

Undernutrition and Associated Factors among Adult Tuberculosis Patients in Hossana Town Public Health Facilities, Southern Ethiopia

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Abstract

Background: Undernutrition and tuberculosis (TB) are interconnected in a complex relationship. There is a high prevalence of undernutrition among adult tuberculosis patients worldwide, specifically in developing countries including Ethiopia. Tuberculosis patients are more likely to be wasted or have a lower body mass index than the healthy person. Tuberculosis causes undernutrition through raised metabolic demands, by decreasing nutritional intake and by decreasing necessary immune functions. Implementation of WHO recommended services for TB patients are very weak, so this study will fill these gaps.

Objective: To assess the magnitude of undernutrition and associated factors among tuberculosis patients at Hossana Town public health facilities.

Method: Institution based cross-sectional study was conducted from November 2015-March 2016 in Hossana Town public health facilities. A total of 247 TB patients were considered for the study. Consecutive study participants were interviewed until the required sample size was reached for each public health facility. Data were entered to SPSS version 20 for statistical analysis. Descriptive statistic, Binary logistic regression was done by using bivariate and multivariate analysis to identify factors associated with undernutrition among TB patients.

Result: The magnitude of undernutrition among adult TB patients was 38.90%. Duration of cough or other TB symptoms before diagnosis of TB (AOR=2.27; 95% CI=1.00, 5.12), family size (AOR=2.98; 95% CI=1.53, 5.83), and HIV co infection (AOR=5.06; 95% CI=2.00, 12.78) were the factors associated with undernutrition.

Conclusion: The magnitude of undernutrition among adult tuberculosis patients was high. Early screening and diagnosis tuberculosis as well as Nutritional status should be part of the routine care for all adult TB patients. In addition, attention should be given to TB-HIV co infected patients.

Keywords: Tuberculosis; Undernutrition; Associated factors

Introduction

Tuberculosis and undernutrition are inter linked in a complex relationship. Undernutrition is highly prevalent among people infected with TB and undernutrition is the risk factor for progression of latent TB to active TB. Undernutrition is a predictor of increased risk of death and TB relapse among TB infected patients [1]. Tuberculosis patients have decreased in appetite, has decreased in nutrient intake, micro nutrient malabsorption, and changed metabolism. These problems lead to wasting. Both protein-energy malnutrition (PEM) and micronutrients deficiencies increase risk death among TB patients. Undernourished TB patients have delayed recovery and higher mortality rates than well-nourished TB patients [2]. Tuberculosis (TB) causes undernutrition through raised metabolic demands and decline in nutrition intake, and nutritional deficiencies may exacerbate the TB disease, or it takes longer recovery by decreasing necessary immune

functions [3]. Malnutrition is recurrently detected in tuberculosis patients [4].

Hard to determine exactly what the nutritional status of patients with active TB was earlier the onset of the disease, making it difficult to fix whether malnutrition directed to the advancement of the disease or whether active TB directed to malnutrition. Number studies described that patients with active TB are more likely to be wasted or have a lower body mass index than the healthy person [5].

The systemic literature review concluded that there was a long linear inverse relationship between TB incidence and BMI, within the BMI range 18.5-30 kg/m². The average slope gave a reduction in TB incidence of 13.8% [95% CI 13.4-14.2] per unit increase in BMI. The dose-response relationship was less certain at BMI <18.5 and 430 kg/m² [6]. Undernutrition problem among TB patients depends on their treatment category, BMI progressively increased as the treatment duration increased from start up to completion [7].

A study conducted in Indonesia shows that 87% of TB patients had malnutrition compared to healthy persons. The mean body mass index (BMI), family history of TB, family size and employment status are the associated factors with undernutrition of TB patients [8].

Study conducted in Ghana shows undernutrition among TB patients was significantly associated with marital status, monthly income, educational status and family size at the time of starting TB treatment. Two months after initiating the TB treatment change in body mass index was significantly associated to age, marital status, employment status, and educational status [9].

