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Tuberculosis Knowledge, Perceived Stigma and Diagnostic Delay Intention among Residents of High-Density Urban Communities in Bangladesh

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ABSTRACT

Tuberculosis remains a major public health concern when people postpone professional assessment after noticing possible symptoms. The relationship between perceived knowledge about TB, expected TB stigma, perceived benefits of early assessment, and access barriers with intention of delay in TB diagnosis was explored in this study. The 610 adults who participated in a cross-sectional survey were analysed using PLS-SEM. The indicator loadings, internal consistency, convergent and discriminant validity of the measurement model were good. Perceived TB knowledge decreased anticipated stigma and directly decreased intention of diagnostic delay and increased perceived benefits of early TB assessment. Intention to delay was greater for anticipated stigma and less for perceived access barriers, and greater for less perceived benefits of early assessment. The variance in the outcome variable, diagnostic delay intention, accounted for by the structural model was 33.7%. Perceived knowledge of TB also had a strong indirect effect on delay intention through anticipated stigma, suggesting that knowledge may affect delay not only directly but also indirectly by reducing the perceived stigma. Results indicate that the diagnostic delay intention can be influenced by both cognitive and social-practical mechanisms. Public health response should therefore centre on having clear information about TB, reducing stigma, improving the process of communication about the importance of seeking early care and action, and improving accessibility of TB services such as diagnostic services in dense urban settings.

INTRODUCTION

Tuberculosis (TB) continues to be a public health problem and successful TB control is dependent on the availability of diagnosis and treatment, but also on the need for people to seek assessment in time. Delayed assessment may increase the time that an infectious person has undiagnosed disease, the time the person is in need of treatment and the time symptoms become more severe (Thomas *et al.*, 2022). These are especially relevant in the context of urban areas, where the density of population and the frequency of inter-personal contacts, the limited space available for living and working and the pressure of work, and the inequity in the availability of services can converge. Knowing the motivations behind weighing up whether to undergo diagnostic evaluation at a later point in time is therefore crucial for the creation of responsive TB communication and service strategies (Fontes *et al.*, 2023).

Delay in diagnosis are usually caused by more than one thing. Symptoms that may occur will be understood in the light of what people already know, their social context, their beliefs as to the value of care, and the ability to access diagnostic services. Someone might feel that they have a cough or other symptoms that need medical attention, but fear the reaction from neighbors, employers or family members (Kumar Bochiwal *et al.*,

2022). A person might agree the need for evaluation and put it off due to the burdens of traveling, loss of time at work, family duties or costs of testing. Therefore, it is important to investigate the phenomenon of diagnostic delay on a multi-dimensional level as a behavioural result and not simply as a lack of knowledge (Kallepalli *et al.*, 2023).

While knowledge is the key element in TB control, factual awareness of TB is not the same as perceived knowledge. Factual knowledge reflects whether a person is able to correctly identify information about transmission, signs, symptoms, treatment and the importance of professional assessment. Perceived TB knowledge is how someone believes they know about TB such as their confidence in being able to identify symptoms and understand the importance of assessment and access to reliable information. There is a distinction between factual knowledge score, which can express what is known correctly, and perceived knowledge score which can function as a behavioural construct, that is, a construct that determines one's beliefs and intentions. These dimensions also prevent right-or-wrong questions from being assigned to a reflective latent construct.

Another important mechanism is stigma. TB can bring with it fears of social criticism, social withdrawal, damage to reputation, and repercussions for relatives.

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When diagnostic services are available, a person who has expected a negative response may wish to postpone assessment to prevent disclosing or suspicions. The expected stigma is likely to have a strong influence on the high-density communities where there are many people around, and neighbors tend to monitor each other's mobility, and social relations are closer. The 'sick-as-a-dog' stigma can affect behaviour even prior to diagnosis (Ryckman *et al.*, 2023).

Perceived benefit of early assessment is another motivational avenue. People are more likely to take prompt action if they feel that early evaluation of the symptoms could be of benefit in helping to understand what is going on, to help with access to the right care, inform their decision making and could still be valuable even if they are continuing to do most of their daily activities. Access barriers may exist on a practical level, irrespective of knowledge and motivation. Residents can be informed about TB and appreciate the assessment, but the time and transportation, work, household responsibilities, costs, or making the appointment to access an appropriate service may be difficult.

