Original Research Article

Delay in diagnosis and treatment among tuberculosis cases: A cross-sectional study in Imphal east district of Manipur

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Abstract

Introduction: Delays in diagnosis the patient or initiation of treatment are important factors which need to be considered for achieving the targets for National Strategic Plan for elimination of tuberculosis from India. Some studies were done in other parts of the country, but no published literature is found from the north-eastern part of the country. **Objectives:** The present study was done to estimate the magnitude of delays in diagnosis and treatment among Pulmonary Tuberculosis cases, compare the delays among different types of PTB cases and also to explore the determinants of delays. **Materials & methods**: A community-based cross-sectional study was carried out during the period May 2019-April 2021 in the Imphal East district of Manipur among 280 consenting PTB cases registered at District Tuberculosis Centre, Imphal East in last 9 months from date of survey. A pre-designed questionnaire adapted from WHO Multinational Diagnostic and Treatment Delay in Tuberculosis was used for data collection. **Results:** The median (IQR) of patient delay, health-system delay and total delay were 41 (36-58) days, 16 (10-24) days and 52 (42-70) days repectively. Those who did not seek healthcare immediately after developing symptoms (AOR=5.10; 95% CI=2.28-11.43), first contacted pharmacy or other methods for healthcare (AOR=5.50; 95% CI=2.51-12.06) and diagnosed at private healthcare center (AOR=2.23; 95% CI=1.03-4.85) were associated with increased odds of patient delay. New-pulmonary drug-resistant cases (AOR=3.62; 95% CI=1.05-12.51), being female (AOR=3.84; 95% CI=1.90-7.76), those with completed higher secondary education (AOR=4.70; 95% CI=1.31-16.78), having no knowledge of ATDs being provided free (AOR=10.54; 95% CI=2.95-37.64) and health facility distance more than 5 km (AOR=3.77; 95% CI=1.87-7.62) had higher odds of health-system delay. Patients' delay contributed to 66.67% of total delay. Finally, married individual (AOR=4.86; 95% CI=1.31-18.02) upper-middle (AOR = 6.20; 95% CI=1.61-23.79), middle (AOR=4.90; 95% CI=1.17-20.55) socio-economic status, those who did not seek immediate treatment (AOR=6.11; 95% CI= 2.83-13.18), diagnosed at private health care center (AOR=2.61; 95% CI=1.28-5.30) and tested negative for HIV (AOR=3.31; 95% CI=1.15-9.53) had higher risk of total-delay. **Conclusion:** TB delay in patient and health-system were still high. Improvements in mapping the high-risk population, carefully planned systematic screening and active case finding can help in early case detection and can reduce risk of transmission, poor treatment outcomes and adverse social and economic consequences.

Keywords: Health systems' delay, Patients' delay, Total delay, Treatment delay, Tuberculosis

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Introduction

Tuberculosis (TB) continues to be one of the most persistent important public health issues of India despite highly effective drugs and vaccine are available. As per the Global TB report 2017 the estimated incidence of TB in India was approximately 28,00,000 which accounts for about a quarter of the world's TB cases[1]. The National Strategic Plan (NSP) 2017-2025 for TB Elimination emphasizes on achieving a target of 80% reduction in TB incidence, 90% reduction in TB mortality and 0% patient having catastrophic expenditure due to TB[2]. However, the delay in diagnosis the patient or initiation of treatment is not taken into consideration while formulating the indicators of program evaluation although it is an important factor.Early detection followed by effective therapy is extremely important in controlling TB[2].

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At the individual level, delayed diagnosis of TB can enhance the transmission of infection, worsen the disease and may be a reason why TB incidence has not substantially declined despite the global scale-up of the Directly Observed Treatment Short Course (DOTS) strategy[3]. It may also lead to a more advanced disease state at presentation. The patient will suffer more and cannot contribute to the development of the family and get stuck in a vicious cycle of disease, poverty, inadequate access to normal diet and malnutrition. There have been some studies done in other parts of the country which highlighted about the delays in TB diagnosis and treatment[4-17]. But, no published literature is found from the north-eastern part of India. Therefore, the present study was felt important.

