

ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE



PREVALENCE OF UNDER NUTRITION AMONG ADULT TUBERCULOSIS
PATIENTS AND ASSOCIATED FACTORS IN PUBLIC HEALTH FACILITIES
OF ADDIS ABABA, ETHIOPIA

By; Mahlet Girma

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Declaration

I, the undersigned, MSc student declare that this thesis is my original work in partial fulfillment of the requirement for the degree of Master of Public Health Nutrition.

Name: Mahlet Girma (Health officer)

Signature: _____ Date: _____

Place of submission: - St. Paul Hospital Millennium Medical College (SPHMMC) school of public health

Date of submission: - September 28/09/2021

This thesis has been submitted with my/our approval as university Advisor:

1. Mr. Shikur Mohammed (Assistant professor)

Signature: _____ Date: _____

2. Ms. Getachew Tilahun (MSC, MPH)

Signature: _____ Date: _____

Examiners

Internal Examiner:

Signature: _____ Date: _____

External Examiner:

Signature: _____ Date: _____

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List of acronyms and abbreviations

AARHB	Addis Ababa health Bureau
AFB	Acid fast bacilli
ATS	American Thoracic society
BCG	Bacillus Calmette-Guerin
BMI	Body mass index
CDC	Center for disease control and prevention
DDS	Dietary diversity score
DOT	Directly observed therapy
DR TB	Drug Resistant Tuberculosis
EXTB	Extra pulmonary Tuberculosis
HC	Health center
IDDS	Individual dietary diversity score
IDS	Infectious disease society of America
NTCP	National Tuberculosis control Program
PLHIV	People living with human immune deficiency virus
SDG	Sustainable development goal
TB	Tuberculosis
TB/HIV	Tuberculosis or Human immune virus
WHO	World health organization

ABSTRACT

BACKGROUND; Malnutrition is a critical yet underestimated factor in susceptibility to infection including Tuberculosis, HIV/AIDS, and others which decrease productivity at the community level. Despite, the high burden of TB and under nutrition in Ethiopia, Assessment of nutritional status is often neglected in clinical practice and national TB program. The nutritional aspect is often not covered in infectious disease health program rather it inclined to non-communicable disease. There is no sufficient research done on prevalence of under nutrition and associated factors among TB patients. Although there are different guidelines about nutrition and TB the implementation of these services is very weak.

OBJECTIVE ; To assess prevalence of under nutrition among adult TB patients and associated factors in public health facilities of Addis Ababa, Ethiopia, 2021.

METHODS; An institutional based cross sectional study design was conducted in selected public health facilities of Addis Ababa. The total sample size of the study was 363. Data were collected by using a pretested structured questionnaire while, Anthropometric measurements such as height and weight were collected using stadiometer and Seca digital scale (Seca Germany). The data were coded and entered into computer using Epi data and analyzed using SPSS version 20. Binary logistic regression analysis was done to assess the association between outcome variable and independent explanatory variables. Odds ratio with 95% CI was estimated and multivariable logistic regression analysis was used. The level of statistical significance was declared at p-value less than 0.05.

RESULTS; The prevalence of under nutrition among adult TB patients in public health facilities of Addis Ababa was 45.5%. Participants who were government employee (AOR= 0.37; 95%CI=0.15, 0.92) and Who had Family size of five and more than five (AOR= 3.54; 95%CI=1.15,10.9) were significantly associated with under nutrition.

Participants who didn't got Dietary counseling (AOR=0.49; 95%CI=0.27,0.92) and who had low Individual dietary diversity (AOR =3.24;95%CI =1.59,6.6) and medium Individual dietary diversity (AOR=2.78; 95%CI = 1.16,6.65) were significantly associated with undernutrition.

Conclusion and Recommendation; The prevalence of undernutrition among adult TB patients in public health facilities of Addis Ababa was high. Hence, Regular nutritional assessment and dietary counseling should be part of routine care of adult TB patients.

KEYWORDS; Nutrition, under nutrition, Tuberculosis patients, Nutritional status, BMI

1, INTRODUCTION

1.1 BACKGROUND

Tuberculosis is the disease that occurs in someone infected with *Mycobacterium tuberculosis*. It is characterized by signs or symptoms of TB disease, or both, and is distinct from TB infection, which occurs without signs or symptoms of TB(1). It typically affects the lungs (pulmonary TB) beside the lung it also attack skin, Skull, Brain, Gut and kidney (Extra pulmonary TB)(2). Pulmonary TB (PTB) accounts for 85 % of all TB cases. It has two classifications; Smear-positive PTB which consists 75 – 80% of PTB cases and Smear-negative PTB consists 20 – 25% of PTB cases, worldwide.(3) There is a term called latent TB which refers to a state of persistent immune response to stimulation by M.Tuberculosis antigens with no evidence of clinically manifest TB disease. There is no gold standard test for direct identification of *M. tuberculosis* infection in humans(1).

Tuberculosis is a major public health problem causing significant health impact and affect productive segment of the population which leads to high burden to the health system and decreasing the individual as well as household economy. Despite the 42% of decline in the annual TB incidence from 369 cases per 100,000 population in 1990 to 177 per 100,000 populations in 2016, Ethiopia remains to be among the 30 countries reported with high burden of TB, TB/HIV, and DR-TB for 2015-2020. TB related mortality mentioned as one of the top ten reported cause of death among hospital admissions, with annual estimated death rate of 26 per 100,000 population in 2015 (4). According to World Health Organization (WHO), Global TB report 2017, about 10 million people newly developed TB and 1.6 million died. It was reported that 23% of the world population is latently infected with mycobacterium TB (MTB) which is causative pathogen of TB and at high risk of MTB reactivation (5).

Malnutrition is a general term which refers to either over nutrition or under nutrition. Under nutrition is a state when the nutritional status of an individual is less than an optimum level. It is commonly linked with illness and infections like pneumonia, TB, Human immunodeficiency virus (HIV), Gastro intestinal disorders and malabsorption. TB makes under nutrition severe and under nutrition weaken immune system by increasing the possibility that latent TB will develop in to active TB(6).

Malnutrition is a critical yet underestimated factor in susceptibility to infection including HIV/AIDS, TB and others which decrease productivity at the community level. Addressing the nutritional requirements of individual with infection is important (7,8). The study aims to assess the prevalence of under nutrition and associated factors among adult TB patients.

1.2 STATEMENT OF THE PROBLEM

Nutrition is an important component of healthy lifestyle which makes proper functioning of all systems of the body including the immune system and it helps for the prevention and management of communicable and non-communicable disease (8). Malnutrition strengthens the development of active TB and once it occurs it makes the nutritional state of the body worse. Nutritional status regulates normal health and functioning of all the vital system of our body, including the immune system. Host resistance to various infectious disease is determines by the immune system. Cell mediated immunity in the body plays a key role in the defense against Tuberculosis. From particular determinants of resistance to TB infection, nutritional status is one of the reasons for people with nutritional deficiency are associated with an impaired immune function (10,11). Nutritional status influences on the occurrence, morbidity and mortality pattern in infectious disease like diarrhea, TB and HIV has been documented but not given enough recognition (10).

The overall nutritional status which is reflected by BMI highly influences the risk of TB. Majority of people who have active TB are in catabolic state and experience weight loss. Weight loss can be occurred due to reduced food intake (because of losing appetite), nausea and abdominal pain, metabolic alterations and loss of nutrient from vomiting and diarrhea. Unintended weight loss is one of the best predictor of worst clinical outcome and manifestation of nutritional wasting. In TB patients major part of weight loss is fat mass, though the fat free component also lost in significant amounts, which has more of a result in physical functioning (6,9). In 2013, WHO launched a guideline on nutritional care and support for patients with TB. Nutrition screening, assessment and management are stated as components of TB treatment and care. All individuals with active TB should get nutritional status measurement and should get counseling accordingly but there is wide gap between the guideline and the reality. Because the implementation of these services is very weak and the limitation of studies on nutritional status and TB restrain the provision of appropriate services as recommended by WHO.

Also there is still no evidence based nutritional guidance specific to Adults who are being treated for active TB (6). The WHO guidelines for nutritional care and support ,The American Thoracic society (ATS), Center for disease control and prevention (CDC), and Infectious disease society of America (IDSA) recommends Further studies have to be conducted to address the gaps in knowledge about TB and under nutrition (6,11) .

Some evidences show that under nutrition in active TB patients is related to an increased frequency and severity of disease and also two to four folds increased in mortality. There is also a fivefold risk of drug induced liver damage. Majority of TB patients need nutritional care and support in developing countries like Ethiopia than developed countries. But they are getting few attentions (11). Progress on malnutrition is not just too slow, it is also deeply unfair and achievement towards Global nutrition target is too far or non-existent. Out of 2025 Global nutrition targets, the 2020 Global nutrition report shows progress on country level towards 8 of the 10 targets. Ethiopia is one of the country which is on track to 0 target (12). Studies states that little is known about the undernutrition of TB patients (13). A study done on adult TB patients states that the biological and social risk factors of TB have unclear relationship with under nutrition in TB patients (14). Another study done in Pune, India uses self-reporting HIV status of TB patients so there was underestimation. But in this study I will take HIV status from the registration.so this will helps to prevent underestimation (15).

The study done on nutritional status of TB patients in Ghana in 2008 states that there was inability to determine the proportion of patients with dual HIV/TB infection, making it difficult to assess the impact of TB infection on the nutritional status of patients. But in this study I will try to specify TB patients from HIV/TB patients (16). The study done on TB patients in 2016 in united states of America excludes HIV patients from the study this may affect generalizability of results. But in this study I will include HIV patients (17). A study done in Brazil on nutritional deficiency of TB patients in 2013 used secondary data. This makes the study with low quality and scope. But in this study I will use both primary and secondary data (18). A study done in Indonesia in 2019 on undernutrition of TB patients noted that Body mass Index is not sensitive enough to detect malnutrition in TB patients (19). A Study done in Korea in 2017 on Association of BMI with incident TB implies further research should be done focusing on TB and alteration of immune response (capability of body to resist infection) According to BMI (20).

According to the global TB report of 2018, in all countries and age groups there were cases. However, overall 90% were adults (aged ≥ 15 years), 9% were people living with HIV (72% in Africa) and two thirds were in eight countries. TB Global report of 2018 states that the Sustainable Development Goal (SDG) and END TB strategy targets set for 2030 can't be met without intensified research and development (21).

Despite, the high burden of TB and under nutrition in Ethiopia, assessment of nutrition intake is often neglected in clinical practice and national TB programs and also only few studies are conducted on the prevalence and associated factors of under nutrition among adult patients in Ethiopia and also they have their own limitations. Most of the time government programs are vertical, low cross- linkages exist, and no program supports patients with TB, there is lack of interaction between civil society, corporate or private sectors and Government programs, there is lack of awareness in patients and health care providers. The nutritional aspect is often not covered in infectious disease health program rather it inclined to non-communicable disease (22)

Information is needed to understand better the impact of under nutrition on TB relapse and Mortality. Well powered studies from diverse contexts are necessary to understand the potential of nutritional requirement during active TB disease to improve treatment outcomes and adherence. Such research will be a vital component of END TB strategy (23). In Ethiopia there is no detailed evaluation of the nutritional status of TB patients which is one of effective management of TB. The treatment guideline also neglects the nutritional supplementation part of an intervention. Priority wasn't given by decision makers as a result of evidence scarcity. so this study will generate baseline information to give priority to the nutritional intervention part of TB treatment.

