

Prevalence of Diabetes mellitus amongst Tuberculosis Patients Accessing Care at Model Healthcare Facility in Rivers State of Nigeria

ABSTRACT

Background: Tuberculosis is a global issues including diabetes particularly the Sub Sahara regions. Mono infection of either of the two is burdensome nonetheless a huge burden is experienced in a comorbid state even death. There is paucity of data about the co-existence of these diseases in this region although, much have been documented on Tuberculosis and Diabetes singly. The study ascertained the prevalence of diabetes mellitus among tuberculosis patients in Obio /Akpok local government area of Rivers State, Nigeria. **Methods:** This Cross sectional survey used purposive sampling technique. 282 pulmonary tuberculosis samples were collected and analyzed for glucose, comprising of 158 females and 124 males. The population for this study was tuberculosis patients hence only tuberculosis patients were included while none tuberculosis patients excluded from the study. Written and Informed consent was obtained from each participant. Laboratory procedure involved the collection of fasting blood Samples collected from patients following the laboratory standard quality procedure. Statistical Package for Social Science software version 21 was used to estimate frequency and percentage including prevalence rates. **Result:** Glucose estimation showed; 170 normal glucose level (93females and 77 males). With 45 known diabetics (28 females and 17 males), 29 newly diagnosed diabetes (15 were males and 14 females) and 38 prediabetics (23females and 15 males). The overall prevalence of diabetes mellitus amongst Tuberculosis was 112 (39.72%) including prediabetics subjects. About 65 (58%) were females and 47 (42%) were males. Also, the most affected ages were between 31 to 50 years (21.98%); likewise, females were mostly affected 65 (23.05%). **Conclusion:** There is a growing prevalence of diabetes mellitus amongst Tuberculosis patients. Glucose estimation should form part of the routine investigations for Tuberculosis patients. Investigation should be done to ascertain the interaction between Tuberculosis and Diabetes comorbidity.

Keywords: Prevalence, Diabetes mellitus, Tuberculosis, Patients, Care, Model, Healthcare, Facility, Rivers State, Nigeria

Introduction

The concerns over the connection between Tuberculosis (TB) and diabetes mellitus (DM) continue to generate global attention, especially due to increasing prevalence of tuberculosis, motivated largely by the HIV epidemic and almost on an equal scale by the increasing incidence of diabetes worldwide. Ojule and Opara (2019) described the situation as a conjunction of great epidemics. Earliest studies evaluated on the more commonly known pre-disposition of patients with diabetes to tuberculosis. Arugu and Maduka (2017) in a study documented the correlation between Diabetes mellitus and Tuberculosis. According to the study, diabetes is frequently complicated by phthisis, especially tuberculosis. Following Avicenna's landmark report, various other studies have associated diabetes with tuberculosis. Fewer studies have however, explored the converse relationship whereby tuberculosis predisposes the individual to diabetes (Shamoon, Hendler & Sherwin, 2017).

In addition, depressed cellular immunity, micronutrient deficiency, and alcoholism, among other culprits, were identified as major contributors to this relationship. There is need to raise awareness on screening for diabetes mellitus in persons with tuberculosis as an underline disease that have a high mortality rate which is neglected during the diagnosis of tuberculosis leading to treatment failure or death due to low immunity. According to Ottamini *et al.* (2017) the estimation of 340 million persons worldwide are diabetic and 3.4 million people die of diabetes mellitus with more than 80% of these deaths occurring in low and middle income countries. Researchers indicated that Tuberculosis was more prevalent in individuals with Diabetes mellitus than in those without. It has also been shown that Diabetes mellitus increases the risk of Tuberculosis. Diabetes mellitus is an independent risk factor for lower respiratory tract infections. TB occurs with an increased frequency in diabetes and causes significantly higher mortality (Ottamini *et al.*, 2017).

There is need for the awareness of diabetes mellitus screening among tuberculosis patients due to its high mortality rate which is neglected during the diagnosis of tuberculosis and its treatment. Little or nothing is investigated or documented about the co-existence of these diseases in Obio /Akpor Local Government Area. Much have been said and documented on Tuberculosis and Diabetes mellitus but not on co-existence of these diseases. The study ascertained the prevalence of diabetes mellitus among tuberculosis patients in Obio /Akpor local government area of Rivers State, Nigeria.

