

Original Article

Insights into the Morbidities and Short-term outcomes of Hospitalised Male and Female Medical Patients in Nigeria: the MOHOPA study.

*Kamilu Musa Karaye¹, Ejiroghene Martha Umuerrri², Ikenna Onwuekwe³, Abdulhakim Muhammad Daiyab⁴, Ruqayya Nasir Sani¹, Charles Anjorin⁵, Henry Iheonye⁶, Zayyad Garba Habib⁷, Abel Onunu⁸, Abdulrazaq Garba Habib¹, Adesola Ogunniyi⁹.

¹Department of Medicine, Aminu Kano Teaching Hospital & Bayero University, Kano, Nigeria.

²Department of Medicine, Delta State University, Abraka, Nigeria. ³Department of Medicine, University of Nigeria, Ituku-Ozalla Campus, Enugu, Nigeria. ⁴Department of Programs and Research, Health Development Alternative Initiative, Kano, Nigeria. ⁵Department of Medicine, University of Maiduguri Teaching Hospital, Maiduguri, Nigeria. ⁶Department of Medicine, Federal Teaching Hospital, Lokoja, Nigeria. ⁷Department of Medicine, University of Abuja Teaching Hospital, Abuja, Nigeria.

⁸Department of Medicine, University of Benin, Benin, Nigeria. ⁹Department of Medicine, University of Ibadan & University College Hospital, Ibadan, Nigeria.

Abstract

Background: In the MOHOPA (Pattern of Morbidities, Mortality and Healthcare Financing of Hospitalised Medical Patients) study, we aimed to determine the pattern of morbidities, short-term clinical outcomes, and determinants of all-cause mortality of male and female patients admitted to the medical wards of Nigerian tertiary-level hospitals.

Methodology: Patients admitted to the medical and emergency wards of seven tertiary-level hospitals, spread across the 6 geopolitical zones of Nigeria and the Federal Capital Territory, were consecutively recruited after obtaining written informed consent. The Research Ethics Committees of the study centres approved the study protocol, with the following reference numbers: Aminu Kano Teaching Hospital, Kano: NHREC/06/12/19/26, dated 21 October 2020; Delta State University Teaching Hospital, Oghara: HREC/PAN/2023/006/0537, dated 19 April 2023; University of Nigeria Teaching Hospital, Enugu: NHREC/05/01/2008B-FWA00002458-1RB00002323, dated 26 May 2023; University of Maiduguri Teaching Hospital, Maiduguri: IRB-FWA 00013572 UMT/REC/23/1158, dated 9 August 2023; Federal Teaching Hospital, Lokoja: FTHL/HREC/Vol.I/2023/180, dated 6 July 2023; University of Abuja Teaching Hospital, Gwagwalada, Abuja: UATH/HREC/PR/266, dated 20 July 2023; University of Ibadan & University College Hospital, Ibadan: UI/EC/23/0331, dated 30 June 2023. Discharged patients were followed up at four-weekly intervals for 12 weeks by telephone calls or until demise, to determine the study outcomes (all-cause mortality (in-hospital and at 12 weeks post-discharge) and rehospitalisation rate).

Results: 705 patients were recruited over ten months, comprising at least 100 patients from each site, and followed up for a median of 97 days. Their mean age was 51.3±18.3 years, and 44.7% were females. Cardiovascular disease (CVD) was the most common primary cause of admission (22.1%) and also the most common co-morbidity (21.3%), without significant gender differences. All-cause mortality rate was higher in males than females (33.3% versus 24.8%; p=0.013), while rehospitalisation rate was higher in females than males (19.0% versus 26.4%; p=0.025), respectively. The risk for all-cause mortality was significantly increased by CVD (hazard ratio: 1.55; 95% confidence intervals: 1.03-2.33) and increased age (hazard ratio: 1.03; 95% confidence intervals: 1.02-1.03).

Conclusion: CVD was the most common indication for admission in Nigeria's referral hospitals. CVD was also the major co-morbidity and determinant of all-cause mortality.

Keywords: Morbidities, Mortality, Hospitalisation, MOHOPA, gender, Nigeria.

***Correspondence:** Professor Kamilu M Karaye. Department of Medicine, Bayero University & Aminu Kano Teaching Hospital, PO Box 4445, Kano, Nigeria. Phone: +234 803 704 2171. Email: kmkaraye.med@buk.edu.ng

How to Cite: Karaye KM, Umuerrri EM, Onwuekwe I, Daiyab AM, Sani RN, Anjorin C, et al. Insights into the morbidities and short-term outcomes of hospitalised male and female medical patients in Nigeria: the MOHOPA study. Niger Med J 2025; 66 (5): 1986-1997. <https://doi.org/10.71480/nmj.v66i5.1150>

Quick Response Code:



Introduction

Nigeria is the most populous country in Africa, with a population of more than 220 million. The country has 33 Teaching Hospitals spread across the six geopolitical zones and the Federal Capital Territory, which offer a combination of optimal patient care with medical education and research. These institutions serve as training grounds for medical professionals while providing comprehensive healthcare services to millions of Nigerians and their neighbours.[1]

