



BMJ Open Effect of food insecurity on mental health of patients with tuberculosis in Southwest Ethiopia: a prospective cohort study

Matiwos Soboka ,^{1,2} Markos Tesfaye,^{1,3} Kristina Adorjan,^{1,4,5} Wolfgang Krahl,^{1,6} Elias Tesfaye,² Yimenu Yitayih ,² Ralf Strobl,^{7,8} Eva Grill^{1,7,8}

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For numbered affiliations see end of article.

Correspondence to

Matiwos Soboka;
matiwos2004@yahoo.com

ABSTRACT

Objective The objective of this study is to investigate the effect of food insecurity on the mental health of patients with tuberculosis (TB) in Ethiopia.

Design A prospective cohort study.

Setting Health centres and hospitals located in Jimma zone, Southwest Ethiopia.

Participants Patients with TB who had recently been diagnosed with TB and started directly observed treatment in the selected 26 health institutions from October 2017 to October 2018. A total of 268 patients were followed for 6 months and data were collected at recruitment and two follow-up visits (at 2 and 6 months). Patients with multidrug-resistant TB were not included in the study.

Main outcome measures Mental distress was measured by the Self-Reporting Questionnaire-20 while food insecurity was assessed by using the Household Food Insecurity Access Scale.

Results A total of 268 patients were recruited and there was no lost to follow-up. The prevalence of food insecurity at baseline, first and second follow-up was 49.3%, 45.9% and 39.6%, respectively. Of these, 28.0% of them reported severe food insecurity at baseline which declined to 23.5% at the end of the sixth month. Likewise, the prevalence of mental distress at baseline was 61.2% but declined to 22.0% at the second follow-up. At baseline, 77.3% of patients with mental distress reported severe food insecurity but declined to 46.0% at second follow-up. In the final model, severe food insecurity (OR 4.7, 95% CI 2.4 to 9.4) and being a government employee (adjusted odds ratio (aOR) 0.3, 95% CI 0.1 to 0.9) were associated with mental distress.

Conclusion In this study, food insecurity was associated with mental distress over the course of follow-up. Likewise, there is a high prevalence of food insecurity and mental distress among patients with TB on treatment. Therefore, early assessment and interventions for food insecurity may improve the mental health of patients with TB on treatment.

INTRODUCTION

Food insecurity is 'a state of limited or uncertain availability of nutritionally adequate and safe foods, or lack of access to food of sufficient quality and quantity or limited or

Strengths and limitations of this study

- This is the first study recruited participants from primary care facilities in rural and urban settings, and assessing the effect of food insecurity on the mental health of patients with tuberculosis (TB).
- The consideration of several known confounding variables in the data analysis makes our results robust.
- The limitation of this study is that it did not include hospitalised patients, patients on retreatment and patients with multidrug-resistant (MDR)-TB.
- Patients with MDR-TB and hospitalised patients with TB may have higher depression and anxiety and their exclusion might have led to underestimated prevalence of mental distress.

uncertain ability to acquire acceptable foods in socially acceptable ways'.^{1,2} Globally, nearly 2 billion people suffered from moderate or severe food insecurity in 2019.¹ This is a great challenge for the second sustainable development goal which aims for zero hunger by 2030.¹ In Africa, food insecurity is increasing with about one-fifth of the population experiencing malnutrition.¹ Approximately, 25% of the Ethiopian population experienced food insecurity in 2016² mainly because of drought.³ Studies showed that food insecurity is associated with the occurrence of tuberculosis (TB), worse TB treatment outcomes^{4,5} and poorer mental health among patients with TB.⁶

Mental distress is a type of mental health problem that includes symptoms of depression, anxiety and somatic complaints, which may not fall into standard diagnostic criteria.^{7,8} In Ethiopia, up to 67.6% of patients with TB had symptoms of mental distress.^{9,10} Food insecurity increases mental distress by generating uncertainty over the ability to maintain food supplies, or to acquire sufficient food

in the future, so it provokes a stress response that may contribute to anxiety and depression.^{11 12} Mental distress is associated with poorer adherence to anti-TB medications,¹³ and TB treatment outcomes.⁴ Also, food insecurity has a huge impact on treatment outcomes because those who have food insecurity at high risk of malnutrition and medication side effects.⁶

