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Original Research Article

Clinical and Host Related Factors Influencing Prevalence of Tuberculosis in Bumula Sub County, Bungoma County in Kenya

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ABSTRACT

Tuberculosis (TB) is an infectious bacterial disease caused by bacillus *Mycobacterium tuberculosis*. Globally 9.6 million people fell ill with TB and 1.5 million died from the disease in 2014. Bumula Sub-County had 200 patients diagnosed with TB in 2016, with a case notification rate of 454 cases per 100,000 people. The main objective of this study was to establish the clinical and host related factors influencing prevalence of TB in Bumula Sub County. Methodologically, this study applied a descriptive design that was cross sectional in nature. Data was collected using a researcher to respondent administered questionnaire; Data was collected from 200 respondents and was analyzed using Statistical Package for Social Sciences version 20 and presented in narratives and tables' forms. The findings of this study revealed that respondents were aged between 15 to 77 years of age, the median age was 42 and the mean age was 42.92 ± 1.133. Males were 56.5% (113/200). Previous history of TB ($\chi2$=7.772, df=1, p=0.005), body mass index ($\chi2$=14.224, df=3, p=0.003), history of pneumonia ($\chi2$=6.288, df=1, p=0.012) and smoking ($\chi2$=0.077, df=2, p=0.045) were factors that significantly influence prevalence of TB. HIV status ($\chi2$=0.357, df=1, p=0.55) and alcohol consumption ($\chi2$=1.664, df=1, p=0.197) were not factors that significantly influence prevalence of TB. This study concluded that 42 years of age is the median age at risk of contracting TB though all are susceptible. It also established that HIV status was not a significant factor that influences the prevalence of TB in Bumula Sub County.

Key words: Tuberculosis, Clinical factor, Bumula, Bungoma, Kenya.

INTRODUCTION

Tuberculosis (TB) is an infectious bacterial disease caused by the bacillus species *Mycobacterium tuberculosis*. It typically affects the lungs but can also affect other sites of the body. [1] Globally 9.6 million people fell ill with TB in the year 2014, 12% of whom were Human Immunodeficiency Virus (HIV) positive cases, 5.4 million were men, 3.2 million were women while 1.0 million were children. Only 6 million TB cases were notified worldwide (37% missing). [1] Globally in 2014, TB killed 1.5 million people, 1.1 million were HIV-negative while 0.4 million were HIV-positive. [1] Over 95% of TB deaths occur in low and middle income countries, and it is among the top five causes of death in those countries. [1] African contributes 26% of the

TB burden globally; hence the second after Asia which contributes 59% of the global case load. [1]

Kenya is ranked 15th among the 22 high TB burden countries that account for 80% of the global TB burden and 4th in Africa after South Africa, Nigeria and Ethiopia. [2] Kenya has an estimated 169,000 new TB infection annually, 40% of such cases were not identified and treated. [1] At least 60 people die of TB and 270 get infected with the disease every day, TB is the 5th cause of death among infectious diseases in Kenya. [2] The cost of TB management in Kenya is Ksh11 billion per year. [2]

In Bungoma County the TB trend has been on a decrease (from 2119 cases in the year 2012-1,803 cases in the year 2016). [3] The notification rate for Bungoma County was 96 per 100,000 in 2015. [2] In the year 2014 Bungoma County notified 1515 cases of TB with HIV co infection rate of 35%. [2]

Bumula sub-County in the year 2016, total of 200 patients were diagnosed with TB between the months of January 2016-December 2016, a case notification rate of 454 cases per 100,000 people. [3] One person with untreated TB can infect 10 to 15 people in close contact. [2] The aim of the study was to investigate the clinical and host related factors affecting prevalence of TB in Bumula Sub County. While the main objective was to; establish the clinical and host related factors affecting prevalence of TB in Bumula Sub County. Significantly, this study was done to its logical conclusion and when its recommendations shall be implemented effectively as informed by this research then cases of TB infections will reduce significantly and resources used for its management will be redirected to other resourceful economic activities.

METHODS

Study design and Study setting

The study applied a descriptive study design that was cross sectional in nature. The study was conducted in Bumula Sub County at one point in time, which is in Bungoma County, Western region of Kenya. Bumula sub county has a catchment population of 116, 023 (projections from 2009 census). Females constitute a majority of the population (52%). Further, 52.9% of the population lives below the poverty line. Agriculture is the main economic activity in the study area. [4]

Study population

The study population who were also target population was 200 participants who were diagnosed with TB during the specified 2016 study period. The participants of the study were people who were 15 years of age and above and reported to all health facilities offering TB management services between, January - December 2016 in Bumula Sub County.

