

Burden of Tuberculosis in Nigeria: Self Care Strategies and Prevention of Complication

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Abstract:

Tuberculosis (TB) remains a global public health problem and one of the top ten leading causes of death, worldwide, with developing countries bearing the highest burden. In 2018, Nigeria was listed as first in Africa and sixth among the 30 countries of the world with the highest TB burden. In 2018 alone, it was responsible for killing 1.5 million people with 10 million people experiencing the illness; 5.6 million men, 3.3 million women and 1.1 million children. Therefore, this paper examined the self-care and prevention of complications associated with tuberculosis. The paper specifically examined the burden of tuberculosis in Nigeria; identified the self-care strategies for controlling tuberculosis; and identified complications arising and its treatment associated with tuberculosis. The burden of TB in Nigeria has negative implications for growth and development of the country because a substantial proportion of those who are affected are in productive age groups. Tuberculosis leads to both direct and indirect economic losses in addition to growing morbidity and mortality. This makes it imperative that such cases be detected promptly and given appropriate treatment with education on activities which individuals are willing to do to protect themselves from TB disease and promote health. It was recommended among others that continuous training of health workers, routine monitoring and evaluation, integration of TB care and prevention into other health services programmes.

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Introduction

Tuberculosis (TB) remains a significant public health issues in low and middle income countries especially in resource-limited settings and a leading cause of death as a single infectious disease ranking above human immune deficiency virus (HIV/AIDS) (WHO, 2017). The burden of the disease is particularly larger in developing countries due to factors like poverty, under nutrition, and even HIV, which propagate its spread and complicates its control (Adebisi, et al., 2019). It is a disease caused by germs that are spread from person to person through the air. It usually affects the lungs, but it can also affect other parts of the body, such as the brain, the kidneys, or the spine. Tuberculosis (TB) is one of the top ten leading causes of death worldwide due to a single infectious agent. In 2018 alone, it was responsible for killing 1.5 million people with 10 million people experiencing the illness; 5.6 million men, 3.3 million women and 1.1 million children (Churchyard & Swindells, 2019).

World Health Organization (WHO), (2020) submitted that a total of 1.5 million people died from TB in 2020 (including 214 000 people with HIV), and it is the 13th leading cause of death and the second leading infectious killer after COVID-19 (above HIV/AIDS). In addition to affecting so many around the world, it can be found in all countries despite being a preventable disease. In an ideal world, timely diagnosis and treatment would be available to all thus drastically reducing transmission and severity of the illness.

A person with TB can die if they do not get treatment (Fekadu, et al 2017). The major culprit for Tuberculosis (TB) is *Mycobacterium tuberculosis*, which principally affects the lungs (pulmonary TB) and, less often, other regions of the body (extra-pulmonary TB). Tuberculosis is also occasionally caused by other bacilli such as *Mycobacterium africanum*, which sometimes appears in West Africa and *Mycobacterium bovis* which causes tuberculosis in domestic or wild cattle but can also cause tuberculosis in humans (Hibstu & Bago, 2016). Not everyone who is infected with the causative bacteria of TB develops the disease. The prevalence of the TB disease is very much greater among HIV sero-positive patients (due to weakened immune system), and also higher among people who smoke, are diabetic, undernourished, and those who drink alcohol excessively (World Health Organization, 2017). This paper examined the self-care and prevention of complications associated with tuberculosis. The paper specifically:

1. examined the burden of tuberculosis in Nigeria;
2. identified the self-care strategies for controlling tuberculosis; and
3. identified complications arising and its treatment associated with tuberculosis

Literature Review

Concept of Tuberculosis

Tuberculosis is a chronic infectious and communicable granulomatous disease caused by mycobacterium tuberculosis (Kalu & Jimmy, 2015). The tubercle bacilli establish infection in the lungs after they are carried in droplets small enough (5 to 10 microns) to reach the alveolar spaces. If the defense system of the host fails to eliminate the infection, the bacilli proliferate inside alveolar macrophages and eventually kill the cells. The infected macrophages produce cytokines and chemokines that attract other phagocytic cells, including monocytes, other alveolar macrophages and neutrophils, which eventually form a Nodular granulomatous structure called the tubercle. If the bacterial replication is not controlled, the

tubercle enlarges and the bacilli enter local draining lymph nodes. This leads to lymphadenopathy, a characteristic clinical manifestation of primary tuberculosis (Tadesse, 2016).