Even though food insecurity may potentially contribute to the occurrence of mental distress and affect treatment outcomes among patients with TB in Ethiopia, the link between food insecurity and mental distress was not adequately investigated. So, it is poorly understood how food insecurity affects mental health of patients with TB. Furthermore, most of the studies done in this region were cross-sectional design, and thus, they did not investigate the direction of the association between food insecurity and mental distress. Having the information regarding the association between food insecurity and mental distress is important for planning intervention strategies to improve the mental health of patients with TB and its complications. Therefore, the objective of this study was to assess the effect of food insecurity on mental health among patients with TB in Southwest Ethiopia.

METHODS

Study area and design

A prospective cohort study was conducted among patients with TB in Jimma Zone, Southwest Ethiopia. Jimma Zone has more than three million inhabitants, about 3% of the total population of Ethiopia. Typically, in Ethiopia TB care is mainly provided by local decentralised health centres to increase take-up of therapy and to monitor directly observed treatment (DOT). At the time of data collection, 91 out of 112 Jimma Zone health centres were providing services for patients with TB. Likewise, there were dedicated TB treatment services at all (four) hospitals. Patients were recruited from four hospitals and 22 randomly selected health centres of Jimma Zone. Twenty health centres and three hospitals were situated in rural areas whereas the remaining one hospital and two health centres were located in Jimma town. The study was conducted for 1 year from October 2017 to October 2018.

Sample size assumption and sampling procedure

We included all patients who had recently been diagnosed with TB and had started DOT in the selected health centres and hospitals. Only patients who had started TB treatment within less than 4 weeks before inclusion and were not planning to transfer to other health institutions were included in the study. Patients younger than 18 years, patients infected with multidrug-resistant (MDR) TB strains, and patients who were hospitalised during data collection were excluded from the study. The sample for this study was drawn from a cohort registered as *m/አ/ም/ድ/ም/ዳ/476/2011* (Institute of health, research, and postgraduate director 476/2011). Patients who consented to participate in the study were consecutively

recruited. One hundred and thirty-two food insecure and 136 food secure patients with TB were followed up for 6 months. Detailed information regarding the study was given by trained data collectors to each patient before written informed consent was obtained.

Data collection procedure

Before data collection, the questionnaires were pretested on a sample (5% of the total sample) of patients with TB who had been on treatment at one health centre in Agaro to check whether the questions work as intended or understood by patients. Fourteen patients from the pretest were not included in the final analysis of the data. Patients were interviewed on three occasions namely, baseline (starting treatment), first follow-up (after 2 months) and second follow-up (at the end of the sixth month). Recruitment of patients and data collection were carried out by health professionals who were working in the TB clinic and specifically trained on the questionnaires, supervised by trained district focal persons.

MEASURES

Outcome variable

Mental distress

The Self-Reporting Questionnaire-20 (SRQ-20) was used to assess mental distress. Examples of the items are sleeplessness, tiredness, irritability, suicidal ideation, poor memory, difficulty in concentrating and somatic complaints. SRQ-20 has been adapted and validated in the Ethiopian context. This is a 20-item questionnaire with a maximum total score of 20 where a total score of below 7 indicates the absence of mental distress, while values of and above indicate mental distress.¹⁴

Independent variables

Food insecurity was assessed by using the Household Food Insecurity Access Scale to determine whether the respondent has experienced any of the indicators of food insecurity in the previous month. No food insecurity is present if none of the items apply. Mild food insecurity is defined as if the respondent endorsed any of the questions 1, 2, 3 and/or 4 but not the questions 5–9. Moderate food insecurity is defined as if the respondent has endorsed questions 5 and/or 6 but not the items 7–9, and ‘severe food insecurity’ if the respondent has endorsed questions 7, 8 and/or 9.¹⁵ The tool has been widely used among people living with HIV (PLHIV) in Ethiopia.¹⁶

