House-hold contact tuberculosis screening adherence and associated factors among tuberculosis patients attending at Health facilities in Gondar town, Northwest, Ethiopia

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Abstract

Abstract Background: Contacts of patients with tuberculosis have a substantial risk of developing the disease. Household contact screening has recently been recommended as a strategy to enhance case detection in high-burden countries but there is no enough information in Gondar Town regarding household contact screening practice among TB patients. Objective: The aim of this study was to assess the magnitude of household contact screening adherence and associated factors among adult tuberculosis patients attending at health facilities in Gondar Town, Northwest Ethiopia. Methods: An institution-based cross-sectional study was conducted from March 1 to 30, 2019 on 404 tuberculosis patients attending at health facilities in Gondar Town. Epi-Info version 7 for data entry and SPSS version 20 for data analysis were used. Descriptive statistics were carried out to illustrate the means, standard deviations, and frequencies of study variables. Bivariable and multivariable logistic regression analyses were used to identify variables having a significant association with the dependent variable. Results: From 412 study populations, 404 participated with 98.06% response rate. The overall household contact TB screening adherence was 47.5% (95% CI: 43.1, 52.5). In the multivariable analysis, certificate and above educational level (AOR=2.83, 95% CI:1.40,5.67), sufficient knowledge on TB (AOR=8.26, 95% CI:4.34,15.71), satisfied patients with delivered health care service (AOR=3.26, 95% CI:1.58,6.76), health education given by health care worker (AOR=2.60, 95% CI:1.54,4.40),and HIV/AIDS co-infection (AOR=3.54, 95% CI:1.70,7.39), were factors associated with household contact TB screening adherence. Conclusion: Compared to other previous studies, the current finding was high but it was low as compared with WHO and Ethiopian
Ministry of Health recommendations (all persons having TB contact should be screened). Educational status, knowledge on TB, satisfaction with delivered health care service, health education given by HCWs about TB and HIV/AIDS co-infection were factors associated with household contact TB screening practice. Thus, strengthening household TB contact screening and educational programs regarding the risk of getting TB infection from household contacts is crucial. Keywords: Contact screening, household, adherence, tuberculosis, Ethiopia

Background

Tuberculosis is an airborne contagious disease mainly caused by Mycobacterium tuberculosis. When TB-infected individuals cough, sneeze and shout tiny particles containing Mycobacterium tuberculosis suspended in air can enter the respiratory system of a nearby healthy person. There are two types of TB named pulmonary and extrapulmonary. Pulmonary tuberculosis occurs when Mycobacterium tuberculosis primarily attacks the lungs. However, it can spread to other organs causing extrapulmonary TB (1-3).

There were an estimated 10.0 million new cases of TB disease (also known as active TB) worldwide in 2017. Even though, tuberculosis is an easily preventable and treatable disease it remains a major cause of morbidity and mortality in many countries and an important public health problem worldwide. TB is one of the top 10 causes of death and the leading cause of a single infectious agent Worldwide with 1,600,000 TB related death in 2017 (3). A study conducted in New Delhi revealed that contacts of pulmonary positive TB patients have significantly higher infection rates as compared to contacts of pulmonary negative TB patients(4).

Ethiopia is one of the 30 high-TB and multidrug resistance TB-burden countries and
TB remains one of the leading causes of death. According to the 2017 World Health Organization (WHO) report, Ethiopia is the 10th from 30th high TB and HIV burden countries with an incidence of all forms of TB 177 per 100,000. Aware of the vast burden of TB in the country, the government of Ethiopia has given due attention to the control of TB and included the prevention and control of TB among the priority health programs in the country’s Health Sector Development Program (HSDP) but not fast enough to achieve 2020 stop TB strategy (5).

Contact of TB patients is a high-risk group for developing TB especially children less than 5 years and people living with HIV are at higher risk (6-8). Household contacts of active TB cases are at high risk of getting TB disease (9, 10). Major challenges to the successful control of TB include timely diagnosis and adequate treatment of infectious active TB (the index case), contact investigation (CI) or screening of persons in close contact with the index case, and treatment of latent tuberculosis infection (LTBI) to prevent its progression to active TB disease(10). These three core elements are the basis of TB control (11). Contact investigation, as one of the core elements, is an important policy in TB control and play an important role in decreasing the incidence of TB in Ethiopia (12).

