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The Prevalence, Pattern, and Burden of Multimorbidity Among Older Adults in Niger State, Northern Nigeria

Abdulsalam Ahmed, Hafiz T.A. Khan, and Muili Lawal

Abstract

Objective: While public health planners and practitioners are increasingly aware of the role of inequity in health, the burden of disease measures have not kept pace with this knowledge. Hence, the aim of this study is to determine the prevalence, and patterns of multimorbidity and to understand the burden of multimorbidity in Niger State Nigeria. **Method:** Data were collected on a cross-section of 734 older adults 60 years and older in Niger northcentral Nigeria. The morbidity was assessed by adopting the list of chronic diseases used in prospective urban and rural epidemiology studies. Collected data was entered electronically via JISC online survey software between October 2021 and February 2022. The data were analyzed by IBM SPSS version 27. Relational association rules were used for determining the pattern of multimorbidity. **Results:** The prevalence of multimorbidity for the study was 51.9%. The commonest dyad combination of multimorbidity among the respondents is hypertension and diabetes mellitus. The top triad of multimorbidity combinations for three disease conditions is hypertension, diabetes, and stroke. Hypertension, diabetes, and peptic ulcer represent the highest disease burden respectively. **Conclusion:** Health conditions like hypertension, diabetes, and acid-peptic diseases are commonly occurring in clusters of multimorbidity. And they represent the greatest disease burden. To reflect the clinical reality of older adults, identifying the common pattern will provide insight for a more integrative multidisciplinary approach focusing on prevention and better management of these disease conditions in groups.

Introduction

Multimorbidity is defined as the simultaneous presence of more than one health condition in the same individual (Faronbi et al., 2020; Hien et al., 2014; Nützel et al., 2014; Ryan et al., 2018; Violan et al., 2014) and multimorbidity patterns as the most frequent combination of specific disease pairs and the groups of health conditions with the highest degree of association using the corresponding statistical analyses of either cluster or factor analysis (Barnett et al., 2012). The multimorbidity global prevalence estimates ranged from 12.9% in the general population to 95.1% among people 65 years and older (Barnett et al., 2012). Disease conditions such as hypertension and diabetes are the most common in older adults, especially after 60 years of age, and sometimes they occur together (Palmer et al., 2018). The principal challenge facing the healthcare systems now and in the coming decades is handling multimorbidity, due to its adverse health and economic implications and for health workers whose decisions are principally supported by single disease-specific guidelines (Muka et al., 2015). To improve safety in primary care, it is essential to consider care of people with multimorbidity. Patients with multimorbidity usually have more complications in terms of having complex symptoms, and higher mortality rates and more often they do not receive cost-effective treatment when compared with individuals with a single disease (Fortin et al., 2012). The complications linked to multimorbidity made the patients more prone to the economic and medical burdens that can lead to damage to their physical and mental health and overall reduced quality of life (Fortin et al., 2012; van den Akker et al., 1996). Additionally, multimorbid patients are prone to frequent hospitalization, polypharmacy, treatment burden, and mortality (Schäfer et al., 2012; Sinclair & Abdelhafiz 2020). Multimorbid are more likely to die prematurely, and they are frequently associated to increase healthcare utilization (Muka et al., 2015; Salisbury et al., 2011). In high-income countries (HICs), individuals with multimorbidity make up 78% of all consultations in primary care (Boutayeb, 2006). Moreover,

