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Research article

The burden of cardiovascular risk factors in hypertensive patients with other co-morbid chronic disease conditions at a teaching hospital in north-east Nigeria

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Key words: Cardiovascular disease, Cardiovascular risk factors, Chronic diseases, Hypertension, Co-morbid diseases

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Abstract

Background: Unidentified or untreated risk factors affect quality of life and cause other negative health outcomes in chronic diseases. **Objectives**: The objective was to identify the burden of both modifiable and non-modifiable risk factors. **Methods**: The cross-sectional observational and prospective study involved a scientific sampling of patients with chronic illness. The most recent laboratory data were retrieved from patients' case notes during each clinic visit. **Results:** About 56.7% patients had co-morbid diseases. Family histories of co-morbid diseases are highest in hypertension/stroke (16.8%) and lowest in Hypertension /Congestive heart failure (CHF) (2.1%). Incidences of HTN/CHF and HTN/Diabetes are equal (15.3% each) while HTN/Stroke (8.2%), HTN/Angina (1.1%), HTN/chronic Kidney disease (2.2%) and HTN/arrhythmias (2.2%) were identified. The fasting blood glucose levels were in diabetic range in 20.5% patients but in impaired range in 22.0%. BMI are in overweight (25.4%), obesity (18.5%) and underweight (13.5%) ranges. The BP is not controlled in 55.8% and 1.87% patients have isolated systolic BP. The lipid profiles were high in LDL-cholesterol 9 (10.1%) and Triglycerides 78 (29.0%) but low HDL-cholesterol occurred in 15 (17.0%) cases. The total risk factors ranges from one 5 (1.8%) to nine 4 (1.4%). In 44.4% risk factors are up to three and 55.6% had above three risk factors. **Conclusion:** Multiple cardiovascular risk factors and co-morbid diseases were present. Modifiable risk factors like BP, blood glucose and cholesterol are not within controlled range in many patients. Risk factors associated with tobacco and alcohol use were low while that of physical inactivity was high. Many patients with high burden of risk factors require monitoring, counseling and education.

Introduction

Chronic non-communicable diseases are common worldwide and may include hypertension, diabetes mellitus, congestive heart failure, arrhythmias, angina, dyslipidaemia, and obesity and so on. They are considered chronic when they lasted or persisted beyond three months and usually emerged in middle aged individuals after long exposure to unhealthy lifestyle activities.

Most chronic diseases have their link with several risk factors, some of which are modifiable while others are not. Numerous risk factors and markers for the development of chronic diseases are known. For instance, in hypertension and several other heart or vascular diseases, risk factors like age, race/ethnicity, family history of hypertension and genetic factors, low level of education and socioeconomic status, greater weight, physical inactivity, tobacco use, psychosocial stressors, sleep apnea, and dietary factors (such as dietary fats, higher sodium intake, lower potassium intake, and excessive alcohol intake) have been reported [1].

An ideal cardiovascular health is one without medicines use as well as been non-smoker and performing moderate physical activity of equal or greater than 150 min/week or vigorous physical activity of equal or greater than 75 min/week alongside with body mass index of less than 25 kg/m^2 with healthy diet pattern, total cholesterol of less than 200 mg/dL, systolic blood pressure of less than 120mmHg/diastolic blood pressure of less than 80 mmHg, and a fasting glucose concentration of less than 100 mg/dL. However, better cardiovascular health has been defined as one in which the cardiovascular health is associated with less incident heart failure, less subclinical vascular disease, better global cognitive performance and cognitive function, lower prevalence and incidence of depressive symptoms, and lower loss of physical functional status [2-9].

Smoking is associated with nearly ten percent of all cardiovascular diseases and tobacco smoking was the second-leading risk factor for death in the United States,

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after dietary risks in 2010. Smoking during pregnancy resulted in several hundred of infant deaths annually [10-11].

High blood pressure is one of the major risk factors for several other conditions like stroke, myocardial infarction, heart failure, aneurysms of the arteries, peripheral artery disease. The risk of ischemic stroke and recurrent stroke is directly related to increase in blood pressure (BP) and medications that directly brings down the blood pressure will also reduce the risk of recurrent stroke after stroke or TIA. Furthermore, moderate blood pressure elevation can be associated with shortened life expectancy [12].

