



**ASSESSMENT OF KNOWLEDGE, ATTITUDE, AND PRACTICES (KAP) TOWARDS
TUBERCULOSIS IN POPULATION OF VALSAD DISTRICT, GUJARAT: A CROSS-
SECTIONAL SURVEY**

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ABSTRACT

Tuberculosis is preventable and curable disease perhaps its burden remains enormous in India as well as globally. A knowledge, attitude, and practices based cross-sectional survey had been conducted in population of rural and urban area of Valsad district of Gujarat considering sample size of 100 subjects from each area to create awareness regarding prevention, control, and management of tuberculosis and to determine comparative analysis of knowledge, attitude, and practice between population of rural area and urban area where rural area defined as area which comes under gram panchayat while urban area defined area which comes under municipal corporation of Valsad district, Gujarat, India. The KAP cross-sectional survey had been conducted with consideration E6 ICH Good Clinical Practices and study report prepared considering E3 ICH Clinical study report. 43% male, 57% female of rural population and 37% male, 63% female of the urban population considering eligibility criteria were included in the cross-sectional survey. The mean age of the rural population was found out to be 33.5 years while in the urban area mean age found out to be 30.7 years. 33% HSC passed and 38% Graduate population have been found out of 100 subjects included in the rural setting while 21% HSC passed and 46% Graduate population have been found out of 100 subjects included in the urban setting.

KEYWORDS: Tuberculosis, Prospective, Multi-centre, Observational, KAP, Cross-Sectional Survey Study, and Valsad district, Gujarat, India.

1. INTRODUCTION

Tuberculosis is a communicable diseases caused by bacterium known as Mycobacterium tuberculosis and it spreads from one person suffering from tuberculosis to another person through air media. Tuberculosis has two stages: **Latent TB** - the bacteria remain in the body in an inactive state and cause no symptoms and are not contagious, but they can become active. **Active TB** - The bacteria do cause symptoms and can be transmitted to others.^[1] United Nation estimated **1350.70 million**, India has reached its population as of 12th April, 2018 while in 2016 India has a population size of **1324.20 million**.^[2] A giant health insurance company ICICI Lombard has mentioned tuberculosis in its Aug 06, 2013 report "Top 10 killer diseases in India" and given 3rd rank to tuberculosis and said it causes about 10.1 % of death in our country India.^[3] The WHO has also given statistical count in 2016 for tuberculosis population suffering in India which says it crossed figure of 2.79 million cases

which includes HIV+TB, while 147000 of MDR Tuberculosis incidences, 423000 are mortality excludes HIV+TB, and 12,000 mortality HIV+TB has been reported.^[4] Department of health & family welfare under ministry of health & family welfare are running a major programme known as Revised National Tuberculosis Control Programme (RNTCP) launched in 1997, which applies the principle of DOTS as treatment of tuberculosis for its control and management in population suffering from tuberculosis in India and expanded across the country in a phased number which was achieved in March 2006.^[5] In the report given by TB statistics India for Gujarat, population its **65,600,000** covered by RNTCP programme, **89293** tuberculosis patients were notified from public sector, **37372** tuberculosis patients notified from private sector, **3561** Pediatric tuberculosis cases, **64134** new patients, **25159** previously treated patients, **126665** total of tuberculosis patients notified, **122865** notified tuberculosis cases with

known HIV status, and 3686 number of tuberculosis patients known to be HIV positive.^[4] All this data indicates India has huge tuberculosis burden of both Tuberculosis and Multi-drug-resistant tuberculosis. It is said to be only 10% of tuberculosis infection progress to active tuberculosis disease while 90% have latent tuberculosis infection and may have no symptoms of it.^[6] Multi-drug-resistant tuberculosis is caused by strains of the tuberculosis bacteria resistant to the two most effective anti-tuberculosis drugs available - isoniazid and rifampicin. MDR TB can only be diagnosed in a specialized laboratory.^[5] Factors which increases the risk of tuberculosis include are: (A) **Patient-related** – Age, First generation immigrants from high-prevalence countries, Close contacts of patients with smear-positive pulmonary TB, Overcoming dormitories like prisons, Homelessness, Chest radiographic evidence of self-healed TB, Smoking cigarettes and bidis. (B) **Associated disease** - Lymphoma, Leukemia, Immunosuppression drugs like anti-TNF therapy, high dose corticosteroids, cytotoxic agents, Type 1 diabetes mellitus, Chronic renal failure, Deficiency of Vitamin D or A.^[7] The common symptoms of tuberculosis include are: cough last longer than 3-4 weeks or more, sometimes with blood-streaked sputum, fever majorly seen during nights, loss in weight, and poor appetite.^[8] Little is known about the knowledge, attitude and practices of communities towards tuberculosis in the current study area and for the RNTCP programme to be a success, it is important that the basic and correct knowledge of the disease and the availability of the treatment should exist in the any community. It is equally important to assess the existence of any incorrect practices regarding TB in the community. Hence I planned to conduct this study to assess the knowledge, attitude, and practice (KAP) regarding TB among the population in Valsad district of Gujarat, India.” KAP survey is a representative study of a specific population to collect information on what is known, believed and done in relation to a particular topic – in this case, Tuberculosis. In most KAP surveys, data are collected orally by an interviewer using a structured, standard questionnaire. These data then can be analyzed quantitatively or qualitatively depending on the objectives and design of the study.^[9] A KAP survey can be designed specifically to gather information about TB-related topics, but it may also include questions about general health practices and beliefs.^[6]

2. MATERIALS AND METHODS

Study Methodology

2.1 Study Design^[10]

The study was prospective, observational in nature conducted in multi-centre area of rural as well as urban cities of Valsad district and subject or participant are included from the time the start of study is decided January 2018. till March 2018.

