Introduction

Globally, an estimated 10.0 million (range: 8.9–11.0 million) people fell ill with tuberculosis (TB) in 2019, a number that has been declining very slowly in recent years. There were an estimated 1.2 million (range: 1.1–1.3 million) TB deaths among HIV-negative people in 2019 (a reduction from 1.7 million in 2000). However, India still contributes to be the highest TB burden country in the world with an estimated incidence of 26.9 lakh cases in 2019 (WHO), and also, it has one of the largest shares (27%) of drug-resistant TB in the world.\(^1\)\(^-\)\(^3\)

TB also has huge socioeconomic impact as it commonly affects the most productive age group and rural high-risk population. An estimated 100 million people fall below the poverty line each year because of the financial burden related to TB disease.\(^4\)

In Karnataka state, where the study is done, the presumptive TB case examination rate is 770/1 lakh population compared to the national (India) rate of 674/1 lakh population, whereas the TB case notification rate in Karnataka is 96/1 lakh population compared to 131/1 lakh population in India. And, our study area, in Mandya district in Karnataka, is having a still lower rate of TB case notification.\(^5\)

Even though India’s share in TB burden is high, the disease is in declining trend since past few years. Under the National Tuberculosis Elimination Program, the treatment is completely free and also the patient will be given financial assistance as well to maintain a better nutrition. Apart from the treatment of the affected, the program also focuses on the early identification of cases through active case finding and by spreading awareness, as delay in

### ABSTRACT

**Background:** Tuberculosis (TB) is a re-emerging disease in India. Creating awareness among the community still plays a vital role in preventing and controlling the spread of TB. **Materials and Methods:** A cross-sectional study was carried out for a period of 4 months in a rural area in Mandya, southern Karnataka. Sample size was estimated and those who fulfill the inclusion criteria were included with prior consent. Data were collected through interview method using structured questionnaire and analyzed using Epi info software. **Results:** Among the 774 participants, majority (61.8%) of the study participants belonged to the age group of 30–59 years; 32.7% of the subjects had studied up to secondary level of education. More than three-fourth of the subjects (76.1%) had heard about TB disease. More than 50% of the subjects mentioned “coughing” by a diseased person as the main reason for spread. Forty percent of the subjects, opined as recovery, will be complete after treatment. More than 60% of the subjects knew that TB diagnosis and treatment is free in any government health center. **Conclusion:** Our study found that knowledge regarding TB and its control in many of the aspects is either insufficient or not satisfactory in the community.

**Keywords:** Awareness, re-emerging disease, TB control, tuberculosis

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approaching health care can lead to delay in diagnosis and treatment, which will hamper our attempts in reaching the target of TB-free India by 2025. And also, in the study area, the TB case notification rate is less compared to national level rate, which is a cause of concern.[6]

Huge reduction in TB disease transmission from infected person to others in the family and community can be achieved by early diagnosis and treatment of TB.[6] Therefore, it is important to assess the awareness level at regular intervals in the community as creating awareness helps in behavioral change and thereby improved health-seeking behavior which halts the ongoing transmission. The primary care physicians (being the first point of contact for the community members) in the rural area or in the immediate vicinity of the concerned community will be more equipped to diagnose and notify the cases early, when there is a better awareness about TB in the community, and thus, our country’s goal of eliminating TB from India by 2025 can be made possible. Hence, the present study was carried out in a rural area of Mandya to estimate the community awareness and their perception toward TB.

Materials and Methodology

A community-based observational study (cross-sectional study) was carried out for a period of 4 months from February to May 2021 in a rural area, Mandya. The total population of the rural field practice area of a tertiary level institute in Nagamangala Tq, Mandya district selected, was 23,000. The individual houses were listed and selected randomly using the random number table to cover the sample size of 774. The sample size calculated using the formula \( n = \frac{Z^2 \cdot \sigma^2}{d^2} \), for prevalence studies in the community, was 688 (with 70% prevalence of knowledge and 5% relative error).[7] An additional 10% was added to cover up for the no response rate at 10%.

