



## INTERVENTION TO INCREASE TUBERCULOSIS CASE DETECTION THROUGH COMMUNITY ENGAGEMENT AND CONTACT SCREENING IN SINDH PAKISTAN.

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### Abstract

**Background:** The escalating risk of Tuberculosis (TB) transmission among household contacts necessitates a comprehensive analysis of Multidrug-Resistant (MDR) and Drug-Susceptible (DS) TB cases through early screening and intervention. This cross-sectional survey-based study, conducted in the Larkana district of Sindh, Pakistan, from January to August 2021, aimed to assess and address the prevalence of MDR and DS-TB among household contacts.

**Methods:** Verbal screening was the initial step, involving the collection of information such as symptoms, age, gender, and relation to the index case. Individuals identified through verbal screening underwent further testing, including molecular testing using GeneXpert and smear testing. The study population comprised 830 household contacts, with 100 associated with MDR-TB and 370 with DS-TB.

**Results:** Among the 830 household contacts, 92% of cases were confirmed as DS-TB, while 7% were identified as MDR-TB. Cough emerged as the predominant symptom, constituting 51% of MDR-TB and 54% of DS-TB cases. All confirmed cases were recommended for treatment, and preventive awareness sessions were conducted by health professionals. The study, while limited by the reliance on verbal screening data, represents a significant contribution to the evidence base for screening household contacts of TB in the Sindh province of Pakistan.

**Conclusion:** The findings underscore the urgency of early detection and intervention in household contacts to mitigate the spread of TB, particularly MDR-TB. Despite the limitations of verbal screening, the study emphasizes the importance of targeted screening programs and preventative measures. This research contributes valuable insights to the ongoing efforts to manage TB in the Sindh province, highlighting the need for comprehensive strategies to address both DS and MDR-TB cases within household settings.

### 1. Introduction

Tuberculosis (TB) is considering a worldwide huge health issue that is caused by bacteria named "Mycobacterium tuberculosis (Talwar et al, 2019). These bacteria infected the lungs of humans despite this the TB bacteria infected any parts of the entire body like they infect the spine, brain, and kidney, etc. (Deutsch-Feldman et al, 2021). This is not necessary that the persons which are infected by TB became sick and show symptoms but the two TB condition may become fatal if it is not properly treated at a time that are TB disease and latent Tb infection (LTBI) (Koesoemadinata et al, 2017).

The (DS-TB) drug-sensitive patients are those individuals that are confirmed susceptible against all first-line anti-Tb drugs. For example, RMP, Streptomycin-SM, and Ethambutol-EMB, etc. It is a condition in which a TB infected person gives no good response to drug therapy they are sensitive to TB drugs (De Schacht et al, 2019).

Multi-drug-resistant TB (MDR-TB) is caused by a bacterial infection in which the infected person became resistant towards the TB drugs that are considered the most potent medicine for cure TB includes Rifampin and isoniazid (Balabanova et al, 2017). These two powerful effective medicines are highly used to cure TB infection in patients in order to save their lives undergo in the lethal condition (Cox et al, 2020).

From the entire world population, there is half of the MDR-TB patients are cure successfully through treatment this treatment procedure is very lengthy and stressful to the patients due to its heavy doses of pills approximately 14.000 along with injection on regular basis (Kibret et al, 2017). Both TB types the multi-drug resistant and drug-sensitive screening done through molecular testing as well as standard culture test through sputum.

For simple detect the TB infection in the individual done sputum culture test for Tb this test considers appropriate to find out the positive and negative outcomes of TB disease through sputum culture (Schumacher et al, 2019). In this test, sputum adds in a substrate that helps enhance the cultural growth of Tb bacteria. In this case, no cultural growth observes so the result considers negative and vice versa.