Data collection

The quantitative data was collected by using structured and semi-structured questionnaire to respondents both at health facility and any-where else they were accessed. The questionnaire had questions that covered; clinical/host factors that influence prevalence of TB in Bumula Sub-County. For each study participants socio-demographic and clinical/ host related information was collected by a standardized questionnaire administered by trained interviewers. A TB patient was either diagnosed as bacteriologically confirmed or clinically diagnosed, for bacteriologically confirmed patient: sputum was taken for Ziehl-Neelsen staining (ZN) or use of GeneXpert and *Mycobacterium tuberculosis* was isolated, for clinically diagnosed, *Mycobacterium tuberculosis* was not isolated but they had clinical presentation and Chest x-ray result consistent with TB. [1] All patients were tested for HIV according to the Ministry of Health rapid HIV testing algorithm. [5] The weight was assessed using a weighing machine and the height was measured using stature meter, body mass index (BMI) was calculated as body weight in kilograms divided by square of body height. [6] Qualitative data was collected by conducting eleven sessions of key informant

interviews (KII). The participants included in the sessions were, sub county TB coordinator and heath care workers working in TB clinics. The required information was collected from respondents using interview guides that enabled discussions to be systematic and enabled the flow of discussions. Data management was done by; cleaning data manually from the field on the questionnaires then coded after which was entered into a prepared computer screen data set and provided with a new code hence cleaned using computer and then analyzed according to the analysis plan. Analysis revealed more meaning using statistical package for social science (SPSS) version 20. Data was analyzed using descriptive statistics by running frequencies focusing on measures of central tendency and dispersion. This established the distributions pattern in terms of; percentages, mode, median, ratio and proportions. Inferential statistics analysis was also conducted hence measured relationships among variables. Correlation analysis was done that revealed different relationships among different variables, Chi square tests of the findings analysis were conducted that established associations that existed amongst them. The findings of this study were presented in narrative tables forms.

RESULTS

Demographic characteristics of people infected with TB in Bumula Sub County

A total of 200 TB patients above 15 years of age were started on treatment during the period and all of them participated in the study, 56.5% (113/200) of respondents were males. The respondents were aged between 16 to 77 years of age, the median age was 42 and the mean age was 42.92 ± 1.133. This study showed that 53.0% (106/200) of the respondents were married while 31.0% (32/200) were single. This study also identified that 48.5% (97/200) of the respondents had primary level of education while 6.5% (13/200) had tertiary level of education.

Clinical and host characteristic of people infected with TB in Bumula Sub County

People who are infected with TB are also liable to lead their own life fully, which include other practices that can affect their lives negatively or positively. The TB patients also have possibility of contracting other diseases that can contribute to prognosis of the conditions.

Table 1: revealed that 6.5% (13/200) of the respondent were HIV positive. It also showed that 26.5% (53/200) of the respondent had a body mass index (BMI) of below 16.5. A total 75.5% (151/200) of the respondents were taking alcohol and 42.0% (84/200) had never smoked cigarettes in their lifetime.

Table 1: Respondent's Clinical and host characteristic of people infected with TB in Bumula Sub County.

Variables		Number (n=200)	Proportion (%)
HIV Status	Positive	13	6.5
	Negative	187	93.5
Body Mass Index	Below 16.5	53	26.5
	16.5-18.4	67	33.5
	18.5-25	66	33.0
	Above 25	14	7.0
Alcohol Consumption	Yes	151	75.5
	No	49	24.5
Cigarette Smoking	Never	84	42.0
	Current or past	116	58.0
Member of family who is a Cigarette Smoker	Yes	53	26.5
	No	147	73.5
History of Asthma	Yes	22	11.0
	No	178	89.0
History of Diabetics	Yes	1	0.5
	No	199	99.5
History of Pneumonia	Yes	59	29.5
	No	141	70.5
History of Respiratory Tract Infection	Yes	122	61.0
	No	78	39.0

*HIV- Human immunodeficiency virus

Clinical and host factors influencing prevalence of TB in Bumula Sub County

The prevalence of TB in an individual is influenced by different factors that are ranging from behavioral to clinical. When these factors are put into consideration, then management of TB can be controlled before the emergence of drug resistant TB.

Table 2: revealed that previous history of TB ($\chi2$=7.772, df=1, p=0.005), body mass index ($\chi2$=14.224, df=3, p=0.003) and the times the patient visited the facility ($\chi2$=8.528, df=3, p=0.036), were factors affecting prevalence of TB. Alcohol consumption ($\chi2$=1.664, df=1, p=0.197) and history of diabetic ($\chi2$=0.026, df=1, p=0.872) were not significantly influencing prevalence of TB.

A high number of KII participants revealed that low body mass index (BMI), smoking, alcohol intake were factors influencing TB prevalence in Bumula. One of KII said "*Most of the people who have TB deny alcohol consumption when asked but most of them normally smell alcohol during clinic days."*

Least number of KII cited history of Asthma, HIV and Diabetic Mellitus as factors influencing TB prevalence in Bumula Sub County. One of the KII said, "*Most of the people believe that having TB is equivalent to having HIV, but most of the TB patients are HIV negative when tested."*

Table 2: Clinical and host factors influencing prevalence of TB in Bumula Sub County

