



# **Systemic Disease Comorbidities among Ophthalmic Patients in Nigeria: Implications for Preventive Ophthalmology**

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## **Authors' contributions**

*This work was carried out in collaboration between both authors. Author CIO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author PECN managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

**Background/Aim:** Quite often patients who are refracted in our clinics have other ocular or systemic conditions that may affect the result or delay the issuance of spectacle corrections – for instance poorly controlled diabetic patients may have to wait for months to achieve better control of their condition. These associated comorbidities may require medical or surgical intervention before spectacles are ordered. The aim of this study is to determine the systemic comorbidities that exist in ophthalmic patients attending the Nigerian National Petroleum Corporation (NNPC) Eye Clinic in Port Harcourt, Nigeria.

**Methodology:** This was a descriptive cross-sectional study in which adult patients who presented in the clinic for change of glasses within the stipulated period of the study were included. They were interviewed to get the relevant information and the data retrieved for each patient included baseline information such as age, gender, unaided visual acuity, visual acuity with their last correction if any as well as co-existing ocular or systemic pathology. The collected data was subsequently analysed using Predictive Analysis Software version 20.

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**Results:** Sixty patients participated in study; both males and females were equally represented. Of this this number, thirty-three patients (55%) had systemic comorbidities .Hypertension was present in 43.3% (n=26) while both hypertension and diabetes mellitus occurred in 10% (n=6) of the participants. Forty percent of those with refractive error had hypertension while about 30% of those with glaucoma were both hypertensive and diabetic.

**Conclusion:** There is a very high level of systemic comorbidities in adult patients attending this peripheral clinic, and this is a pointer to the high prevalence of these conditions in the larger population.

*Keywords: Ophthalmic patients; preventive ophthalmology; systemic comorbidities.*

## 1. INTRODUCTION

The problem of poor results to standard treatment regimens that medical practitioners often see in patient management may continue to be poorly understood until we are certain that our patients have 100% compliance to therapy. In most parts of the world including Nigeria the benefits of early diagnosis and proper treatment of a variety of disorders is well documented – for instance, poor compliance when there is high motivation is usually due to high cost of drugs. In some resource-poor settings where a large percentage of the population earns less than one US dollar a day, patients may find it convenient to live in denial of health conditions especially when they believe it to be stigmatizing to them or their family whether they are simple things such as use of medicated glasses, being a known hypertensive or at the other end of the spectrum - a family history of blindness. This study was carried out at the NNPC Medical Centre in Port Harcourt, which offers free medical care to serving and retired company staff, their spouses and children up to the age of twenty years. Since treatment is free, it has large patronage and comorbidities are all attended to in the relevant out-patient clinics. A diagnosis of hypertension by this medical out-patient clinic is based on three separate recordings of an elevated blood pressure greater than 140/90 mmHg and confirmed with a manual sphygmomanometer. The criteria for diagnosis of diabetes mellitus are- an elevated fasting blood sugar above 7.0 mmol /L, a 2 hours post-prandial blood sugar greater than 11mmol/L and a glycated haemoglobin greater than 7%.

## 2. METHODOLOGY

A descriptive cross-sectional study was used. The formula for cross-sectional study was employed in determining the minimum sample size of this study [1]. Based on the 95% confidence level ( $z\alpha = 1.96$ ), prevalence of

systemic disease co-morbidity of 22% ( $p=0.22\%$ ) from a study involving glaucoma patients [2]. error limit of 0.12 and a non-response rate of 80%, a minimum sample size of 58 was obtained, which was rounded off to 60.

A structured proforma comprising of variables on age, sex, visual acuity, intra-ocular pressure and cup-disc ratio was used for data collection which was interviewer-administered. Data collected was put into an Excel spread sheet for data checks and cleaning. Cleaned data were analysed using Predictive Analytics Software 20.0. Independent t- test was used to compare differences between means. Pearson's Chi square and Fisher's exact tests were used as appropriate to determine the relationship between demographic characteristics (age and sex) and refractive error at a 0.05 alpha level.