A study conducted in Uganda and Malawi reveals that there is higher undernutrition among adult TB patients. Moreover, another study conducted in Uganda showed that undernutrition among adult TB patients was 62% [10,11].

As studies conducted in Ethiopia (Gonder and Addis Ababa) shows that there was higher prevalence of undernutrition among Adult TB patients 65% and 39.7% [12,13].

WHO recommended services for TB patients are nutrition assessment and counseling, management of malnutrition and supplementation of micronutrients. However, implementation of these services is very weak and limitations of researches conducted on undernutrition and associated factors among adult tuberculosis patients in Hossana town hindered the provision of appropriate services as recommended by WHO. So, the aim of this study was to fill these gaps. Moreover, the findings of this study will be used for evidence-based intervention in the study area. And it will also provide information for health planners, managers and researchers.

Methodology

Study area

Hossana Town is the capital town of Hadiya zone, which is located 232 km far from Addis Ababa, the capital city of Ethiopia, and 194 km far from the regional city, Hawassa [14]. Hossana Town has divided into three sub cities and eight administrative Kebeles. According to the 2015/16 G.C data, the Town has a total population of 100501 from which 50984 (50.73%) were females. The Town had one zonal public Hospital (Nigist Eleni Mohamed Memorial Hospital) and three public health centers (Hossana Health Center, Lichamba Health Center and Bobicho Health Center). All these public Hospitals has currently started TB treatment services.

Study design and study period

The institution based cross-sectional study was conducted from November 2015-March 2016.

Source and study population

All adult TB patients currently recorded and on TB treatment care in Hossana town public health facilities were considered as source population. Tuberculosis patients who were visiting the public health facility during the data collection period were study population.

Inclusion and exclusion criteria

Adult TB patients age ≥ 18 in public health facilities and those who were visiting public Health facility during study period irrespective of

their sex were included in the study whereas TB patients with a serious mental health problem were excluded from the study.

Sample size determination

Single population proportion formula was used to determine the sample size. The following assumptions were considered. The prevalence of malnutrition among Tuberculosis patients 39.7% which gives a maximum sample size after checking for different factors from different literatures [13], 95% confidence interval and 5% margin of error.

$$n = z \frac{2}{\alpha} * \frac{P(1-P)}{d^2} = (1.96)^2 * 0.39(0.61) / 0.0025 = 366.$$

Then, the correction factor formula was used to determine final sample size because the source population was less than 10,000.

$nf = n / (1 + n/N) = 366 / (1 + 366/596) = 224$ and the final sample size was 247 after considering a 10% non-response rate.

Sampling procedures

All public health facilities in Hossana town were considered for the study (Nigist Eleni Mohamed Memorial Hospital, Hossana Health Center, Lichamba Health Center and Bobicho Health Center). The sample size for each public health facilities was calculated based on the population proportion to size TB patient currently enrolled for each public health facility. Study participants were consecutively interviewed until the required sample size reached for each public health facility.

Data collection tools and procedures

A structured questionnaire was adopted after reviewing different scientific literatures on the area of undernutrition and associated factors among TB patients. The adopted questionnaire was translated into Amharic and back to English to check its consistency.

Public Health facilities record were used to collect information on basic demographic data, type of Pulmonary TB, the length of symptom before the diagnosis of Tuberculosis, and length of treatment after diagnosis of tuberculosis. Information like monthly income and number of family size was collected by interviewing study participants.

Measurement

Weight was measured at the time of data collection to the nearest ± 100 g precision on a digital standing scale. Weight was measured with minimal or light clothing on and calibration to zero continuously conducted after each measurement. Known weight measurement for checking the instrument was carried out daily before any measurement had started. The same weight measurement instruments were used and calibrated at each morning to ensure validity of the results. Height of the patients was measured while standing erect without shoes with a stadiometer using standard procedures. Both height and weight were recorded with two decimal places. Body mass index (BMI in kg/m^2) was calculated and classified into categories as recommended by WHO.

