Public Health Research
Ogbara et al. Afr Chron Res Pub J 2025 1(1):67-81
Article URL: https://researchpubjournals.org/?post=1414

Proposal for evaluation of prevalence of infection comorbidities among individuals living with type 2 diabetes mellitus at General Hospitals in Bayelsa State Nigeria

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Received: 09/04/2024
Revised: 25/07/2025
Accepted: 16/09/2025
Published: 23/09/2025

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Abstract

Background: Type 2 diabetes mellitus (T2DM) is a preventable public health concern including infectious disease complications. In Bayelsa State Nigeria, there is dearth of knowledge regarding the relationship between T2DM and infections comorbidities, especially the types of infectious microbes commonly observed, risk factors, and the management practices.

Objective: This study is aimed to evaluate the prevalence of infection co-morbidities among individuals living with T2DM in General Hospitals in the eight (8) Local Government Areas of Bayelsa State.

Method: This was designed to follow a mixed-methods approach including cross-sectional clinical audit and surveys. Seven general hospitals and one cottage hospital in Bayelsa State constituted the performance sites for clinical audit. The surveys would include patients and healthcare professionals within the chosen health facilities. The choice to use the General Hospitals is based on previous study area being convenience sampling at hospitals.

Expected results: The study would provide answers to questions around burden of T2DM, prevalence of infection comorbidities and the spectrum of infections. Other expectations include provision of information about potential risk factors diabetes infections and healthcare management practices

Conclusion: This significance of the study proposal lies in potential for improved care for diabetes infections. Knowledge of the spectrum of infections may highlight areas for public health awareness and primary healthcare development in diabetes care.

Keywords: prevalence of infection, general hospitals, infectious diseases, management practice, preventive measures, risk factors.

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1. 0. Introduction

1.1. Synopsis of the literature

Diabetes mellitus (DM) as a disease is a clinical syndrome associated with deficiency of insulin action. It is considered as one of the highest health threats in our society. DM increases the susceptibility of such patients to infectious diseases due to the presence of a hyperglycemic environment that favors immune dysfunction. DM is a chronic and complex metabolic disease that is characterized by several manifestations, including but not limited to increased susceptibility to infectious disease as complications (Chávez-Reyes et al., 2021).

Zhou and Lansang (2024) also pointed that diabetes is a disease that has to do with a significant risk factor for several types of infections that can lead to hospitalization of a patient. This situation normally occurs due to the immune system dysfunction. Skin, soft tissue, respiratory, genito-urinary and gastrointestinal infections appear to affect people with DM more often.

DM is one of topmost four non-communicable disease (NCD) killers besides cancer, cardiovascular disease, and respiratory diseases. However, while mortality in other three diseases have declined between 2000 and 2019, diabetes death increased by 3% (World Health Organization, 2023). However, infectious diseases involving the bacteria and viruses joined the NCDs to constitute top 10 leading causes of mortality in the 2021 global health statistics (World Health Organization, 2024).

It has been established that individuals with T2DM are at a higher risk for developing certain infections such as COVID and tuberculosis (Carey et al., 2023; Chávez-Reyes et al., 2021; Holt et al., 2024; Marhl et al., 2020; Tenconi et al., 2007), and insulin or glycaemia indicated to be main biomolecular determinants (Chávez-Reyes et al., 2021; Sun, 2023). Although, genetics indicated to play some role (Adeghate et al., 2006; Qin et al., 2012), environmental factors remain critical. It is known that non-adherence to good DSM practices is crucial (Colberg et al., 2016); and environmental pollution is yet another factor (Rao et al., 2015). Hence, health education constitutes an important aspect of DM health service management regimen (Khunti et al., 2012; Venmans et al., 2011).

1.2 Statement of Problem

While it is known that persons with DM have over 150% greater risk of infection (Holt et al., 2024; Kim et al., 2019), the prevalence of infectious spectra in the diabetes population is limited. A quick review on PubMed shows only three papers

(Abu-Ashour et al., 2018; Carey et al., 2018; Kim et al., 2019), none of which is from Nigeria. A further quick scoping review for literatures about diabetes in Nigeria yields thousands of articles. However, limiting focus to Bayelsa State shows only three papers (Dambo et al., 2024; Kasia et al., 2020; Okoro & Jumbo, 2021), but all three studies were limited scope of prevalence of DM i.e. none extended to include infections. It is of interest to investigate the spectrum of infectious agents within the same population. Further, while fungal infection has been reported to be prevalent in nearby state of Enugu Nigeria (Udeani et al., 2018), the prevalences of fungal and viral infections among individuals living with T2DM in Bayelsa State are unknown.

1.3 Aims and Objective

The primary aim of this study is to evaluate the prevalence of infection comorbidities among individuals living with T2DM, as well as infectious disease management practices in Bayelsa State.

1.4. Specific objectives

1. To determine the prevalence of T2DM in the study population.
2. To identify the common comorbid infections associated with T2DM in Bayelsa State
3. To determine the prevalence of common comorbid infections among T2DM patients.
4. To identify risk factors for common comorbid infections among T2DM patients.
5. To ascertain the management practices of common comorbid infections among T2DM patients.

