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RESEARCH

Tuberculosis risk factors in Lephalale local municipality of Limpopo province, South Africa

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Lephalale local municipality is the leading sub-district in Limpopo province with 9.8% of deaths caused by tuberculosis. This study aimed to describe the risk factors for TB in Lephalale local municipality. A quantitative descriptive, cross-sectional survey design was used to target 148 registered TB patients aged 18 years and above in the sub-district's 6 clinics. Approval and ethical clearance was obtained from the relevant authorities (SHS/15/PH/14/2006). Only respondents who agreed in writing to be part of the study were included. Ethical research principles were observed. A researcher-developed self-administered questionnaire was used to collect data. The data were analysed using the Statistical Package for Social Sciences® version 22.0. Of 148 respondents, a high proportion of diagnosed TB patients (43.24%) were receiving less than R1 000 per month; the majority (53.38%) were unemployed; 22% were overcrowded in a single room; 31.8% had skipped taking TB medication at some point; 12% had previously worked in the mining industries; 37.16% never opened windows: 39.19% were from a rural settlement. TB risk factors in Lephalale include overcrowding, inadequate ventilation, TB treatment interruption, rural settlement, working in a mine, and low income. Educating communities about improving ventilation and treatment adherence as well as community empowerment with entrepreneurial skills might assist.

Keywords: cultural, risk, socio-economic, tuberculosis

Introduction

Tuberculosis is one of the critical global health issues currently.[1] The World Health Organization[2] estimated that there were 9 million incident cases of TB and 1.1 million deaths among non-HIV cases of TB in 2015 worldwide. According to Siddiqui *et al*.,[3] every two minutes 36 people are infected with TB, and among these six die. At present one-third of the earth's population is infected with TB.[2] In 2010, Africa alone contributed 26% of the global burden with 9 of the 22 high-burden countries contributing 81%. Tuberculosis causes great illness in poverty-affected populations, especially in low-income countries, with Kenya ranking 15th among the 22 burden countries in the world and 5th in Africa. The country had 74 335 new cases.[2]

South Africa had the third highest burden of disease in the world, after India and China, with an estimated incidence of 450 000 cases of active TB in 2013, an increase of 400% over the last 15 years.[1] An estimated 60–73% of the 450 000 incident cases have both HIV and TB infection. The incidence of multi-drug resistant (MDR) and extensively drug-resistant TB are increasing.[4] South Africa has the second highest number of reported multi-drug resistant TB (MDR-TB) cases globally.[5] TB remains the leading cause of death in South Africa.[6] Limpopo province had 17 301 national TB cases and ranked number seven among all nine provinces. Tuberculosis is one of the major problems in Limpopo province and it is regarded as the first priority of the Department of Health strategy plan.[7] According to Tshitangano,[8] Limpopo province has gradually recorded an increase in TB load, up from 11 897 in 2005 to 22 158 in 2011.

Motsoaledi[9] emphasised that South Africa is facing challenges in terms of controlling TB in the mines with about 41 810 cases of active TB detected every year. According to Motsoaledi,[9] the incidence of TB in the mining industry is higher than in any other working population in the world, and 9.6 million work days are lost each year to TB. The mining industry acts as a conduit to increase the spread of TB in communities around the mines. In 2012, Waterberg district was the leading district in Limpopo province with 9.8% of deaths caused by TB.[7] Lephalale local municipality remains the area of research interest as it forms part of Waterberg district. According to Taha *et al*.,[10] the determinants of active TB in HIV/AIDS patients include factors such as socio-economic status, which include ownership of house, income, residence, marital status, occupation and education; there are also proximate determinants, which include age, sex, and previous history of TB. One common and useful way to contribute to the control of tuberculosis is to identify the important risk factors for tuberculosis. Studies have addressed the issue of behaviour and biomedical aspects as the risk factors associated with tuberculosis.[11] A study conducted by Padmapriyadarsini *et al*.[12] found that HIV is associated with tuberculosis. Diabetes mellitus is another disease associated with tuberculosis.[13] According to Odone *et al*.,[13] malnutrition has been seen to be a risk factor associated with tuberculosis. The WHO[1,2] asserts that identifying and managing the risk factors (determinants) is one useful strategy to control TB. This study therefore aimed to describe the risk factors for TB in Lephalale local municipality, South Africa. The following objectives directed the study:

(1) to explain demographic and socio-economic factors that contribute to the spread of TB in Lephalale local municipality;

(2) to describe cultural factors that contribute to the spread of TB in Lephalale local municipality;

(3) to describe environmental factors that contribute to the spread of TB in Lephalale local municipality;

(4) to assess attitudes and behaviour associated with the spread of TB in Lephalale local municipality.

