**Research Article**

# Community Knowledge, Attitude and Practice towards Tuberculosis in Nakfa Subzone: Cross-Sectional Study, 2021

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## Abstract

**Background:** Since tuberculosis places its heaviest burden on the world's poorest and vulnerable communities, acknowledging, managing and investing in the disease will result in substantial economic and health returns. There had been surge of TB in the Nakfa subzone, resulted from inappropriate knowledge of the disease's causes, transmission modes and treatments which affected the attitude and hampered the Healthcare-seeking behaviors. The aim of the study was to assess the communities' knowledge, attitude and practices towards TB in the Nakfa sub zone.

**Method:** Community-based cross-sectional survey was conducted from March to June, 2021. A total of 665 respondents were selected by two stage cluster sampling from the 33 villages in the subzone. Data was collected by trained health professionals through face-to-face interview using structured questionnaire. Difference in knowledge score and attitude score was assessed using non-parametric tests while factors that affect appropriate practice were determined using multivariable logistic regression, through SPSS (Version 26).

**Result:** Even though 98% of the participants had ever heard about TB, only 20.2% answered bacteria/germs as the main cause of TB. Sneezing and cough (93.6%) and covering mouth and nose (92.7%) were predominantly responded as mechanism of transmission and prevention, respectively. The percentage of participants who considered TB as very series was 79.2%. Almost all (97.9%) of them responded that the first action that they do if symptom appeared is to go to health facility. Knowledge score was found to be significantly different across the categories of age and educational level, while practice score was different across educational level, occupation, number of people living in household. On the other hand, the predictors of appropriate practice at multivariable level were age, knowledge score and attitude score.

**Conclusion:** The Nakfa subzone community has good awareness towards TB however, knowledge gap on the mode of transmission as well as negative attitude such as fear and stigma were observed. Further enrichment of their knowledge and attitude; as well as devising a mechanism to translate their knowledge and attitude to appropriate practice should be formulated.

**Keywords:** Tuberculosis; KAP; Nakfa subzone.

## Background

Even though tuberculosis (TB) is a curable and preventable disease, it continues to pose a major global health problem as infectious disease

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following HIV/AIDS [1]. The World Health Organization (WHO) stresses, through the Global Tuberculosis Report 2020, that an estimated 10.0 million (range, 8.9-11.0 million) people around the world contracted TB in 2019, a number that has been declining very slowly in recent years [2]. The disease is spread through droplets when people with TB expel the mycobacterium into the air (e.g. by coughing). TB typically affects the lungs (pulmonary TB) but can also affect other sites (extrapulmonary TB) [2] . TB is one of the major causes of morbidity and mortality in the Horn of Africa with the estimated incidence from 65 cases per 100,000 people per year in Eritrea, 192 cases per 100,000 per year in Ethiopia, 274 cases per 100,000 in Somalia, and 378 cases per 100,000 per year in Djibouti [3, 4]. According to the recent WHO estimate report, a total of 3100 new TB cases were present in 2018 in Eritrea, corresponding to 89 cases per 100,000 population [4].

Tuberculosis places its heaviest burden on the world's poor and vulnerable, aggravating existing inequalities, and claims more than 50% of their average income [5, 6]. The United Nations have pinned the End TB epidemic strategy under its SDG by 2030 [1]. TB remained among the leading (top-ten) causes of global fatality in 2019 with about 1.2 million deaths and an additional 0.2 million deaths among co-infected people with HIV [2]. As TB is a leading cause of disability adjusted life years (DALYs), acknowledging, managing and investing in the disease will result in substantial economic and health returns [4] .

Factors such as poor nutrition, co-morbidities and age extremity play a role, the lack and inappropriate knowledge of the disease's causes, transmission modes and treatments can affect the attitude and as a result hamper the health care seeking behaviors and practices [7]. Poverty and lack of awareness about TB are also considered the most important factors that increase the risk of exposure to TB [8]. In addition poor access to health facilities and shortage of financial sources within communities do not only affect the health seeking behavior of patients but favors the use of traditional healers over biomedical approaches. All this could lead to poor adherence to TB treatment and/or prolong delay in diagnosis, which pose a formidable challenge to control the disease [9-11]. Over all when the community embraces a wrong concept of TB, this can lead to stigmatization and fear towards patients with TB and affect the target of "Stop TB Strategy" of the WHO [12].

The first of the three pillars in the End TB strategy proposed by the UNSDG, is integrated patient-centered TB care and prevention [12]. This focuses on early detection, treatment and prevention for all TB patients. Therefore, the main themes are to ensure that all TB patients not only have equal, unhindered access to affordable services, but also engage in their care. This plays a crucial role in alleviating burdens that will weigh even more heavily if not tackled [3].

There had been a soaring cases of TB in the Nakfa Subzone with late presentations to the health facilities, accompanied with range of complications, including death [13]. Though many factors are at play, literature indicates that TB control can significantly be enhanced if more concern is given to improve knowledge and attitudes towards the disease. Adequate information about area specific knowledge, attitude and practice and associated risk factors of tuberculosis isn't readily available in Eritrea.

This cross sectional survey was aimed to assess the knowledge, attitude and practice on tuberculosis among the communities of Nakfa subzone, Eritrea.

## Methods

### Study area

The study was conducted in the Nakfa subzone, Northern Red sea region Eritrea between the months of March and June 2021. Nakfa is a town, endowed with much heroic historical significance in our struggle to independence. A tribute to pig-headed determination and endurance, Nakfa was so integral to the Eritrean history. When the post-independence government launched a national currency, it seemed only natural that it should be baptized the Nakfa. It is situated in the Northern Red sea region, 221km from the capital city, Asmara. With mountainous landscape, Nakfa is a highland at about 2300 meters from the sea level, between Latitude 16.6655 & Longitude 38.4768. There are currently 11 administrative villages and 33 villages within. The major ethnic group is Tigre with some Tigrigna. Majority of the people are farmers and pastoralists with a good some of people living in nomadic life style. There are about 11,314 households in the subzone. The total population in the subzone is estimated to be 60,486 by the local census.

Nakfa subzone comprises a primary level hospital, three health stations, and five health posts, working to meet the daily health needs of the communities in regards to Maternal and child health(MCH), EPI (Expanded Program for Immunization), NCD (Non Communicable Diseases).