2.2 Study Area

The study area was Valsad district of Gujarat, India.

2.3 Study Subject

The study subject includes population from villages in rural areas as well as cities in urban areas of Valsad district of Gujarat where complete awareness regarding prevention, control, and management of tuberculosis is might not available among the population.

2.4 Sample Size

Approximately 200 Subjects (100 Subjects from rural areas & 100 Subjects from urban cities of Valsad district of Gujarat, India).

2.5 Study Eligibility

2.5.1 Inclusion Criteria

- Human subject between 18-70 years.
- A subject should be either able to read and write with understanding or should be willing to give at least a thumb impression in the declaration of not possessing basic schooling study hence complete the questionnaire with the assistance provided by the research scholar/family member / partial witness.

2.5.2 Exclusion Criteria

- Subject to mental illness which can affect their understanding or judgment.
- Subject to vision impairment.

2.6 Study Procedure / Conduct of Study^[11]

2.6.1 Pre Study Plan

- The cross-sectional survey study was conducted in rural villages & urban cities of Valsad district of Gujarat, India.
- The study started after the permission Sangini Hospital Ethics Committee of Gujarat, India.
- Approximately 200 subjects (100 Subjects from rural areas & 100 Subjects from urban cities) were included with the consideration of inclusion and exclusion criteria into the study.

2.6.2 During the study

- All subjects were introduced regarding the research programme and importance of participation in it.
- A written informed consent form was obtained from the subjects prior to enrolling them in the research programme.
- Subjects were asked regarding their basic information details to fill the Part II: Demographics into CRF form.
- Then all subjects were approached first to fill the Part III: Questionnaire form into CRF cum Questionnaire form to evaluate their knowledge, attitude, and practices towards tuberculosis.
- Then complete details have been provided to them orally regarding prevention, control, and management of tuberculosis.
- Also Part IV: Feedback form into CRF had been asked the subject's to fill so to enhance the level of the programme in future perspectives.

2.6.3 After the study

- All the collected data in CRF were recorded into the Ms excel by manual data entry process.
- Further by using filter function and other tools statistical analysis had done.
- Result and Conclusion drawn from data obtained by using Ms excel and tools were available online.

2.7 Study Duration

From January 2018 to March 2018 the investigation had taken place as the timeframe set for this study is final IV semester of M.Pharm as defined by the Gujarat Technological University, Ahmedabad, Gujarat.

2.8 Sample Size Calculation

The required sample size for this cross-sectional survey study is calculated using the formula required for determination of sample size for estimating single proportion. Based on the assumption that 50% of the study participants had the high level of knowledge of TB and with additional assumption of 95% exact confidence interval, 8% margin of error and 10% non-respondent rate in our estimate, a total sample of **178** will be needed.

2.9 Ethical Approval^[10]

- Ethical approval is taken from Independent Ethics Committee of Gujarat. The protocol, synopsis, informed consent form, case report form cum questionnaire form and other study related documents had been submitted to the ethics committee and written approval have obtained and submitted to college prior to initiation of research.
- The research scholar had not made any changes in the research study without any prior ethics committee approval.

2.10 Method For Data Collection:^[12]

The following tools would have used for data collection

a) Demographics

The Part II Demographics in the CRF were included name of subject, gender, age, address, contact details includes mobile number, date of birth as per identity proof, marital status, education detail, occupation detail, duration of residing in present address, distance of government clinic from their village and history of tuberculosis.

b) Questionnaire Form

The Part III Questionnaire form in the CRF includes below-mentioned sections:

- **Health-seeking behavior/Practice of rural population towards tuberculosis.**
- **TB Knowledge and awareness among the rural population of villages.**
- **TB attitudes and care-seeking behavior of rural population towards tuberculosis.**
- **TB attitudes and stigma.**

2.11 Quality Standard

The study followed ICH standards for cross-sectional survey research including ICH-E6 (GCP) and ICH-E3 (Study Reporting) standards for the conduct of the study. Quality assurance for the data and conduct of the study was primarily the responsibility of Research Scholar. The institute will ensure that the study complies with the norms of Good Clinical Practice.

2.12 Data Analysis

Statistical analysis performed with the help of descriptive data analysis that is mean, standard deviation and median. Descriptive analysis was done depending on variable suitable as per respective formula and resultant data compared between rural villages and urban cities.

3. RESULTS AND DISCUSSION

The population who fulfill the eligibility criteria were enrolled in the study. The total number **200 population** were included in the cross-sectional survey; **100 subjects were from the rural area** and **100 subjects from the urban area**, where rural area defined as area comes under Gram panchayat while urban area defined as area comes under Municipal Corporation of Valsad district of Gujarat, India.

The mean age of the *rural* population was **33.5 years** and their age in between **18 - 70 years** while the mean age of the *urban* population was **30.7 years** and their age in between **18 – 65 years**.

Demographics Characteristics: The demographic profile of the rural populations is summarized in Table 1, while urban populations in Table 2.

