RESEARCH PAPER

Community Knowledge, Attitudes, and Practices Regarding Pulmonary Tuberculosis: Recognition of Prolonged Cough, Willingness to Seek Care at BHUs, and Stigma Perceptions Among Rural Adults in Punjab

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ABSTRACT

Background: Tuberculosis (TB) is a significant public health issue in Pakistan that bears one of the highest TB burdens in the world. Although free diagnosis and treatment is available via Basic Health Units (BHUs), delayed access to care and social stigma remain a challenge in controlling the situation in rural populations. **Methods:** The study was done in four districts of South Punjab (Multan, Muzaffargarh, Lodhran and Vehari) involving 500 rural adults between July and October 2024. TB knowledge, attitudes, including perceptions of stigma, and care-seeking practices were measured using a validated, pre-tested structured questionnaire. Multivariate logistic regression was used to determine the predictors of willingness to seek care in BHUs and appropriate symptom recognition. **Results:** The mean TB knowledge score was 5.03 ± 2.11 out of 10. The proportion of warning signs recognized as a cough of 2 weeks or more as a warning of TB was only 57.4%. A large percentage (52.2) supported the stigmatisation attitude towards TB patients. Only 38.6% of them said they were willing to visit a BHU first in case of long-lasting cough. Higher education (aOR 1.89; 95% CI 1.31–2.73), higher TB knowledge (aOR 2.97; 95% CI 1.98–4.45), low stigma perceptions (aOR 2.31; 95% CI 1.57–3.40), and proximity to BHU (aOR 1.94; 95% CI 1.33–2.84) were independent predictors of BHU care-seeking. **Conclusions:** There are huge gaps in TB knowledge, endemic stigma, favoring private providers that hinder timely care-seeking in rural Punjab. There is an urgent need to engage in targeted community education, stigma-reduction campaigns, and strengthening of BHU services.

Keywords: tuberculosis; KAP study; stigma; BHU; prolonged cough; care-seeking behaviour; health literacy
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Introduction

Tuberculosis (TB) is among the oldest and most endemic infectious diseases that endanger the public health across the world. In 2022, the World Health Organization (WHO) Global TB Report 2023 estimated 7.5 million new cases of TB in the world, the highest number since the world started to monitor this, and 1.32 million TB deaths occurred in people without HIV (WHO, 2023). South Asia is disproportionately affected by this burden: India, Indonesia, and Pakistan contribute almost 45 percent of the total global TB incidence (WHO, 2023). Pakistan has a high incidence of 268 per 100,000 population, and 610,000 new cases every year; this places it fifth among the 30 high-TB-burden countries (National TB Control Programme [NTP], 2023).

The Punjab province, which harbors over 110 million and is the most populous province in Pakistan, is providing a national burden of TB cases of more than 55 percent (NTP Pakistan, 2022). In Punjab, the south has rural districts with high poverty levels, low literacy, insufficient healthcare facilities and the cultures of the people are very strong and can contribute to the stigma and slow care seeking (Hussain et al., 2024). Though Pakistan National TB Control Programme has created a network of Basic Health Units (BHUs) that provide free diagnosis of TB, directly observed therapy short-course (DOTS), and contact tracing, the programme coverage in rural areas is less than optimal (NTP, 2023).

Early identification of symptoms and timely reporting at healthcare centers is a critical factor in successful TB control. The cardinal and most sensitive symptom of pulmonary TB is prolonged cough-that is, cough that lasts more than two weeks (Duko et al., 2019). The delays in the perception of this symptom as a possible TB warning signal at the community level correlate directly with the prolonged period of infection, spread, and poor treatment outcomes (Bhatia et al., 2020). The research in the neighbouring nations and in the urban centres of Pakistan shows that inadequate TB

knowledge and stigma are independent barriers to seeking care (Arinaminpathy et al., 2023; Crisan-Dabija et al., 2020).