Like other low- and middle-income countries, Nigeria is undergoing an epidemiological transition with consequent changes in its people's health and disease profile. The World Health Organisation (WHO) reported that in 2021, 63.7% of all deaths were caused by communicable, maternal, perinatal and nutritional conditions, while non-communicable diseases (NCDs) were responsible for 27.7% of the deaths, in all age groups.[2] The most common causes of death in all age groups and in order of frequency were lower respiratory tract infections, malaria, diarrhoea, tuberculosis, ischaemic heart disease (IHD), birth asphyxia/birth trauma, stroke, preterm birth complications, maternal conditions, and human immunodeficiency virus (HIV) infection.[2] However, these specific causes of death differed significantly by age and gender. Above the age of 60 years and in both genders, the most common causes of death were stroke, IHD and tuberculosis, followed by chronic liver disease, cancers and diabetes mellitus.[2]

The disease pattern observed among hospitalised patients might reflect the important and critical ailments in the general population. To the best of our knowledge, there is no nationally representative data on the pattern of morbidities and short-term clinical outcomes of hospitalised medical patients in Nigeria. This information will be vital for strategic planning and policy formulation that can lead to reduced early and late mortality from medical conditions, and ultimately contribute to improved national socio-economic development in Nigeria.

In the MOHOPA (Pattern of Morbidities, Mortality and Healthcare Financing of Hospitalised Medical Patients) Study, our general aim was to determine the pattern of morbidities among patients admitted to the medical wards of the teaching hospitals, the short-term outcomes of admissions and their determinants, the challenges of managing patients in the medical wards, and the pattern of healthcare financing for medical patients in Nigeria. In the present analysis, however, we aimed to present the pattern of morbidities among male and female patients admitted to the medical wards of Teaching Hospitals spread across Nigeria, their short-term clinical outcomes, and the determinants of all-cause mortality. We hypothesised that this information would significantly differ by gender.

Methods

The MOHOPA Study Protocol has been published and is summarised as follows.[3]

Study design

The MOHOPA Study was a prospective, multi-centre longitudinal study conducted in seven tertiary-level hospitals, one in each of the six geopolitical zones and the Federal Capital Territory of Nigeria. Patients admitted to the medical and emergency wards of the seven study sites were consecutively recruited to join the study after obtaining written informed consent. Each patient was followed up for 12 weeks or until his/her demise or referral to another facility.

Ethical considerations

Informed consent was obtained from all recruited patients, and a consent form was signed. Ethical approval for the study was sought from the Ethics Research Committees of all the participating centres before the commencement of the study, with the following reference numbers: Aminu Kano Teaching Hospital (AKTH), Kano: NHREC/06/12/19/26, dated 21 October 2020; Delta State University Teaching Hospital (DELSUTH), Oghara: HREC/PAN/2023/006/0537, dated 19 April 2023; University of Nigeria Teaching Hospital (UNTH), Enugu: NHREC/05/01/2008B-FWA00002458-1RB00002323, dated 26 May 2023; University of Maiduguri Teaching Hospital (UMTH), Maiduguri: IRB-FWA 00013572 UMTH/REC/23/1158, dated 9 August 2023; Federal Teaching Hospital (FTH), Lokoja: FTHL/HREC/Vol.I/2023/180, dated 6 July 2023; University of Abuja Teaching Hospital (UATH), Gwagwalada, Abuja: UATH/HREC/PR/266, dated 20 July 2023; University of Ibadan (UI) & University

College Hospital (UCH), Ibadan: UI/EC/23/0331, dated 30 June 2023. The research conformed to the ethical guidelines of the Declaration of Helsinki, on the principles for medical research involving human subjects.[4]

Sample size estimation

The minimum sample size for the study was estimated at 584, using a two-sided significance level of 95%, a power of 80%, and assuming that one out of every three patients presenting to the medical emergency units of the hospitals was admitted. The sample size was estimated using the following formula for cohort studies:[5]

$$\text{Sample size } n = \frac{[DEFF * Np(1-p)]}{[(d^2/Z^{2(1-\alpha)^2} * (N-1) + p * (1-p))]}$$

Where N was the estimated number of patients (62,000) that presented to the seven study sites over ten months; p was the hypothesised frequency of admissions among patients that presented to the study sites (33.3%), which was based on reasonable expert estimation; d was the confidence limit (5%); DEFF was the design effect (1.0).

However, 705 patients were consecutively recruited into the study after satisfying the inclusion criteria.

Inclusion criteria

- I. Patients admitted to the participating centres' emergency units or medical wards for ≥ 3 hours.
- II. Patients who provided written informed consent.

Exclusion criteria

- I. Patients who could not have the relevant investigations to arrive at a working diagnosis with some degree of certainty.
- II. Patients who did not have a reliable contact phone number.
- III. Patients who refused written informed consent.

Study outcomes: These were all-cause mortality (in-hospital and at 12 weeks post-discharge) and rehospitalisation rate.

Data collection at enrolment

Consultant Physicians working at the study sites were invited to participate based on their track records as Investigators. Site Coordinators were nominated to ensure that the study was conducted according to the protocol. The Site Coordinator consulted his/her colleagues to nominate two Research Assistants who were Resident Doctors. The study protocol was provided to each participating centre to guide investigators to consistently complete the case report forms. The Site Coordinator and Research Assistants for each centre had at least three compulsory online training sessions on the study protocol, and data acquisition and entry into a secured mobile app database, before the commencement of the study.