In molecular testing, rapid diagnostics tests called GeneXpert MTB/RIF assay are widely used to detect TB infection and the MDR or DS patient of TB. This advanced molecular testing helps to detect (MTBC) Mycobacterium tuberculosis complex and (RIF) rifampin resistance within two hours as compared to convention smear testing which gives results six weeks for MTBC culture growth and additionally requires three more weeks to detect the drug resistance (Opota et al, 2019). Both types the drug-sensitive and multiple drugs resistant diseases are communicable that are spread in the same way. TB patients spread infection via coughing, sneezing which is present in the throat and lungs of the patient (Fox et al, 2017). These bacteria stay in the air for several hours and get in contacted with surrounding persons. So based on this contacting issue several studies done in order to estimate the contact infected ratio of the TB-DS and TB-MDR patients and give awareness about spreading of disease through conducting health awareness session program, it is very necessary and important thing to control over any disease in the society (Hansadah & Sonalika 2018).

## **2. Literature review**

In this current situation of TB spreading the global Tb control system mainly focus on the prevention of this drug-sensitive (DS-TB) and multiple drug resistance (MDR-TB) in order to limit the contact spreading of the disease in the region across the world after observation the significant increasing rate in the toxicity, cost, and low-grade treatment results. To overcome the disease spreading researchers have done different strategies to decrease the rate of transmission of the MDR/DS. (Fox et al, 2017). For this purpose, in this research, we did a literature review of past done experiments outcomes to analyze and evaluate the contact rate of speeding TB of the MDR/DS patients.

Through rapid molecular testing and culture testing, we detect the contact ratio of MDR and DS TB patients (Shi et al, 2020). On correct time diagnosis, we control over the increasing ratio of this lethal disease.

A research study conducts in Peshawar city, Pakistan. In this research, the screening procedure was done for analysis of the outcomes of household contacts of multidrug-resistant tuberculosis patients. In this study cross-sectional method was used to conduct this design research in order to find out the close contact of the MDR-TB patient. In the methodology, they utilized several clinical diagnostic methods includes bacteriological (culture test) and radiological (x-ray) was utilized to perform screening and analysis of the final outcomes (Javaid et al, 2016). In the last concludes that

significant increasing ratio of MDR-TB between close contact surroundings and focus the requirement of the screening process for contact cases which help to break the flow chain of this lethal disease transmission.

Another research is done to investigate the contact screening and risk factor analysis in the TB patients among contact children in their surroundings (households). The main aim of this study conduct is to find out the new TB cases among children who contact with the TB patient in homes in order to decrease the transmission ratio of the disease in the community. With help of this study health sector easily evaluates the risk factors in the individual in which the TB infection is in the developing stage (children) and success to overcome the secondary TB cases in HHC (household contacts) (Laghari et al, 2019).

The cross-sectional study was done in this research there are 508 children and 443 caretakers include in a questionnaire interview session. And for analysis of the risk factors in TB patients the Logistic regression analysis is utilized. In this research, there is only 9.3% from the all household contacts (children) were tested for TB. In last they mention the requirement of the new strategies for evaluating the confirmed contact screening among children and also the risk factors which spread Tb disease.

Multidrug-resistance tuberculosis (MDR-TB) cases and their contacts with surrounding analysis were conducted in the research study to evaluate the confirmed development of high-risk TB disease enhancement. For this purpose, in this study run a cross-sectional study among eight countries that possess great Tb burdens in the population of adult MDR-TB and their HHCs. In this study screening was done on the household contacts by several clinical testing methods includes a chest x-ray, (IGRA) interferon-gamma testing, and tuberculin skin test (TST) (Gupta et al, 2020). After analyzing the outcomes of the screening find out the in these high burden countries the major portion of the HHC is highly susceptible to TB infection. Finally, they recommended preventive drug therapy and new policy and regulation for the treatment of TB.