The magnitude of TB screening adherence in Thailand, Southeast Nigeria, Gambo rural hospital, and urban districts of Amhara region in Ethiopia was 52%, 23.6%, 55.7%, 33.7% respectively (13-16). Regarding the associated factors, marital status, religion, family income, relationship with contact, knowledge, sharing a bedroom and type of TB were significantly associated factors with TB screening adherence. Besides distance from health-care facilities, lack of transport, direct and indirect costs of health care all present barriers to access household contact screening (15-17).
Screening specific risk groups have been part of the Stop TB Strategy since its launch in late 2012, like household contacts (18, 19). Despite, household contact TB screening adherence is an important component to achieve the strategy of stop TB there is no study conducted in Gondar town health facilities regarding household contact screening adherence on TB patients. Few studies conducted in Ethiopia on the magnitude of household contact screening practice and that available literature within the country were limited in numbers of factors that influence household contact screening adherence. Therefore, the aim of this study was to assess the magnitude of household contact screening adherence and associated factors among TB patients attending at health facilities in Gondar Town.

Methods

Study design and period
An institution-based cross-sectional study was conducted from March 1 to 30, 2019.

Study area
The study was conducted in Gondar Town, Northwest Ethiopia. Gondar town is one of the historical towns in Ethiopia. It is found about 737-km away from Addis Ababa. In the town, there is one governmental specialized hospital, eight governmental health centers, one private Hospital, and one private clinic, which delivers anti TB treatment and screening service currently for about 483 patients with TB of those 412 were adults and had household contacts.

Source population
The source population constitutes all adult patients with TB who had household contact and anti-TB treatment follow up at health institutions in Gondar Town.

Study population
All adult patients with TB who had household contact and anti-TB treatment follow up at health facilities found in Gondar town during the specified study period.

**Inclusion criteria**

All adult patients with TB who had household contacts and anti-TB treatment follow up in Gondar town health facilities were included.

**Exclusion criteria**

Adult patients with TB who had household contacts and were critically ill and unable to communicate, patients start treatment at the day of data collection.

**Sample size determination and sampling procedure**

The sample size was determined using a single population proportion formula, taking 33.7% magnitude of household contact screening practice of a study conducted in Amhara Region, Northwest Ethiopia (16) with the following assumptions: 95% CI and 5% margin of error and by adding 10% none response rate the total sample size was 379. The study populations were 412 close to the sample calculated so all the study populations were included in the study.

**Operational definition**

**Household contact:** A person who shared the same enclosed living space for one or more nights with the index case during the 3 months before the commencement of the current treatment episode(16, 20, 21).

**Household contact TB screening adherence:** if the patient brought at least one household contact for TB screening and otherwise not-adherent(16).

**Patient with sufficient knowledge on TB:** a patient who answered greater than or equal to 80% of the given TB related knowledge questions(16).

**HIV AIDS co-infection:** Presence of confirmed HIV/AIDS along with TB (22).

**Waiting time:** time taken to get service after the arrival of health facilities(13).
Patients who were satisfied by the services delivered at health facilities:
Those respondents who scored points ≥ 75% of the given satisfaction related questions otherwise unsatisfied (23, 24).

Index Case: refers to TB patient who is initially diagnosed with infectious TB, and around him, contact investigation for a potentially exposed individual is indicated (21).

Data collection tools and procedures
A pre-tested and structured interviewer-administered questionnaire adapted from previous studies was used. The questionnaire was prepared in the English version and it translated from English to the local language (Amharic); then it re-translated again to the English by a language expert to ensure consistency. The questionnaire had five sections; Socio-demographic characteristics of the patients, practice, Personal and behavioral factors of the patient, Health care system-related factors, Disease and treating conditions associated with the practice. The logbook review was used to collect information about the type of TB, date of diagnosis and HIV/AIDS infection status and the instrument for logbook review was part of the main instrument (questionnaire) indicated by observing. After briefly presenting the study purpose and getting consent from each individual patient, data collectors interviewed the participants.

Data quality assurance:
The quality of the data was assured by pre-testing the questionnaire on 5% of the sample (20 TB patients) in Addis Zemen Hospital and health center prior to the actual study to test the fitness of the questionnaire for the study settings. Training about the data collection tool as well as data collection procedures was given to data collectors and supervisors for a total of two days prior to the data collection
The collected data were checked daily for the completeness and accuracy by supervisors and principal investigator and detailed feedback was provided to the data collectors in the next morning.

**Data processing and analysis:**

After data collection, a questionnaire was checked for completeness and consistency then it was entered to Epi-Info version 7 and then export to the SPSS software version 20 for analysis. Descriptive statistics were carried out to illustrate the means, standard deviations, and frequencies of the demographic profile of the respondents, magnitude of the practice. Tables and figures were used to display the findings. Binary logistic regression analysis was made to identify variables having a significant association with the dependent variable. Then all independent variables with a p-value less than 0.2 in the bivariate analysis were again entered to multivariable logistic regressions to control the effect of confounding. Finally, significant factors were determined based on AOR included in 95% confidence level at P-value less than 0.05. Hosmer and Lemeshow goodness of fit test was used for model fitness.