Even Though, there is a wide coverage of Anti-TB treatment in Health facilities of Ethiopia, There is paucity of evidence on reasons and associated factors of non-adherence of Anti- Tb treatment in the study area. There is also no Evidence based guidance on food provision or supplementation for adults being treated for TB, with or without concurrent HIV infection. At present, even if there are large population sizes in Addis Ababa and overcrowding, there are no sufficient studies conducted. So this study will be done to fill the gaps on nutritional care of TB patients.

1.3 SIGNIFICANCE OF THE STUDY

Since there is no sufficient research done on undernutrition of TB patients in the study area, the findings of this study will be used for ministry of health and other implementing partners to plan intervention strategies and coordinate care and support activities for TB patients. It may also open room for researchers to investigate more and/or could be used as a baseline reference for further studies. The information generated in this research also helps policy makers, health planners and managers in designing intervention program.

2, LITERATURE REVIEW

2.1 PREVALENCE OF UNDERNUTRITION AMONG ADULT TUBERCULOSIS PATIENTS

Prevalence of undernutrition on the study done in Brazil on prevalence of nutritional deficiency in patients with pulmonary TB, From the study on Malnutrition and socio-demographic factors associated with pulmonary tuberculosis in Timor and Rote Islands, Indonesia and From the study done in Pokhara on Dietary practice was 50% ,87% and 36.1% Respectively (18)

A study done in Nepal on Nutritional Status of Patients with Pulmonary Tuberculosis receiving Anti-Tuberculosis Treatment revealed that among TB patients 10.7% were severely malnourished and 39.3% were moderately malnourished (24).

According to the study done on nutritional status of pulmonary tuberculosis patients aged 25-44 years attending tuberculosis clinic at Lodwar County and Referral Hospital in Kenya and in Burkina Faso on Nutritional Status of Patients with Tuberculosis and Associated Factors in the Health Centre Region prevalence of undernutrition was 48.2% and 35.8% respectively (9, 30). Overall, 7.3 percent of patients had severe thinness (BMI < 16.0 kg/m²), 8.9% moderate thinness (16.0–16.99 kg/m²), and 19.5% mild thinness (17.0–18.49 kg/m²) (25).

From the study done on nutritional assessment of newly diagnosed tuberculosis patients in a tertiary care hospital of Tripura, India and in rural central India on Nutritional status of adult Tuberculosis patients in Burdwan municipality area of West Bengal, under nutrition was found 66% and 53% respectively (31,32). Prevalence of Under nutrition on Predictors of Low Body Mass Index among Patients with Smear Positive Pulmonary Tuberculosis on three high Tb burden provinces in Kenya and From the study done in rural district of Malawi on moderate to severe malnutrition in patients with TB, showed 43% and 57% respectively (33, 35).

From the study on Patients Attending the Limbe and Buea Regional Hospitals, Cameroon on Incidence and Risk Factors of Anti-tuberculosis Drugs Cameroon showed, 78.21% Of the total study participants had BMIs less than 18.5 kg/m² (28).

Study on Evaluation of nutritional status of pulmonary TB patients of The Effia-nkwanta regional Hospital, Ghana Showed prevalence of Under nutrition to be 51% and 24%, 12% and 15% of patients respectively had mild, moderate and severe under nutrition (16).

Adult nutritional status can be evaluated in many ways but Body mass index (BMI) is the most widely used because it is inexpensive, non-invasive and suitable for large scale surveys. It used for not only to assess adult nutritional status but also the socioeconomic condition of a population in developing countries (29). It helps to measure the degree of thinness and fatness in adults over 18 years of age. During TB treatment lack of adequate weight gain and low BMI ($<18.5\text{kg/m}^2$) have high risk of TB relapse and death (6). The link between BMI (the ratio of weight per height squared) and TB was first recognized by Hippocrates (30). The study done in India on malnutrition and cytokine response shows that there is relationship between BMI and inflammatory cytokines of TB. Low BMI decrease the circulating level of pro-inflammatory cytokines but increase the level of regulatory cytokines (31).

The study done in Korea on Association of BMI and incident TB shows that higher BMI might be a protective factor of TB development, with inverse dose-response relationship although very high BMI ($\geq 30\text{kg/m}^2$) did not decrease risk of incident TB in young females and participants with diabetes mellitus among this Korean population (32). In another Indian study on Epidemiological evaluation of risk factors for TB revealed that TB patients were 11 times more likely to have a BMI < 18.5 (33).

In Ethiopia, The study done in Amhara regional state of Ethiopia on nutritional status of TB patients, the study done on nutritional deficiency and associated factors among new pulmonary TB patients of Bale zone and study done in Yirgalem hospital in Sidama zone on the impact of functional performance, HIV status, malnutrition and clinical features on treatment outcome of patients with pulmonary TB showed that prevalence of under nutrition was 57.17%, 63.2% and 77.9% respectively (40, 43, 45).

From the study done in central and northwestern zones of Tigray state on undernutrition among TB patients on directly observed short-course therapy, From the study done on undernutrition and associated factors among adult TB patients in Jigjiga public health facilities and From the study on Environmental and host-related determinants of tuberculosis in Metema district, north-west Ethiopia found prevalence of undernutrition 45.6%, 44.3% and 51% respectively (35).

From the study on Prevalence of pulmonary tuberculosis and associated risk factors in prisons of Gamo Goffa Zone, south Ethiopia the mean BMI of patients with active PTB was significantly

lower than the mean BMI of patients without active PTB (17.4 kg/m² versus 21.9 kg/m²) (36). The study on determinant factors of Treatment Failure among Tuberculosis Patients under Directly Observed Therapy in Tigray Regional State Public Hospitals, North Ethiopia, 68.8% of failure and 51.2% of cured patients were Under nourished (37). The study done in Hosanna and Addis Ababa on under nutrition and associated factors among TB patients showed 38.9% and 39.7% of undernourishment among TB patients (38).

The study on determinants of active pulmonary tuberculosis in Ambo Hospital, West Ethiopia, 63.5% of patients were undernourished (39). An Institution-based cross-sectional study conducted on Prevalence and associated factors of malnutrition among adult hospitalized patients at Amhara National Regional State Referral Hospitals and The study done in Adama on Assessment of Nutritional Status and Associated Factors Among Adult TB Patients on Directly Observed Treatment of Short Course in Health Facilities showed the prevalence of undernutrition was 55.6% and 53% respectively (40).

2.2 FACTORS ASSOCIATED WITH UNDER NUTRITION AMONG TB PATIENTS

2.2.1 SOCIO-ECONOMIC AND DEMOGRAPHY FACTORS

Malnutrition is a cause and consequence of poverty (TB fuels poverty and poverty fuels TB). Individual health and affects societies economic and social development (41). People who live in Places where there is an overcrowding and slum area are more prone to Mycobacterium. Poverty invites under nutrition and under nutrition invites TB infection (42). Poverty makes TB more severe because TB patients will get high expense and loss of income. This makes them to face the double burden of TB. Almost 75% of all TB cases affect people who are 15-54 years of age which is their prime working years. Most of the time will be too sick to work so their families will be forced to cover the expenses (6). From the study done on nutritional assessment of newly diagnosed tuberculosis patients in a tertiary care hospital of Tripura, India. 71% of female patients were suffering from malnutrition comparing with males (62%) (42).

In Chhattisgarh state, central India there was a study done on Nutritional Status of Adult Patients with Pulmonary Tuberculosis and Its Association with Mortality, It revealed as more than 85%

of men and almost 95 % of women were underweight at ($\text{BMI} < 18.5 \text{ kg/m}^2$), and two-thirds of women and half of men were severely underweight ($\text{BMI} < 16 \text{ kg/m}^2$) (43).

The study done on undernutrition among pulmonary TB patients in India for patients from 21-40 years of age group (63.93%) are malnourished, from 41-60 years age group (54.92%) are malnourished and >60 years of age group (59.09%) (8). Another Study on Evaluation of nutritional status of pulmonary TB patients of The Effia-nkwanta regional Hospital, Ghana, Showed as magnitude of under nutrition was much greater in those who have low income (less than 10.5 US dollar per month) (16). Another study in Tanzania on Wasting and body composition of adults with pulmonary tuberculosis in relation to HIV-1 coinfection, socioeconomic status, and severity of tuberculosis showed that undernutrition is positively associated with socio economic indicators (44).

One study from Ethiopia assesses TB/HIV costs. The mean pretreatment (from the first symptom to the first hospital visit) patient costs US\$196 for only TB services, US\$259 for TB/HIV services and US\$437 for only HIV services. According to patients annual income these are consistent to 35%, 33%, and 45% respectively (45). The study done on nutritional status and associated factors among adult pulmonary TB patients in Adama town shows that more females are malnourished (13.8%) than males (4.8%) (46). The study done on undernutrition of TB patients, a comparative study in Amhara regional state in Ethiopia shows that severity of TB was more virulent in females than males (47). Prevalence and associated factors of malnutrition among adult hospitalized patients at Amhara National Regional State Referral Hospitals showed that Illiterate patients were two times more likely to be malnourished as compared to literates (40).

2.2.2 HIV

people living with HIV (PLHIV), Individuals in contact with TB patient and with immunodeficiency conditions are high risk of TB (1). There is a synergy between TB and HIV. HIV is fueling TB epidemic and in high HIV prevalent areas TB is a leading cause of morbidity and mortality. HIV increases vulnerability to TB infection, progression of latent TB to active TB, Incidence and prevalence of TB, chance of re-infection and relapse of TB (2).

Evidences also shows that HIV negative individuals have 5%-10% risk over their life time but being HIV positive reactivates TB infection at a rate of 10% per year. HIV positive individuals are also exposed to re-infection with new strains of TB from their surroundings and drug resistance may occur repeatedly. PLHIV are 20 times more likely to develop TB disease than HIV negative individuals. In 2018 out of all HIV deaths one third of them are caused by TB (1,3). A study in Uganda on severity of HIV infection is associated with decreased phase angle, Fat mass and body cell mass in adult with pulmonary TB demonstrated that poor nutritional status is common among adults with pulmonary TB (48).

However, Predictors of change in nutritional and hemoglobin status among adults treated for tuberculosis in Tanzania showed that about 40% of HIV positive and 47% of HIV negative patients were undernourished (49). A study done in Ethiopia in 155 active TB patients (81 HIV-negative and 74 TB/HIV co-infected) and 31 controls, BMI<18.5 was common (65.4% of TB patients, 71.6% of TB/HIV co-infected), and severe malnutrition (BMI<16) was more common in those co-infected (50). From the study done in Gondar on Alterations in serum levels of trace elements in tuberculosis and HIV infections Malnutrition was detected in 71.6% of HIV-positive and 65.4% of HIV-negative TB patients. Severe malnutrition was more pronounced in TB patients with HIV coinfection (50).

