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Integration of Tuberculosis and Human Immunodeficiency Virus Services in Ngaka Modiri Molema District, North West Province

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ABSTRACT Tuberculosis (TB) and human immunodeficiency virus (HIV) epidemics in South Africa are closely intertwined. This study seeks to determine and describe the level and implementation model of integration of TB/HIV services in *Ngaka Modiri Molema* district, North West province. A cross-sectional chart review was employed in the study. A total of 305 patient records were reviewed from four PHC and four CHC clinics. Participants' ages ranged from 6 to 73 years and females (63%) dominated the study. Patients' entry point to care was HIV (98%) and TB (2%). Majority of PLWH (97%) were screened for TB. TB patients (100%) were tested for HIV, and given co-trimoxazole. Most patients (82%) were initiated in ART within 2 weeks. Majority of them (88%) adopted full TB/HIV integrated services. Proper implementation of TB/HIV integrated services can promote the reduction of risk of TB incidence, illness and death among PLWH, through extended preventive therapies.

INTRODUCTION

The global tuberculosis (TB) and human immunodeficiency virus (HIV) epidemics in sub-Saharan Africa are closely linked to each other. Tuberculosis have been reported to be the leading cause of death among people living with HIV (PLWH) worldwide, with South Africa having the highest number of PLWH and rated among the top six countries with the highest TB incidence rates worldwide (HIV and AIDS in South Africa [HASA] 2017). This had been highlighted through the TB Global Report that about 1.3 million TB deaths were recorded and about 476 774 reported TB cases of HIV-positive TB that accounts for 46 percent of the estimated TB incidence cases (World Health Organisation [WHO] 2017). TB was acclaimed to have the ability of changing the manifestation of HIV from the gradual progressing disease with tolerable likelihood of developing into AIDS to one with rapid progression and high mortality rate (Manosuthi et al. 2016; Getahun et al. 2007). Hence, this study seeks to investigate the level of TB/HIV integration services between these two co-epidemics.

Tb case rate had been reported to have increased 20-fold since the discovery of HIV and similarly there had been an increased trend of 80 percent prevalence of HIV that was found among newly diagnosed TB patients, mainly in countries that are resource constrained such as south Africa (Martinson et al. 2011; Corbett et al. 2006). In 2016, forty percent of HIV deaths were due to TB (WHO 2018). Sub Saharan Africa project the highest burden of TB/HIV interface, which had been proved tragic, and promoted by the lack of resources for their control (Zumla et al. 2015; Adeiza et al. 2014; Gandhi et al. 2006). To emphasize on this, WHO (2017) reported that Sub Saharan Africa feel the impact of the dual burden of TB/HIV and accounted for about 86 percent of all death from HIV-related TB in the year 2016.

The burden of TB on PLWH had also been revealed by WHO (2016) in the year 2015, in that out of 454000 TB incident cases in South Africa, about 57 percent (258,000) were PLWH. This in turn provides evidence that in regions where there is an increase number of PLWH, there is also an increase in the number of TB cases coupled with drug-resistant strains of TB (WHO 2007; Mayer and Hamilton 2010). These challenges had also been amplified through the health care systems, like in South Africa as developing country that is faced with limited resources and

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the poor management of those available resources for decades to date. This challenges faced by south Africa cannot be hidden as individuals who are co-infected with TB/HIV personifies the problems that the compromised health care systems pose (Mayer and Hamilton 2010). WHO (2004) recommended that undertaking TB services should be coupled with undertaking HIV services, this is true given that HIV is a powerful force providing the opportunity for the rise of TB epidemic and similarly, undertaking HIV should also include undertaking TB as a leading killer among PLWH. Therefore, who recommended the collaborated TB and HIV activities and ever since then, the prevention and treatment of TB in PLWH have become an urgent priority for both HIV and TB programmes (Fujiwara et al. 2012). This saw to the implementation of three cores approach namely, decreasing the burden of TB among PLWH and decreasing HIV burden among TB patients (Denegetu and Dolamo 2014).