Objectives

The present study was done to estimate the magnitude of delays in diagnosis and treatment among Pulmonary Tuberculosis (PTB) cases, compare the delays among different types of PTB cases and also to explore the determinants of delays considering the patient delay and health system delay.

Materials & methods

A community-based cross-sectional study was carried out during the period May 2019-April 2021 in the Imphal East district of Manipur, which is situated in the North-eastern part of India. The study population consisted of the PTB cases registered at District Tuberculosis Centre (DTC). Only those cases registered in last 9 months from date of survey and gave consent were included. People

who could not be contacted after 2 home-visits, those who suffered from major psychiatric disorders like schizophrenia, mania, bipolar disorder, Alzheimer's disease and other seriously ill patients were excluded from the study.Considering the prevalence rate of 58.2% from a study in East Sikkim[4] and taking an allowable error of 10% at 95% significance level, a sample size of 276 was estimated which was rounded off to 280. PTB patients registered at DTC, Imphal East were consecutively enrolled according to registration sequence until the sample size was reached.A pre-designed, pre-tested, semi-structured interview questionnaire (Adapted from WHO multinational questionnaire of Diagnostic and treatment delay in tuberculosis[5]) was used for data collection. Status of TB and sociodemographic variables were the independent variables. Outcome/dependent variables were knowledge of TB, social stigma factors, knowledge of DOTS, health care seeking characteristics and time of diagnosis and treatment start.The operational definitions used were (i) **Patient delay**: If the period from the onset of first symptom(s) of suspected pulmonary TB or extra pulmonary TB to the date when the patient first contacted any health-care services facility was >30 days then it was considered as patient delay. (ii) **Health system delay**: From the date of patient's first contact with any healthcare service to the date of final diagnosis and initiation of anti-tuberculosis treatment, if it is more than 7 days, it was taken as prolonged health system delay. (iii) **Total delay:** If the period from the initial symptom(s) to the initiation of anti-tuberculosis treatment is more than 37 days then it was considered as Total delay[5].If the stigma score is ≥ to 4, it was considered as high degree stigma[5]. Data collection was done by the investigators themselves. Home visits were made to the families having eligible study-subjects. After obtaining informed verbal consent, the interview was done in the local dialect. The confidentiality of the interview information was taken care of by assigning code for each case.Ethical clearance was obtained from the Institutional Ethics Committee of JNIMS, bearing IEC No. Ac/06/IEC/JNIMS/2 018(PGT) before conducting the study

Data collected were entered and analysed by using SPSSv20 (IBM company, Chicago, Illinois, United States). Descriptive statistics were used to describe the socio-demographic characteristics of the participants, proportion of delays in diagnosis and treatment, the knowledge regarding TB and DOTS and the stigma. Delay in number of days was estimated using mean and median along with standard deviation separately for patient delay, health system delays as well as for total delay. Bivariate logistic regression was performed for the predictor variables taking $p<0.05$ as statistically significant and adjusted for confounders using multivariate logistic regression. Adjusted odds-ratios were calculated considering $P<0.05$ as statistically significant. For the logistic regression patient delay, health system delay and total delays were taken as the dependent variable.

Results

A total of 280 PTB cases were included in the study. Most of them (246; 87.9%) happened to be newly diagnosed pulmonary TB drug-sensitive cases (NPTB-DS), whereas 16 (5.7%) were recurrent pulmonary TB drug-resistant (RPTB-DS), 15 (5.4%) being newly diagnosed pulmonary TB drug-sensitive (NPTB-DR) and 3 (1.1%) being recurrent pulmonary TB drug-resistant cases (RPTB-DR).