2.2.3 NUTRITIONAL SUPPLEMENTS AND TB OUTCOME

Nutritional supplementation of TB patients may help to improve Nutritional status. A study found that nutritional supplementation with counselling helps to increase energy intake, body weight, Total lean mass and physical function. Patients in nutrition supplementation group continued to show a great increase in body weight than control subjects during later follow up. Accelerating the recovery of lean tissue might help to restore physical functions more rapidly. Restoration of physical functions might help to shorten the convalescent period and facilitate earlier return to productive work. Early restoration of nutrition could also lead to immunologic changes that could enhance the clearance of mycobacteria and reduce infectiousness of the patient (51).

However, the overall evidence on improving TB outcomes by nutritional supplementations is limited and they have low quality.

Cochrane systematic review establish only six trials with good quality from the studies on the effect of macro nutrients and micro nutrients supplementation on outcomes of treatment and quality of life. So Cochrane researchers states that there was insufficient research to know whether routine supplementation of free food or energy can do better on TB outcome however, the supplementation could help people to recover from their illness by strengthening their immune system, muscle strength (52). Giving nutritional support for TB patient on treatment will help to improve nutritional status and TB outcomes (22). Specific nutrients might play a role in influencing risk of TB. So It is necessary to study the effect of nutrient supplementation on nutritional status (53).

CONCEPTUAL FRAMEWORK

This framework shows factors assumed to affect under nutrition of TB patients is adopted and modified from different literatures (6,50,51)

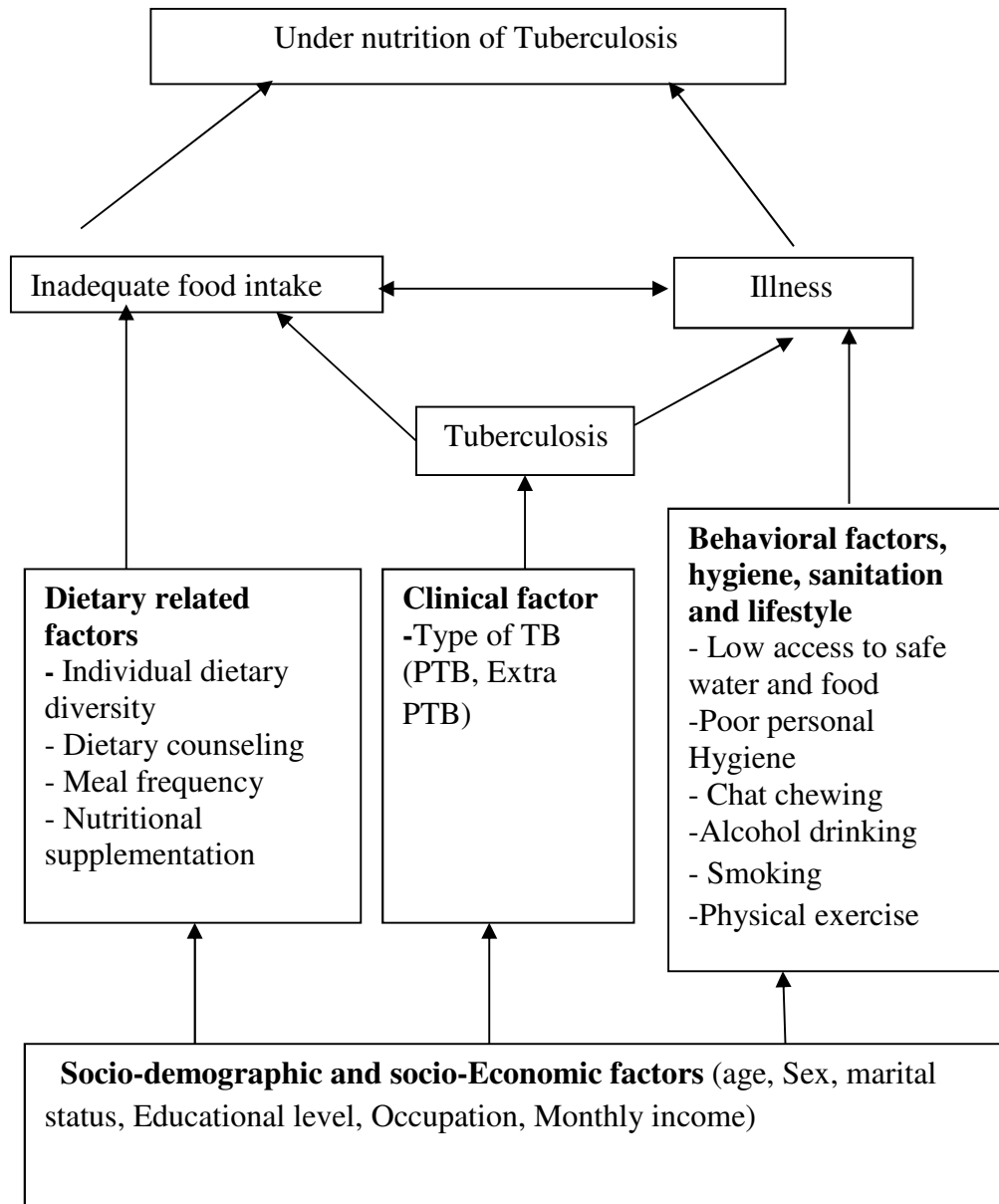


Figure1 The conceptual framework of factors assumed to affect under nutrition of TB patients (modified and developed from different literatures) (6,50,51)

3, OBJECTIVES

3.1 General objectives

- To assess the prevalence of under nutrition among adult Tuberculosis patients and associated factors in public facilities of Addis Ababa, Ethiopia, 2021

3.2 Specific objectives

- To determine prevalence of under nutrition among Adult Tuberculosis patients in public health facilities of Addis Ababa, Ethiopia, 2021
- To identify factors associated with under nutrition among adult Tuberculosis patients in public health facilities of Addis Ababa, Ethiopia ,2021

4, METHODS

4.1 Study area and period

The study was conducted in selected public health facilities of Addis Ababa from Nov 20,2020 to Jan, 21, 2021. Addis Ababa is the capital city of Ethiopia. It is located in the heart of the country surrounded by Oromia. It lies between 2200 and 2500 meters above sea level. The city lies at the foot of the 3000 meters high Entoto Mountains. Based on the 2007 census, Addis Ababa has a total population of 2,738,248, Where 1,304,518 is Male and 1,433,730 are females. Despite differences in number, almost all ethnic groups live in Addis Ababa. However, the two largest ethnic groups are Amhara 47.04% and Oromo 19.51%. Regarding religion, 74.7% of the population are Orthodox Christians, 16.2% Muslims, 7.77% Protestants, and 0.48% Catholics. Addis Ababa comprises ten sub cities (54). In Addis Ababa there are 80 public health facilities, of which 14 are hospitals and 66 are health centers Each Health center has a catchment population of 40,000 (55). Among ten subcities four of them were selected randomly. These are Kolfe sub city, Kirkos sub city, Yeka sub city and Gulele sub city. Among them four health centers which renders Anti-TB services were selected. In the study area 550 were the number of TB patients who have follow up at public health facilities.

4.2 Study design

- Institutional based cross sectional study was conducted.

4.3 Population

4.3.1 Source population

TB patients who have follow up in TB clinics of public health facilities in Kolfe, Kirkos, Yeka and Gulele sub cities in Addis Ababa.

4.3.2 Study population

TB patients who have follow up in TB clinics of the selected public health facilities in kolfe, Kirkos, Yeka and Gulele sub cities in Addis Ababa.

4.4 Eligibility criteria

4.4.1 Inclusion criteria

All adult TB patients aged 18 years and above, who come to attend their follow up in selected public health Facilities within the data collection period.

4.4.2 Exclusion criteria

Pregnant women and patients who are critically sick, mentally ill, with physical disabilities and unable to communicate will be excluded from the study.

4.5 Sampling

4.5.1 Sample size determination

For objective 1

The sample size was estimate using single population proportion formula. The following assumptions were used.

Prevalence of under nutrition among adult TB patients to be 39.7% is adopted from research done in Addis Ababa in 2015 by Berihun D.(56).

Where, n = required sample size,

z = the selected critical value of desired confidence level (1.96)

p = the population proportion (39.7%)

$q = 1-p$

d = the desired level of precision (0.05).

95% confidence interval which gives $n = 368$

since TB patients on follow up were 550 it is less than 10,000 then we used correction formula.

Where

n_i = initial sample size = 368

n_f = new sample size

N = population size = 550

$$N_f = 220$$

then add 10% non-response rate (22) $(220+22) = 242$.

Design effect 1.5 was used (242×1.5) It yields 363.

For objective 2

-The sample size was determined using double population proportion formula . The following assumptions were used.

- ❖ From the study done in Hossana on under nutrition and associated factors among adult TB patients in 2018 by Gebremeskel T. HIV was one of the significant factor (38).

Where, p_1 = Proportion of TB patients who were undernourished among those who were HIV positive = 65.71%

p_2 = proportion of TB patients who were undernourished among those who were HIV negative = 34.43 %

α = 0.05 probability of type I error (1.96)

β = 20 % probability of rejecting true difference

r = ratio of unexposed to exposed = 1

$n = 92$. then add 10% non-response rate (9.2) $(92+9.2) = 101$

then design effect 1.5 will be used $(101 \times 1.5) = 152$

- ❖ From the study done in Hossana on under nutrition and associated factors among adult TB patients in 2018 by Gebremeskel T. family size was another significant factor (38)

Where, p_1 = Proportion of TB patients who were undernourished among those with family size of ≥ 5 = 52.69 %

p_2 = proportion of TB patients who were undernourished among those with family size of ≤ 5 = 30.52 %

α = 0.05 probability of type I error (1.96)

β = 20 % probability of rejecting true difference

r = ratio of unexposed to exposed = 1

$n=170$ then add 10% non-response rate $(17) (170+17) = 187$

design effect 1.5 will be used $(187 \times 1.5) = 281$

Accordingly, the sample size calculated for the first objective yielded the largest sample size which is 363, so that it was the final sample size of this study.

Table 1 sample size determination of adult TB patients and associated factors in public health facilities of Addis Ababa, 2021

Specific objectives	Assumptions										
	p		Z			D	Formula	n	n_{total}	DEFF	N
Objective 1	39.7%		1.96			0.05	Single population proportion	368	242	1.5	363
Objective 2	p_1	p_2	α	β	R	D	Formula	n	n_{total}	DEFF	N
HIV/AIDS	65.71%	34.43%	0.05	20%	1	0.05	Double population proportion	92	101	1.5	152
Family size	52.69%	30.52%	0.05	20%	1	0.05		170	187	1.5	281

4.5.2 Sampling technique/procedure

A multi-stage sampling technique was used for this study. First, four sub cities was selected out of ten sub cities of Addis Ababa city by using simple random sampling method. Then, health facilities rendering TB treatment services was selected using simple random sampling technique proportionally from the four sub cities. Finally, by taking the list of all adult patients from the list of TB registers of the respective health facilities under the study, Which is 550 the sampling frame was constructed. Then, the total sample size was proportionally allocated to the number of adult TB patients per each facility and individual patient was selected using systematic random sampling. Sampling interval (K) = total population (550)/sample size (363) = 2 . So the first participant was selected randomly then every 2th participant will be selected.