**Results**

**Socio-demographic characteristics of respondents**

From 412 study participants, 404 participated in the study with 98.06% response rate. Among the participants, 144 (35.6%) were in the age group of 20-29 years, with the mean age of 35.75 years (±14.28 standard deviation). Two hundred twenty-one (54.7%) of the participants were males. Two hundred (49.5%) of the participants were married and majority 386 (95.5%) of the respondents were Amhara by Ethnicity. One hundred thirty-two (32.7%) of respondents were merchant
by occupation. About 122(30.2%) of study participants had a primary school education. From all study participants, 283 (70%) had >=1001 ETB average monthly income. About 210 (52%) of respondents had contact relationship with their son/daughter (Table 1).

**Personal, health care system and disease-related characteristics**

From a total of 404 study participants, 285 (70.5%) had sufficient knowledge about TB. Concerning to causes of TB from 404 study participants 209(51.7%) believed that bacteria cause it and 348(86.1%) of them perceived as TB is transmitted through infectious droplets released from TB patients. The majority of 332(82.2%) of the patients were satisfied with the service delivered at the TB clinic. Two hundred (49.5%) and 152(37.6%) were patients with drug-sensitive Pulmonary Tuberculosis (PTB) and drug-sensitive extrapulmonary tuberculosis (EPTB) respectively. Two hundred forty (59.4%) participants were on a continuation phase of anti TB treatment. Regarding HIV/AIDS co-infection status of the participants, 60(14.9%) of were HIV infected along with TB. (Table 2)

**Household contact TB screening adherence**

In this study, the overall prevalence of household contact screening adherence was 47.5% (95% CI: 43.1, 52.5). The mean number of household contacts of participants was 3.56 with a Standard Deviation of ±2.09 and the mean number of household contacts brought for screening purpose was 2.16 with Standard Deviation of ±1.24.

**Factors associated with household contact TB screening adherence**

In the bivariable logistic regression analysis, household contact-screening adherence was significantly associated with educational status, knowledge on TB, health education given by health care workers about TB, patient satisfaction by delivered service at health facilities, type of tuberculosis and HIV/AIDS co-infection.
However, in multivariable logistic regression, educational status, knowledge on TB, health education is given by health care workers about TB, patient satisfaction by delivered service at health facilities, and HIV/AIDS co-infection were significantly associated with household contact screening practice. Participants who had a certificate and above educational level were nearly three times more likely to practice household contact screening as compared with who were not formally educated (AOR = 2.82, 95% CI: 1.40, 5.67). Patients with sufficient knowledge on TB were eight times (AOR = 8.26, 95%CI: 4.34, 15.72) more likely to practice household contact screening as compared with who had insufficient knowledge. Participants who were satisfied by delivered health care services were three times (AOR = 3.26, 95% CI: 1.58, 6.76) more likely to practice household contact screening as compared to patients who were not satisfied. Patients who took health education from HCWs were nearly three times (AOR = 2.60, 95% CI: 1.54, 4.40) more likely to practice household contact screening as compared to patients who did not take health education. Patients who had HIV/AIDS co-infection were 3.5 times (AOR = 3.54, 95% CI: 1.70, 7.39) more likely to practice household contact screening as compared to patients who had no HIV/AIDS co-infection (Table 3).