The median (IQR) age of the study participants was 47 (26-56) years. A male preponderance was seen amongst the study participants (186; 66%). And more than half (164; 59%) of the participants were from rural areas. By religion, Hindus constituted the majority (163; 58.2%), followed by Christian (29.3%), Meitei/Sanamahism (7.1%) and Islam (5.4%). Two-thirds of them were married patients.Half of the participants (147; 52%) had completed higher education. About one-third (95; 33.9%) of the participants were engaged in private business as occupation. More than half of the participants (160; 57.1%) belonged to upper-middle of socio-economic status class according to modified BG Prasad socio-economic classification 2019. Out of all the 280 study-participants, 174 (62%) had patient delay in TB diagnosis. The median patients' delay was 41 days (IQR: 36-58). In bivariate analysis, patients' delay was found to be associated with sex, marital status, socio-economic status, seeking immediate treatment after symptoms, first contact for health care, number of health facilities visited before final diagnosis and healthcare where diagnosis was made. (Table 1)

Table 1: Bivariate analysis of patient delay and patient's characteristics

Variable	Patient delay			
	No	Yes	COR (95% CI)	p-value
Sex				
• Male	62	124	1	1
• Female	44	50	0.56 (0.34-0.94)	0.02
Marital status				
• Single	41	41	1	1
• Married	57	116	2.03 (1.19-3.48)	0.01
• Divorced	2	2	1.01 (0.13-7.44)	0.99
• Widowed	-	3	-	-
• Widower	6	12	1 (0.68-5.83)	0.20
Socio-economic status				
• Upper	12	10	1	1
• Upper-middle	65	95	1.75 (0.71-4.29)	0.21
• Middle	23	58	3.01 (1.14-7.96)	0.02
• Lower-middle	6	10	2 (0.53-7.44)	0.30
• Lower	-	1	-	-
Sought treatment immediately				
• Yes	95	102	1	1
• No	11	72	6.09 (3.04-12.71)	0.001
Type of facility attended first				
• Govt.	57	51	1	1
• Private	34	37	1.21 (0.66-2.21)	0.52
• Pharmacy or others	15	86	6.40 (3.29-12.47)	0.01
No. of facility visits before final diagnosis				
• 1	57	67	1	1
• 2-3	49	102	1.77 (1.08-2.89)	0.02
• ≥4	0	5	-	-
Health center where final diagnosis was made				

• Govt.	85	118	1	1
• Private	21	56	1.92 (1.08-3.41)	0.02

In multivariate logistic regression analysis using these variables which were found to be significant from the above table, those who did not seek healthcare immediately after symptoms (AOR=5.10; 95% CI=2.28-11.43), those who first contacted pharmacy or other methods for healthcare (AOR=5.50; 95% CI=2.51-12.06) and those who were diagnosed at private healthcare center (AOR=2.23; 95% CI=1.03-4.85) were found to have higher risk of having patient-delay and this was found to be statistically significant. (Table 2)

Table 2: Multivariate analysis for patient delay

Variable	Patient delay			
	No	Yes	COR (95% CI)	AOR (95% CI)
Sex				
Male	62	124	1	1
Female	44	50	0.56 (0.34 – 0.94)*	0.65 (0.33 – 1.28)
Marital status				
Single	41	41	1	1
Married	57	116	2.03 (1.19 – 3.48)*	1.83 (0.90 – 3.74)
Divorced	2	2	1.01 (0.13 – 7.44)	0.51 (0.04 – 5.95)
Widowed	0	3	-	-
Socio-economic status				
Upper	12	10	1	1
Upper-middle	65	95	1.75 (0.71 – 4.29)	1.76 (0.55 – 5.63)
Middle	23	58	3.01 (1.14 – 7.96)*	1.86 (0.52 – 6.56)
Lower Middle	6	10	2 (0.53 – 7.44)	0.59 (0.10 – 3.26)
Lower	0	1	-	-
Seeking treatment immediately				
Yes	95	102	1	1
No	11	72	6.09 (3.04 – 12.71)*	5.10 (2.28 – 11.43)*
Type of health facility contacted first				
Government	57	51	1	1
Private	34	37	1.21 (0.66 – 2.21)	0.90 (0.43 – 1.91)
Pharmacy and others	15	86	6.40 (3.29 – 12.47)*	5.50 (2.51 – 12.06)*
Number of healthcare facility visited before final diagnosis				
None	57	67	1	1
Two – three	49	102	1.77 (1.08 – 2.89)*	1.72 (0.37 - 1.41)
Four – five	0	4	-	-
More than five	0	1	-	-
Healthcare where final diagnosis was made				
Government institutes	85	118	1	1
Private institutes	21	56	1.92 (1.08 – 3.41)*	2.23 (1.03 – 4.85)*