Tuberculosis (TB) is primarily a lung disease with systemic involvement that may affect other organs and systems in the body in about one third of cases. Following infection, the bacilli may disseminate and settle in any part of the body and remain dormant for months or years. Once the person's body immunity wanes, individual can come down with infection in any part of the body. Delay in presentation and poor adherence to treatment will give rise to complications to develop in any part of the body. The complications are common and often the cause of morbidity and mortality in patients with TB.

The burden of TB in Nigeria has negative implications for growth and development of the country because a substantial proportion of those who are affected are in productive age groups. Tuberculosis leads to both direct and indirect economic losses in addition to growing morbidity and mortality. Direct losses result from the expenses incurred for treatment; indirect losses stem from lost earned income by TB patients resulting from less than optimum capacity to earn it (Adebayo, et al., 2020).

There are two sources of TB infection human and bovine (connected with domestic and wild mammals). The most common source of infection is the human cases whose sputum is positive for tubercle bacilli and who has either received no treatment or not been treated fully (Tobin, Okojie, & Isah, 2013). Amongst the members of the mycobacterium tuberculosis complex (MTBC), mycobacterium tuberculosis is mainly a human pathogen, whereas mycobacterium bovis has a broad host range and is the principal agent responsible for tuberculosis (TB) in domestic and wild mammals. Mycobacterium bovis also infects humans, causing zoonotic TB through ingestion, inhalation and, less frequently by contact with mucous membranes and broken skin. Zoonotic TB is indistinguishable clinically or pathologically from TB caused by *M. tuberculosis* (Onyeonoro, et al 2014). In addition, the causative agent of bovine tuberculosis; mycobacterium bovis, is also responsible for some cases of tuberculosis in human beings. Infection of human beings with mycobacterium bovis almost always occurs by inhalation of aerosols or consumption of milk containing the bacillus. Although milk was the usual source of infection of town dwellers, it was considered likely that farm workers were often infected by mycobacterium bovis by inhalation and acid-fast bacilli were seen in dried bovine sputum on the walls and windows of cow sheds (Onyeonoro, et al 2014).

Tuberculosis is transmitted mainly by droplet infection and droplet nuclei generated by sputum positive patients with pulmonary tuberculosis. The frequency and vigor of cough and the ventilation of the environment influence transmission of infection (Adane, et al 2017). Tuberculosis is spread through the air from one person to another. The bacteria are put into the air when a person with tuberculosis disease of the lungs or throat coughs, sneezes, speaks, or sings. People nearby may breathe in these bacteria and become infected. TB disease in the lungs or throat can be infectious. This means that the bacteria can be spread to other people. Untreated pulmonary TB can spread the infection but treatment after two weeks TB cannot spread to the others. People with TB disease are most likely to spread it to

people they spend time with every day. This includes family members, friends, and coworkers or schoolmates (Adane, et al 2017).

Although, the treatment of TB is free but the management of these complications is not covered by this free treatment in Nigeria. In most developed nations, the disease is diagnosed early and complication hardly seen. When they occur, the cost of treatment of complications is covered by the health insurance scheme; albeit with low morbidity and mortality. The financial burden of these complications is high since the patients are more ill and often need hospital admission. The morbidity and mortality due to these complications is significantly high in the poor resource nations. This is because the patient may present late and of course lack of skills and facilities for prompt diagnosis and intervention.