To proportionally allocate the sample size we used the formula

$n_h = (N_h/N) \times n$ Where, n_h = sample size for stratum h

N_h = population size for stratum h

N = total population size = 550

n = total sample size = 363

In Woreda 11 health center 137 patients are on follow up, In Kasanchis HC 136 patients are on follow up, In Yeka HC 138 patients are on follow up and In Shiromeda HC 139 patients are on follow up. So by using the above formula it gave 90 for Woreda 11 Hc, 90 for Kasanchis HC, 91 for Yeka HC and 92 for Shiromeda HC. The patient flow in TB clinics of each health institution per day on average was; 10-30 at Woreda 11 health center, 10-25 at Kasanchis HC, 15-30 at Yeka HC and 10-35 at Shiromeda HC.

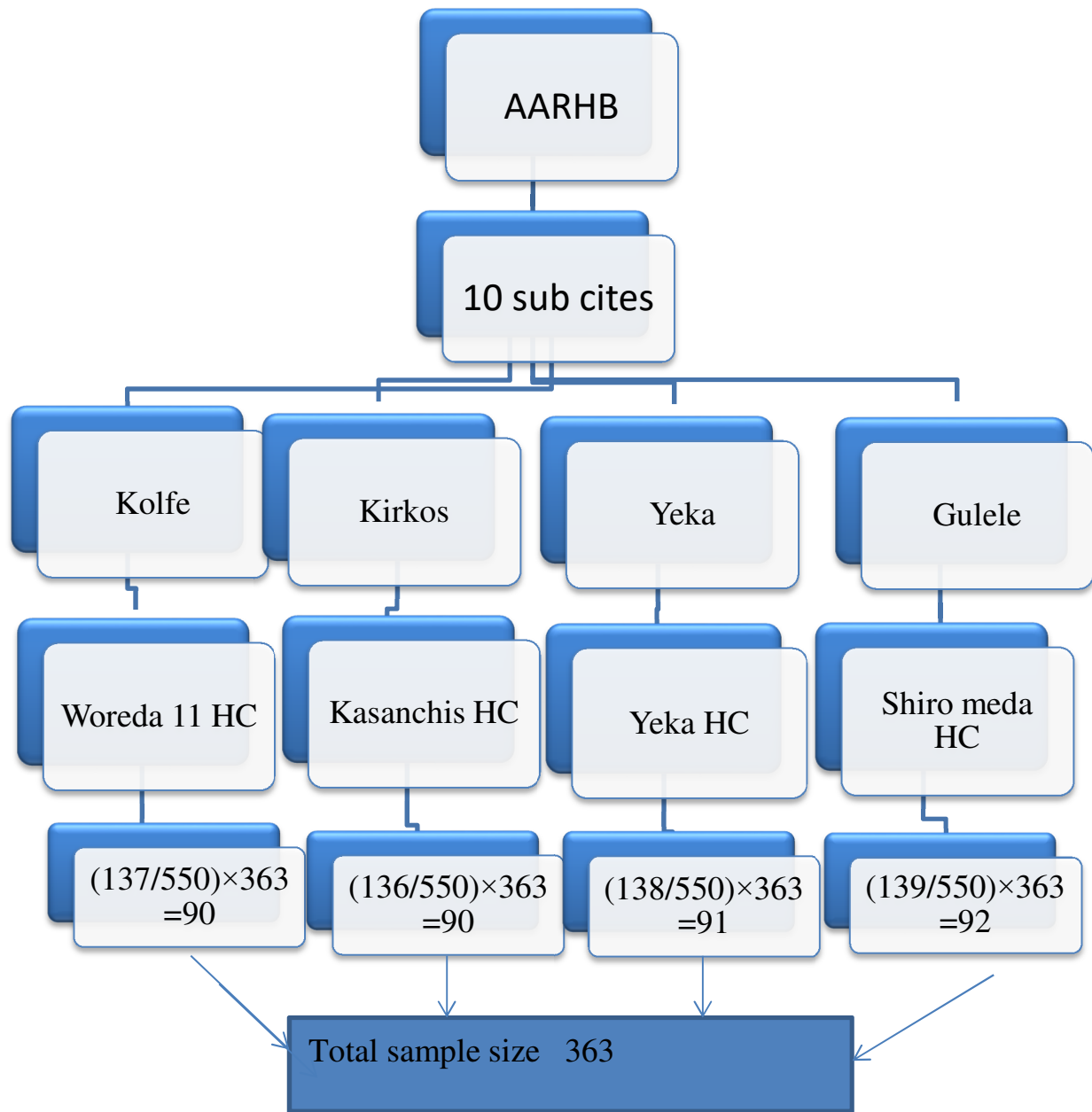


Figure 2 Diagrammatic presentation of the sampling procedure of study on under nutrition among adult TB patients and associated factors in public health facilities of Addis Ababa, 2021

4.6 STUDY VARIABLE

4.6.1 Dependent variable

- **Under nutrition** (Yes, No)

4.6.2 Independent variables

- **Socio-demographic and socio-Economic characteristics;** Age, Sex, Marital status, Educational level, Occupation, Income of the household
- **Dietary related factors;** Individual dietary diversity, Dietary counselling, Meal frequency, Provision of food supplement
- **Clinical factor;** Type of TB, Extra TB
- **Behavioral factors, hygiene and sanitation and lifestyle;** Low access to safe water, Poor personal hygiene, Alcohol, Smoking, Chat chewing, Physical exercise

4.7 OPERATIONAL DEFINITION

Pulmonary TB- (PTB):

Two or three initial sputum smear examinations positive for AFB (acid fast bacilli), or one sputum smear positive for AFB plus radiographic abnormalities consistent with active pulmonary TB, as determined by clinician, or one sputum smear positive for AFB(smear positive cases). cases with three sputum smears negative for AFB but clinical and radiological features compatible with active TB and showing improvement after empirical anti TB treatment where considered to be smear negative case. Both smear positive and smear negative patient will be treated as pulmonary TB cases for my analysis.

Extra pulmonary TB (EPTB): type of TB which includes organs other than lungs, such as lymph nodes, gastro intestine tract, genitourinary tract, skin, joints and bones, meninges, etc.

Body mass index (BMI): Is defined as the weight in kilogram of the individual divided by the square of the height in meter and used to determine the nutritional status of TB patients and classified as follows: Undernourished BMI < 18.5 Kg/m² and BMI > 18.5 Kg/m² not undernourished.

Dietary counseling -Is a process by which a health professional with special training in nutrition helps people make healthy food choices and form healthy eating habits.

Nutritional supplementation – It refers to any dietary supplement that is intended to provide nutrients that may not be consumed in sufficient quantities; for example, Vitamins, minerals, proteins, amino acids or other nutritional substances. Substances are usually ingested in capsule, tablet or liquid form.

Meal frequency – Refers to how many times per day an individual eat his/her meal

Dietary Diversity – Refers to the number of different foods and food groups consumed by the individual within 24 hours.

High dietary diversity- when Individual eat greater than or equal to 6 food groups.

Medium dietary diversity – when individual eat four or five food groups.

Low dietary diversity – When individual eat less than or equal to three food groups.

personal hygiene –Those practices performed by an individual to care for one's body health and wellbeing through cleanliness.

Physical activity: is defined as any bodily movement produced by skeletal muscles that requires energy expenditure

Moderate physical activity -Activities that require moderate physical effort and cause small increases in breathing or heart rate.

Vigorous physical activity - Activities that require hard physical effort and cause large increases in breathing or heart rate.

Typical week - A week when the participant was engaged in his/her usual activities considered as typical week.

Typical day - A day when the participant was engaged in his/her usual activities considered as typical day

Metabolic Equivalent (MET) - MET is the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy cost of sitting quietly, and is equivalent to a caloric consumption of 1 kcal/kg/hour.

4.8 DATA COLLECTION TOOLS AND PROCEDURES

Data collection was done by using structured interviewer administered questioner which was adopted consistent with the conceptual frame and reviewed literatures. Standard technique of anthropometric measurement was done. Secondary data was taken from the register. Dietary diversity score standard questioner was used. Data was collected by two BSC nurses and supervised by two health officers.

Before introducing questionnaires, study subjects was informed about the purpose of the study. They were aware of the fact that they can withdraw from the study at any stage of the study. Written informed consent was taken from each study subject by trained data collectors who can speak the local language fluently were collect the data.

Anthropometry measurement

Nutritional status was assessed using body mass index(BMI), Which is defined as weight in kilograms divided by the square of her height in meters ($BMI = \text{kg}/\text{m}^2$). Height and weight was measured using stadiometer and Seca digital scale (Seca Germany). Weight was measured using portable standing scale. It has ability to measure weight from 0 to 150 Kg. The weight was recorded to the nearest 0.1 kg. It was calibrate against known weight regularly. During the procedure the subjects were wear light clothes and took off their shoes. Height was measured in cm using portable stadiometer. All adults were measured against the wall without foot wear and with heels together and their heads positioned and eyes looking straight ahead (Frankfurt plane) so that the line of sight was perpendicular to the body. The height was recorded to the nearest 0.1cm. All measurements was taken twice and the average was computed. When the two measurements differ by one unit, the measurement had been repeated.

Since the data collection was done during Covid 19 pandemic all precautionary measures were taken. Data was collected with good ventilation as much as possible.

Both data collectors and study participants were wearing masks throughout the data collection, Hand sanitizer was used before and after measuring height and weight of the study participants.

4.9 DATA QUALITY MANAGEMENT

The questionnaire was prepared first in English and translated to Amharic (the official language of Ethiopia) then back to English so as to check for consistency. Pre testing of questionnaire was done. The questioner was tested with 5% of the sample population. Finally, they were asked which questionnaire was not clear, difficult to understand, uncomfortable and boring. After identifying the major problems improving and modifying the questionnaire was made. Data collectors were got one day training on the objective, methods, tool and ethics of the study. The functionality of digital weight scales was checked using known weight every morning before data collection begins and before every weight measurement. data collectors ensured the scale reading exactly at zero.

The data collection process was supervised by two health officers and the principal investigator on a daily basis. Investigator checked the collected data for completeness and consistency throughout the data collection period. Data coding, entry and cleaning was performed by the principal investigator. The supervisor and the principal investigator together was recheck the completeness and consistency. Non over lapping numerical code was assign for each question and the coded data were entered and cleaned into Epi data software. Before analysis, data were checked for normality then analyzed & interpreted. Finally, a quality report was developed and will be disseminated.

4.10 DATA PROCESSING AND ANALYSIS

All responses to the survey questionnaires was coded against the original English version, checked for missing values and outliers, cleaned and entered in to the Epi data, and analyzed using SPSS (SPSS Inc. Version 20.0).

In the techniques of data analysis part, the captured quantitative data were presented, analyzed, described and interpreted in a systematic manner for the next step of the research process.

