Results: Based on their BMI status 27.57%, 95%CI (22.4-32.8) of elderly were underweight and 2.1%, 95% CI (0.7-3.8) were overweight. Likewise, 29.7%, 95%CI (24.5-35.2) of elderly were malnourished and 61.7%, 95% CI (55.5-67.2) were at risk of malnutrition based on Mini-Nutritional Assessment tool. Rural residence (AOR= 10.32, 95%CI (3.62-29.39)), unable to read and write (AOR = 3.54, 95%CI (1.64-7.64)), decline in food intake (AOR= 13.47, 95%CI (6.14-29.52)) and household monthly income <35.6USD (AOR = 4.32, 95%CI (1.97- 9.46)) were significantly and independently associated with under nutrition in elderly population.

Conclusion: The prevalence of under nutrition among the elderly in the study area was high, and making it an important public health burden. Place of residence, educational status, food intake and household income were the determinants of under nutrition.

Introduction

The world has seen significant growth in the number of the elderly and anticipated to become the largest demographic group in the next few years. As per to the United Nations, in 2025, it is expected that the number of people ≥ 60 years of age will be 1.2 billion and 2 billion in 2050 taking about 22.0% of the world's population (1). High number of elderly gives an understanding to reevaluate the suitability of health infrastructures for the elderly. Eleven percent of the world population and 3.2% of Ethiopian population is categorized under elderly population aged ≥ 65 years (2). Anthropometric measurements are pointers that help determine one's nutritional status. The well-known and applied anthropometric assessment in older adults is the Body Mass Index (BMI) (3).

Malnutrition may be as a result of lack of nutrients (under-nutrition), or an excess of nutrients (over-nutrition) (4). A physiologic deterioration in food intake is seen among the elderly due to change in

neurotransmitters and hormones that affect the central feeding drive (5-7). Loss of lean body mass and the low metabolic rate in elderly may impact appetite and food intake. Decrement in sensation both olfaction and taste decreases the enjoyment of food, leads to reduced intake of diversified food. Underlying pathology and medical treatment can cause anorexia and malnutrition (8). Chronic illness among the elderly are treated with medications and dietary restriction that affects food intake. Drugs also affect nutritional status through its side effects and through change of nutrient absorption, metabolism and excretion (9). Weight loss in older adults is often related with a loss of muscle mass and can finally affect functional status. Malnutrition in older adults is related with complications and premature life loss(10). The advancement to malnutrition is mostly treacherous and often unnoticed. On the other hand, restriction of mobility and sedentary lifestyle make them overweight and obese (11). Concerning the current corona virus (COVID -19) pandemic, studies have demonstrated that elderly patients with COVID-19 are at greatest risk of malnutrition or co-malnutrition. Additionally, COVID-19 can affect the mucosal epithelium and cause gastrointestinal symptoms, which can additionally damage the nutritional status of elderly patients with COVID-19 (12). The price of health cost which is related associated with treating the infection and/or malnutrition is high (13). The health and nutrition of the elderly is usually ignored; many of the intervention activities are directed toward neonates, children, adolescents, expectant and nursing mothers. As far as the authors' best search, no study has been ever conducted or documented to determine the nutritional status and its determinants among these segments of the population in South Gondar Zone thus far (14). Therefore, understanding the cause of under nutrition among older people has utmost importance to arrest the problem. Hence, this study was carried out to determine the magnitude and determinant factors of under nutrition among people aged ≥ 65 years in south Gondar Zone, Ethiopia.

Methods

Study area, design and period

The study was conducted in South Gondar Zone. South Gondar is a Zone in the Ethiopian Amhara Region. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this Zone has a total population of 2,051,738. With an area of 14,095.19 square kilometers, South Gondar has a population density of 145.56; 195,619 or 9.53% are urban inhabitants. A total of 468,238 households were counted in this Zone, which results in an average of 4.38 persons to a household. There are 96 health centers, 7 primary hospitals, and 1 general hospital in the zone. According to the 2011 CSA, South Gondar zone has a total population of, 2,239,077 (female 1,103,490 male1, 135,587). And 2.8% of the total population is expected to be above the age of 65 years. A community based cross-sectional study was conducted from October 1- December 15, 2020.

