Primary Health Care System Readiness for Diabetes Mellitus and Tuberculosis Service Integration in South Africa

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ABSTRACT

Background: In recognition of the convergence of high levels of Tuberculosis (TB) and increasing Diabetes Mellitus (DM) in South Africa, the country has prioritized integrated clinical service management for acute diseases and chronic conditions at the primary health care level. The shift toward collaborative activities requires changes in all areas of the health system.

Objective: To assess the readiness of the primary health care system to provide integrated tuberculosis and diabetes services, this case study assessed leadership/governance, the health workforce, health information systems, access to medicines, and service delivery.

Methods: The mixed-method study included interviews with health facility managers, facility checklist of TB and DM supplies and commodities, review of health records, a patient survey, and focus group discussions with health managers in three districts in KwaZulu Natal Province, Eastern Cape Province, and Free State Province.

Results: Performance in bi-directional screening and co-management of TB and DM was weak: TB patients sometimes received DM screening, and the results were sometimes reported. Whether DM patients were routinely being screened for TB was unclear due to the lack of systematic reporting on DM patients. Two potential factors undermining service delivery were the overburdened health workforce and the poor health information system, particularly for DM data recording and reporting. The availability of supplies and commodities for integrated service delivery was good.

Conclusion: South Africa has exhibited a strong policy-level commitment to the integrated management of chronic and acute diseases at all levels. The challenge is on operationalizing the guidelines at the primary health care level. Investments need to focus particularly on strengthening the capacity of the health workforce at the primary health care level and establishing an integrated strategy for data collection and analysis.

Keywords: Diabetes mellitus; Tuberculosis; Integration of services; Bi-directional screening; Treatment outcomes; DM-TB interaction; Programmatic challenges

INTRODUCTION

The link between Tuberculosis (TB) and Diabetes Mellitus (DM) is well-established and increasing in urgency. Diabetes triples the risk of developing TB [1]. In most regions, TB patients have almost double the rate of diabetes as the general population [2].

A systematic review found that between 1.7% to 36% of DM patients screened for TB were found to have TB, and between 1.9% to 35% of TB patients screened for DM were found to have DM [3]. The highest values were in settings with a high prevalence of TB and of DM. Diabetes also undermines TB treatment outcomes, treatment failure, relapse, and death [4]. In

2015, diabetes accounted for 10.6% (6.8-14.8) of global TB deaths among HIV-negative individuals [5].

The convergence of the two diseases will have severe impacts, particularly in Africa. In 2017, 25% of the word's TB patients in 2017 occurred in Africa, driven by the HIV epidemic [6]. While the number of new TB patients declined by 4% between 2013 and 2017, the region continues to have significant gaps in TB detection and treatment [6]. The challenges in TB control will be compounded by growing diabetes: between 2017 and 2045, the number of people with diabetes is predicted to increase by 156% [7]. The prevalence of diabetes among people with active TB varies greatly, from 1.9% in Benin to 32.4% in Ethiopia. In South Africa, 15% of TB patients have been estimated to be attributable to DM [1].

To guide efforts to establish integrated care for both diseases, the World Health Organization (WHO) and the International Union Against Tuberculosis and Lung Disease (The Union) launched the Collaborative Framework for Care and Control of Tuberculosis and Diabetes in 2011 [8]. The subsequent Guide to Essential Practice provides guidance on collaborative activities, specifically on implementing bi-directional screening, managing and treating patients with the dual disease, and the importance of monitoring and reporting [9]. However, further evidence is needed on the most appropriate TB screening and DM testing approaches optimum treatment strategies, and other issues at the programming level [10].

South Africa provides an informative case study of the challenges of operationalizing TB and DM collaborative activities in a routine setting. The country established Integrated Chronic Disease Management (ICDM) in 2011 and has a strong commitment to integrating care for acute and chronic conditions at the primary healthcare level through the Integrated Clinical Services Management (ICSM) program, a key focus within an Ideal Clinic program started in 2013 [11]. In line with South Africa's national guidelines for TB and DM, facilities are also required to provide integrated TB/DM services. While several studies have been done on the effectiveness of bidirectional screening in South Africa [12-14] no studies have examined the health system's readiness for integrated TB/DM service delivery. This study takes a health systems approach to assess the readiness of the primary health care system to provide integrated TB/DM services, reviewing leadership/governance, the health workforce, health information systems, access to medicines, and service delivery.