		PTB n(%)	EPTB n(%)	X^2	df	p value
HIV* status	Positive	13 (6.7)	0 (0)	0.357	1	0.550
	Negative	182 (93.3)	5 (100.0)			
Previous history of TB*	Yes	48 (24.6)	4 (80.0)	7.772	1	0.005
	No	147 (75.4)	1 (20.0)			
Body Mass Index at TB* diagnosis	<16.5	48 (24.6)	5 (100.0)	14.224	3	0.003
	16.5-18.4	67 (34.4)	0 (0)			
	18.5-25	66 (33.8)	0 (0)			
	> 25	14 (7.2)	0 (0)			
Number of times participant visited the health facility before diagnosis of TB* was made	Once	17 (8.7)	0 (0)	8.528	3	0.036
	Twice	92 (47.2)	2 (40.0)			
	Thrice	58 (29.7)	0 (0)			
	Four &>	28 (14.4)	3 (60.0)			
Alcohol Consumption	Yes	146 (74.9)	5 (100.0)	1.664	1	0.197
	No	49 (25.1)	0 (0)			
Cigarette Smoking history	Never	82 (42.1)	2 (40.0)	0.077	2	0.045
	Current/past	113 (57.9)	3 (60.0)			
History of Asthma	Yes	22 (11.3)	0 (0)	0.634	1	0.426
	No	173 (88.7)	5 (100.0)			
History of Diabetic Mellitus	Yes	1 (0.5)	0 (0)	0.026	1	0.872
	No	194 (99.5)	5 (100.0)			
History of Pneumonia	Yes	55 (28.2)	4 (80.0)	6.288	1	0.012
	No	140 (71.8)	1 (20.0)			
History of Respiratory Tract Infection	Yes	122 (62.6)	0 (0)	8.021	1	0.005
	No	73 (37.4)	5 (100.0)			

HIV* Human Immuno-Deficiency Virus *TB- Tuberculosis

DISCUSSION

Majority of the participants in this study were males this is similar to study done in Russia [7] and Mombasa, [8] which showed that males had a high incidence of TB. This may be attributed to males migrating to urban areas searching for employment and they are likely to live in overcrowded places, also most of the people who smoke cigarette are males that can predispose to contracting TB.

Previous history of TB was a factor influencing prevalence of TB; this results are similar to study done in Gambia and Ethiopia [9-10] but that was contradict by the study that was done in South Africa. [11] This can be due to the previous infection making the lungs predisposed to another infection due to weak immunity or

reactivation of previous infection. This can also be attributed to poor adherence which can lead to increased risk of TB relapse.

Body mass index was associated with prevalence of TB. This is similar to study done in Pakistan [12] also study done by Hanrahan *et al* showed that low body mass index was a risk factor for TB development. [13] This can be due to low immunity due to under nutrition, which increases the reactivation of latent TB infection.

Cigarette smoking was associated with prevalence of TB this results are similar to the study done in India [14] Pakistan [12] and England, [15] which showed an association of TB and cigarette smoking. This can be attributed to reduced respiratory function, immunity and also smoking affects the metabolism of TB drugs. [16] Cigarette smoking can also lead to poor adherence to TB drugs which eventually leads to relapse of previously treated TB.

results showed that pneumonia was associated with prevalence of TB. These results are similar to previous study done in South Africa [17] and Malaysia [18] which showed association between pneumonia and TB, This is because, it is common for TB to be misdiagnosed as pneumonia, mostly in acute phase because both present with similar symptoms and signs. [19]

Apparently from the study findings alcohol was not associated with prevalence of TB this contradict with the study done in South Africa [20] and Canada [21] which showed that alcohol was associated with development of TB. This can be due to low number of alcoholics in the study population and also counseling done during TB treatment on effect of alcohol consumption. This can also be attributed to the fact that most people understand the effect of alcohol and drug interaction thus they are likely to deny even when they are consuming alcohol.

The study showed that diabetic mellitus (DM) was not associated with prevalence of TB this contradicts with a systemic review of 13 observational studies [22] and study done in Indonesia, [23] that showed a strong association of DM and TB. This can be due to the lack of screening of TB patients for DM during the treatment. It can also be due to low number of participants with DM in the study population.

The results revealed that HIV was not associated with prevalence of TB; this result is similar with the prevalence survey done in Kenya which showed that TB is common in HIV negative people. [24] This result contradicts with those of research done in countries with high and low burden prevalence of HIV which showed a strong association between TB and HIV. This can be due to low number of those HIV infected in the study population. This can also be attributed to Isonazid preventive therapy (IPT) given to HIV patients to prevent TB disease. It can also be attributed to good collaboration between TB program and HIV program.

CONCLUSION AND RECOMMENDATION

The study established that most of the respondents were HIV negative. The study showed that BMI, cigarette smoking, history of respiratory tract infection and pneumonia were significantly influencing TB prevalence.

It is recommended that those people with malnutrition should be screened for TB and effort should be put in place to improve the nutritional status of the people. Those who have TB should adhere to the treatment to reduce re-infection. Measures should be put in place before treatment of pneumonia, TB should be rule out, and this will reduce delayed TB diagnosis, morbidity, mortality and risk of TB transmission.

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Conflict Of Interest: None

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