Epidemiology of Tuberculosis

According to World Health Organization (2018), Tuberculosis (TB) is a communicable disease caused mainly by *Mycobacterium tuberculosis*. Among infectious diseases, it is the leading cause of death by preceding HIV/AIDS. Tuberculosis (TB) is a global challenge affecting around 10 million people worldwide. It is not only limited to morbidity, but causing estimated 1.2 million deaths in HIV negative and 251, 000 deaths in HIV-positive patients in 2018 (World Health Organization, 2019). In the World Health Organization (WHO) 2018 report; most of the cases were reported from South-East Asia (44%) and Africa (24%). Ethiopia located in Eastern horn of Africa is one of the top 30 high TB burden countries with a total annual estimated incidence of 165,000 HIV-positive tuberculosis incidences, 24,000 HIV-negative patient mortality, and 2200 HIV-positive tuberculosis mortality (World Health Organization, 2019).

Geographically, most people who developed TB in 2019 were in the WHO regions of South-East Asia (44%), Africa (25%) and the Western Pacific (18%), with smaller percentages in the Eastern Mediterranean (8.2%), the Americas (2.9%) and Europe (2.5%). Eight countries accounted for two thirds of the global total: India (26%), Indonesia (8.5%), China (8.4%), the Philippines (6.0%), Pakistan (5.7%), Nigeria (4.4%), Bangladesh (3.6%) and South Africa (3.6%). The other 22 other countries in WHO's list of 30 high TB burden countries accounted for 21% of the global total (WHO, 2020). The TB incidence rate at national level varies from less than 5 to more than 500 new and relapse cases per 100 000 populations per year. In 2019, 54 countries had a low incidence of TB (50% in previously treated cases) were in countries of the former Soviet Union (WHO, 2020).

Globally, 9.7 million people get sick with tuberculosis (TB) and 1.7 million people die from it, each year (Ugwu, Agbo & Ezeonu, 2021). TB continues to be a major public health problem across the world, including Ethiopia. It causes ill-health among millions of people each year and ranks as the second leading cause of death from an infectious disease (Ugwu, Agbo & Ezeonu, 2021). Globally, the TB incidence rate is falling, but not fast enough to reach the 2020 milestone of a 20% reduction between 2015 and 2020. The cumulative reduction from 2015 to 2019 was 9% (from 142 to 130 new cases per 100,000 population), including a reduction of 2.3% between 2018 and 2019. More positively, the WHO European Region has almost reached the 2020 milestone, with a reduction of 19% in the TB incidence rate between 2015 and 2019, and the African Region has made good progress, with a reduction of 16%. A total of 78 countries are on track to reach the 2020 milestone, including seven high TB burden

countries that have already reached it (Cambodia, Ethiopia, Kenya, Namibia, the Russian Federation, South Africa and the United Republic of Tanzania) and three other high TB burden countries that are on course to do so (Lesotho, Myanmar and Zimbabwe) (WHO, 2020).

Africa is the continent most affected by tuberculosis. From the estimated 1.2 million new HIV-positive TB cases that occurred globally in 2014, almost three-quarters were in the African region (World Health Organization, 2015). Similarly, in 2015, among the estimated 1.2 million new cases of TB among people who were HIV-positive, 71% were living in Africa (World Health Organization, 2016). World Health Organization (WHO) estimates that one third of the world's population is infected by *Mycobacterium tuberculosis* and 10% of them are at risk for illness. As one of the top 10 causes of mortality worldwide, tuberculosis (TB) is a growing public health challenge in many parts of the world, especially in developing countries (Tavakoli, 2017). Next to human immunodeficiency virus infection, TB is the second leading cause of death due to infectious diseases (Endris et al., 2014).