Methods

A cross-sectional survey was found to be the most suitable design to address the objectives of this study. The research method used was quantitative descriptive in nature. The study was conducted at Lephalale local municipality where 148 registered TB patients aged 18 years and above in 6 clinics using a TB register were included in the study population. The participants had to be registered in any of the six clinics. Only respondents who agreed in writing to be part of the study were included.

Sampling

The sample size for this study was calculated using Slovin's formula, where N was the total number of TB patients, n was the sample size and e was the accepted level of error. The accepted level of error, e, was 0.05. Therefore the sample size was 149 as calculated below:

$$\frac{n = N}{1 + N(e^2)}$$

$$\frac{n = 238}{1 + 238(0.05)^2}$$

$$\frac{n = 238}{1 + 0.5925}$$

$$\frac{n = 238}{1.5925}$$

$$\frac{n = 148.2}{n = 148}$$

To select the participants from the target population until the sample was reached, two sampling methods were utilised. First the stratified random sampling technique was employed by dividing groups (strata) according to their clinics then systematic random sampling was used to select names from the clinics' TB registers. The total number of TB registered patients was divided by the sample size to find the K value, which is the interval value; K value = 238/148 = 2. Therefore, every second TB patient from the register was selected to participate in the study until the sample size of 148 was reached.

Data collection

Data were collected using a self-administered questionnaire, which consisted of open and closed ended questions. A researcher developed self-administered questionnaire was used to collect the data: Section A: Socio-demographic characteristics that include age, employment status, sex, income, type of income and level of education; Section B: Environment factors; Section C: Personal Risk factors; and Section D: Attitude and behaviours. Prior to the collection of data, approval and ethical clearance were obtained from the University of Venda SHS/15/PH/14/2006) and the provincial Department of Health, Limpopo Province. Principles of self-determination, anonymity, confidentiality, informed consent and protection from harm were observed throughout the data-collection process. Data were collected in clinics by the researcher, assisted by clinic managers. Moreover, the dates were arranged with the nurses to confirm the availability of TB patients. Questionnaires were administered to the participants when they came for their monthly TB treatment schedule. Eligible participants were requested to sign the consent form once they agreed to participate in the study.

Reliability and validity of questionnaire instrument

The questionnaire was presented to staff members from the Department of Public Health at the University of Venda and also presented to the members of the Higher Degree Committee (HDC) of the School of Health Sciences in order to assess its appropriateness and assist where anything was lacking. Content validity was also observed throughout the evaluation by environmental health specialists, supervisors, lecturers from the department and other departments, together with students who attended the departmental seminars. To ensure validity of the questionnaire an extensive literature search was conducted and the research developed in line with the objectives. Furthermore the questionnaire was developed in close cooperation with TB experts who evaluated it before data collection, hence its validity. Instrument reliability was ensured by the test–retest method. The researcher administered the questionnaire to 10 participants in Lephalale hospital. After two weeks the researcher administered the instrument to the same 10 participants for a second time. The scores for test and retest were compared and there was a small difference. Cronbach's alpha, which measures the degree of internal consistency ($0 \leq \alpha \leq 1.0$) of the instrument, was used to ascertain the reliability of the instrument. The results yielded an alpha (α) value of 0.84; it was therefore concluded that the instrument had high consistency and thus was reliable.

Statistical analysis

The Statistical Package for Social Sciences® (SPSS) version 22.0 (IBM Corp, Armonk, NY, USA) was used to analyse the data in the form of frequency and percentages. Data analysis was carried out using SPSS version 22.0, whereby the frequency distribution and cross-tabulation were used. Every response item on the questionnaire was carefully entered as a numbered code under the question header in SPSS when all the survey questionnaires had been collected. A data-cleaning process was employed to produce quality data and referring back to the objectives of the study.

Results

From all selected cases of TB patients, 148 completed questionnaires out of 149 targeted sample giving a 99.3% response rate. The results were presented according to the objectives outlined in the introduction, namely demographic factors, socio-economic factors, environmental factors and attitudes and behaviour associated with TB.

