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ABSTRACT

Background: **Tuberculosis (TB) is the leading cause of mortality among infectious diseases globally, surpassing HIV. There were 1.5 million deaths attributed to TB in 2014, and 0.4 million of these were TB-HIV co-infected. The World Health Organization End TB strategy focuses on 95% reduction of mortality from Tuberculosis by 2035. The mortality rate of all TB in Kenya is 7%. There is limited information on the characteristics of patients dying after being diagnosed with TB in Kenya.**

Objective: **To determine the characteristics of patients who died while on management for TB in Kwale County in the period 2012-2016.**

Design: **A retrospective cross-sectional study**

Setting: **Kwale County, Kenya**

Results: **We reviewed mortality records of 330 out of 5957 cases notified between 2012 and 2016 giving a mortality rate of 6%.The males accounted for 180(54.5%) with the adults aged above 45 years comprising of 20% of all cases. Smear negative presentation was found among 141(42.7%), with 258 (78.2%) with pulmonary TB. The moderately malnourished accounted for 109(40.0%). The HIV negative accounted for 158 (48%) of all cases and 283 (86%) among new cases. Of the HIV positive patients, 109(73.0%) had been initiated on ART. There were 172 (52.1%) of deaths that occurred after 60 days of initiation of TB treatment.**

Conclusion: **We observed a high all-cause mortality rate among patients with tuberculosis in Kwale County. They were clinically characterized new patients, were HIV negative, majority of patients well-nourished and death occurred after intensive phase of Tuberculosis treatment. There is need to consider other diagnosis among patients with these characteristics in the population. We recommend a follow-up study to determine predictors of death and review of National data.**

INTRODUCTION

Tuberculosis (TB) remains the leading infectious cause of mortality globally, with 1.5 million deaths attributed to TB in 2014, and 0.4 million of these were TB-HIV co-infected (1). A total of 9.6 million new cases of tuberculosis were reported the same year with 74% of these from Africa(2). Kenya's burden of Tuberculosis attributable mortality was about 120,000 including the TB- HIV co-infected patients, in 2014(2).

Mortality attributable to tuberculosis has been associated with various factors such as poverty, gender, age, Diabetes Mellitus, HIV, cultural practices and malnutrition especially with low BMI/ malnutrition (3,4) and timing of treatment for Tuberculosis. In TB- HIV coinfection acceleration of mortality is associated with development of Immune reconstitution syndrome at initiation of ARV therapy, rapid disease progression and adverse drug effects (4,5) .Unknown HIV status has also been associated with high risk deaths among tuberculosis patients(6).

In Kwale County, tuberculosis burden stands at 272/100,000 of cases notified as per 2016 data with tuberculosis deaths standing at 8% of those notified, which is higher than the recommended 3% as per 2014-2018 Kenya Tuberculosis and lung health strategy(7). The End TB Strategy targets to reduce TB deaths by 35% by 2020 and 95% by 2035(2). Towards this end effort Kenya was reported by WHO as the first African Country to achieve targets for case detection and treatment success of new smear positive cases. Nationally Kenya has further committed to reduction of mortality due to TB by 3% by year 2018(8). Currently, there is paucity of data describing those who die generally in Kenya, and more specifically in Kwale County. We therefore undertook this study in order to address characteristics of the patients who are being managed for TB who die in Kwale County.

METHODOLOGY INADEQUATE DESCRIPTION OF METHODOLOGY

The study design of the research was a retrospective cross sectional study using routine data in Tuberculosis Information from Basic Unit (TIBU).

Study site and Setting: Kwale County is located 30 km southwest of Mombasa where most patients with TB and other medical complications are referred. Mombasa County has the 2nd highest tuberculosis burden in the country.

Context: The health care worker checks the patients who have not reported to take the weekly or two weekly collections to the community health care workers and starts tracing. The community health care worker calls the client if she has a mobile number or DOTS supporter number and asks for the reason for non-attendance. If the patients died, they report to the TB nurse in the facility so that updates can be made into the TIBU system.

Study Participants: Records of All TB patients notified and managed in Kwale County who died between 2012- 2016 and registered in TIBU

a. A retrospective cross-sectional study was used.
b. We reviewed mortality records of 330 out of 5957 cases notified between 2012 and 2016.
c. In the year 2012 -2016 the cases were 80, 73, 94.64,19, respectively, and were sampled.
d. Patients who were managed for tuberculosis from the year 2012-2016 were included while those without any outcome were not included.

Sources of data: TB Program utilizes TIBU data management as the central database of the NTLD-P which is a web based solution integrated with mobile/tablet technology developed and introduced in Kenya in the year 2012 with inter-sector support. Patients with TB upon diagnosis, are registered in the facility tuberculosis register (notification), treated and followed up with primary record capture obtained from patient records and Multi Drug Resistant (MDR) log book entered into registers as a summary of the data entered in the registers. This data is subsequently uploaded at Sub – County level into TIBU by sub-county TB coordinators electronically via mobile computer tablets.