### Study design, source population

The study design was a community-based cross-sectional and the data was collected using questionnaire administered by data collectors. The study population was all general public aged 18 years or above living in Nakfa subzone. Individuals were not included if they resided less than six months, if they were less than 18 years of age, or if they did not consent.

### Sample size and sampling technique

Initial sample size was calculated using one proportion computation formula without correction for continuity. The assumption utilized for the expected proportion, z statistic and precision levels were 0.5, 1.96, and 0.05 respectively. Therefore, the initial sample size calculated was 386.

After adjusting for 10% non-response rate (due to nomadic lifestyle) and design effect of 1.5, the final sample size was adjusted to be at least 643 household heads. A two stage cluster sampling was used with probability proportionate to size while selecting the primary sampling units. The villages were selected at the first stage using PPS and hence chance of selection is higher for those villages with higher number of households. In the second stage, households were selected from the selected villages. The individual households were selected using systematic sampling technique with random interval of 7.

## Study participants

Every individual aged 18 years and above residing in the randomly selected seven villages of the study town was eligible for the study. Study participants were all 18 years of age and older individuals who were randomly selected from eligible individuals in the selected households and consented to participate in the study.

## Data collection and quality control

A standard structured questionnaire which consists of questions on socio demographic characteristics of the study participants and their knowledge, attitudes and practices towards TB was used to collect data. The questionnaire was first designed in English based on the WHO guidelines and information from different literatures developed for similar purpose [9, 11]. The questionnaire was then translated into the major local language of the study area, Tigre, with careful assessment to avoid meaning loss. Data was then collected via face to face interview. The questionnaire encompass 4 main parts: (i) Socio-demographic status, (ii) Knowledge and Awareness, (iii) Health-care seeking behavior and attitude, and, (iv) Assessment of TB stigma of the community. Training of the data collectors and supervisors (research staff) was conducted to decrease the inter-collector discrepancies. The questionnaire was administered by trained health professional at house-to-house visit and filling the questionnaires from voluntary and eligible participants.

The training and questionnaire pre-test were done within three days. The training included sessions on objectives of the survey, principles of conducting an interview, presentations and discussion on sections of the questionnaires, procedures for listing the households, and the second stage sample selection of the households. The team supervisors were further trained in data quality control procedures and fieldwork coordination. During the training, every enumerator and supervisor was given his/her roles and responsibilities. As part of the training, which was prior to the main survey, the questionnaires were pretested on 30 individuals from three villages not included in the sampled villages. Ten households were interviewed from each village. The pre-test was done to help in assessing the quality of translation, the ability of the questions to elicit appropriate information, the capability of the data collectors to administer the questionnaire and determine the time required to complete a questionnaire. Based on the observations and interviewers comments from the pre-test field and review of the findings from the pre-test, the questionnaires were revised with some last improvements and prepared for the main study.

## Variables considered in this study

The independent variables were age, sex, marital status, ethnicity, religion, and educational status. There were three main outcome variables: knowledge of community towards TB, attitude of the community towards TB, and practice of the community towards TB [9, 11]. These three outcome variables are composite scores as it is not possible to measure them directly. Each of the three outcomes was measured using responses given by study participants to several set of questions. The detail of the content of the questions and how these outcomes were scored is summarized below:

## Knowledge of community towards tuberculosis

The overall knowledge of the respondents about TB was assessed using the following 10 main questions: [1] Ever heard of TB, [2] able to mention bacteria/germ as a cause of TB, [3] able to mention the cardinal sign/symptoms of TB (persistent cough for two or more weeks, sputum with blood, chest pain, weight loss, loss of appetite and fever/sweat), [4] able to classify TB as a transmissible disease, [5] able to enumerate correct mode of transmission of TB (cough/breath, sharing cups, not sharing feeding utensils, not through body contact or sharing clothes), [6] knowing that TB is treatable, [7] knowing that effective treatment for TB is modern drugs, [8] knowing that TB is preventable, and [9] able to enumerate correct preventive methods of TB (covering mouth and nose when coughing or sneezing, avoid sharing cups, using separate rooms, early treatment, not avoiding body contact/ hand shaking), and [10] Knowing that the Drugs are available for free. Each question was rated, that a score of one is given to correct responses and a score of zero for incorrect/ don't know responses. Then, upon summing the responses a knowledge score ranging from 0 to 22 was generated.

## Attitude and practice of community towards tuberculosis

Four questions were used on assessing the attitude of the study participants about TB: [1] able to consider TB as a very serious or somewhat serious disease and problem, [2] able to acknowledge that TB can happen to anybody, [3] able to mention positive feeling towards the disease and [4] feeling compassion and desiring to help the patient. A score of one point was awarded to correct attitude answer towards the disease and those afflicted. A zero point was given to answers not consistent with the correct attitude towards the disease and those afflicted. Later, the responses were added together to provide an attitude score ranging from 0 to 7.

In the same manner, communities' health care seeking behaviors and practices about TB were measured using the answers for the following 4 questions: [1] communities' consultation to doctors or other health professionals about their illness if they had TB, [2] preference and reliance of the communities on the existing method of treatment, [3] seeking medical help immediately as soon as they realize they had symptoms related to TB or when symptoms that look like TB signs lasts for 2 or more weeks and [4] if the community supports and helps TB patient. A score of one point was allocated to answers consistent with the correct health care seeking behaviors and practices with regards to the illness. A score of zero point was given to answers not consistent with the correct health care seeking behaviors and practices with regards to the illness. A score ranging from 0 to 4 was generated after the response to these questions were summed up together. A participant who got 4 correct responses out of the four health seeking behaviour related items was considered as having appropriate practice, otherwise inappropriate.