Materials and Methods

Cross sectional survey was adopted in this study. This study was carried out in Obio/Akpor Local Government Area of Rivers State, Nigeria. Obio/Akpor has its headquarters in Rumuodomaya. It is one of the largest local government areas in Nigeria. The study population comprised all diagnosed adult tuberculosis patients 18 years of age and above receiving outpatient treatment at the directly observed treatment short-course (DOTS) clinic of Model Primary Health Centre Rumuigbo in Obio/Akpor, Rivers State, Nigeria, during the study period. Judgemental sampling technique was employed in this study. This non probability sampling technique was adopted in choosing the study facility and population however, a simple random sampling technique was used to select study participant. This gave participants equal chances of been recruited into the study till a total of 282 tuberculosis patients undergoing treatment were selected. Treatment exposed patients made up the sample size due to their regular visit and availability at the time of this present study.

Also, the population for this study was tuberculosis patient's particularly pulmonary tuberculosis hence, only tuberculosis patients were included while none tuberculosis as well as patients on treatment for extrapulmonary tuberculosis were excluded from this study. Written and Informed consent was obtained from each participant. Sample Size was according to sample size formula $N = z^2 \times p(1-p)/e^2$ (Cochran, 1977). Laboratory procedure involved the collection of fasting blood Samples from patients following the standard quality procedure according to Chessbrough (2006). All data were analysed using statistical package of social science (SPSS) version 21 for frequency distribution and prevalence.

Results

Demographics of Study Participants

The study included two hundred and eight-two known Tuberculosis patients with different educational status such as 29 (10%), 76 (27%), 138 (49%) and 39 (14%) for no formal education, primary, secondary and tertiary education respectively. Also, marital status information in this study showed that the study participants were mostly married; 159 (56% and few widowers 4 (2%). See figure 1 and 2 for details.