Another study was done in Pakistan through verbal screening with HHC (household contacts) of the MDR-TB (multiple drug resistance tuberculosis) patients. The main aim of this study is to evaluate the risk of spreading infection among contacts based on symptomatic or vulnerable peoples of the surroundings should be tested and go to the early therapy. This study was conducted in Pakistan three great loads of TB regions in the time period from July 2013 to June 2014. In this study, an MDR-TB index patient design in which the information is recorded according to the list of household contact members. The information includes any symptoms of TB they have like coughing sneezing, fever, loss of weight, and sweating while sleeping mostly at night time (Qadeer et al, 2017).

Based on this “facility-based verbal screening” evaluate symptomatic contacts with TB infection and give named presumptive TB cases and invited them to proper clinical screening procedures in the nearest healthcare setting. This study is helpful in the high load infected TB regions of Pakistan which have very low resources in health care settings.

To control over the disease the community awareness program also plays crucial role to prevent disease and improvement the health of the public. It is a very effective way to stop the spreading of TB in the society. Community members aid by contributing their act as a good responsible citizen. the health care professional through camping done awareness program communicate with everyone share knowledge about health-related concern, use kind language to educate them (Hansadah & Sonalika 2018).

On the basis of all the above research analysis findings, we conclude that the transmission of tuberculosis from MDR/DS-TB patients is rapidly increasing on regular basis worldwide especially those close contact peoples who present in the surroundings of that patient are most suspected to expose first from the infection. So, in order to reduce this increased proportion of the cases in Sindh we design this research study to find out the actual suspected number of the HHCs and suggest developing new strategies to control it along with give awareness in the community through conduct health awareness program.

### **3. Material and methods**

In this research paper, these are the following materials and methods are utilized for conducting the design study.

#### **3.1. Study Design and setting**

A cross-sectional facilitated-based study design for household's contacts screening of the DS and MDR-TB patients. This research study was conducted in the time period from January 2021 to August 2021 from the Sindh province health care settings of Pakistan.

According to world health development indicators in terms of civilization, weather, infrastructure, landscape, and culture Pakistan consider one of the more diverse country among worldwide. In the year 2011, the Pakistan population estimated below the national poverty lines recoded is 29.5% from the total 178 million pollutions of Pakistan (World Bank Publications. (2013).

#### **3.2. MDR/DS -TB contact tracing**

In the year 2013, in Pakistan, the NTP initiate the tracing program to figure out the MDR-TB patient's close households contacts across the three high-loaded infection sites includes Karachi, Murree, and Lahore (Qadeer et al, 2017).

Based on this study in this research study we design the MDR/DS-TB index, patients. In which all information's are listed which is required for this research includes the name of the index cases in which 103MDR/DS-TB cases were recorded, type of index (MDR/DS), area/village name/location/address where they belong, contact information, number of household contacts from age 1-13 years and 14- above, number of close family members which give samples (sputum) for screening and confirmed outcomes of MDR/DS testing.

Through the trained research assistant first verbal screening was done through a structured questionnaire of the close household's contacts of the MDR/DS-TB patients. In this data includes individual contacts names with age and sex and diagnosis for DS and MDR-Tb index. Any household contacts have any productive symptoms of TB like fever, sweating, coughing and loss of weight also recorded in the index. If any person faces any symptoms so another Column is present for noted the onset of this symptom, type of sample specimen given by the contacts, and result of screening column also present in the index. According to the index list, we physically investigate all close contact of the MDR/DS-TB patient in which those are exposed symptomatic selected for further clinical diagnostic testing (which includes the standard smear microscopy, Xray and rapid diagnostic GeneXpert molecular testing). And we also visited the home for screening purposes of those who are unable to visit the health care setting for testing.

#### **3.3. Study population**

The study population of this designs research was the close household contacts of the multiple drug resistance MDR and Drug sensitive DS tuberculosis patients selected for screening from January 2021 to August 2021 in the Sindh province of Pakistan.

