Annales Africaines de Médecine
Article original

Socio-demographic Characteristics of Tuberculosis Mortality in Grootfontein District, Namibia: analysis of hospital data between 2018 and 2022

Caractéristiques sociodémographiques de la mortalité par tuberculose dans le District de Grootfontein, Namibie : analyse des données hospitalières entre 2018 et 2022

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Résumé

Contexte & objectif. La tuberculose est la première cause de mortalité parmi les maladies infectieuses et figure parmi les dix premières causes de décès dans le monde. L'un des facteurs qui alimentent l'épidémie de tuberculose est l'augmentation mondiale de la tuberculose multirésistante. L'objectif de la présente étude a été de décrire les caractéristiques sociodémographiques de la mortalité due à la tuberculose.

Méthodes. C'était une série documentaire des cas de tuberculose colligés (à l'aide de registres de tuberculose, cartes de tuberculose, dossiers médicaux) et admis à l'hôpital de district de Grootfontein en Namibie entre 2018 et 2022. Une analyse descriptive des décès attribués comme étant causés par la tuberculose à l'aide de la CIM 10 a été réalisée. *Résultats*. Quatre-vingt cinq décès ont été déplorés entre 2018 et 2022. Le nombre moyen de décès dus à la tuberculose par an était de 17 (écart-type 6,8). Le nombre de décès a augmenté régulièrement entre 2020 (9,4 %) et 2022 (31,8 %). 44,7 % des personnes décédées de la tuberculose étaient co-infectées par le VIH. La majorité des décès dus à la tuberculose concernait les personnes âgées de 50 ans ou plus (n = 26, 30,6 %). Les hommes avaient 1,086 plus de chances de mourir de la tuberculose que les femmes. Près d'un quart (24,7 %) des décès dus à la tuberculose étaient dus à une tuberculose multirésistante. *Conclusion.* Une tendance à l'augmentation de décès dû à la tuberculose, en particulier (chez

Summary

Context and objective. Tuberculosis (TB) is ranked first killer among infectious diseases and listed among the top 10 causes of death worldwide. One of the factors fuelling TB epidemic is the global rise of multidrug resistant TB. The aim of this study was to describe the sociodemographic characteristics of TB mortality. *Methods.*This was a documentary series of TB cases recorded (using TB registers, TB cards, and medical files) and attended at Grootfontein District Hospital in Namibia between 2018 and 2022. Descriptive analysis of deaths assigned as caused by TB using ICD 10 was performed. *Results.*Eighty-five deaths occurred from 2018 to 2022. The average number of deaths from TB per year was 17 (SD 6.8). There was a steady deaths increase from 2020 (9.4 %) to 2022 (31.8%). 44.7% of TB deaths were HIV co-infected. Majority of deaths from TB were in the 50 or above age categories (n = 26, 30.6 %). Males had 1.086 higher odds of dying from TB than females. Almost a quarter (24.7%) of all TB deaths was due to drug resistant TB. *Conclusion.* There has been an upward trend in TB deaths in recent years, particularly among HIV co-infected and men aged >50 years. Hence, the crucial need to enhance community awareness, TB surveillance and access to TB diagnosis and treatment to improve treatment outcomes and decrease TB mortalities.

Keywords: socio-demographic, characteristics, mortality, trend, tuberculosis

Received November 5th, 2023
Accepted April 27th, 2024
https://dx.doi.org/10.4314/aamed.v17i3.9

les PVV et les hommes agés > 50 ans) est observée au cours des dernières années. D'où le besoin crucial d'améliorer la sensibilisation de la communauté, la surveillance de la tuberculose et l'accès au diagnostic et au traitement de la tuberculose afin d'améliorer la mortalité due à la tuberculose.

Mots-clés : caractéristiques, socio-démographiques, mortalité, tendance, tuberculose
Reçu le 5 novembre 2023
Accepté le 27 avril 2024
https://dx.doi.org/10.4314/aamed.v17i3.9

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Introduction

Tuberculosis (TB) ranks as one of the top causes of morbidity and mortality globally (1). TB is ranked first killer among infectious diseases and listed among the top 10 causes of death worldwide (2). One of the factors fuelling tuberculosis epidemic is the global rise of multidrug resistant TB (MDR-TB) (2-5). The global incidence of TB is estimated at an average of 130 cases per 100,000 population per year with approximately 10 million people being infected with TB in 2018 (6). The 2019 global TB report estimates that there were approximately 1.5 million people that died of TB in 2018 (6).