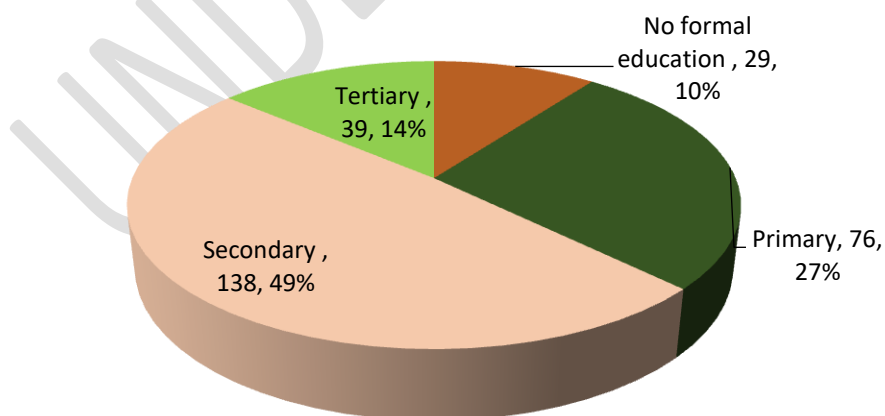


Figure 1: Pie Chart showing Educational Level of Study Participants

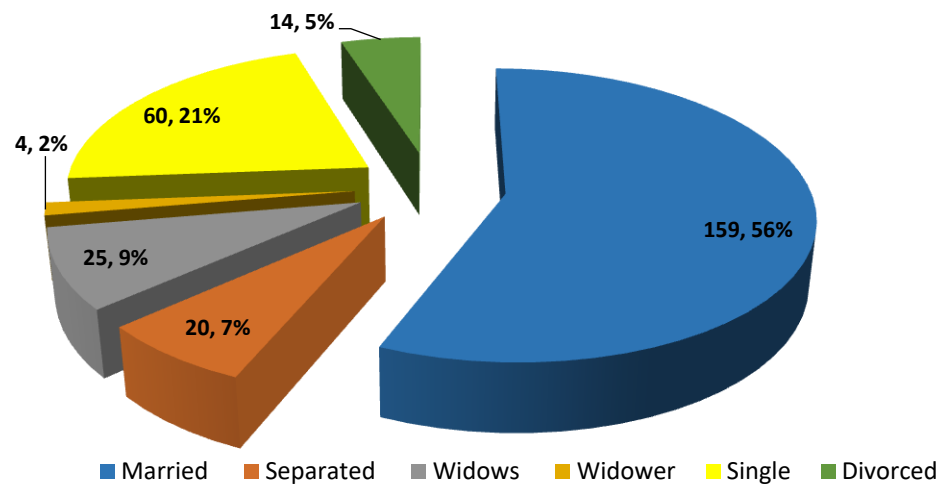


Figure 2: Frequency Distribution of Marital Status of Study Participants

Distribution and Prevalence Rate of Diabetes amongst TB Patients

Figure 3 shows distribution of glucose levels amongst Tuberculosis patients. The studied proved varying degrees of glucose based on classification; 170 (60.28%), 38 (13.48%), 29 (10.28%) and 45 (15.96%) for normal glucose level, prediabetic, newly diagnosed and known diabetes accordingly.

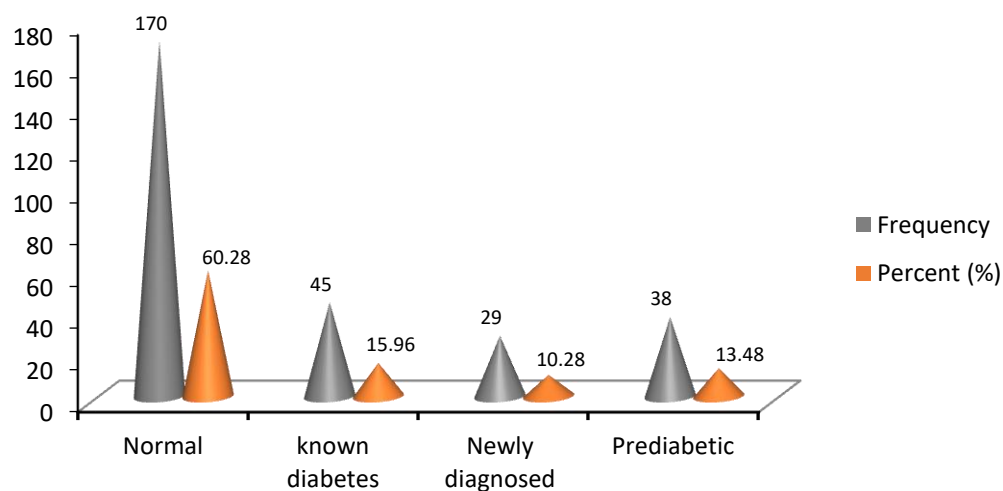


Figure 3: Column Chart of Glucose Level amongst TB Patients

Table 1: Frequency Distribution of Diabetes mellitus amongst TB Patients reporting number tested, those negative and positive cases. For sex variable, it recorded 170 without diabetes (93 females and 77 males) and 112 diabetic (65 females and 47 males). Based on age (years), group 18 – 30 years group had the highest number of subjects with no diabetes whereas, group 81 – 100 years were the least with 5 subjects. On the other hand, the study had diabetic subjects within the age group of 31 – 50 years with the highest number of diabetes at 62 while the 51 – 80 years age group recorded 22 diabetes as observed.

Table 1: Frequency Distribution of Diabetes mellitus amongst TB Patients

| Variable | Classification | Number Tested | No Diabetes | Diabetes |
|-------------------|----------------|---------------|-------------|----------|
| Sex | Females | 158 | 93 | 65 |
| | Males | 124 | 77 | 47 |
| | Total | 282 | 170 | 112 |
| Age Group (Years) | 18-30 | 104 | 76 | 28 |
| | 31-50 | 126 | 64 | 62 |
| | 51-80 | 47 | 25 | 22 |
| | 81-100 | 5 | 5 | 0 |
| | Total | 282 | 170 | 112 |

The study had an overall prevalence rate of diabetes amongst Tuberculosis patients as 39.72%. Specifically with reference to age, the highest rate of diabetes was observed for age group 31 – 50 years (21.98%) and 51 – 80 years (7.8%) had the least recorded diabetes. However, the geriatrics group 81 – 100 did not record any case of diabetes. See figure 4 for detail. The most affected age group was 31 - 50 (21.98%).