#### **3.4. Data collection**

There are 830 TB patients are registered for conducting this cross-sectional study across different sites of the Sindh province of Pakistan between January 2021- 31 August 2021. The close household suspected TB patients were identified through questioner index which pattern is discussed above then further go towards the clinical testing for TB screening. The diagnostic test performs under the health care setting on the sample were collected from the close household's contacts of the MFDR/DC-TB patients after taking the informed consent. These all obtained data gathered in the electronic digital device of the health care setting by the trained research assistant.

In this research study, the data gathered further clean and authenticate by using EPI-data entry software. The following variables were inserted in the software Sex, age, screening, symptoms, status of TB index, test findings.

### 3.5. Community awareness program

In order to prevent spreading the TB in the Sindh district of Pakistan the health care professional team run a camping through which they educate the members of the community how they successfully control over this lethal disease and secure their family as well as surroundings. for accomplish this an awareness session conducted for all MDR and DS-TB patients cases include in this study.

### 3.6. Statistical analysis

For data statistical analysis to analyze the number of close contacts which are screened, and find out the symptomatic and non-symptomatic contacts and for detected the MDR and DS-TB patient among patients in this research cross-tabulation method and descriptive statistics are utilized. Separately screened done on the close contacts for children and adults (less than fifteen years).

## 4. Results

From January 2021- 31 August, 2021a total number of 830 household contacts of 256 MDR-TB cases and 574 DS-TB contacts were identified through verbally investigating session of screening from Sindh district Larkano. Among household contacts, the MDR contacts are identified according to age 29% of <5 years, 31% of 6-13 years, and 40% of 14 & above. Despite this in DS contacts 4% of <5

years, 35% of 6-13 years, and 61% of 14 & above. 40% of MDR-TB and 60% of DS-TB household contacts observed history of TB. 52% and 62% of MDR-DS TB household contacts shoed symptoms respectively. In both MDR and DS-TB household contacts cough consider the most dominant signs are 51% and 54% respectively as shown in Table1.

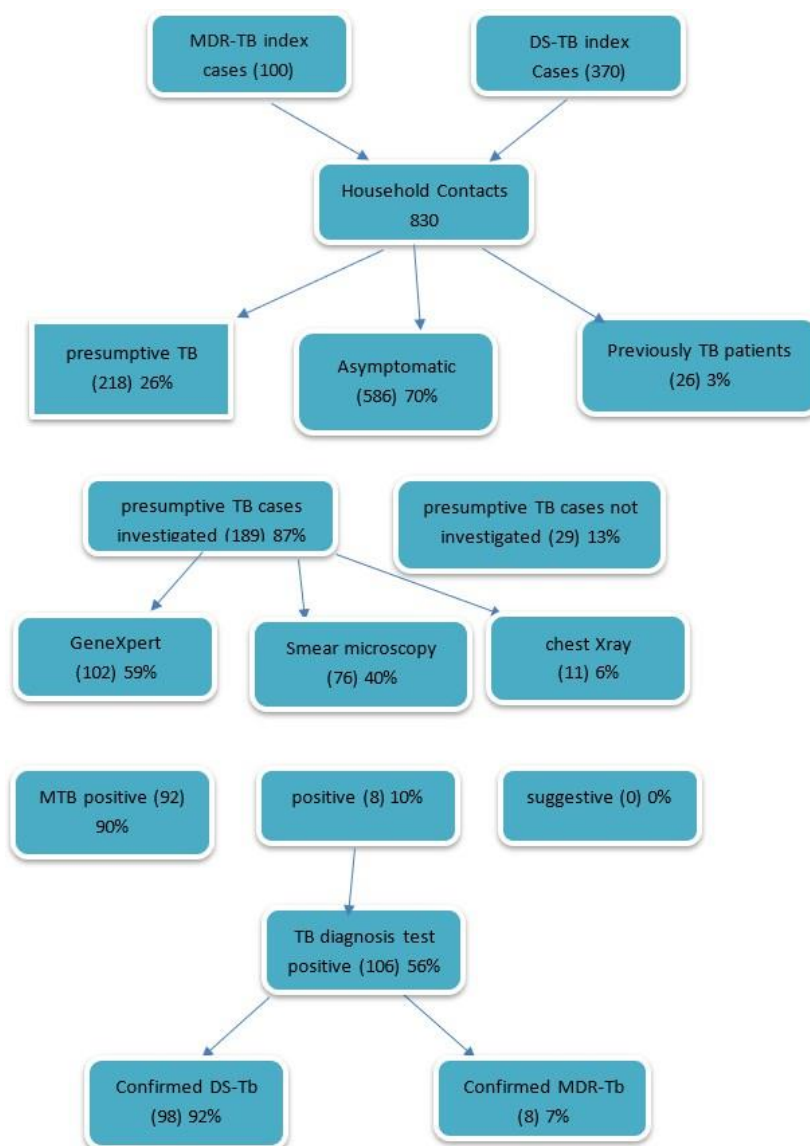
**Table 1 The clinical characteristics and demographics of DS and MDR-Tb household contacts in the Larkana region of the Sindh site of Pakistan.**