Sub-Saharan Africa bears the highest global TB burden and over 50% of TB cases in the region are co-infected with HIV (7). As part of the goal to end the global TB pandemic, the World health organization(WHO) has set targets aimed at a 90% reduction in global TB deaths and 80% reduction in the global incidence of TB by the year 2030 from the baseline rates of the year 2015 (8). In most sub-Saharan African settings, the causes of deaths are relatively unknown as death registration is often incomplete due to ineffective and undeveloped civil registration systems. Another challenge in determining causes of death in these countries is that a notable proportion of deaths occur outside health centers, mostly at home, where they are not attended by healthcare workers. In instances where deaths are captured, the cause of death is often either not captured or misclassified, particularly in rural settings. Only about less than 25% of deaths are registered (as inside or outside hospital) in most countries in sub-Saharan Africa. (9). In a study conducted in Kenya, TB was found to be the second-leading cause of death for females and the third-leading cause of death for males (1); the pattern for causes of death varied significantly across various socio-economic characteristics.

Namibia is ranked among the high TB burden countries. In 2019, the estimated TB mortality rate in Namibia was 50/100,000 population for HIV infected TB patients and 57/100,000 population for those who were HIV negative (10). As of 2020, the estimated TB incidence was 460 cases per 100, 000 population (11); Approximately 12,000 people developed TB in 2020. Among them 1,400 were children. About 1,500 people died because of TB the same year (12). There is critical need for data on causes of death for health planning, resources allocation, monitoring and evaluation, policy formulation, and prioritization of health programs and interventions. This shortage of critical information has been documented in several public health, demographic and epidemiological literature. (13-17). TB mortality surveillance is

important in assessing programmatic performance (18).

This paper aimed to assess socio-demographic characteristics of tuberculosis mortality in Grootfontein district of Namibia.

Methods

Design and study area

This was a documentary series of TB mortality cases collected from hospital mortality records (TB registers, TB cards, medical files) at Grootfontein district hospital between 2018 and 2022. Grootfontein is a city of 23,793 inhabitants in the Otjozondjupa Region of central Namibia. It is one of the three towns in the Otavi Triangle, situated on the B8 national road that leads from Otavi to the Caprivi Strip.

Data

The mortality data on the following characteristics was collected from the hospital mortality records into a structured form. These include gender, age, data source, level of health facility, weight at the time of diagnosis, date and place of death, date started TB treatment and treatment category, type of patient (new or previously on treatment), disease classification, sputum results before treatment, time between diagnosis and treatment, HIV status, cause of death, and other comorbidities.

Ethical considerations

The study did not seek written informed consent because it is a retrospective review of medical records. Client's confidentiality was observed by assigning a serial number to each participant that was known only to the study personnel. Only the client's initials and serial number appeared on the data collection forms. Waiver of ethical clearance and study approval were sought and obtained from the Namibia national health research office (Ref: Ref: 22/3/1/1); and authority to disseminate research findings (Ref: 22/4/2/3) obtained from the Ministry of Health and Social Services (MoHSS).

Data analysis

We used SPSS 18 for data analysis. We also used MS Excel (version 2016) to draw the graph. We performed a descriptive analysis of deaths assigned as caused by TB using ICD 10 from 2018 to 2022. We determined the trend of the deaths over the years of analysis. TB deaths were characterized based on socio-demographic characteristics of age, sex, social health-seeking patterns etc. and summarized in tables and graphs. Given the documented differences in TB prevalence and morbidity by sex, Pearson-Chi-square tests were used to determine if health care seeking/duration of treatment before death, place of death and age characteristics were statistically different based on sex. Those who died within 3 months of starting anti-tuberculosis treatment were classified as late treatment seekers. Adjusted logistic regression analysis was carried out to examine the risk of death from TB within the socio-demographic characteristics (sex, place of death and year of death). In the logistic regression analysis, the dependent variable was derived from the entire mortality data and consisted of a binary variable defining whether one died from TB or not.

Results

The figure 1 below shows trend of deaths from 2018 to 2022: 17 deaths in 2018, 15 deaths in 2019, 8 deaths in 2020, 18 deaths in 2021, 27 deaths in 2022.