1.5. Research Questions and hypothesis

These are as tabulated (Table 1)

2. 0. Methods

2.1. Study design:

The design for this study is sequential mixed methods research. This design combines qualitative (interview) as an addition to provide nuance to quantitative data (Creswell & Hirose, 2019; Onwuegbuzie & Collins, 2007). To test hypothesis, comparative method would be adopted (He et al., 2024). The study is also designed to be cross-sectional observational method similar as in surveillance approach (Bell Ngan et al., 2020). Furthermore, the identified clinical data from the hospitals would constitute secondar0y data to enable a retrospective review and case analysis (He et al., 2024)

2.3. Study population

The targeted population of this study involves all T2DM patients attending the general hospitals and one cottage hospital

(cottage hospital Ekeremor) in Bayelsa State is 116,247.

2.4. Selection criteria

2.4.1. Inclusion Criteria: Men and Women who are diabetic (both type 1 and type 2) between 1st July, 2024 to 31st December, 2024.

2.4.2. Exclusion Criteria: Men and Women who are not diabetic (both type 1 and type 2) before 1st July, 2024 and after 31st December, 2024.

2.5. Sampling method

The sampling procedure for this study will be purposive method, because recruitment of volunteer participants would be based on those present during the research period. The proposal intended to work with a round-up total number of 400 participants including hospital records. Questionnaires will be given to patients; medical personnel's attending to diabetes patients to fill and identify the determinant factors etc that could cause infections and the comorbidity infect ions associated with T2DM patients.

2.6. Sample size

The sample size for this study is all about T2DM patients in the study area and would be calculated according to Taro Yamane's formula for sample size determination for estimating proportion in a finite population (Blarinwa, 2020). Based on estimated targeted population of 116,247, the online version of the formula was used to drive sample size of N=383.

2.7. Data collection

Medical records will be reviewed for burden (objective 1, epidemiology (objectives 2 – 4), and management practices (objective 5). The hospital records of the general hospitals would be accessed to elicit for demographic variables (Table 2). Survey questionnaires will be administered to medical staff and DM patients to collect further data on other variables such as diabetic –related infections (bacterial, fungal and viral), risk factors of common comorbid infections and management practice for common comorbid infections that will be used for epidemiological evaluations. There is a standard recommended diabetes care plan (CDC, 2024), which will be used to collected the clinical data for assessment of objective 5. Demographic information will be as in a related study from another State (Udeani et al., 2018).

For respondents that are literate, they will be given the free will to respond to the instrument. But for those who could not read or write, the research assistant or the researcher will assist them by reading and explain each item in the questionnaire for

them to respond. Their responses will be appropriately written or tick in the questionnaire allocated to them.

2.8. Statistical analysis

The data will be analyzed along the following research questions and hypothesis (see table 1). The questionnaires will be manually sorted out, entered a computer and the obtained data will be analyzed using IBM SPSS version 20. Descriptive analysis of all the variables measured will first be done, and the categorical variables will be reported as frequencies and proportions/percentages, while the continuous variables will be reported as means ± standard deviation. Cross-tabulations will be done to test for associations between the different categorical variables (in line with the objective of the study) using the chi-square test. Fisher's exact test will be used where the expected value is less than 5. Mixed logistic regression models will be conducted to estimate the association between each of the common comorbid infections and T2DM and also for the association between infection control methods and T2DM management practices.

Table 1: Research questions and hypotheses matching specific objectives

SN	Research questions	Null hypothesis. No significant differences in:
1	What is the prevalence of T2DM among diabetic patients in Bayelsa State?	Gender and stratified age groups
2	What are the common comorbid infections associated with T2DM patients in Bayelsa State?	Level of bacterial, fungal, and viral infections between DM
3	What is the prevalence of the common comorbid infections among T2DM patients in Bayelsa State?	Proportions of various reported bacterial, fungal, and viral infections between stratified durations of T2DM
4	What are the risk factors for common comorbid infections among T2DM patients in Bayelsa State?	Compare risk factors of common comorbid infections between T2DM and non-DM groups
5	What are the management practices of common comorbid infections among T2DM patients in Bayelsa State?	In diagnostic requests for bacterial, fungal, and viral infections

Key: SN – serial number for specific research objectives

Table 2: Research objectives matching design and data proposal

SN	**Research objectives**: To determine	**Study design**
1	Burden of T2DM in the study population.	Cross-sectional descriptive
2	Infections associated with T2DM in Bayelsa State	Comparative
3	Prevalence of the identified infectious microbes.	Cross-sectional mixed-methods
4	Identify risk factors for infection comorbidities among T2DM patients.	Comparative
5	Management practice of infection comorbidity in T2DM patients	Cross-sectional mixed-methods

Key: SN – serial number for specific research objectives

3. 0. Scope and limitations of Study

3.1. Scope: The geographical scope of this study is Bayelsa State, and it will be conducted in seven (7) general hospitals including one cottage hospital in the eight (8) LGAs of Bayelsa State Nigeria. The study will focus on T2DM patients by identifying common comorbid infections among them and determining the prevalence these common comorbid infections among T2DM patients. It will also explore the risk factors that predisposes T2DM patients to these common comorbid infections.