## Data processing and analysis

In order to check the structure of data, questionnaire skip patterns and range of validity of values using the data entry software CSPro (Ver 7.3) was utilized. Moreover, interval consistency check-ups as well as verifications were performed. Data was exported to SPSS (Version 26.0) for analysis. Because of the multi-stage sampling technique used, weights were computed before conducting any analysis. Results were summarized by counts (percentage) for categorical variables. Mean (SD) or median (IQR) were also used to describe quantitative variables, as appropriate. Fisher's measure of skewness and kurtosis (if standard error of skewness and kurtosis is between -1.96 and 1.96) were used to assess the normality of knowledge and attitude scores. After assessing the normality of the knowledge score, independent samples T-test and ANOVA were used to find out the possible difference across the categories of demographic variables. Consequently, variables that were found to be significant were subjected to multivariable

analysis. However, non-parametric statistical tools were used to analyze the attitude scores because of its ordinal nature. The potential difference in attitude scores across the categories of demographic variables was assessed using Mann-Whitney U test and Kruskal Wallis tests. Finally, the associates of practice at bivariate level, were determined using binary logistic regression. The demographic variables and additional potential predictors (knowledge and attitude towards tuberculosis) that were found to be significant associates at bivariate level were forwarded for the multivariable analysis. Adjusted odds ratios were computed to determine the strength of association after controlling the effect of confounding variables. P-values less than 0.05 were considered as significant throughout the analysis.

## Results

### Socio-demographic characteristics of the study participants

The socio-demographic profile of the respondents is summarized in Table 1. A total of 665 study participants were involved with majority being females (65.4%). The minimum age of the participant was 18, in which the age group 18-29 years (32.6%) had highest percentage. Related to educational level, 42.8% were illiterate; and occupation wise 53.1% were house wives while 18.7% were pastoralists. Forty eight percent of households included 4-7 people, and (91.7%) of respondents were married.

### Knowledge about the cause, symptoms, mode of transmission, prevention and treatment of TB

As illustrated in Table 2 exceeding number (98.9%) of the respondents had heard of TB, in which 9.8% of the female reported they had TB before. Regarding the main source of information, 84.5% reported that they heard it from health

**Table 1:** Socio-demographic characteristic of the respondents in Nakfa Subzone, Eritrea

| Background Characteristics | | Percent | Number | Total |
|---|---|---|---|---|
| Gender | | | | |
| | Male | 34.6 | 230 | 229 |
| | Female | 65.4 | 435 | 436 |
| Age | | | | |
| | 18 – 29 | 32.6 | 217 | 226 |
| | 30 – 44 | 30.3 | 201 | 219 |
| | 45 – 59 | 25.5 | 169 | 161 |
| | 60 or above | 11.6 | 77 | 59 |
| Educational Level | | | | |
| | Illiterate | 42.8 | 285 | 242 |
| | Primary | 32.3 | 215 | 215 |
| | Secondary | 18.5 | 123 | 151 |
| | University | 2.1 | 14 | 27 |
| | Junior | 4.3 | 29 | 30 |
| Marital Status | | | | |
| | Ever married | 91.5 | 608 | 595 |
| | Never married | 8.5 | 57 | 70 |
| Occupation | | | | |
| | Government/private employee | 17.7 | 118 | 174 |
| | Unemployed/Student | 10.6 | 70 | 82 |
| | House wife | 53.1 | 353 | 313 |
| | Farmer/pastoralist | 18.6 | 124 | 96 |
| Number of people in household | | | | |
| | <4 | 39.5 | 263 | 249 |
| | 4 to 7 | 48 | 319 | 327 |
| | 7 or above | 12.5 | 83 | 89 |

**Table 2:** Communities' distribution on whether they ever heard TB, ever had TB, source of information, knowledge about the signs/symptoms, mode of transmission, prevention and treatment of TB in Nakfa Subzone, Eritrea 2021

| Variables | Gender | | Total n (%) |
|---|---|---|---|
| | Female n (%) | Male n (%) | |
| **Ever heard about TB** | | | |
| Yes | 429 (98.6) | 229 (99.5) | 658 (98.9) |
| No | 7 (1.4) | 1(0.5) | 8 (1.1) |
| **Ever had TB** | | | |
| Yes | 42 (9.8) | 16 (6.8) | 58 (8.8) |
| No | 393 (90.2) | 214 (93.2) | 607 (91.2) |
| **Source of Information** | | | |
| Newspapers/magazines | 14 (3.2) | 15 (6.3) | 28 (4.3) |
| Media (radio, TV, etc…) | 184 (42.8) | 116 (50.8) | 300 (45.6) |
| Brochures, posters, and printed materials | 27 (6.3) | 15 (6.4) | 42 (6.4) |
| Health workers | 360 (84.0) | 195 (85.3) | 555 (84.5) |
| Family, friends, neighbors and colleagues | 311 (72.7) | 144 (62.9) | 456 (69.3)§ |
| Religious leaders | 6 (1.4) | 2 (0.7) | 8 (1.1) |
| **Cause of TB** | | | |
| Bacteria/germs | 86 (20.1) | 47 (20.6) | 133 (20.2) |
| Cold air | 127 (29.7) | 71 (31.0) | 198 (30.1) |
| Bad spirit/witchcraft | 13 (2.9) | 5 (2.2) | 18 (2.7) |
| Shortage of food | 332 (77.4) | 186 (81.3) | 518 (78.8) |
| Hot climate | 8 (1.9) | 9 (3.9) | 17 (2.6) |
| Smoking/chewing | 3 (0.7) | 0 (0) | 3 (0.4) |
| Unboiled milk | 160 (37.20 | 64 (27.9) | 223 (34.0) |
| Other* | 18 (4.1) | 7 (3.10) | 25 (3.8) |
| Don't know | 8 (1.9) | 2 (0.8) | 10 (1.5) |
| **Signs and symptoms of TB** | | | |
| Cough for 2 or more weeks | 425 (99.1) | 228 (99.7) | 653 (99.3) |
| Sputum with blood | 408 (95.3) | 214 (93.6) | 623 (94.7) |
| Weight loss | 117 (27.3) | 68 (29.8) | 185 (28.2) |
| Loss of appetite and weakness | 151 (35.2) | 93 (40.8) | 244 (37.2) |
| Fever and sweat at night | 366 (85.3) | 197 (85.8) | 562 (85.5) |
| Chest pain | 95 (22.3) | 56 (25.6) | 154 (23.4) |
| Other** | 5 (1.1) | 4 (1.9) | 9 (1.4) |
| Don't know | 3 (0.7) | 1 (0.3) | 3 (0.5) |
| **Can be transmitted** | | | |
| Yes | 424 (99.0) | 225 (98.3) | 649 (98.7) |
| No | 2 (0.5) | 2 (1.0) | 5 (0.7) |
| Don't know | 2 (0.5) | 2 (0.70) | 4 (0.6) |
| **TB transmitted through** | | | |
| Sneezes and coughs | 401(94.7) | 206 (91.6) | 607 (93.5) |
| Mosquito bite | 5 (1.1) | 2 (0.7) | 7 (1) |
| Sharing Cups | 313 (73.7) | 168 (74.9) | 481(74.1) |
| Eating with same plate | 141 (33.4) | 108 (48.1) | 249(38.5) |
| Hand shaking | 27 (6.4) | 15 (6.7) | 42(6.5) |
| Other (clothes and sweat of TB patient') | 9 (2.2) | 1 (0.5) | 10(1.6) |
| **Can TB be prevented** | | | |
| Yes | (420) 98.1 | (224) 97.7 | 644 (97.8) |
| No | (3) 0.8 | (3)1.5 | 6(1.1) |
| Don't know | (5) 1.1 | (2)0.8 | 7(1.0) |
| **Preventive methods of TB** | | | |
| Covering mouth and nose | 395 (93.9) | 203 (90.6) | 598 (92.7) |
| Avoid hand shaking | 30 (7.2) | 14 (6.3) | 44 (6.9) |
| Early treatment | 168 (40) | 88 (39.4) | 256 (39.8) |
| Avoid sharing cups | 296 (70.5) | 152 (68) | 448 (69.6) |
| Closing windows at home | 4 (0.9) | 3 (1.3) | 7(1.0) |
| Good nutrition | 69(16.4) | 47 (20.9) | 116(18.0) |
| Separate patient | 275 (65.3) | 160 (71.5) | 435(67.5) |
| Others (sanitation, cook food properly) | 2 (0.4) | 2 (0.7) | 4(0.5) |
| **Is TB treatable** | | | |
| Yes | 428 (99.8) | 229 (100) | 657(99.9) |
| No | 1(0.2) | - | 1(0.2) |
| **Treatment methods of TB** | | | |
| Modern drugs from Health institute | 420 (98.3) | 228 (99.5) | 648(98.6) |
| Herbal remedies | 4 (1) | 5(2.2) | 9(1.4) |
| Home rest without medicine | 4 (0.9) | 2 (1.1) | 6(1) |
| Praying | 0 (0.1) | 2 (0.7) | 2(0.3) |
| Self-treatment | 6 (1.3) | 5 (2.2) | 11(1.6) |