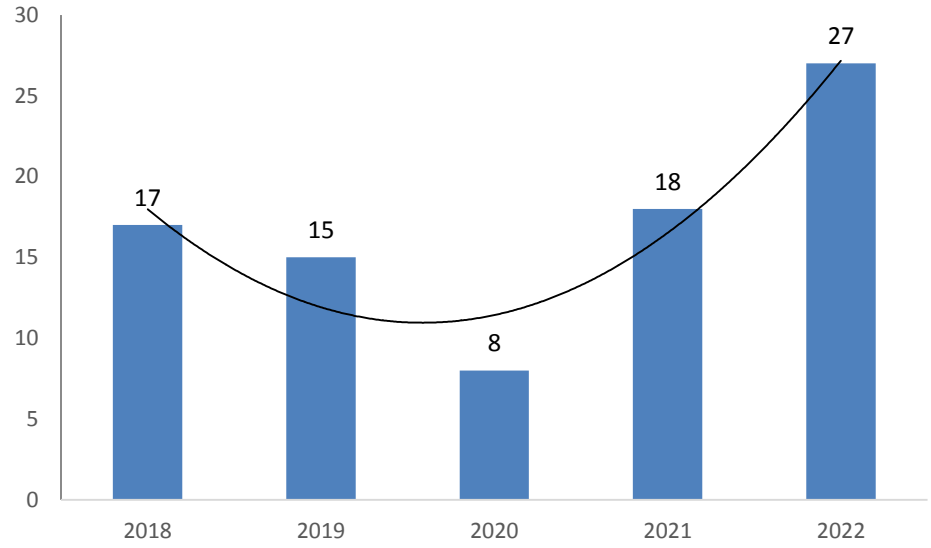

Figure 1: Trend of deaths from 2018 to 2022

There were 85 deaths in the hospital mortality records from 2018 to 2022. The average number of deaths from TB per year was 17 (SD 6.819091) with the highest being in 2022 (31.8% n = 27). Figure 1 shows the trend of deaths from TB in the Grootfontein district TB records. The graph shows the percentage of deaths from TB as a total of all deaths in the hospital TB mortality records. There was a steady decline from 2018 (20%) to 2020 (9.4%), followed by a steady increase from 2020 (9.4 %) to 2022 (31.8 %) with the sharpest upward trend from 2020 (9.4 %) to 2021 (21.2 %). The socio-demographic and other characteristics of people who died from TB in Grootfontein between 2028 and 2022 are shown in table 1.

Table 1: Socio-demographic and other characteristics of people who died from TB

Variables	N= 85	%
Age (years)		
0 – 9	4	4.7
10 – 19	3	3.5
20 – 29	20	23.5
30 – 39	19	22.4
40 – 49	13	15.3
≥ 50	26	30.6
Sex		
Female	35	41.2
Male	50	58.8
Type of patient		
New	57	67.1
Relapse	21	24.7
Rx after loss to follow up	2	2.4
Previously on second line Rx	3	3.5
RX after failure	2	2.4

Data source		
Treatment register	82	96.5
Treatment card	2	2.4
Medical file	1	1.1
Place of death		
Hospital	78	91.8
Home	7	8.2
Health facility level		
Hospital	85	100
Health centre	0	
Duration of anti TB treatment before death		
Within 1 month	48	56.5
Within 2 months	11	12.9
Within 3 months	8	9.4
Within 4 months	7	8.2
Within 5 months	5	5.9
Within 6 months or more	1	1.2
Missing data	5	5.9
Treatment category		
Susceptible TB	61	71.8
Drug resistant TB	21	24.7
No treatment	3	3.5
Disease classification		
Pulmonary TB	67	78.8
Extra pulmonary TB	18	21.2
Gene X pert results before treatment		
Positive	36	42.4
Negative	20	23.5
No result	6	7
Rifampicin resistant	23	27
Smear results before treatment		
Positive	41	48.2
Negative	18	21.2
No result	26	30.6
HIV status		
Positive	38	44.7
Negative	47	55.3
Antiretroviral treatment	N = 38	
Yes	36	94.7
No	2	5.3
N/A	47	

Majority of deaths from TB were in the 50 or above age categories (n = 26, 30.6%) followed by the 20–29 age category (n = 20, 23.5%). The lowest number of deaths from TB were in the 10–19 years category (n = 3, 3.5%). All children below the age of 10 who died from TB were co-infected with HIV. There was a 17.6 % higher proportion of TB deaths among males as compared to females (58.8% vs 41.2%). A majority (n = 78, 91.8%) of the TB deaths happened at the health facility compared to those that happened at home (n = 7, 8.2%). The majority of patients who died were new on TB treatment (n=57, 67.1%) compared to all re-treatments (n=28, 32.9%): including relapses (24.7%), treatment after loss to follow up (2.4%), those previously on second line treatment (3.5%), and treatment after failure (2.4%). Most deaths occurred within 1 month on TB treatment (n=48, 56.5%) followed by those who died within 2 months on TB treatment (n=11, 12.9%). There was only one patient who died in the 6 months or more on TB treatment category (1.2%). A big proportion of TB deaths were on susceptible TB treatment (71.8%) followed by those who were treated for drug resistant TB (24.7%), while there was no recorded evidence of treatment among 3.5% of TB deaths. Most deaths were due to pulmonary TB as compared to extra-pulmonary TB (78.8% vs 21.2%). A significant number of deaths from TB were co-infected with HIV (n=38, 44.7%) and most of them were on antiretroviral treatment (n=36, 94.7%).