Even with the substantial benefits, Schito et al. (2012) revealed that HIV programmes were slow on the implementation of TB-reduction services (Such as screening for TB among PLWH) that led to the evident missed opportunities that could have prevented unnecessary increase in TB case among PLWH. However, different models for delivering integrated TB/HIV services exist in several countries. These models are full, partial and with no integration of TB/HIV services (WHO 2010). According to Kerschberger et al. (2012), 'full integration' of TB/HIV services is when TB/HIV services are offered in a single facility by a single health care provider. Furthermore, TB/HIV integration was found to be feasible in the Western Cape Province. 'Partial integration' includes providing cotrimoxazole prophylaxis and ART in TB facilities, or screening for TB and employing directly observed TB treatment (DOTS) in HIV facilities and 'no integration' is when TB/HIV services are separately provided, however, there should be an enforced cross-referral between TB and HIV facilities (Chimzizi et al. 2005; Smart 2008; Shetty et al. 2008).

Furthermore, according to WHO (2010), this implementation of integrated TB/HIV services depends on the local context, the epidemiology and the status of the health system which determines the service delivery model. South Africa is amongst the countries that are over-burdened by the TB/HIV co-infection and can significantly benefit from employing these TB/HIV integrated services as failure to detect and effectively treat TB and HIV cases makes it difficult to take measures necessary for mortality reduction in HIV-infected TB patients and this also have the potential to negatively impact on the already over-burdened health care system and the under-resourced or poorly managed facilities. Therefore, there was a need to investigate the level and type of TB/HIV integration within Ngaka Modiri Molema district in North West province.

Objectives

The objectives of this study were to describe the level of integration of TB services among HIV patients, to describe the level of integration of HIV services in TB patients; and to determine the type of integration employed in *Ngaka Modiri Molema* district, North West in South Africa.

MATERIAL AND METHODS

A cross-sectional chart review was conducted in *Mafikeng* sub-district within Ngaka Modiri Molema *District* in the North West province, one of South Africa's nine provinces. Mafikeng sub-district was randomly selected for this study. The North-West University Ethics Committee provided ethical clearance for the study. Voluntary participation and written consent was obtained from all patients. Patients were informed about the study purpose and their names were not printed anywhere in the study. Confidentiality was ensured. Systematic random sampling was used to sample facilities meeting the inclusion criteria and patient records from January 2012. The study was inclusive of 4 primary health care clinics, 4 community health centres accredited to initiate ART, TB/HIV co-infected patients initiated on Anti-TB treatment or ART from January 2012 to December 2013 and provided care by NIMART (Nurse-initiated Management of Antiretroviral Therapy) trained nurses. Data was collected from February to August 2014.

There were no standardized data collection instruments to determine the integration of TB/HIV in SA. However, the medical record review (MMR) checklist was developed which was inclusive of participant demographics, integration of TB services to HIV services, and integration of HIV services to TB services. The MMR checklist was developed with the guidance of the

South African Antiretroviral Treatment Guideline (2010), National TB Management Guideline (2009) and recommendations made by the World Health Organization (WHO) (2010), Centre for Disease Control and Prevention (CDC) as well as the South African National Department of Health (NDoH) and cited TB/HIV integrated interventions literature (Fujiwara et al. 2012). Data abstraction was achieved through the use of a medical record review (MRR) instrument. The abstraction of data was conducted reliably and according to Gilbert et al. (1996). Data abstraction was conducted in a manner that adhered to the following strategies with the aim of reducing bias and promoting inter and intra- reliability. Thus, data was collected through a trained research assistant and in addition, accuracy and reliability of the collected data was checked through random samples (Reid 1970; Horowitz and Yu 1984; Wu and Ashton 1997; Beard et al. 1992; Allison et al. 2000). IBM SPSS (Statistical Program for Social Sciences) statistics 21 was used to analyse data. Descriptive statistics were employed in this study. Demographic, level of integration of TB in HIV services and HIV in TB services information was tabulated using frequencies and percentages with age using mean and standard deviation.

RESULTS

A total of 305 patients' records were sampled randomly for this study from 4 PHC and CHC clinics selected. Data abstraction was conducted in an unbiased manner. Patients' ages ranged from 6-73 years (mean=39.11, SD=10.44), and females (63%) dominated in the study as indicated in Table 1. About 99 percent (n=301) were African; approximately 62 percent (n=186) were unemployed and about seventy-three percent lived with 2 or more family members, from which about 76 percent of them had about 2-4 family members in their households and 91 percent were taken care of by their family member. Most patients' entry point to care was HIV (n=299; 98%) which was then followed by TB (n=6; 2%).