MATERIALS AND METHODS

The case study assessed the current status of integrated TB and DM service delivery at 22 facilities in three districts in three provinces of South Africa: Umgungundlovu District in KwaZulu Natal Province, Buffalo City District in Eastern Cape Province, and Mangaung District in Free State Province. The facilities were selected based on their high volume of TB and/or DM patients. Data were collected between February and June 2016 to provide baseline information for the Improved Management of Patients with Tuberculosis and Diabetes Comorbidities Project. Findings would inform the design of a package of interventions to strengthen the delivery of integrated DM and

TB care in routine health services and increase early detection and appropriate management of patients with TB and DM comorbidities.

The mixed-method study included interviews with health facility managers, facility checklist of TB and DM supplies and commodities, review of health records, a patient survey, and focus group discussions with health managers. Facility managers at all 22 facilities were interviewed using a structured questionnaire to collect data on facility demographics, operating hours, TB/DM service delivery integration, and performance. A facility checklist was used to assess the availability of service delivery guidelines and supplies and commodities for TB and DM service delivery.

At fifteen facilities, randomly selected patient records were reviewed for a total of 600 patients (300 for TB and 300 for DM) who had received TB and/or DM services between June and December 2015. The review examined if the record included information on TB and DM screening and on TB/DM comorbidity.

A patient survey collected information on patient experience with TB and DM education, counseling, screening and testing, as well as knowledge about TB, DM, and TB/DM co-morbidity. Respondents were selected through convenience sampling at all 22 facilities. The survey was verbally administered to 417 TB patients who had been on treatment for at least one month and to 419 DM patients who had been on treatment for at least two months. The study was approved by the Faculty of Humanities and Social Sciences Research Ethics Committee at the University of KwaZulu Natal.

Three district-level focus discussion groups solicited open-ended information on TB and DM prevention, diagnosis and care from district health managers, health promotion managers, focal persons from both TB and DM services, information officers, and facility managers or representatives.

RESULTS

Facility manager interviews

Facility managers described the processes for diagnosis and treatment of TB, DM, and TB/DM co-morbid patients. TB patients were screened for DM at treatment initiation using Random Plasma Glucose (RPG).

Patients diagnosed with DM or TB/DM had their glucose levels checked every six months using glycated hemoglobin A_{1C} (HbA1c). Facility managers noted that staff may not be familiar with the latest guidelines for the management of DM as none of them had received training on the updated guidelines (revised in 2014).

TB screening was routinely done for all patients visiting the facility, including patients with DM. Suspected TB patients were tested using microscopy smear and Xpert MTB/RIF, with the samples processed within 48 hours and results returned to the testing facility, where TB treatment was initiated by a nurse. Chest X-rays were done only at the hospital level on referral by a doctor. Treatment of complicated TB patients such as extra-

pulmonary TB and Multi-Drug Resistant TB (MDR-TB) had to be initiated by doctors.

Facility checklist

A checklist was used to assess whether facilities had service delivery guidelines for TB and DM, and stocks available for TB and DM service delivery. While facilities had service delivery guidelines available, none had the Updated Management of Type 2 Diabetes in Adults at Primary Care Level guidelines (2014). All facilities were found to have the equipment (e.g. blood pressure monitor, weight scale) and TB and DM medicines available.

Record review

The review of TB patient records found that all contained information on the previous diagnosis of DM. In one district, 90% of patient records were found to include information on DM screening. The information was also found in the TB register. In the two other districts, none of the patient records included information on DM screening. The review of DM patient records was complicated by two factors. First, DM patient records were not kept at the facility but were taken home by the patient. As a result, not only do facilities lack access to patient records, but they were also unable to collect or use any aggregated data. However, patients did carry cards with limited information. Secondly, the DM patient record did not include a field for TB information, so it was noted in various sections of the record, such as the comments section. The review found that 45% of the patient records/cards included information on TB screening results. The review also checked if the records included the results of biannual HbA1c testing. None of the patient records/cards contained the information. As a result of the lack of aggregated DM patient information, data on the number of patients with both TB and DM was not available.

Patient survey

Table 1 summarizes the results of the patient survey. Patients were asked questions about their knowledge of TB, DM, and TB/DM co-morbidity. Patients were asked whether they had received health education, counseling, screening, and testing.

Respondents were asked one open-ended question on what counseling they had received. TB patients said they were counseled on cough etiquette and DM patients on diet. However, they had not received counseling on adherence to the treatment regimen, need for regular check-ups, or the long-term consequences of uncontrolled DM.

Table 1: summary of the results of the patient survey.