Regarding health system's delay, a total of 69 (25%) patients out of the total 280 had delay in TB diagnosis. The median (IQR) health-system's delay was 16 (10-24) days. In bivariate analysis, treatment group, age, sex, education, knowledge of ATDs being made free, distance of health care facility, time required to arrive at clinic and history of known chronic illness were found to be significantly associated with the delay.

Multivariate logistic regression analysis of these variables showed that, new-pulmonary drug-resistant cases (AOR=3.62; 95% CI=1.05-12.51), female (AOR=3.84; 95% CI=1.90-7.76), those who had completed higher secondary & above education (AOR=4.70; 95% CI=1.31-16.78), those having no knowledge of ATDs being provided free (AOR=10.54; 95% CI=2.95-37.64) and health facility distance more than 5 km (AOR=3.77; 95% CI=1.87-7.62) were found to have higher risk of health-system delay as compared to their counterpart and this was statistically significant. Those with retreatment pulmonary drug-sensitive TB cases were found to have less risk factors of developing health-system delay and (AOR=0.01; 95% CI=0.01-0.41) this was found to be statistically significant. (Table 3)

Table 3: Multivariate analysis for health-system delay

Variable	Health-system delay			
	No	Yes	COR (95% CI)	AOR (95% CI)
Treatment status				
NPTB-DS	120	44	1	1
NPTB-DR	190	56	5.08 (1.73 – 14.91)	3.62(1.05 – 12.51)
RPTB-DS	6	9	0.22 (0.02 – 1.75)	0.02 (0.01 – 0.41)
RPTB-DR	15	1	-	-
Sex				
Male	156	30	1	1
Female	55	39	3.68 (2.09 – 6.49)	3.84 (1.90 – 7.76)
Education				
Primary	6	2	2.33 (0.34 – 15.80)	7.57 (0.77 – 74.27)
Middle	27	6	1.55 (0.39 – 6.12)	1.31 (0.27 – 6.32)

Secondary	50	10	1.40 (0.40 – 4.87)	0.90 (0.20 – 4.01)
Higher secondary & above	100	47	3.29 (1.09 – 9.91)	4.70 (1.31 – 16.78)
No formal education	28	4	1	1
Knew that ATDs are made free of cost				
Yes	200	60	1	1
No	11	9	2.72 (1.07 – 6.89)	10.54 (2.95 – 37.64)
Distance of healthcare facility from residence				
<5 kms	88	73	1	1
≥5 kms	36	83	2.70 (1.54 – 4.73)	3.77 (1.87 – 7.62)
Time duration to arrive at clinic				
<1 hour	201	60	1	1
≥1 hour	10	9	3.01 (1.17 – 7.76)	2.99 (0.87 – 10.19)
Any other known chronic disease				
No	81	142	1	1
Yes	25	32	0.36 (0.15 – 0.84)	0.37 (0.11 – 1.20)

With regards to total delay, out of the total 280 patients, a little more than half (56%) of patients had total-delay in TB diagnosis. The median total-delay was 52 days (IQR=42-70). Out of 156 total delays, patients' delay contributed to 104 (66.67%) while health-system contributed to 11 (7%), 41 (26.28%) being common for both (Figure 1).