Alcohol use disorders

The alcohol use disorder identification test (AUDIT) was used to collect data on alcohol use disorders (AUDs).¹⁷ The AUDIT was evaluated over two decades and provides an accurate measure of the risk of AUDs across gender, age and cultures. With a cut-off score of 8 or more, the sensitivity and specificity of AUDIT for AUDs were 0.90 and 0.80, respectively.¹⁸ AUDIT was used in the Ethiopian

context and questions number two and three regarding standard drinks were adapted to a more locally appropriate question. Local alcohol drinks, for example, arake, tela and teji were first converted from local measurements to millilitres. Then the measured alcohol was converted into a standard drink by calculating the mass and volume of the alcohol. Similarly, local beer (bottles and glasses), draft and wine were converted to standard drinks based on their alcohol content.¹⁹

Khat use

Khat use was assessed by a self-reported questionnaire. Since there is no standardised questionnaire for khat use, patterns and reasons for khat use were assessed by using a structured questionnaire that was developed after reviewing the literature. Any consumption of khat during the last month was considered as current khat use.

Sociodemographic variables

Age, sex, marital status, level of education, religion, ethnicity, income, household size, occupation, place of residence and living conditions were assessed using a structured questionnaire. Income was categorised considering that the minimum monthly wage for employees of a governmental organisation in Ethiopia was Br1214 (€36.67).²⁰ Then the monthly income of each patient was multiplied by 12 months to obtain the annual income, and we used a cut-off Br14568 (€439.98).

Social support

The Oslo Social Support Scale (The Oslo 3 items) was used to collect data on the strength of social support. The Oslo-3 total score 3–8 indicates poor social support, 9–11 indicates moderate social support and 12–14 indicate strong social support.²¹ The scale has been widely used among patients with TB in Ethiopia.²² Social support was assessed at baseline, second month (at first follow-up), and 6 months (at the completion of anti-TB treatment or second follow-up).

Comorbidities

Data related to comorbidities such as HIV, previous mental illness, hypertension and diabetes mellitus were collected from patients' charts.

Data analysis

Participants' characteristics and study variables were described using descriptive statistics. The missing values were excluded from the analysis. A generalised linear mixed model was used to examine the effect of food insecurity over 6 months. All time points for food insecurity and mental distress were included in the analysis. An intercept only model was used to investigate mental distress over time (model 0) without adding other variables; model 1 investigated the association between food insecurity and mental distress without including other variables. Model 2 investigated the association between food insecurity and mental distress after controlling for substance use. Model 3 (full model) investigated the

association between and food insecurity on mental distress after adjusting for the full set of a covariate. Model fitness was examined with the Bayesian Information Criterion. Data were analysed using R (V.1.2.1335).

Role of the funding source

The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Patient and public involvement

Patients were not involved in the development of the research questions, study design, interpretation of results or writing of the manuscript.

RESULTS

Sociodemographic and clinical characteristic

In this study, a total of 268 patients (mean age=32.4, SD=14.4, range=18–80 years, and 60.1% male) were recruited and followed over 6 months. There was no lost to follow-up. Out of the total patients, 132 (49.3%) patients with TB had food insecurity, while 136 (50.7%) of them had food security at baseline (see [table 1](#)). Out of the total participants, 40.3% (n=108), 32.5% (n=87) and 27.2% (n=73) were diagnosed as smear-positive, smear-negative and extrapulmonary TB, respectively. At baseline, 3.7% (n=10) patients were diagnosed with HIV, and 7.1% (n=19) with other comorbidities. There were 22 missing data of annual income which we excluded from the analysis.