Table 2 indicates that among the HIV patients, about 97 percent (n=296) of patients were screened for TB while three percent were not screened. Of those screened, 89 percent (n=264) had no clinical findings hence, about 11 percent (n=32) had one or more clinical findings and were categorized as TB suspects. Sputum smear microscopy was collected in 99 percent (n=31) of suspects and only 29 percent (n=9) tested positive. Tuberculin Skin Test (TST) was not done in about 97.6 percent (n=290) of all patients and chest X-ray was also not done in about 98.3 percent (n=291) patients as indicated in Table 2. These findings reveals that there was moderate integration of TB/HIV services as some of the TB services where not fully offered to PLWH and some of the HIV services where not provided to TB diagnosed patients.

In Table 3, all TB patients enrolled in the study (n=11; 100%) were tested for HIV and tested positive. CD4 cell count was collected in all patients and only nine percent (n=1) did not receive adherence counselling. Co-trimoxazole preventive therapy (CPT) and pyridoxine was given to all the patients. About 82 percent (n=9) were initiated in ART in less than 2 weeks and eighteen percent (n=2) after 2 weeks. About 88

Table 1: Patients demographic data

	Frequency	*Percentage (%)*
Age (6-73 years)	Mean=39.11	SD=10.44
Gender (n=305)		
Male	113	37.0
Female	192	63.0
Race (n=305)		
African	301	98.7
Coloured	4	1.3
Employment Status (n=305)		
Employed	45	15.0
Unemployed	186	62.0
No record	69	23.0
Living Arrangements (n=290)		
Living with more than one family member	213	73.4
Living with one family member or relative	75	25.9
Living alone	2	.7
Number of Family Member in a Household (n=286)		
Less than 2 family members	72	25.2
2-4 family members	188	65.7
5 and above	26	9.1
Patient Caregiver (n=290)		
Community/home based caregiver	16	5.5
Family member	264	91.0
Family relative	4	1.4
Friend	6	2.1
Patients' TB/HIV Services Entry Point (n=305)		
TB	6	2.0
HIV	299	98.0

Source: Authors' own work

Table 2: Level of integration of TB services among HIV patients

	Frequency	*Percentage (%)*
TB Screening Done (n=305)		
Yes	296	97.1
No	9	2.9
Clinical Findings (n=296)		
No clinical findings	264	89.2
One or more clinical findings	32	10.8
TB Suspect (n=296)		
Yes	32	10.8
No	264	89.2
Sputum Smear Microscopy Collected (n=32)		
Yes	31	96.9
No	1	3.1
Results (n=31)		
Negative	22	71.0
Positive	9	29.0
Tuberculin Skin Test (TST) (n=297)		
Done	2	0.7
Not done	290	97.6
N/A	5	1.7
Chest X-ray (n=296)		
Done	3	1.0
Not done	291	98.3
N/A	2	0.7
TB Patients Started on Treatment (n=9)	9	100.00

Source: Authors' own work

Table 3: Level of integration of HIV services among TB patients

	Frequency	*Percentage (%)*
HIV Test Done (n=11)		
Yes	11	100.0
No	0	0.0
If Yes Results (n=11)		
Positive	11	100.0
Negative	0	0.0
CD4 Collected for HIV Positive Client (n=11)		
Yes	11	100.0
No	0	0.0
Adherence Counselling Done (n=11)		
Yes	10	90.9
No	1	9.1
If HIV/TB Client Co-trimoxazole and Pyridoxine Given (n=11)		
Yes	11	100.0
No	0	0.0
ART Initiation (n=11)		
Less than two weeks	9	81.8
Less than one month	1	9.1
More than a month	1	9.1

Source: Authors' own work

percent (n=7) of facilities adopted full integration of TB/HIV services as opposed to about 12 percent (n=1) that adopted partial integration of TB/HIV services (See Table 3).