Table 1: Demographic characteristic of 100 population's in a rural area of Valsad district, Gujarat, India from January 2018 to March 2018.

| Characteristic | Population | Percentage |
|----------------------------|-------------------|-------------------|
| Gender | | |
| Male | 43 | 43 |
| Female | 57 | 57 |
| Age in years | | |
| 18 – 28 | 56 | 56 |
| 29 – 38 | 16 | 16 |
| 39 – 48 | 6 | 6 |
| 49 + | 22 | 22 |
| Marital Status | | |
| Single | 49 | 49 |
| Married | 47 | 47 |
| Other | 4 | 4 |
| Occupational Status | | |
| Employed | 34 | 34 |
| Self Employed | 17 | 17 |
| Student | 23 | 23 |
| Housewife | 15 | 15 |
| Other | 11 | 11 |
| Educational Status | | |
| Less than SSC | 7 | 7 |
| SSC | 17 | 17 |
| HSC | 33 | 33 |
| Graduate | 38 | 38 |
| Post Graduate | 5 | 5 |
| Doctorate | 0 | 0 |

Male populations constituted from a **rural** area 43%, 56.52% were younger than 30 years of age and **Women** populations constituted from a **rural** area 57%, 54.38% were younger than 30 years of age.

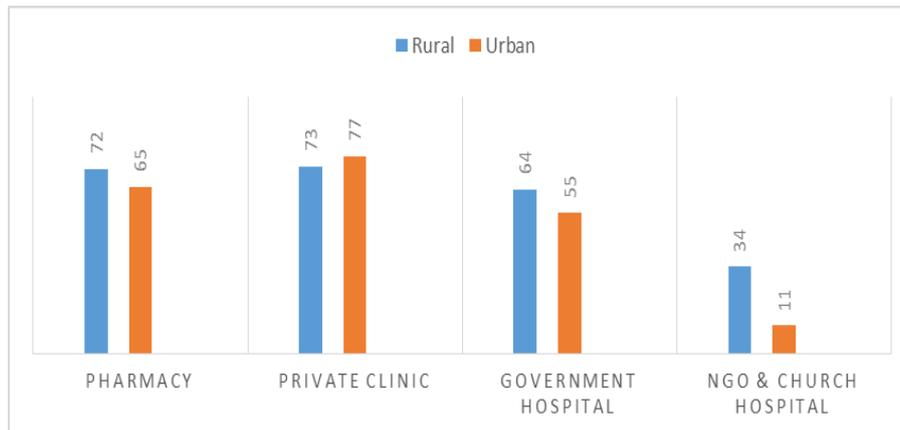
Table 2: Demographic characteristic of the population's in the urban area of Valsad district, Gujarat, India from January to March 2018.

| Characteristic | Population | Percentage |
|-----------------------------|-------------------|-------------------|
| Gender: | | |
| Male | 37 | 37 |
| Female | 63 | 63 |
| Age in years: | | |
| 18 – 28 | 69 | 69 |
| 29 – 38 | 11 | 11 |
| 39 – 48 | 05 | 05 |
| 49 + | 15 | 15 |
| Marital Status: | | |
| Single | 58 | 58 |
| Married | 40 | 40 |
| Other | 02 | 02 |
| Occupational Status: | | |
| Employed | 36 | 36 |
| Self Employed | 15 | 15 |
| Student | 31 | 31 |
| Housewife | 17 | 17 |
| Other | 01 | 01 |
| Educational Status: | | |
| Less than SSC | 11 | 11 |
| SSC | 08 | 08 |
| HSC | 21 | 21 |
| Graduate | 46 | 46 |
| Post Graduate | 13 | 13 |
| Doctorate | 01 | 01 |

Male populations constituted from **urban** area 37%, 54.05% were younger than 30 years of age and **Women** populations constituted from **urban** area 63%, 77.77 % were younger than 30 years of age.

Table 3: Rural & Urban Population Health-seeking behavior/practice of Valsad district of Gujarat, India from January 2018 to March 2018.

| Variables | Number (%) of rural | Number (%) of urban | Total number (%) |
|---|---------------------|---------------------|------------------|
| Pharmacy/medical store | 72 | 65 | 137(68.5) |
| Private Clinic | 73 | 77 | 150 (75) |
| Government Clinic or hospital | 64 | 55 | 59.5 (59.5) |
| Clinic run by a non-governmental organization or church | 34 | 11 | 45 (22.5) |

**Figure 1: Community health-seeking behavior/practice.**

Majority of the *rural* population are primarily *Pharmacy or Medical Store* to treat their general health problems while *urban* population primarily prefers *Private Clinic*. Also, the *rural* population is said to chosen *NGO or Church-based hospital* after *Government hospital* as their second choice for their treatment of general health problem while *urban* population has chosen *Government Hospital* after *Pharmacy or Medical Store*.