The magnitude of food insecurity

The prevalence of food insecurity at baseline, second month and sixth month was 49.3% (n=132), 45.9% (n=123) and 39.6% (n=106), respectively. Out of patients with food insecurity, 21.3% (n=57) and 28.0% (n=75) of them had mild to moderate and severe food insecurity, respectively, at baseline. The prevalence of severe food insecurity at the second follow-up was 23.5% (n=63). The prevalence of severe food insecurity among female participants was 31.8%, 34.6% and 22.4% at baseline, first and second follow-up, respectively. Also, the proportion of food insecurity at the end of the sixth month was higher among patients within the age group of 44–55 years compared with patients within the age group of 18–24 years (37.0% vs 19.4%, p=0.03). Moreover, the prevalence of severe food insecurity among daily labourers at baseline, first and second follow-up was 59.5% (n=25), 57.1% (n=24), 50.0% (n=21), respectively (see [table 1](#)).

The magnitude of mental distress

The prevalence of mental distress at baseline, the second month and end of the sixth month was 61.2% (n=164), 38.1% (n=10.2), 22.0% (n=59), respectively. Out of patients with mental distress, the majority of them were in the age group of 55–64 years at baseline (76.0%) and

Table 1 Sociodemographic characteristics and food insecurity of tuberculosis patients in Southwest Ethiopia, 2017/2018 (n=268)

Variables		Frequency N (%)	Food insecurity					
			Baseline N (%)		First follow-up N (%)		Second follow-up N (%)	
			Mild/moderate	Severe	Mild/moderate	Severe	Mild/moderate	Severe
Gender	Female	107 (39.9)	24 (22.4)	34 (31.8)	19 (17.8)	37 (34.6)	16 (15.0)	24 (22.4)
	Male	161 (60.1)	33 (20.5)	41 (25.5)	22 (13.7)	45 (28.0)	27 (16.8)	39 (24.2)
Age	18–24	93 (34.7)	23 (24.7)	21 (22.6)	12 (12.9)	24 (25.8)	15 (16.1)	18 (19.4)
	25–34	87 (32.5)	17 (19.5)	23 (26.4)	16 (18.4)	27 (31.0)	14 (16.1)	17 (19.5)
	35–44	36 (13.4)	10 (27.8)	11 (30.6)	7 (19.4)	11 (30.6)	9 (50.0)	9 (50.0)
	45–54	27 (10.1)	4 (14.8)	11 (40.7)	3 (11.1)	11 (40.7)	2 (7.4)	10 (37.0)
	55–64	25 (9.3)	3 (12.0)	9 (36.0)	3 (12.0)	9 (36.0)	3 (12.0)	9 (36.0)
Occupation	Merchant	29 (10.8)	8 (27.6)	9 (31.0)	6 (20.7)	9 (31.0)	7 (24.1)	8 (27.6)
	Farmer	92 (34.3)	24 (26.1)	28 (30.4)	16 (17.4)	30 (32.6)	15 (16.3)	23 (25.0)
	Government employee	105 (39.2)	19 (18.1)	13 (12.4)	12 (11.4)	19 (18.1)	16 (15.2)	11 (10.5)
	Daily labourer	42 (15.7)	6 (14.3)	25 (59.5)	7 (16.7)	24 (57.1)	5 (11.9)	21 (50.0)
Education	No formal education	169 (63.1)	16 (16.7)	28 (29.2)	17 (17.7)	29 (30.2)	16 (16.7)	21 (21.9)
	Literate	99 (36.9)	41 (23.8)	47 (27.3)	24 (14.0)	53 (30.8)	27 (15.7)	42 (24.4)
Annual income in Birr	<14568	206 (76.9)	45 (21.8)	60 (29.1)	34 (16.5)	62 (30.1)	36 (17.5)	47 (22.8)
	≥14568	40 (14.9)	7 (17.5)	14 (35.0)	5 (12.5)	17 (42.5)	4 (10.0)	14 (35.0)
Marital status	Single	97 (36.2)	18 (18.6)	24 (24.7)	11 (11.3)	28 (28.9)	14 (14.4)	22 (22.7)
	Married	157 (58.6)	36 (22.9)	44 (28.0)	27 (17.2)	49 (31.2)	27 (17.2)	38 (24.2)
	Divorced/widowed	14 (5.2)	3 (21.4)	7 (50.0)	3 (21.4)	5 (35.7)	2 (14.3)	3 (21.4)
Family size	Less than five	181 (67.5)	33 (18.2)	51 (28.2)	25 (13.8)	57 (31.5)	23 (12.7)	46 (25.4)
	Five or larger	87 (32.5)	24 (27.6)	24 (27.6)	16 (18.4)	25 (28.7)	20 (23.0)	17 (19.5)
Residence	Rural	127 (47.4)	35 (27.6)	32 (25.2)	24 (18.9)	33 (26.0)	23 (18.1)	27 (21.3)
	Urban	141 (52.6)	22 (15.6)	43 (30.5)	17 (12.1)	49 (34.8)	20 (14.2)	36 (25.5)
Type of tuberculosis	Smear positive	108 (40.3)	24 (22.2)	26 (24.1)	13 (12.0)	34 (31.5)	18 (16.7)	23 (21.3)
	Smear negative	87 (32.5)	15 (17.2)	34 (39.1)	13 (14.9)	33 (37.9)	10 (11.5)	28 (32.2)
	Extrapulmonary	73 (27.2)	18 (24.7)	15 (20.5)	15 (20.5)	15 (20.5)	15 (20.5)	12 (16.4)