workers followed by family & friends (69.3%) and media (45.6%). 20.2% of the respondents answered bacteria/ germs or "M. tuberculosis" for the question "what is the cause of TB?" while others reported shortage of food (78.8%), cold air (30.1%), bad spirit/ Witchcraft (2.7%), hot climate (2.6%), and smoking (0.4%).

On the communities knowledge about the signs and symptoms of TB, majority of the respondents reported persistent cough for 2 weeks or more (99.3%), sputum with blood (93.4%), and fever and night sweating (85.5%) as the three most common symptoms. The commonest ways of transmission mentioned were: sneezing and coughing from people with TB (93.6%), sharing cups (74.1%) followed by eating with the same plate (38.6%). Relatively, a higher proportion of males were in favor of using separate room for TB patients as a prevention method of the disease than female individuals (71.5% versus 65.3%). Majority (98.1%) of the respondents knew that TB is treatable disease. Almost all (99.9%) responded that TB can be cured. The most commonly reported way of curing was the use of modern drugs (98%).

## Communities' attitude towards TB

More than three fourth (79.2%) of the study participants considered TB as a very serious disease and 42.2% said it is a very serious problem in their area (Table 3). For the question "do you think you can get TB?" 82.3% answered "yes". Referred to their reaction if they themselves had TB, most of them responded that they would experience fear (52.4%), while others stated they would feel surprised (33.5%). Female participants were more likely to experience sadness and shame compared to male participants (32.5%, 14.3% versus 26.6, 4.9%) respectively. Almost two out of five (44.4%) of the participants felt compassion and desire to help the patient, while 27.1% stated they felt compassion but better to stay way. Regarding the question on how a person with TB is treated in the community, 45.5% responded they are friendly but avoid the TB patient. 41.5% stated the community support and help TB patients while, 12.2% replied that most people reject the patient. One out of hundred (1%) replied that they don't know the communities' feeling towards a TB patient or not sure whether they help or not.