Regardless of these issues, there is limited rigorous community-based evidence based on rural South Punjab which is characterised by unique socioeconomic and cultural conditions. The limited KAP studies available on Pakistan have sampled mainly urban, hospital outpatients (Hussain et al., 2024), or students (Ali et al., 2019), which restricts the generalisability of the results to rural adults, who are the primary users of first-level BHU services. In addition, the joint evaluation of knowledge, attitude with stigma, and actual care-seeking intentions regarding BHUs has seldom been done in a combined way in the area.

The aim of the study was therefore: (1) to determine community levels of knowledge about TB including the presence of prolonged cough as a warning sign of TB; (2) to describe attitudes toward TB patients and attitudes towards stigma; (3) to measure the level of care-seeking including willingness to use BHU services; and (4) to identify sociodemographic and cognitive factors that influence BHU care-seeking and correct symptom recognition among rural adults in South Punjab.

2. Materials and Methods

2.1 Study Design and Setting

The community-based cross-sectional descriptive-analytic study was carried out between July and October 2024 in four rural districts of South Punjab Multan, Muzaffargarh, Lodhran, and Vehari. These districts were purposely chosen to be representative of the rural South Punjab epidemiological and socioeconomic environment high agricultural dependency, high poverty indices, and reported TB burden (above provincial average) (Punjab Health Department, 2023). The BHUs that serve all four districts fall under the Primary and Secondary Healthcare Department (P&SHD) of Punjab with all the facilities being required to offer free TB DOTS services.

2.2 Study Population and Sampling

The study population was permanent residents of the four study districts, rural union councils aged 18 years and above. People who had a specific, ongoing, diagnosis of TB were excluded to avoid the bias of unequal response. We stratified each district (by tehsil, sub-district) to use a multistage stratified cluster random sampling design. In every tehsil, a probability proportional to size (PPS) was used to randomly select union councils. Households in each of the chosen union councils were enumerated sequentially using community lists that were kept at BHUs. The Kish grid method was used to select one adult per household.

The sample size was estimated with the formula of estimating a population proportion: $n = z^2p(1-p)/d^2$, where $z = 1.96$ (95% confidence) and $p = 0.50$ (maximum variance; no previous estimate of this particular population), and $d = 0.05$ (margin of error). This yielded $n = 384$; which was adjusted by a design effect of 1.2 (cluster sampling) and an expected 10% non-response rate, the final target was 507, which was rounded to 500 participants due to logistical considerations (Fatima et al., 2014).

2.3 Data Collection Instrument

A questionnaire based on a structured interview was designed in English and was professionally translated to Urdu and back-translated to ensure conceptual similarity (WHO, 2020). The instrument consisted of four parts. Sociodemographic data (age, sex, education, occupation, income, district) were taken in section A. Part B determined TB knowledge with 10 items (dichotomous and multiple-choice) resulting in a knowledge score based on 10. Section C assessed attitudes such as stigma based on 8 Likert-scale items (strongly agree to strongly disagree) out of which a composite stigma score was obtained (range 8-40; high scores reflecting high stigma). Section D evaluated practices and care-seeking behaviour associated with TB, such as willingness to visit BHUs and previous health-seeking experiences.

The questionnaire was tested on 30 non-study participants in a non-study union council in Khanewal District and Cronbach alpha coefficients were obtained: knowledge section $\alpha = 0.74$; attitude section $\alpha = 0.81$; practice section 0.69-all were found to be acceptable-to-good internal consistency. In case of needed adjustments, required adjustments were carried out before final data collection.

2.4 Data Collection Procedures

Face-to-face interviews were carried out in the homes of the participants in the local language (Urdu/Seraiki) by eight trained field interviewers (four men, four women). All interviewers were at least a Bachelor of health sciences and had a two-day standardised training in the administration of instruments, participant engagement, informed consent, and quality of data. Supervisors checked the completeness and internal consistency of completed questionnaires on a daily basis. Re-administerment of a 10 percent random sample of the completed interviews was done to check the quality of data.

2.5 Ethical Considerations

The Institutional Review Board of the Nishtar Medical University, Multan and administrative permission were obtained and the ethical approval was taken by the IRB and the administrative permission was obtained by the District Health Officers of all the four study districts. All participants were informed and given written consent before the interview. Participants were told that they had right to withdraw without penalty. The anonymity was ensured with the help of participant codes. Questionnaires did not record any personally identifiable information.