The subjects in the age group 18–65 years (able to respond in a language known to them) were included in the study in the selected households, after obtaining their informed consent (one person in each household). Those unable to reach in our three consecutive visits and those affected with TB were excluded from the study. A pretested and structured questionnaire was used in assessing the level of awareness about TB and health-seeking behavior. Data were collected through interview method using Google form. Prior permission from the institution and the institution ethics committee approval was taken, with reference number AIMS/IEC/2293/2021.

Data were entered in the excel sheet, refined, and there were no missing values. The results were analyzed using Epi info software. Results were expressed in terms of percentage and proportions. Inferential statistics like chi square and logistic regression were used to determine the association and the strength of the association between the categorical variables of interest.

Results

Majority (478) of the study participants belonged to the age group of 30–59 years (i.e. 30–39 is 20.4%, 40–49 years is 23.8%, and 50–59 years is 17.6%). Nearly 22% of them were elders (60 years and above), the remaining 16.4% of them were in the age group of 10–29 years (depicted in Table 1).

Nearly one-third (32.7%) of the subjects had studied up to secondary level of education and the remaining primary (27.5%), college (11.1%), and illiterates (24.7%). Only 4% of them had completed basic graduation courses as shown in Table 2. The difference in educational status among male and female subjects was found to be statistically significant with a \( P \) value of 0.010 (Chi-square value 13.331).

Majority of the subjects, that is, 76.1% of the responded, had heard about TB disease (Table 3 and Figure 1: 60% mentioned the correct name “Kshaya roga” in local language Kannada). Nearly three-fourth of the female subjects and 80% of the male subjects had heard about TB disease. The difference was found to be statistically significant with a \( P \) value of 0.024 (Chi-square value 5.074).

Table 4 depicts the past history of TB disease among the subjects. Only 2.7% of them had TB disease in the past. Among the

| Table 1: Distribution of subjects by age group in years |
|---------------------------------------------------|
| Age group in years | Female | Male | Total |
|-------------------|--------|------|-------|
| 10-19             | 11     | 9    | 20 (2.6) |
| 20-29             | 77     | 30   | 107 (13.8) |
| 30-39             | 108    | 50   | 158 (20.4) |
| 40-49             | 110    | 74   | 184 (23.8) |
| 50-59             | 81     | 55   | 136 (17.6) |
| 60 and above      | 103    | 66   | 169 (21.8) |
| Total             | 490    | 284  | 774 (100) |

Figures in parenthesis indicate percentage

| Table 2: Educational status of the study participants/subjects |
|---------------------------------------------------------------|
| Educational status of the subjects | Female | Male | Total |
|-----------------------------------|--------|------|-------|
| Illiterate                        | 140    | 51   | 191 (24.7) |
| Primary                           | 136    | 77   | 213 (27.5) |
| Secondary                         | 144    | 109  | 253 (32.7) |
| College                           | 51     | 35   | 86 (11.1) |
| University and above              | 19     | 12   | 31 (4) |
| Total                             | 490    | 284  | 774 (100) |

Figures in parenthesis indicate percentage

| Table 3: Awareness about TB disease among the subjects |
|------------------------------------------------------|
| Awareness about TB disease | Gender | Total |
|---------------------------|--------|-------|
|                           | Female | Male  |      |
| Have you heard of TB?     |        |       |      |
| No                        | 130    | 55    | 185  |
| % within gender           | 26.5%  | 19.4% | 23.9% |
| Yes                       | 360    | 229   | 589  |
| % within gender           | 73.5%  | 80.6% | 76.1% |
| Total                     | 490    | 284   | 774 (100%) |

\( P \) = 0.024
subjects, 16.4% of them knew someone in their area who has/had TB disease.

More than 50% of the subjects mentioned “coughing” by a diseased person as the main reason for spread and 15% of the subjects were specific in telling bacteria causing TB [Table 5; Figure 2]. The difference in knowledge regarding TB was not significant by gender.