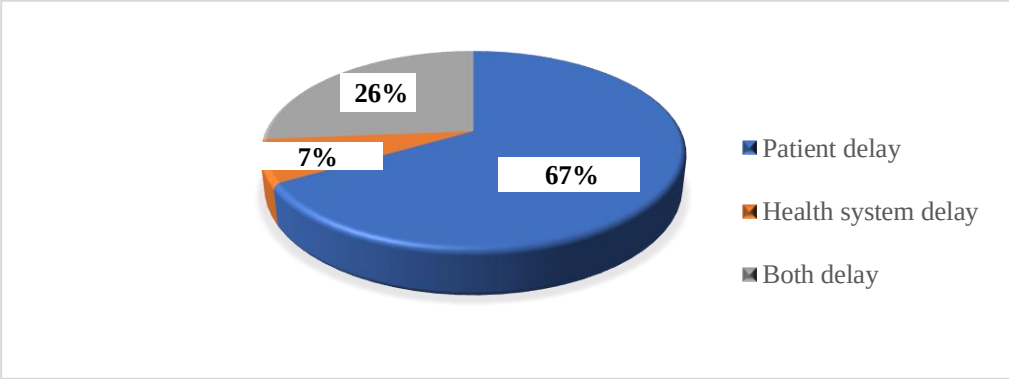

Fig.1: Contribution to total delay

For this total delay, in bivariate analysis, place of residence, age, marital status, socio-economic status, seeking of treatment immediately after symptoms, number of healthcare facility visited, place where final diagnosis was made, health-care facility distance and HIV-status were found to be associated. In multivariate analysis, married individual (AOR=4.86; 95% CI=1.31-18.02) upper-middle (AOR =6.20; 95% CI=1.61-23.79), middle (AOR=4.90; 95% CI=1.17-20.55) socio-economic status, those who did not seek immediate treatment after developing symptoms (AOR=6.11; 95% CI= 2.83-13.18), those who were diagnosed at private health care center (AOR=2.61; 95% CI=1.28-5.30) and those who were tested negative for HIV (AOR=3.31; 95% CI=1.15-9.53) were found to have higher risk of having total-delay and this was found to be statistically significant. (Table 4)

Table 4: Multivariate analysis for health-system delay

Variable	Total-delay			
	No	Yes	COR (95% CI)	AOR (95% CI)
Residence				
Urban	60	56	1	1
Rural	64	100	1.29 (1.03 – 2.70)	0.86 (0.45 – 1.62)
Age				
18 – 30 years	49	45	1	1
31 – 50 years	26	45	1.88 (1.01 – 3.53)	1.72 (0.79 – 3.76)
>50 years	49	66	1.46 (0.84 – 2.53)	1.74 (0.90 – 3.33)
Marital status				
Single	45	37	1	1
Married	68	105	0.87 (1.10 – 3.19)	4.86 (1.31 – 18.02)
Divorced	2	2	1.21 (0.16 – 9.05)	3.85 (0.94 – 15.70)
Widowed	0	3	-	-
Widower	9	9	1.21 (0.43 – 3.37)	1.54 (0.25 – 9.28)
≥ Higher secondary	67	80	0.71 (0.32 – 1.57)	-
Socio-economic status				
Upper	17	5	1	1
Upper-middle	126	34	3.17 (1.18 – 8.54)	6.20 (1.61 – 23.79)
Middle	56	25	4.78 (1.68 – 13.56)	4.90 (1.17 – 20.55)