Table 4: Rural & Urban Population Communities Source of Information about Tuberculosis in Valsad district of Gujarat, India from January 2018 to March 2018.

| Variables | Number (%) of rural | Number (%) of urban | Total number (%) |
|--|---------------------|---------------------|------------------|
| Source of Information | | | |
| - Newspaper and magazines | 38 | 49 | 87 (43.5) |
| - Radio/TV | 84 | 76 | 160 (80) |
| - Health workers | 45 | 32 | 77 (38.5) |
| - Brochures, poster, etc | 15 | 21 | 36 (18) |
| - Teachers | 75 | 52 | 127 (63.5) |
| The seriousness of tuberculosis in your area? | | | |
| - Very serious | 28 | 29 | 57 (28.5) |
| - Not very serious | 24 | 33 | 57 (28.5) |
| - Somewhat serious | 48 | 38 | 86 (43) |
| Sign and symptoms | | | |
| - A cough | 46 | 66 | 112 (56) |
| - A cough that lasts longer than three weeks | 60 | 90 | 150 (75) |
| - Coughing up blood | 55 | 54 | 109 (54.5) |
| - A severe headache | 23 | 11 | 34 (17) |
| - Weight loss | 43 | 65 | 108 (54) |
| - Fever | 42 | 65 | 107 (53.5) |
| - Chest pain | 50 | 66 | 116 (58) |
| - Shortness of breath | 24 | 18 | 42 (21) |
| Preventive measures for tuberculosis | | | |
| - Avoid shaking hands | 30 | 28 | 58 (29) |
| - Covering mouth and nose when coughing or sneezing | 67 | 85 | 152 (76) |
| - Closing windows at home | 24 | 11 | 35 (17.5) |

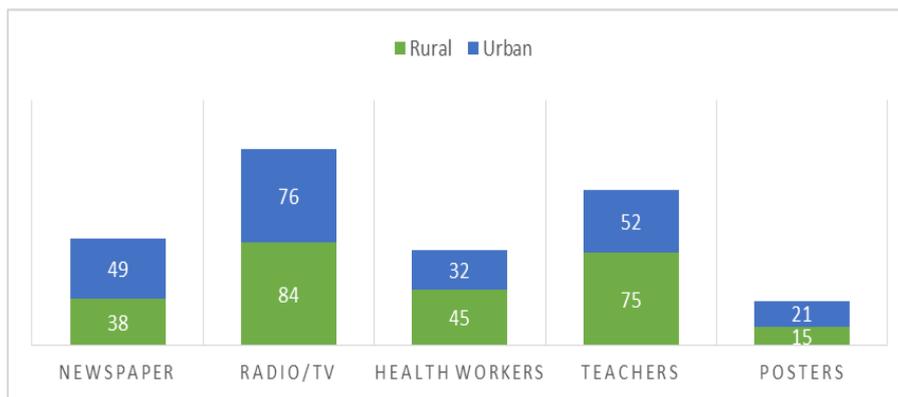


Figure 2: Community sources of information

"Teacher" educational remained a prominent source of awareness regarding tuberculosis irrespective of the *rural* or *urban* area. However *rural* population said they heard about Tuberculosis mostly through *radio/television advertisement* so do *urban* populations. Further *rural*

population said *Health Workers* are using come villages to talk about on such health issues while *urban* population said *Brochures* and *Posters* are commonly seen in their surrounding on such health issues.

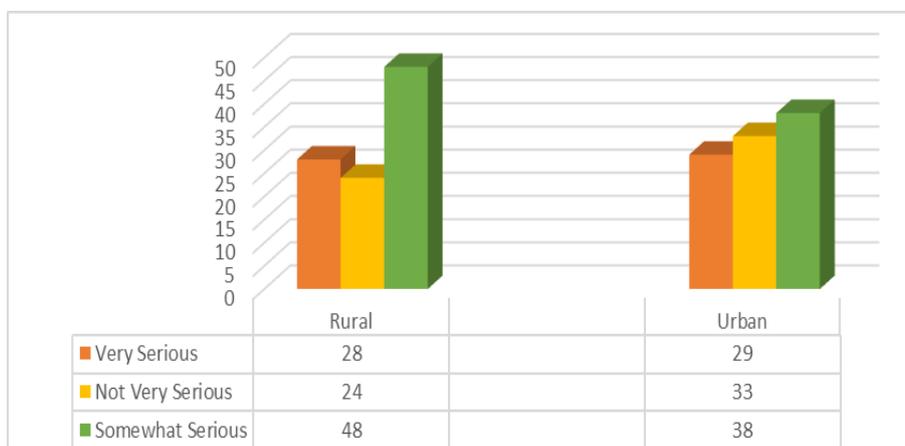


Figure 3: How serious a problem do you think TB in your area?

The data obtained shows in *rural* area tuberculosis is still a major concern and population thinks in below order from higher to lower as a problem in their region: "SOMEWHAT SERIOUS" > "VERY SERIOUS" > "NOT VERY SERIOUS"

While in *urban* area population thinks in below order from higher to lower as a problem in their region: "SOMEWHAT SERIOUS" > "NOT VERY SERIOUS" > "VERY SERIOUS"

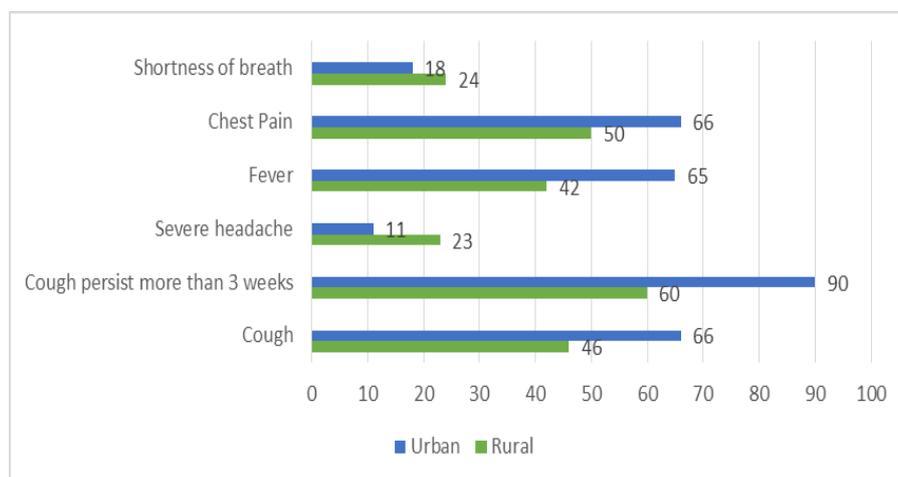


Figure 4: What are the sign and symptoms of TB?