Stages and Pathogenesis of Tuberculosis

The following are the stages of TB:

1. **Exposure:** This happens when a person has been in contact with, or exposed to, another person who has TB. The exposed person will have a negative skin test, a normal chest X-ray, and no signs or symptoms of the disease.
2. **Latent TB infection:** This happens when a person has TB bacteria in his or her body, but does not have symptoms of the disease. The infected person's immune system walls off the TB organisms, and the TB remains inactive throughout life in most people who are infected. This person would have a positive skin test, but a normal chest X-ray.
3. **TB disease:** This describes the person who has signs and symptoms of an active infection. The person would have a positive skin test and a positive chest X-ray.

Pathogenesis of TB Infection occurs when a person inhales droplet nuclei containing tubercle bacilli that reach the alveoli of the lungs. These tubercle bacilli are ingested by alveolar macrophages; the majority of these bacilli are destroyed or inhibited. A small number may multiply intra-cellularly and are released when the macrophages die. These bacilli may spread by way of lymphatic channels or through the blood stream to more distant tissues and organs (including areas of the body in which TB disease is most likely to develop: regional lymph nodes, apex of the lung, kidneys, brain, and bone). This process of dissemination primes the immune system for a systemic response (Fekadu, et al 2017).

When droplet nuclei containing tubercle bacilli are inhaled, enter the lungs, and travel to the alveoli, tubercle bacilli multiply in the alveoli. A small number of tubercle bacilli enter the bloodstream and spread throughout the body. The tubercle bacilli may reach any part of the body, including areas where TB disease is more likely to develop (such as the brain, larynx, lymph node, lung, spine, bone, or kidney), Within 2 to 8 weeks, special immune cells called macrophages ingest and surround the tubercle bacilli. The cells form a barrier shell, called a granuloma, that keeps the bacilli contained and under control. If the immune system cannot keep the tubercle bacilli under control, the bacilli begin to multiply rapidly (TB disease). This process can occur in different areas in the body, such as the lungs, kidneys, brain, or bone (Hibstu & Bago, 2016).

Main Body

Burden of Tuberculosis

Tuberculosis (TB) remains a global public health problem and one of the top ten leading causes of death, worldwide, with developing countries bearing the highest burden (WHO, 2020). In 2018, Nigeria was listed as first in Africa and sixth among the 30 countries of the world with the highest TB burden (WHO, 2020). Unfortunately, the problem of TB in Nigeria has been complicated by the emergence and spread of drug resistant TB and a high burden of HIV/AIDS (WHO, 2018). The problem of TB is worsened when there is also a high burden of HIV infections, as people with HIV are more likely to develop active TB. According to WHO reports, an estimated 63,000 Nigerians living with HIV/AIDS develop TB, while about 39,000 die from the disease, each year (WHO, 2018).

To further compound the problem, Nigeria is ranked among the 10 countries that accounted for 77% of the global gap in TB case detection and notification in 2016. It is reported that Nigeria contributes about 8% of the 4.3 million TB cases missed globally. In Nigeria, the prevalence of TB among HIV-negative people was 27%, the TB incidence rate was 158 per 100,000 populations, and the total number of TB mortality was 39,933 in 2016 (WHO, 2018). The problem of TB globally has been found to be worsened by HIV/AIDS, as people with HIV have a much higher risk of developing active TB. According to health reports, about 45% of HIV-negative people with TB and nearly all HIV-positive people with TB, have a high risk of death, without appropriate treatment (WHO, 2020). HIV and TB, co-infection has been described as a lethal combination, as each disease speeds up the other's progress; a realization which probably led to updating of the WHO TB/HIV treatment approach, in 2012, to place persons with HIV on TB-preventive therapy upon confirmation of HIV status, regardless of CD4 count (WHO, 2020). This makes it imperative that such cases be detected promptly and given appropriate treatment with education on activities which individuals are willing to do to protect themselves from TB disease and promote health. Hence, need to implement self-care strategies and prevention of complications.