DISCUSSION

This study determines the level of integrated TB/HIV services in Ngaka Modiri Molema district. It was evident that there is moderate to high integration of TB/HIV services within the selected facilities. Scott et al. (2010) stated that South Africa by far shows a lot of progress in integrating TB/HIV services and that South Africa has shifted from a vertical programmatic approach in the year 2000, with isolated staff and service model to a new decentralized TB/HIV integrated method that provide room for strengthening of primary health care services (Scott et al. 2010; Chehab et al. 2013). Mburu et al. (2014) indicated that while some progress has been made in ensuring effective integration of TB/HIV services, African countries are still not on track to meet the goals of halving TB mortality among PLWH. Furthermore, access to TB prevention, diagnosis and treatment among PLWH remains an extensive challenge fueled by the given rise in MDR-TB coupled with the limited availability of medical resources for effective screening, limited treatment options and the treatment that is extensively costly and not widely available and with serious side-effects experienced by patients (Mburu et al. 2014). This reveals that though progress is being made in TB/HIV integrated services, other factors also need to be taken into account as they significantly influence this integration, which is the availability of human, financial and medical resources.

Tuberculosis services were offered to the majority of PLWH although TST and chest x-ray were not done in almost all HIV patients which is a violation of the recommendations of the 'National Consolidated Guidelines, for the Prevention of Mother-to-Child Transmission of HIV' (PMTCT) and the management of HIV in children, adolescents and adults' (National Department of Health [NDoH] 2015). This may be as a result of the high usage of sputum smear microscopy that is highly utilized in South Africa to diagnose TB. This is in agreement with the findings of Chandra et al. (2015) and Lawn et al. (2011a), indicating the need for routine microbiological screening (Sputum Smear Microscopy) especially in resource-limited countries due to

its simplicity, rapidity, and low cost. Moreover, co-infected patients are also likely to benefit from sputum smear microscopy because of its specificity and it is the principal method of TB detection in numerous resource-limited countries (Padmapriyadarsini et al. 2011).

This study demonstrates that HIV services were rendered to TB patients. TB patients were entirely tested for HIV and the ones who were newly diagnosed with HIV had blood samples taken from them for CD4 count, treatment adherence counseling was done, CPT was given and ART was initiated to most patients within two weeks of diagnosis. These findings are consistent with the Médecins Sans Frontières (2011) stating that ninety-nine percent of co-infected patients' CD4 cell count were recorded and above ninety-five percent received CPT, and integration has led to a decrease in the average time from the start of TB treatment to ART initiation. However, Kumar et al. (2016) indicated that nearly half of all presumptive TB patients were tested for HIV, although there was a large variability indicated within the district-wise analysis. Though the study didn't focus on TB patients but presumptive TB patients, it brought the importance of the need to provide HIV testing among all presumptive TB patients as this may provide less missed opportunities regarding HIV testing among presumptive TB and diagnosed TB patients. The reduction of testing for HIV among presumptive TB patients had been found to be possibly due to variation unavailability of HIV testing facilities and the way they are located at the health care facilities (Kumar et al. 2016). All these activities were recommended by the WHO (Fujiwara et al. 2012) and have been adhered to in accordance to the findings of this study setting. The researchers have identified in recent studies that early initiation of ART with combination of CPT have beneficial effects such as reducing mortality rate by more than fifty percent; halving TB recurrence rates; less hospital visits; weight gain; improved CD4 cell count; reduced viral load; improved prognosis of TB/HIV co-infection and increase in overall life expectancy (Abdool Karim et al. 2010; Harries et al. 2010; Lawn et al. 2011b; Anglemyer et al. 2014).