At enrolment, the study was explained to the patients, who were then interviewed, clinically evaluated and recruited consecutively after meeting the inclusion criteria. A time period of at least three hours was allowed for each admitted patient to settle down and get stabilised before he/she was approached for recruitment into the study. Sex assigned at birth was used to define the patients' gender.

For each patient, demographic data, relevant aspects of history and physical signs, results of investigations, medications, co-morbid conditions, complications and outcomes were recorded in a detailed pretested questionnaire and then entered into an electronic database using a secured mobile app. It was monitored by the Principal Investigator and then subsequently cleaned of errors, and then analysed. Data quality control measures include range and consistency checks, and missing data handling at the point of entry.

Follow-up visits

Discharged patients were followed up at least three times at four-weekly intervals for 12 weeks after discharge, by telephone calls, to determine the study outcomes. Investigators were to first call the patient's phone number, and if unsuccessful, then those of his/her next of kin. We targeted more than 95% follow-up.

Definitions of research terms

Categories of diagnoses: These were decided by at least one Consultant Physician at the study sites, during the index admissions.

Primary diagnosis: This refers to the disease that had caused most of the patient's morbidity, leading to the index hospitalisation.

Co-morbidities: This refers to other important diseases that afflicted the patients and that needed treatment. Disease risk factors that did not need treatment were not listed as co-morbidities. Diseases were classified using the eleventh revision of the International Classification of Diseases (ICD-11).^[6]

Categories of diagnostic certainty: This was decided by at least one Consultant Physician.

Confirmed diagnosis: This refers to the diagnosis that was arrived at when all the most recent standard criteria set by an internationally recognised body of experts were satisfied. The bodies of experts considered were the WHO or its affiliates, or disease-specific internationally recognised Societies or Associations (e.g. European Society of Cardiology).

Highly likely diagnosis: This refers to the diagnosis that was arrived at when only a few of the most recent standard criteria set by an internationally recognised body of experts could not be satisfied, because of a lack (or non-affordability) of diagnostic facilities.

Probable diagnosis: This refers to the diagnosis that was arrived at when a majority of the most recent standard criteria set by an internationally recognised body of experts could not be satisfied, because of lack (or non-affordability) of diagnostic facilities, but a consultant in the relevant field strongly suspected the disease based on some clinical findings or experience.

Possible diagnosis: This refers to the diagnosis that was arrived at when the most recent standard criteria set by an internationally recognised body of experts could not be satisfied because of lack (or non-affordability) of diagnostic facilities, but a consultant in the relevant field strongly suspected the disease based on some clinical findings or experience.

Study locations:

MOHOPA Study was a prospective, multi-centre and longitudinal study in Nigeria. Patients admitted to the medical and emergency wards of the seven strategically located tertiary level hospitals (AKTH, UMTN, FTH Lokoja, UCH, UNTH, Ituku-Ozalla, DELSUTH, Oghara, and UATH), spread across the six geopolitical zones of Nigeria and Abuja, were recruited consecutively between May 2023 and March 2024, after obtaining written informed consent.

Data management and analysis

Continuous variables were explored for the presence of skewness. Proportions, medians (with 25th - 75th percentiles) and means (with standard deviations) were used to summarise patients' characteristics as appropriate. Chi-square, Student's t and Mann-Whitney tests were used to compare categorical and continuous variables, as appropriate. All-cause mortality (occurring from baseline profiling to end of follow-up), sub-analysed according to gender, was examined in all patients with complete follow-up via the Kaplan-Meier method followed by Cox-proportional hazard models (entry method with proportional hazards confirmed by visual inspection) to derive adjusted hazard ratios and 95% confidence intervals, with consideration of baseline demographic and clinical characteristics that achieved statistical significance when the deceased patients were compared with the survivors. The statistical analysis was carried out using SPSS version 30.0 software. Two-sided p-value <0.05 was considered the minimum statistical significance level.

Results

A total of 705 patients were recruited consecutively between May 2023 and March 2024, from the medical wards of the seven study sites. None of the patients was recruited from the Intensive or Coronary Care Units. Of the 705 patients, 390 (55.3%) were males and 315 (44.7%) were females, and their baseline characteristics are compared in Table 1. Male patients were older, had lower frequency of unemployment, better education, higher income and waist:hip ratio, lower body mass index, and higher frequencies of cigarette smoking and excess alcohol intake. The sex assigned at birth was similar to the self-reported gender of all the patients.

Table 1: Baseline characteristics

Variables	All patients n=705	Males n=390	Females n=315	p-value
Age, years	51.3±18.3	53.0±18.6	49.2±17.6	0.007*
Unemployment	138(19.6%)	36(9.2%)	102(32.4%)	<0.001*
Education				<0.001*
None/informal	143(20.3%)	61(15.6%)	82(26.0%)	
Primary	89(12.6%)	36(9.2%)	53(16.8%)	
Secondary	207(29.4%)	123(31.5%)	84(26.7%)	
Tertiary	266(37.7%)	170(43.6%)	96(30.5%)	
Cigarette smoking	58(8.2%)	57(14.6%)	1(0.3%)	<0.001*
Excess alcohol	110(15.6%)	102(26.2%)	8(2.5%)	<0.001*
Personal monthly income <\$25	208(29.5%)	70(18.0%)	138(43.8%)	<0.001*
Family monthly income <\$25	55(7.8%)	22(5.6%)	33(10.8%)	0.025*
BMI, Kg/m ²	25.2±5.7	24.7±4.8	25.8±6.6	0.011*
Waist:hip ratio	0.87±0.20	0.88±0.20	0.85±0.19	0.031*
HR/min	94±18	94±18	94±18	0.675
SBP, mmHg	128±31	129±31	126±30	0.291
DBP, mmHg	80±20	80±20	78±19	0.288

Key: Values were expressed as numbers with percentages in parentheses or mean±standard deviation.