Study participants, sample size and sampling techniques

All old people aged ≥ 65 years old who were living in 3 randomly selected woredas of South Gondar Zone at the time of data collection were the study population. Those who were critically ill and those mentally

incompetent were excluded from the study. The sample size was calculated using single population proportion formula. Taking the prevalence of under nutrition 21.9% (14), margin of error of 5%, Z value of 1.96 and taking 10% non-response rate the final sample size was 290. First three woredas (geographic sub divisions of a Zone) were selected by lottery method from a total of 18 woredas; then census was conducted to enumerate the total number of elderly in each woredas. Then the calculated sample was allocated to each Woredas proportionally based on the number of elderly. Finally, systematic random sampling technique was used for the selection of individual respondents.

Measurements

Assessment of under nutrition

The outcome variable, under nutrition was measured using Mini Nutritional Assessment (MNA) tool developed by Nestle Nutrition Institute. The MNA tool was validated in developing setting including Ethiopia (15). Based on MNA scores, elderly is categorized into non-malnutrition group (MNA 12-14), the group with risk of malnutrition (MNA of 8-11) and malnutrition group (MNA score ≤ 7) (16). In addition, BMI was calculated to determine the nutritional status of elderly. Arm span was used as a proxy measure for height in elderly. Thus, body mass index (BMI) was estimated as the weight in kg divided by arm span in meters squared (kg/m^2). Obesity was defined $\geq 30.0 \text{ kg}/\text{m}^2$, overweight was defined as $25.0 \text{ kg}/\text{m}^2 \leq \text{BMI} < 29.9 \text{ kg}/\text{m}^2$ and underweight was defined as BMI of less than $18.5 \text{ kg}/\text{m}^2$ (4, 13) .

Anthropometric measurements

Weight was measured in light clothes with bare feet using a beam scale (Seca®, Germany). Arm span was measured between the middle figure of one hand to the middle figure of other hand using a measuring tape (Seca®, Germany). The height and arm span accuracy were 0.1 cm. The anthropometric measurements were measured following a standard procedure (17). All measurements were done in twice, and the average value was used for analyses.

Assessment of predictors

In addition to anthropometric measurements and MNA assessment, place of residence, gender, age, economic status, marital status, occupation, educational status, illness in the past three months, food intake status, presence of known chronic disease, current medication intake, physical activity, dietary habits, 24hr dietary diversity score and alcohol consumption was assessed. The age of the elderly was defined as age ≥ 65 years .Dietary diversity score was detected using 24 dietary recall method. Dietary diversity as categorized into poor (those who consumed less than 5 food groups out of 9 food groups) and good (those who consumed 5 or more food groups out of 9 food groups). Physical activity was defined as doing any activities or exercise for more than 30 minutes (18).

Pretested and structured questionnaires using face-to-face interviewing with participants were used for data collection. The questionnaire was adapted from food and agriculture organization of united

nation (19). Data were collected by three diploma nurses and supervised by two public Health officers. A two days comprehensive training was given to data collectors and supervisors. The questionnaire was first prepared in English and then translated into Amharic (the local language), and back into English to ensure consistency. To ensure the quality of the data, every day the questioner was reviewed for completeness, accuracy and clarity by the principal investigator.

Data processing and analysis

The questionnaires were coded and entered into Epidata version 3.1 statistical software and then exported to SPSS windows version 25 for further analysis. Data were summarized and presented using descriptive statistics. Bi- variate and multiple logistic regressions were computed to identify the presence and strength of associations. Odds ratios with 95% CI were computed and variables having p-values less than 0.05 in the multiple logistic regression models were considered significantly associated with the outcome variable.

Results

Socio demographic and economic related characteristics of participants

A total of 290 elderly participated in the study giving response rate of 100.0%. The mean (\pm SD) age of participants was 68.54 (4.19) years. Most of them were aged 65-69 years, 52.28 % (169). Among the study participants more than half of them were female 55.86% (162).

Concerning place of residence, 64.14% (186) of the participants were from rural areas and 58.62 % (170) of participants were married regarding to their marital status. When we see their educational status, 45.51% (132) were unable to read and write. Concerning economic dependency, 52.76 % (153) of the respondents were partially dependent economically and 47.57 % (138) were farmer before retirement. Regarding monthly income, 52.41% (152) of the participants had low monthly income (Table 1).