In respect of community knowledge regarding the sign and symptoms of tuberculosis diseases, *persistent cough that lasts longer than 3-4 weeks* is major identifiable symptoms irrespective significant area difference; In a rural community, population said other symptoms include in this from high to low order as below:

“COUGH” > “CHEST PAIN” > “FEVER” > “SHORTNESS OF BREATH”

while In urban community said other symptoms include in this from high to low order as below:

“CHEST PAIN” > “COUGH” > “FEVER” > “SHORTNESS OF BREATH”

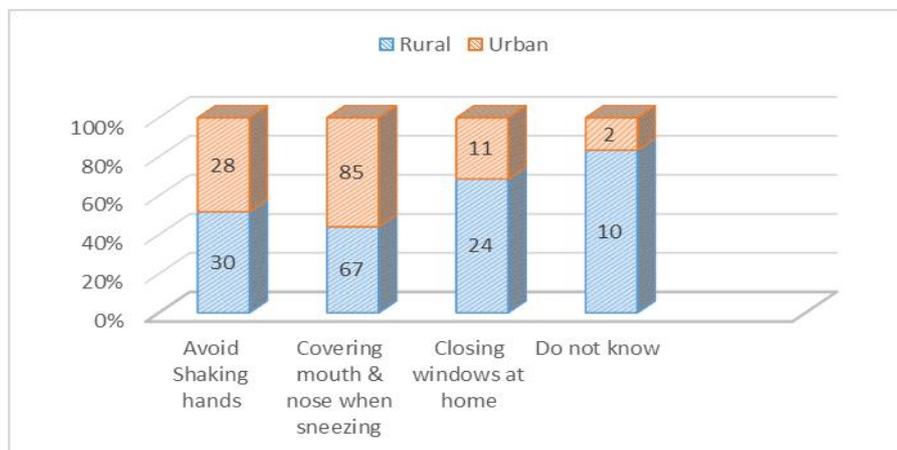


Figure 5: How can a person prevent getting from TB?.

In *rural* populations, 85 out of 100 “Covering mouth and nose when sneezing” said the preventive measure of tuberculosis while in the *urban* populations, 67 out of

100 said “Covering mouth and nose when sneezing” will be a significant measure.

Table 5: Rural and Urban Population Attitudes and care-seeking behavior about Tuberculosis in Valsad district of Gujarat, India from January 2018 to March 2018.

| Variables | Number (%) of rural | Number (%) of urban | Total number (%) |
|--|---------------------|---------------------|------------------|
| Reaction towards yourself finding infected with TB? | | | |
| - Fear | 83 | 58 | 141 (70.5) |
| - Surprise | 22 | 38 | 60 (30) |
| - Embarrassment | 25 | 11 | 36 (18) |
| - Sadness or hopelessness | 55 | 46 | 101 (50.5) |
| If having symptoms of TB, at what point would you go to a health facility? | | | |
| - When treatment of own does not work | 8 | 21 | 29 (14.5) |
| - TB sign & symptoms last for 3-4 weeks | 33 | 25 | 58 (29) |
| - As soon as I realized my symptoms related to TB | 56 | 54 | 110 (55) |
| - I would not go to the doctor | 3 | 0 | 3 (1.5) |
| An expense of TB diagnosis and treatment | | | |
| - Free of charge | 42 | 41 | 83 (41.5) |
| - Reasonably priced | 26 | 40 | 66 (33) |
| - Somewhat/moderately expensive | 17 | 11 | 28 (14) |
| - Very expensive | 15 | 08 | 23 (11.5) |
| What would be the reason not go health facility? | | | |
| - Not sure where to go | 33 | 40 | 73 (36.5) |
| - Cost | 50 | 32 | 82 (41) |
| - Difficulties with transportation | 41 | 43 | 84 (42) |
| - Cannot leave work | 11 | 50 | 61 (30.5) |

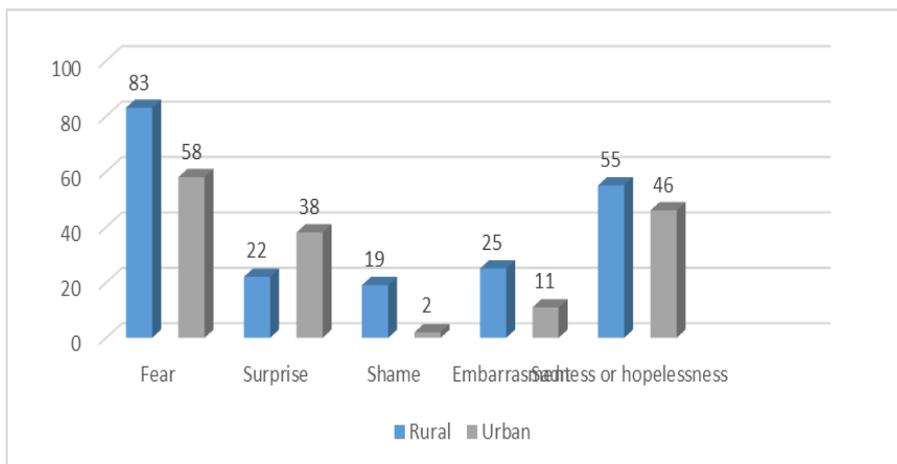


Figure 6: What would be your reaction if you were found out that you have TB?