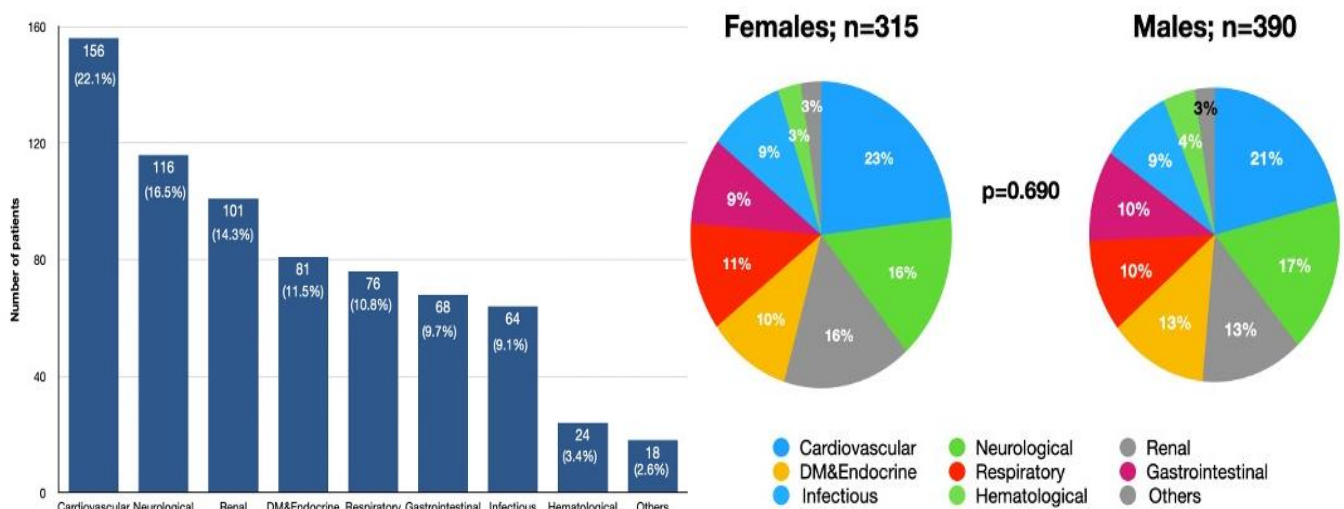


Figure 1: Pattern of primary diagnoses

a: Primary diagnoses in all patients

b: Primary diagnoses by gender

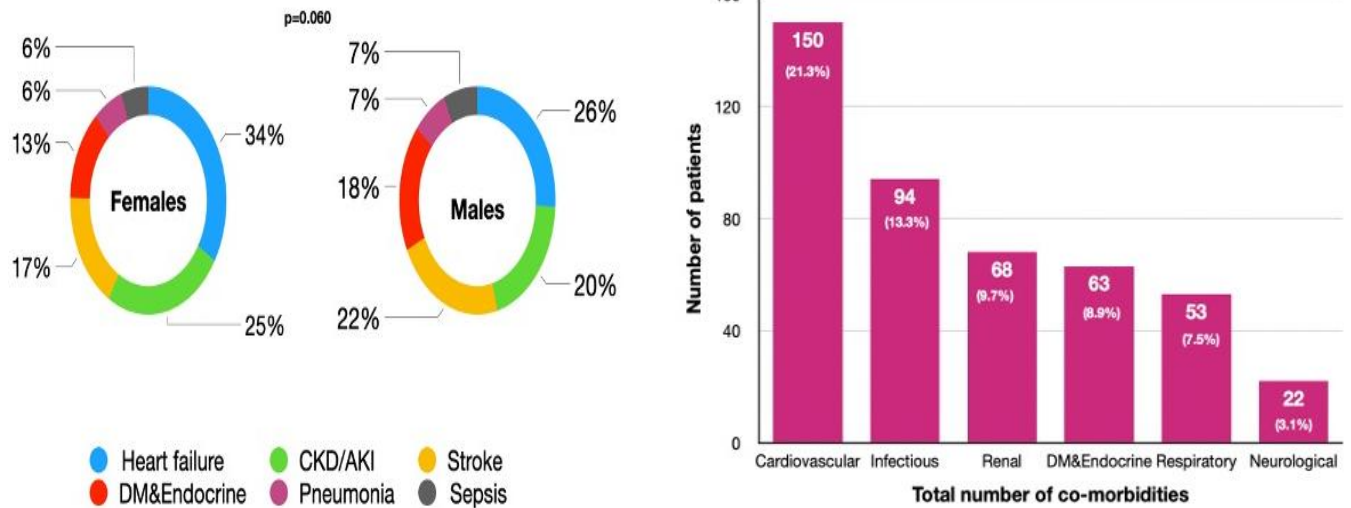


Fig 1c: The commonest specific primary diagnoses by gender Fig 2a: Pattern of co-morbidities

The patterns of primary diagnoses in all patients and in males and females, are shown in Figures 1a and 1b, while the specific primary diagnoses are shown in Figure 1c. The most common diagnoses in all patients were cardiovascular (CVD), followed by neurological and renal disorders, without significant gender differences. Heart failure (HF) was the commonest specific diagnosis in both genders, followed by stroke in males, and by acute and chronic kidney disease in females, but the overall pattern was similar in both groups ($p=0.060$).