2.6 Statistical Analysis

Data were recorded twice in EpiData 3.1 and then exported to IBM SPSS Statistics version 26.0 to analyse the data. Sample characterisation and KAP response summarisation were done using descriptive statistics frequencies and percentages of categorical variables; means and standard deviations of continuous variables. Bivariable chi-square (χ^2) tests were used to evaluate the relationship between sociodemographic variables and KAP outcomes. The variables with a significant value of $p < 0.20$ in bivariate analyses were inputted into two multivariate binary logistic regression models: Model 1 which included the outcome of willingness to seek care at a BHU with prolonged cough (yes/no), and Model 2 which included the outcome of correct identification of prolonged cough as a warning signal of TB (yes/no). Adjusted odds ratios (aOR) together with 95% confidence interval (CI) are provided. The Hosmer-Lemeshow test and Nagelkerke R^2 were used to determine model fit. $p < 0.05$ was used as the statistical significance.

3. Results

3.1 Sociodemographic Characteristics

Out of 507 households contacted, 500 adults were interviewed (response rate 98.6%). Table 1 shows the sociodemographic profile of the participants. The sample was almost balanced in terms of sex (49.6% males, 50.4% females). The largest age group was 30–44 years (35.6%), with a mean age of 38.7 ± 13.4 years. One-third (32.6%) had no formal education. Most (67.4%) of them earned less than PKR 30,000 (around USD 105) per month, indicating the largely low-income rural setting. The occupational group (37.2%), which was the largest, was composed of farmers and agricultural labourers, which is in line with the agrarian nature of the study area.

Table 1. Sociodemographic Characteristics of Study Participants (n = 500)

Variable	n	%	95% CI
Sex			
Male	248	49.6	45.3–53.9
Female	252	50.4	46.1–54.7
Age Group (years)			
18–29	112	22.4	18.8–26.4
30–44	178	35.6	31.5–39.9
45–59	143	28.6	24.8–32.7
≥60	67	13.4	10.5–16.8
Education Level			
No formal education	163	32.6	28.6–36.8
Primary (1–5)	134	26.8	23.0–30.9
Middle/Secondary (6–10)	127	25.4	21.7–29.4
Higher Secondary & above	76	15.2	12.1–18.7
Household Monthly Income (PKR)			
<15,000	148	29.6	25.6–33.8
15,000–29,999	189	37.8	33.7–42.1
30,000–49,999	107	21.4	17.8–25.4
≥50,000	56	11.2	8.5–14.4
District of Residence			
Multan	168	33.6	29.6–37.8
Muzaffargarh	142	28.4	24.5–32.6
Lodhran	112	22.4	18.8–26.4
Vehari	78	15.6	12.5–19.2
Occupation			
Farmer/Agricultural labourer	186	37.2	33.1–41.4
Homemaker	149	29.8	25.9–34.0
Daily wage/informal labour	98	19.6	16.2–23.4
Other	67	13.4	10.5–16.8

Total	**500**	**100.0**	—

Note: CI = confidence interval; PKR = Pakistani Rupee. Percentages may not sum to 100 due to rounding.

3.2 TB Knowledge

Table 2 presents the distribution of correct responses to TB knowledge items. The average score of knowledge was 5.03 ± 2.11 out of 10 which reflects moderate general knowledge with a large standard deviation. Most (79.6) were aware that TB can be cured when treated properly and 76.2% of them were aware that TB is a communicable disease. Nevertheless, there were considerable gaps: only 57.4% of participants were able to report a cough with a duration of two weeks and more as a warning of TB, which is of vital programmatic significance. Less than half (46.2) were aware of the fact that free TB treatment is available at BHUs and only 40.6% were aware that the treatment is a minimum of six months. Knowledge of drug-resistant TB was significantly low at 17.8%. Bivariate analysis indicated that there was a significant difference in all knowledge items based on the level of education ($p < 0.05$ across the board).