Table 6 depicts more than one-third of the subjects knew that TB is a preventable disease and 60% of the subjects knew that TB can be treated effectively. The preventive options known to subjects include therapy (20.4%), vaccine (8.8%), isolation (7.6%), and few others like wearing mask, good hygiene, and nutrition (less than 1%).

More than 50% of the subjects knew that treatment for TB is for more than 1 month and 22.4% of the subjects mentioned 6 months of treatment option. Nearly 40% of the subjects were of the opinion that recovery from TB disease will be complete if right treatment is given for a right duration prescribed. More than 60% of the subjects mentioned that TB diagnosis and treatment is free in any government health center [Table 7].

Table 8 depicts the treatment-seeking behavior among subjects with major and minor symptoms. More than 80% seek treatment if the symptoms are worse (cough with blood) but more than 30% neglect for minor cough symptoms.

The difference in TB awareness among subjects with different educational status was found to be statistically significant with \( P \) value of <0.001. The subjects with better educational level had a better awareness related to TB with an adjusted odds ratio value ranging from 4.867 to 19.366, as shown in Table 9.

**Table 4: Distribution of subjects by past history of TB disease**

| Past history of TB disease | Frequency | Percentage |
|---------------------------|-----------|------------|
| Don't know                | 52        | 6.7        |
| No                        | 701       | 90.5       |
| Yes                       | 21        | 2.7        |

**Table 5: Awareness about TB disease characteristics**

| Modes of spread            | Frequency | Percentage |
|----------------------------|-----------|------------|
| Cough (air)                | 402       | 51.9       |
| Hereditary                 | 9         | 1.2        |
| Being in a public area    | 15        | 1.9        |
| Sexual contact with TB patient | 4     | 0.5        |
| Unclean food or water     | 34        | 4.4        |
| Other reasons              | 17        | 2.2        |
| Don’t know                 | 293       | 37.9       |
| Total                      | 774       | 100.0      |

**Table 6:**

| Cause of TB               | Frequency | Percentage |
|----------------------------|-----------|------------|
| Bacteria                   | 117       | 15.1       |
| Don’t know                 | 616       | 79.6       |
| Evil eye                   | 6         | 0.8        |
| Satan or witchcraft        | 2         | 0.3        |
| Virus                      | 33        | 4.3        |
| Total                      | 774       | 100.0      |

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The difference in TB awareness among subjects with different educational status was found to be statistically significant with \( P \) value of <0.001. The subjects with better educational level had a better awareness related to TB with an adjusted odds ratio value ranging from 4.867 to 19.366, as shown in Table 9.

### Discussion

In the present study, majority (61.8%) of the study participants belonged to the age group of 30–59 years. Around 50% of our study participants hadn’t completed their primary schooling.

Majority of the subjects, that is, 76.1% of them, had heard about TB disease. Nearly three-fourth of the female subjects and 80% of the male subjects had heard about TB disease. The difference was found to be statistically significant with a \( P \) value of 0.024 (Chi-square value 5.074). This finding was similar to the study conducted by Rami et al.\(^7\) (72.18%) in Patan, Gujarat, with majority of the participants being from rural area, whereas a study done by Koneru et al.\(^8\) in a tertiary medical college in Tamil Nadu showed 90% subjects having heard about TB. The better knowledge in their study might be due to the fact that the study included out-patient department patients in the hospital.

**Figure 1:** Awareness about TB disease in percentage (have you heard about TB disease?—Yes or no)

**Figure 2:** Mode of spread of TB
However, studies done by Jangid et al.\cite{9} (in Rajasthan) and Kala et al.\cite{10} (in Tamil Nadu) showed 70–90% subjects having heard about TB. This may be due to the fact that their study was conducted among TB patients who were informed about the TB disease by the health workers and accredited social health activist (ASHA) workers. More than 60% of the subjects in our study were aware that TB is an infectious disease, among which 50% of the study subjects knew that “coughing” is the mode of spread and 15% of the subjects were specific in telling bacteria-causing TB. This finding is similar to a study done by Charles et al.\cite{11} in South India, where more than half of the study participants were aware that TB spreads through air.