**Table 3:** Communities' attitude about TB in Nakfa Sub-Zone, Eritrea 2021

| Variables | Gender | | Total n (%) |
| --- | --- | --- | --- |
| | Female n (%) | Male n (%) | |
| **How serious is TB** | | | |
| Very serious | 346 (80.8) | 175 (76.2) | 521 (79.2) |
| Somewhat serious | 45 (10.5) | 23 (9.8) | 67 (10.3) |
| Not very serious | 35 (8.1) | 32 (13.8) | 66 (10.1) |
| Don't know | 3 (0.7) | 0 (0) | 3 (0.5) |
| **How serious do you think TB is in your area?** | | | |
| Very serious | 177 (41.4) | 100 (43.7) | 277 (42.2) |
| Somewhat serious | 51 (11.8) | 27 (11.8) | 78 (11.8) |
| Not very serious | 90 (21.1) | 63 (27.6) | 153 (23.3) |
| Don't know | 110 (25.7) | 39 (17.0) | 149 (22.7)§ |
| **Do you think you can get TB?** | | | |
| Yes | 354 (82.7) | 187 (81.5) | 541 (82.3) |
| No | 53 (12.4) | 24 (10.3) | 77 (11.7) |
| Don't know | 21 (4.9) | 19 (8.2) | 40 (6.) |
| **Reaction if found out TB** | | | |
| Fear | 226 (52.9) | 118 (51.6) | 344 (52.4) |
| Surprise | 139 (32.4) | 81 (35.5) | 220 (33.5) |
| Shame | 61 (14.3) | 11 (4.9) | 73 (11.1)§ |
| Sadness or hopelessness | 139 (32.5) | 61 (26.6) | 200 (30.4) |
| Acceptance | 17 (4.0) | 17 (7.2) | 34 (5.1) |
| **Are some people more likely infected?** | | | |
| Yes | 219 (51.0) | 140 (61.1) | 359 (54.5) |
| No | 149 (34.8) | 66 (28.8) | 215 (32.7) |
| Don't know | 61 (14.2) | 23 (10.1) | 84 (12.7) |
| **Who are more likely to be infected?** | | | |
| Men | 6 (2.6) | 2 (1.5) | 8 (2.2) |
| Women | 28 (12.9) | 34 (24.1) | 62 (17.3)§ |
| Both men and women | 28 (13.0) | 22 (15.9) | 51 (14.1) |
| Children under 5 years | 100 (45.7) | 53 (37.5) | 153 (42.5) |
| Very old people | 182 (83.2) | 109 (77.8) | 291 (81.1) |
| Malnourished | 19 (8.5) | 8 (5.9) | 27 (7.5) |
| Other** | 2 (0.9) | 7 (4.7) | 9 (2.4) |
| Don't know | 1 (0.4) | 0 (0) | 1 (0.4) |
| **Do you now people with TB?** | | | |
| Yes | 297 (69.3) | 184 (80.1) | 481 (73.1)§ |
| No | 114 (26.7) | 42 (18.2) | 156 (23.7) |
| Don't know | 17 (4.0) | 4 (1.6) | 21 (3.2) |
| **Feeling towards people with TB** | | | |
| Compassion and desire to help | 188 (44.0) | 103 (45.2) | 292 (44.4) |
| Compassion but stay away | 113 (26.3) | 65 (28.5) | 178 (27.1) |
| It is their problem and I can't get TB | 9 (2.1) | 9 (3.8) | 18 (2.7) |
| Fear because they may infect me | 109 (25.6) | 42 (18.4) | 152 (23.1) |
| No particular feeling | 9 (2.1) | 9 (4.1) | 18 (2.8) |
| **How is a person with TB regarded in the community?** | | | |
| Most people reject | 45 (10.5) | 35 (15.4) | 80 (12.2) |
| Most people are friendly but avoid him/her | 201 (46.9) | 97 (42.4) | 298 (45.3) |
| Mostly support him/her | 176 (41.1) | 96 (42.1) | 273 (41.5) |
| Don't know | 6 (1.5) | 1 (0.2) | 7 (1.0) |

## Communities' Practice on TB

More than eighty five percent (86.9%) of the study participants said that they would consult doctors or other medical workers about their illness (Table 4). While others would like to talk to their spouse (61.6%), parents (53.6%), and close friends (26.5%).When asked what they would do if they had symptoms of TB, 97.9% answered that they would go to a health facility. Other mentioned ways of treatment were to pursue self-treatment options, like herbs (3.8%), visiting traditional healers praying (0.8%) and visiting a pharmacy (2%). Reports at what point the participants would seek help, almost half (48%) responded as soon as they realized that they had TB symptoms and half (50%) if symptoms that look like TB signs lasted for 3–4 weeks. Very few (1.4%) participants responded that they would seek medical help when self-treatment failed to work; while 0.6% didn't know

**Table 4:** Percentage distribution on behavior of respondents on TB related activities in Nakfa subzone, Eritrea, 2021.

| Variables | Gender | | Total n (%) |
|---|---|---|---|
| | Female n (%) | Male n (%) | |
| **Talk to about illness** | | | |
| Doctor / medical worker | 379 (88.4) | 192 (83.9) | 571 (86.9) |
| Spouse | 257 (60.1) | 147 (64.4) | 405 (61.6) |
| Parent | 227 (53.0) | 125 (54.8) | 353 (53.6) |
| Close friend | 109 (25.4) | 65 (28.5) | 174 (26.5) |
| No one | 1 (0.3) | 1 (0.2) | 2 (0.3) |
| Other* | 1 (0.1) | 0 (0) | 1 (0.1) |
| **First action done if symptoms appeared** | | | |
| Self-treatment | 17 (4.0) | 8 (3.3) | 25 (3.8) |
| Go to health facility | 421 (98.2) | 223 (97.3) | 644 (97.9) |
| Go to pharmacy | 10 (2.3) | 4 (1.5) | 13 (2.0) |
| Go to traditional healers | 3 (0.6) | 2 (1.1) | 5 (0.8) |
| Others** | | | |
| **Point medical help is sought, if symptoms appear** | | | |
| Self-treatment doesn't work | 6 (1.4) | 3 (1.3) | 9 (1.4) |
| Symptoms last for 3-4 weeks | 208 (48.4) | 121 (52.9) | 329 (50.0) |
| As soon as symptoms are realized | 213 (49.8) | 103 (45.0) | 316 (48.0) |
| Go to health facility | 0 (0) | 0 (0) | 0 (0) |
| I don't know | 2 (0.5) | 2 (0.7) | 4 (0.6) |
| **Reason for not going to health facility** | | | |
| Not sure where to go | 34 (8.0) | 24 (10.6) | 58 (8.9) |
| Cost | 248 (57.8) | 118 (51.5) | 366 (55.6) |
| Cannot leave work | 36 (8.5) | 33 (14.6) | 70 (10.6) |
| Do not want to find out something is wrong | 23 (5.5) | 21 (9.0) | 44 (6.7) |
| Difficulties with transportation | 292 (68.1) | 153 (66.9) | 445 (67.7) |
| Do not trust medical workers | 3 (0.6) | 0 (0) | 3 (0.5) |
| Do not like attitude of medical workers | 20 (4.7) | 7 (3.2) | 27 (4.2) |
| Fear of contracting COVID-19 | 19 (4.5) | 13 (5.7) | 32 (4.9) |
| Other***(no reason) | 1 (0.3) | 0 (0) | 1 (0.2) |
| Don't know | 1 (0.3) | 0 (0) | 1 (0.2) |

what to do. Regarding reason for not going to health facility, 67.7% responded due to transportation problem, followed by high hospital cost (55.6%). Less than ten percent (8.9%) stated they are not sure where to go; while 4.9% reported due to fear of COVID-19.