3.2. Limitations of study using SWOT analysis: To understand the research findings a SWOT analysis was conducted to identify the strengths, weaknesses, opportunities, and threats of this study.

Strength: will be its relevance and importance to public health. The outcome of this research will improve infection control and management thereby reducing complications among T2DM patients. The study findings can also influence clinical practice, preventive measures, and patient's education which will improve health outcome both at individual and community level.

Weakness: This will include resource constraints in terms of cost of executing the research and time in collecting/ reviewing medical records. Logistic and technical challenges in accessing a large pool of volunteers is also another weakness to be acknowledged.

Opportunity: It will aid collaboration with other health professional, open-up dissemination channels for sharing research findings, a platform for further studies on the subject matter, and opportunities for sponsorships that can enhance the project scope. Research findings can also lead to improved public health policies on preventive measures and treatment

guidelines for common comorbid infections within the diabetic population.

Threat: This is self-funded research, which constitutes limitation to engagement of supporting personnel for the work. Ethical and privacy concerns constitute a threat as it has been known that assessment of lifestyle can be difficult (Ene-Obong et al., 2013), just as incomplete documentation in medical records also constitute another challenge (Gbeinbo et al., 2023; Nwose et al., 2019).

4.0. Expected outcome/results

4.1. Expected outcome: It will contribute to the knowledge of the general public on better ways to manage T2DM. It will create awareness on what symptoms to look out for when it has to do with common T2DM comorbid infections. It will be a guide to researcher and policy makers when handling non- communicable disease issues.

4.2 Expected results: 6 points

1. High prevalence of infection comorbidities: the study may reveal a high prevalence of infection comorbidity among T2DM patients in the study population, Identify potential risk factors and demographical characteristics associated with T2DM in these groups, and inform the development of targeted interventions and public health strategies to prevent and manage T2DM in the vulnerable population in Bayelsa State.
2. Identification of common comorbid infections: The study may identify the most common types of infections among T2DM patients such as: urinary tract infection (UTIs), skin infections (e.g., cellulitis, diabetes foot ulcer), respiratory tract infection (pneumonia), and gastrointestinal infections.
3. This study may find association between common comorbid infections and demographic/ clinical factors such as age, duration of T2DM e.t.c, which can increase the risk of infection comorbidity, and poor glycaemia control which may also predispose to a high risk of infection comorbidity.
4. Will provide a comprehensive understanding of the current management practices and strategies employed by healthcare providers in managing infection co-morbidity in patients with T2DM.

Identify gapes and challenges in the existing management practices, and to enhance effective management of infection co-morbidity in T2DM patients so as to improve health outcome and quality of life.

5. The study's findings may highlight opportunities for targeted interventions to reduce the burden of infection comorbidity among T2DM patients, such as improved glycemic control, enhance infection preventive control measures, timely diagnosis and treatment of infections, patient education, and awareness program. These expected outcomes can inform healthcare strategies and interventions to improve patient outcomes and reduce the burden of infection comorbidity among T2DM patients in Bayelsa State.

4.3. Significance of expected findings:

It is known that the preventive medicine for infectious disease comorbidity in diabetes comprises both avoiding direct infections and reducing the risks of being infected (American Diabetes Association, 2022). This study will serve as a needs-assessment to enable government to improve on healthcare services geared towards reducing risks of infections. It will provide update knowledge for diabetic patients on infection signs, symptoms and to know when to seek for help from a physician.

4.4. Justification of Study

Currently, T2DM is a dangerous non communicable disease, as its prevalence is continuously increasing in our society and accounts for about 422 million individuals living with it (Guangtone *et al.*, 2019). Different literature reviews have shown the prevalence of diabetes mellitus in different geopolitical zones in Nigeria. Factors such as family history, urban dwelling, physical inactivity, advance age, and unhealthy diet are important risk factors among the individuals (Andrew *et al.*, 2018). Humanity is continually being faced with emerging and re-emerging diseases, especially those of viral origin. The COVID-19 for instance has been reported to easily affect patients with underling illnesses, one of such is diabetes mellitus (DM). The understanding of this fact therefore forms an impetus for the current study.

5.0. Time frame

This research from initiation till its complete will take 30 months.

6.0. Ethical compliance

6.1. Ethical clearance:

Approval for the research will be sought from the Research and Ethics committee of the Bayelsa State Ministry of Health, Bayelsa State Hospital Management Board and Novena University Ogume, Delta State.

6.2. Consent/confidentiality:

Informed consent will be obtained from each participant and confidentiality will be maintained at each stage in accordance with clinical principle for the guidance of physicians in medical research as stipulated in the Helsinki Declaration of 1964 as reviewed in the sixth edition of 2008 (Williams, 2008).

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Declarations

Conflict of interest: Nil.

Funding: Nil