Cardiovascular disease also account for high proportion of all mortality in people with other co-morbid conditions like diabetes where the risk of cardiovascular events may be 2 to 3 times higher in people with type 1 or 2 DM, which is reported disproportionately higher in women [13]. It is reported that conditions like diabetes in patients who have experienced cardiovascular events have poorer prognosis compared with people without such chronic conditions. Diabetes also has two-fold increase in the risk of stroke [13]. Diabetes Mellitus is associated with a substantially increased risk for first ischemic stroke. Diabetes often co-exists with other co-morbid conditions like obesity, dyslipidemia, hypertension and hyperuricemia and can predispose to atherosclerotic disease while High blood cholesterol increases the risk of heart disease and stroke. The identifications of risk factors for cardiovascular events in patients with non-communicable chronic diseases are incidental towards the institution of preventive measures that will improve patient's wellness or quality of life.

Aim and objectives

The study was aimed at identifying the burden of both modifiable and non-modifiable cardiovascular risk factors in patients with chronic diseases; and to identify the burden of co-morbid disease conditions among patients.

Materials and method

The cross-sectional an prospective study was conducted at the cardiology, neurology and nephrology clinics of University of Maiduguri Teaching Hospital, north-East, Nigeria; which lies on latitude 11^5 N and longitude 13^5 E. Ethical clearance and informed consents were obtained from the hospital management and from all the patients respectively. A total of 268 patients who met the criteria of chronic illness were randomly selected. The results of the most recent laboratory information ordered for patients during their clinic visits was retrieved from patients case notes that were written during each visit in addition to information on their demographic data. A 16-item validated questionnaire that was self-administered was used to obtained information not already mentioned in their case note.

Results

The mean age of the study group was 44.6 ± 11.4 years with predominant cases 88 (32.8%) occurring in those of 40-49 years age band while those in the age band of 70-79 years recorded the least 3(1.1%). The gender distribution showed a mean age and standard deviation of 53.3 ± 10.2 years for the males as opposed to that of the women who are 43.0 ± 11.9 years (Table 1). The ratio of female to male was 1.85. Family history of co-morbid diseases was highest in HTN with stroke 45 (16.8%) and lowest with HTN/CHF (2.1%). The proportions of patients having other family histories are HTN 32 (11.9%), diabetes 23 (8.6%), and HTN/Diabetes 27 (10.0%). About 115 (42.9%) are uneducated while the rest have varying levels of education ranging from primary 26 (9.7%), secondary 58 (21.6%) and tertiary 69 (25.8%). High proportions 239 (89.2%) were married while the rest categories of patients who are students, widow and divorcee were in equal proportion of 3.7% each (Table 2).

There are no co-morbid diseases in 116 (43.3%) cases while in 152 (56.7%) cases with co-morbid diseases are observed. Co-morbid diseases like HTN/CHF and HTN/diabetes occurred in equal proportion of 41 (15.3%) each. Hypertension with stroke and HTN/angina were 22 (8.2%) and 3 (1.1%) respectively. Patients presented with HTN/CKD and HTN with arrhythmias were 6 (2.24%) each (Table 3). A total of 140 (52.2%), 221 (82.5%), and 31(13.8%) regularly monitor their blood glucose levels, blood pressure and BMI respectively while 128 (47.8%) engaged in physical activity (Table 4).

The fasting blood glucose level evaluation showed 55 (20.5%) patients in the diabetic range but while 139 (51.9%) are within the normal range, 59 (22.0%) have impaired glucose concentration (Table 5). The BMI status in 68 (25.4%) patients are overweight, 49 (18.4%) have obesity of various degrees and 36 (13.5%) are underweight (Table 5). The blood pressure values in 55.8% patients are not within controlled range while 69 (25.8%) cases of pre-hypertensive status were identified. Isolated systolic hypertension was observed in 5 (1.9%) cases (Table 5). The lipid profile of patients indicated high levels of LDL cholesterol and Triglycerides in 9 (10.1%) and 29.0% respectively while HDL cholesterol was low in 15 (17.0%) cases (Table 5). The number of risk factors (both modifiable and non-modifiable) ranges from one (1) to nine (9). Eighty (30.0%) patients had a total number of three separate risk factors while 4 (1.4%) had the maximum (Table 6).

Table 1. Age and Gender Distributions of Patients.

Age Bands	Male	Female	Total	Percentage (%)
< 20	0	0	0	0
20-29	0	31	31	11.6
30-39	2	35	37	13.8
40-49	34	54	88	32.8
50-59	26	21	47	17.5
60-69	29	33	62	23.1
70-79	3	0	3	1.1
≥80	0	0	0	0
Total	**94 (35.1)**	**174 (64.9)**	**268 (100)**	**100**

Table 2. Other Demographic Characteristics of Patients.