The integrated framework was developed and tested in the current study. The study highlights the intention for diagnostic delay and perceived barriers to seeking care, perceived benefits of early TB evaluation, perceived access, perceived TB knowledge, and anticipated TB stigma through the application of partial least squares structural equation modelling (PLS-SEM). An independent 5 item factual knowledge-check is used to yield a descriptive measure of objective TB knowledge. The study measures six direct pathways and one mediation pathway and separates what residents feel they know from what they feel socially and what they feel is good, what are the practical obstacles they foresee, and if they would be looking to postpone assessment (Yunita *et al.*, 2025).

The present study enters the contribution that it is not a measure of delay but stated intention to delay in a hypothetical symptom scenario. It also distinguishes the factual and perceived knowledge and checks whether the anticipated stigma is a mediator or not. This would then enable analysis to see if there is any relationship between perceived knowledge and delay intention, mediated in part by the decrease of stigma related concerns. The evidence that ensues can help design TB interventions that simultaneously target information, social acceptance, perceived value and access conditions.

LITERATURE REVIEW

Perceived TB Knowledge and Behavioural Response

Perceived TB knowledge is the confidence of the individual that they know how TB is transmitted, what signs they would look for would trigger TB assessment, the need for professional confirmation, and sources of reliable information regarding TB (Chaudhary & Singh, 2022). This perception of understanding can influence behaviour as it allows informed people to have greater

clarity on uncertainty and have an informed sense of what the implications of inaction or delay might be. Hence, perceived knowledge is likely to elicit timely professional care (Amin *et al.*, 2023).

Knowledge can also be influential to social understanding. Not understanding TB can foster fear, misconceptions about transmission, and the view of TB as a socially threatening or shameful condition (Janah *et al.*, 2022). These concerns may be decreased by improved perceived knowledge of the disease making it more understandable and manageable. If there is increased awareness of TB treatment and the clinical role of assessment, this could make people less likely to anticipate negative social responses (Noman *et al.*, 2023).

H1: Perceived TB knowledge is negatively associated with anticipated TB stigma.

Perceived TB Knowledge and Perceived Benefit of Early Assessment

Knowledge can reinforce the perception of the benefit of early assessment. People that know that their symptoms cannot be used to diagnose TB without professional judgment are more likely to appreciate the need for diagnostic clarity (Aryani, 2021). They may also value the knowledge that having them assessed promptly can result in suitable care and information pertinent to safeguarding close contacts. Perceived knowledge, thus, can be said to give a mental underpinning to the benefits of action taken before symptoms are serious (Adiutama *et al.*, 2021).

H2: Perceived TB knowledge is positively associated with the perceived benefit of early assessment.

Perceived TB Knowledge and Diagnostic Delay Intention

It is also expected that there will be a direct relationship between perceived knowledge and delay intention. People living in the community who have the ability to identify symptoms that are relevant to them should not have too many informational reasons for delaying professional assessment (Nuttall *et al.*, 2022). Knowledge can decrease the uncertainty of what to do, where and how to get information, and why waiting might not be appropriate. But knowledge does not necessarily remove social and/or practical barriers. The proposed direct path is thus its 'pure' contribution, once stigma, perceived benefits and access barriers are taken into account (Ningsih *et al.*, 2022).

H3: Perceived TB knowledge is negatively associated with diagnostic delay intention.

Perceived TB stigma and TB diagnostic delay intention

Expected stigma is the stigma that a person thinks might occur if they were seeking evaluation for TB. That means thinking about judgment, avoidance, how treated in social situations, and potential repercussions for family members. These expectations may have an impact even prior to diagnosis. Asking to be assessed can be a warning

sign of possible TB and some people may choose to ignore that sign and not seek care (Platini & Maulana, 2023).

Especially in highly populated areas, it could be important how visible a person's health seeking behaviour is within their social circle. Residents' concerns about confidentiality or reputation may be more prominent if they have regular interaction with neighbours and local networks (Hutagalung *et al.*, 2022). This potential stigma may develop a psychological impact on the diagnostic evaluation process as well. The model predicts that stigma will produce a greater delay.

H4: Anticipated TB stigma is positively associated with diagnostic delay intention.

Perceived Benefit of Early Assessment and Diagnostic Delay Intention

Perceived benefit of early assessment reflects how much people are willing to consider and agree with the usefulness and value of early professional evaluation and for making the right decisions. This is because individuals might accept symptoms as long as they are able to work or perform daily activities (Darise *et al.*, 2023). A positive experience of benefit may provide a catalyst for de-emphasis from functioning to diagnostic knowledge and prompt action.

If one knows that the evaluation of early success can be of benefit, then waiting is less desirable. People can be aware that it is useful for assessment to help them understand if symptoms are TB or caused by other illnesses, allow for appropriate care and also make informed protection decisions about close contacts (Herawati *et al.*, 2020).