At least one co-morbidity was found in 40.9% (288/705) of the patients, and the patterns in all patients and in both genders are shown in Figures 2a and 2b respectively. The commonest comorbidity was CVD, followed by infectious and renal disorders, without significant gender differences.

Diagnoses were confirmed in 520 (73.8%), highly likely in 166 (23.5%) and probable in 19 (2.7%) cases, with significant differences between the sites ($p<0.001$). In addition, there was no “possible diagnosis” at all the sites. Diagnostic facilities to confirm the diagnoses were available and affordable in 565 (80.1%), available but not affordable in 112(15.9%), available but not functional in 7(1.0%) and not available in 21(3.0%) cases, with significant differences between the sites ($p<0.001$).

Patients spent a median of 10 (6-17) days on the index admissions, without significant gender difference ($p= 0.965$). Patients were followed up for a median of 97 (53-104) days with a range of 1-228 days, and without gender difference ($p=0.200$). Eight patients (seven females and one male; $p=0.034$) were lost to follow-up after discharge. The in-hospital and post-discharge clinical outcomes are presented and compared by gender in Table 2. It shows that the in-hospital all-cause mortality and frequencies of discharges were similar in both genders, but more males than females were referred to other facilities. All cause rehospitalisations were higher in female than male patients at all time points. Overall, 26.4% (83/315) of females versus 19.0% (74/390) of males ($p=0.025$) were rehospitalised at least once during the study.

In-hospital all-cause deaths in all patients (13.5%) increased to 24.3%, 26.4% and 29.5% at the end of four, eight and twelve weeks of follow-up respectively (Table 2). These mortality rates were higher in males than females at all time points as shown in Figure 3 (log-rank $p=0.017$).

Table 2: Clinical outcomes in male and female patients

Outcomes	All patients n=705	Males n=390	Females n=315	p-value
In-hospital outcomes				
In-hospital all-cause deaths	95(13.5%)	55(14.1%)	40(12.7%)	0.587
Discharged	541(76.7%)	290(74.4%)	251(79.7%)	0.097
DAMA	45(6.4%)	27(6.9%)	18(5.7%)	0.511
Referred	24(3.4%)	18(4.6%)	6(1.9%)	0.049*
Post-discharge all-cause deaths				
At 4 weeks	171(24.3%)	107(27.4%)	64(20.3%)	0.028*
At 8 weeks	186(26.4%)	117(30.0%)	69(21.9%)	0.015*
At 12 weeks	208(29.5%)	130(33.3%)	78(24.8%)	0.013*
All-cause rehospitalisations				
At 4 weeks	63(8.9%)	31(8.0%)	32(10.2%)	0.306
At 4-8 weeks	51(7.2%)	26(6.7%)	25(7.9%)	0.518
At 8-12 weeks	43(6.1%)	17(4.4%)	26(8.3%)	0.032*

Key: * p-value statistically significant. Values were expressed as numbers with percentages in parentheses.

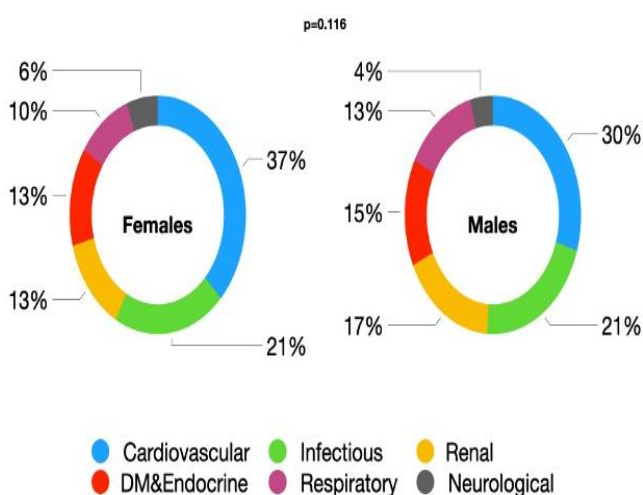


Fig 2b: Pattern of co-morbidities by gender female patients

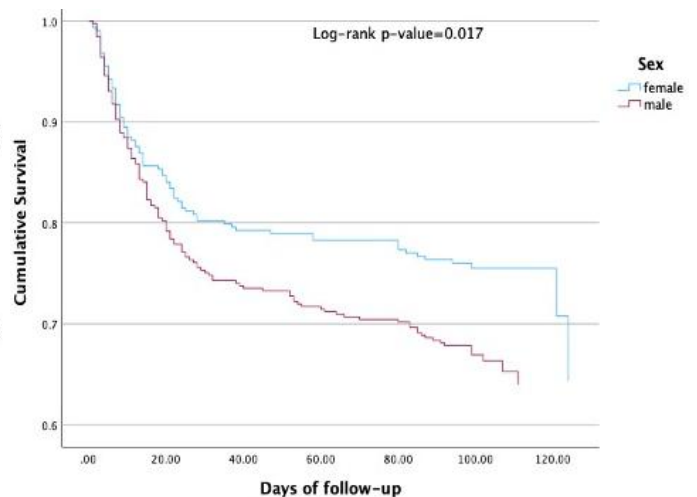


Fig3: Kaplan-Meier Survival Curves in male versus female patients

No. of patients at risk	20 days	40 days	60 days	80 days	100 days	120 days
Males	308	285	277	272	118	13
Females	264	248	245	242	113	16

Kaplan Meier curves for all-cause mortality among the hospitalised male versus female patients. Log rank (Mantel-Cox) p-value=0.017.