	Variables	n (%)
Gender	Male	94 (35.1)
	Female	174 (64.9)
	Total	**268 (100)**
Positive Family History	Hypertension	32(11.9)
	Diabetes	23(8.6)
1st degree only	HTN/CHF	6(2.2)
	HTN/diabetes	27(10.1)
	HTN/Stroke	45(16.8)
	None	1(0.37)
2nd degree	HTN	3(1.1)
	DM	8 (2.9)
1st & 2nd degree	HTN/CHF	17 (6.3)
	HTN	3(1.1)
	HTN/CHF	23(8.6)
	HTN/DM	15(6.0)
Negative Family History	HTN	2(0.75)
	DM	15(6.0)
	HTN/CHF	0 (0.0)
	HTN/DM	3(1.1)
	HTN/Stroke	0(0.0)
	others	44(16.4)
	Total	**268 (100)**
Marital Status	Single	10 (3.7)
	Married	239(89.2)
	Widow	10 (3.7)
	Divorcee	10 (3.7)
	Total	**268(100)**
Ethnic Group	Babur	16(6.0)
	Bura	17(6.3)
	Fulani	12(4.5
	Hausa	47(17.5)
	Kanuri	92(34.3)
	Margi	20(7.7)
	Shuwa	27(10.0)
	Kilba	11(4.1)
	Igbo	11(4.1)
	Yoruba	6(2.2)
	Others	11(4.1)
	Total	**268 (100)**
Educational status	Uneducated	115(42.9)
	Primary	26 (9.7)
	Secondary	58 (21.6)
	Tertiary	69 (25.8)
	Total	**268 (100)**

Table 3. Morbid and Co-morbid Disease Characteristics of Patients.

Disease Description	Frequency	Percentage (%)
Hypertension Only	88	32.8
Congestive Heart Failure Only	28	10.5
Hypertension with Congestive Heart Failure	41	15.3
Hypertension with Stroke	22	8.2
Hypertension with Arrhythmias	6	2.2
Hypertension with Diabetes	41	15.3
Hypertension with Angina	3	1.1
Hypertension with Chronic Kidney Disease	6	2.2
Hypertension with Congestive Heart Failure & Chronic Kidney Disease	2	0.8
Hypertension and Others	20	7.5
Hypertension with Congestive heart Failure and Others	11	4.1
Total	**268**	**100**

Table 4. Patients Self-Monitoring of Risk Factor.

Parameter Assessed	YES (Positive outcome)		NO (Negative outcome)		Total	
	n	(%)	n	(%)	n	(%)
Fasting glucose level	140	(52.2)	128	(47.8)	268	(100)
Regular Blood pressure	221	(82.5)	47	(17.5)	268	(100)
Body Mass Index	31	(13.8)	228	(86.2)	268	(100)
Alcohol intake limited	21	(7.84)	247	(92.16)	268	(100)
Tobacco Smoking avoidance	29	(10.8)	239	(89.2)	268	(100)
Engagement on Physical activity	128	(47.8)	140	(52.2)	268	(100)

Table 5. Laboratory Assessment of Modifiable Risk Factors.

Parameter	Description	N (%)
FBS (n=268)	Below normal	15 (5.6)
	Normal	139(51.9)
	Impaired glucose Concentration	59 (22.0)
	Diabetic	55 (20.5)
BMI (n=268)	Underweight	36 (13.5)
	Normal	114(42.7)
	Overweight	68 (25.4)
	Obese Class 1	32 (12.0)
	Obese Class 2	13 (4.9)
	Obese Class 3	4 (1.5)
BP (Systolic) (n=268)	Below normal	22 (8.2)
	Normal range	22 (8.2)
	Pre-hypertension	69 (25.8)
	Stage 1 HTN	59 (22.1)
	Stage 2 HTN	90 (33.7)
	ISH	5 (1.9)
BP(Diastolic) (n=268)	Normal range	70 (26.1)
	Pre-hypertensive	55 (20.5)
	Stage 1 HTN	71 (26.5)
	Stage 2 HTN	72 (26.9)
LDL Cholesterol (n=86)	Optimal	36 (42.0)
	Near optimal	30 (35.0)
	Borderline optimal	11 (12.8)
	High	8 (9.0)
	Very high	1 (1.2)
HDL Cholesterol (n=86)	Below normal	15 (17.4)
	Within normal	34 (39.5)
	Above normal	37 (43.0)
Triglyceride (n=86)	Normal	44 (51.2)
	Borderline high	29 (33.7)
	High	23 (26.7)
	Very high	6 (7.0)

Key: FSB=Fasting blood sugar; BMI=Body mass index; BP=Blood pressure; HTN=hypertension; LDL=low density lipoprotein; HDL=High density lipoprotein.