H5: Perceived benefit of early assessment is negatively associated with diagnostic delay intention.

Perceived Access Barriers and Diagnostic Delay Intention

Access barriers are the obstacles to turning intent into action. The framework takes into account the travel and service attendance times, work or household chore disruption, anticipated travel or service cost, and service attendance time difficulty. These are conceptually separate from attitudes towards TB (Sajodin *et al.*, 2022). An individual can know what to do and be willing and motivated to do it but still think that assessment is hard to organise.

Practical obstacles can promote deferral for increased cost to obtain care. Being absent from work can diminish income, and household activities, travel and waiting time can compete with other tasks. Thus, access barriers are modeled as a positive predictor of delay intention (Elebesunu *et al.*, 2022).

H6: Perceived access barriers are positively associated with diagnostic delay intention.

Mediating Role of Anticipated Stigma

The theory also posulates part of the effect that expected stigma has on the intention to delay a TB

diagnosis. Anyhow, perceived knowledge can decrease misconceptions and uncertainty, which can decrease expectations of judgement or avoidance. Expected stigma can be lowered, and social costs of seeking assessment lowered. This pathway suggests that knowledge can affect delay by acting via a direct cognitive pathway, but also a social-psychological pathway (Anjelina *et al.*, 2022).

The direct path PTK–DDI is kept, since knowledge can have an impact on decisions many ways. If there were a significant indirect effect in addition to the direct effect, then it would signify that expected stigma accounts for only a portion of the association (Lepuen *et al.*, 2020).

H7: The relationship between perceived TB knowledge and intention for TB diagnostic delay will be mediated by the anticipated TB stigma; the mediation effect of TB stigma will be negative.

Conceptual Framework

The conceptual model considers the perceived TB knowledge as an upstream construct. It is supposed to decrease the expected stigma, increase the perceived benefit of early assessment and directly decrease the diagnostic delay intention. Delay intention is expected to grow with anticipated stigma, and to decrease with perceived benefit. As an extra positive predictor, perceived access barriers are modelled. The mediation pathway through which perceived knowledge to delay intention is manifested is mediated by anticipated stigma (Yasobant *et al.*, 2023). Hence, it is an explanation that is both cognitive, social, motivational and pragmatic, using a structural framework where the main endogenous output is the intention to delay diagnosis.

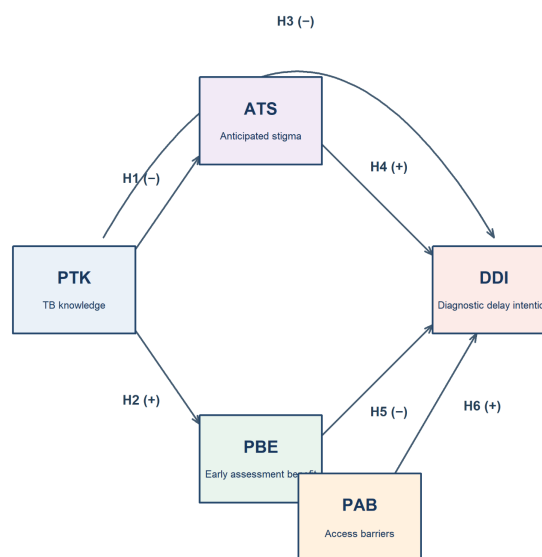


Figure 1: Conceptual framework and hypothesised relationships.

MATERIALS AND METHODS

Study Design and Participants

This study used a cross-sectional survey design to investigate factors affecting the intention to delay diagnosis among urban dwellers in high density community in

Bangladesh. Eligible participants were members of the selected community aged 18 years and older who had resided within the community for six months or more. There were 610 respondents in the analytical dataset. This questionnaire covered a scenario where TB symptoms may occur and the possibility for a professional assessment (Chen, 2023). The outcome is thus an expression of intention to delay, and not necessarily of actual time to diagnosis.

Age group, gender, education, occupation, household income, length of residence, past history of TB and knowledge about where one could get TB assessment was documented in the background section. The previous existence of a TB diagnosis was considered background information, not as a reason for exclusion. Participation was optional. The questionnaire did not ask respondents to give their name and participants were able to skip some questions or to end their participation. Responses were meant to be analyzed as a group.