Data obtained from respondents by using different data collection techniques were analyzed. Data collected by using interviews were compiled for analysis and interpretation.

Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to organize the demographic and socio-economic characteristics. Binary logistic regression was done to investigate the association between different explanatory variables and outcome variable. Variables with P-value < 0.2 on the binary logistic regression analysis and important variables for the objective of the study based on literature review was entered to the multivariate model. Having a p-value of less than 0.05 was used to declare the presence of statistically significant association between different variables. Weight and Height measurements were taken and body mass index (BMI) was calculated. According to WHO, BMI < 18.5 kg/m² are Undernourished and BMI > 18.5 kg/m² are not Undernourished (57).

Dietary diversity score

Dietary diversity score (DDS) was used to measure nutritional adequacy which refers to the Number of food groups consumed in a given time, often in 24 hrs. It included all foods he/she consumed the previous day, inside and outside the home. To better reflect a quality diet, the number of different food groups consumed was calculated by using IDDS (individual dietary diversity score) nine food groups was used and it was calculated by using the type and number of food groups consumed by the Individual. Then dietary diversity was divided in to three in which low IDDS for those who use 3 and less than 3 food groups, Medium IDDS for those who use 4 up to 5 food groups and high IDDS for those who use 6 and more than 6 food groups (58).

Behavior and lifestyle

Cigarette smoking status was categorize in to 1-5 times/day, 6-10 times/day and more than 10 times per day. Habit of chat chewing and drinking alcohol was categorized in to sometimes, once a day and more than one.

Physical activity and sedentary behaviors

Global Physical Activity Questionnaire (GPAQ) analysis guide was used for analysis of physical activity level of study participants.

Participant's minutes spend on each domain of physical activity was multiply by number of days of physical activity to get a week's physical activity in minutes.

Finally minutes in each domain was added together to get total physical activity level (TPA) per week. The level of physical activity was classified in to two groups based on the World Health Organization (WHO) physical activity guidelines, which is at least 150 minutes of moderate-intensity physical activity or 75 minutes of vigorous-intensity physical activity per week or an equivalent combination of moderate and vigorous-intensity physical activity achieving at least 600 Metabolic Equivalents (MET) minutes. Sedentary time spent per day was categorize as < 8 hours and ≥ 8 hours per day based on the mean sedentary time (59).

4.11 ETHICAL CONSIDERATIONS

Ethical approval for this study was obtained from ethical review committee of st. paul millennium medical college, school of public health. Then Addis Ababa public health Research and Emergency management Directorate was given ethical clearance. verbal consent was obtained from each study participant after thoroughly explaining the objectives and benefits of the study. In this study, the consent was prepared in English and translated in to Amharic. privacy and confidentiality were assured at all levels. All individuals had the right to refuse participation and data collectors were instructed not to attempt to force anyone to participate.

4.12 DISSEMINATION OF RESULTS

The result of the study will be submitted to st, Paul millennium medical college, school of public health. The findings of the study will also be reported to the Ethiopian Ministry of health, Addis Ababa health bureau. The findings will also be given to non-governmental organizations that are working on malnutrition and related projects in Ethiopia. The Great efforts also be made to disseminate the result through publication on reputable peer review journals and presentation in scientific conferences.

5. RESULT

5.1 Socio demographic characteristics

A total of 363 adults were sampled, out of which 18 adults were not willing to participate resulting a response rate of 95%. Of the total respondents, 179 (51.9%) were males, 162 (47%) married, 234 (67.8%) had family size of two up to four, 92 (26.7%) were daily laborers and 119 (34.5%) were primary school.

The mean (SD) of age of the respondents was 33.95 ± 11.54 years, out of which 39.1% were between 27 and 35 years. The mean (SD) of total monthly income of the respondents was 2320.86 ± 1294.57 Ethiopian birr (ETB).

Table 2 Socio demographic characteristics of adult TB patients in public health facilities of Addis Ababa, 2021

Variable	Frequency	Percent
Sex		
Male	179	51.9
Female	166	48.1
Age (in years)		
18-26	86	24.9
27-35	135	39.1
36-44	80	21.2
≥ 45	44	12.8
Marital status		
Married	162	47
Single	157	45.5
Widowed	18	5.2
Separated	8	2.3
Family size		
1	22	6.4
2-4	234	67.8

≥ 5	89	25.8
Occupation		
Merchant	47	13.6
Daily laborer	92	26.7
Government Employee	70	20.3
Housewife	63	18.3
Student	47	13.6
Other	26	7.5
Education		
Can read and write	51	14.8
Primary school	119	34.5
Secondary school	77	22.3
Above secondary school	98	28.4
Income		
< 2000	191	55.4
2000-2999	60	17.4
3000-4499	60	17.4
≥ 4500	34	9.9

5.2 Prevalence of undernutrition

The mean BMI of respondents was 19.86 ± 4.64 . The prevalence of under nutrition among the respondents was 157 (45.5 %). Among the undernourished 87 (55.41%) were males and 70 (44.58%) were females.

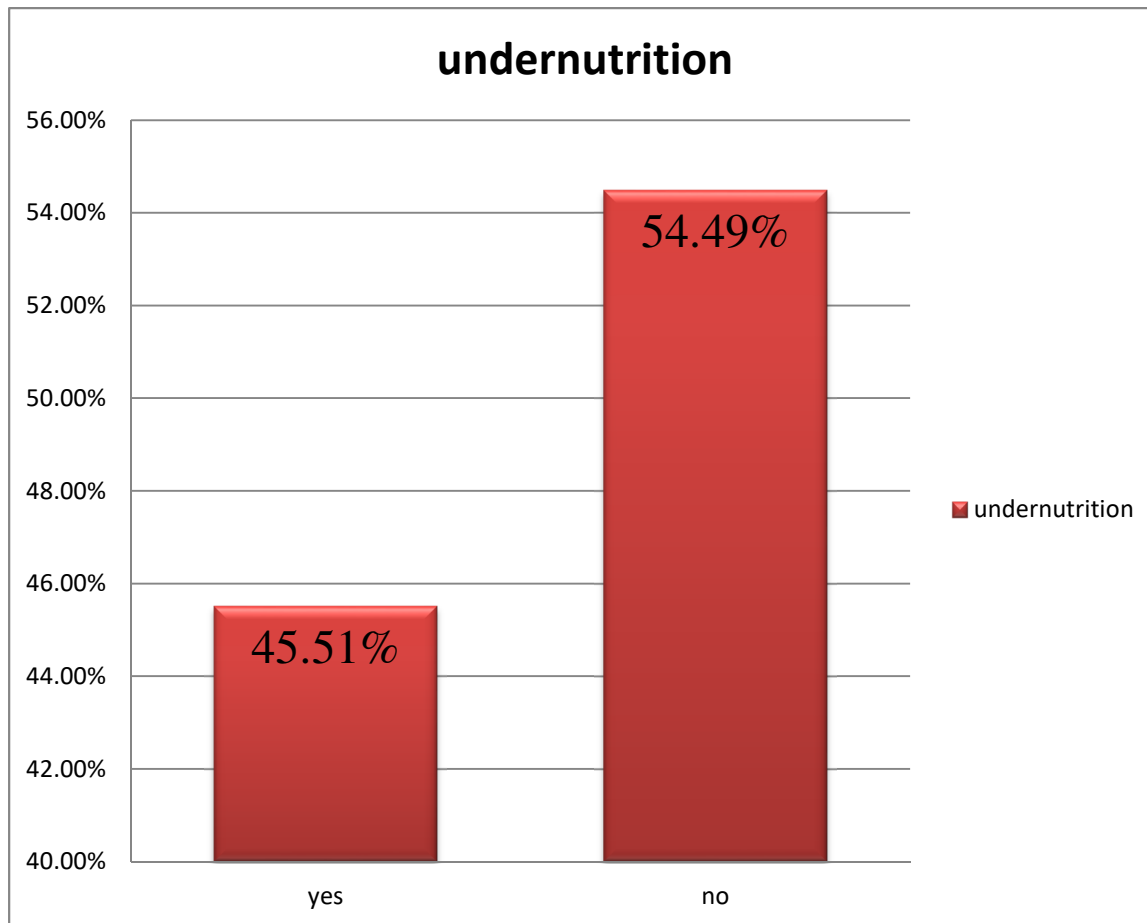


Figure 3 Under nutrition of adult TB patients in public health facilities of Addis Ababa, 2021

5.3 Nutrition and Dietary habit and Individual dietary diversity

Based on the data of the total participants 257 (74.5) ate meal three times per day, 281 (81.4%) has got dietary counseling and 270 (78.3) did not receive nutritional supplementation. Based on the data from food consumption, 237 (68.7%) of the respondents ate six and more food groups.

Table 3 nutrition and dietary habits of Adult TB patients and Individual dietary diversity in public health facilities of Addis Ababa, 2021

Variable	Frequency	Percent
Meals per day		
Twice	8	2.3
Three times	257	74.5
Four and above times	80	23.2
Dietary counseling		
Yes	281	81.4
No	64	18.6
Nutritional supplementation		
Yes	75	21.7
No	270	78.3
IDDS		
Low IDDS (1-3 food groups consumed)	237	68.7
Medium IDDS (4 up to 5 food groups consumed)	58	16.8
High IDDS (6 & more food groups)	50	14.5

5.4 Behavior, life style and Physical activity and sedentary behavior

From the total respondents, 311 (90.1%) of the respondents doesn't smoke cigarettes, 277 (80.3%) of them doesn't drink alcohol and 308 (89.3%) doesn't chew chat. Out of the respondents 259 (75.1 %) adult TB patients didn't meet WHO recommendation of physical activity, Which was 135 (52.12 %) among female and 124 (47.8 %) among male. Regarding sedentary time per day, 222 (64.3 %) spent greater than eight hours per day, which was 114 (51.35%) among female and 108 (48.64%) among male.

Table 4 Behavior and life style of Adult TB patients and Physical activity and sedentary behavior in public health facilities of Addis Ababa, 2021

Variable	Frequency	Percent
Cigarette		
Yes	34	9.9
No	311	90.1
Cigarette per day		
Never	311	90.1
1-5	27	7.8
6-10	7	2
Drink Alcohol		
Yes	68	19.7
No	277	80.3
Drink per day		
Never	277	80.3
Sometimes	47	13.6
Once a day	20	5.8
Often	1	0.3
Chew chat		
Yes	37	10.7
No	308	89.3

Chat per day		
Never	307	89
Sometimes	26	7.5
Once a day	12	3.5
Total physical activity		
Not MET	259	75.1
MET	86	24.9
Sedentary behavior		
<8 hours	123	35.7
>8 hours	222	64.3

5.5 Personal hygiene and sanitation and General health status of adult TB patients

From the total respondents 305 (88.4%) of them had latrine, out of which 165 (47.8%) used vip latrine, 326 (94.5%) respondents wash hands before eating, 266 (77.1%) of them wash hands after toilet and 232 (67.2%) always use soap. Out of the respondents, 209 (60.6%) had pulmonary TB, 175 (50.7%) had new case TB, 296 (85.8%) were HIV negative and 218 (63.2%) were on continuous phase of treatment.