it is mainly responsible for increase in out-of-pocket expenditure in developing countries. Multimorbidity as opposed to comorbidity is considered as a more patient-centered concept and a better reflection of disease burden, this is because regardless of which diseases started first, each disease is regarded as having equal importance (Czibula et al., 2014). At its most basic level, the “burden of disease” in public health reports simply characterizes the existence of a disease in a particular population. Noncommunicable diseases (NCDs) burden in low- and middle-income countries (LMICs) is undeniably enormous following rapid urbanization, change in nutrition, and epidemiological transitions, this is superimposed on a fragile health and social protection system (Abdulraheem et al., 2017; Wallace et al., 2015). For instance, LMICs are experiencing a rapid increase in the prevalence of NCDs while the burden of infectious diseases and malnutrition remains significant (Roman Lay et al., 2020). This dual burden of infectious and non-infectious disease represents a challenge for population health and healthcare system in developing countries (Sakib et al., 2019). Sadly, the healthcare system, particularly public health is yet to adjust to accommodate these challenges efficiently. Irrespective of how disease burden is measured, the burden of disease represents the cornerstone of public health planning and practice. They provide valuable information about the impact of disease and help guide decisions about when and where to intervene. While public health planners and practitioners are increasingly aware of the role of inequity in health, the burdens of disease measures have not kept pace with this knowledge. Prevalence estimates are generally lower in LMICs than in HICs, and the limited studies from LMICs reported anticipated increases in multimorbidity in the coming years (Li et al., 2016). Considering the fact that the high prevalence of multimorbidity and its burden on both patients and healthcare are less documented in LMICs compared to HICs, it’s a pointer that less attention is being paid to this phenomenon by these countries. However, understanding which diseases pose the greatest threat to health and well-being, will help public health practitioners and policymakers to be better prepared and decide how to use limited resources for maximum benefit.

Method

We conducted a questionnaire-based, cross sectional descriptive study between October 2021 and February 2022.

The Setting: The survey was conducted at the outpatient department of four public secondary health facilities in Niger state Nigeria. A purposeful sampling method was used to select four high-volume general hospitals, one each in the three geopolitical districts and one in the state capital, all having a good representative of multimorbid patients.

Study Population: Patients presenting to the outpatient departments of the selected hospital were invited to participate in the study if they were at least 60 years old and older. A systematic random sampling was used to select 734 patients with two or more chronic diseases (multimorbidity) aged 60 years and above (as part of a larger study, the detail on Ahmed et al. 3 sample size determination was discussed in our earlier studies (Abebe et al., 2020; Frenk & Gómez-Dantés, 2017) who presented for routine ambulatory outpatient and consented to participate in the study. However, the study excluded patients having communication problems and the acutely and severely sick that will need admission and/or a specialized line of management. Additionally, patients with any form of cognitive impairment were also excluded.

Measurement of Variables: The questions on sociodemographic characteristics of participants were collected, which included age, sex, ethnicity, marital status, types of family or composition of the family, level of education, types of occupation, and monthly family income. Multimorbidity was operationalized according to the definition recommended by the National Institute for Health and Care Excellence: the presence of “two or more long-term health

conditions.” A simple count of individual chronic conditions was used as the approach to measuring multimorbidity, which is also the most common across the literature (Amuna & Zotor, 2008). For this study, multimorbidity comprised self-reported conditions (patient’s diagnosis) and confirmation of diagnoses through the use of the patient case note (folder). A total of 21 noncommunicable chronic diseases were included in the study. The morbidity was assessed by adopting the list of chronic diseases used in prospective urban and rural epidemiology studies because the disease on the list fulfills WHO criteria for chronic diseases. This includes hypertension, diabetes, peptic ulcer, arthritis, heart failure, stroke, other heart diseases, angina, COPD, CLD, obesity, depression, asthma, cataract, chronic renal failure, osteoporosis, glaucoma, tuberculosis, emotional and mental illness, cancer, Alzheimer’s disease, and dementia.

Statistical Analysis: The data was collected face-to-face, entered into JISC online survey and exported to SPSS. For this study, all participants have two or more chronic diseases. And the highest number of chronic diseases in an individual in this study was 5. The prevalence of multimorbidity was calculated from the total number of all patients that presented to outpatients of the four hospitals during the lifespan of data collection. For clustering or pattern of multimorbidity, relational association rules were used. Relational association rules are an extension of ordinal association rules, which are a particular type of association rules that describe numerical orderings between attributes that commonly occur over a dataset (Simões & Lucas, 2020). This rule was also adopted in newer studies (Vogeli et al., 2007). Firstly, cross-tabulation of all chronic diseases in the study was done to find the dyad pattern of multimorbidity. The result was presented in a correlation matrix table. For the triad, tetra, and Penta of morbidities combination, the individual’s morbidities were summed up and categorized into four groups based on the number of chronic diseases (2, 3, 4, and 5). An independent chi-square was performed against each category of multimorbidity. The percentage of the dyads, triad, tetra, and penta morbidities were determined by the frequency of the chronic disease in the category divided by the total of the category and then multiple by 100. The chronic diseases were presented in frequency and percentage and were disaggregated by gender. Chronic disease was also grouped based on systems and system contributions were calculated and highlighted accordingly.