Table 2. Distribution of Responses to TB Knowledge Items (n = 500)

Knowledge Item	Correct n (%)	Incorrect n (%)	Don't Know n (%)	p*
TB is a communicable disease	381 (76.2)	73 (14.6)	46 (9.2)	<.001
TB is caused by a bacterium (M. tuberculosis)	214 (42.8)	167 (33.4)	119 (23.8)	.002
Cough lasting ≥2 weeks is a warning sign of TB	287 (57.4)	132 (26.4)	81 (16.2)	<.001
TB spreads through respiratory droplets/air	329 (65.8)	101 (20.2)	70 (14.0)	<.001
TB can be cured with proper medication	398 (79.6)	57 (11.4)	45 (9.0)	<.001
Treatment duration is at least 6 months	203 (40.6)	187 (37.4)	110 (22.0)	.018
Free TB treatment is available at BHUs	231 (46.2)	148 (29.6)	121 (24.2)	.004
DR-TB (drug-resistant TB) exists	89 (17.8)	243 (48.6)	168 (33.6)	.041
TB can co-exist with HIV/AIDS	118 (23.6)	201 (40.2)	181 (36.2)	.037
BCG vaccination protects against severe childhood TB	267 (53.4)	143 (28.6)	90 (18.0)	<.001
Mean knowledge score (out of 10)				5.03 ± 2.11

Note: *p-values from chi-square tests for variation across education groups; SA = Strongly Agree; A = Agree; N = Neutral; D/SD = Disagree or Strongly Disagree.

3.3 Attitudes Toward TB Patients and Stigma

Table 3 is the summary of attitudinal responses. Perceptions of stigma were common: 52.2% said they agreed or strongly agreed that a TB patient needs to be isolated by the family and 57.4% agreed or strongly agreed that neighbours would avoid a TB patient. More than half (57.4%), were embarrassed about the possibility of a family member having TB. Another indication of perceived quality differences was only 51.0% agreed or strongly agreed that BHUs could offer adequate TB care, and 73.4% preferred private providers to BHUs in treating the symptoms of TB. The average composite stigma score was 23.8 ± 5.6 out of 40 which showed moderate-high levels of stigma in the rural sample.

Qualitative investigating in interviews (as identified by field supervisors) showed that TB was generally linked with poverty, low moral character and divine punishment-cultural constructs that enhance stigma and deter revealing (Matakanye et al., 2021). Some of the female respondents added that the diagnosis of TB might threaten their or their children chances of

marriage, which is a strongly social impact of the disease in this regard.

Table 3. Attitudes Toward TB Patients and BHU Care-Seeking (n = 500)

Attitude Statement (5-point Likert scale)	SA n (%)	A n (%)	N n (%)	D/SD n (%)
Stigma & Social Attitudes				
A person with TB should be isolated from the family	94 (18.8)	167 (33.4)	89 (17.8)	150 (30.0)
I would be embarrassed if a family member had TB	108 (21.6)	179 (35.8)	74 (14.8)	139 (27.8)
TB patients are responsible for getting sick	61 (12.2)	128 (25.6)	97 (19.4)	214 (42.8)
Neighbours would avoid a TB patient	132 (26.4)	211 (42.2)	68 (13.6)	89 (17.8)
Healthcare & BHU Attitudes				
BHUs can provide adequate TB care	87 (17.4)	168 (33.6)	109 (21.8)	136 (27.2)
I would prefer a private doctor over a BHU for TB symptoms	203 (40.6)	164 (32.8)	67 (13.4)	66 (13.2)
Free government TB treatment is effective	96 (19.2)	174 (34.8)	118 (23.6)	112 (22.4)
Distance to BHU is a barrier to seeking care	178 (35.6)	198 (39.6)	64 (12.8)	60 (12.0)

Note: SA = Strongly Agree; A = Agree; N = Neutral; D/SD = Disagree or Strongly Disagree.

3.4 TB-Related Practices and Care-Seeking Behaviour

Table 4 describes TB practices. Although the proportion of those who said that they would seek care when a cough persisted beyond two weeks was 63.2 percent, only 38.6 percent said they would go to a BHU as their initial resort- the others would go to any private clinic, traditional healer, or at home. The use of home remedies was also very common: 66.2% of them said that they would use home remedies to get rid of a persistent cough, and then they would consult formal care. Out of 267 respondents who had visited a doctor within the past 12 months to take care of a respiratory illness, only 36.7% of them visited a BHU first.

