

# Tuberculosis Diagnosis Delays and Associated Institutional Barriers Among Tertiary Hospitals in Tharaka Nithi County, Kenya

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## ABSTRACT

Globally, delayed diagnosis of Tuberculosis (TB) is a significant contributor to spread of TB despite availability of diagnostic algorithm and advanced diagnostic machine. Kenya is still grouped among high TB burden nations and has the highest TB incidences in East Africa. This has been associated with delays in diagnosis, resulted to either individual or community health and economic challenges. The purpose of this study was to assess health system related factors influencing timely diagnosis of TB in Tharaka Nithi County. A descriptive cross-sectional survey study design was adopted among 154 randomly selected patients and 12 purposively selected key informants in selected hospitals in Tharaka Nithi County. A self administered questionnaire and key informant guide were used to collect data among patients and key informants respectively. Descriptive and inferential statistics were used to analyse data. Bivariate analysis was used to test the strength of association between health system related factors and duration of TB before diagnosis. Qualitative data was analysed thematically. Study findings revealed that most (70.86%, n=107) respondents delayed in diagnosis. Bivariate regression results revealed that multiple visits (OR=3.24;95%CI:1.55-6.76,p=0.002), long turnaround time (OR=2.38 ;95% CI:1.06-5.30;p=0.035), cash payment (OR=4.53;95%CI:1.82-11.23; p= 0.001), far diagnostic centers (OR=3.86;95%CI:1.71-8.73;p=0.001),lack of prior TB health education (OR=2.71; 95%CI: 1.29-5.64;p=0.008) and long laboratory results turnaround time (OR=2.49; 95% CI: 1.29-5.64; p=0.016) as significant associated with delayed diagnosis. Machine breakdown, misdiagnosis, and inadequate counselling on TB were identified as precipitators of diagnostic delay within a hospital. The study recommends empowerment of community based-hospital referral system, strengthening of collaboration between County government and independent service providers, equipping health facility and continuous training on TB diagnosis and care.

**Keywords:** Timely diagnosis, Health System Related, Tuberculosis, Delay, Barriers

## INTRODUCTION

Approximately over 30 years after declaration of TB as a global emergency [1], it still remains the leading single cause [2] of morbidity and mortality globally [1],[3], affecting approximately 30% of global population despite provision of proper

mitigation measures by various nations [1]. In 2015, WHO member state set in motion a plan dubbed "TB eradicate by 2030," with a tripple targets approach of five years apart [4],[5]. However, an aggregated decline of 9% on TB incidence rate was attained between 2015 and 2020, compared to set target of

20% [4]. The decimal decline poses a greater challenge on TB control. Thus resulting to continued disease spread and advancement within the community. Delayed diagnosis of tuberculosis has been reported to significantly perpetuate TB spread and inhibit its eradication [6]. Thus the need to identify the gap in tuberculosis diagnosis.

Literature on prevention and control of TB has revealed that the rising number of tuberculosis undiagnosed cases is alarming [7]. In 2019 alone, approximately three million TB cases were believed not to be diagnosed or reported [5]. This may be associated with either patients or hospital barriers. Among developing nations, many studies conducted are on patients related delay in TB diagnosis. Thus the need to investigate and address the gaps within health care system. A study in Ethiopia revealed that hospital delays in timely TB diagnosis as contributor to high TB burden in sub-Saharan region [8]. However, it has been established that delays in diagnosis differ greatly among nations [9]. Some of reported health factors include distance to diagnostic center [7]; [8]; [10]; [11], misdiagnosis [2]; [12], clinical inertia [13], high workload [2], multiple visits to hospital [1]; [3]; [14], cash payment [2]; [3]; [7], machine breakdown [15] and inadequate health education [15]; [16].

In 2021, the prevalence of TB in Kenya was reported as 426 per 100,000 population [17]; [18]. In addition, 40% and 52% of TB cases were reported to be missing and not diagnosed on time respectively [17]. This poses a public health challenge to Kenya population. Thus the need to investigate hospital factors delaying diagnosis of TB. This will provide useful information to aid in setting policies and strategies of TB control in the county.

## MATERIALS & METHODS

A hospital based descriptive cross-sectional survey research design was adopted among 154 randomly selected patients and 12 purposively selected key informant in

Chuka and Chogoria Hospitals in Tharaka Nithi County. A self-administered pre-designed and pre-tested modified WHO questionnaire was used to collect data among patients' respondents while a key informant guide was adopted among the key informants. Data was coded and analysed using MS Excel and SPSS v26 respectively. Patients' characteristics were presented using descriptive statistics while bivariate analysis was used to test the strength of association between health facility factors and duration of tuberculosis before diagnosis. Qualitative data was analysed thematically. The study categorized TB diagnosis time into either delay (>21 days) or no delay (<21 day), through assumption of a 21-day cutoff adopted from WHO. Frequencies and percentages were used to present study results. Institutional ethical approval was sought from Chuka University Ethics and Research Committee (NACOSTI/NBC/AC-08120) and NACOSTI research permit (NACOSTI/p /23/24959). Permission for data collection was sought from hospital administrators. The researcher observed all ethical considerations during data collection.