The clinical profiles of the deceased patients were compared with the survivors in Table 3. It shows that the deceased patients were older, had lower frequency of CVD and co-morbidities, and higher frequency of male gender, and neurological and gastrointestinal diseases. These variables were included in the Cox Proportional Hazard Regression model for all-cause mortality, shown in Table 4. It shows that an increase in age by one year, presence of a co-morbidity and CVD were associated with a 3%, 34% and 55% higher risks of all-cause mortality respectively, while gastrointestinal diseases were associated with a 49% lower risk of all-cause mortality, after controlling for confounding factors.

Table 3: Clinical profile of the deceased patients versus the survivors

Variables	Deceased (N=208; 29.5%)	Survivors (N=497; 70.5%)	P-value
Age, years	58.4±18.2	48.4±17.4	<0.001*
Males	130(62.5%)	260(52.3%)	0.013*
Systolic BP, mmHg	127±30	128±31	0.735
Diastolic BP, mmHg	79±20	80±20	0.368
Heart rate, bpm	93±13	95±17	0.306
Waist:hip ratio	0.87±0.19	0.87±0.20	0.729
Rural residency	36(17.3%)	65(13.1%)	0.144
Unemployment	38(18.3%)	100(20.1%)	0.572
Uneducated	45(21.6%)	93(18.7%)	0.372
Co-morbidity	72(34.6%)	216(43.5%)	0.029*
Personal monthly income \$25	55(26.4%)	153(30.8%)	0.249
Excess alcohol	40(19.2%)	70(14.1%)	0.086
Cigarette smoking	23(11.1%)	35(7.0%)	0.077
Rehospitalisation	41(19.7%)	81(16.3%)	0.275
CVD	31(14.9%)	125(25.2%)	0.003*
Neurological diseases	49(23.6%)	67(13.5%)	<0.001*
Renal diseases	28(13.5%)	73(7%)	0.672

Respiratory diseases	16(7.7%)	60(12.1%)	0.087
Gastrointestinal diseases	30(14.4%)	38(7.7%)	0.005*
Infectious diseases	23(11.1%)	41(8.3%)	0.237
Diabetes mellitus & other endocrine diseases	5(2.4%)	24(4.8%)	0.210

Key: BP, blood pressure; CVD, cardiovascular disease; * p-value statistically significant. Values were expressed as numbers with percentages in parentheses.

Table 4: Factors associated with all-cause mortality

Variables	Univariate analyses: HR (95% CI)	p-value	Multivariate analyses: HR (95% CI)	p-value
Age, years	1.03(1.02-1.03)	<0.001*	1.03(1.02-1.03)	<0.001*
Male sex	1.40(1.06-1.86)	0.018*	1.30(0.98-1.73)	0.070
CVD	1.72(1.18-2.52)	0.005*	1.55(1.03-2.33)	0.034*
Neurological diseases	0.58(0.42-0.80)	<0.001*	0.77(0.54-1.10)	0.149
Gastrointestinal diseases	0.57(0.39-0.84)	0.004*	0.51(0.34-0.77)	0.001*
Co-morbidities	1.40(1.06-1.87)	0.02*	1.34(1.00-1.79)	0.050

Key: CVD, cardiovascular disease; CI, confidence interval; HR, Hazard Ratio; * p-value statistically significant. Values were expressed as hazard ratios with 95% confidence intervals in parentheses.

Discussion

In the MOHOPA Study, we have reported, perhaps for the first time, a detailed assessment of the patterns of morbidity and the short-term clinical outcomes, of patients admitted to Nigeria’s tertiary referral hospitals. Our results showed that CVD was the most common primary indication for admission, followed by neurological, renal, diabetes mellitus and other endocrine, respiratory, gastrointestinal, infectious and haematological disorders, without significant gender difference. Co-morbidities were common, and again dominated by CVD in both genders. In-hospital mortality rate and other short-term clinical outcomes were high in both genders. The all-cause mortality rate was however higher in males and majorly determined by CVD, while the rehospitalisation rate was higher in females.