Demographic factors

Of 148 respondents, a high proportion of diagnosed TB patients (43.24%) were receiving less than R1 000 per month; the majority (53.38%) were unemployed; 22% were overcrowded in a single room; 31.8% had skipped taking TB medication at some point; 12% had previously worked in the mining industries; 37.16% never opened windows; 39.19% were from a rural settlement. The results revealed that 20.95% were within the 34–40 years age bracket with a slight difference of 20.27% falling in the range of 26–33 years of age. More than half (52.7%) of the respondents were males while 43.5% were females.

Among the respondents 70% were unemployed while 33.7% depended on a government grant. The majority of the respondents (43.24%) receive an income of less than R1 000 per month. About 54.05% had secondary education as compared with 12.8% who did not attend school at all. About 12% of the respondents indicated that they had previously worked in the mining industries. About 12.1% of the respondents worked on farms, while the majority of the respondents were unemployed (53.38%) and dependent on a grant of less than R1 000 (see Table 1).

Cultural risk factors

Table 2 indicates that 18.92% of TB patients first consulted a traditional healer before they went to the health care centre. About 58.11% of TB respondents visited the health care centre for their first TB consultation. The results show that 18.92% of respondents had a family history of TB, while 81.08% had no family history of TB.

Environmental risk factors

The majority of respondents' houses (79.05%) had windows compared with 20.95% who did not. Few (31.76%) respondents were opening windows frequently compared with 37.16% who never did and 31.8% who sometimes do so (see Table 3).

The participants (Figure 1a) also indicated that (49%) of respondents had shared a room in the past, while (45%) had not shared a room in the past year. Some 6% of the respondents shared a room. Figure 1b indicates that (22%) of respondents were overcrowded in a single room, and about 30% of respondents were accommodating two people per single room. Figure 1c indicates that 12% of the respondents stated that they had previously worked in the mining industries, while 9.1% of them worked in health facilities such as clinics and hospitals. About 12.1% of the respondents had work in farming, while the majority of the respondents were unemployed (53.38%).

Attitude and behaviour risk factors

Table 4 indicates that (31.8%) of respondents had skipped taking medication, while 68.2% were taking medication every day. The results also show that respondents were ashamed to discover that they had TB (20.27%). About 77.7% disagreed with this statement. The table indicates that 51.35% of respondents were hiding their TB status while 46.62% had disclosed their TB status to relatives and friends. Some 92% of TB patients agreed that having TB affects relationships with family members, while 37.84% of respondents believed that having TB does not affect their relationship with family members. A high proportion of TB patients (43.92%) will take their medication despite the side effects as long as they manage to finish the treatment, while 37.84% believe that drug side effects affect the process of completing treatment.

Cross-tabulation was employed to investigate any association between geographic area and stigmatisation. Rural formal (43.1%) and urban informal (51.35%) TB patients were respectively associated with stigma (p-value = 0.002) (see Table 4).

Discussion

The discussion is arranged under sub-headings based on the objectives of the study, namely socio-cultural risk factors,

Table 1: Socio-economic and demographic characteristics.

Variables	Frequency (n = 148)	%
Age		
18–25	23	15.54
26–33	30	20.27
34–40	31	20.95
41–47	25	16.89
48–55	11	7.43
56+	28	18.92
Sex		
Male	78	52.70
Female	70	47.30
Marital status		
Married	28	18.92
Single	66	44.59
Separated	39	26.35
Cohabiting	13	8.78
Widowed	2	1.35
Education level		
None	19	12.84
Primary	28	18.92
Secondary	80	54.05
Tertiary	21	14.19
Occupation		
Unemployed	104	70.27
Employed	30	20.27
Self-employed	14	9.46
Type of income		
Salary	27	18.24
Grant/pension fund	50	33.78
Profit (business)	15	10.14
Student	13	8.78
None	43	29.05
Income		
less R1 000	64	43.24
R1 000–R3 000	56	37.84
R4 000–6 000	6	4.05
R7 000–10 000	5	3.38
>R10 000	17	11.49

Table 2: First place consulted before being diagnosed with TB and history of TB in the family.