Institutional Review Board Statement: Research ethics panel of College of Nursing, Midwifery and Healthcare of University of West London gave the ethical approval (Ethical Approval No. 1055). And authorization to collect data was obtained from the Research, Ethics, and Publication Committee of the Hospitals Management Board, Minna, Niger State of Nigeria.

Informed Consent Statement: Participants freely signed their informed consent about 24 hr prior to participating in the study, and the individual’s right to withdraw was observed.

Results

Here 734 out of 800 contacted participants agreed to participate in the study, accounting for 91.8% response rate. Sixty-six of them withdrew from the study for personal reasons. The analysis of the sociodemographic data is shown in Table 1.

Prevalence of Multimorbidity and Burden of Chronic Diseases: The main objective of this phase of the study is to determine the prevalence and pattern of chronic disease conditions and their burden among older people in Niger state Nigeria. The prevalence of chronic health conditions in the sample is shown in Figure 1. The three leading chronic diseases in both sexes were hypertension 68.4% (37.45% males and 62.55 males), diabetes 55.30% (40.15 males and 59.85% females), and peptic ulcer 22.60% (33.73% males and 66.27%). Arthritis was the fourth most common chronic health disease among males and post-CVD (stroke)

among females. In both sexes, heart failure came in fifth place. The least common chronic health disease among males is Alzheimer's disease and dementia, and epilepsy in females. Cardiovascular system disease was the most affected system, contributing about 46% (339) of the multimorbidities, followed by the endocrine system at 20.6% (151) and gastroenterology at 10.6% (78). The least affected system was the oncology system with five persons (see Table 2). The overall prevalence of multimorbidity for this study was estimated to be 51.9% (see Table 3). Hypertension, diabetes, and peptic ulcer account for the first, second, and third medical conditions responsible for the most hospital visit, contributing 29.8%, 19.6%, and 8.6% respectively of all the visits by the multimorbid patients in Niger state, Nigeria (see Figure 2). Heart failure (8.3%) and stroke (post cerebrovascular accident disease; 7.2%) make up the top five and together they represent the leading cause of disease burden in this study. Similarly, findings from Table 4 show the association of multimorbidity with disease cluster of multimorbidities.

Patterns of Multimorbidity:The commonest dyads (two chronic diseases) combination of multimorbidity among the respondents in the study is hypertension +diabetes mellitus contributing to about 19% of all the possible combinations of multimorbidity when considering two chronic disease conditions. Hypertension + heart failure, hypertension +stroke, and hypertension + acid peptic diseases. Diabetes+ heart failure completes the top 10 of the dyads of multimorbidity. The top triad of multimorbidity that is the commonest combination of three disease conditions is first(hypertension + diabetes +stroke), second (hypertension + diabetes + osteoarthritis), and third (hypertension +diabetes +acid peptic diseases). The commonest combination of four chronic disease conditions is (hypertension +diabetes +heart failure +stroke) followed by (hypertension + diabetes +heart failure + osteoarthritis). Two patterns of multimorbidity of five chronic diseases were observed in the study predominantly. The first is the combination of (hypertension +diabetes +stroke +osteoarthritis + heart failure) and the second is (hypertension +diabetes +stroke +osteoarthritis + acid peptic). For all classes of multimorbidity, it is higher in females than males.