**Predictors of knowledge score**

The overall mean knowledge score was 29.74 out of 39 (SD=2.82, Minimum=20.00, Maximum=38.00) as shown in (Table 5). The results revealed that knowledge score was not significantly different across the categories of gender (p=0.415), marital status (p=0.459), occupation (p=0.052), and number of people living in household (p=0.112). However, significantly different knowledge scores were observed across the categories of age (p=0.001) and educational level (p=0.024). Further examination of the

**Table 5:** Comparison of knowledge score across categories of basic background characteristics at bivariate level along with the post-hoc tests

| Background characteristics | M (SD) | t/F value | p-value | Hochberg Pairwise post-hoc result (p-value) |
|---|---|---|---|---|
| Gender | | -0.82 | 0.415 | |
| Male | 29.62 (2.57) | | | |
| Female | 29.80 (2.95) | | | |
| Age (r=-0.171, p<0.001) | | 5.71 | 0.001 | D < A (p<0.001), D < B (p=0.016) |
| 18 – 29 A | 30.20 (2.96) | | | |
| 30 – 44 B | 29.82 (2.91) | | | |
| 45 - 59 C | 29.54 (2.59) | | | |
| 60 or above D | 28.68 (2.40) | | | |
| Educational Level | | 2.84 | 0.024 | |
| Illiterate A | 29.42 (2.72) | | | |
| Primary | 29.72 (2.85) | | | |
| Secondary C | 30.45 (2.76) | | | C > A (p=0.008) |
| University | 30.17 (2.68) | | | |
| Junior | 29.83 (3.46) | | | |
| Marital Status | | 0.74 | 0.459 | |
| Ever married | 29.76 (2.83) | | | |
| Never married | 29.46 (2.72) | | | |
| Occupation | | 2.59 | 0.052 | |
| Government/ private employee | 30.11 (2.46) | | | |
| Unemployed/ Student | 28.99 (2.44) | | | |
| House wife | 29.84 (3.07) | | | |
| Farmer/ pastoralist | 29.51 (2.53) | | | |
| Number of people in household | | 2.2 | 0.112 | |
| <4 | 30.03 (2.92) | | | |
| 4 to 7 | 29.53 (2.88) | | | |
| 7 or above | 29.65 (2.13) | | | |

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**Table 6:** Comparison of the attitude scores across categories of basic background characteristics along with the post-hoc test at bivariate level

| Background characteristics | Md (IQR) | M (SD) | Mann-Whitney Z /Kruskal - Wallis Chi-square value | p-value | p-value (using Mann - Whitney post hoc **) |
|---|---|---|---|---|---|
| Gender | | | -1.9 | 0.057 | - |
| Male | 5.0 (2.0) | 4.95 (0.90) | | | |
| Female | 5.0 (1.0) | 4.86 (0.88) | | | |
| Age | | | 1.27 | 0.735 | - |
| 18 – 29 | 5.0 (1.0) | 4.88 (0.83) | | | |
| 30 – 44 | 5.0 (2.0) | 4.92 (0.94) | | | |
| 45 – 59 | 5.0 (2.0) | 4.86 (0.91) | | | |
| 60 or above | 5. (1.0) | 4.92 (0.82) | | | |
| Educational Level | | | 24.84 | <0.001 | B>A (p<0.001), |
| Illiterate A | 5.0 (1.0) | 4.72 (0.93) | | | C>A (p=0.006), |
| Primary B | 5.0 (1.0) | 5.30 (0.80) | | | D>A (p=0.006) |
| Secondary D | 5.0 (2.0) | 4.96 (0.85) | | | |
| University E | 5.0 (1.75) | 5.12 (1.01) | | | |
| Junior C | 5.0 (2.0) | 5.07 (0.89) | | | |
| Marital Status | | | -0.81 | 0.418 | - |
| Ever married | 5.0 (2.0) | 4.88 (0.90) | | | |
| Never married | 5.0 (0.0) | 4.97 (0.73) | | | |
| Occupation | | | 9.68 | 0.021 | F>H (p=0.029), |
| Government/private employee | 5.0 (1.0) | 5.06 (0.92) | | | I>H (p=0.010) |
| Unemployed/Student G | 5.0 (1.0) | 4.89 (0.77) | | | |
| House wife H | 5.0 (1.0) | 4.80 (0.89) | | | |
| Farmer/pastoralist I | 5.0 (2.0) | 4.99 (0.87) | | | |
| Number of people in household | | | 7.36 | 0.025 | L>J (p=0.016), |
| <4J | 5.0 (1.0) | 4.88 (0.87) | | | L>K (p=0.009) |
| 4 to 7 K | 5.0 (2.0) | 4.84 (0.92) | | | |
| 7 or above L | 5.0 (1.0) | 5.13 (0.75) | | | |
| | r | N | p-value | | |
| Knowledge score | -0.037 | 639 | 0.347 | | |

*Md: Median; IQR: Interquartile range; M: Mean; SD: Standard Deviation; **Applies only to independent variables with more than two categories signifying significant relationship at the first stage of the analysis*

knowledge scores using Hochberg pairwise post-hoc test revealed that knowledge scores among 60 or above years old was significantly less than the age groups 18 – 29 (M=30.20, SD=2.96, p<0.001) and 30 – 44 (M=29.82, SD=2.91, p=0.016). Moreover, knowledge score among secondary level (M=30.45, SD=2.76) was significantly greater (p=0.008) than those of illiterate (M=29.42, SD=2.72).

In order to control the confounding effect, multivariable model was conducted to determine the predictors of knowledge score (Additional file 1). The result identified age as a significant predictor (p=0.005). Hence, age has the largest partial eta squared ($\eta 2 = 1.3\%$), showing its prime role in prediction of the knowledge score.

**Predictors of attitude score**

Mann-Whiney U test showed that the categories of gender (p=0.057), and marital status (p=0.418) did not have significantly different attitude score (Table 6). Similarly, attitude score across the categories of age, using Kruskal-Wallis test, was not significantly different (p=0.735).

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However, categories of educational level (p<0.001), occupation (p=0.021) and number of people living in a household were significantly different.

Post-hoc results revealed that participants at primary level (p<0.001), junior (p= 0.006) and secondary level (p= 0.006) had significantly higher attitude score compared to those at illiterate level. Government or private employed (p=0.029) and farmer/pastoralists (p=0.010) also had significantly higher attitude score compare to housewives. A household with 7 or above members did have significantly greater attitude score compared to households with less than 4 members (p=0.016) and 4 to 7 members (p=0.009).

### Predictors of practice

Practice, unlike knowledge and attitude scores, was categorized as appropriate and inappropriate (Table 7). Accordingly, bivariate logistic regression was applied to determine the associates of appropriate practice. Variables that were found to be significant at bivariate level were retained for analysis at multivariable level. Crude odds ratio (for bivariate analysis) and adjusted odds ratio (for multivariable analysis) were computed and reported.