Discussion

The overall household contact screening practice was 47.5%(95% CI:42.2,52.2). It was in line with the practice level reported in Bangkok, Thailand: 52% (13). This finding has exceeded the findings of Enugu and Ebonyi States, Southeast Nigeria, another study conducted in Southeast Nigeria and in Amhara region (20%, 23.6%, and 33.7%) respectively (14, 16, 25). The possible explanations could be differences
in socio-cultural status of the index cases and health policy and health care system
in the countries as well in study settings. In contrast, it was lower compared to a
study done from Gambo Rural Hospital, Ethiopia showed that 55.7% of the index
cases brought at least one household contact for screening (15). This difference
might be due to the study design and source of information differences for the
studies. The previous study that was done from Gambo Rural Hospital was done by
logbook review so there might be over completion and reporting.
Educational status of respondents was significantly associated with household
contact screening practice. Tuberculosis patients who had a certificate and above
level of education were nearly three times more likely to practice household contact
screening as compared to who had no formal education. This might be due to
educated individuals read and listen to routine distributed information on TB
through different media and easily understand risks for TB transmission and the
benefits of contact investigation (16).
In this study, Knowledge of participants about TB and its' treatment were found to
be the factor for household contact tuberculosis screening practice. Thus, patients
who had sufficient knowledge of tuberculosis were eight times more likely to
practice household contact screening as compared to who had insufficient
knowledge about TB. The Comparable finding was obtained from a study conducted
in Amhara region, Northern Ethiopia two times more likely (16). And in Bangkok,
Thailand five times more likely to practice household contact tuberculosis screening
as compared with who had no sufficient knowledge (13). It was also consistent
within Enugu, Southeast Nigeria revealed that knowledge about contact tracing has
significant association on household contact screening practice (26).
Participants who had sufficient knowledge had a good understanding of the risks of
household contact for tuberculosis and the benefit of bringing household contact to TB screening among tuberculosis patients might contribute to their practice. In this study, patient satisfaction by delivered health care service at health facilities plays a crucial role to practice household contact screening. Patients who satisfied by delivered health care service were three times more likely to practice household contact screening as compared to patients who were not satisfied. This might be because health care service satisfaction at health facilities might increase healthcare-seeking behavior among TB patients.

Health education by HCWs was significantly associated with household contact TB screening adherence, as patients who took health education, were three times more likely to adhere to household contact screening. A similar study conducted in Vietnam showed that majority of the patients went for screening as a result of instructions provided to the health education (27). This finding was also shown in another study done in Southeast Nigeria (26). This finding was also consistent with a study conducted in Northern Ethiopia revealed that awareness creation about contact tracing has a significant association with household contact screening adherence(16). This might be due to health education about TB at health facilities that focus on signs and symptoms of TB, the advantage of early screening and TB infection prevention techniques so those awareness creation activities might increases household contact TB screening practice among TB patients.

In the present study, the household contact TB screening adherence among HIV infected participants was nearly four times more likely to practice household contact TB screening as compared with no-infected participants. This might be due to HIV infected patients have regular visits to a health facility for antiretroviral therapy follow up. This implies that when patients came to health facilities
frequently, their awareness about household contact screening practice also increased.

Limitations of the study

In this study there might be social desirability bias from participants towards which they assumed good response even though; we tried to overcome by select data collectors from health professionals working outside the TB clinic.

Conclusion

The overall household contact TB screening practice was 47.5% (95% CI: 43.1, 52.5). As compared to other previous studies findings, household contact screening practice among tuberculosis patients attending in Gondar Town health facilities was high but it was low as compared with WHO and Ethiopian Ministry of Health recommendations. Educational status, knowledge on TB, satisfaction with delivered health care service, health education given by HCWs about TB and HIV/AIDS co-infection were factors associated with household contact TB screening practice. Therefore, strengthening household TB contact screening and educational programs regarding the risk of getting TB infection from household contacts is mandatory.

List of Abbreviations

AOR: Adjusted Odds Ratio, CI: Confidence Interval, COR: Crude Odds Ratio, EPT: Extrapulmonary Tuberculosis, HCW: Health Care Worker, HIV: Human Immune Deficiency Virus, HIV/AIDS: Human Immune Deficiency Virus/ Acquired Immuno-deficiency syndrome, HSDP: Health Sector Development Program, MDR-TB: Multidrug Resistance Tuberculosis, OR: Odds Ratio, PTB: Pulmonary Tuberculosis, SD: Standard Deviation, SPSS: Statistical Package for Social Sciences, TB: Tuberculosis,
WHO: World Health Organization.

Declarations

**Ethical approval and consent to participate:**

The ethical clearance was obtained from the ethical review committee of the School of nursing on behalf of the University of Gondar. An official letter was obtained from the School of nursing and was communicated to the selected health facilities in Gondar Town. The participants were asked to involve in the study voluntarily and they had a right to withdraw at any time from the study without any consideration. The data were collected only after they gave their verbal consent to participate. The Interview was performed at a suitable and secure place for respondents. To protect the privacy of participants, they were guaranteed for confidentiality and they were assured that identifying information would not be made available to anyone who is not directly involved.

**Availability of Data and Materials**

The raw data would not be provided for the reason of protecting patients’ confidentiality. But, the summary data are available in the main document

**Competing interest**

The authors declare that they have no competing interest.

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**Authors’ contributions**

**DAS** designed the study, developed the proposal, participated in the data collection,
performed analysis, and drafted the manuscript. HSM and ATA approved the proposal with revisions, participated in data analysis and revised subsequent drafts of the manuscript. All authors read and approved the final manuscript.

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Tables

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