Data obtained from *rural* populations indicate majorly population is *afraid* of tuberculosis also find the reason of *embarrassment* and *shame* while data obtained from *urban* populations are indicated majority populations are

equally *afraid* and find it reasons for *sadness* or *hopelessness* also *urban* population significantly will be *surprised* to be infected.

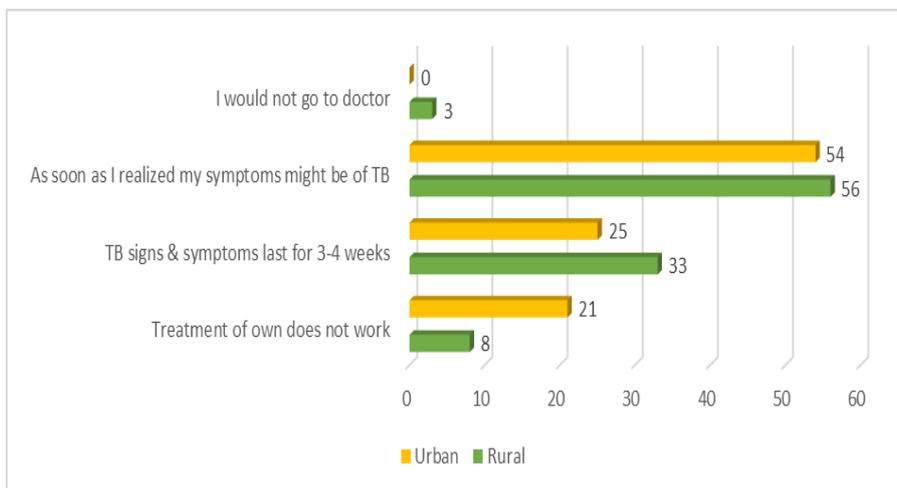


Figure 7. If you had symptoms of TB, at what point would you go to a health facility?

The response of *rural* populations and *urban* populations are somewhere similar except *urban* people does try

their “*own treatment*” significantly higher than *rural* populations before to go health facility for treatment.

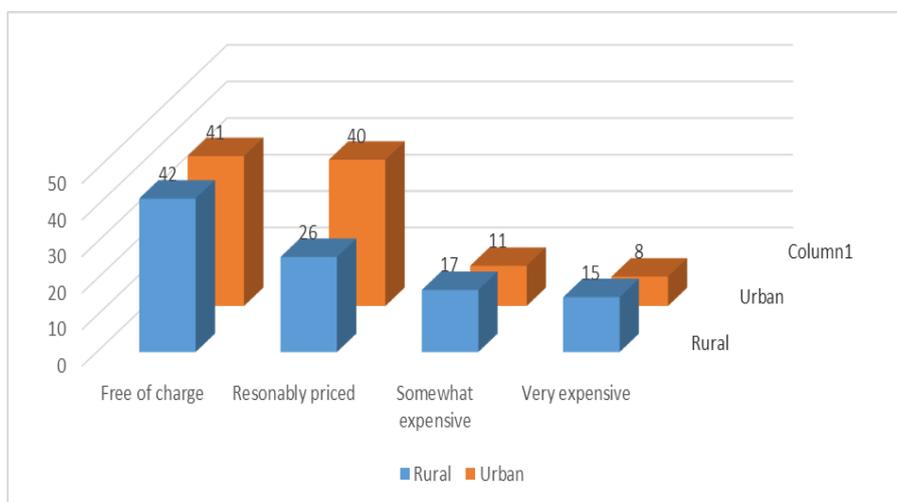


Figure 8: How expensive do you think TB diagnosis and treatment in your area?

Regarding expense for *diagnosis* and *treatment* at *government health facility* both *rural* and *urban* population are aware of it is “*free of charge*” with no monetary value. In private setting of health facility

urban populations think it is “*reasonably priced*” while *rural* populations think it is either will be “*somewhat expensive*” or “*very expensive*”.

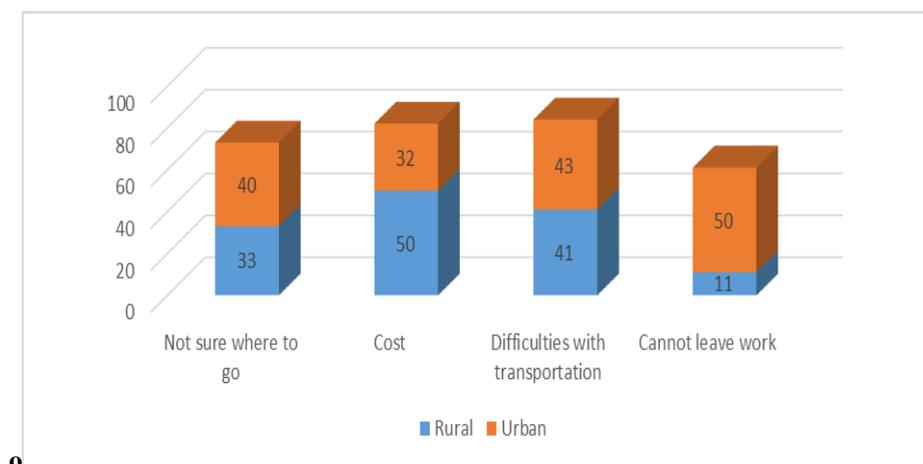


Figure 9: If you would not go to a health facility, what is the reason?