first follow-up (56.0) while it was 32.0% in the second follow-up. Of patients with mental distress, 71.4% were either divorced or widowed.

About three-fourths (77.3%) of patients with severe food insecurity had mental distress at baseline, but it decreased to 64.6% and 46.0% in the second and sixth months, respectively. The prevalence of AUD among patients with mental distress was 62.1%, 44.2% and 18.6% at baseline, first follow-up and second follow-up, respectively, while 65.7%, 47.6, 23.0% of them were using khat at baseline, first, and second follow-up, respectively (see table 2).

Effect of food insecurity on mental distress

The odds of having mental distress among patients with severe food insecurity was seven times higher than that of patients who had no food insecurity (OR 7.3, 95% CI 3.7 to 14.2). After adding alcohol and khat use disorder into model 2, there was no change in the association between

severe food insecurity and mental distress (adjusted odds ratio (aOR) 7.0, 95% CI 3.6 to 13.7).

After adjusting for potential confounder using a generalised linear mixed model, severe food insecurity (OR 4.7, 95% CI 2.4 to 9.4) and being a government employee (aOR 0.3, 95% CI 0.1 to 0.9) were associated with mental distress. Government employees had a 70% lower likelihood of having mental distress compared with the local trader (see table 3).

DISCUSSION

To our knowledge, this is the first study that assessed the relationship between food insecurity and mental distress among patients with TB. In this study, we found: (1) a high prevalence of mental distress among patients with food insecurity, (2) severe food insecurity was associated with mental distress independent of sociodemographic

Table 2 Mental distress at the three time points among patients with tuberculosis in Southwest Ethiopia, 2017/2018 (n=268)