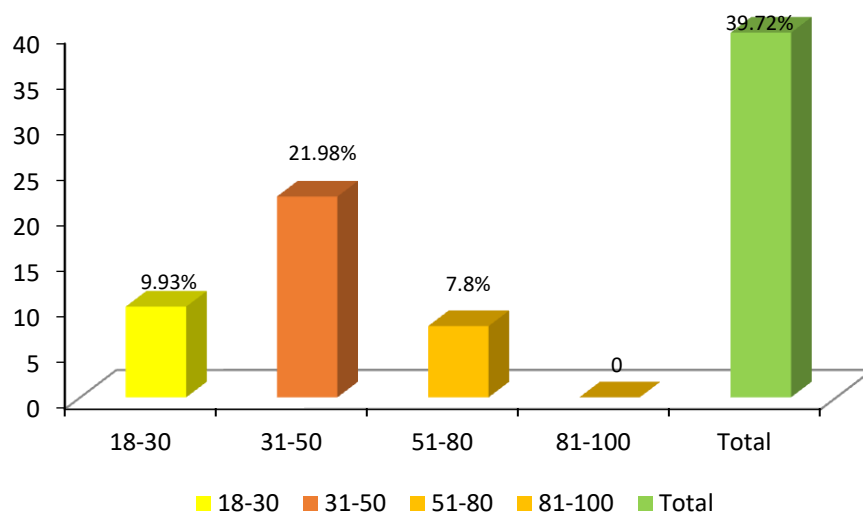


Figure 4: Bar Chart of Age Specific Prevalence Rate of Diabetes mellitus amongst TB patients

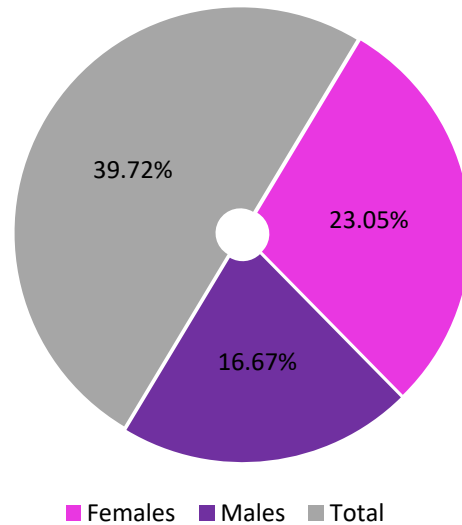


Figure 5: Pie Chart of Sex Specific Prevalence Rate of Diabetes mellitus amongst TB patients

Sex specific prevalence showed that females had the highest prevalence rate of diabetes mellitus amongst Tuberculosis patients from the report of this study.

Discussion

Despite all efforts taken globally, pulmonary tuberculosis being an infectious disease remains a global threat. Besides, Diabetes mellitus infection is among the emerging cases complicating tuberculosis which has been recognized for its wide range of clinical spectrum and chronically. In most directly observed treatment short-course (DOTS), centres in Nigeria part of the standard operating procedure (SOP) is to screen all presumptive tuberculosis cases for HIV, but no such inclusion to screen for Diabetes mellitus.

From the glucose estimation obtained in this study with majority having normoglycaemia, this suits the report of previous studies (Ojule & Opara, 2019; Srivatana *et al.*, 2016). Furthermore, the overall prevalence of diabetes mellitus as revealed in this study (39.9%) is higher than what was seen in earlier study (13.9%) done in same region (Ojule & Opara, 2019). This result confirms an upsurge of diabetes among Tuberculosis patient also; a prove of the conclusion of Ojule and Opara (2019) that the prevalence of 13.9% that was reported in their study was “typical of an iceberg phenomenon, whereby majority of the cases were undetected”. Moreover, Koo (2013) observed that 10-30% of people with active tuberculosis were plausible to develop diabetes mellitus.