Health and life style characteristics

About 73.79% (214) of the respondents had a history of known chronic illness during the interview. Nearly half, 48.62 % (141), of the participant had a complaint of illness in the past 3 months before the interview. Concerning the types of chronic diseases, 32.72 % (70) had hypertension and 23.81 % (51) had heart failure. Regarding alcohol intake and cigarette smoking, 60.00 % (174) took alcohol and among them 74.71% (130) took alcohol on daily basis but there was no cigarette smoker. Among the study participants 23.79 % (69) of them took soft drink and other sugary foods once or twice per week; and the rest 76.21 % (221) took occasionally. About 26.21 % (76) of participants consumed meat and other fatty foods (butter and milk products) 1-3 times per week, 6.90 % (20) consumed daily, the rest 66.90% (194) uses occasionally.

About 81.72 % (237) of the participants do physical activity and among this majority (75.53 % (179)) of them do walking followed by walking and harvesting 23.63 % (26) and fetching water 0.84 % (2). From

the total participants, 38.28% (111) of them were suffering from decline in food intake in the last three months and most (97.30 % (108)) of them mentioned loss of appetite as a reason. Among the study participants, 48.28 % (140) took medication; among them 66.43 % (93) took one or two medications (Table 2).

Dietary diversity characteristics

The most commonly consumed food groups in the last 24 hours were legumes and nut 75.86 % (220) followed by cereals and roots 51.72% (150) and dark green vegetables 46.55% (135). Regarding the dietary diversity score (DDS), 10.69 % (31) scored well and 89.31 % (259) scored poor (Table 3).

Nutritional status of elderly

According to this study, the overall prevalence of under nutrition among the participants was 27.57 % (80) while majority 70.34% (204) had normal BMI and only 2.07% (6) of them were overweight. As per mini nutritional assessment tool, 8.6 % (25) were having normal nutritional status, 61.7 % (179) were at risk of malnutrition and 29.7% (86) of elderly are malnourished.

Factors associated with under nutrition

On bivariate logistic regression; residence (living in rural area), sex, not being married, being unable to read and write, illness in the last three months, known chronic illness, decline in food intake and household monthly income <35.6USD were positively associated with under nutrition. Whereas, residence (living in rural area), being unable to read and write, decline in food intake and household monthly income <35.6USD were remained significantly associated with under nutrition on the multivariable logistic regression. The odds of under nutrition was more than 12 times higher among elderly who have history of decline in food intake (AOR= 13.471, 95%CI: 6.147-29.525). This study also showed that elderly whose monthly income less than 35.6USD were 4.3 times (AOR = 4.319, 95%CI: 1.971-9.460) more likely to be undernourished than their counterparts. Also, being unable to read and write increased the odds of under nutrition among the study participants (AOR = 3.542, 95%CI: 1.642-7.643). Study participants who lived in rural area were more than 10 times to be undernourished than those from urban area (AOR= 10.320, 95%CI: 3.624-29.390) (Table 4).

Discussion

The overall prevalence of under nutrition was 27.57%. This finding is comparable with the studies done in Nepal 24.8% (95% CI :20.21–29.30) (20). However, it was higher than that of the studies done in Wolaita Zone Ethiopia 17.1% (21), Northwest Ethiopia 21.9% (22), Ethiopia 17.6% (95%CI: 15.00, 20.20) (23), Cameroon 6% (24), Delhi India 20.8% (25). This difference could be due to geographical difference, variation in socio-economic status of study population. In addition in the current study most of the study participants were from rural area which might be associated with lower food buying power of participants

to diversified food items. On the other hand, the prevalence of under nutrition was lower as compared to study done in Ghana 48.0% (24).

In this study, the prevalence of under nutrition was high among females 20.34% compared to males 7.23% .In agreement with this, a study from Gondar found that being female (AOR= 3.0 ,95% CI (1.6-5.4)) was associated with under nutrition(22) .Similarly a study which assessed chronic energy deficiency and associated factors among older population in, Aykel town , Ethiopia in 2018 showed that under nutrition was significantly associated with female sex (AOR= 1.58, 95%CI(1.04, 2.41) (23). This might be because most female elderly were economically dependent, gender discriminations and less health seeking behavior, which may negatively influence women's health and nutritional status.

This study pointed out that 89.31% of the elderly had poor dietary diversity score. This might be due to the study was conducted during fasting period, most of the participants were economically dependent and most of them were unable read and write.