Measurement Instrument

There were 5 TB factual check items and 5 PLS-SEM reflective constructs. The knowledge item required selecting a yes, a no and a do not know for statements regarding transmission, symptoms, the certainty with symptoms alone, treatability and consulting a professional. Each question yielded a score of 1 for correct answers, and 0 for incorrect or “do not know” answers, with the sum of the scores ranging from 0 to 5. This score was descriptive and not used as a reflective latent construct (Moura & Neves, 2025).

All PLS-SEM section questions were measured on a 5-point agreement scale (1 = strongly disagree, 5 = strongly agree). Four items assessed Perceived TB Knowledge (PTK): understanding of how TB is transmitted, symptom recognition, seeking professional evaluation, and access to reliable information on TB. Expected judgement, avoidance, discomfort about neighbours finding out about assessment, and concern about impacts on family were assessed in four items on anticipated TB stigma (ATS). Perceived Benefit of Early Assessment (PBE) was comprised of four items related to diagnostic clarification, access to appropriate care, protection of close contacts, and the value of early clarification. Four PAB items focused on time, work or household duties, cost and problems arranging a diagnostic appointment. Items pertaining to Diagnostic Delay Intention (DDI) included four scenario-based items that included postponement, waiting for symptoms to get better, delaying until daily life was affected, and delaying despite being aware of possible TB (Emon, 2024).

Analytical Strategy

To investigate measurement and structural models, partial least squares structural equations model (PLS-SEM) was employed. Analysis started with descriptive statistics of the sample, factual knowledge check, and construct scores. Next, indicator loadings, Cronbach’s

alpha, composite reliability, average variance extracted, and heterotrait-monotrait ratios were used to assess the quality of the measurements. These measures were used to test reliability, convergent validity, and distinguish the five constructs in the reflective indicators. Indicator loadings were examined at the item level and reliability statistics, at the construct level (Earley, 2023). The average variance extracted was used to check if sufficient variance was captured by each construct’s indicators, and HTMT ratios were employed to check if conceptually different constructs remained separable on an empirical level.

Inner VIFs of the structural model were examined for problematic collinearity among predictors. Six hypothesised direct path coefficients were then estimated. Bootstraps of 5,000 resamples were used for statistical inference. Each direct effect was estimated and presented as a standardised path coefficient, a bootstrap standard error, a t value, a two-sided bootstrap p value and a percentile 95% confidence interval. When the estimated effect was in the direction of the proposed hypothesis and the confidence interval using the bootstrap did not contain zero, the hypothesis was considered as supported (Chen, 2023).

To examine the explanatory power of the model, R-squared and adjusted R-squared values for the endogenous constructs were used. These statistics were not taken to reflect a true sense of the accuracy of the prediction but rather variation explained by the given predictors. Effect sizes were computed as well to illustrate which individual predictors contributed to a percentage of the explained variance. Lastly, because of the issue of anticipated stigma, the indirect effect of PTK on DDI through ATS was examined. The direct path from PTK to DDI was also kept in the mediation test to assess the indirect mechanism on the assumption of no complete mediation.

Analytical Interpretation

Interpretation was association based and not causal. This distinction is crucial since all variables were assessed within a single cross-sectional survey and the behaviour that was measured was an intention. Thus, the model can be used to identify systematic relationships among the perceived knowledge, anticipated stigma, perceived benefits, access barriers and stated delay intention, but not to find out which gives rise to another or determine the real diagnostic delay in days. This conservative interpretation is maintained throughout the results and discussion (Zhang & Chen, 2022).

RESULTS AND DISCUSSION

Respondent Characteristics

The analytical sample included 610 respondents. The age category distribution was wide, the highest being for 55 years or older and the lowest being 35-44 years. Responses for gender were spread evenly between woman, man, other description and prefer not to say. The educational levels were either no education, or education up to university or higher. Occupational and/or household-

income categories also varied. Nearly two thirds were aware of the place to seek TB assessment in or near their area, and most respondents reported that they were not previously diagnosed with TB.