The data obtained from the cross-sectional survey indicates that majority of the rural population are facing

cost as challenges while urban population facing their work as challenges to not go health facility.

Table 6: Rural & Urban Population Attitudes and Stigma about Tuberculosis in Valsad district of Gujarat, India from January 2018 to March 2018.

| Variables | Number (%) of rural | Number (%) of urban | Total number (%) |
|--|---------------------|---------------------|------------------|
| Do you know people who have/had TB? | | | |
| - Yes | 64 | 44 | |
| - No | | | |
| Statement close to your feeling people’s suffering from TB? | | | |
| - I feel compassion and desire to help | | | |
| - I feel compassion but I tend to stay away | 62 | 49 | |
| - It is their problem and I can’t get TB | 20 | 37 | |
| - I fear them because they may infect me | 07 | 08 | |
| - I have no particular feeling | 09 | 05 | |
| - | 01 | 01 | |
| How is a person who has TB usually treated in your community? | | | |
| - Most people reject him or her | 22 | 25 | |
| - Most people are friendly, but they generally try to avoid them | 27 | 28 | |
| - Community mostly supports and help them | 49 | 37 | |

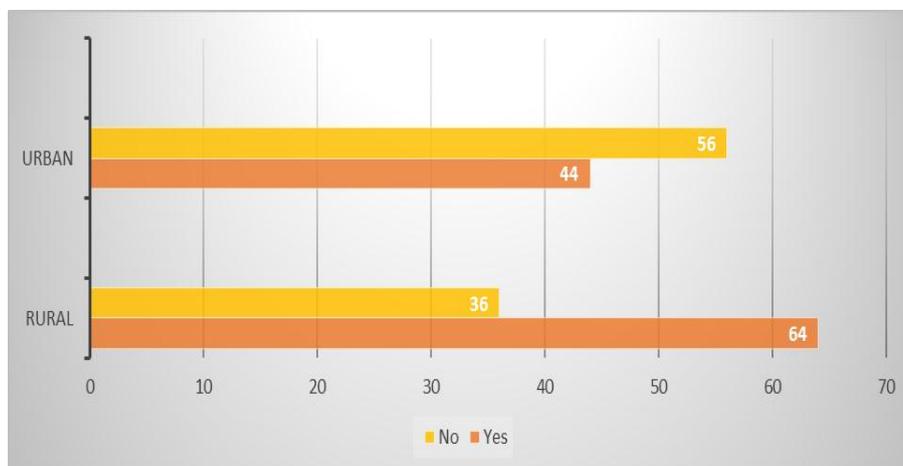


Figure 10: Do you know people who have had TB?

The *rural* population **66%** were said they know people who have/had tuberculosis while *urban* population only

44% were said they know people who have/had tuberculosis.

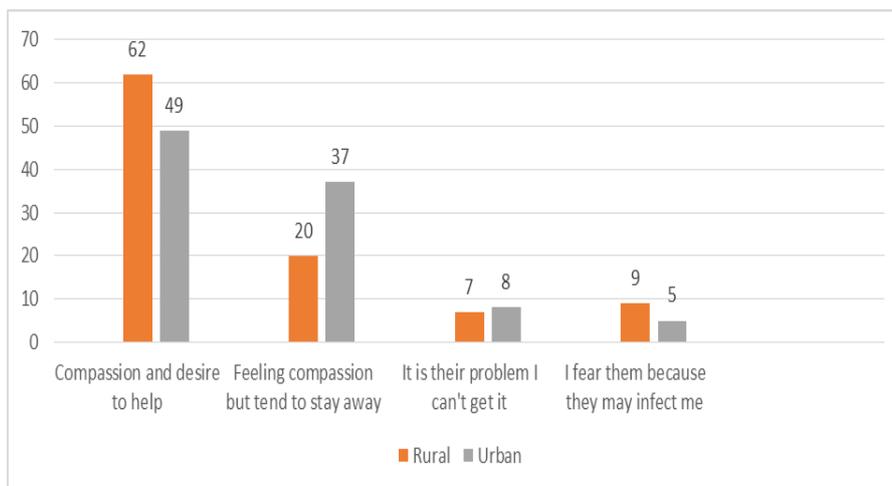


Figure 11: Which statement is closed to your feeling about people with TB disease?

In the assessment of stigma of attitude toward positive tuberculosis patients the data shows the *rural* population is significant feels higher **“compassion and desire to help”** to tuberculosis-infected peoples than *urban* while

urban populations **“does feel compassion”** towards tuberculosis infected peoples but they significantly feels higher **“tend to stay from infected people”** than rural populations so not get infected.