## RESULT

The researcher approached 154 patient respondents, of which 3 were excluded due to inadequate filling of the research tool, resulting to 151 study respondents (98.0% response rate). Data analysed revealed a mean age of 38.71 (SD, 13.65) years, median and mode of 36.0 and 42.0 years respectively among patients' respondents. In addition, nearly 30% (n=48) of the respondents were aged 31-40 years. It was further observed that more than a half of the respondents were male [n=85 (56.29%)] and married [n=84 (55.62%)]. Regarding respondents' education status only 18.54% (n=28) had attained post-secondary education. Almost a half of the respondents were self-employed [n=74 (49.01%)] and had household income <10,000/= [n=88 (58.28%)], Table 1].

Table 1: Respondents socio-demographic characteristics

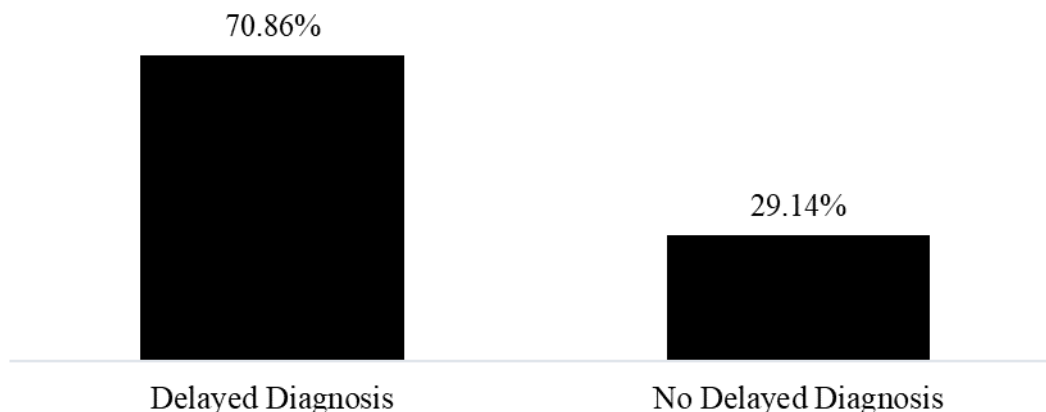
Variables		Frequency	Percent
Respondents' gender	Male	85	56.29
	Female	66	43.71
	Totals	151	100.0
Respondents' Age	20-30	33	21.85
	31-40	48	31.79
	41-50	44	29.13
	Over 50	26	17.22
	Totals	151	100.0
Respondents' Marital status	Single	21	13.91
	Married	84	55.62
	Divorced	27	17.88
	Widowed	19	12.58
	Totals	151	100
Respondents' education status	Never attended school	17	11.26
	Primary	49	32.45
	Secondary	57	37.75
	Post secondary education	28	18.54
	Totals	151	100.0
Respondents' Occupation	Unemployed	47	31.13
	Self employed	74	49.01
	Government employed	30	19.86
	Total	151	100
Respondents' household income	<10,000/=	88	58.28
	10,000-20,000/=	23	15.23
	>20,000/=	40	26.49
	Totals	151	100.0

### TB diagnostic Duration

The study sought to identify percentage of respondent experiencing delayed diagnosis. The results are presented in figure 1 below. It was observed that

majority[n=107(70.86%) of the respondents delayed in T diagnosis while only 29.14%(n=44) were diagnosed on time (Figure 1).

Figure 1: A bar graph of Uptake of diagnostic Services.



### Hospital based barriers to timely diagnosis

From table 2 below, respondents who visited hospital more than three times prior to diagnosis were 3.24 times(95%;CI=1.55-6.76;p=0.002) more likely to delay in diagnosis compared than those who visited less than three times. Turn around time of more than three hours was reported to

increase diagnostic delay by 2.3 times(95%;CI=1.06-5.30;p=0.035) compared to turnaround time of less than 3 hours. Similarly, it was observed that respondents whose laboratory investigation results took more than 2 days were 2.4 times(95%;CI=1.18-5.26;p=0.016) more likely to experience diagnostic delay compared to respondents whose results took

less than 2 days. Respondents who didn't receive health education on TB were 2.7 times (95%;CI=1.29-5.64;p=0.008) more likely to delay in TB diagnosis than respondents educated on TB before diagnosis. With reference to insurance payment, cash paying respondents were

4.5(95%;CI=1.82-11.23;p=0.001).