Variables	n = 148	%
First place for consultation		
Traditional healer	28	18.92
Pharmacy	6	4.05
Healthcare centre	86	58.11
Hospitals	22	14.86
Self-medication	5	3.38
Prayer/church	1	0.68
Family diagnosed with TB		
Yes	28	18.92
No	120	81.08

Table 3: Environmental factors: indoor ventilation.

Variables	*n* = 148	%
Does your dwelling have windows?		
Yes	117	79.05
No	31	20.95
Were you opening the window to allow fresh air indoors?		
Yes	47	31.76
No	55	37.16
Sometimes	46	31.08

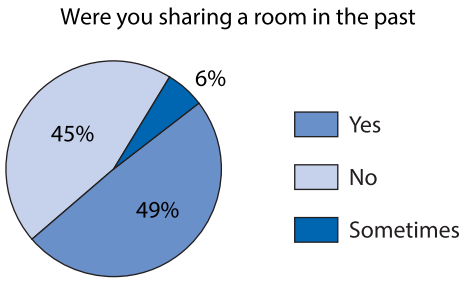

Figure 1a: Living arrangements.

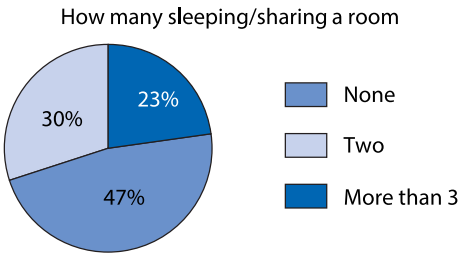

Figure 1b: Overcrowding.

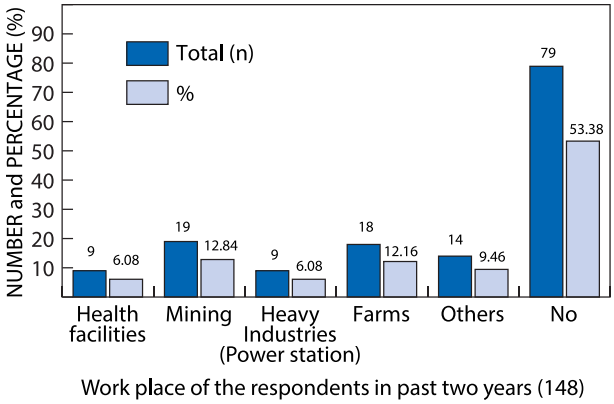

Figure 1c: Work environment.

environmental risk factors, economic factors, and attitudes and behaviour associated with the spread of TB. In this study people living with TB are in the age brackets 34–40 years and 26–33 years, which is to say that the young economically productive age groups suffer more from tuberculosis. Previous studies have reported a rapid rise in TB mortality and morbidity among this young adult population, mostly between 15 and 44 years of age,[14] which is in line with the findings showing higher HIV infection in these age groups in sub-Saharan Africa.

Table 4: Attitude of the respondents towards TB.

Variable	*n* = 148	%
Have you skipped taking medication?		
Yes	47	31.76
No	101	68.24
Were you ashamed when you found out that you have TB?		
Disagree	115	77.70
Neutral	3	2.03
Agree	30	20.27
I always hide TB status to avoid being stigmatised		
Disagree	69	46.62
Neutral	3	2.03
Agree	76	51.35
Does having TB affect your relationship with other family members		
Disagree	56	37.84
Neutral	27	18.24
Agree	65	43.92
I will keep taking treatment despite the side effects as long I finish treatment		
Disagree	30	20.27
Neutral	25	16.89
Agree	93	62.84

Geographic area settlement	I always hide TB status to avoid being stigmatised			
	Disagree	Neutral	Agree	*p*-value
Rural formal	32 (55.17)	1 (1.72)	25 (43.10)	0.002
Rural informal	13 (65)	0.00	7 (35)	
Urban formal	0.000	0.00	16 (100)	
Urban informal	24 (44.44)	2 (2.03)	76 (51.35)	

With regard to gender and TB morbidity this study showed that a significantly higher percentage of males (52.70%) as compared with females (47.30%) are affected by TB. Evidence from a study conducted by the World Health Organization reports that males are 1.4 times more likely to have TB than females.[1] These findings were supported by Gomes *et al.*,[15] who indicate that in most countries greater numbers of men are diagnosed with TB than women, and men have a higher death rate from TB. Similarly, the WHO[2] asserts that, globally, more men than women fall ill with TB annually, and that an estimated 5.4 million incident cases among men and 3.2 million among women were reported in 2014. Men are more likely than women to contract TB due to smoking.[1]