More protective practices were more welcoming: 72.8% of them said that they opened their windows on a regular basis to ventilate their homes, and 68.2% would advise an infected family member to test with TB. Nevertheless, only a quarter of them (28.4%) were informed about using sputum in the diagnosis of TB. Forty-four point eight percent of those who sought care reported a care-seeking delay of more than two weeks since the onset of cough- an announcement of a delay of care-seeking that is congruent with accepted definitions of patient delay in tuberculosis care-seeking (Alsaleh et al., 2023).

Table 4. TB-Related Practices and Care-Seeking Behaviour (n = 500)

Practice / Behaviour	Yes n (%)	No n (%)	χ^2 (p-value)
Symptom Recognition Practices			
Would seek care if cough persists >2 weeks	316 (63.2)	184 (36.8)	28.4 (<.001)
Would go to BHU first for prolonged cough	193 (38.6)	307 (61.4)	18.7 (<.001)
Would first try home remedies for a cough	331 (66.2)	169 (33.8)	32.1 (<.001)
Would cover mouth while coughing/sneezing	287 (57.4)	213 (42.6)	9.8 (.002)
Past Health-Seeking Behaviour			
Sought care for respiratory illness in past 12 months	267 (53.4)	233 (46.6)	—
Among those who sought care: visited BHU first	98 (36.7)	169 (63.3)	14.2 (<.001)
Among those who sought care: visited private clinic first	138 (51.7)	129 (48.3)	—
Delayed care >2 weeks after onset of cough	224 (44.8)	276 (55.2)	11.6 (.001)
Preventive Practices			
Opens windows regularly for ventilation	364 (72.8)	136 (27.2)	—

Knows about and uses sputum collection for TB diagnosis	142 (28.4)	358 (71.6)	22.3 (<.001)
Would encourage a coughing family member to test for TB	341 (68.2)	159 (31.8)	16.8 (<.001)

Note: χ^2 = chi-square statistic; p-values from chi-square tests of independence.

3.5 Predictors of BHU Care-Seeking and Symptom Recognition

Table 5 shows the outputs of multivariate logistic regression analyses. For the outcome of willingness to seek care at a BHU first, five independent predictors were identified: secondary or higher education (aOR 1.89, 95% CI 1.31–2.73, p = .001), high TB knowledge score ≥7/10 (aOR 2.97, 95% CI 1.98–4.45, p < .001), low stigma perceptions (aOR 2.31, 95% CI 1.57–3.40, p < .001), proximity to BHU (aOR 1.94, 95% CI 1.33–2.84, p = .001), and any prior BHU utilisation (aOR 1.73, 95% CI 1.19–2.52, p = .004). The model accounted 34% of the variance (Nagelkerke R 2 = 0.34) and had sufficient calibration (HosmerLemeshow 2 = 8.7, p =.37).

For the outcome of correctly recognising prolonged cough as a TB symptom, secondary or higher education (aOR 2.51, 95% CI 1.72–3.66, p < .001), prior exposure to TB health messaging (aOR 1.98, 95% CI 1.36–2.89, p < .001), and a history of TB in the household (aOR 2.86, 95% CI 1.67–4.90, p < .001) were significant predictors. Adjustment Sex, age, occupation and district of residence were not significantly independent in either model.

Table 5. Multivariable Logistic Regression: Predictors of BHU Care-Seeking and Symptom Recognition