TIBU has internal consistency checks to ensure that data entry errors are minimized. The TB program has quarterly data quality audits at the county level and biannually at the national level.

Data analysis: The data was extracted from TIBU and analyzed using STATA. Descriptive analysis was done and reported as proportions for demographics and clinical characteristics. The deaths reported here is all cause mortality among the TB patients.

Ethical consideration: This study was approved by the Moi University College of Health Sciences (MU/CHS) and Moi Teaching & Referral Hospital (MT&RH) Institutional Review Board (IREC).

RESULTS

There were 330 deaths among 5,957 patients on management for tuberculosis during the period of study, 2012-2016. The year 2014 had the highest proportion of deaths and the lowest proportion was reported in the year 2016 94 (28.5%) and 19 (5.8 %) respectively as shown in figure 1.

Figure 1
Trend of mortality from 2012 to 2016

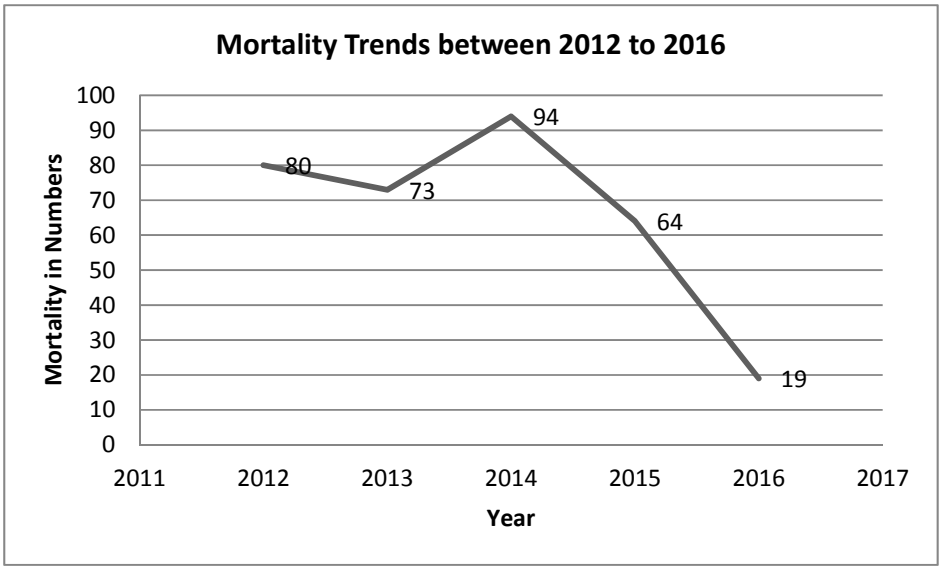

Table 1, shows mortality by various characteristics. For instance, there were more males than females who died 180 (54.5%). The deaths reported in the public sector were 294 (90.7%) of the reported cases and the age group most affected by deaths was above 45 years at 65 (19.8%) followed by 25-44 years at 63(19.1%) and while the age group with the least deaths was 0-4 years at 4 (1.2%). The zones which had most deaths were Kinango Zone and Msambweni Zone at 101 (30.6%) and 99 (30%) respectively, while Kwale (Matuga) Zone had the least tuberculosis deaths at 63 (19.1%).

The figure above shows the distribution of who died while being managed for tuberculosis from the year 2012-2016,whereby it demonstrated that there was highest proportion of deaths in the year 2014 compared to 2016.

Table 1:
Trends and Demographic characteristics of patients managed for Tuberculosis in Kwale County who died from 2012-2016.

Demographic Characteristic	Category	N=330 (%)
Sector(n=324)	Private	30(9.3)
	Public	294(90.7)
Sex M/F	Female	150(45.5)
	Male	180(54.5)
Age group	0-4	4(1.2)
	5-14	20(6.1)
	15-24	14(4.3)
	25-34	63(19.1)
	35-44	57(17.3)
	45+	65(19.8)
Zone	Kinango	101(30.6)
	Msambweni	99(30)
	Lunga Lunga	67(20.3)
	Kwale	63(19.1)

Interestingly, there was a higher mortality 141 (42.0%) for those with smear negative results compared to smear positives though there was a big proportion whose sputum was not tested. A majority of those who died, were new patients 283 (85.8%); had pulmonary TB (258 (78.2%). There was a slightly higher mortality for patients who were HIV negative 158 (47.9 %) compared to those positive as shown in Table 2 below.

Table 2:
Clinical characteristics of patients managed for Tuberculosis in Kwale County who died from 2012-2016.

Clinical Characteristic	Category	N, % what was your N?
Sputum Smear Examination Month	Not done	120(36.4)
	Negative	141(42.7)
	Positive	69(20.0)
Type of TB	Pulmonary	258(78.2)
	Extra pulmonary	72(21.8)
Type of patient (n=320)	New	283(85.8)
	Previously treated	47(14.2)
HIV status(n=330)	Not done	23(7.0)
	Negative	158(47.9)
	Positive	149(45.2)
Cortrimoxazole preventive	No	5(3.4)
	Yes	144(96.6)
Anti-retroviral nn therapy(n=148)	No	39(26.4)
	Yes	109(73.6)
Body mass index(n=257)	Severe	52(19.5)
	Moderate	109(40.0)
	Normal	91(34.1)
	Overweight	15(5.6)

Surprisingly, severely malnourished patients had a lower mortality 52 (19.5%), compared to the moderate malnutrition 109 (40.0%) as illustrated by table 2 below.