Characteristics		MDR-TB household contacts (256)		DS-TB household contacts (574)	
		n	%	n	%
Age	(<5years)	74	29%	21	4%
	(6-13years)	80	31%	201	35%
	(14 and above)	102	40%	352	61%
Sex	Female 436	130	51%	322	56%
	Male 394	126	49%	252	44%
History of TB	Yes	102	40%	348	60%
	No	154	60%	226	39%
symptoms	Yes	134	52%	357	62%
	No	122	48%	217	38%
Sign and symptoms	Fever	56	22%	146	25%
	wight loss	58	23%	90	16%
	Cough	130	51%	311	54%
	Sweating	12	5%	27	5%

**One patient has more than one sign and symptoms**

**Fig.1** In this figure screening procedure is described in a flowing manner among MDR and DS-Tb patient household contacts. most of the symptomatic patients refused for screening. The total number of MDR-TB contacts is 100 and DS-TB is 370 selected for screening with their 830 household contacts. from these 830 contacts, 70% are Asymptomatic, 26% are presumptive TB and 3% are already have TB. from 26% of presumptive TB the 87% are investigated and 13% are not investigated. from the total 87% of investigated presumptive TB cases on 59% GeneXpert test done,

40% smear microscopy through sputum samples, and only 6% go for chest Xray in which 90% MTB positive, 10% smear-positive, and 0% suggestive estimated respectively. so, from the total 56% of positive diagnostic tests, 92% of DS and 7% of MDR patients confirmed.



**Fig. 1 DS and MDR TB patients were identified among household contacts in the Larkana district of Sindh Pakistan 2021.**

**Table.2** shows the proportion of MDR and Ds-TB household contacts according to age. the number of confirmed MDR and DS-TB cases suggested for treatment and also selected for clinal awareness program for TB.

Characteristics	Household screen	Presumptive Tb DS/MDR	Test done DS/MDR	ConfirmDr cases	Confir DS cases	Suggest for treatment	Selected for clinal awareness
Age	830	(<5years)	24/ 15	22/12	2	All confirmed cases	All confirmed cases
		(6-13years)	40/ 180	38/ 175	3		
		(14 and above)	51/ 290	45/ 42	2		

The above table shows that the total number of DS and MDR on which test was performed to diagnosed confirm cases according to age that is in MDR 2 in <5 years, 6 in 6-13 years and 2 in 14

& above and in DS 20 in <5 years, 35 in 6-13 years and 43 in 14 & above.

There is 3334 total number of participants attended TB health awareness session from all cases that was confirmed in MDR and DS-TB. through this successfully session we also get case detection rate.

## 5. Discussion

This is the first study done in the Larkana district of Sindh, Pakistan in which research was done for investigating household contacts of MDR (multi-drug resistant) and DS (drug-susceptible) of TB patients. In this research first, we have done verbal screening through questioner via trained research assistants and take useful information that is required for this research work. include age, sex symptoms, etc. after verbal investigation further research proceeds through diagnostic testing like smear testing and molecular testing GeneXpert.