Data quality management

Data collectors and supervisor were deployed based on educational status and experience in a TB clinic. Two days training were given on

data collection tools and procedure. Standardization for weight and height measurement during intra and inter-data collection was conducted. The questionnaire was pre-tested in two public health facilities out of the main study area and necessary corrections were made. Crosschecking for completeness during data collection on daily basis were conducted. Moreover, data cleaning and checking were done before analysis and a unique code number labeled for each individual questionnaire that helped to found missed value and to retrieve back during analysis.

Data analysis

Data were entered into SPSS version 20 for descriptive and logistic regression analysis. Bivariate and multivariate analysis was used to identify factors associated with undernutrition among TB patients. Variables with $p \leq 0.2$ in the bivariate logistic regression analysis were entered into multivariate logistic regression analysis. Variables in multivariate logistic regression analysis with P value ≤ 0.05 was considered as significantly associated factors with outcome variable.

Operational definitions

Undernutrition: A person with BMI <18.5 kg/m² were considered as undernutrition.

Body mass index (BMI): BMI is defined as weight of the individual divided by the square of the same individual height in meter and classified as BMI <16.0 kg/m² (Sever Undernutrition), BMI 16.0 kg/m²- 16.99 kg/m² (Moderate undernutrition), BMI 17.0 kg/m²- 18.49 kg/m² (Mild undernutrition), BMI 18.5 kg/m²- 24.99 kg/m² (Normal weight), BMI 25.0 kg/m²- 29.99 kg/m² (Overweight) and BMI ≥ 30 kg/m² (Obesity).

Duration of cough or other TB symptom before diagnosis of TB: Length or duration of days lasted with a cough or other TB symptoms

like accidental weight loss, night sweats, loss of appetite, and fever before the diagnosis of TB

Ethical Consideration

Ethically clearance was obtained from Addis Continental Institute of Public Health, Ethical Committee. Ethical committee confirms, the instruments and procedures will not cause any harm on study participants. Permission letter was obtained from Hadiya Zone Health Department, Hossana town administration health office, and respective Public health facilities. Written and oral consent was obtained from each study participants after explaining the purpose of the study. Confidentiality was ensured by not writing their personal identification. The privacy of study participants was ensured. Respondents with a problem of undernutrition were counseled and referred for appropriate nutritional care and support.

Results

Socio demographic characteristics of study participants

The mean age of study participants was 32.90 (± 14.60) years. More than half of the study participants were married 140 (57%) and less than fifty percent of the study participants were single 99 (40%). Half of the study participants were protestants 124 (50%), 43 (17%) of study participants had no formal education, and 91 (37%) of the study participants were unemployed.

Among study participants, 206 (83%) were living in the urban area and 93 (37%) had a family size of less than or equal to five and 93 (37%) of the study participants had the lowest monthly income quintile which was less than 300 ETB (Table 1).

Variables	Category	Frequency (N) = 247	Percentage (%)
Age	<24	84	34.0
	24–30	65	26.3
	31–40	41	16.6
	>40	57	23.1
Sex	Male	129	52.2
	Female	118	47.8
Marital Status	Married	140	56.7
	Single	99	40.1
	Divorced	4	1.6
	Widowed	4	1.6
Religion	Protestant	124	50.2
	Orthodox	86	34.8
	Muslim	33	13.4
	Catholic	4	1.6

Educational Status	No Formal Education	43	17.4
	Primary (Grade 1-8)	85	34.4
	Secondary (Grade 9-10)	69	27.9
	Preparatory (Grade 11-12)	28	11.3
	Post Preparatory (Grade 12+)	22	8.9
Occupation	Housewife	54	21.9
	Government Employee	24	9.7
	Farmer	35	14.2
	Merchant	43	17.4
	Unemployed	91	36.8
Residence	Urban	206	83.4
	Rural	41	15.0
Family Size	≤ 5	154	62.3
	>5	93	37.7
Income(ETB)	<300	93	37.7
	300-1100	92	37.2
	>1100	62	25.1

Table 1: Socio-demographic characteristics of study participants at Hossana town public health facilities, Southern Ethiopia, November 2015-March 2016.