Table 2 shows the associations between sex and the other social demographic characteristics of the people that died of TB in Grootfontein.

Table 2: Association between sex and other socio-demographic characteristics

	Female n (%)	Male n (%)	p-Value
Duration of anti TB treatment before death			
Within 1 month	19 (22.4)	29 (34.1)	0.518
Within 2 months	4 (4.7)	7 (8.2)	
Within 3 months	5 (5.9)	3 (3.5)	
Within 4 months	2 (2.4)	5 (5.9)	
Within 5 months	1 (1.2)	4 (4.7)	
≥ 6 months	1 (1.2)	0	
Missing data	3 (3.5)	2 (2.4)	
Place of death			
Hospital	32 (37.6)	46 (54.1)	0.925
Home	3 (3.5)	4 (4.7)	
Age (years)			
0 – 9	2 (2.4)	2 (2.4)	0.428
10 – 19	1 (1.2)	2 (2.4)	
20 – 29	10 (11.8)	10 (11.8)	
30 – 39	4 (4.7)	15 (17.6)	
40 – 49	7 (8.2)	6 (7.1)	
≥ 50	11 (12.9)	15 (17.6)	
Total	35 (41.2)	50 (58.8)	

Health care-seeking behaviour among those that died of TB did not vary significantly based on sex (p value = 0.519), 80% of females (n = 28/35) were reported to have sought health care late (died within 3 months of starting TB treatment) as opposed to 78 % of the males (n = 39/50). There was also no difference between sex (p = 0.925) for place of death. The percentage of males who died in the house was 4.7% as compared to females (3.5%), while the percentage of females who died in the hospital (37.6%) as compared to males (54.1%). Also, the proportions of deaths within various age groups were comparable between gender (p = 0.428).

Table 3 shows the adjusted logistic regression associations of risk of death from TB within various socio-demographic characteristics of TB deaths as assigned using ICD 10 in Grootfontein.

Table 3: Adjusted logistic regression analysis to examine the risk of death from TB within various socio-demographic characteristics

Variables	AOR	95 % CI		Wald P Value	LR P Value
		Lower	Upper		
Sex					
Female	Ref				
Male	1.086	0.227	5.203	0.011	0.918
Year of death					
2022	Ref	Ref	Ref		
2021	3.680	0.883	15.342		
2020	1.892	0.428	8.369		
2019	3.025	0.495	18.486		
2018	2.677	0.570	12.564	3.617	0.460
Place of death					
Home					
Hospital	Ref				
	0.920	0.192	4.400	0.11	0.917

AOR = Adjusted Odd Ratio; LR = Logistic Regression.

There was some evidence that sex was associated with the risk of death from TB (p-value < 0.05). Males had 1.086 higher odds of dying from TB than females (AOR 1.086; 95% CI 0.227–5.203; p-value = 0.011). There was no statistically significant association between those that died in the hospital as compared to those who died at home. Similarly, there was no evidence of increased risk of dying from TB in various different years of death as compared to those who died in 2022.

Some parameter of interest such as weight at the time of diagnosis, time between diagnosis and treatment, cause of death, and other co-morbidities had very incomplete data and therefore, were not analysed.

Table 4: HIV status by age group

Age (years)	Total Number (N=85)	HIV Positive	Positivity rate %
0 – 9	4	4	100
10 – 19	3	0	0
20 – 29	20	11	55
30 – 39	19	10	52.6
40 – 49	13	3	23
≥ 50	26	10	38.46

The above self-explanatory table 4 shows the distribution of HIV patient according to the age range.