Full integration model of TB/HIV was employed in majority of facilities included in this study. The provision of a "one-stop shop" is an example of full integration of services where TB and HIV services are provided to TB/HIV co-infected patients at a same facility and within the same or one or separate consulting room. This was consistent with WHO (2012) model of integration "TB and HIV services provided at a same facility", thus, TB clinic offers HIV treatment; HIV clinic offers TB treatment; primary health care clinics provide integrated diagnosis and treatment for both TB and HIV either in one or separate rooms (WHO 2012). Furthermore, integrated TB/HIV services promote early detection and treatment of undiagnosed infectious tuberculosis, and may lead to the reduction of TB risk as compared to separate services (WHO 2012). Hence, this model offers and promotes timely initiation of ART in TB patients living with HIV without the compulsion to refer the patient elsewhere (WHO 2012; Médecins Sans Frontières 2011). This may be due to the support from the management, provision of outreach training among nurses to initiate and manage ART in the PHC facilities, as well as timely updates on TB/HIV programs offered by the regional training centers and human resource development within the province, mentorship and monitoring of these programs. Kerschberger et al. (2012) and Georgeu et al. (2012) acknowledged that attainment of buy-in from facility management and health care providers facilitates the integration of TB/HIV services. In addition, providing training that advances competencies of nurses to deal with TB/HIV, mentoring TB nurses on ARV care in the initial staging of integration, and changing management processes to simplify distinct areas of accountability for nursing staff are all beneficial to the achievement of fully integrated TB/HIV services. The limitation of this study is that chart review was conducted and if any data was missing in the charts, it was difficult to retrieve it and no follow up was done.

CONCLUSION

From this study, it is evident that most facilities have employed the full integration model of TB/HIV services showing great impact on the provision of these services and this reflects greatly in the promising results that South Africa has shown in implementing integrated TB/HIV services. However, emphasis must be made especially on the TB services that HIV patients should be provided with, because majority of TB cases may be missed due to a deficiency of

definitive diagnostic tests or inadequate health care infrastructure. An increased combination of TB and HIV programs should be made and in order for these programs to be successful, they should be designed in the presence of constraints of existing resources. Thus, South Africa is different from other countries and within its own means the comprehensive and cost-effective TB/HIV integrated program can be designed. The appropriate execution of TB/HIV integrated services may promote reduction of TB incidence risk, ill health and mortality amongst PLWH, through extended preventive therapies of co-trimoxazole and isoniazid preventive therapy for PLWH. This is imperative in making sure that the country's (South Africa) target of 90-90-90 strategy is attained.

RECOMMENDATIONS

It is also recommended that adherence to treatment guidelines by NIMART trained nurses be evaluated as they form an integral part in promoting TB/HIV integrated services; Strengthen training among nurses as a way of promoting their skills, attitude and knowledge regarding the integration of TB and HIV services; and research on patient outcomes need to be evaluated to bring out the impact of TB/HIV integration toward improved patient outcomes.

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REFERENCES

Abdool Karim SS, Naidoo K, Grobler A, Padayatchi N, Baxter C, Gray A et al. 2010. Timing of initiation of antiretroviral drugs during tuberculosis therapy. *New England Journal of Medicine,* 362(8): 697-706.

Adeiza MA, Abba AA, Okpapi JU 2014. HIV-Associated tuberculosis: A sub-Saharan African perspective. *Sub-Saharan African Journal of Medicine,* 1: 1-14.

Allison JJ, Wall TC, Spettell CM, Calhoun J, Fargason CA Jr, Kobylinski RW, Farmer R, Kiefe C 2000. The art and science of chart review. *The Joint Commission Journal on Quality Improvement,* 26: 115-136.

Anglemyer A, Rutherford GW, Easterbrook PJ, Horvath T, Vito´ria M, Jan M, Doherty MC 2014. Early initiation of antiretroviral therapy in HIV-infected adults and adolescents: A systematic review. *AIDS,* 28(Suppl 2): S105-S118.

Beard CM, Yunginer J, Reed CE, O'Connell EJ, Silverstein MD 1992. Inter-observer variability in medical record review: An epidemiological study of asthma. *Journal of Clinical Epidemiology,* 45: 1013-1120.

Chandra TJ, Selvaraj R, Sharma YV 2015. Same day sputum smear microscopy for the diagnosis of pulmonary tuberculosis: Ziehl-Neelsen versus fluorescent staining. *Journal of Family Medicine and Primary Care,* 4(4): 525-528.

Chehab JC, Vilakazi-Nhlapo AK, Vranken P, Peters A, Klausner JD 2013. Current integration of tuberculosis (TB) and HIV services in South Africa, 2011. *Plos One,* 8(3): e57791.

Chimzizi R, Harries A, Gausi F 2005. *Report of a Country-wide Survey of HIV/AIDS Services in Malawi for the Year 2004.* Lilongwe, Malawi: National TB Programme, HIV Unit, National AIDS Commission and Centers for Disease Control and Prevention, Ministry of Health.