Respondents living more than five kilometers from TB diagnostic centers were 3.8 times(95%;CI=1.71-8.78;p=0.001) more likely to diagnostic delay than respondents living less than five kilometers from diagnostic centers.

Table 2: Association between hospital factors and TB diagnostic duration

Variable	Diagnostic Duration		OR (95%CI)	P-value	
	No Delay (%)	Delay (%)			
Prior visits with TB suggestive symptoms before diagnosis of TB	<3 times	23(15.2)	27(17.9)	*	*
	>3 times	21(13.9)	80(53.0)	3.24(1.55-6.76)	0.002
Consultation Turn around time	<3 hours	34(22.5)	63(41.7)	*	*
	>3 hours	10(6.6)	44(29.2)	2.38(1.06-5.30)	0.035
Health Education on TB before diagnosis	Yes	21(13.9)	27(17.9)	*	*
	No	23(15.2)	80(53.0)	2.71(1.29-5.64)	0.008
Laboratory tests turn around time	>2 days	25(16.6)	82(54.2)	2.49(1.18-5.26)	0.016
	<2 days	19(12.6)	25(16.6)	*	*
Service Payment Methods	Cash	30(19.9)	97(64.2)	4.53(1.82-11.23)	0.001
	Insurances	14(9.3)	10(6.6)	*	*
Distance to Diagnostic centers	<5 KM	17(11.3)	15(9.9)	*	*
	>5 KM	27(17.9)	97(78.8)	3.86(1.71-8.73)	0.001

## Health factors associated with delay in diagnosis of TB: Qualitative findings

### Theme 1: Misdiagnosis

Nurses and Clinical Officers interview revealed that misdiagnosis among TB symptomatic patients precipitated diagnostic delay. Most tuberculosis patients ended up been diagnosed with lower respiratory tract infections particularly pneumonia. Therefore, medication prescribed resulted to subsiding of TB symptoms and recurrence of symptoms after the dosage was over.

*“Majority of the patients when they come to TB clinic usually report of been on antibiotic treatment for pneumonia or other diseases affecting the lower part of the respiratory system before diagnosis of TB is made. The antibiotics normally subsides the symptoms then after the duration of taking the drugs is over the symptoms emerge. This results to prolonging the duration of TB diagnosis.”* (Respondents No.1, 2 and 5).

The interview was further designed to gather information of the caused of misdiagnosis within the county, among the respondents it was reported that, inadequate onjob training, unclear chest imaging results, low suspicion index and high

workload as contributors to misdiagnosis. One of the respondents had this to say:

*“When patients report in a hospital they first go through the outpatient department. In most cases we are few in the consultation rooms and patients waiting to be seen are very many. So it becomes very difficult to ask patients questions pertaining to night sweats, loss of weight, coughing among other. But instead focus more on the patients main complain.”* (Respondents No. 10).

Another Clinical officer indicated that:

*“Sometimes, we may send a patient for an X-ray to help in the diagnosis. When we review the films of the X-ray they are not clear to help in making a diagnosis”*(Respondent No.10)

A nurse during the interview has this to say:-

*“There is few on-job training on the update of TB among members not on the TB clinic or outreach services. This results to failure to be aware of recent diagnostic and treatment plan of the diseases.”*(Respondent No.3)

Clinical officers at different hospital further added that:-

*Some of the health workers may have low suspicion of the disease depending on the information given by the patients resulting into wrong treatment when one already has TB.*" (Respondent No. 1 & 10)

### **Theme 2: Inadequate Counselling**

Health professional interviewed reported that inadequate counselling or health education resulted to unwanted delays in Tb diagnosis. In addition, challenges such as lack of privacy, poor doctor patient relationship, high workload and communication barriers were identified as hindrance to proper individual health education. The nurses and clinical officers had this to say:

*"Majority of the patients are not educated on reasons for examination, causes of symptoms they are experiencing. Furthermore, only a few patients are able to recognize TB symptoms. Thus, they end up leaving the hospital not understanding what they are suffering from."*(Respondents No. 1,5 &10).

Similar observation were further collaborated by clinical officers:

*"As health care providers we are faced with some challenges which prevent us from providing proper counselling. For example, communication becomes a challenge if you met patients who do not understand Kiswahili or English, lack of privacy in the consultation rooms, unsupportive health professionals and high workload."*(Respondents No. 2&6).

### **Theme 3: GeneXpert machine breakdown**

Laboratory technologists reported that machine breakdown among the few GeneXpert machines in the county was a big problem:

*"Sometimes the hospital GeneXpert machine does not work, for example we have been sending samples to Chogoria for the last two months."* (Respondent No. 9)

*"Currently, the GeneXpert machine we have operated under three modules, despite it being a four module machine. The fourth module has some problems."* (Respondents No.3)

Another respondent had this to say:

*"In the county we have three GeneXpert machines, when one of them fails we receive large number of samples (approximately 60). So we tell the patients to go home they will be called or texted when the results are ready.....high number of samples also results in stockout of reagents for the samples exceeds the normal approximated monthly analysis resulting to waiting for the reagents to be bought a process which may take approximately a week."*(Respondent No. 11)

### **Theme 4: Distance to facility.**

Delay in sputum results was reported as a crucial barrier within health system whose interaction with other barriers at individual level such as lack of fare and distance to hospital further minimized the chances of commencing anti-TB treatment.