Indicator	Result
Percent of TB patients who know that DM is high blood sugar	41%
Percent of TB patients who recognize thirst, fatigue, weight loss, or frequent urination as symptoms of DM	Less than 20%
Percent of TB patients who know that there is a link between DM and TB	3.60%
Percent of TB patients who received health education	22%
Percent of TB patients who received counseling on DM	25%
Percent of TB patients who were screened for DM	43%
Percent of TB patients who were tested for DM	55%
Percent of DM patients who understand their condition will worsen if they do not take medication regularly	39%
Percent of DM patients who know that regular exercise can keep them healthy	27%
Percent of DM patients who know that regular checkups are important to control DM	13%
Percent of DM patients who know that DM increases the risk of TB	20%
Percent of DM patients who received health education	22%
Percent of DM patients who received counseling on TB	26%
Percent of DM patients who were screened for TB	36%
Percent of DM patients who were tested for TB	37%

District-level focus group discussions

Focus group discussions examined the challenges to and current strengths of TB/DM service integration. Themes that emerged in the discussion are summarized below under health system components.

Leadership and governance: Focus group participants stated that the guidelines for Management of Type 2 Diabetes at Primary Care Level (2014), National Tuberculosis Management Guidelines (2014), and Primary Care 101 Guidelines (2014/2015) provide a good foundation for integrated service delivery.

Efforts have also benefited from the support of non-governmental partners (community-and faith-based

organizations, development partners) who have been involved in strengthening and expanding TB control activities and the health system more broadly.

Service delivery: Regarding overall service delivery, participants described that service delivery was poor in some areas due to lack of access to public health facilities or due to limited operating hours. Both TB and DM service delivery benefited from strong infection control practices.

Services for TB/DM patients also benefited from the strong TB service delivery system: all public health facilities were using GeneXpert MTB/RIF for diagnosis, had access to support from the National Health Laboratory Services, and could refer DR-TB patients to TB hospitals or treat them at the primary health care level. A specific challenge was the high mobility of TB patients which resulted in a high defaulter rate. Participants also described that medication and nutritional support was available to patients.

Participants also discussed the work of health promotion teams which organized community education on TB and Non-Communicable Diseases (NCD), conducted healthy lifestyle campaigns, and provided promotive and preventive services. However, without dedicated health promoters, such activities were not done. Outreach was also the responsibility of WBOTs, but they often lacked transport. Facility-level resources for health promotion were weak, with limited information materials available on TB/DM comorbidity and lack of staff to conduct outreach.

Health workforce: The discussion identified a lack of human resources as a key barrier to the implementation of TB/DM service delivery. Under the ICDM approach, primary care facilities should establish a Ward-Based Outreach Team (WBOT) to serve as a link between the facility and the community, ensuring continuity of care for patients with chronic disease, organizing health education in the community, and screening high-risk individuals. However, implementation has proved challenging. Participants stated that facilities were frequently understaffed and the providers had a high workload. Furthermore, nurses were not currently allowed to diagnose and treat DM, which formed a bottleneck at community health centers, many of which lacked a doctor.

Health information system: The lack of an effective data collection system for DM was described to impact both patient follow-up and the ability of managers at both facility and district levels to make informed decisions and measure the impact of programs.

DISCUSSION

In 2011, the South African Ministry of Health (MOH) launched the Integrated Chronic Disease Management (ICDM) model which supports the prevention, treatment, and care of chronic diseases, including diabetes, at the primary healthcare level [15]. This was shortly followed by the development of the Ideal Clinic Program which has a key focus on Integrated Clinical Services Management (ICSM). ICSM takes a patient-centered approach that provides a continuum of services for chronic and/or acute diseases [16]. Building on the experiences of the HIV program,

the program identifies and tracks performance on key elements that must be in place at each primary health care facility. Elements include, for example, patient records with information on screening for HIV, TB, STI, and diabetes and availability of the national guidelines for the Management of Type 2 Diabetes at Primary Care Level (2014).

This case study examined the South African health system's readiness for integrated TB/DM service delivery by collecting information on leadership/governance, service delivery, the health workforce, health information systems, and access to medicines at 22 facilities in three provinces. At the time of the study, the Ideal Clinic program had been underway for two years and structures such as WBOTs were just beginning to be established (68% coverage in 2014/15 [17]). The interviews, facility checklist, record review, patient surveys, and focus group discussions suggested several key areas that need to be addressed for integrated TB/DM service delivery to progress.