Discussion

In this cross-sectional study among multimorbid older adult patients receiving care at four high-volume general hospitals, the total number of diseases in an individual range from two to five chronic diseases. The total number of health conditions in individuals increases with advancing age, this is consistent with findings in the earlier studies (see, e.g., Ahmed et al., 2022, 2024; Huntley et al., 2012; Zheng et al., 2022). This steady finding is important because it is reported that if we are to deal with an increasing prevalence of multimorbidity in an aging population, we need to know about disease combinations so we can design best practice guidelines for clinicians (Duerden et al., 2013). To our knowledge, this is the first study to determine the pattern of multimorbidity only among multimorbid patients in Niger state north-central Nigeria. The prevalence of multimorbidity in our study is 51.9%, and falls within the prevalence estimates range from 27% to 74.4% among elderly Nigerians and closest to 49% in a study in Anambra (Johnston et al., 2019). This is consistent with findings in other studies from Canada 49.4% (Salisbury et al., 2011), Ireland 53.7% (Oni & Unwin, 2015), but was less than the value in Burkina Faso 65% (Afshar et al., 2015; Mercer et al., 2016). This is, however, lower than finding from other parts of the world. For example, a study in Belgium showed that the multimorbidity rate was as high as 82.6% (Cucinotta & Vanelli, 2020) and another study in Australia showed that 83.2% of the respondents suffered from multimorbidity (Boeckxstaens et al., 2014). The prevalence of multimorbidity among studies should be interpreted and reported with caution because of differences in the definition of multimorbidity, demography of the sample and different study methodologies (Steinman et al., 2012). This could be the explanation for the contrasting differences studies in Belgium showed that the multimorbidity

rate was as high as 82.6% (Boeckxstaens et al., 2014) and another study in Australia showed that 83.2% of the respondents suffered from multimorbidity (Zhang et al., 2019).

So many dyads' combinations of morbidities have been reported in previous studies. The commonest dyads pair in this study is hypertension and diabetes which is consistent with a previous Nigeria study (Duerden et al. 2013). However, this is inconsistent with findings that reported rheumatoid and digestive disease as the most frequent dyads (Ahmed et al., 2024; Zhang et al., 2019). For triads of morbidities, hypertension, diabetes, and post cerebrovascular disease were the commonest in this study. This partially coincides with other study, which reported the highest prevalence was in HBP, diabetes, and heart problems (10.3), and HBP, heart problems, and Osteoarthritis (9.8%; Duerden et al., 2013). However, the result partially disagreed with findings from other studies where arthritis or rheumatism, stomach or other digestive diseases, and hypertension were the commonest triads (Cucinotta & Vanelli, 2020; Zhang et al., 2019). While it was evident that arthritis can easily coexist in these studies, the medical condition that easily coexists in our study is hypertension mainly because the prevalence of hypertension in this study is high (28.9%), substantiating with existing studies in Nigeria (Johnston et al., 2019). Figure 1 ranked health conditions according to the reason for hospital visits. Hypertension and diabetes represent the greatest burden, this was buttressed by a high relative risk for hypertension and diabetes (27.72 and 22.42 respectively). Hypertension and diabetes are also among the leading component of all the leading morbidity in the dyads and triads, tetra and penta commonly occurring diseases in multimorbidity in this study. Though the frequent occurrence of hypertension or diabetes in multimorbidity in this study might be simply due to the high prevalence of these diseases, this is vital when designing and implementing management guidelines for multimorbid patients in this part of the world. This is consistent with findings from other studies, see for example Ahmed et al. (2023), Javanmardi et al. (2020), and Johnston et al. (2019).

Strength and Limitation

Although the result of this study revealed the burden of multimorbidity and the existence of associations beyond chance among the different diseases, which has the potential to address this emerging health priority holistically, by adopting a more integrated and sustainable model of care, the sample selection is limited to four hospitals in Niger state, thus the findings cannot be generalized to Nigeria. However, the study can be replicated elsewhere in the country to increase its impact.

Conclusion

In all categories of multimorbidity, women are more affected than men, perhaps because women live longer. Chronic disease conditions like hypertension, diabetes, and acid peptic diseases are commonly occurring in clusters of multimorbidity with the first two representing the greatest burden of morbidities. Information on the burden of disease provides valuable information about the impact of disease and this will help guide decisions about when and where to intervene.

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