Table 01: Sociodemographic Characteristics of Respondents

Variable	Category	Frequency	Percentage
Age Group	18–24	113	18.52
Age Group	25–34	129	21.15
Age Group	35–44	109	17.87
Age Group	45–54	119	19.51
Age Group	55 or older	140	22.95
Gender	Another description	158	25.90
Gender	Man	152	24.92
Gender	Prefer not to say	147	24.10
Gender	Woman	153	25.08
Education	Higher secondary	126	20.66
Education	No formal schooling	113	18.52
Education	Primary	125	20.49
Education	Secondary	104	17.05
Education	University or above	142	23.28
Occupation	Daily wage work	83	13.61
Occupation	Homemaking	92	15.08
Occupation	Other	88	14.43
Occupation	Salaried work	81	13.28
Occupation	Self-employed	89	14.59
Occupation	Student	94	15.41
Occupation	Unemployed	83	13.61
Household Income BDT	15000–29999	111	18.20
Household Income BDT	30000–49999	108	17.70
Household Income BDT	50000–79999	96	15.74
Household Income BDT	80000 or above	107	17.54
Household Income BDT	Below 15000	95	15.57
Household Income BDT	Prefer not to say	93	15.25
Residence Duration	1–3 years	136	22.30
Residence Duration	4–6 years	150	24.59
Residence Duration	6–11 months	173	28.36
Residence Duration	More than 6 years	151	24.75
Previous TB Diagnosis	No	565	92.62
Previous TB Diagnosis	Prefer not to say	13	2.13
Previous TB Diagnosis	Yes	32	5.25
Knows Assessment Location	No	117	19.18
Knows Assessment Location	Unsure	103	16.89
Knows Assessment Location	Yes	390	63.93

As can be seen from Table 1, one can say that the sample did not necessarily have to be concentrated in a single demographic and socio-economic profile. Each age group constituted approximately 20% of the sample. The level of education was also widely distributed with 23.28% having university education or higher and 18.52% having no formal education. There was also a balance in

the number of occupations. 5.25% reported having been diagnosed with TB in the past. Important point is that, 63.93 % knew, 36.07 % did not know or were not sure where a TB assessment could be obtained. This residual uncertainty of service location is relevant because of two things: perceived knowledge and practical access are key factors in the structural model.

Tuberculosis Knowledge Check

We found moderate rather than uniformly high TB

knowledge in the factual knowledge results. The percentage of correct responses for each item was between 50.98%

Table 2: Responses to the Tuberculosis Knowledge Check

Item	Correct n	Correct percent	Mean	SD	Minimum	Maximum
KQ1	317	51.97				
KQ2	315	51.64				
KQ3	342	56.07				
KQ4	311	50.98				
KQ5	352	57.70				
Total knowledge score			2.68	1.24	0	5

and 57.70%. The mean for the overall score was 2.68 of 5 possible points, and was standard deviation = 1.24. This shows that there is significant variation in terms of objective knowledge among the respondents. The outcome also confirms the distinction of the factual knowledge and perceived knowledge in PLS-SEM model. When the number of answers that respondents were objectively

correct was small, they may have been equally uncertain about their knowledge about TB.

Descriptive Statistics of the Constructs

The mean construct score was near the middle of the 5-point range. PTK had a mean of 3.048, PBE 3.038, ATS 3.007, PAB 2.993, and DDI 2.990. Standard deviations varied

Table 3: Descriptive Statistics of the Study Constructs

Construct	N	Mean	SD
PTK	610	3.048	0.726
ATS	610	3.007	0.688
PBE	610	3.038	0.75
PAB	610	2.993	0.694
DDI	610	2.99	0.696

from 0.688-0.750. The descriptive results thus indicate no extremely high (or low) endorsement of any construct, on average. However, the respondents' answers were at a moderate level and varied enough for structural analysis. This design makes the relationships between the path especially revealing, as the model assesses the systematic

effect of differences between survey respondents on the diagnostic delay intention (Janah *et al.*, 2022).

Measurement Model Assessment

The measurement model showed good performance. All loadings of indicators were greater than 0.82, varying from

Table 4: Indicator Loadings, Internal Consistency, and Convergent Validity

Construct	Indicator	Loading	SD	Minimum	Maximum
PTK	PTK1	0.857	0.874	0.914	0.726
PTK	PTK2	0.844			
PTK	PTK3	0.871			
PTK	PTK4	0.835			
ATS	ATS1	0.832	0.865	0.908	0.712
ATS	ATS2	0.855			
ATS	ATS3	0.862			
ATS	ATS4	0.826			
PBE	PBE1	0.865	0.891	0.924	0.753
PBE	PBE2	0.865			
PBE	PBE3	0.88			
PBE	PBE4	0.86			
PAB	PAB1	0.823	0.872	0.912	0.722
PAB	PAB2	0.852			
PAB	PAB3	0.878			
PAB	PAB4	0.844			
DDI	DDI1	0.836	0.862	0.906	0.706
DDI	DDI2	0.844			
DDI	DDI3	0.852			
DDI	DDI4	0.83			

0.823 to 0.880. Cronbach's alpha values varied from 0.862 to 0.891 and composite reliability varied from 0.906 to 0.924. The average of variance extracted differed between 0.706 and 0.753. These results show that the indicators

reliably measured the constructs expected and that there was a large variance in each indicator of the construct. No indicator exhibited weak loading that might warrant their exclusion for statistical reasons (Yunita *et al.*, 2025).