The morbidity pattern, majorly dominated by CVD, neurological and other NCDs, appears to be a reflection of the epidemiological transition affecting persons above the age of 50 years in Nigeria and the African region, as described by the WHO.[2] Our findings therefore support the hypothesis that disease pattern in hospitals is a reflection of the ailments in the general population. However, infectious diseases are still important, being primarily responsible for 9.1% of admissions, and 13.3% of the burden of co-morbidities. Although 76.7% of the admitted patients improved clinically and were discharged, in-hospital and post-discharge clinical outcomes were high in both genders. In-hospital all-cause mortality rate was 13.5% within a median of 10 days, without a significant gender difference. Similar studies across Africa have reported varied morbidity and short-term mortality patterns.[7-9] In the African Critical Illness Outcomes Study (ACIOS), 19872 patients from 180 hospitals in 22 African countries

were consecutively recruited within three months.[7] Patients were described as critically ill, if at least one vital sign was severely deranged. The all-cause in-hospital mortality rate at 7 days of admission was 4.9%; substantially higher among the critically ill (20.7%) than among those who were more clinically stable (2.7%). In another prospective study, the in-hospital mortality among patients admitted to a tertiary-level hospital in Uganda, of whom 42.5% were males, was 6.2%.[8] The commonest indications for admission were infectious diseases, and only 7.0% and 5.5% had HF and stroke respectively. In a retrospective study of 5564 patients admitted to an Ethiopian teaching hospital, the commonest causes of admission were CVD, infectious and respiratory diseases.[9] The overall in-hospital mortality rate was 12.8%, which was significantly influenced by weekend admission.

In MOHOPA study, all-cause mortality rate increased rapidly in all patients to 24.3% within four weeks and 29.5% within twelve weeks, and was consistently worse in males (33.3%) than in females (24.8%) at twelve weeks, as illustrated by the Kaplan-Meier survival curves. The all-cause mortality rate was independently increased by a 3% unit increase in age, CVD by 55%, and most likely by the presence of co-morbidities ($p=0.050$). Gastrointestinal disorders were however associated with 49% lower risk of all-cause mortality. Our findings are consistent with the WHO report, which stated that 19.8 million people died from CVD in 2022, representing approximately 32% of all global deaths.[10] Of the CVD deaths, 85% were due to heart attacks and stroke, and over three-quarters take place in low- and middle-income countries like Nigeria. Most CVD can however be prevented by addressing behavioural and environmental risk factors such as tobacco use, unhealthy diet (including excess salt, sugar, and fats) and obesity, physical inactivity, harmful use of alcohol and air pollution.[10] It is therefore important to detect CVD as early as possible, especially in low-income countries, so that appropriate management can begin to avoid complications. Teaching hospitals in Nigeria are referral centres and therefore receive the most advanced medical cases, often after long delays in commencing specific treatments, and frequently at the tail end of the diseases' natural histories, contributing to the poor clinical outcomes. However, measures to improve the care for CVD patients in our hospitals, including the provision and upgrading of facilities for both interventional and noninterventional cardiovascular services, should be a priority policy for the government.

Rehospitalisation rate is an important index because it defines the quality of healthcare services and is costly. Overall, 26.4% of females and 19.0% of males were rehospitalised at least once during the MOHOPA study. The rehospitalisation rates were higher in the first four weeks after discharge (8.9% for all patients; 10.2% in females versus 8.0% in males) than at eight (7.2% for all patients) and twelve weeks (6.1% for all patients), but were not associated with all-cause mortality. The higher rehospitalisation rate in females in the present study is of particular concern because nearly one-third of them were unemployed and nearly 44% of them earned <\$25 monthly. The total hospital costs for rehospitalisations within 30 days of hospital discharge in the United States were estimated at \$44 billion per year.[11] It was demonstrated that 19.6% of Medicare beneficiaries in the United States were readmitted to the hospital within 30 days of discharge, and 34.0% were readmitted within 90 days.[12] Medical patients were more readmitted than surgical patients (21.1% vs. 15.6%) at 30 days, and the highest rates were observed for patients with HF (26.9%), than psychoses (24.6%), recent vascular surgery (23.9%), chronic obstructive pulmonary disease (22.6%), and pneumonia (20.1%).[12] Therefore, the rehospitalisation rates in the United States are considerably higher than ours most likely because of better patients' affordability and access to care.

Our seven study sites were strategically chosen from the six geopolitical zones and the Federal Capital Territory (Abuja) of Nigeria, to ensure representativeness of the diverse socio-cultural population of the country. We consecutively recruited at least 100 patients from each site, and achieved gender balance. However, our results should be cautiously interpreted given the fact that we sampled only 705 patients from the seven study sites, while Nigeria has 33 teaching and several other hospitals serving a population of more than 220 million.[1] Still, our results have provided for the first time, comprehensive information on the morbidity and short-term clinical outcomes of patients admitted to our teaching hospitals, which would be useful in policy formulation and advancement in the care being provided.

Our investigators could confirm the diagnoses while applying standard international criteria in 73.8% of the cases, and a further 23.5% of the diagnoses were adjudged to be highly likely, as defined using our innovative criteria. Contrary to the general belief, diagnostic facilities to confirm the diagnoses were almost always available (in 96% of cases), although not always affordable (in 15.9% of cases), at our Teaching Hospitals. The fact that only 3.4% of the cases were referred for further treatment affirms that treatment modalities for the diagnosed diseases were available at the sites. These findings imply that our Teaching Hospitals have the capacity to handle almost all the medical cases referred to them, albeit challenged by patients' affordability. This is particularly relevant because 29.5% of the patients, who were disproportionately females (43.8% versus 18.0%), earned below \$25 monthly at the time of recruitment. Our findings therefore suggest that the menace of medical tourism in Nigeria, which negatively impacts the country's national socio-economic development, may not be blamed on lack of diagnostic or therapeutic facilities, but perhaps on lack of awareness of availability of the services at the teaching hospitals or even patriotism. Importantly, healthcare financing needs to be critically addressed by the government and communities, to especially support indigent patients.