Leadership and governance

South Africa has exhibited a strong policy-level commitment to the integrated management of chronic and acute diseases at all levels through programs such as ICDM, ICSD, and the Ideal Clinic. While TB/DM co-morbidity is not discussed in the Standard Treatment Guidelines and Essential Medicines List for South Africa for primary healthcare (2018), [18] collaborative DM and TB activities are included in South Africa's national guidelines for the two diseases. The National Tuberculosis Management Guidelines (2014) state that all newly diagnosed TB patients be screened for diabetes using urine dipsticks [19]. In addition, symptoms such as polydipsia, polyuria, and blurred vision should be followed up with a random or fasting blood glucose test. Health care workers should also provide health education and counseling for better diabetes control during TB patient visits. The Management of Drug-Resistant Tuberculosis: Policy Guidelines (2013) also recommend monitoring glucose, creatinine, and potassium, as well as monthly blood pressure measurements [20]. The guidelines for Management of Type 2 Diabetes at Primary Care Level (2014) recommend screening DM patients for TB symptoms at the time of diagnosis and during regular check-ups, analysis of glucose values for all TB patients at the start of their TB treatment, infection control to reduce transmission of TB in health care settings, and developing indicators and approaches to monitor and evaluate activities [21].

At the next revision of the guidelines, the TB/DM content could be further strengthened beyond screening to strengthen the management of TB/DM co-morbidity. Poorly controlled DM leads to poorer TB outcomes; it is important to consider how the TB and DM drugs interact and how their joint side effects impact the patient [9]. Stronger guidance could also be provided on when patients should be referred.

Service delivery

The challenge is on operationalizing the guidelines at the primary health care level where 90% of the patient contacts are intended to occur [22]. This case study in three districts found

that performance in bi-directional screening and co-management of TB and DM was weak.

TB patient management: Findings suggested that TB patients sometimes receive DM screening, and the results are sometimes reported. Facility managers stated that all TB patients are tested for DM at treatment initiation using RPG. However, according to TB patient surveys, less than half (43%) had been screened for DM and half (55%) were tested for DM. DM screening was reported only on the TB forms in one district. Motivation to conduct the screening and/or record the results may be low because reporting TB/DM co-morbidity was not obligatory. Where DM was diagnosed, treatment initiation may have been delayed because while nurses were authorized to diagnose and treat TB, they could not initiate insulin therapy, which had to be done by doctors [18].

Furthermore, DM screening was the only field on the TB reporting form, so data on follow-up was limited. To identify patients of DM emerging after treatment initiation, facility managers stated that glucose testing of TB patients was done every six months. In addition, according to the national DM guidelines, DM diagnosis should always be confirmed by repeating the same test on another day.

Because TB may elevate blood glucose or HbA1c levels, resulting in false-positive diagnoses, any DM diagnosis made at treatment initiation should be confirmed at a later date [10]. However, repeat testing and confirmation of diagnosis were not reported on the TB form, nor any information on whether TB/DM patients received any ongoing monitoring to manage their DM.

DM patient management: Whether DM patients were routinely being screened for TB was unclear due to the lack of systematic reporting on DM cases. Only a third (36%) of DM patients surveyed said they had been screened for TB, and only 37% had been tested. This is concerning given the aim of the national TB guidelines to screen every person every year for TB [19]. One possibility is that patients were unaware that they had been screened. Reliable recording and reporting of DM patient information are essential to know whether screening is being done and how often it is repeated. Without regular screening, TB might remain undetected among DM patients.

TB diagnosis of DM patients is done using GeneXpert MTB/RIF given the low sensitivity of sputum smear examination and chest radiography for TB diagnosis among people with HIV and in line with the WHO recommendations on the use of molecular techniques to detect TB. South Africa has one of the highest rates of TB in the world, with an estimated 567 incident patients per 100,000 population in 2017, of which 340 patients were co-infected with TB and HIV and 25 had MDR-TB [6] Given the lack of a system of DM patient records and reporting, information on the DM patients' past history with TB, or where and how it was treated was unavailable.

Patient education: This study found that the majority of TB and DM patients did not know about the other disease and only a quarter had received counseling on the possibility of co-infection. It confirms the findings of other studies that find that people-including those diagnosed with DM-generally have low

knowledge of DM [23,24]. TB and DM patient visits provide a significant opportunity to provide patient-centered counseling on the risks of TB/DM co-morbidity and on healthy lifestyles, clarify signs and symptoms of TB and DM, provide guidance on when to seek care, and supporting patient self- management.

Health workforce

The previous section highlights two key barriers to the delivery of integrated TB/DM services: the limited availability and capacity of the health workforce and the lack of an effective information system.

The high workload of the nurses may be one contributing cause of the low levels of screening for TB/DM co-morbidities and/or reporting the screening. CHCs are the entry point for diagnosis, treatment, and management of TB and MDR-TB as well as services for NCDs including diabetes. As a result, the providers have an enormous workload [22,25] Most of the care-with the exception of insulin initiation for DM patients-is provided by nurses, who in 2015 made up 77% of the public health system workforce in comparison to 11% who were doctors [17] more than half of whom work part-time [26] The nurse workload has been further increased by WBOT obligations for health education and community-based screening of high-risk individuals. Better strategies need to be identified to support this cadre of health workers if they are expected to provide high quality, integrated TB/DM care and to achieve Ideal Clinic status.