Table 5: Discriminant Validity: HTMT Ratios

Construct	PTK1	ATS	PBE	PAB	DDI
PTK					
ATS	0.272				
PBE	0.471	0.169			
PAB	0.066	0.043	0.045		
DDI	0.364	0.448	0.415	0.325	

Results from the HTMT ratios indicate that the five latent constructs were empirically discernible. None of the reported value exceeded one and the maximum was reported as 0.471 between PTK and PBE. The highest HTMT value obtained by DDI was 0.448 with ATS, followed by the value of 0.415 with PBE and 0.364 with PTK. Lowest HTMT values were observed for PAB in combination with PTK, ATS and PBE. This pattern

suggests that the constructs of perceived knowledge, stigma, perceived benefit, access barriers and delay intention refer to different constructs and hence, the results provide support for discriminant validity.

Structural Model Assessment and Hypothesis Testing

There were no problems with structural collinearity. For

Table 6: Structural Model Collinearity Assessment

Outcome	Predictor	Inner VIF
ATS	PTK	1
PBE	PTK	1
DDI	PTK	1.266
DDI	ATS	1.066
DDI	PBE	1.218
DDI	PAB	1.01

the two single predictor equations (ATS and PBE) the VIF value turned out to be 1.000. DDI VIFs varied between 1.010 and 1.266 for PTK, ATS, PBE and PAB, respectively. These values indicate very limited overlap among the

predictors at the structural level. Thus, the direct effects on intention to delay diagnosis can be inferred given that there was no evidence of over collinearity among the predictors and effects on coefficient.

Table 7: Direct Effects and Hypothesis Tests

Hypothesis	Path	Expected direction	Beta	Bootstrap SE	T value	P value	CI 2.5 percent	CI 97.5 percent	Decision
H1	PTK -> ATS	Negative	-0.239	0.038	6.326	<0.001	-0.313	-0.166	Supported
H2	PTK -> PBE	Positive	0.415	0.034	12.24	<0.001	0.35	0.482	Supported
H3	PTK -> DDI	Negative	-0.159	0.034	4.635	<0.001	-0.226	-0.09	Supported
H4	ATS -> DDI	Positive	0.305	0.036	8.506	<0.001	0.231	0.374	Supported
H5	PBE -> DDI	Negative	-0.245	0.04	6.152	<0.001	-0.321	-0.166	Supported
H6	PAB -> DDI	Positive	0.274	0.032	8.539	<0.001	0.21	0.337	Supported

Results showed that all six direct hypotheses were accepted. PTK was found to have a significant effect on decreasing ATS ($\beta = -0.239$) and increasing PBE ($\beta = 0.415$). Furthermore, PTK was found to have a direct negative effect on DDI ($\beta = -0.159$). The direct predictors of DDI had the largest positive coefficient as

ATS ($\beta = 0.305$) and PAB ($\beta = 0.274$). PBE reduced DDI ($\beta = -0.245$). All 95% bootstrap confidence intervals did not contain zero and all p values were < 0.001 . Thus, the results indicate that the cognitive, social, motivational, and practical factors are associated with diagnostic delay intention at once.

Table 8: Explanatory Power and Effect Sizes

Endogenous construct	Predictor	R squared	Adjusted R squared	F squared
ATS	PTK	0.057	0.056	0.061
PBE	PTK	0.173	0.171	0.209
DDI	PTK	0.337	0.333	0.03
DDI	ATS	0.337	0.333	0.132
DDI	PBE	0.337	0.333	0.074
DDI	PAB	0.337	0.333	0.112

The structural model accounted for 33.7% of the variance in DDI with an adjusted R-square of 0.333. PTK explained 5.7% of the variance in ATS and 17.3% of the variance in PBE. For DDI, the largest reported individual

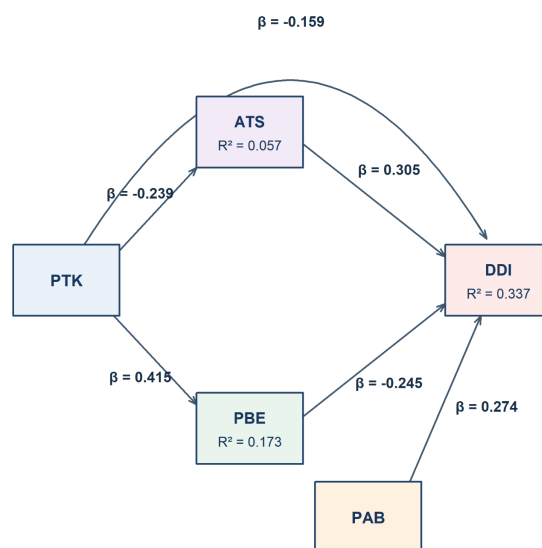


Figure 2: Structural model with standardised path coefficients (β) and R^2 values.