Variables		Mental distress					
		Baseline		First follow-up		Second follow-up	
		Yes N (%)	No N (%)	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Gender	Male	104 (64.6)	57 (35.4)	66 (41.0)	95 (59.0)	45 (28.0)	116 (72.0)
	Female	60 (56.1)	47 (43.9)	36 (33.6)	71 (66.4)	14 (13.1)	93 (86.9)
Age	18–24	47 (50.5)	46 (49.5)	26 (28.0)	67 (72.0)	18 (19.4)	75 (80.6)
	25–34	52 (59.8)	35 (40.2)	33 (37.9)	54 (62.1)	17 (19.5)	70 (80.5)
	35–44	26 (72.2)	10 (27.8)	16 (44.4)	20 (55.6)	10 (27.8)	26 (72.2)
	45–54	20 (74.1)	7 (25.9)	13 (48.1)	14 (51.9)	6 (22.2)	21 (77.8)
	55–64	19 (76.0)	6 (24.0)	14 (56.0)	11 (44.0)	8 (32.0)	17 (68.0)
Occupation	Merchant	24 (82.8)	5 (17.2)	12 (41.4)	17 (58.6)	7 (24.1)	22 (75.9)
	Farmer	68 (73.9)	24 (26.1)	45 (48.9)	47 (51.1)	23 (25.0)	69 (75.0)
	Government employee	43 (41.0)	62 (59.0)	23 (21.9)	82 (78.1)	14 (13.3)	91 (86.7)
	Daily labourer	29 (69.0)	13 (31.0)	22 (52.4)	20 (47.6)	15 (35.7)	27 (64.3)
Education	No formal education	55 (57.3)	41 (42.7)	35 (36.5)	61 (63.5)	21 (21.9)	75 (78.1)
	Educated	109 (63.4)	63 (36.6)	67 (39.0)	105 (61.0)	38 (22.1)	134 (77.9)
Marital status	Single	48 (49.5)	49 (50.5)	26 (26.8)	71 (73.2)	20 (20.6)	77 (79.4)
	Married	106 (67.5)	51 (32.5)	71 (45.2)	86 (54.8)	35 (22.3)	122 (77.7)
	Divorced/widow	10 (71.4)	4 (28.6)	5 (35.7)	9 (64.3)	4 (28.6)	10 (71.4)
Family size	Less than five	103 (56.9)	78 (43.1)	74 (40.9)	107 (59.1)	44 (24.3)	137 (75.7)
	Five and more	61 (70.1)	26 (29.9)	28 (32.2)	59 (67.8)	15 (17.2)	72 (82.8)
Residence	Rural	93 (73.2)	34 (26.8)	48 (37.8)	79 (62.2)	24 (18.9)	103 (81.1)
	Urban	71 (50.4)	70 (49.6)	54 (38.3)	87 (61.7)	35 (24.8)	106 (75.2)
Type of tuberculosis	Smear positive	63 (58.3)	45 (41.7)	37 (34.3)	71 (65.7)	18 (16.7)	90 (83.3)
	Smear negative	62 (71.3)	25 (28.7)	41 (47.1)	46 (52.9)	27 (31.0)	60 (69.0)
	Extrapulmonary	39 (53.4)	34 (46.6)	24 (32.9)	49 (67.1)	14 (19.2)	59 (80.8)
Social support	Poor	49 (52.7)	44 (47.3)	37 (43.5)	48 (56.5)	37 (26.4)	103 (73.6)
	Moderate	77 (68.1)	36 (31.9)	45 (40.5)	66 (59.5)	19 (25.7)	55 (74.3)
	Good	38 (61.3)	24 (38.7)	20 (27.8)	52 (72.2)	3 (5.6)	51 (94.4)
Food insecurity	No	69 (50.7)	67 (49.3)	36 (24.8)	109 (75.2)	18 (11.1)	144 (88.9)
	Mild/moderate	37 (64.9)	20 (35.1)	13 (31.7)	28 (68.3)	12 (27.9)	31 (72.1)
	Severe	58 (77.3)	17 (22.7)	53 (64.6)	29 (35.4)	29 (46.0)	34 (54.0)
AUD	No	146 (61.1)	93 (38.9)	83 (36.9)	142 (63.1)	51 (22.7)	174 (77.3)
	Yes	18 (62.1)	11 (37.9)	19 (44.2)	24 (55.8)	8 (18.6)	35 (81.4)
Khat use	No	95 (58.3)	68 (41.7)	52 (31.9)	111 (68.1)	36 (21.4)	132 (78.6)
	Yes	69 (65.7)	36 (34.3)	50 (47.6)	55 (52.4)	23 (23.0)	77 (77.0)

AUD, alcohol use disorder.

factors, substance use, social support and type of TB diagnosis.