Discussion

Namibia is working hard to reduce tuberculosis mortalities in line with the WHO's end TB strategy (8) like many other countries in the continent. Tuberculosis mortality surveillance needs to be enhanced to achieve appropriate resources allocation, even in Grootfontein district and ultimately end TB. The epidemiology of TB mortality in Grootfontein district has evolved over the years as shown in this paper. This research describes tuberculosis mortalities as classified using ICD 10 code in Grootfontein district hospital between 2018 and 2022. The pick in TB deaths between 2020 and 2022 can be partly associated with the emergence of COVID 19 pandemic (19). Unfortunately, this paper did not explore the Tuberculosis co-infection with COVID 19 among patients who died from TB due to its retrospective nature and lack of documentation. The highest numbers of tuberculosis deaths for the study period were in the age category 50 years and above. This is the same age group that had the highest HIV prevalence according to the Namibia Population-based HIV Impact Assessment (NAMPHIA 2017) report published in July 2018 (20). This report showed a 12.6 HIV prevalence in Namibia for adult men and women aged 15-64 years (20). Though HIV -TB co-infection data was not available for analysis, evidence shows that the risk of developing TB is estimated to be between 15 to 22 times greater in people living with HIV than among those without HIV infection (21).

There was a higher proportion of TB deaths in males as compared to females in Grootfontein district hospital medical records within the study period. The 2021 report on TB notified cases found a similar pattern of higher TB cases in males in comparison to females (22). Contributing factors may include poorer health-seeking behaviour among men as compared to women (23) and higher TB risk factors among men such as smoking, alcohol and occupational exposure to undetected TB cases (24).

Late health care-seeking behaviour was also noted in the Grootfontein district TB mortality records with a comparable proportion of females and males. In contrast, in studies from Zambia and Kenya, males were less likely to seek care for their presumptive TB symptoms (1, 23). Findings in this study demonstrate the crucial need of health care-seeking interventions targeted to both men and women to curve morbidity and mortality patterns in Namibia.

About 8.2 % of the deaths from TB happened at home. Though access to care data was not available for analysis, the high number of deaths at home could be an indicator of access to care challenges. People in farms and informal locations around Grootfontein have health care access challenges due to transport limitations, explaining why a proportion of the patients die at home.

Health-seeking behaviour may also have been affected by the low perception of the seriousness of symptoms, stigma for TB related symptoms because of its correlation with HIV, and delayed care-seeking due to poor awareness of the cardinal signs and symptoms of TB (1). Community awareness on TB signs and symptoms and subsequent follow-up measures have a crucial role in enhancing appropriate and timely care seeking (25), this would lead to early diagnosis and treatment. Almost a quarter (24.7 %) of all tuberculosis deaths was due to drug resistant TB. This research is particular in such that it shows the proportion of drug resistant TB deaths among all tuberculosis mortalities. Many other studies have shown the drug resistant TB mortality rate among people who contracted drug resistant tuberculosis with a pooled incidence mortality of 17% in a meta-analysis reviewing 43 studies in Sub-Saharan Africa (3).

Some limitations for this paper are: we used routine hospital TB program data for analysis, there was no available record on associated co-morbidities, including COVID-19 TB co-infection that may lead to under or overestimation of TB related deaths (26). The other challenge is that the dataset used in the analysis covered a small sample size over a short period of time in Grootfontein rural district of Namibia.

Conclusion

This research reveals that there was an increase in TB deaths over the last few years of the study period in the Grootfontein district hospital TB mortality records. There were some sex differences in TB mortality in the district with males more likely to die of tuberculosis (1.086 higher odds of dying from TB) as compared to their female counterparts. A quarter of the TB deaths were associated with drug resistant tuberculosis. Almost four firths of all deaths (67/85, 78.8 %) were due to late treatment seeking behavior. There is a crucial need to enhance community awareness, tuberculosis surveillance and access to tuberculosis diagnosis and treatment in Grootfontein to improve TB detection rates, treatment outcomes, enhance access to services and ultimately minimize late case detection and subsequent TB mortalities.

Author's contribution

CK, Conceptualized and designed the study, developed the study protocol and data collection tools, trained data collectors & supervised data collection, analyzed data, compiled the study report, and developed the manuscript. KWM, conceptualized and designed the study, reviewed the study protocol and data collection tools. KJ, reviewed the study protocol and data collection tools, provided input into the study report and the manuscript. KMJ, HCI, conceptualized the study; reviewed and provided input into the study report and the manuscript.

Disclosure

The authors declare no potential conflict of interest.

Acknowledgements

We are grateful to Ms Cheroltha January for her participation in data collection for this study. We sincerely thank the hospital medical officers (Kasita Fenni, Dibwe Fita, Bezuidenhout Michelle, Ndikudze David) and all other staff members who participated in the study discussion.

Funding

None

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Cite this article as: Katamba C, Miina KW, Josephina K, Mukendi JK, Indilini HC. Socio-demographic Characteristics of tuberculosis mortality in Grootfontein District, Namibia: analysis of hospital data between 2018 and 2022. *Ann Afr Med* 2024; **17** (3): e5674-e5684. https://dx.doi.org/10.4314/aamed.v17i3.9