Table 5 personal hygiene and sanitation of adult TB patients and General health status in public health facilities of Addis Ababa , 2021

Variables	Frequency	Percent
Latrine		
Yes	305	88.4
No	40	11.6
Type of latrine		
Pit latrine	140	40.6
Vip latrine	165	47.8
Wash hand before eating		

Always	326	94.5
Often	19	5.5
Sometimes	0	0
Never	0	0
Wash hand after toilet		
Always	266	77.1
Often	72	20.9
Sometimes	7	2
Never	0	0
How often use soap		
Always	232	67.2
Often	78	22.6
Sometimes	35	10.1
Type of TB		
Pulmonary	209	60.6
Extra pulmonary	136	39.4
TB treatment		
New	175	50.7
Previous history of TB	170	49.3
HIV/AIDS		
Positive	49	14.2
Negative	296	85.8
Anti TB treatment		
Intensive phase	127	36.8
Continous phase	218	63.2

5.6 Factors associated with undernutrition

In this study, binary logistic regression analysis were performed, and variables that have p-value less than 0.2 were fitted in to the multivariable logistic regression analysis model.

In binary logistic regression analysis; Socio demographic characteristics such as Age with in the category of 27-35 [(COR =1.48, 95%CI (0.86,2.55)] and with in the category of 36-44 [(COR = 1.63, 95%CI (0.88,3.02)] , Occupation such as Daily laborer [(COR = 0.36, 95%CI (0.17,0.78)], Government employee [(COR = 0.45, 95%CI (0.2,1.0)], House wife [(COR = 0.47, 95%CI (0.21,1.07)], student [(COR = 0.33, 95%CI (0.14, 0.79))] ,others [(COR = 0.44, 95%CI (0.16, 1.21) and Family size of ≥ 5 [(COR = 2.33, 95% CI (0.9, 6.05)],) with P-value < 0.2 were found to be significantly associated with undernutrition.

Nutrition and dietary habits such as three times meal frequency per day [(COR = 0.168, 95%CI (0.02,1.38)] and four times meal frequency per day [(COR = 0.158, 95%CI (0.01,1.34)], Dietary counseling [(COR= 0.46, 95%CI (0.26,0.8)], Nutritional supplementation [(COR = 0.56, 95%CI (0.33, 0.95)], Medium IDDS [(COR = 2.67, 95%CI (1.21, 5.93)] and high IDDS [(COR = 3.48, 95%CI (1.8, 6.7)] with P-value < 0.2 were found to be significantly associated with undernutrition.

Type of TB such as Extra pulmonary TB [(COR =1.4, 95%CI (0.9,2.1)] and HIV/AIDS [(COR = 1.72, 95%CI (0.93,3.17)] with P-value < 0.2 were found to be significantly associated with undernutrition.

Table 6 Binary logistic regression result showing factors associated with undernutrition among adult TB patients in public health facilities of Addis Ababa, 2021

Variable	Undernutrition			P-value
	Yes	No	COR (95% CI)	
	N (%)	N (%)		
Age (in years)				
18-26	46(53.5)	40(46.5)	1.0	
27-35	59(43.7)	76(56.3)	1.48 (0.86, 2.55)*	0.156
36-44	33(41.2)	47(58.8)	1.63 (0.88, 3.02)*	0.116

≥ 45	19(43.2)	25(56.8)	1.51 (0.72, 3.14)	0.267
Sex				
Male	87(55.4)	92(48.93)	1.0	
Female	70(44.5)	96(51.06)	1.29 (0.84, 1.98)	0.23
Marital status				
Married	68 (43.3)	94(50)	1.0	
Single	74(47.1)	83(44.1)	0.81 (0.52, 1.26)	0.354
Widowed	10(6.36)	8(4.25)	0.57 (0.21, 1.54)	0.27
Separated	5(3.18)	3(1.59)	0.43 (0.1, 1.87)	0.26
Occupation				
Merchant	13(27.7)	34(72.3)	1.0	
Daily laborer	47(51.1)	45(48.9)	0.36 (0.17, 0.78)*	0.009
Government employee	32(45.7)	38(54.3)	0.45 (0.2, 1.0)*	0.05
Housewife	28(44.4)	35(55.6)	0.47 (0.21, 1.07)*	0.074
Student	25(53.2)	22(46.8)	0.33 (0.14, 0.79)*	0.013
Other	12(46.2)	14(53.8)	0.44 (0.16, 1.21)*	0.114
Education				
Can read& write	10(37)	17(63)	1.0	
Primary school	51(42.9)	68(57.1)	1.28(0.66,2.47)	0.45
Secondary school	34(44.2)	43(55.8)	1.21(0.59,2.47)	0.58
Above secondary school	47(48)	51(52)	1.04(0.53,2.05)	0.9
Family size				
1	13(59.1)	9(40.9)	1.0	
2-4	110(47)	124(53)	1.62(0.67, 3.95)	0.28
≥5	34(38.2)	55(61.8)	2.33(0.9, 6.05)*	0.08
Income				
< 2000	91(35.4)	100(53.19)	1.0	
2000-2999	23(8.94)	37(19.68)	1.46 (0.8, 2.64)	0.2
3000-4499	27(10.5)	33(17.55)	1.11 (0.62, 1.99)	0.72
≥4500	16(6.22)	18(9.57)	1.02 (0.49, 2.12)	0.9
Meals per day				
Twice	1(12.5)	7(87.5)	1.0	
Three times	118(45.9)	139(54.1)	0.168(0.02,1.38)*	0.098
Four and above times	38(47.5)	42(52.5)	0.158(0.01,1.34)*	0.091
Dietary counseling				
Yes	118(42)	163(58)	1.0	
No	39(60.9)	25(39.1)	0.46(0.26,0.8)*	0.007
Nutritional supplementation				
Yes	26(34.7)	49(65.3)	1.0	

No	131(48.5)	139(51.5)	0.56 (0.33, 0.95)*	0.034
IDDS				
High IDDS	35(22.2)	15(7.9)	1.0	
Medium IDDS	27(17.19)	31(16.4)	0.76 (0.43, 1.36)	0.371
Low IDDS	95(60.6)	142(75.5)	0.28 (0.14, 0.55)*	0.000
Type of TB				
Pulmonary	102(48.8)	107(51.2)	1.0	
Extra pulmonary	55(40.4)	81(59.6)	1.4 (0.9 , 2.1)*	0.128
TB treatment				
New case	81(51.5)	94(50)	1.0	
Previous history	76(48.4)	94(50)	1.06 (0.69, 1.62)	0.768
HIV				
Negative	28(57.1)	21(42.9)	1.0	
Positive	129(43.6)	167(56.4)	1.72 (0.93, 3.17)*	0.08
Anti TB treatment				
Intensive phase	55(35)	72(38.2)	1.0	
Continuous phase	102(64.9)	116(61.7)	0.86 (0.5, 1.3)	0.531

In multivariable logistic regression analysis Adjusting for Age, Meals per day, Nutritional supplementation, HIV/AIDS and Type of TB, Statistically significant associations with under nutrition were found for Occupation, Family size, Dietary counseling, Individual dietary diversity.

Although the variables Type of meals per day and nutritional supplementation were significantly associated with under nutrition in Bivariable regression, their association disappeared in the multivariable model after being adjusted for the other covariates.

Adjusting for the covariate variables, Study participants who were government employee had 63% lower likelihood of being undernourished than merchants, AOR(95%CI) = 0.37 (0.15, 0.92) and p-value < 0.05.

Study participants who had family size of five and more than five had 3.54 times higher odds of under nutrition than those who had one family member, AOR (95%CI) = 3.54 (1.15, 10.9) and p-value < 0.05.

Study participants who didn't got dietary counseling had 51% of lower likelihood of being undernourished than those who got dietary counseling, AOR(95%CI) = 0.49 (0.27,0.92) and p-value < 0.05.

Study participants who ate 4 up to 5 food groups had 2.78 times higher odds of undernutrition than those who ate 6 and more than 6 food groups, AOR (95%CI) = 2.78 (1.16, 6.65) and p-value < 0.05. Study participants who ate 1 up to 3 food groups had 3.24 times higher odds of undernutrition than those who ate 6 and more than 6 food groups, AOR(95%CI) = 3.24 (1.59, 6.6) and p-value < 0.05.

Table 7 Multivariable analysis on factors associated with undernutrition among adult TB patients in public health facilities of Addis Ababa, 2021

Variable	Undernutrition			
	Yes	No	COR (95% CI)	AOR (95% CI)
	N (%)	N (%)		
Age (in years)				
18-26	46(53.5)	40(46.5)	1.0	1.0
27-35	59(43.7)	76(56.3)	1.48 (0.86, 2.55)*	1.8 (0.9, 3.6)
36-44	33(41.2)	47(58.8)	1.63 (0.88, 3.02)*	1.89 (0.89, 4.02)
≥ 45	19(43.2)	25(56.8)	1.51 (0.72, 3.14)	1.74 (0.72, 4.23)
Occupation				
Merchant	13(27.7)	34(72.3)	1.0	1.0
Daily laborer	47(51.1)	45(48.9)	0.36 (0.17, 0.78)*	0.41 (0.17, 1.01)
Government employee	32(45.7)	38(54.3)	0.45(0.2, 1.0)*	0.37 (0.15, 0.92)*
Housewife	28(44.4)	35(55.6)	0.47 (0.21, 1.07)*	0.53 (0.21,1.36)
Student	25(53.2)	22(46.8)	0.33 (0.14, 0.79)*	0.47 (0.17, 1.31)
Other	12(46.2)	14(53.8)	0.44 (0.16, 1.21)*	0.45 (0.14, 1.42)
Family size				
1	13(59.1)	9(40.9)	1.0	1.0
2-4	110(47)	124(53)	1.62 (0.67, 3.95)	2.35 (0.8, 6.6)
≥5	34(38.2)	55(61.8)	2.33 (0.9, 6.05)*	3.54 (1.15, 10.9)*
Meals per day				
Twice	1(12.5)	7(87.5)	1.0	1.0
Three times	118(45.9)	139(54.1)	0.16 (0.02, 1.38)*	0.15 (0.01, 1.42)
Four and above times	38(47.5)	42(52.5)	0.15 (0.01, 1.34)*	0.12 (0.01,1.23)
Nutritional supplementation				

Yes	26(34.7)	49(65.3)	1.0	1.0
No	131(48.5)	139(51.5)	0.56 (0.33, 0.95)*	0.6 (0.3,1.09)
Dietary counseling				
Yes	118(42)	163(58)	1.0	1.0
No	39(60.9)	25(39.1)	0.46 (0.26, 0.8)*	0.49 (0.27, 0.92)*
IDDS				
High IDDS	35(22.2)	15(7.9)	1.0	1.0
Medium IDDS	27(17.19)	31(16.4)	0.76 (0.43, 1.36)	2.78 (1.16, 6.65)*
Low IDDS	95(60.5)	142(75.5)	0.28 (0.14, 0.55)*	3.24 (1.59, 6.6)*
Type of TB				
PTB	102(48.8)	107(51.2)	1.0	1.0
Extra PTB	55(40.4)	81(59.6)	1.4 (0.9, 2.1)*	1.31 (0.8,2.1)
HIV/AIDS				
Negative	28(57.1)	21(42.9)	1.0	1.0
Positive	129(43.6)	167(56.4)	1.72 (0.93, 3.17)*	1.79 (0.9, 3.5)

6, Discussion

The aim of this study was to assess the prevalence of under nutrition among adult Tuberculosis patients and associated factors in public facilities of Addis Ababa. Accordingly, the prevalence of undernutrition was found to be 45.5%. The prevalence of malnutrition among pulmonary TB patients was higher in male patients (55.41%) than females (44.58%).