More than half of the deaths 172 (52.1%) occurred in patients who had been on anti TB treatment for more than 60 days as shown in Table 3 below.

Table 3:

Timing of death from initiation of treatment for Tuberculosis for patients managed in Kwale County who died from 2012-2016.

Characteristic	Number (n=330)	%
Timing of death from initiation of treatment (days)		
0-14	40	12.1
15-30	49	14.8
31-60	69	20.9
More than 60	172	52.2
Totals	330	100

DISCUSSION

Our study showed that deaths among patients on treatment of Tuberculosis in Kwale County were highest among those aged 45 years and above. This could be due to decrease in immunity of this age set and plausible co-morbidities which mostly occur as one advances in age which may lead to this population being highly predisposed to developing Tuberculosis disease and also this is an age set whereby tuberculosis mostly affects cite this. The Kenya Tuberculosis prevalence survey which was conducted 2015/2016 similarly showed high Tuberculosis rates among older patients(9).

The smear negative type of tuberculosis has high burden of mortality and in most of these patients they tend to be HIV positive with lowers immunity making them predisposed to tuberculosis. In our study the probable reason is that some of clinically confirmed TB patients may be suffering from other ailments other than Tuberculosis since other conditions present like Tuberculosis for example Malignancies of lungs, liver, pleura and peritoneum.

In a study conducted in South Africa to know the causes of death in patients being treated for Tuberculosis in a rural South African Hospital, more than a third of patients on TB treatment who die do not have Tuberculosis(10).This was also demonstrated also in other studies done in Surin province, Thailand(11) and studies also done in Harare, Zimbabwe that showed that smear negative reported high mortality while being managed for Tuberculosis(12).

In Kwale County, deaths mainly occurred at more than two months after initiation of treatment. These deaths may be due to comorbidities like diabetes mellitus, cancers of lungs, among others. Though studies done Rio de Janeiro, Brazil showed that the mortality was high in patients who were co-infected within the first three months of treatment of Tuberculosis(13).But according to studies done in South Africa it showed that mortality was high during first month of tuberculosis treatment and most of them were not due to Tuberculosis(14)

The study showed most of the patients who died while being managed for Tuberculosis had moderate malnutrition, these could be due to increased severity of the disease which make them vulnerable to mortality. Malnourished patients have higher risk of hepatotoxicity, which is a major side effect of TB therapy and can lead to death. Half of the county is semi-arid and the poverty index is high making access to food to be a challenge to most of its populace. This study concurred with a study done among Tuberculosis patients in south India which reported high death rates among patients with malnutrition(15)

Patients with active TB disease should receive immediate diagnosis and treatment should be initiated early based on WHO guidelines and the national standards of care(2). If malnutrition is identified at the time of TB diagnosis, it should be considered as a key causal factor of mortality in patients being managed for Tuberculosis that needs to be addressed. If the client is losing weight during TB treatment this should be investigated further for co-morbidities like Diabetes Mellitus, HIV, Malignancies and poor adherence to treatment or development of resistance to anti-TB medications. In malnourished cases, nutritional therapy should run concurrently with anti-tuberculosis treatment as there is evidence of such good results in studies done in West Bengal, India(16).

The study established that advancement in age, being HIV negative and moderate malnourishment in patients contributed significantly to death. Close monitoring and linkage of at risk TB patients should be instituted. These measures include early HIV testing and treatment, early detection and treatment of TB patients, screening for non-communicable diseases among TB patients and strengthening drug resistant TB surveillance among previously treated TB cases. The major strengths of this study included the availability of mortality information in TIBU available for analysis from health facilities and the community feedback for notified cases that die. The limitations of the study were lack of postmortems on patients managed for tuberculosis to verify that the deaths are due to tuberculosis. This analysis also had no evidence for all-cause mortality as no autopsy or mortality audit was conducted to provide a definitive cause of death and may result in an over-estimation of Tuberculosis mortality. The tuberculosis and HIV program has enhanced Integration of service delivery of both HIV and TB programs, however, there is need to integrate funding, planning and policy development in order to reduce the mortality in patients who are being managed for Tuberculosis due to HIV. The tuberculosis program should also intensify community and facility based case finding to find new cases in order to make early diagnosis of cases to reduce community transmission thus preventing death due to late diagnosis of patient suffering from Tuberculosis

CONCLUSION

The study showed that in Kwale county there is need of integration management of nutrition, HIV, and tuberculosis in order to reduce mortality among tuberculosis patients. There is need of keen monitoring of all patients being managed for tuberculosis and more so in those who are 45 years and above and those whose nutritional status is good with clinically diagnosed tuberculosis.

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