Other studies done by Sharma et al.\cite{12} (89%), Fochsen et al.\cite{13} (95%), and Samal et al.\cite{14} showed still a better knowledge among their study participants. This is in contrast to a study done in rural Tamil Nadu by Kar et al.\cite{15} which showed regarding knowledge about mode of spread of the disease, only 20% replied cough or sputum as the mode of spread. The better knowledge among our study participants might be because of the proximity of the area to the health center nearby and also to the tertiary level medical college, with continuous health awareness program being conducted in the area studied.

More than one-third of the subjects in our study told that TB is a preventable disease and 60% of the subjects knew that TB can be treated effectively. The preventive options known to subjects include therapy (20.4%), vaccine (8.8%), isolation (7.6%), and few others like wearing mask, good hygiene, and nutrition (less than 1%). In a study done by Koneru et al.\cite{16} in Tamil Nadu, 23% opined that TB was not curable and 54.4% had knowledge on prevention of TB by avoiding contact, using handkerchief while coughing, and living in clean environment. These findings are similar to the findings in our study, except the better knowledge on TB being preventable in their study as the participants were TB-infected patients. The findings of our study are in contrast to the study done by Shriraam et al.\cite{17} in Tamil Nadu, where 18.5% of the participants mentioned TB as a curable disease as they involved brick kiln workers with more than 50% being illiterates.

In our study, 22.4% of the subjects mentioned a minimum of 6 months of treatment for TB. Nearly 40% of the subjects were of the opinion that recovery from TB disease will be complete if right treatment is given for a right duration prescribed, whereas studies done by Jangid et al.\cite{9} in Rajasthan and Vidhani et al.\cite{18} in rural Surat (Gujarat) in 2012 found that 55.8% and 32.9% of the participants, respectively, were aware of the duration of TB treatment as 6–9 months, as the study included only TB patients.

Nearly two-third of the subjects in our study felt that TB diagnosis and treatment is completely free in any government health center near or far. A study done in Delhi by Sharma et al.\cite{19} after an information education & communication (IEC) campaign showed 89% of the subjects mentioning TB diagnostics and treatment as “free.”

| Table 6: Response from the subjects with regard to TB prevention and management |
|----------------------------------|---------|---------|
| **TB is preventable**            | Frequency | Percentage |
| Response from the subjects       |          |          |
| Don't know                       | 471      | 60.9     |
| No                               | 32       | 4.1      |
| Yes                              | 271      | 35.0     |

| Table 7: Response of participants with regard to treatment duration for TB |
|----------------------------------|---------|---------|
| **Treatment duration for TB**    | Frequency | Percentage |
| Response                         |          |          |
| Don't know                       | 337      | 43.5     |
| 1 month                          | 53       | 6.8      |
| 2 months                         | 33       | 4.3      |
| 3 months                         | 82       | 10.6     |
| 6 months                         | 173      | 22.4     |
| 1 year                           | 96       | 12.4     |
| Total                            | 774      | 100.0    |

| Recovery complete                | Frequency | Percentage |
|----------------------------------|-----------|------------|
| Response                         |           |            |
| Don't know                       | 439       | 56.7       |
| No                               | 36        | 4.7        |
| Yes                              | 299       | 38.6       |

| Table 8: Response of subjects for TB symptom (e.g., cough with blood in sputum) |
|----------------------------------|---------|---------|
| **Subject response for worst TB-related symptom (cough with blood in sputum)** | Frequency | Percentage |
| Response                         |          |          |
| Neglect                          | 3        | 0.4      |
| Consult someone-traditional medicine | 42      | 5.4      |
| Consult someone-modern medicine  | 665      | 85.9     |
| Self-treatment-modern medicine   | 35       | 4.5      |
| Self-treatment-traditional medicine | 29     | 3.7      |
| Total                            | 774      | 100.0    |