This differs from the study done in Burkina faso and Adama town (25,46) .The difference is may be due to biological, social and lifestyle factors. Moreover, Occupation, Family size, Dietary counseling, Individual dietary diversity were factors significantly associated with undernutrition among adult TB patients.

The prevalence was comparable with the study done in Kenya on predictors of low BMI among pulmonary TB patients, With the study done in central and northwestern zones of Tigray state on undernutrition among TB patients on directly observed short-course therapy and With the study done on undernutrition and associated factors among adult TB patients in Jigjiga public health facilities (43%,45.6%,44.3%) Respectively (27,35,60) . This is may be due to relatively the same quality of service provision, care and support.

The prevalence was lower from the study done on nutritional status of pulmonary tuberculosis patients aged 25-44 years attending tuberculosis clinic at Lodwar County and Referral Hospital in Kenya (48.2%) (9), lower from the study done in Brazil on prevalence of nutritional deficiency in patients with pulmonary TB (50%) (18), lower From the study done in rural district of Malawi on moderate to severe malnutrition in patients with TB (57%) (61), lower from the study done in Tripura, India (66%), Rural central India (53%) Cameroon (78.21%) (31,32,47) also lower than the study done in Ghana (51%)(16) and from the study done in Timor and Rote islands in Indonesia (87%) (62). The difference may be explained by differences in socioeconomic status, Study area, life style and Economic status of countries.

From the studies done in Ethiopia, The prevalence was lower than the study done in Amahara regional state and Adama town (57.17%,53%) respectively (56,52). This may be attributed to the difference in lifestyle and time of the study conducted. The prevalence of undernutrition in this study was also lower than the study done in Yirgalem in Sidama zone (77.9%) (21).

This may be attributed to the difference in urban and rural dwellers and socio economic status of the society in those areas.

The prevalence was lower from the study done in Amhara National regional state among adult hospitalized TB patients and also lower from the study done in Metema district, North west Ethiopia (55.6%,51%) Respectively (51,44). This could be explained by the fact that most of the time this region is more vulnerable for chronic food insecurity so many people are undernourished.

The prevalence was higher than the study done in kenya and the study done in Burkina Faso (43%,35.8%) Respectively (33,30). The difference may be due to the study done in Burkina Faso exclude TB patients on continuation phase, Extra pulmonary TB patients and socio-cultural factors. The prevalence was also higher than the study done in Ghana (40%) (16). The difference may be explained by differences in Feeding pattern of countries and lifestyle.

From studies done in Ethiopia, The prevalence in this study was higher than the study done in Hosana and in Addis Ababa (38.9%,39.7%) Respectively (38,56). It was also higher than the study done on determinants of active pulmonary tuberculosis patients in Ambo Hospital and from the study done on nutritional deficiency and associated factors among new pulmonary TB patients of Bale zone (63.5%,63.2%) Respectively (50,43). A possible explanation may be differences in the socio-economic status, study time and area and sample size of the studies.

In this study Family size had significant association with undernutrition. Respondents who had family number of five and more than five were 3.54 times more likely to be undernourished. This means adult TB patients with high number of family member will be at high risk of undernutrition. This study was comparable with the study done in Timor and Rote islands of Indonesia (62) and also It was supported by the findings of the study done in Hosana (38).

This might be due to when family member increases the demand of food will increase and also affect economy of the family so they will have low purchasing capacity for food. This leads to serving of foods with poor quality and quantity.

The study also showed that Occupation was significantly associated with undernutrition. Participants who were government employee had 63% lower likelihood of being undernourished than merchants. This study was consistent with the study done in Indonesia (62).

This study was also consistent with the study done in Bale zone hospitals, southeast Ethiopia (64). This can be possibly explained by government employees are educated so they are so close to get informations on balanced nutrition and diet through books, megazines, social media and others. So If they apply properly what they read and hear about dietary habit they can decrease their chance of being undernourished and they are income generating for an individual as well as household to purchase food items.

The study found that dietary counseling had significant association with undernutrition. Respondents who didn't got dietary counselling had 51% lower likelihood of being undernourished than those who got dietary counselling.

This finding was lower than the study conducted in Addis Ababa (23). This could be due to those who got the counseling will be more informed about amount and type of food and they might eat balanced diet but If the counselling is not understandable or If it is not enough to change participants dietary habit or If they are not financially enabled then they can't apply the counselling and protected from undernutrition.

This study also found that individual dietary diversity had significant association with undernutrition. Participants who ate 1 up to 3 food groups were 3.24 times and 4 up to 5 food groups were 2.78 times more likely to be undernourished.

This is supported by the findings of the study done in Kenya on nutritional status of pulmonary TB patients aged 25-44 years attending TB clinic at Lodwar country (9) and It was comparable with the study done in Amhara National regional state on prevalence and associated factors of malnutrition among adult hospitalized patients (40). This means adult TB patients who didn't eat diversified diet were more likely to be undernourished than who ate diversified diet. This might be due to eating diversified food makes them to get balanced diet and being well nourished.

7, Strength and limitation of the study

Strengths of the study

There was high response rate. I used standardized protocol for Anthropometric measurements. This helps to find accurate and precise measurement on each anthropometrical measurement and reduce errors. There were validated tools in the data collection process and also use of pretested and modified questioner.

Limitations of the study

The limitation of the study might be since the study is cross sectional, It will be difficult to find out whether the exposure precedes the outcome or not. Since we used patient interview methods, there will be recall bias however, we tried to minimize by different mechanisms. The study willn't use to make inference for other age groups other than adults. The study mayn't be generalized for other parts of the country due to sociodemographic and economic situations.

8, Conclusion and Recommendation

Conclusion

The finding of this study revealed that the prevalence of undernutrition among adult TB patients in public health facilities of Addis Ababa was high. The proportion of malnourished patients was higher among male than female. Participants who were Government Employees, Had 5 or more than 5 Family size, Who didn't got Dietary counseling and who had low Individual dietary diversity were found to be significantly associated with nutritional status of TB patients.

Recommendation

Based on the findings of the study, the following recommendations were made.

For federal ministry of health

- The development of guidelines for nutrition care and support to improve the quality of nutrition care.
- Strengthening nutritional programs among adult TB patients including the integration of food assistance in the TB National Program Strategic Plan, advocacy to Partners and mobilize resources for food assistance.

Public health facilities

- Dietary Counselling services including diversified diet should be given for all TB patients to improve their nutritional status and Nutritionists should be assigned in health facilities.
- There is a need to refresh the knowledge of health professionals on diet in public health facilities.

- Incorporating nutrition education into the education curriculum of the public health facility helps to improve awareness of undernutrition and its consequences for patients with TB and their family members.
- Public health actions and collaboration with stakeholders are also needed to improve quality of services.

Researchers; Further research that uses advanced design is needed to identify more variables that determine undernutrition of adult TB patients.

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ANNEX

ANNEX 1 ENGLISH VERSION OF PARTICIPANT INFORMATION SHEET AND INFORMED VOLUNTARY CONSENT FORM

How are you, My name is------. I am working as a data collector for the study being conducted in selected public health facilities of Addis Ababa by Mahlet Girma, who is studying for her Master's degree St. Paul Millennium College of Health Sciences. I kindly request you to lend me your attention to explain you about the study and being selected as the study participant.

The study title is:

Prevalence of Under nutrition among adult TB patients and associated factors in Addis Ababa, Ethiopia.

Purpose of the study

The Aim of this study is to identify under nutrition and factors affecting under nutrition of adult TB patients. Knowing these factors have great importance for the regional health office to plan intervention programs so as to reduce under nutrition of TB patients. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's Program in Public Health Nutrition for the principal investigator.

Procedure and duration:

I will be interviewing you using a questionnaire to provide me with pertinent data that is helpful for the study. There are 55 questions to answer where I will fill the questionnaire by interviewing you. The interview will take about 50 minutes, so I kindly request you to spare me this time for the interview.

Risks and benefits:

The risk of being participating in this study is very minimal, but only taking few minutes from your time. There would not be any direct payment for participating in this study. But the findings from this research may reveal important information for the local health planners. And health education related to the study will be given for study participants.

Confidentiality:

The information you will provide us will be confidential. There will be no information that will identify you in particular. The findings of the study will be general for the study community and will not reflect anything particular of individual persons or housing. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

Rights:

Participation for this study is fully voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefits which you otherwise are entitled. You do not have to answer any question that you do not want to answer.

Contact address:

If there are any questions or enquires any time about the study or the procedures, please contact principal investigator using this address.

Name of the principal investigator: Mahlet Girma Tel: +251-09-32-17-24-22 Email; mahifafi@gmail.co

Declaration of informed voluntary consent:

I have read/ was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to withdraw from the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to participate in this study with my signature as indicated below.

Signature of participant: -----

Date : -----

Name of data collector: -----

Signature of data collector -----

date: -----

Annex II ENGLISH VERSION OF Questionnaires

Part one- Demographic and socioeconomic profile

Instructions-Now I would like to ask you about your socio demographic and Economic characteristics

No	Question	Response	Skip
101	How old are you? / When were you born?	_____ in years	
102	Record sex of the patient	1.Male 2.Female	

103	What is your current Marital status	1.married 2.Single 3.Widowed 4.Separated	
104	What is your Family size ?		
105	What is your current Occupation?	1.Farmer 2.Merchant 3.Daily laborer 4.Government employee 5.House wife 6.student 7. other, specify	
106	What is your current Educational status	1.No formal education 2.can Read and write 3.Primary school 4.Secondary school 5.Above secondary school	
107	What is your average household income per month?	-----Ethiopian Birr	

Part two-Nutrition and diet information

Instructions- Now I would like to ask you about your dietary practices

No	Question	Response	Skip
201	How many meals per day are you getting?	1.One times 2.Two times 3.Three times	

		4.Four and above four	
202	Do you get dietary counseling?	1, yes 2, no	
203	Did you ever receive any nutritional supplement?	1.yes 2. no	

Part three-Dietary diversity questionnaire

Instructions-Please describe the foods (meals and snacks) that you ate or drank yesterday during the day and night, whether at home or outside the home. Start with the first food or drink of the morning. (Write down all foods and drinks mentioned. When composite dishes are Mentioned, ask for the list of ingredients. When the respondent has finished, probe for meals And snacks not mentioned.)