Lower Middle	12	4	4.44 (1.11 – 17.66)	2.45 (0.40 – 14.90)
Lower	0	1	-	-
Seeking treatment immediately				
Yes	110	87	1	1
No	14	69	6.2 (3.28 – 11.81)	6.11 (2.83 – 13.18)
Type of health facility did you contacted first				
Government	66	42	1	1
Private	31	40	2.02 (1.10 – 3.72)	1.34 (0.63 – 2.85)
Pharmacy & others	27	74	4.30 (2.39 – 7.74)	2.61 (1.28 – 5.30)
Number of healthcare facility visited before final diagnosis				
One	67	57	1	1
Two – three	57	94	1.9 (1.19 – 3.14)	0.63 (0.32 – 1.22)
Four – five	0	4	-	-
More than five	0	1	-	-
Healthcare where final diagnosis was made				
Government institute	101	102	1	1
Private institutes	23	54	2.32 (1.32 – 4.70)	2.36 (1.12 - 4.96)
Distance of healthcare facility from residence				
<5 kms	88	73	1	1
≥5 kms	36	83	2.77 (1.68 – 4.57)	1.80 (0.92 – 3.50)
HIV status				
Positive	17	8	1	1
Negative	89	124	2.9 (1.22 – 7.16)	3.31 (1.15 – 9.53)
Not known	18	24	2.8 (1.01 – 8.01)	2.78 (0.81 – 9.45)

Discussion

The median patient delay in the present study was found to be 41 days (IQR: 36-58). Studies done by Gope A et al, Natesan M et al Saqib SE et al were found to have similar findings to the present study[7-9]. Lower patient delay was found in the studies done Sumana M et al and Bhatt AN et al in South India, Paramasivam S et al in Kerala, and Das S et al in West Bengal[10-12].

The possible reasons for differences in delay could be due to difference in study sites, study participants; socio-demographic profile and time of conducting the study. Our study was a community-based study where patients were selected from the list registered in DTC, Imphal East while other studies included patients from hospitals where most of the patients are referred cases from lower health units. While majority of the studies were conducted before the COVID-19 pandemic, our heightened patient delay can be attributed to the pandemic as it disrupts access to TB care services and timely referral. The other reasons for inconsistencies in patient delay could be due to operational definition of patient delay. In our study we have considered acceptable patient delay up-to thirty days. In studies conducted by Bhatt AN et al and Paramasivam S et al they considered acceptable patient delay as 14-15 days[10-11]. In our study, those who did not seek healthcare immediately after developing symptoms, those who contacted pharmacy or traditional healer and those who were diagnosed at private healthcare center were found to have higher odds of having patient delay in multivariate logistic regression. Similar results were noted in studies of Sumana M et al and Thakur R et al[10-13]. The reasons as revealed by Mundra et al in their qualitative study, could be due to the prevailing social practices and cultures which influence the individual's healthcare seeking nature[14].

In the present study, participants' place of residence and distance of healthcare facility had no significant association with patient delay, a finding which is comparable with other studies findings[12-13].

Our study did not reveal social stigma as a risk factor for patient delay which is consistent findings made by Mundra et al[14]. This can be explained by the level of awareness and attitude of the community towards TB[18].

The median health system delay was 16 days (IQR: 10-24). Our results were found to be comparable with studies done by Sumana M et and Paramasivam S et al[10,18]. Higher system delay was found in studies done by Das S et al, Natesan M et al and Rajeswari R et al[6,8,19]. However, lower health system delay than our study was found in studies by Thakur R et al and Bhatt AN et al[11,13]. The observed lower health system delay in our study could be due to the improved public health systems, especially in public sectors for disease notification and health service extension program in grass-root level in the study area.

Our study results found NPDRTB treatment category being at higher risk of having health-system related delay. The reason may be explained by the fact that drug-resistant investigation needs referral to higher health facilities and the prevailing pandemic has crippled the regular schedule of duty at health system. On the other hand, those with RDSPTB were found to have less risk related to health-system delay. This was consistent with the finding of Shiferaw et al[19]. This might be due to the fact that previously infected patients probably had better information about TB related signs and symptoms and therefore, were seeking treatment early.

Female sex was also found to have higher risk related to health-system delay in our study which is consistent with findings made by Saquib S et al[9]. This may be due to the fact that socio-economic condition and cultural factors influence women's position in the communities and may add to healthcare accessibility constraints.

Previous studies done by Tegegn et al, Yeshiwok AM et al and Gebeyehu et al found out that those without formal education or illiterate have higher chances of health-system delay[20-22]. This was in contrast to our finding of a higher level of education could cause health-system delay. Our study also revealed that those did not know ATDs were provided free had higher chances of having health-system delay. The small sample size we used might be the reason of this discrepancy.