Table 7: Direct Effects and Hypothesis Tests

Hypothesis	Indirect path	Expected direction	Indirect Beta	Bootstrap SE	T value	P value	CI 2 5 percent	CI 97 5 percent	Decision
H7	PTK -> ATS -> DDI	Negative	-0.073	0.014	5.119	<0.001	-0.103	-0.047	Supported

effect size belonged to ATS ($f^2 = 0.132$), followed by PAB ($f^2 = 0.112$), PBE ($f^2 = 0.074$), and PTK ($f^2 = 0.030$). The pattern shows that, stigma and access barriers were the most important independent contributions to delay intention, with perceived knowledge having a smaller independent contribution once all other predictors were added.

The negative effect of ATS on DDI was statistically significant and indirect (indirect $\beta = -0.073$, $t = 5.119$, $p < 0.001$). The 95% bootstrap interval for the estimate did not include 0, and was given as $(-0.103, -0.047)$. The support was thus given to H7. Results showed the direct effect of PTK to DDI was also significant, so the effects of PTK to DDI were in partial mediation. There seems to be a direct negative link between perceived TB knowledge and delay intention regarding TB diagnosis as well as an indirect negative link because of the reduction in anticipated stigma (Darise *et al.*, 2023).

Discussion

Using a combination of cognitive, social, motivational and practical factors, the study looked at the intention to undergo a diagnostic delay. Lower perceived stigma, higher perceived benefit of early assessment and lower intention of delay for diagnostic test were associated with perceived TB knowledge. Stigma and access barriers, on the other hand, had a positive effect on Delay intention, while perceived benefit had a negative effect (Herawati *et al.*, 2020). The model accounted for about one-third of the variance in diagnostic delay intention, suggesting that the constructs included in the model account for a significant, but not joint, aspect of the decision process. There was a statistically meaningful and negative link between perceived TB knowledge and anticipated stigma. Knowledge does not seem to be limited to merely symptom recognition. Respondents who felt better informed

about transmission, symptom recognition, necessity of professional assessment and reliable information had a decreased likelihood of anticipating negative social responses. Stigma can be magnified by uncertainty. Ignorance of TB can lead to an overestimation of social implications or an expectation that assessment will lead to judgement. If there is better understanding then TB may be seen as more manageable and the social threat of assessment diminished (Platini & Maulana, 2023).

There was a very good positive correlation between perceived benefit of early assessment and perceived TB knowledge. This was the highest path coefficient that stemmed from PTK. This finding indicates that awareness might have a particular impact on perceived usefulness of acting early. Knowing the reason for the professional evaluation can enhance the value of diagnostic clarification. It can also help reinforce the link between early assessment and provision of appropriate care. Based on these, communication should bridge TB facts to the advantages of early assessment.

The direct negative relationship between perceived knowledge and intention for diagnostic delay remained even when stigma, perceived benefit and access barriers were added to the model. This indicates that knowledge retains an independent association with behavioural intention. If they feel better informed they may be less likely to delay assessment, recognise the importance of symptoms, know that symptoms are not enough to diagnose TB, and will have a clearer idea of the next steps. Nevertheless, the rather smaller effect size for this direct path also reveals that such knowledge alone is hardly likely to suffice. Social and practical conditions still play a role. The strongest positive direct predictor of the intention to delay a diagnosis was anticipated stigma. This finding emphasizes the role that expected social reactions play in behaviour. Stigma can impact behaviour without discrimination occurring. Diagnostic assessment can have a social cost because of the social stigma for that person of being thought of differently, avoided, discussed by neighbours, or judged (Noman *et al.*, 2023). Such concerns may be exacerbated in the context of a dense urban community where the potential for detection of health-seeking behaviour may be greater. In this context, interventions with exclusive attention to symptom awareness might consequently have limited effect if they don't socialize and render the assessment acceptable.

This is fortified by the mediation result. Part of the reason for the reduction of DDI by PTK was that of its negative connection with ATS. One way this knowledge might depress delay is by reducing the stigma worry pathway. The mediation was partial since the direct link between PTK and DDI stayed crucial. Theoretically this is a useful pattern. It implies that there are many ways of knowing, among these, social. A resident who is more knowledgeable about TB can make a more educated choice for himself and may be less intimidated by other people's responses (Nuttall *et al.*, 2022).