This study has revealed that 25.52% of rural elderly people were malnourished in that participants who lived in rural areas were more than 10 times more likely to be undernourished than those from urban area. Thus, it appears that under nutrition is much higher among the elderly residing in the rural areas. This finding is consistent with the results of studies conducted in wolaita zone Ethiopia (21), Northwest Ethiopia (22) and Ethiopia (23).

In the current study monthly income of less than 35.6USD had significant association with under nutrition. Similarly studies done in wolaita Zone Ethiopia (21), Northwest Ethiopia(22) and Ethiopia(23) showed that low income had negative effect on nutrition status of elderly. This might be due to food purchasing ability depends on the level of incomes and low income may make elderly to prefer not to eat.

Decreased food intake was positively associated with under nutrition. This could be due to the effects of increased age which reduces the natural drive to eat and drink and resulting in anorexia of aging; to their comorbid illness of which most of them had chronic illness and; to the medication they took since most of them took medications. This finding was similar to a study conducted in Wolaita Zone Ethiopia (21).

This study pointed out being unable to read and write was 3.5 times (AOR = 3.542, 95%CI: 1.642-7.643) more likely to be undernourished than those who can read and write. This finding is consistent with the results of earlier studies conducted in Wolaita Zone Ethiopia (21) and in Northwest Ethiopia(22) . This might be related to the fact that educated people are more likely to consume diversified food and follow healthy eating style.

Strength of the study

The study was community based and it can represent the population.

Limitation of the study

The study did not assessed micronutrient level and fat composition of elderly.

Conclusion

The overall prevalence of under nutrition among the elderly in the study area was high making important public health burden. It was significantly associated with residence, being unable to read and write, decline in food intake and household monthly income. Therefore, there is a need to design and implement programs and strategies to improve nutritional status particularly focusing on female older population, those living in rural area and improving household economic status. For this, further studies are needed to generate a database for effective policy making and formulate a national policy on the nutrition of the elderly to ensure healthy aging.

List Of Abbreviations And Acronyms

BMI	Body Mass Index
CDC	Centre for Disease Control
CI	Confidence Interval
COVID-19	Virus Disease of 2019.
CSA	Central Statistical Agency
DDS	Dietary Diversity Score
ETB	Ethiopian Birr
GC	Gregorian Calendar
MCH	Mother and Child Health
NICU	Neonatal Intensive Care Unit
OPD	Outpatient Department
OR	Odds Ratio
SARS –Cov 2	Severe Acute Respiratory Syndrome Corona virus 2
SD	Standard Deviation
SPSS	Statistical Package for Social Science
WC	Waist Circumference

WFP World Food Program

WHO World Health Organization

Declarations

Ethics approval and consent to participate

This study have been performed in accordance with the Declaration of Helsinki. Ethical clearance was obtained from Debre Tabor University College of medicine & health science ethical review committee. Then, the participants of the study were informed about the purpose of the study, the importance of their participation, and their right to withdraw at any time. All methods were carried out in accordance with ethical guidelines and regulations. Informed consent was obtained prior to data collection. To keep the confidentiality of clients' data, their names was not document. People aged ≥ 65 who were malnourished during the data collection were advised regarding their nutrition.

Consent to publish

All the authors have agreed and gave consent for the publication

Availability of data and materials

The datasets used during the current study are available from the corresponding author on a reasonable request.

Competing of interest

All authors declared that there is no competing interest at all.

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Authors' contributions

HY, IM and MA made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data. GA, AE, MM and FT took part in drafting the article or revising it critically for important intellectual content. All authors agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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Tables

Table 1 Socio-demographic and economic characteristics of elderly in South Gondar Zone, Amhara, Ethiopia.