Our study's results also revealed that long distance of health facilities can have health-system delay. This finding was similar to the finding of Rajeshwari R et al[23].

Chakrabartty A et al found that person with lower stigma was associated with higher delay[24]. But findings in our study did not support this. The difference may be due to high TB suspicion in the study population by the health-facility or the consulting doctor and better diagnostic tools available for TB diagnosis.

Patient delay alone contributed to more than half (66.67%) of total delay. Our study found a median total delay of 52 days (IQR = 42-70). However, lesser total delay was revealed in studies by Thakur R et al and Sumana M et al[10,13]. The inconsistencies can be due to the differences in the operational definitions, which in our study 37 days was considered acceptable.

Our study findings showed that patients who are married currently were more likely to have delay compared to single patients. This finding was consistent with Htike W et al[25] and may be due to

constraints such as social obligations that limited time to go for health care.

In our study socio-economic status was found to be associated with total delay, where middle class patients has higher odds of having total delay compared to upper class. Considering income of the family as a predictor for delay, a study by Bonadonna LV et al reinforced that being poor has more odds of having delay[26].

Those patients who did not seek immediate treatment after developing symptoms had higher odds of having total delay although reasons for not seeking treatment immediately were not included in the study. A mixed-method study by Mundra et al revealed that lack of seriousness of the condition was given as the main reason[14], although no statistical association was established.Patients who first contacted private facility for healthcare had higher odds of having total delay. It can be due to the time taken while referring to public sector for treatment initiation. Doctors at private health set-up might start on treatments which are non-standard regimens and where the facilities for TB diagnosis are unavailable[7].

In our study, patients whose HIV statuses were negative were found to have higher total delay risk. This finding was consistent with Ukwaja KN et al[27] and can be due to the collaborative TB/HIV activities existing in the health-system. No association could be established between tobacco smoking or history of alcohol abuse and delay, which was found consistent with other study findings[7].

Our study had some limitations. Since the population was based on those patients who were registered under the District TB Center, those who were under the private-sector or un-notified could not be accessed. Since we relied on the patient's memory to recall the dates or timing of symptoms initiation it might introduce bias in our results. We have tried to eliminate the bias by relying on the treatment card produced by the patient. The COVID-19 pandemic situation has crippled the normal diagnostic network and the drugs logistics and this may overestimate the patient as well as system delay. Hence, it can affect the generalizability of the study in other non-COVID times or where the impact of the pandemic is less.

Conclusion & recommendations

The present study revealed that TB delay in patient and health-system was still significant. Patients' delay contributed to more than the health-system's delay. A little less than three-fourths (62%) of the participants who had patient delay with median delay of 41 days. A quarter of the participants (25%) had health-system related delay with median delay of 16 days. Out of 156 total delays, patients' delay contributed almost three-fourth (66.67%) while health-system contributed around (7%), and almost a quarter (26.28%) being common for both. For patients' delay, patients who do not seek healthcare immediately after symptoms, those who first contacted pharmacy or other methods for healthcare and those who were diagnosed at private healthcare center were found to have higher risk. For health-system delay, those patients who were new-pulmonary drug-resistant TB cases, those who have completed higher secondary and above education, those having no knowledge of ATD's being made free under the program and distance of health-facility more than 5 kms were found to have higher risk while retreatment pulmonary cases who were drug sensitive had lower risk. And for total-delay, married individuals, those belonging to upper-middle class and middle class, those who do not seek immediate treatment after symptoms and those who were tested negative for HIV were found to have higher risk.Tuberculosis patients have gone through a long journey to initiate anti-TB treatment. Improvements in mapping the high-risk population carefully planned systematic screening and active case finding can help in early case detection. This can reduce risk of transmission, poor treatment outcomes and adverse social and economic consequences. To End TB by 2025, expansion of TB services and addressing determinants of TB that are beyond health, through a multi-sectorial approach is necessary.

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