Health status of the study participants

Among study participants, 35 (14%) of them were HIV positives, 30 (12%) of study participants showed the symptom of a cough or other TB symptoms within less than one month, 172 (69%) study participants were showed the symptom of a cough or other TB symptoms within one to three months and 45 (18%) of study participants were showed the symptom of a cough or other TB symptoms after three months before diagnosis of TB.

From study participants, 101 (40%), 116 (47%) and 30 (12%) were smear positive, smear negative and extra pulmonary TB patients respectively. More than ninety percent of study participants were new TB cases 227(92%). A total of 136 (55%) and 111 (45%) of the study participants were in the intensive and continuous phase of the treatment respectively (Table 2).

Variable	Category	Frequency (N=247)	Percentage (%)
Pregnancy Status	No	110	93.2
	Yes	8	6.8
Lactation Status	No	113	95.8
	Yes	5	4.2
HIV status	Reactive	35	14.2
	Non-Reactive	212	85.8
Co morbidity			
Diabetes	No	234	94.7
	Yes	13	5.3
Chronic Kidney Disease	No	238	96.4

	Yes	9	3.6
Duration of cough or other TB Symptom before diagnosis of TB	Less Than a month	30	12.1
	1-3 month	172	69.6
	3 months and above	45	18.2
Type of TB	Smear +	101	40.9
	Smear -	116	47.0
	EPTB	30	12.1
Form of TB	New case	227	91.9
	Retreatment Case	15	6.1
	MDR	5	2.0
Anti-TB Rx Status	Intensive Phase	136	55.1
	Continuous Phase	111	44.9

Table 2: Health status of adult tuberculosis patients at Hossana Town public health facilities, Southern Ethiopia, November 2015-March 2016.

Anthropometric status of the study participants

The mean height, weight, and BMI of the study participants were 177 cm (± 0.94), 57 kg (± 8.97) and 19.36 kg/m² (± 3.00) respectively. Ninety-six study participants had a BMI less than 18.5 kg/m² 96

(38.9%) (undernutrition), whereas only one study participant had a BMI greater than or equal to 25 kg/m² (overweight). The study participants with weight less or equal to 45 kg were 21 (8.5%) (Table 3).

Anthropometric Variable	Category	Frequency (N)	Percentage (%)
Adult TB patient Height	>145 cm	247	100
Adult TB patient weight	≤ 45 kg	21	8.5
	>45 kg	226	91.5
Nutritional Status	<18.5 kg/m ² (Undernutrition)	96	38.9
	18.5 kg/m ² – 24.99 kg/m ² (Normal)	150	60.7
	≥ 25 kg/m ² (Overweight)	1	0.4

Table 3: Anthropometric status of adult tuberculosis patients at Hossana Town public health facilities, Southern Ethiopia, November 2015-March 2016.

Factors associated with undernutrition in adult tuberculosis patients

Bivariate and multivariate logistic regression analysis was conducted to identify factors associated with undernutrition of Tuberculosis patients. The odd of being undernourished were three times more likely in TB patients who stayed more than 3 months with symptom of a cough or other TB symptoms before diagnosis of TB as compared to TB patients stayed with symptom of a cough or other TB symptom less than 3 months before diagnosis of TB (AOR=2.27; 95% CI=1.00, 5.12).

The odds of being undernourished were three times more likely in TB patient with family size of more than five household members when compared to those who have the small number of household family members (AOR=2.98; 95% CI=1.53, 5.83).

The odds of being undernourished were five times more likely in TB patient who has HIV positive result when compared to TB patient who has negative HIV test result (AOR=5.06; 95% CI=2.00, 12.78) (Table 4).