Predictor Variable	cOR (95% CI)	aOR (95% CI)	p-value	Nagelkerke R^2
Outcome: Willingness to seek care at BHU				
Sex (Female vs Male)	1.23 (0.87 – 1.74)	1.18 (0.81 – 1.72)	.39	—
Age ≥45 years vs <45	0.81 (0.58 – 1.14)	0.76 (0.53 – 1.08)	.12	—
Education ≥ Secondary vs lower	2.14 (1.52 – 3.01)	1.89 (1.31 – 2.73)	.001	—
Income ≥30,000 PKR vs lower	1.76 (1.22 – 2.54)	1.61 (1.09 – 2.38)	.017	—
High TB knowledge score (≥7/10)	3.42 (2.33 – 5.03)	2.97 (1.98 – 4.45)	<.001	—
Low stigma perception score	2.67 (1.84 – 3.88)	2.31 (1.57 – 3.40)	<.001	—
Distance to BHU ≤5 km	2.09 (1.46 – 2.99)	1.94 (1.33 – 2.84)	.001	—
Prior BHU visit (any reason)	1.88 (1.31 – 2.69)	1.73 (1.19 – 2.52)	.004	—
Overall model fit	—	—	<.001	0.34
Outcome: Correct recognition of prolonged cough as TB symptom				
Education ≥ Secondary vs lower	2.88 (2.01 – 4.13)	2.51 (1.72 – 3.66)	<.001	—
Exposure to TB health messaging	2.19 (1.53 – 3.13)	1.98 (1.36 – 2.89)	<.001	—
Prior TB case in household	3.17 (1.89 – 5.32)	2.86 (1.67 – 4.90)	<.001	—
Overall model fit	—	—	<.001	0.29

Note: cOR = crude (unadjusted) odds ratio; aOR = adjusted odds ratio; CI = confidence interval. Reference categories: Male (sex), Age <45 years, Education below secondary, Income <30,000 PKR. Hosmer-Lemeshow test p > .05 for both models indicating adequate calibration.

3.6 Summary of Findings: Visualised

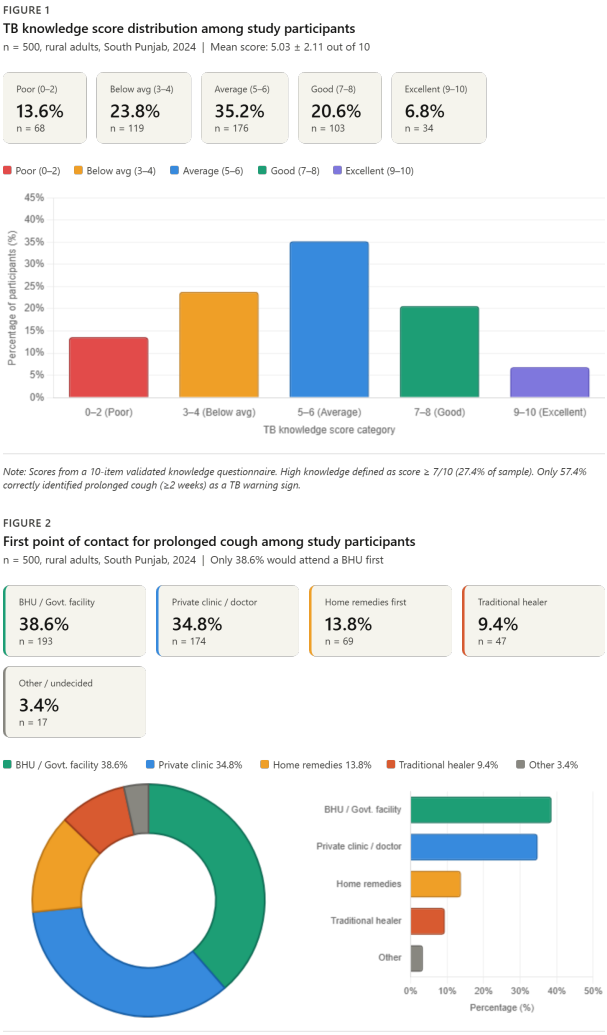

Figure 1 — A coloured bar chart of the complete distribution of the TB knowledge scores in five categories (Poor → Excellent). The most common modal category is Average (56), which was the result of 35.2% of the participants, and only 6.8% of participants scored Excellent. The distinctly coloured bars, as well as the hovering, display both the percentage and the absolute numbers.

Figure 2 — A dual-panel visualisation of the preferred first point of contact of prolonged cough with the inclusion of a donut chart and horizontal bar chart. Notable implication: 38.6% (n=193) would visit a BHU initially, 34.8% would visit a private clinic, and 13.8% would attempt home treatment initially, which has direct implications on the design of TB programmes.