Corbett EL, Marston B, Churchyard GJ, De Cock KM 2006. Tuberculosis in sub-Saharan Africa: Opportunities, challenges and change in the era of antiretroviral treatment. *The Lancet,* 367(9514): 926-937.

Denegetu AW, Dolamo BL 2014. Tuberculosis Case Finding and Isoniazid Preventive Therapy among People Living with HIV at Public Health Facilities of Addis Ababa, Ethiopia: A Cross-sectional Facility Based Study. BMC Public Health, 14: 52. From <https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-14-52> (Retrieved on 18 August 2017).

Fujiwara PI, Dlodlo RA, Ferroussier O, Nakanwagi-Mukwaya A, Cesari G, Boillot F 2012. *Implementing Collaborative TB-HIV Activities: A Programmatic Guide*. Paris, France: International Union against Tuberculosis and Lung Disease, The Union.

Gandhi NR, Moll A, Sturm AW, Pawinski R, Govender T, Lalloo U, Zeller K, Andrews J, Friedland G 2006. Extensively drug-resistant tuberculosis as a cause of death in patients co-infected with tuberculosis and HIV in a rural area of South Africa. *The Lancet,* 368(9547): 1575-1580.

Georgeu D, Colvin CJ, Lewin S, Fairall L, Bachmann MO, Uebel K, Zwarenstein M, Draper B, Bateman ED 2012. Implementing nurse-initiated and managed antiretroviral treatment (NIMART) in South Africa: A qualitative process evaluation of the STRETCH trial. *Implementation Science,* 7: 66.

Getahun H, Harrington M, O'Brien R, Nunn P 2007. Diagnosis of smear-negative pulmonary tuberculosis in people with HIV infection or AIDS in resource-constrained settings: Informing urgent policy changes. *The Lancet,* 369(9578): 2042-2049.

Gilbert EH, Lowenstein SR, Kozoil-McLain J, Barta DC, Steiner J 1996. Chart reviews in emergency medicine research: Where are the methods? *Annals of Emergency Medicine,* 27(3): 305-308.

Harries AD, Zachariah R, Corbett EL, Lawn SD, Santos-Filho ET, Chimzizi R, Harrington M, Maher D, Williams BG, De Cock KM 2010. The HIV associated tuberculosis epidemics - when will we act? *The Lancet*, 375(9729): 1906-1919.

HIV and AIDS in South Africa (HASA) 2017. From <https://www.avert.org/professionals/hiv-around-world/sub-saharan-africa/south-africa> (Retrieved on 5 August 2017).

Horowitz RI, Yu EC 1984. Assessing the reliability of epidemiologic data obtained from medical records. *Journal of Chronic Disease*, 37(11): 825-831.

Kerschberger B, Hilderbrand K, Boulle AM, Coetzee D, Goemaere E, De Azevedo V, Van Cutsem G 2012. The effect of complete integration of HIV and TB services on time to initiation of antiretroviral therapy: A before-after study. *PLoS ONE*, 7(10): e46988.

Kumar S, Stecher G, Tamura K 2016. MEGA 7: Molecular evolutionary genetics analysis version 7.0 for bigger datasets. *Mol Biol Evol*, 33(7): 1870-1874.

Lawn SD, Brooks SV, Kranzer K, Nicol MP, Whitelaw A, Vogt M et al. 2011a. Screening for HIV-associated tuberculosis and rifampicin resistance before antiretroviral therapy using the xpert MTB/RIF assay: A prospective study. *PLoS Medicine*, 8(7): e1001067.

Lawn SD, Harries AD, Williams BG, Chaisson RE, Losina E, De Cock KM, Wood R 2011b. Antiretroviral therapy and the control of HIV-associated tuberculosis. Will ART do it? The *International Journal of Tuberculosis and Lung Disease*, 15(5): 571-581.

Manosuthi W, Wiboonchutikul S, Sungkanuparph S 2016. Integrated therapy for HIV and tuberculosis. *AIDS Research and Therapy*, 13(1): 22.

Martinson NA, Barnes GL, Moulton LH, Msandiwa R, Hausler H, Ram M, McIntyre JA, Gray GE, Chaisson RE 2011. New regimens to prevent tuberculosis in adults with HIV infection. *The New England Journal of Medicine*, 365(1): 11-20.