Furthermore the study revealed that a high proportion of the respondents receive less than R1 000 per month, and are unemployed. There is a significant relationship between poverty and TB morbidity globally. According to review evidence from the World Health Organization, low-income countries are at high risk of TB.[2] From the research findings, it was evident that poor people were more likely to be diagnosed with TB. Poverty has been associated with TB mortality as a strong risk factor.[16] Systematic review reporting from 134 countries revealed that the incidence of tuberculosis was falling more quickly in high-income countries than in those with low income.[1] This corresponds to a study conducted by Tshabalala,[17] which concluded that poverty is a leading factor resulting in TB patients' non-compliance with treatment. The majority of the respondents were residing in rural settlements (39.1%), while 36.5% of TB patients resided in urban settlements. These findings were supported by the study of Ephrem *et al.*,[18] which shows that the

prevalence of TB is higher in rural areas than urban areas. The study was further supported by Haider et al.[19] who indicated that poor housing due to overcrowding led to increased transmission of TB, leading to weakened immunity.

Research found that destinations such as traditional healers, the church and pharmacy shops were consulted by the majority of patients before they attended healthcare facilities. A high number of diagnosed patients consulted a traditional healer before going to healthcare centres. Mathibela et al.[20] further indicate that approximately 80% of people in Africa rely on traditional medicine for most of their health needs. The findings indicate that 18.92% of TB patients first visited a traditional healer, while 8.38% were using self-medication rather than seeking treatment in a clinic or hospital. The place which patients first visited contributed to the delay in reporting to a healthcare facility. The support study done by Hargreaves[11] found that patients who visited traditional healers before they attended modern services had more delay in reporting to a health facility. Such types of behaviour enhance the spread of TB, and promote the risk of contracting TB among community members. The findings were supported by Viney *et al*.,[21] who found that people who have been infected by tuberculosis tend to consult a traditional healer before they seek Western medication.

Overcrowding is one of the factors that plays a major role in the transmission of tuberculosis. In this study 64.3% of families were living in single rooms, some with as many as 10 people. About 49% of the respondents had shared a single room in the past. About 23% of the respondents were living in an overcrowded household with more than three people in one single room. Similar studies in India revealed that 73.3% of TB patients lived in overcrowded residences.[22] A study done in Gambia shows that TB cases increase when there is overcrowding.[22] Research by Lygizos[23] found that ventilation created by opening windows and doors provide a high rate of air exchange, absolute ventilation and theoretical protection against airborne TB infection.

Stigma and societal attitudes fuel non-adherence to TB medication. The findings show that 31.8% of the respondents skipped taking medication. Tarimo[24] indicates that stopping medication or skipping it results in the development of multi-drug resistance. Some respondents indicated that they were ashamed when they were diagnosed with TB (20.27%). Moreover, results show that respondents tried to hide their TB status because of stigmatisation (51.35%). Cross-tabulation was performed to investigate geographic areas and those who hide their TB status. The findings proved statistically significant among people who live in a rural formal household, with 25 (43.1%; p-value = 0.002) trying to hide their status. The number of TB patients who reside in urban informal settlements associated with hiding their TB status from other community members was 76 (51.35%; p-value = 0.002). The findings were supported by the study done by Tarimo,[24] which shows that being diagnosed with TB and fear of social isolation are obstacles to seeking timely health care.

Conclusion

This study confirms the findings of previous studies, i.e. that demographic, environmental and behavioural factors are linked to high tuberculosis morbidity in Lephalale

Recommendations

Intensive community education aimed at changing perceptions of TB risk factors, particularly ventilation and TB treatment adherence, might yield beneficial results. Community development projects aimed at empowering communities with entrepreneurial skills would also assist.

Conflict of interest – The authors hereby declare that no financial gain motivated this study.