*"Patients are very much disappointed when they are told to come back tomorrow for results and they fail to get them. Some of the patients come from far areas and use fare to come to hospital. If they come the third time and fail to get results they normally don't come again."* (Respondent No. 5)

## **DISCUSSION**

In this study majority (70.86%) of the respondents experienced diagnostic delay. This was slightly lower compared to diagnostic delay (87.4%) reported in India<sup>[19]</sup>. However, this finding didn't concur with findings of a study done in Ethiopia which reported diagnostic delay of 50.9%<sup>[10]</sup>. This difference in the findings may be associated with cutoff of delayed diagnosis and study sample size. A relationship between multiple visits to health providers before diagnosis and diagnostic duration was established. This

mirrored with finding of many studies that reported multiple visits to health professional as a risk factor to diagnostic delay<sup>[1]; [7]; [14]; [19]; [20]; [21]</sup>. This may be due to lack of patients' satisfaction, poor quality of care and health professional attitude resulting to patients to seek consultation in other facility. In this study, an association between long consultation turn around time and diagnostic delay was established. These findings agreed with a systematic review conducted among high burden nations which reported that long turnaround time as a barrier to timely TB diagnosis<sup>[1]</sup>. This may be associated with busy schedules of patients resulting to seeking care in either chemist or private clinic, thus prolong diagnostic time. Similarly, delays in laboratory results were identified to influence diagnostic delay in this study. This was congruent with a study done in Uganda<sup>[13]; [15]</sup>.

There was a significant association between health education before diagnosis and duration of TB before diagnosis. This was in line with findings of a study done in Tanzania which revealed that more effort was put on educating patients on noncommunicable diseases, thus neglecting communicable disease such TB health education<sup>[12]</sup>. This may be associated with raise of incidence rates of noncommunicable disease, stigma associated with communicable disease, inadequate knowledge among staffs about TB managements updates. Moreover, in this study, it was established that cash payment method contributed to diagnostic delay. This concurred with finding of studies done in Nigeria<sup>[2]</sup>, Indonesia<sup>[7]</sup> and Ethiopia<sup>[13]</sup>. This may be due to the expenses the patients incur before diagnosis is made. However, a study conducted in Ghana revealed that medical insurances were facilitators to TB diagnosis<sup>[3]</sup>. An association was established between distance to diagnostic centers and duration of diagnosis in this study. This findings concurred with other study finding which established that long distance to TB diagnostic centers as a precipitator to

diagnostic delay<sup>[8]; [9]; [10]; [11]; [22]</sup>. However, this finding did were not in line with finding of a study done in Mombasa County, Kenya<sup>[23]</sup>.

In this study, it was revealed that inadequate counselling of TB patients was a risk factor to diagnostic delay from the interviews conducted. This was agreed with as conducted in Uganda, which reported that inappropriate counselling of patients by health care providers on TB resulted to unacceptable delays<sup>[15]</sup>. This may be linked with lack of privacy, high work load and staff shortage. In addition, this study reported misdiagnosis of tuberculosis patients with other respiratory diseases as a barrier to timely diagnosis. This was similar to study finding from a study in West Pokot County, Kenya, which reported that more than eighty percent of the patients were misdiagnosed and started on empirical therapy despite having symptoms suggestive of TB<sup>[6]</sup>. Moreover, other studies reported of unclear chest imaging results<sup>[15]</sup>, staff shortage<sup>[24]</sup>, inadequate onjob training<sup>[6]</sup>, non-adherence to guideline<sup>[2]</sup> and clinical inertia<sup>[20]</sup> to precipitate diagnostic delay. This was congruent with findings of this study.

## CONCLUSION

In this study a significant delay in diagnosis was established. However, contributory factors to the delay seems to be similar to those of other African Nations. In addition, misdiagnosis, multiple visits, distance to diagnostic centers, long turnaround time either in consultation or laboratory, lack of TB health education, inadequate counselling and machine breakdown were reported to contribute to diagnostic delays within the county. The study recommends incorporation of people and developing their skills to raise understanding of the policies and infrastructures that the government sector has at its disposal, through establishment of specimen network framework, and provision of necessary resources need for TB control. There is also need to do a research on patients level of

knowledge and its relationship with diagnosis duration.

### Declaration by Authors

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**Conflict of Interest:** The authors declare no conflict of interest.

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