Variable		Frequency	Percentage
Residence	Urban	104	35.86
	Rural	186	64.14
	Total	290	100.00
Sex	Male	128	44.14
	Female	162	55.86
	Total	290	100.00
Age	65-69	169	58.28
	70-74	95	32.76
	75-79	13	4.48
	>=80	13	4.48
	Total	290	100.00
Marital status	Currently married	170	58.62
	Single	2	0.69
	Separated	17	5.86
	Widowed	101	34.83
	Total	290	100.00
Economic dependence	Partially dependent	153	52.76
	Fully dependent	127	43.79
	Independent	10	3.45
	Total	290	100.00
Occupation before retirement	Housewife	84	28.97
	Self employed	46	15.86
	Farmer	138	47.57
	Nongovernment employee	4	1.38
	Government employee	18	6.21
	Total	290	100.00

Current occupational status	Retired	172	59.31
	Housewife	42	14.48
	Self employed	13	4.48
	Farmer	62	21.38
	Nongovernment	1	0.34
	Total	290	100.00
Educational status	Cannot write and read	132	45.52
	Read and write with no formal education	114	39.31
	Primary education	24	8.28
	College and above	20	6.90
	Total	290	100.00
Monthly household income	Low (<35.6USD)	152	52.41
	Middle (35.6USD -106.8USD)	88	30.35
	High (>106.8USD)	50	17.24
	Total	290	100.00

Table 2 Health and Life style characteristics of elderly in South Gondar Zone, Amhara, Ethiopia 2020

Variable		Frequency	Percentage
Illness in the past three months	Yes	141	48.62
	No	149	51.38
	Total	290	100.0
Known chronic illness(n=214)	Hypertension	70	32.71
	DM	20	9.35
	Joint Pain	28	13.08
	Heart Failure	51	23.81
	Asthma	17	7.94
	HIV	5	2.24
	Liver Disease	3	1.40
	Other	20	9.35
	None	76	26.21
	Total	290	100.0
Family history of obesity	Yes	1	0.34
	No	289	99.66
	Total	290	100.0
Alcohol consumption	Yes	174	60.0
	No	116	40.0
	Total	290	100.0
Frequency (n= 174)	Daily	130	74.71
	5-6 days per week	10	5.75
	1-4 days per week	20	11.49
	1-3 days per month	14	8.04
	once per month	1	0.57
	Total	290	100.0
Physical activity	Yes	237	81.72
	No	53	18.28
	Total	290	100.0

Which one(n=237)	Walking	179	75.53
	Fetching	2	0.84
	Walking and harvesting	56	23.63
	Total	237	100.0
Decline in food intake	Yes	111	38.28
	No	179	61.72
	Total	290	100.0
Reason(n=111)	loss of appetite	108	97.30
	chewing problem	3	2.70
	Total	111	100.0
Current medication usage	Yes	140	48.28
	No	150	51.72
	Total	290	100.0
Number of medications (n=140)	≤ 2	93	66.43
	≥ 3	47	33.57
	Total	140	100.0

Table 3 Consumption of the nine food groups by the study subjects in the last 24 hours in South Gondar Zone, Amhara, Ethiopia 2020

Variable		Frequency	Percentage
Cereal and root	Yes	150	51.72
	No	140	48.27
	Total	290	100.0
Dark green vegetable	Yes	135	46.55
	No	155	53.45
	Total	290	100.0
Fruits and vegetable	Yes	107	36.90
	No	183	63.10
	Total	290	100.0
Other vitamin A rich fruits and vegetables	Yes	49	16.90
	No	241	83.10
	Total	290	100.0
Meat and fish	Yes	26	8.97
	No	264	91.03
	Total	290	100.0
Organ meat	Yes	4	1.38
	No	286	98.62
	Total	290	100.0
Legumes and nut	Yes	220	75.86
	No	70	24.14
	Total	290	100.0
Milk	Yes	63	21.72
	No	227	78.28
	Total	290	100.0
Egg	Yes	25	8.62
	No	265	91.38
	Total	290	100.0
Dietary diversity score	Good	31	10.69

Poor	259	89.31
Total	290	100.0

Table 4 : Factors associated with under nutrition among elderly in South Gondar Zone, Amhara, Ethiopia 2020

Variables		Under nutrition		95% C. I for OR	
		Yes	No	Bivariate (COR)	Multivariable (AOR)
		Frequency	Frequency		
Education	Read and write and above	19	141	1	1
	Cannot read and write	61	69	6.561(3.637-11.835)	3.542(1.642-7.643)
Residence	Urban	6	99	1	1
	Rural	74	111	11.000(4.586-26.387)	10.320(3.624-29.390)
Monthly household income	<35.6USD	58	94	3.253(1.856-5.702)	4.319(1.971-9.460)
	≥35.6USD	22	116	1	1
Decline in food intake	Yes	68	43	22.008(10.937-44.285)	13.471(6.147-29.525)
	No	12	167	1	1