Table 6. Summary of Number of Modifiable and Non-modifiable Risk Factors.

Number of risk factor(s)	Frequency	Percentages (%)
1	5	1.9
2	34	12.7
3	80	29.9
4	60	22.4
5	51	19.0
6	20	7.5
7	8	3.0
8	6	2.2
9	4	1.4
Total	**268**	**100**

Discussion

Chronic diseases are common illnesses all over the world. They significantly impart negative health outcomes and limit quality of life [14-15] owing to their high morbidity and mortality rate particularly when poorly managed or undetected in good time.

Among the population with chronic illnesses in this present study, majority were female with the female to male ratio of 1.85. This finding is consistent for two reasons. Firstly, it has been reported that women 18 years through 64 years have higher prevalence of multiple chronic diseases than male of similar age stratum in some quarters [16] and secondly, we previously reported in this region that the women health seeking behaviors which is higher than that of the men will always account for why the female proportion is always higher than the men in most studies conducted in the region [17]. The high difference observed in this study may therefore not reflect the true picture of gender difference in the prevalence of chronic diseases in the region since it is also possible that the observed differences is due to the fact that women are more likely to be diagnosed because they may visit their health providers more often than men [18].

Multiple chronic disease conditions are common and occur with ageing and could arise as complications of underlying diseases. In this study, more than half of the studied populations are afflicted with more than one form of chronic illnesses. For instance, a little above half of the patients have two co-morbid disease conditions while a few proportions have three. Co-morbid diseases like congestive heart failures, cerebrovascular accident, arrhythmia, diabetes, angina, chronic kidney disease, obesity and dyslipidemia among others were identified in many patients. These chronic diseases are consistent with co-morbid conditions in other parts of the world. Increasing number of chronic conditions implies increasing risk for prematurely death or hospitalization and greater risk of poor day-to-day functioning [19]. Hypertension is observed present in nearly all the cases of patients having two or more co-morbid conditions, suggesting that these diseases may have arisen due to complications of untreated or poorly managed hypertension or that they are serving as etiological agents for hypertension. The number of chronic diseases in this study is consisted with findings in other part of the world. For example in the United States, 1 to 4 chronic conditions were reported to be present in adults aged 18 years and above [16]. Owing to the complex nature of these diseases, the management of patient with multiple chronic conditions requires an interdisciplinary team approach in order to provide appropriate treatment that adjusts to the patient as his/her individual response varies and to achieve definite positive outcome.

Numerous risk factors and markers for development of chronic diseases have been identified. For instance, in hypertension risk factors like age, race/ethnicity, family history of hypertension and genetic factors, lower education and socioeconomic status, greater weight, lower physical inactivity, tobacco use, psychosocial stressors, sleep apnea, and dietary factors (including dietary fats, higher sodium intake, lower potassium intake, and excessive alcohol intake) are known. The identification and treatment of individual's risk factors is key factor towards improving health related quality of life as well as limiting negative health outcomes.

Positive family history is one of the predictive non-modifiable risk factors for most chronic diseases. In this present study, this risk factor was observed in ten percent of patients having hypertension with diabetes and even higher proportion in those with hypertension alone as well as hypertensive patients who have witnessed their first episode of stroke. These proportions are within the 12%-36% range of patients with positive family history reported by Carroll *and* colleagues [20]. Adequate communication of risks posed by family history in chronic disease could motivate patients to adopt healthier lifestyles and undergo recommended screening.

Multiple modifiable and non-modifiable risk factors are associated with hypertension and all other cardiovascular diseases. In this study, several modifiable risk factors like high blood pressure, obesity, hypercholesterolemia, diabetes, tobacco smoking, and physical in-activity as well as non-modifiable risk factors such as age, gender and family history observed in this study are consistent with conditions reported in literatures [13].