Perceived benefit of early assessment had a significant

negative effect on diagnostic delay intention. This research highlights the need to motivate people to take action early, while symptoms can still be controlled. When the only rationale for assessment is that it is needed only because of serious deterioration, waiting can be seem rational. However, if residents feel that early testing helps them understand the reason for their symptoms, enables the right care, helps with decisions around close contacts and remains worthwhile despite continuing daily life, then early testing is not as unattractive. Early assessment should thus be emphasized as a valuable tool prior to major disruptions in public health communications.

Diagnostic delay intention was also strongly affected by perceived access barriers and these had one of the largest effect sizes for the outcome. This is to validate those practical constraints to limit willingness and knowledge. Travel, attendance, lost work, housework, expenses and arranging an appropriate visit can all lead to immediate expenses. The significance of these barriers may be particularly great for those whose income or family functioning relies on daily availability. So, service design is needed, along with education, to reduce diagnostic delay (Aryani, 2021).

The findings are complemented by descriptive factual knowledge results. The overall results for the objective questions had a mean of 2.68/5 and no single knowledge item was known correctly by more than half the respondents. This shows a significant opportunity for developing factual knowledge. Perceived knowledge was measured independently and revealed good structural relationships at the same time. This differentiation is important because fact and confidence do not necessarily go hand in hand (Thomas *et al.*, 2022). Future interventions should target both: residents' correct information and their feeling of ability to use this information to decide if they should seek assessment.

The R-squared also is 0.337, so there are other influences that probably also still exist. Examples of these factors include the severity of symptoms, trust in service providers, concerns about confidentiality, prior experience with providers, family influences, fear of diagnosis, and financial vulnerability. The current model also provides a clear structure of central components: knowledge, stigma, perceived benefit, and barriers to access, all of which play a part in the intention to delay diagnosis. The relationships are "coherent".

Practical and Policy Implications

The results are in favour of a multi-modal approach. First, TB communication needs to reinforce factual knowledge and also increase residents' confidence in their own ability to decide on appropriate assessment. Information need to be shared in messages regarding the transmission, the common warning symptoms, treatment and the limits of self-diagnosis. Information should also clearly point to reliable assessment that can be obtained.

Second, stigma reduction should be considered as a behaviour focus priority instead of a second-line

communications goal. Community messages should make TB screening more common, highlight that it's a good health choice, and avoid words that contribute to the social stigma of TB screening. Communication should also discuss concerns over impact on families and worry of being socially avoided (Noman *et al.*, 2023).

Third, gains from early assessment should be called out. Residents need to know that assessment is good even if they can still work or carry on as normal. Reaching the right diagnosis early can help provide the right treatment and choices before symptoms get worse.

Lastly, service level responses are needed to address the practical barriers. The pathways for diagnostic activities should be designed to minimise unnecessary travel, wait time, loss of income and disruption to appointments. Practical access costs for residents to take swift action are likely to be lower if the information is local, the services are convenient, the referral process is efficient, and the directions are clear for where to go. The findings suggest that, if education were provided without improvements to access, an important source of delay intention would remain unaddressed.

Limitations and Future Research

There are a number of cautions in understanding what to make of these figures. The cross-sectional design only reveals associations and does not imply causal relationships. The intention to delay diagnosis was measured using a hypothetical scenario and should not be viewed as actual behaviour of a patient, nor as observed delay in his or her actual diagnosis. Perceptions may also vary from the actual behaviour in response to an actual attack of illness. The study targeted the selected high-density urban communities; caution should be applied to generalising the findings to a rural population or other urban communities.

We might consider following-up symptomatic people in future to obtain a more direct measure of care-seeking behaviours than intention. Other constructs, such as trust, confidentiality, symptom severity, household decision-making processes, service experience, and financial vulnerability may also be included. Factual knowledge and perceived knowledge may further be investigated as they interact, and if there are differences in the structural relationships between them based on some demographic or socioeconomic subgroups.

CONCLUSION

In high-density urban communities of Bangladesh knowledge is not the only diagnostic delay intention associations. Perceived TB knowledge was negatively associated with stigma, positively associated with perceived benefit of TB early assessment and directly reduced delay intention. Delay intention was positively related to anticipated stigma and access barriers but negatively related to perceived benefit. There was also a significant indirect effect of anticipated stigma between perceived knowledge and delay intention.

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