The ICDM model's strategy to establish WBOTs that bring together Community Health Workers (CHWs) and a nurse team leader to engage households and communities to increase awareness of chronic diseases and support self-management also have the potential to expand service delivery to TB/DM patients. Under the TB program, South Africa effectively shifted management of TB, including MDR-TB, to the community level. Within the context of declining TB and increasing DM, CHW experienced in TB service delivery could be re-trained to manage chronic diseases, including DM [27]. CHW support to DM self-management by patients has already been piloted in South Africa, albeit with mixed results [28,29]. Any CHW program must ensure that the workers are appropriately paid, trained and supported, and supplied with materials including glucose strips, and that strong linkage with a supervising clinic are maintained.

Health information systems

Poor performance on screening for TB/DM co-morbidities may also be the result of limited accountability for reporting results. Although the TB patient records observed in this study included a field for DM screening, the results were not reported to higher levels. DM patient records did not include fields for TB screening. Neither reporting form includes fields that support the monitoring of the quality of care to TB/DM patients. This is an urgent gap in ICSM and PHC revitalization in South Africa.

The challenges of establishing a monitoring and evaluation framework for co-management of TB/DM are not unique to South Africa. China and India use similar treatment cards that

are used at the clinic level for patient management but are not registered or linked to a larger database [30,31]. Guidelines on TB/DM management from the International Union Against Tuberculosis and Lung Diseases recommends the use of treatment cards, registers, and electronic medical record systems to record and report patients and conduct quarterly cohort analysis [9].

Access to medicines

While this case study did not find stock-outs related to TB and DM supplies and commodities, such gaps have been identified specifically for DM supplies by other studies in South Africa. For example, in uMgungundlovu District, 20% of hospitals and community health centers were found to lack blood glucose test strips or plasma glucose tests [32] The NCD program could leverage the experience of the systems developed by TB and HIV programs to ensure a steady supply of insulin and other diabetes supplies.

Limitations

This study was designed as a rapid assessment of health facilities in three districts. As a result, it did not comprehensively assess all health system capacities. Beyond the availability of policies, there was limited discussion of leadership and governance capacities at the district level, even though the District Health System is responsible for the delivery of primary health care. The study also did not explore health financing for TB and DM services nor the impact of the roll-out of the new National Health Insurance.

Information on delivery of screening and treatment was based on patient self-reports and on patient records which turned out to be incomplete at best.

CONCLUSION

The case study on the readiness of primary health care to deliver integrated TB/DM services in line with national TB and DM guidelines and the requirements of South Africa's ICSM program highlighted two urgent areas for action. Key among these is the need to accelerate investments in the health workforce at the primary health care level and establishing a recording and reporting system for DM, which would link the TB reporting system. Furthermore, the integration of TB services with other non-communicable diseases (NCDs) services such as hypertension is critical.

A bottleneck to the treatment of DM is the policy restricting treatment initiation to doctors. This policy should be reconsidered, given the strong reliance of the South African health system on nurses as the frontline service providers. However, the task-shifting should be accompanied by increased training and support on DM, and TB/DM co-morbidities to the health task force, particularly the nurses. In addition to knowledge and skills related to screening, testing, and treatment of TB and management of DM, content should include counseling on healthy lifestyles, symptoms of co-morbidity, and TB treatment adherence. The latest guidelines and job aids to support delivery should also be available. Given the low level of

knowledge about DM, public education also needs to be better resourced. Health promoters and WBOTs need to be sufficiently resourced to conduct community outreach and population-level screening. The second urgent priority is strengthening data recording and reporting, particularly for DM. TB and DM forms should incorporate not only bi-directional screening but also information on TB treatment and DM management. A copy of DM patient records needs to be kept at the facility, and facility-level analysis is conducted to ensure DM and TB/DM patients are receiving the full continuum of services.

The District Health Information System (DHIS) should be updated to incorporate fields to record DM patient information, as well as other NCDs, and enable cohort analysis. Data collection and analysis at the facility-level can be further supported through supportive supervision. Finally, the study focused only on the integration of TB and DM. Further research is needed on integration with other chronic diseases such as hypertension, in line with country's ICSM program at the primary healthcare level to support service improvement and informed decision making for coordinated and improved health outcomes.

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DISCLAIMER

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