At bivariate level, practice of the community was not significantly associated with gender (p=0.445), educational level (p=0.656), marital status (p=0.960), occupation

**Table 7:** Predictors of practice across the categories of basic background characteristics, knowledge and attitude scores at bivariate and multivariable level

| Background characteristics | Practice | | COR (95% CI) | AOR (95% CI) |
| --- | --- | --- | --- | --- |
| | Inappropriate | Appropriate | | |
| | n (%) | n (%) | | |
| Gender | | | | |
| Male | 151 (35.9) | 78 (33.0) | Referent | |
| Female | 270 (64.1) | 159 (67.0) | 1.14 (0.81, 1.59) | - |
| Age | | | | |
| 18 – 29 | 133 (31.6) | 83 (34.9) | Referent | Referent |
| 30 – 44 | 113 (27.0) | 86 (36.2) | 1.22 (0.82, 1.80) | 1.35 (0.89, 2.06) |
| 45 – 59 | 127 (30.2) | 41 (17.4) | **0.52 (0.33, 0.82)**** | **0.57 (0.36, 0.91)*** |
| 60 or above | 47 (11.2) | 27 (11.6) | 0.94 (0.54, 1.61) | 1.31 (0.73, 2.33) |
| Educational Level | | | | |
| Illiterate | 179 (42.6) | 100 (42.2) | Referent | |
| Primary | 138 (32.9) | 75 (31.7) | 0..97 (0.67, 1.41) | |
| Secondary | 77 (18.2) | 46 (19.4) | 1.07 (0.69, 1.67) | - |
| University | 11 (2.7) | 3 (1.1) | 0.40 (0.10, 1.61) | |
| Junior | 16 (3.7) | 13 (5.6) | 1.54 (0.71, 3.32) | |
| Marital Status | | | | |
| Ever married | 385 (91.4) | 217 (91.6) | Referent | |
| Never married | 36 (8.6) | 20 (8.4) | 0.97 (0.55, 1.73) | - |
| Occupation | | | | |
| Government/private employee | 79 (18.8) | 39 (16.3) | Referent | |
| Unemployed/Student | 46 (11.0) | 23 (9.8) | 1.03 (0.55, 1.93) | |
| House wife | 212 (50.3) | 136 (57.5) | 1.31 (0.85, 2.04) | - |
| Farmer/pastoralist | 84 (20.0) | 39 (16.4) | 0.94 (0.55, 1.62) | |
| Number of people in household | | | | |
| <4 | 152 (36.1) | 106 (44.7) | Referent | |
| 4 to 7 | 210 (49.8) | 108 (45.5) | 0.74 (0.53, 1.04) | |
| 7 or above | 59 (14.1) | 23 (9.9) | 0.57 (0.33, 1.00) | |
| | **M (SD)** | **M (SD)** | **COR (95% CI)** | **AOR (95% CI)** |
| Knowledge score | 29.21 (2.57) | 30.69 (2.99) | **1.22 (1.15, 1.30)**** | **1.24 (1.16, 1.32)**** |
| Attitude score | 4.82 (0.89) | 5.00 (0.85) | **1.28 (1.06, 1.54)**** | **1.34 (1.10, 1.63)**** |

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(p=0.380) and number of people in a household (p=0.057). However, significant associations were observed with age (p=0.002), knowledge score (p <0.001) and attitude score (p<0.001).

Multivariable results revealed that the odds of appropriate practice was 1.75 times higher among 18-29 years old (AOR=0.57, 95% CI: 0.6, 0.91) compared to the age group 45-59. Besides, for unit increase in knowledge scores, the odds of appropriate practice increased by 24% (AOR=1.24, 95% CI: 1.16, 1.32). Similarly, for unit increase in attitude scores, the odds of appropriate practice increased by 34% (AOR=1.34, AOR=1.34, 95% CI: 1.110, 1.63).

## Discussion

In this study, 98.9% of the respondents had heard about TB, whereas, 8.8% of the respondents had TB infection prior to this study. This high percentage awareness could be due to the regular health education given to the community in the health facilities and through the reach outs. The findings of this study are congruent to a study done in Ethiopia [9, 11], Pakistan (14), Libya [15] in which majority responded they have heard about TB.

Health workers provided the main source of information about TB followed by family, friends and close relatives. This could be explained by close interaction between the health workers and the community to ensure appropriate information. Congruent to this study studies done in Gambella [16] and Ethiopia [17] reported health workers as the main source. In contrary, studies in Tunisia [18], Pakistan [14] found out mass media as the main source of information.

Concerning the causes of TB, more than three quarter of the respondents (78.8%) stated shortage of food while only 20.2% asserted that TB was caused by bacteria/germs. This could be due to the communities' nomadic life style and scarcity of food. A fifth of the respondents concurred bacteria as a causative agent of TB, which is in agreement with the findings of studies from Ethiopia and South Africa [17, 19]. Incongruent to the current findings, another study done in Ethiopia revealed that only 3.3% of respondents had stated bacteria as the main cause of transmission [11].

In this study, coughing for two or more weeks, sputum with blood, as well as fever and sweat at night were the common signs and symptoms stipulated by the respondents. This could be explained to the fact that the MOH- Eritrea had intensive health promotion programs of TB in the region. Similar results regarding persistent coughing were obtained in a study done in Ethiopia [9] and Nigeria [20]. Whereas studies done in Pakistan [14] and Ethiopia [11] found out that a few number of the respondents mentioned persistent productive cough as a sign of PTB. Majority (99.3%) of the participants in this study were able to identify the early signs and symptoms of TB which were key in the diagnosis of the disease however, late signs and symptoms which implies the onset of complications were a challenge to the majority of the respondents. This could be explained by the fact that health promotion focuses on the early signs and symptoms of the disease for prompt early health seeking behavior whereas the complications are essentially clinical based.

Similarly 98.7% of the respondents knew that TB is a transmittable. Majority (93.7%) of the respondents stated coughing and sneezing as the main mode of transmission followed by sharing of common utensils like cups (74.1%). In addition various studies in Ethiopia [9, 21], Pakistan [14] agree with this findings. On the other hand, a study done in South Africa stated overcrowding (84.6%) as the main mode of transmission [19].