| **Wait duration before seeking treatment if symptoms are minor (cough)** | Frequency | Percentage |
|------------------------------------------------------------------------|-----------|------------|
| Response                                                               |           |            |
| Neglect                                                                | 254       | 32.8       |
| >3 months                                                              | 2         | 0.3        |
| 1 month                                                                | 30        | 3.9        |
| 1 week                                                                 | 391       | 50.5       |
| 2 months                                                               | 4         | 0.5        |
| 2 weeks                                                                | 93        | 12.0       |
| Total                                                                  | 774       | 100.0      |
Similar findings were shown by a study done in Mumbai and Patna by Shah et al.\[19\]

In our study, more than 80% seek treatment if the symptoms are worse (cough with blood) but more than 30% neglect for minor cough symptom. More than 8% of the subjects preferred self-treatment even with severe symptoms mentioned above. A study done in rural area of Madhya Pradesh showed 67% of the subjects with symptoms like cough sought health care.\[13\]

These symptoms are similar to the findings in our study.

Our study finding of higher level of education, having better odds (odds ratio ranging from 4.867 to 19.366) of TB knowledge, was also shown by study done by other studies.\[6,11,19‑29\]

Being the usual first point of contact for the people in the community, the primary care physicians and family physicians (peripheral health institutions) serving in the rural areas and in areas with vulnerable people for TB have a great role to play in making India TB free by 2025. Focused, community oriented, and regular programs to improve the awareness related to TB care, prevention and the precautionary behavior related to control of TB infection in the country, will strengthen the primary care physician’s capability to help improve the TB case notification and help realize the goal of a TB-free India by 2025. And also, primary care physicians have a much bigger role to play in communicating the accurate and appropriate TB-related information to the community, so as to reduce much of the stigma associated with TB.\[30\]

Summary and Conclusion

More than three-fourth of the subjects in our study had heard about TB disease. More than 60% of them were aware that TB is infectious disease, and 50% of them knew that “coughing” is an important mode of spread. More than one-third of the subjects mentioned that “TB is a preventable disease” and 60% of the subjects knew that TB can be treated effectively. Nearly two-third of the total subjects felt that TB diagnosis and treatment is completely free in any government health center. The adjusted odds ratio for TB awareness was higher among those with better educational level, which was significant statistically. More than 80% in our study mentioned that they would seek treatment if the symptoms are worse (cough with blood) but more than 30% neglect for minor cough symptoms.

The above findings from our study highlight the fact that knowledge regarding TB and its control in many of the aspects is either insufficient or not satisfactory in the community. Health education of the members of the rural community at large needs to be improved. And also, this study reiterates the need of large-scale community-based TB awareness studies in rural as well as urban areas to help our effort toward TB elimination from India by 2025. Strengthening our attempts toward TB-free India by 2025 necessitates the need for a coordinated effort by the community members with the accurate and necessary information and the health-care professionals, be it the health workers, primary care physicians, public health professionals, specialists in TB care, or even policy makers and administrators at the highest level. Multi-sectoral approach by various stakeholders involved in TB care, with people having the right information related to TB, is the need of the hour.

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Conflicts of interest

There are no conflicts of interest.

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Table 9: Association of TB awareness with subject’s educational status

| Educational status with TB awareness | Illiterate | Primary | Secondary | College and above | Total |
|-------------------------------------|------------|---------|-----------|-------------------|-------|
| Have you heard of TB?               |            |         |           |                   |       |
| No                                  | 104        | 42      | 34        | 5                 | 185   |
| Yes                                 | 87         | 171     | 219       | 112               | 589   |
| Total                               | 191        | 213     | 253       | 117               | 774   |
| P                                   |            |         |           |                   | <0.00 |
| aOR (adjusted odds ratio)           | Constant   | 4.867 (CI 3.129‑7.569) | 7.700 (CI 4.861‑12.197) | 19.366 (CI 7.512‑49.924) |
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