Self-care Strategies for Controlling Tuberculosis

Tuberculosis preventive behavior is the activities perform by an individual and belief these activities which are able to promote healthy life and prevent the transmission of TB infection from one person to another person. These activities are eating healthy food, avoiding close contact of TB patients, seeking health care and attaining screening program, keeping house good ventilation and reading health news about TB. Tuberculosis preventive behavior is intent to prevent TB and actual behaviors taken to prevent this disease (Glanz et al., 2015).

Tuberculosis preventive behavior involves activities which individuals are willing to do to protect themselves from TB disease and promote health. Kasl and Cobb define preventive health behavior as "any activity undertaken by an individual who believes himself/ herself to be healthy for the purpose of preventing or detecting illness in an asymptomatic state" (Glanz et al., 2015). Tuberculosis is infectious communicable disease. It is spread through the air from one person to another. The bacteria are put into the air when a person with tuberculosis disease of the lungs or throat coughs, sneezes, speaks, or sings. People nearby may breathe in these bacteria and become infected. It is essential to control the transmission from one person to another.

There are two types of preventive measures; clinical preventive measure and behavioral preventive measure. The clinical preventive measure focused on early case finding and treatment. The behavioral preventive measure focused on preventive activities. The behavioral preventive behavior focuses on the general health promoting activities. This mainly in respect to; living in good ventilated house, avoidance of overcrowding, avoidance of close contact with TB patients, good nutrition and better personal health habits with regard to spitting and coughing (Zhao, 2012). Therefore, the recommended activities are; Living in a good ventilated house can be reducing the getting change of TB infection. Good ventilation spills out the bacteria from the house in order to reduce the TB bacterial overload in the house. People try to keep their house good ventilated when they can understand how it can prevent them from TB infection. Overcrowding is the factor for developing TB disease because it is air born disease.

Avoidance of overcrowding area especially health care facilities where TB patients spend considerable time can be reducing the getting chance of TB. Good diet habit is the one of preventive measure of disease prevention and promotion of health. Malnutrition plays an important role to develop TB disease. Good nutrition increases the body immunity which is essential to protect the body from disease. Good dietary habit can be reducing the getting chance of TB by creating strong body immunity.

Avoiding close contact can reduce the chance of getting TB when taking care or working with TB patients. Sometimes people are exposed to TB case but may not be infected. People who have close contact with an infected person over a long period of time are at high risk for developing TB infection. Better personal health habit with regard to spitting and coughing can reduce the transmission of TB infection. When someone is coughing or sneezing during that time covering the mouth and nose can prevent TB infection. These behaviors not only prevent TB infection but also prevent other air borne infectious diseases.

The WHO, (2019) policy on TB infection control in health-care facilities, congregate settings and households, set some policy to prevention of TB transmission in households these include:

1. Basic infection control activities should be part of any community information, education and communication messages. The infection control messages need to promote the importance of early identification of cases, adherence to treatment and implementation of proper TB infection control measures (cough etiquette and respiratory hygiene) in the household, before and after diagnosis of TB. Behavior change campaigns for family members of smear-positive TB patients and health service providers should aim to minimize stigma and the exposure of non-infected patients to those who are infected (WHO, 2019).
2. Reduce households' exposure Houses should be adequately ventilated, particularly rooms where people with infectious TB spend considerable time (natural ventilation may be sufficient to provide adequate ventilation). Anyone who coughs should be educated on cough etiquette and respiratory hygiene, and should follow such practices at all times. Smear positive TB patients should spend as much time as possible outdoors. Sleep alone in a separate, adequately ventilated room, if possible. Spend as little time as possible in congregate settings or in public transport (WHO, 2019).

Prevention of Complications and Treatment of Complications

Early detection and prompt initiation of correct treatment in people with tuberculosis is key to reducing transmission. Other preventive measures include: reducing exposure to tuberculosis micro-organisms through airborne infection control measures, identifying persons with tuberculosis infection and preventing the development of tuberculosis disease through preventive treatment and BCG vaccination, management of various comorbidities, such as the provision of antiretroviral treatment for people living with HIV, maintaining glycemic control in persons with diabetes mellitus, smoking cessation among tobacco users etc., also contribute to the prevention of tuberculosis. Airborne infection control comprises measures aimed at minimizing the risk of transmitting micro-organisms through the air.