## 3. RESULTS

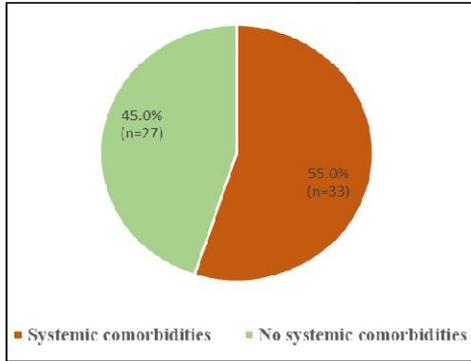
### 3.1 Age and Gender Distribution of Study Participants

Sixty patients took part in the study. The mean age of respondents was 54 years $\pm$  (SD=9) with age categories ranging from 31-40 years to 71-80 years. Fifty five percent of participants were found to have systemic comorbidities - out of these, 43% were hypertensive,10% were both hypertension and diabetic and 1.7% were asthmatic (Table 1). Most of the patients were in the 51 to 60 year age group, followed by the 41 to 50-year age group. There was a significantly higher number (70%) of females in the 51-60 years age group. The relationship between age and gender was statistically significant ( $p=0.003$ ).

### 3.2 Systemic Comorbidities

Fig. 1 shows that 55% (n=33) of the patients had systemic comorbidities while Fig. 2 shows the distribution of systemic comorbidities in the patients. Hypertension was present in 43.3%

(n=26) while both hypertension and diabetes mellitus occurred in 10% (n=6) and asthma was present in 1.7% (n=1).



**Fig. 1. Prevalence of systemic comorbidities among patients with refractive error**

### 3.3 Prevalence of Systemic Comorbidities across Ophthalmic Diagnosis

Table 2 shows the prevalence of systemic comorbidities across ophthalmic diagnosis – 40% of those with refractive error had hypertension while about 30% of those with glaucoma were both hypertensive and diabetic

Table 3 shows that the mean age of those with systemic comorbidities is 56.7 years in males and 53.3 years in females.

## 4. DISCUSSION

Studies have shown that a person's overall health should be seen as a whole in order to address the management of individuals with multiple coexisting diseases [3], as up to 80% of Med-care spending in some countries is devoted to patients with four or more chronic conditions, with costs increasing exponentially as the number of disorders increase [4]. This realization is responsible for the growing interest of medical practitioners and researchers with respect of the impact of comorbidity on a range of outcomes, such as mortality, health-related quality of life, and quality of provided health care.

Attempts to study the impact of comorbidity are complicated by the lack of consensus about how to define and measure the concept since [5,6] related terms such as multi-morbidity, burden of disease and frailty are often used interchangeably. There is an emerging consensus that internationally accepted

definitions are needed to move the study of this topic forward.

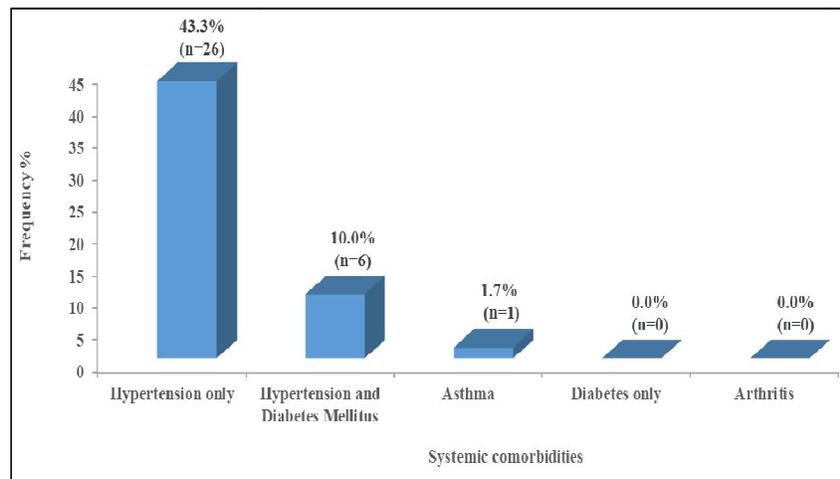
The proportion of older people in the world population is expected to increase rapidly during the upcoming decades. A proper distinction between concepts of multi-morbidity is important because it can be very difficult to separate the complications of an index disease under study from comorbidity [7]. Also, coexistence of several ocular diseases is more frequent than suspected. In spite of the refractive errors, one or more of the following can be detected simultaneously: glaucoma, cataracts, uveitis, age-related macular degeneration and dry eyes. Indeed as people age, ocular comorbidities are much more frequently seen. Specific diseases are openly acknowledged to affect the eyes and vision, such as diabetes mellitus, high blood pressure, arthritis, hyperthyroidism, neurodegenerative disorders, hematologic malignancies, and/or systemic infections. Recent advances in early diagnosis and therapy of the ophthalmic pathologies have reinforced patient options to prevent visual impairment and blindness. For this reason, it is important not to overlook sight-threatening conditions such as the ocular comorbidities and/or the eye involvement in the context of systemic disorders. Moreover, multidisciplinary cooperation improves and sustains management of patients affected with eclectic ocular comorbidities and/or systemic disorders with ocular involvement [8,9]. When a patient has more than one chronic condition, the conditions may interact such that the patient's healthcare costs are greater than the sum of the costs for the individual diseases [10].