The present study has limitations as previously described.[3] Firstly, the seasonality of disease patterns was not taken into consideration during recruitment of patients, which might influence our results. Seasonality, which refers to the tendency of certain diseases to occur more frequently during specific times of the year, is often linked to environmental factors, host behaviour, or a combination of both. Secondly, in view of our study objectives, the follow up period was deliberately short. Hence, the long-term outcomes or complications of the various diseases are beyond the scope of the MOHOPA study. Thirdly, we used a DEFF of 1.0 in our sample size estimation, which we acknowledge is a simplification that might have resulted in our modest sample size. DEFF measures the statistical inefficiency of complex sampling methods relative to a simple random sampling of the same size. It simply quantifies the loss of efficiency in a complex sampling design compared to simple random sampling. We used a DEFF of 1.0 because we assumed that our study design is as efficient as simple random sampling. DEFF <1.0 is used if the study design is considered more efficient than simple random sampling (for example with effective stratification) while DEFF >1.0 implies that the sampling method is less efficient than SRS.[13] We excluded patients who did not have a reliable contact phone number, so as to maximise the follow-up rate, but these patients were in reality very few and unlikely to significantly introduce selection bias. Under coverage bias could occur if some study participants are inadequately represented in the sample, but this was deliberately avoided in MOHOPA study by the regional spread of our study sites. Finally, it is pertinent to observe that some NCDs have a primary infectious aetiology, making it difficult to distinctly classify some diseases into a specific group. Examples of these diseases include rheumatic heart disease, chronic liver disease and chronic kidney disease. In MOHOPA study however, we used the International Classification of Diseases (ICD-11), which is the global standard for recording health information and causes of death.[6]

Conclusion

We have reported, perhaps for the first time, detailed insights into the patterns of morbidity and the short-term clinical outcomes, of patients admitted to Nigeria's tertiary referral hospitals. CVD was the most common primary indication for admission, followed by neurological and renal diseases, without significant gender bias. Co-morbidities were common, and again dominated by CVD in both genders. In-hospital mortality rate and other short-term clinical outcomes were high in both genders. All-cause mortality rate was however higher in males while rehospitalisation rate was higher in females. Individuals with increased age, admitted for CVD and with a co-morbidity were at higher risk of all-cause mortality, while those admitted with a gastrointestinal condition were at lower risk of all-cause mortality, during the twelve weeks of follow-up. This information is vital for strategic planning and policy formulation.

References

1. Federal Ministry of Health & Social Welfare, Federal Republic of Nigeria: Teaching Hospitals. <https://health.gov.ng/teaching-hospitals/> (Accessed on 15 October 2025).
2. World Health Organisation 2025 data.who.int, Nigeria [Country overview]. (Accessed on 15 October 2025)
3. Karaye KM, Umuerrri EM, Onwuekwe I, Daiyab AM, Sani RN, Anjorin C, et al, on behalf of the MOHOPA Study Investigators. Pattern of morbidities, mortality and healthcare financing of hospitalised medical patients in hospitals (MOHOPA): the study protocol. *West Afr J Med* 2025; 42(6): 430-442.
4. World Medical Association Declaration of Helsinki, Ethical Principles for Medical Research Involving Human Subjects. *J Postgrad Med* 2002; 48: 206-208
5. Schaeffer RL, Mendenhall W, Ott L. *Elementary Survey Sampling*, Fourth Edition. Duxbury Press, Belmont, California 1990.
6. International Classification of Diseases Eleventh Revision (ICD-11). Geneva: World Health Organization; 2022. License: CC BY-ND 3.0 IGO.
7. African Critical Illness Outcomes Study (ACIOS) Investigators. The African Critical Illness Outcomes Study (ACIOS): a point prevalence study of critical illness in 22 nations in Africa. *Lancet* 2025; 405(10480): 715-724. doi: 10.1016/S0140-6736(24)02846-0.
8. Wasingya-Kasereka L, Nakitende I, Nabiryo J, Namujwiga T, Kellett J; Kitovu Hospital Study Group. Presenting symptoms, diagnoses and in-hospital mortality in a low resource hospital environment. *QJM* 2021; 114(1): 25-31. doi: 10.1093/qjmed/hcaa169.
9. Arega B, Solela G, Tewabe E, Agunie A, Zeleke A, Tefera E, et al. Weekends admitted adult medical patients have higher in-hospital mortality in Ethiopia: An implication for quality improvement. *PLoS One* 2024; 19(10): e0312538. doi: 10.1371/journal.pone.0312538.
10. World Health Organisation: cardiovascular diseases (CVDs). [https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-\(cvds\)](https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)) (Accessed on 31 October 2025).
11. Jencks SF. Defragmenting care. *Ann Intern Med* 2010; 153: 757-758.
12. Joynt KE, Jha AK. Thirty-day readmissions-truth and consequences. *N Engl J Med* 2012; 366:1366–1369.
13. What is Design Effect in Sampling and Why It Matters? <https://hospitality.institute/mha903/design-effect-sampling-why-it-matters/> [accessed on 13 December 2025]