Mayer KH, Dukes Hamilton C 2010. Synergistic pandemics: Confronting the global HIV and tuberculosis epidemics. *Clinical Infectious Diseases*, 50(S3): S67-S70. Doi: 10.1086/651475.

Mburu RW, Folayan MO, Akanni O 2014. The Abuja +12 declaration: Implications for HIV response in Africa. *African Journal of Reproductive Health*, 18(3): 34-46.

Médecins Sans Frontières 2011. Khayelitsha 2001-2011 Activity Report: 10 Years of HIV/TB Care at Primary Health Care Level. From <http://www. sajhivmed.org.za/index.php/sajhivmed/article/view/761/616> (Retrieved on 11 May 2016).

National Department of Health (NDoH) 2015. Prevention of Mother-to-Child Transmission of HIV (PMTCT) and the Management of HIV in Children, Adolescents and Adults. South Africa: Department of Health, Republic of South Africa. From <http://www.sahivsoc.org/Files/ART%20 Guidelines% 201505 2015.pdf> (Retrieved on 11 May 2018).

Padmapriyadarsini C, Narendran G, Swaminathan S 2011. Diagnosis and treatment of tuberculosis in HIV co-infected patients. *Indian Journal of Medical Research*, 134(6): 850-865.

Reid JB 1970. Reliability assessment of observation data: A possible methodological problem. *Society for Research in Child Development*, 41(4): 1143-1150.

Schito M, Peter TF, Cavanaugh S, Piatek AS, Young et al. 2012. Opportunities and challenges for cost-efficient implementation of new point-of-care diagnostics for HIV and tuberculosis. *The Journal of Infectious Diseases*, 205(Suppl 2): S169-S180.

Scott V, Chopra M, Azevedo V, Caldwell J, Naidoo P, Smuts B 2010. Scaling up integration: Development and results of a participatory assessment of HIV/TB services, South Africa. *Health Research Policy and Systems*, 8: 23.

Shetty PV, Granich RM, Patil AB, Sawant SK, Sahu S, Wares DF, Chauhan LS, Joshi PL 2008. Cross-referral between voluntary HIV counselling and testing centres and TB services, Maharashtra, India, 2003-2004. *International Journal of Tuberculosis and Lung Disease*, 12(3s1): 26-31.

Smart T 2008. Taking Charge of TB Services for People with HIV. AIDS Map. From <http://www. aidsmap. com/Taking-charge-of-TB-services-for-people-with-HIV/page/1430939> (Retrieved on 21 May 2018).

WHO 2004. Recommendations of the interim policy on collaborative TB/HIV activities. *Weekly Epidemiological Record*, 79(1-2): 6-11.

WHO 2007. Global Tuberculosis Control: Surveillance, Planning, Financing. *WHO Report*. Geneva, Switzerland: WHO.

WHO 2010. *Priority Research Questions for TB/HIV in HIV-Prevalent and Resource-Limited Settings*. Geneva, Switzerland: WHO.

WHO 2012. *Policy for Collaborative TB/HIV Activities: Guidelines for National Programmes and Stakeholders*. Geneva, Switzerland: WHO.

WHO 2016. Global Tuberculosis Report 2016. From <www.who.int/tb/en> (Retrieved 12 August 2018).

WHO 2017. HIV-Associated Tuberculosis. <http://www.who.int/tb/publications/tbhiv_factsheet.pdf> (Retrieved 12 August 2018).

WHO 2018. Tuberculosis. From <http://www.who.int/en/news-room/fact-sheets/detail/tuberculosis> (Retrieved on 26 April 2018).

Wu L, Ashton CM 1997. Chart review: A need for reappraisal. *Evaluation and Health Professions*, 20(2): 146-163.

Zumla A, Chakaya J, Centis R, D'Ambrosio L, Mwaba P, Bates M, Kapata N, Nyirenda T, Chanda D, Mfinanga S, Hoelscher M 2015. Tuberculosis treatment and management—an update on treatment regimens, trials, new drugs, and adjunct therapies. *The Lancet Respiratory Medicine*, 3(3): 220-234.

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