4. Discussion

The study presents a detailed community-based data on KAP of a population that is usually underrepresented in TB research, rural adults in South Punjab, Pakistan. We find that the constellation of knowledge deficiencies, attitudes with stigma, and existence of suboptimal care-seeking practices are all significant barriers to TB control in this high-burden environment.

4.1 Knowledge of TB and Symptom Recognition

The average knowledge of 5.03 out of 10, depicts that there is moderate level of TB awareness in this rural population. This number is congruent with, but slightly lower, than estimates of rural Pakistan (5.7/10; Liaqat et al., 2020) and rural India (5.4/10; Shah et al., 2020), and still significantly lower than scores in urban Pakistani populations (6.8/10; Siddiqui et al., 2019). The disparity highlights the urban-rural disparity in health literacy and the weak infiltration of TB awareness initiatives into rural areas.

Importantly, a warning sign of TB (prolonged cough (≥2 weeks) was identified by only 57.4% of the participants properly. This observation is disturbing considering that the cardinal symptom in community-level TB case finding, the foundation of the symptom-based screening in the DOTS programme in Pakistan, is prolonged cough (NTP, 2023). Low rates of symptom recognition have been reported in the rural sub-Saharan African context (Ross et al., 2021) and in other South Asian settings (Ngamvithayapong-Yanai et al., 2019), indicating that poor symptom knowledge is not specific to the Punjab but needs to be addressed. One of the most interesting results was a very low level of awareness about drug-resistant TB (17.8%), as well as the accessibility of free treatment at BHUs (46.2%). Such loopholes can be disastrous: the patients who do not know about free services provided in the country can get pricier or worse quality of care in a private clinic, raising the out-of-pocket expenses and causing the inability to complete the treatment, which are the two factors contributing to drug resistance (Loh et al., 2023).

4.2 Attitudes and Stigma

Our data indicate that the rates of stigmatising attitudes are high: more than half of the respondents supported the idea of social isolation of TB patients, and the same percentage expressed their personal embarrassment. The results are highly reminiscent of the wider body of literature about TB stigma in South Asia. A systematic review by Ay and Hidiroglu (2021) established that stigma about TB in low-income contexts was related to several interacting factors, which included fear of contagion, moral blame, poverty-related association, and implications to social identity, which resonated with qualitative data of our field supervisors. The correlation of TB to poverty and moral ineptitude in this paper recapitulates the results of Muzaffargarh District specifically (Ali et al., 2019) and rural Balochistan (Liaqat et al., 2020). These associations may establish strong disincentives to disclosure and care-seeking, especially in women and younger adults where TB diagnosis has potential implications on marriage

prospects - a result that is congruent with Hays (2023), who reported the gendered aspects of TB stigma in Pakistani settings. The fact that the proportion of preference towards private providers (73.4%) is significantly higher than that of BHUs (free care) indicates that the latter do not only face stigma issues (whereby anonymity in a private clinic might save identity) but are also perceived as having a better quality, behaviour, and waiting time (Luba et al., 2019). Such a preference is a well-reported trend in the healthcare environment in Pakistan (Abu-Humaidan et al., 2022) and is a structural issue that is not confined to TB control.

4.3 Care-Seeking Practices and BHU Utilisation

The fact that at most, 38.6% of the respondents would attend a BHU when they had prolonged cough, and 44.8% of those who sought care took over two weeks to seek care is very alarming. Patient delay is a vital factor in TB transmission and outcomes because it is defined as the period between onset of symptoms and the initial healthcare visit (Datiko et al., 2020). The national data of Pakistan indicate that median patient delay in TB diagnosis in Pakistan is more than 4 weeks in rural areas, which is not different than our results (NTP, 2023).

The pre-eminent position of home remedies (reported 66.2%) as the initial response to chronic cough is also reported in rural South Asia. In a rural Maharashtra study, Chowdhury & Turin (2020) established that more than three-quarters of TB patients used herbal or traditional remedies in the pre-formal care phase, which is related to both cultural familiarity and the non-specific nature of initial TB symptoms. In our context, these delays are enhanced by the fact that mass media TB campaigns have a low level of access to rural homes with lower literacy levels.