The baseline prevalence of food insecurity found in this study (49.3%) was lower than the finding of a study done in Surabaya, Indonesia (64%).²³ The baseline prevalence of food insecurity found in this study falls within the range of prevalence reported from two studies done among PLHIV in Southwest Ethiopia (38.7% and 63.0%).^{16 24}

In this study, higher proportions of female patients were found to have food insecurity at baseline (54.2%) and first follow-up (52.3%). This might be due to women's limited economic, educational and employment opportunities and because they are more involved in unpaid work such as childcare and domestic activities than men particularly in a low-income country like Ethiopia.^{25–27} So, further study is needed to address the gender disparity in terms of

**Table 3** Factors affecting mental distress among patients with TB in Southwest Ethiopia 2017/2018 (n=268)

Variables		Model 1			Model 2			Full model		
		aOR	95% CI		aOR	95% CI		aOR	95% CI	
			Lower	Upper		Lower	Upper		Lower	Upper
Food insecurity	No	Ref								
	Mild/moderate	2.0	1.0	3.9	2.0	1.0	3.8	1.7	0.9	3.3
	Severe	7.3	3.7	14.2	7.0	3.6	13.7	4.7	2.4	9.4
Gender	Female	Ref			Ref			Ref		
	Male	-	-	-	-	-	-	1.8	0.9	3.3
Age	18–24	Ref			Ref			Ref		
	25–34	-	-	-	-	-	-	0.9	0.5	2.1
	35–44	-	-	-	-	-	-	1.5	0.5	4.4
	45–54	-	-	-	-	-	-	1.2	0.4	3.9
	55–64	-	-	-	-	-	-	1.8	0.5	6.3
Occupation	Merchant	Ref			Ref			Ref		
	Farmer	-	-	-	-	-	-	0.9	0.3	2.6
	Government employee	-	-	-	-	-	-	0.3	0.1	0.9
	Daily labourer	-	-	-	-	-	-	0.8	0.3	2.8
Annual income	<14568 Eth Birr	Ref			Ref			Ref		
	≥14568	-	-	-	-	-	-	1.9	0.8	4.3
Marital status	Married				Ref			Ref		
	Single	-	-	-	-	-	-	0.8	0.4	1.7
	Widowed/divorced	-	-	-	-	-	-	0.9	0.2	3.5
Type of TB	Smear positive	Ref								
	Smear negative	-	-	-	-	-	-	1.8	0.9	3.6
	Extrapulmonary	-	-	-	-	-	-	0.9	0.4	1.9
AUD	No	Ref			Ref			Ref		
	Yes	-	-	-	1.2	0.7	2.2	1.0	0.6	2.0
Khat use	No	Ref			Ref					
	Yes	-	-	-	1.5	0.9	2.6	1.1	0.6	1.9
Social support	Good	Ref			Ref			Ref		
	Moderate	-	-	-	-	-	-	1.3	0.7	2.4
	Poor	-	-	-	-	-	-	1.2	0.6	2.2
BIC		886.6			896.4			955.3		

aOR, Adjusted Odds Ratio; AUD, alcohol use disorder; BIC, Bayesian information criterion; Ref, Reference; TB, tuberculosis.

food insecurity and treatment outcomes among patients with TB in Ethiopia and other low-income countries. In this study, more than half of daily labourers reported food insecurity at baseline (59.5%), first (57.1%) and second (50.0%) follow-up. This may be due to daily labourers have low income and as a result, face difficulties in accessing adequate food. Studies showed that low income was associated with food insecurity.^{28 29}