Prevention of transmission in health facilities and other high-risk congregation settings is based on a series of priorities: Administrative systems need to be put in place when there is a high degree of clinical suspicion of tuberculosis: persons with cough should be rapidly separated from others, promptly investigated and started on treatment if tuberculosis is diagnosed. All settings where tuberculosis is diagnosed should have an airborne infection control and prevention plan, staff training, support programs and a focal person or a committee to oversee the implementation of various infection control measures.

Environmental control measures, such as the maximization of natural ventilation, control of air flow, filtration and use of ultraviolet germicidal irradiation, should be implemented. Personal respiratory protection is the lowest priority. No matter how effective, personal respiratory protection cannot compensate for deficiencies in administrative and environmental controls. The most appropriate personal protective equipment for preventing exposure to micro-organisms is a respirator. Surgical masks should be used by persons with cough before treatment is initiated to prevent respiratory secretions from becoming airborne, that is, to ensure cough hygiene.

Implications to Nursing Education and Practice

Nurses play an important role in the management of tuberculosis disease (TB) patients at primary, secondary, tertiary levels of care. In order to perform their functions, it is pertinent that they have a good understanding of lung functions and improving lung care. Adequate knowledge of transmission of the infection and its care must be included in nursing education and practice to facilitate efficient management of patients. Pathophysiology of TB must be well understood as well as importance of treatment to avoid discouragement due to the lengthy period of treatment and nurses' roles in treatment. Nurses ensure that patients are given the correct medication and can provide support for patients and their relatives to prevent lapses in treatment. Occasionally patients do not take their medications despite extra support, supervised treatment or directly-observed therapy (DOT) must be implemented because of the risk to the wider population which involves a nurse visiting the patient at home three times a week and administering the treatment.

Nurses have five roles namely: care giver, communicator, advocator, counselor and educator. Nurses have the responsibility to help clients learn about their health and health procedures and explain the reasons why routine care activities are carried out as well as strengthening the patients' learning and preventive self-care behaviors and evaluating the progress. In the treatment of tuberculosis in TB patients, the role of the nurse as an educator is needed to

provide education about treatment procedures, food intakes that must be consumed by patients and adherence to treatment to maintain their health.

Conclusion

Although there has been advocate for coverage of tuberculosis disease patient in the National Health Insurance Scheme, this will prevent the burden of out-of-pocket expenditure for test and management of the disease. Also, more tuberculosis disease screening centers across the country will help early diagnosis and improve outcome for patients, as well as more awareness and increase public awareness by government and community-based organization. In addition, maintaining healthy lifestyle requires that the individual adhere to preventive measures such as the maximization of natural ventilation, control of air flow, filtration and use of ultraviolet germicidal irradiation. Prevention is the key by adopting healthy lifestyle: it is cheaper to avoid tuberculosis disease than to manage it.

Recommendations

The following recommendations were suggested:

1. Provide regular and up-to-date training to all staff of the DOTS center. The standards of care for TB are constantly changing as is the guideline, hence, to keep the staff at par with the best practices, training and step down training must be integrated into the TB guideline.
2. Conduct regular periodic audits of practice to identify lapses and correct them promptly. The lapses identified in this study could have been found and addressed if there were regular audits of the DOTS centers. These should be scheduled and not just ad hoc.
3. Provide incentives to patients on anti-TB therapy to encourage them to continue and complete treatment. The role of incentives in treatment of chronic conditions like TB is well established.
4. Reducing TB disease burden in the country will require a multipronged approach that includes increased funding, health system strengthening and improved TB surveillance, as well as preventive efforts for alcohol use, smoking and diabetes.

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