The significant independent relationship between previous BHU utilisation and desire to receive future care at BHUs (aOR 1.73) is consistent with the health systems evidence that familiarity and previous positive experience are strong determinants of facility-level trust (Ramadhany et al., 2020). This indicates that measures to enhance the use of BHUs as a means of addressing any health problem- not just TB- can have a spillover effect on seeking care in TB.

4.4 Determinants of Positive Outcomes

Education was found to be one of the most powerful independent predictors of both correct symptom recognition (aOR 2.51) and BHU care-seeking (aOR 1.89). This aligns with the literature which has revealed that health literacy which is closely related to formal education enables the understanding of disease aetiology, symptoms and services available better (Nutbeam, 2008). This result in the situation in Pakistan, where 32.6% of our rural sample did not receive any formal education, highlights the inter-sectoral role of educational investment as a contributor to the outcome of public health (Hussain et al., 2024).

High TB knowledge (aOR 2.97) was the strongest independent predictor of BHU care-seeking, highlighting that effective, understandable health education can have a significant impact on care-seeking intentions. Health messaging related to TB was also a powerful predictor of accurate symptom recognition (aOR 1.98) -a result that directly informs programme strategy: increased community-level awareness initiatives, especially through credible channels like Lady Health Workers (LHWs) and community mosques, will probably lead to quantifiable benefits.

The high negative correlation between stigma and the BHU utilisation (low stigma aOR 2.31 of BHU care-seeking) highlight the fact that knowledge is not sufficient but that the attitudes need to be altered with the information provision. TB stigma-reduction interventions have been found to be effective where advocates involved include community leaders, religious leaders, and recovered TB patients (Chen et al., 2021). The Lady Health Worker programme of Pakistan has a strong community base and it is an under-explored channel to deliver stigma-reduction messages.

4.5 Limitations

There are a few shortcomings that should be mentioned. First, the cross-sectional design does not allow making causal conclusions; there is no possibility to determine the time-correlation of determinants and outcomes. Second, over-reporting of protective measures like mask use and window ventilation might have been caused by social desirability bias. Third, the study districts were chosen to be representative of rural South Punjab, so the results may not be generalised to other provincial settings that have a different cultural and geographic setting. Fourth, the graphical forms are not used to present the figures; instead, the text form is used, which can be considered a methodological limitation of the present form of document preparation. Lastly, the qualitative depth was restricted to field supervisor notes and was not a systematic in depth interview which would have contributed to a more thorough comprehension of stigma mechanisms.

5. Conclusions and Recommendations

The research reports substantial and clinically relevant knowledge gaps in TB, high levels of stigmatization, and sub-optimal care-seeking behavior of the rural adults in South Punjab. Only one out of five (57.4%) would recognise prolonged cough as a TB warning, only one out of every three (38.6%) participants would present himself to a BHU first, and stigmatising attitudes were experienced by over half of the study participants. Positive intentions of seeking care were independently linked with higher education, increased TB knowledge, reduced stigma, proximity to BHU and previous experience at BHU. It is on the basis of these findings that the following programme recommendations are suggested. Firstly, the NTP Punjab

needs to step up its community based TB education initiatives with a clear focus on the need to identify prolonged cough as a TB symptom, free treatment offered at BHUs and the need to complete the full course of treatment. New training modules with these messages should be provided to Lady Health Workers and community health volunteers. Second, stigma-reduction has to be incorporated as an essential part of TB control strategy, and religious leaders, community elders, and TB champions (recovered patients) should be involved in altering the community discourse on TB. Third, the quality of BHU services should be enhanced, such as with shorter waiting time, a promise of drug availability, and a respectful attitude towards the patient and the provider to change the preferences of the population towards the private provider. Fourth, population with low literacy and mobility should be accessed through digital health tools (SMS reminders, community radio spots). Fifth, a longitudinal follow-up study is suggested to evaluate whether the introduction of targeted interventions alters KAP results in the long run and results in the earlier diagnosis and higher rates of successful treatment.

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