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References

1. World Health Organization. Global tuberculosis report. 2014. Available October 2014 from: http://www/who.into/mediacenter/factsheets/fs104/en/
2. WHO. Global tuberculosis report ISBN 9789241565059; 2015.
3. Siddiqui MS, Fakih HA, Burney WA, et al. Environmental and host-related factors predisposing to tuberculosis in Karachi: a cross-sectional study. J Pioneer Med Sci. 2011 Apr 1;1(1):13.
4. Mbengo F, Ngirande H, Ndou ND, et al. Strategies to boost the uptake of voluntary counselling and testing (VCT) by university students. Mediterr J Social Sci. 2014 Jul 4;5(15):458.
5. Pietersen E, Ignatius E, Streicher EM, et al. Long-term outcomes of patients with extensively drug-resistant tuberculosis in South Africa: a cohort study. Lancet. 2014 Apr 11;383(9924):1230. https://doi.org/10.1016/S0140-6736(13)62675-6
6. Statistics South Africa. Mortality and causes of death in South Africa, 2011: findings from death notification. Pretoria: Stats SA; 2014.
7. National Department of Health. Annual performance plan 2012/13-2014/15. National Department of Health. South Africa. Diseases. 2012;34:153–7.
8. Tshitangano TG. The management of latent tuberculosis infection in health care workers at hospitals in Vhembe district. Occup Health South Afr. 2013;19(5):14–9.
9. Motsoaledi, A. South Africa's TB burden. 4th RSA TB conference. Durban. 2014.
10. Taha M, Deribew A, Tessema F, et al. Risk factors of active tuberculosis in people living with HIV/AIDS in southwest Ethiopia: a case control study. Ethiop J Health Sci. 2011 Jul;21(2):131–40.
11. Hargreaves JR, Boccia D, Evans CA, et al. The social determinants of tuberculosis: from evidence to action. Am J Public Health. 2011 Apr;101(4):654–62.
12. Padmapriyadarsini C, Narendran G, Swaminathan S. Diagnosis & treatment of tuberculosis in HIV co-infected patients. Indian J Med Res. 2011 Dec 1;134(6):850.
13. Odone A, Houben RM, White RG, et al. The effect of diabetes and undernutrition trends on reaching 2035 global tuberculosis targets. Lancet Diabet Endocrinol. 2014 Sep 30;2(9):754–64. https://doi.org/10.1016/S2213-8587(14)70164-0
14. World Health Organization. Global tuberculosis report 2013. World Health Organization; 2013.
15. Gomes NM, Bastos MC, Marins RM, et al. Differences between risk factors associated with tuberculosis treatment abandonment and mortality. Pulm Med. 2015 Oct;27:2015.
16. Cai J, Wang X, Ma A, et al. Factors associated with patient and provider delays for tuberculosis diagnosis and treatment in Asia: a systematic review and meta-analysis. PloS One. 2015 Mar 25;10(3):e0120088. https://doi.org/10.1371/journal.pone.0120088
17. Tshabalala, DL. Tuberculosis treatment interruption; 2007.
18. Ephrem T, Mengiste B, Mesfin F, et al. Determinants of active pulmonary tuberculosis in Ambo Hospital, West Ethiopia. Afr J Prim Health Care Fam Med. 2015;7(1):1–8.
19. Haider BA, Akhtar S, Hatcher J. Daily contact with a patient and poor housing affordability as determinants of pulmonary tuberculosis in urban Pakistan. Int J of Mycobacteriology. 2013;2:38–43.

20. Mathibela MK, Egan BA, Du Plessis HJ, et al. Socio-cultural profile of Bapedi traditional healers as indigenous knowledge custodians and conservation partners in the Blouberg area, Limpopo Province, South Africa. J Ethnobiol Ethnomed. 2015 Jun 6;11(1):1.
21. Viney KA, Johnson P, Tagaro M, et al. Tuberculosis patients' knowledge and beliefs about tuberculosis: a mixed methods study from the Pacific Island nation of Vanuatu. BMC Public Health 2014 May 17;14(1):1.
22. Hill PC, Sillah DJ, Donkor SA, et al. Risk factors for pulmonary tuberculosis: a clinic-based case control study in The Gambia. BMC Public Health 2006;6(1):156. doi:10.1186/1471-2458-6-156.
23. Lygizos M, Shenoi SV, Brooks RP, et al. Natural ventilation reduces high TB transmission risk in traditional homes in rural KwaZulu-Natal, South Africa. BMC Infect Dis. 2013 Jul 1;13(1):1.
24. Tarimo, GB. Delay in seeking care among tuberculosis patients attending tuberculosis clinics in rungwe district, Tanzania. Master of Public Health Dissertation. Muhimbili University of Health and allied Sciences; 2012.

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