In this study, the prevalence of mental distress was decreasing over 6 months from 61.2% at baseline to 22.0% at the second follow-up. This is consistent with other studies done on similar populations in Ethiopia¹⁰

and South Africa.³⁰ This might be due to patients with TB experience severe symptoms of the disease in the first month of treatment initiation which may overlap with the symptoms of mental distress but as patients get improvement from TB, symptoms of mental distress may also decline. Also, since SRQ-20 contains several physical symptoms that overlap with the symptoms of TB, the improvement of TB symptoms such as fatigue, loss of appetite throughout anti-TB treatment may account for the reduction in the level of mental distress. However, the baseline prevalence of mental distress found in this study (61.2%) was greater than the finding of a study

done in Angola (44.4%)³¹ and South Africa (34.1%).³⁰ The difference might be due to the tool used to assess mental distress (SRQ-20 vs Hospital Anxiety and Depression Scale, and K-10). For example, K-10 has nine items of psychological symptoms and only one physical item, so little overlap with TB symptoms compared with SRQ-20. The prevalence of mental distress at the first (38.1%) and second (22.0%) follow-up found in this study was in line with the studies conducted in Huambo hospital, Angola (44.4%)³² and South Africa (21.8%)^{30 33} but lower than the finding of studies conducted in a similar population in Dire Dawa and Harar cities (63.3%)⁹ and Addis Ababa Ethiopia (48.5%).¹⁰

In this study, severe food insecurity was associated with mental distress independent of other covariates which are in line with previous studies done in similar populations in Zambia and South Africa.^{34–36} Also, it is in line with a community-based study conducted in Rural Tigray and SNNP (Southern Nations, Nationalities, and Peoples) Regions, Ethiopia.³⁷ This may be due to uncertainty to have adequate food could lead to chronic stress that affects the mental health of the patients.³⁵

LIMITATIONS

The limitation of this study is that it did not include hospitalised patients, patients on retreatment and patients with MDR-TB, therefore, the results cannot be generalised for these patients. Patients with MDR-TB and hospitalised patients with TB may have higher depression and anxiety and their exclusion might have led to an underestimated prevalence of mental distress.

Patients with MDR-TB are under special treatment and surveillance so that including this group of patients might have biased the results. Moreover, SRQ-20 is not a gold-standard to measure mental disorders. So, TB related physical symptoms might overlap with SRQ-20 and led to the overestimate of mental distress.

STRENGTHS

Some strengths of this study are: the recruitment of participants from primary care facilities in rural and urban settings, and the consideration of several known confounding variables in the data analysis make our results robust. Also, the good surveillance system and presence of follow-up make the data collection highly reliable.

CONCLUSIONS

In this study, we have found a high prevalence of food insecurity and mental distress among patients with TB. Likewise, food insecurity associated with mental distress independent of other covariates. This implies that many patients with TB in Southwest Ethiopia are suffering from both mental health problems and lack of adequate food both of which might adversely affect treatment

outcomes. Therefore, this finding would be an input for TB programmes so that effective interventions for mental distress and food insecurity are integrated into the care of patients with TB. Future studies need to evaluate the effectiveness of interventions for food insecurity in reducing mental distress in patients with TB.

Author affiliations

- ¹Center for International Health, Ludwig Maximilian University, Munich, Germany
- ²Department of Psychiatry, Medical Faculty, Jimma University, Jimma, Ethiopia
- ³Department of Psychiatry, St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia
- ⁴Institute of Psychiatric Phenomics and Genomics (IPPG), University Hospital, LMU, Munich, Germany
- ⁵Department of Psychiatry and Psychotherapy, LMU Munich, Munich, Germany
- ⁶Department of Forensic Psychiatry, Isar Amper Klinikum, Munich, Germany
- ⁷German Center for Vertigo and Balance Disorders, University Hospital LMU Muenchen, Munich, Germany
- ⁸Institute for Medical Information Processing, Biometry and Epidemiology, Ludwig Maximilians University Muenchen, Munich, Germany

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ORCID iDs

Matiwos Soboka <http://orcid.org/0000-0003-2820-0947>

Yimenu Yitayih <http://orcid.org/0000-0002-0300-394X>

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