Based on sex related prevalence, this present study agreed and contradicts other studies. Similar to the higher prevalence rate of diabetes in females compared to males that was reported in this study, is the study of Isara and Okundia (2015) although the values obtained here (23.05% for females and 16.63% for males) differed from Isara and Okundia (2015) which had a prevalence of 5.8% for females and 1.9% for males. Further specific sex comparison, revealed that this study is in contrary to the work of Ojule and Opara (2019) as this present work had higher prevalence for female compared to the male counterpart. Trends have not changed as sex disparity in glucose levels is accompanied by diverse conclusions (Ojule & Opara, 2019; Arugu & Maduka, 2017; Isara, & Okundia, 2015).

The outcome of this study when judged with the rate of some risk factors associated with diabetes. Ojule and Opara (2019) in a study attributed the higher prevalence of diabetes amongst males to be the result of behavioural lifestyle and habits mostly seen in males like substance abuse (drugs, smoking, alcohol). This brings an accumulative effect of these predisposing elements hence, resulting to higher rate. Regrettably, this behavioural habit is increasingly seen in females in recent times therefore, this could be the applicable in the high rate observed amongst the female.

Additionally, age specific prevalence rate which showed low prevalence rates at the extremes of age (18-30 years and 80 – 100 years) could be due to the fact that these age groups had lower number of patients. The age group (31-50 years) were the highest sampled and might be the reason for having the highest prevalence. However, the mostly affected age group in this study forms the most energetic age group in every population likewise the most productive age with high workforce. This calls for urgent consideration.

Generally, explanation regards the underlying mechanism of Tuberculosis and diabetes comorbidity has remained unclear however, some scholars have varying opinions. Drug induced effects, stress and others have been used to explain the occurrence of diabetes amongst Tuberculosis patients. Also, pancreatitis is one of such reasons; there is tuberculosis induced inflammation on the organ responsible for glucose regulation. Remarkably, since the study population was a tuberculosis patient mostly on treatment, some tuberculosis drugs have been implicated to impair glucose metabolism in a bid to meet with the complementary dosage requirement. Ottamini and colleagues (2010) revealed that this causes high glucose level in some patients on treatment with isoniazid and rifampicin. Beside, quite a lot of other pathways have been identified to explain this relationship.

Diabetes mellitus has been noted to have accumulating prevalence in Nigeria. In the amasses of the increasing prevalence of tuberculosis and diabetes, especially in the developing countries, this study carried out was a preliminary investigation which screened tuberculosis patients on treatment centres and determined their fasting glucose profile. This is in view to raising awareness on the relationship between tuberculosis and diabetes mellitus early identification of marker classifies properly and initiates rapid intervention of treatment as indicated in this study.

Conclusion

Tuberculosis is a global issue including diabetic complications particularly in the Sub Sahara region. Mono morbidity of tuberculosis or Diabetes constitutes public health menace of great concerns. This disease burden has been cumbered by co-existence in a patient resulting to severe complications and this has been attributed to high mortality. The prevalence of Diabetes mellitus amongst tuberculosis patients was high in this study. Females were mostly affected and ages between 18 to 50 years which is the most productive age with high workforce had higher rate. Geriatrics was less affected as evident in this study.

Study Limitation

The present study was delimited in area and content to tuberculosis patient just within ObioAkpokor local government area in Rivers State, Nigeria specifically patients accessing care at the Rumuigbo Model Healthcare facility. Also, the study might not have been able to control for extraneous variables. Besides, the designed did not involve a follow up approach as to have a broader view of the situation rather a snapshot was obtained.

Recommendation

Screening for diabetes mellitus is strongly recommended amongst tuberculosis patients and there should be emphasis on early screening of diabetes mellitus among tuberculosis patients. Also, tuberculosis diagnosis should be done along side with Glucose estimation for a successful treatment of tuberculosis. Clinicians are advised to put this in consideration. In-depth study should be mulled over in this direction to evaluate the interplay between tuberculosis and diabetes mellitus.

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