A bigger proportion of the study participants agreed that covering the mouth and nose while coughing and sneezing, using a separate room for the patient and early treatment enhances the prevention strategies for the disease. Further to this, respondents concurred that TB is treatable and cura [22] Iraq [23], and Tajikistan [24].

A great number of the respondents stated that sputum examination as the main means of diagnosis followed by blood examination, X-ray and the least being stool examination. Similar findings were found in a study done in Pakistan [14], whereas a study in Libya reported chest X-ray as best diagnostic tool for TB [15]. A small proportion of respondents in this study identified self-treatment and other traditional methods as ways of curing TB, but a larger part of the respondents agreed that modern drugs as the ultimate cure for TB. The findings were consistent with studies done in Ethiopia [9], South Africa [22], Iraq [23] and Kenya [25]. On the other hand, a Tanzanian study found out that the use of root barks and animal products was effective for the treatment of TB among the rural folks [26]. Similarly a study done in Ethiopia among on the pastoralists reported less use of modern medication [27].

Majority of respondents in this study agreed that treatment was offered for free, and stopping treatment would be better done under the instruction of a health worker. Effective health education delivery by the MOH and the introduction of Direct Observation Treatment of Tuberculosis (DOT-TB) may have an impact in raising communities' awareness towards TB. In disagreement to this finding, a study done in Nigeria found out that few people knew treatment was provided for free [20].

A higher proportion of the respondents admitted that TB is a very serious disease and anyone can get it. A small portion of the respondents did not know the seriousness of the disease. Regarding the reaction, the majority of the respondents indicated fear towards the disease while the least percentage showed acceptance towards TB. This study had similar findings to a study done in Pakistan [14], Tunisia [18], Vietnam [28], Tajikistan [24] and Ethiopia [27]

Regarding opinion on which group of people are mostly affected by TB, the majority suggested the elderly and children as being highly affected. Opinion on men contracting TB was at the lowest level. Other studies found out, groups of population/individuals such as poor, people living with HIV/AIDS, alcohol consumption and smokers are at high risk of getting TB in Ethiopia [29], in India [30] Vietnam [28] and Tajikistan [24].

Concerning their feeling towards people with TB, stigma was at 55.7%. In this study the community handling of TB patients varies from individual to individual however, the highest number of stigmatized participants expressed a friendly attitude with avoidance of TB patients. Similar studies in Ethiopia [27], Tunisia [18] and Pakistan [14] had considerably higher level of stigma. Majority of the participants in this study would prefer to discuss TB with their health care providers, other important consultations would also involve relatives and close friends. Most of the study participants would visit a health facility in the event of developing symptoms hence a clear indication of health promotion strategy and health seeking behavior. This findings was in line with a community study done in rural Ethiopia [31], but in contradiction with another study done in Gambella, Ethiopia [11].

Less than two percent of the participants would seek medical help when self-treatment fails as compared to study done by Tolossa et al. in which considerable number of participants were in favor of using self-treatment options [9]. On the other hand, half of the participants indicated that they would seek medical help only when the symptoms last 3-4 weeks, and a similar number of the participants would go to a health facility as soon as the symptoms develop. In this study, the participants expressed a wide range of factors which act as a set back towards going to health facilities, the most identified being lack of transport, and other general costs involved, excluding TB treatment. These factors give rise towards hindering the accessibility of the treatment.

Age and educational level were significant determinants of knowledge score on TB. It was observed as educational level increases the knowledge also increases trendy decrease in knowledge scores with increase in age, which is in line with a Nigerian study [32], but a different study done in Nigeria found out knowledge increase as age increases [20] However, direct relationship was observed with educational level. Similarly a study done in Ethiopia Tigray region [29] and Nigeria [32] found out illiteracy was associated with poor knowledge score. Other studies done in Nigeria and Ethiopia found out that females had low level knowledge in comparison to males [11, 32]. Similarly a study done in Ethiopia found out no association between sex and knowledge [16].

Educational level, occupation and number of person living in a house hold were found to be significant determinants of attitude score in this study. The predictors of positive attitude were being at higher level of education and good TB knowledge [20] [32].

Good knowledge of TB was found to be a predictor of both positive attitude and good preventive measures. Age groups, knowledge score and attitude score were found to be significant predictors of practice in this study. In order to exercise an appropriate practice good knowledge and attitude is mandate towards TB. Similarly, a study in Nigeria showed that good knowledge as a predictor of good practice [32].

## Conclusion

The Nakfa subzone community has good awareness towards TB, however, knowledge gap on the mode of transmission was observed. Age and knowledge were the determinants of knowledge score whereas, educational level, occupation and number of person living in a house hold contributed to the attitude score. There was a negative attitude such as fear and stigma which were highly perceived. Overall good knowledge and attitude score were displayed but they were not translated to appropriate practice as expected.

## Abbreviation

ANOVA: Analysis of Variance; PPS (probability proportionate to size)

## Competing interests

The authors have no competing interests.

## Authors' contributions

AYK: Study conception and design of study, acquisition of data, analysis and interpretation of data, drafting and submission of manuscript; BYK and MEG: participated in study design and coordination of the study; EHT: participated in study design, data analysis and write-up. All authors read, critically revised and approved the final manuscript. AYK: is the guarantor of the paper.

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## Availability of data and materials

The complete dataset supporting the conclusions of this article is available from the corresponding author and can be accessed upon a reasonable request.

## Ethics approval and consent to participate

The study protocol for this research project was approved by the Research and Ethical Clearance Committee of the Ministry of Health (reference number 09/02/2021). Furthermore, additional approval was sought from the Nakfa Referral Hospital medical director, Zoba, Sub-zoba and administrative area authorities to conduct the study. Written informed consent was obtained from the study participants or legal representatives after the aim and methods of the study and the affiliations of the researchers was explained in detail. Only competent adult participants who gave their written informed consent were included in the study. The researchers ensured that the study protocol and questionnaire will not cause any harm to the participants. The privacy of participants was insured as all data were collected anonymously. And the confidentiality of the data collected was maintained according to the Ministry of Health protocol, as data was only used for the purpose of the current study. All the participants had the right to withdraw from the study at any point during the data collection time. All methods of the study were carried out in accordance with relevant guidelines and regulations of the research and ethical clearance committee of the Ministry of health.

## Consent for publication

Not applicable.

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