Approximately one-tenth of the population who regularly smoke cigarette or on a quitting programme may be at

higher risks of cardiovascular events. The proportion in this study is lower than the smoking statistics recorded during the nationwide statistics survey in the United States and may also be lower compared to higher incidences in other regions like in Jamaica where 17.8% were reported to smoke varieties of cigarette [21]. Cigarette Smoking is generally known to cause adverse health consequences because it damages the endothelium, increases the fatty deposit in the arteries, increases clotting, raises LDL-Cholesterol, lower HDL-cholesterol, and promotes coronary artery spasms. Smoking is known to be one of the major risk of death attributable to CVD and stroke while the risk of mortality attributable to hypertensive heart disease and hypertensive renal disease is related to smoking [22]. Cigarette smoking has also been identified as an independent risk factor for both ischemic stroke and has a synergistic effect on other stroke risk factors such as systolic BP [23]. Current smokers always have 2 to 4 times increased risk of stroke compared with non-smokers or those who quitted smoking for >10 years [24]. These findings underscore the need for appropriate attention on smoking cessation programme as a component of care for smokers.

The health benefits of physical activities cannot be overemphasized. Leisure time physical activity that is up to 75 minutes of brisk walking per week were associated with reduced risk of mortality compared with participants who engaged in no physical activity. In this study, close to half of the patients studied claimed to engage in regular physical activities or exercise. Although this may be considered encouraging and close to the proportions recorded among adults in countries like US who met the aerobic guideline, more educational programmes and efforts are still required among other patients that do not undertake physical activities.

Overweight in adult is defined as a BMI of $\geq$ 25 kg/m^2 and obesity is defined as BMI of 30kg/m^2 while a BMI value of $\leq$ 18.5 is considered underweight. In this study, a little above one-tenth of the populations falls within an underweight BMI status with overweight present in one-quarter of the patients while close to one-fifth are obese and the rest population having normal BMI status. Overweight and obesity are major risk factors for cardiovascular disease, including CHD, stroke, Atrial Fibrillation and CHF [25-26]. Extreme obesity was present in 1.5% patients which is lower than the 7.7% cases recorded among US population. The burden of cardiovascular risk is expected to be lowered when appropriate intervention measures are carried out on overweight and obese patients.

The systolic blood pressure level of patients when not adjusted for any treatment guidelines was uncontrolled in more than half of the patients. High blood pressure is risk factors for many chronic illnesses of cardiac and vascular origins. Some authors reported that the risk for stroke and heart disease mortality increases in a log-linear fashion from SBP levels <115 mm Hg to >180 mm Hg and from DBP levels <75 mm Hg to >105 mm Hg and that each 20 mm Hg higher SBP or 10 mm Hg higher DBP is associated with a doubling in the risk of death caused by stroke, heart disease, or other vascular disease [27]. Luckily enough, a high proportion of patients in this study monitor their blood pressures regularly possibly during their routine clinic visits. This notwithstanding, it is still unexplainable why their blood pressure values were high in more than half of the population. The results may have shown that beyond BP check, monitoring patients' compliances with medications are also necessary.

The lipid profile such as HDL, LDL and Triglycerides were abnormal in many patients. The values obtained in this study are lower than results reported elsewhere in the globe. For instance the cholesterol levels was once reported to be highest in the WHO European Region to the magnitude of 54% for both sexes while the WHO Region of the Americas was determined to be 48% for both sexes. The WHO African Region and the WHO South-East Asia Region cholesterol levels were reported to show the lowest percentage values of 23% and 30%, respectively [28].

The proportion of people with chronic diseases having high fasting glucose concentrations is about one-fifth in the study, which implies that diabetic is one of the prevalent chronic diseases in the region. Diabetes mellitus is a major risk factor for cardiovascular diseases such as coronary heart disease, stroke, peripheral artery diseases, heart failure and atrial fibrillation [29]. Glycaemic control is therefore required to reduce the cardiovascular risk burden in chronic illnesses.

Conclusion

Multiple risk factors and co-morbid diseases conditions are observed in several patients. Despite high proportion of patients who regularly monitor their blood pressure (perhaps only during clinic visits) elevated blood pressure was still identified as one of the major risk factors, which implies that beyond BP check medication compliances need to be assessed in every patients. The risk factors posed by tobacco use and excessive alcohol intake were generally low and the proportion of patients who engaged in physical activity was just a little below average. However, just a little above half of the patients monitored their blood sugar levels. Patients monitoring, counseling and education programmes are required to reduce the burden of risk factors in several patients.

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