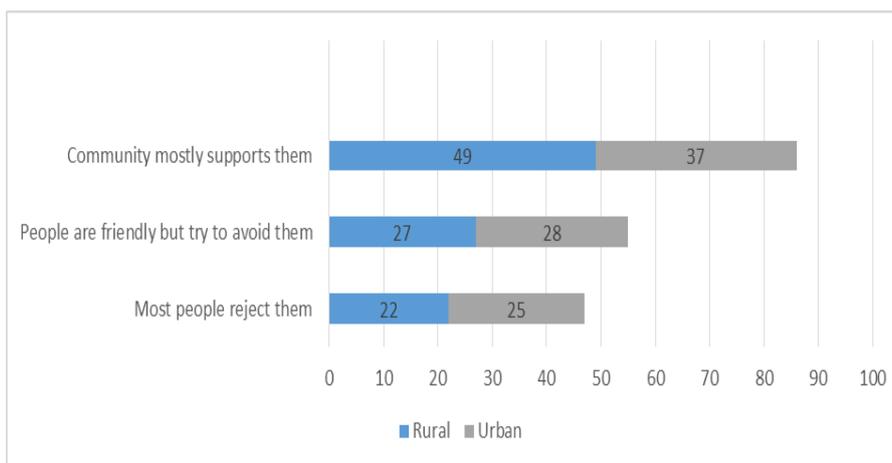


Figure 11: In your community, how is a person who has TB usually regarded?

The data obtained from cross-sectional survey reflects that *rural* population community comparatively supports "Tuberculosis infected peoples" higher than *urban* populations community.

4. LIMITATIONS

In this study, efforts were taken to determine the knowledge, attitudes, and practices of the community towards tuberculosis which can support the tuberculosis control programs in Valsad district of Gujarat. However during the conduct of study I came across few challenges which enhanced my knowledge regarding potential limitations including lack of focus group discussion which might be used to triangulate the finding, absence of information on HIV, lack of questions about MDR and XDR-TB, and lack of data about current and former personal tuberculosis infection of family members.

5. CONCLUSION

From the cross-sectional survey done, I can conclude following below:

5.1 Health-seeking behavior/practice

Rural population are still dependent on pharmacy/medical store for treating general health problems while urban population majorly goes to private clinic to treat general health problems hence government should take initiative to teach or create awareness amongst rural population regarding medication adherence or drug resistance phenomenon to avoid MDR-TB or antibiotic resistance and encourage them to visit nearest government or NGO or church-based health facility.

5.2 TB knowledge and awareness

The rural population is equally or more aware of sign and symptoms when comparing to the urban population because a significant number of rural populations have said a cough persists more than 3-4 weeks, chest pain, fever and shortness of breath are major sign and symptoms. Also covering mouth while coughing and sneezing should be done is almost equally rural population has said. Further to this rural population majorly said anybody can be infected with tuberculosis as like urban populations.

5.3 TB attitude and care-seeking behavior

Fear from TB is a common reaction in rural populations, they find TB as reason of embarrassment also rural population said they will become sad or feel hopeless which can lead them to depression. While urban population almost equally responds towards fear and sadness or hopelessness feeling but urban populations said they will significantly feel surprised if they found out to be TB infected comparatively to rural populations. And both rural and urban populations are aware of TB diagnosis & treatment are freely available at government health facility.

5.4 TB attitudes and Stigma

There are 66% of the rural population said they know people who have/had TB while only 44% urban population said they know people who have/had TB. This reflects tuberculosis is significantly seen in the rural area compared to the urban area. Also in the assessment of stigma of attitude toward tuberculosis infected people's rural populations feels higher compassion and desire to help while urban population does feel compassion towards TB infected people but they significantly feels higher tend to stay from infected people than rural populations so they don't get infected.

6. REFERENCES

1. Colledge NR, Walker BR, and Ralston SH. Davidson's Principles & Practice of Medicine, 21 st Edition, 2010; 688 – 696.
2. "Population of India (2018 and historical)", March 2018, www.worldometers.info/world-population/india-population/
3. "What's Killing India? Knowing Top 10 Killer diseases in India", February 2018, www.icicilombard.com/health_insurance_info/Knowing-top-10-killer-death-diseases-in-India.html
4. "TB Statistics India – National, Treatment Outcome & State Statistics", February 2018, www.tbfacts.org/tb-statistics-india/
5. TB India, "Revised National Tuberculosis Control Programme, Annual Status Report, Central TB Division, Directorate General of Health Services." Ministry of Health and Family Welfare, Nirman Bhavan, New Delhi, 2017; 110108: 9.
6. "Government of India, Central Tuberculosis Division", February 2018, <https://tbcindia.gov.in/>
7. Tripathi KD. Essential of Medical Pharmacology, 7th Edition, 2013; 765–766.
8. Bansal R, Desai K, Gupta A, and Bansal M. Textbook of Pathophysiology, I: 229–232.
9. "Advocacy, communication and social mobilization for TB control, A guide to developing knowledge, attitude and practice surveys." published by World Health Organization, 2008; 6–7.
10. Zahra Nailah White. Survey on the knowledge, Attitude, and Practice on tuberculosis (TB) among healthcare workers in Kingston & St. Andrew, Jamaica. Dissertation submitted for the degree of Master of Public Health, University of Liverpool, July 2011.
11. Samal J, Dehury RK. Impact of a Structured Tuberculosis Awareness Strategy on the Knowledge and Behaviour of the Families in a Slum Area in Chhattisgarh, India, Journal of Clinical and Diagnostic Research, Mar, 2017; 11(3): LC11–LC15.
12. AlSalem SB, AlEisa AM, Raslan IA, Binjawhar AS, Khouqueer AF, and Gad A. "Tuberculosis: Awareness among Students in a Saudi University", Health, 7: 175–182.