Based on demographics we estimated household contacts among Ds and MDR -TB patients we found active TB Cases age-wise that were 14 and above 40%, 6-13 years 31% and in <5 31% observed. adults showed the highest number of households contact active cases among all age groups of DS and MDR-TB patients' group. These findings consider helpful as epidemiological evidence for diagnosis purposes.

The number of cases finds out in children also consider important because it is a worrying situation for the government about suspected TB children in the district's areas of Sindh. among all age groups, the cough is estimated highest sign in these active cases.

In this study, we used a facility-based verbal screening strategy to approach household contacts of TB patients. After verbal selection through molecular and smear testing, we have done a screening of 100 MDR and 370 DS-TB patients with their 830 household contacts. from the total 87% of investigated presumptive TB cases screening test, the highest results showed by GeneXpert 90% MTB positive and smear testing showed 10% positive results. Based on these results we measured 7% MDR and 92% DS confirmed cases.

All confirmed cases of DS and MDR-TB household contacts are suggested for treatment after analysis and also select for the awareness program. in the awareness session, the health care expert gives preventive measures to the family to how you prevent transmission the TB infection in households in which includes, the house should be ventilated. if any person has a cough, fever and other symptoms so should go for screening and start treatment, wearing a mask, avoid face to face contacts, etc. along with research in this health awareness session also conduct in the community (Sindh, Larkana district). and get successful results to find cases.

This research work was very useful had many strong points in which include it gives evidence of rapidly increasing the transmission of disease among households in the Sindh district of Pakistan and through camping of health awareness program it also educate community peoples to live disease free healthy lives despite this study also have several limitations like in the study those data were not included which person did not fill the consent form, through verbal screening first not significantly figure out the whole household members especially children's and some are refused for screening also missed in the data.

## 6. Conclusion

In this research study was done screening the MDR (Multi Drug-resistant) and DS (drug-sensitive) TB patients household contacts with active symptoms. For this purpose, in this cross-sectional study was done on Sindh district Larkana, Pakistan from January 2021-31 August 2021. The total number of 830 household contacts is estimated for screening. First through verbal screening data was collected with the help of a design questioner form based on them further testing was perform for diagnosed TB in which smear testing and GeneXpert was included. Based on the results the confirmed cases suggested treatment and also give awareness sessions through health care workers to prevent transmission of disease among households. There was a limitation observed in a verbal screening where some households refuse to full fill the consent form despite this limitation this

study has importance as evidence for conducting household contacts investigation among DS and MDR-TB cases of Sindh district Larkana Pakistan. this study also indicated that the children who lived with TB patients possess a high risk for contact with the disease. based on this finding's government give priority to give efforts to cure and stop TB.

## 7. Recommendations

Based on the analysis, conclusion and discussion, there are several recommendations which have been developed in this study. These recommendations are provided below:

- It is recommended that the NTB should be increase the contact tracing with proper monitoring at grass root level.
- It is recommended that the lady health worker should be well aware of the disease and their protocols. This is due to the reason that lady health worker has an important role in providing the basics and awareness about TB .
- The reason that lady health worker has a substantial character and role providing health promotion and support in community as well as they can play a meaningful positive role between health care provider and community for awareness raising, referral support for contact tracing and also, we should engage them as a surveillance tool at ground level
- The research results proposed is anticipated to perform a justified and significant role in enhancing the skills and knowledge of TB staff in the region with respect to proper protocols and advancement of TB detection and treatment
- According to results the health care professionals and policy makers should review and to think up more initiative to address this issue in rural area and all over region with integration of PTP and NTP.
- Additionally, it is also recommended that travelers should pay a visit to doctors so that they may stay safe from TB. This is due to the purpose that they might be infected and may bring disease along them. This will also help them to stay updated regarding the health and safety.

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