Our results show that 55% of the adult patients who were refracted during the study period had systemic comorbidities of which hypertension alone accounted for 43.3% and hypertension and diabetes were present in 10% (Fig. 2). Only 1.7% were asthmatic. Hypertension [11,12] is the strongest modifiable risk factor for a number of cardiovascular diseases. Ilesanmi, et al. in a cross-sectional survey of 250 hypertensive patients from Ilesa discovered a mean age of 61±11.2 years but we did not find any reports of studies done or observed systemic comorbidities occurring in ophthalmic patients in literature for comparison. Hence this pilot study is of public health importance as it reveals the heavy burden of systemic comorbidities that many ophthalmic patients have in Nigeria. It will also serve as a reference point for comparison with future studies in Nigeria and the diaspora.

**Table 1. Age and gender distribution of study participants**

Age	Gender		Total n (%)
	Male n (%)	Female n (%)	
31 – 40 years	3 (10.0)	0 (0.0)	3 (5.0)
41 – 50 years	12 (40.0)	5 (16.7)	17 (28.3)
51 – 60 years	8 (26.7)	21 (70.0)	29 (48.3)
61 – 70 years	5 (16.7)	1 (3.3)	6 (10.0)
71 – 80 years	2 (6.7)	3 (10.0)	5 (8.3)
<b>Total</b>	<b>30 (100.0)</b>	<b>30 (100.0)</b>	<b>60 (100.0)</b>

Fisher's Exact=14.017; p-value=0.003



**Fig. 2. Distribution of systemic comorbidities in ophthalmic patients in the study**

**Table 2. Prevalence of systemic comorbidities across ophthalmic diagnosis**

Ophthalmic diagnosis	N	Prevalence of systemic comorbidities	
		Hypertension only n (%)	Hypertension and diabetes n (%)
Maculopathy	1	1 (100.0)	0 (0.0)
Cataract	3	3 (75.0)	1 (25.0)
Glaucoma suspect	3	1 (33.3)	0 (0.0)
Glaucoma	7	3 (42.9)	2 (28.6)
Refractive error	45	18 (40.0)	3 (6.7)

**Table 3. Relationship between age and gender with systemic comorbidities**

Variables	Systemic comorbidities		Test	p-value
	Present	Absent		
<b>Age</b>				
Mean age (±SD) in years	56.0 (±10.3)	52.2 (±7.7)	1.592*	0.117
<b>Sex</b>				
Male n (%)	17 (56.7)	13 (43.3)	0.067**	0.795
Female n (%)	16 (53.3)	14 (46.7)		

SD – Standard deviation; \*Independent t-test; \*\*Chi square test

More than half 167 (66.8%) of these hypertensive patients from Ilesa were 60 years and above and all of them paid out of pocket for their treatment [13]. Many of the patients were traders 142 (56.8%) with a mean household income of (\$95.3±\$19.6).The mean total cost of

treatment was (\$9.6±3.7), the mean proportion of the household income spent on treatment was 11.1%±4.2%. So 132 (52.8%) spent greater than 10% of their total household income on treatment .Less than half (47.6%) were persistent with prescribed drugs and appointments. As a result,

successful BP control was recorded in only 33.6% of them. With poor control, the complications of hypertension, both ocular and systemic cannot be prevented. These patients from Ilesa can be regarded as representative of the larger hypertensive population in Nigeria. They are poor, largely undiagnosed, unable to afford regular treatment and are approaching epidemic proportions.