Variables	Undernutrition		COR (95%CI)	AOR (95%CI)
	Yes	No		

		No (%)		No (%)			
Family Size	≤ 5	47	30.52	107	69.48	2.53 (1.49, 4.31)	2.98 (1.53, 5.83)*
	>5	49	52.69	44	47.31	1.00	1.00
Income	<300	40	43.01	53	56.99	2.36 (1.16, 4.81)	1.76 (0.54, 5.74)
	300-1100	41	44.57	51	55.43	2.52 (1.24, 5.13)	1.97(0.71, 5.48)
	>1100	15	24.19	47	75.81	1.00	1.00
HIV Status	Reactive	23	65.71	12	34.29	3.65 (1.71, 7.75)	5.06 (2.0, 12.78)*
	Non-Reactive	73	34.43	139	65.57	1.00	1.00
Duration of cough or other TB Symptom before diagnosis of TB	Less than a month	4	13.33	26	86.67	27.9 (8.3, 94.2)	0.57 (0.15, 2.24)
	1-3 month	76	44.19	96	55.81	1.43 (0.72, 2.83)	2.27 (1.00, 5.12)*
	3 months and above	16	35.56	29	64.44	1.00	1.00
Anti-TB treatment status	Intensive Phase	64	47.06	72	52.94	1.00	1.00
	Continuous Phase	32	28.83	79	71.17	2.19 (1.29, 3.73)	0.56 (0.3, 1.06)

Table 4: Factors associated with undernutrition among adult Tuberculosis patients at Hossana town public health facilities, Southern Ethiopia, November 2015-March 2016.

Discussion

The finding of this study showed that 38.90% of the study participants were undernourished this finding is in line with a recently conducted study in Addis Ababa [13]. This is might be due to relatively the same quality of service provision, care, and support, including nutritional counseling service for TB patients in Public health facilities. Also, public health facilities in the country follows the same TB program intervention strategy both at community and health facility level. As per the study conducted in Taipei, Taiwan and Peru undernutrition of adult TB patients were lower than the finding of this study [15,16]. Whereas, the study conducted in Gonder (Ethiopia), rural India, Uganda, Sekondi-Takoradi (western region of Ghana) and Malawi revealed that higher undernutrition status among adult TB patient than the finding of this study [9-12,17]. This difference might be due to a socioeconomic situation, sociocultural situation, lifestyle, feeding pattern difference of the countries and time of the study conducted.

This study revealed that TB patients stayed more than three months with the symptom of a cough or other TB symptoms before diagnosis of TB were more likely to develop undernutrition when compared to patient stayed with the symptom of a cough or other TB symptoms less than three months before diagnosis of TB. This finding might be due to the fact of Tuberculosis suspected patients are more prone to undernutrition and need early detection and referral within three weeks or less than three weeks for diagnosis and treatment including the necessary nutritional support and follow-up [18].

Poor nutritional status reflects the socio-demographic context in which a risk factor for the development of Tuberculosis infection [19]. Studies revealed that overcrowded homes and living in densely populated neighborhoods are conducive for an increased transmission of Tuberculosis bacilli and also could contribute to the development of TB [20-23]. In addition, a study in Ghana [6] and Indonesia [8] revealed that leaving in an extended and large family size were found

to be associated with undernutrition among adult TB patients. This fact was in line with the finding of this study in which TB patient with a large number of family size was more likely to develop undernutrition when compared to those who have a small number of household family members [24,25].

A study in Malawi, showed that HIV co-infection with Tuberculosis is known to contribute and worsen the degree of undernutrition among TB patients in which strengthen the finding of the current study. This study revealed that TB patient who has HIV positive result were more likely to develop undernutrition when compared to TB patient who has negative HIV test result which was in line with the finding of the study in Gondar too [12].

Conclusion and Recommendation

This study revealed that undernutrition status among adult Tuberculosis patients was very high. Duration of a cough or another symptom of TB before diagnosis and treatment of TB, family size, and HIV co-infection were factors associated with undernutrition among adult TB patients. Early screening and diagnosis Tuberculosis as well as Nutritional status should be part of the routine care for all adult TB patients. In addition, attention should be given to TB-HIV co infected patients.

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