No	Food group	Response option	Skip
301	Cereals (corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, noodles, porridge, <i>Enjera</i> , or other grain products)	1=Yes 2-No	
302	Roots and tubers(potatoes & other foods made from roots)	1=Yes 2=No	

303	Vitamin A rich vegetables and tubers(pumpkin, carrot, sweet potato)	1=Yes 2=No	
304	Dark green leafy vegetables (Broccoli, salad, lettuce, etc.)	1=Yes 2=No	
305	Other vegetables (e.g. tomato, onion)	1=Yes 2=No	
306	Vitamin A rich fruits (mango, papaya, peach, and 100% fruit juice)	1=Yes 2=No	
307	Other fruits(wild fruits and 100% fruit juice)	1=Yes 2=No	
308	Organ meat(liver, kidney, heart or other organ meats or blood-based foods)	1=Yes 2=No	
309	Flesh meat(beef, pork, lamb, goat, rabbit, chicken, duck, other birds, insects)	1=Yes 2=No	
310	Eggs (chicken, duck, guinea hen or any other egg)	1=Yes 2=No	
311	Fish and seafood(fresh or dried fish)	1=Yes 2=No	
312	Legumes, nuts and seeds(beans, peas, lentils, nuts, or foods made from these)	1=Yes 2=No	

313	Milk and milk products (milk, cheese, yogurt or other milk products)	1=Yes 2=No	
314	Oils and fats(oil or butter added to food or used for cooking)	1=Yes 2=No	
315	Sweets (sugar, honey, sweetened juice drinks, chocolates, candies, cookies and cakes)	1=Yes 2=No	
316	Miscellaneous Spices, beverages (spices salt, sauce, coffee, tea, alcoholic beverages)	1=yes 2=No	

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Part four-Behavior and life style

Instructions- Now I would like to ask you about Alcohol drinking, Cigarette smoking and chat chewing

No	Question	Response	Skip
401	Do you smoke cigarette?	1.Yes 2.No	If yes go to 402
402	If yes, how many cigarettes do you smoke per day?	1 1-5 2.6-10 3. more than 10	

403	Do you drink alcohol?	1. yes 2. no	If yes go to 404
404	If yes, how many times do you drink per day?	1.sometimes 2.once a day 3. more than one	
405	Do you chew chat?	1. yes 2. no	If yes go to 406
406	If yes, how many times do you chew per day?	1.sometimes 2.once a day 3. more than one	

Part five-Personal hygiene and sanitation information

Instructions- Now I would like to ask you about Housing condition and latrine usage behavior

No	Question	Response	Skip
501	Do you have latrine?	1.Yes 2.No	
502	If yes which type of latrine?	1.Pit latrine 2.vip latrine	
503	How often did you wash your hands before Eating?	1. Always 2.Often(more than ten times a day) 3. Sometimes(three to ten times a day) 4. Never	
504	How often did you wash your hands after Using the toilet or latrine?	1. Always 2.Often(more than ten	

		times a day) 3. Sometimes (three to ten times a day) 4. Never	
505	How often did you use soap when washing Your hands?	1. Always 2. Often (more than ten times a day) 3. Sometimes (three to ten times a day) 4. Never	

Part six- Assessment of physical activity and sedentary behaviors

Instructions- Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person. Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, seeking employment. In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.

No	Question	Response	Skip
Work			
Vigorous Intensity Physical Activity			
601	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate such as	1=yes 2=no	If no, go to 604

	[carrying or lifting heavy loads, digging or construction work] for at least 10 minutes continuously		
602	In a typical week, on how many days do you do vigorous intensity activities as part of your work? For Interviewer:- Typical week” means a week when the participant is engaged in his/her usual activities	Number of days-_____	
603	How much time do you spend doing vigorous-intensity activities at work on a typical day? For interviewer:- Ask the participant to think of a typical day he/she can recall easily in which he/she engaged in vigorous-intensity activities at	Hours; Minutes _____;_____	

	work. The participant should only consider those activities undertaken continuously for 10 minutes or more. Probe very high responses (over 4 hrs.) to verify Typical day” means a day when the participant is engaged in his/her usual activities		
Moderate-Intensity Physical Activity			
604	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking [or carrying light loads] for at least 10minutes continuously?	1-yes 2-no	If no, go to 607
605	In a typical week, on how many days do you do moderate intensity	Number of days _____	

	activities as part of your work? For interviewer:- “Typical week” means a week when the participant is engaged in his/her usual activities		
606	How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours;Minutes ____;____	
Travel to and from places			
The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship.....			
607	Do you walk or use a bicycle for at least 10 minutes continuously to get to and from places?	1-yes 2-no	If no, go to 610
608	In a typical week, on how many days do you walk or bicycle	Number of days	

	for at least 10 minutes continuously to get to and from places?		
609	How much time do you spend walking or bicycling for travel on a typical day? For interviewer :- Ask the participant to think of a typical day he/she can recall easily in which he/she engaged in transport-related activities. The participant should Only consider those activities undertaken continuously for 10 minutes or more. Probe very high responses (over 4 hrs.) to verify.	Hours;Minutes ____;____	
Recreational activities			
The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreational activities (leisure),			
vigorous-intensity physical activities			

610	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like [running or football] for at least 10 minutes continuously?	1-yes 2-no	If no, go to 613
611	In a typical week, on how many days do you do vigorous intensity sports, fitness or recreational (leisure) activities?	Number of Days-_____	
612	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hours; Minutes _____;_____	
moderate-intensity physical activity			
613	Do you do any moderate-intensity sports, fitness or	1-Yes 2-No	If No, go to 616

	recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, [cycling, swimming, volleyball] for at least 10 minutes continuously?		
614	In a typical week, on how many days do you do moderate intensity sports, fitness or recreational (leisure) activities?	Number of Days-_____	
615	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	Hours; Minutes _____;_____	
Sedentary behavior			
The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent sitting at a desk, sitting with friends, traveling in car, bus, train, reading, playing cards or watching television, using computer but do not include time spent			

sleeping			
616	How much time do you usually spend sitting or reclining on a typical day?	Hours; Minutes ____;_____	

Part seven-. Record from health institution

701	Type of TB	1.Plumonary TB 2.Extra pulmonary TB
702	TB treatment	1.New case 2.Previous history of TB treatment
703	HIV/AIDS status	1. Positive. 2.negative
704	Anti-Tb treatment status	1.Intensive Phase 2.Continuous Phase

Part eight Anthropometric measurement

Instructions- Now I will take your height and weight measurement

For Interviewer- please check the respondent wears light cloths and Record the measurement to the nearest one Decimal

S.No	Measurements	Results
Q801	Height in centimeter	 (cm)
Q802	Weight in kilogram	 (Kg)

Thank you very much

Annex III Amharic version of Participant Information Sheet and Informed consent form

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ጥናት

እ ለመመረቂያ የሚሆን ጥናት ማካሄድ ሲሆን የጥናቱ ውጤት ደግሞ የሚመለከታቸው አካላት መረጃው ከደረሰቸው በኋላ ጥናቱን ውጤት ተመለክተው ለበለጠ ዕቅድ ለማቀድ ይጠቅማቸዋል።

የጥናቱ ሂደትና ግዜ- ለጥናቱ የሚያገለግሉና መረጃ ሊሰጡ የሚችሉ ጥያቄዎች ተዘጋጅተዋል እነዚህ ጥያቄዎች ጠቅላላ 55 ሲሆኑ በቃለምልልስ ጥያቄዎችን ለመመለስ በግምት 50 ደቂቃ ይፈጃል። ክብደትና ቁመት ለመለካቱ በግምት 10ደቂቃ ይፈጃል። ስለዚህ አሁንም በድጋሚ ጊዜዎች እንዲሰጡን በአክብሮት እጠይቃለሁ።

ጉዳት፡- በዚህ ጥናት በመሳተፍዎ ከሚወስደው ጊዜ በስተቀር የሚደርስበት ጉዳት በጣም አነስተኛ ነው። ክብደትና የቁመት መጠን መለካቱ ምንም አይነት ጉዳት የለውም።

ጥቅም፡- ባሁኑ ሰዓት በዚህ ጥናት በመሳተፍዎ የሚያገኙት ቀጥተኛ ጥቅም የለም ነገር ግን ከጥናቱ የተገኙት ጠቃሚ መረጃዎች ስለጤና እና ጤናን በተመለከተ ለሚያቅዱ የሚመለከታቸው ባለድርሻ አካላት ይጠቅማቸዋል።

ምስጢር አጠባበቅ፡-የሚሰጡን መረጃ ሁሉም ስጢርነቱ የተጠበቀ ነው፤ ለዚሁም አርሶዎን የሚገልጽ ምንም ነገር የለም፡ ለምሳሌ የእርሶ ስም መጠይቁ ላይ ወይም ደግሞ የስምምነት ማረጋገጫ ፎርም ላይ አይፃፍም። የጥናቱ ውጤት ለግለሰብ ወይም ደግሞ ለቤ ብ ሳይሆን አጠቃላይ ነው።

የተሳታፊው መብት፡-በዚህ ጥናት ለመሳተፍ ሙሉ ፈቃደኝነት ያስፈልጋል። በዚህ ጥናት የመሳተፍ ወይም ያለመሳተፍ ሙሉ መብት አለዎት። ላለመሳተፍ ከፈለጉ ደግሞ በማንኛውም ጊዜ በመሀል ራስዎን ከጥናቱ ማግለል(ማቋረጥ) ይችላሉ። ካቋረጡኩኝ ጥቅም ይጎልብ ብለው አያስቡ። መመለስ የማይፈልጉትን ማንኛውም ጥያቄ አለመመለስ መብት ነው።

ስለጥናቱ አካሄድ ወይም ስለጥናቱ መጠይቅ ወይም ደግሞ ጥናቱን በተመለከተ ማንኛውም ጥያቄ ካሎት የሚከተሉትን አድራሻ ይጠቀሙ።

251-09-32-17-24-22

mahifafi@gmail.com

በፈቃደኝነት ላይ የተመሰረተ የስምምነት ማ ጋገጫ ፎርም

የተሳታፊውን መረጃ ፎርም አንብቤዋለሁ ወይም ተነበልኛል። የጥናቱ ዓላማ፤ ያለውን ጉዳትና ጥቅም፤ ምስጢር አጠባበቅ የመሳተፍ እና ያለመሳተፍ መብት እንዲሁም ችግር ካለ ከማን ጋር መገኛኝት እንዳለብኝ ሁሉ ተገልጾልኝ፤ጥያቄ ካለኝ ደግሞ እንድጠይቅ እድል ተሰጥቶኝ በመሀል ደግሞ ጥናቱን ለማቆም ከፈለኩኝ በማንኛውም ጊዜ ጥናቱ/ከተሳታፊነት/ መውጣት እንደምችል በመጨረሻም መመለስ የማልፈልገውን ጥያቄ አለመመለስ መብቱ እንዳለኝ ከተረዳሁኝ በኋላ በሙሉ ፈቃደኝነት በዚህ ጥናት ለመሳተፍ የወሰንኩኝ መሆኔን ከዚህ በታች በተቀመጠው ፊርማዬ አረጋግጣለሁ።

ፊርማ ቀን.....

የመረጃስብሳቢስም ቀን..... ፊርማ አመሰግናለሁ

Annex Iv Amharic Version Questionnaire

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