Diabetes mellitus is a chronic, debilitating and costly disease arising from chronic hyperglycaemia. The chronic hyperglycaemia damages almost all cell types in the body. Diabetes is associated with severe complications, poses severe risks to families and seriously challenges achievement of internationally agreed developmental goals, (the Millennium Developmental Goals). The incidence of diabetes mellitus (DM), especially type 2 DM is rapidly growing. Roglic, et al. and IDF [14,15]. In 1985, about 30 million people were estimated to be suffering from the disease and by the end of 2006, the number had increased to 230 million (approximately 6% of world population). Of this number, 80% are in the developing world. By 2011, the International Diabetes Federation (IDF) estimated that 366 million adults aged 20-79 years out of the world's 7 billion population had DM. The annual cost of managing Diabetes in Africa is about 137 U.S. dollars which constitutes about 10% of the income of most of the patients [16].

Despite the rising global prevalence of DM, the proportion of cases presenting to health facilities with classical symptoms of polyuria, polydipsia, polyphagia and weight loss is small, compared to the prevalence of asymptomatic or undiagnosed DM. Most Governments of African countries do not recognize the catastrophic potential of the diabetes epidemic and time may be running out for Africa. Akin to HIV/AIDS, by the time Governments wake up, the epidemic may have overwhelmed the continents already meagre resources, resulting in avoidable death of millions of Africans. For long, Africa was considered safe from many of the "so-called diseases of affluence" plaguing the Western World, especially diabetes mellitus (DM). Indeed, medical statistics from 1959 to the mid-1980s showed the prevalence rate for DM in Africa to be  $\leq 1.4\%$  except in South Africa where the DM estimate was as high as 3.6% in 2001 [16,17]. From the 1990s to date, the virtually static low prevalence rates appear to have changed drastically. By 1994, the continent wise

prevalence of DM stood at 3 million, with this figure predicted to double or triple by the year 2010. Approximately 7.1 million Africans by the year 2000 were reported to be suffering from DM with the figure expected to rise further to 18.6 million by 2030.

The diabetes epidemic is an evolving phenomenon in Nigeria and sub-Saharan Africa. Most African Governments need to reverse the current trend where DM occupies very low priority in their national health care agenda. Diabetes must compete for political attention and financial involvement. Information on the detailed cost of diabetes care (direct, indirect and total costs) in Nigeria and other developing nations needs to be evaluated and documented, such that policy makers and policy drivers will appreciate the need to focus on introducing early, cost effective interventions for both primary and secondary prevention. The Diabetic association of Nigeria (DAN) [16] has already started a training curriculum for health workers since November 2013.

Diabetes programmes must be integrated and evidence based, highlighting the scale of the problem and areas for effective intervention. This will help trigger shifts in current public health priorities and augment comprehensive efforts from multiple stakeholders – countries, international organizations, academic institutions, civil society and the private sector – in combating the still evolving diabetes epidemic.

## **5. CONCLUSION AND RECOMMENDATIONS**

There is a high level of systemic comorbidity in ophthalmic patients, mostly hypertension but more recently diabetes. We do not have adequate prevention of hypertension programmes in place, so piggy backing with existing prevention of diabetes programmes will be beneficial and of public health significance.

The following was advocated by DAN [18] to reverse the increasing prevalence of diabetes in Nigeria:

1. A National survey every 5 years to determine the burden and pattern of diabetes. Hypertension should be included.
2. Diabetes health education in primary and secondary schools (with emphasis on nutrition, exercise, and healthy lifestyle).

3. National plan for a healthy diet, avoiding smoking and excess alcohol.
4. Checking of blood glucose yearly from age 30 years.
5. Checking blood pressure yearly from age 25 years.
6. Checking serum cholesterol profile yearly from 35 years.
7. Eye examination every 5 years.
8. Compulsory and free primary education nationally.
9. An increase of health insurance coverage from the current less than 5%, to 50% in the next 5 years including
  - a. Universal and free primary healthcare for all Nigerians, provided by Local Governments. This would fulfil the recommended care in the IDF(International Diabetic Federation) Clinical Guideline 2012.21
  - b. Free Secondary Health Care, provided by State Governments. This is also in line with the care recommended by IDF Guidelines of 2012.21
  - c. Tertiary healthcare covered by a National Health Insurance Scheme (NHIS), provided by the Federal Government of Nigeria, and consistent with the comprehensive care stated in the IDF Guidelines.21
10. Making health and physical education a compulsory and practical course at primary and secondary school level.

## 6. LIMITATION OF THE STUDY

This paper is based on preliminary dataset. Readers are requested to consider this paper as a preliminary research article .The authors are aware that a bigger sample size is required to get a scientifically established interpretation. Readers are requested to use the conclusion of this paper judiciously as the sample size is small. Authors also recommend a bigger sample size for similar future studies.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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