ANALYSIS OF ECONOMIC BURDEN OF HYPERTENSION IN NIGERIA:
Empirical Evidence from the Federal Capital Territory, Abuja

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ABSTRACT

One of the predominant measures of quality of life in an economy is the health status of residents and an important measure of this is the burden of diseases that ravage the health of its members. Hypertension has become a daunting public health challenge globally as it affects a substantial number of people of productive age with serious socioeconomic consequences. However, very few studies have examined the economic burden posed by hypertension on individuals living with the disease in Nigeria. This study analysed the effect of hypertension on the income, savings and productivity of people living with hypertension (PLWH) in Nigeria. Data were collected using the survey method from the University of Abuja Teaching Hospital and the National Hospital, in the Federal Capital Territory, Abuja. Data were analysed using logistic regression and descriptive statistics techniques. The results revealed negative relationships between hypertension and patients' income, productivity, and savings. Catastrophic spending was estimated using household's capacity to pay method and results revealed that average annual total cost attributable to hypertension is ₦145,086:12k per patient. Hypertension-related expenditure is catastrophic in 30.5% of the least-paid respondents. The study concludes that hypertension poses a heavy burden to victims, and catastrophic spending, especially among individuals living below the poverty line, suggests that hypertension is one of the drivers of poverty. The paper therefore, recommends public and private intervention programmes, such as

provision of affordable drugs by way of subsidy, expansion of primary health-care services and new techniques in handling the disease at all levels of government.

JEL classification: A10, I11, I15, I31

1. Introduction

One of the predominant measures of quality of the life in an economy is the health status of citizens, hence policies are formulated to address the scourge of disease, particularly in developing economies. However, the disease hypertension constitutes a daunting public health challenge globally as it affects a substantial number of people of productive age with serious socioeconomic consequences. Hypertension is one of the causes of cardiovascular diseases such as heart failure, stroke and chronic kidney diseases (Bloom et al., 2013; Jha, Nugent, Verguet, Bloom & Hum, 2013; Webb & Conrad 2012; World Health Organisation, 2011; Audibert, Motel & Drabo, 2010; Acemoglu, Johnson & Robinson, 2003). High blood pressure (HBP) has a devastating effect on people's health both in developing and developed countries. According to Elliot (2003), hypertension leads most Americans to the hospital and about 34% of 50 million American adults with hypertension controlled it to less than or equal to 140mm Hg systolic and 90mm Hg diastolic level. The burden of hypertension on the individuals with the disease encompasses both social, economic and health issues in sub-Saharan African countries. The 1991 national survey on non-communicable diseases has shown that the number of borderline hypertensive Nigerians over the age of 15 years stood at 4.8 million (Federal Ministry of Health, 1991). This figure is projected to increase by 17 percent if effort is not made to stem the tide.

It is appalling to note that diseases that were perceived as mainly associated with developed countries' rich or elderly populations are now prevalent among all cohorts of the population without geographical boundary. The World Health Organisation (WHO) (2017) established that 40 million persons die of non-communicable diseases (NDCs) yearly, which is about 70 percent of global deaths. WHO (2017) stressed further that among the non-communicable diseases, cardiovascular disease accounts for 17.7 million and diabetes accounts for 1.6 million. Thus, hypertension is implicated in 19.3 million of the 40 million

people that die of NCDs globally each year. Furthermore, 15 million deaths of people between the ages of 30 and 69 years, which is 80 percent of premature deaths, occur in low- and medium-income countries, among which is Nigeria. Since the death of bread winners in their productive ages has devastating consequences on both present and future incomes, the severity of hypertension among the populace may lead to serious decline in households' incomes, aggregate output and intergenerational distribution. In addition, individuals who crave for more health care incur more expenditure to satisfy their health needs. Increases in health-care spending may lead to diversion of funds away from other productive investments that could have been used to enhance growth and development. Thus, the burden of hypertension has two possible effects. It impacts the individual's income and life expectancy, causes productivity loss, and may reduce savings. These may erode private investment, leading to low capital accumulation. It may also lead to low revenue for government resulting from a decline in taxes due to low investments. Also, Bloom et al. (2013) maintained that poor health is associated with early retirement, lower labour supply, while mortality due to non-communicable diseases affects the stock of labour.

Therefore, the health status of economic agents, especially households, is an essential condition for the determination of the growth of every country's economy. According to Soyibo (2005), the health of every economy and the economics of health are now profoundly understood through health indicators which constitute channels through which the effects of diseases on the growth and development of every economy can be measured. Thus, productivity of labour, labour supply, life expectancy rate, morbidity rate, mortality rate, income, capital accumulation, savings and investment of households are all indicators of the effect of diseases (Abegunde, Marthers, Ortegon & Strong, 2007; Acemoglu et al., 2003; Webb & Conrad, 2012; Jha et al., 2013). Growth is determined by various factors but health status and educational level play a significant role as established in the human capital development framework. In his study on public spending, Olaniyi (2002) emphasized that a more urgent war to be won in sub-Saharan African today is the war against hunger, ignorance, and disease.

To our knowledge, very few studies (Ilesanmi, Ige & Adebiyi, 2012; Nwafor, Nnoli and Chuku, 2014) have examined the economic burden posed by

hypertension on individuals living with the disease in Nigeria. This is a serious gap in the literature given the strong link between quality of health of individuals and the developmental outcomes of every nation. To fill this gap, this study analysed the burden of hypertension on the income, savings and productivity of people living with hypertension (PLWH) in Nigeria. The study is guided by the following research questions: does hypertension have any effect on the income of affected persons? Is there any relationship between the burden of hypertension and the productivity of the patients? Does hypertension have any effect on the savings level of affected individuals?

This study is significant to individuals afflicted with the disease, their family members, caregivers, healthcare providers, government, non-governmental bodies and academic researchers in the field of health. To individuals, it will enable them develop better health behaviour that will either keep them healthy and prevent the disease of hypertension or help them detect it as early as possible to prevent chronic situations. To the government, the study will enhance the understanding of the epidemiological trends of the burden of hypertension and its socioeconomic effect in the country.

2. Review of the Literature

2.1 Effect of non-communicable diseases (NCDs) on individual income and the economy

Stressing the importance of health and its relationship with economic growth and development, WHO (2011), in conjunction with Columbia University, formed the National Macroeconomics Health Commission (NMHC) in many countries. The primary objective of the commission was to enhance mutual public health investment and economic development. It was pointed out by the commission that the macroeconomic consequences of health are not limited to infectious diseases but also non-communicable diseases that are ravaging the global population with negative consequences on the growth and development of developing economies.

WHO(2005) puts countries' losses in income due to heart disease, stroke and diabetes at USD18 billion , USD11 billion, USD9 billion and USD3 billion for China, Russian, India and Brazil respectively. Thus, comparing the economic impact of diseases, WHO (2005) affirmed non-communicable diseases to pose more burden than communicable diseases like malaria in the 1960s or AIDS in

the 1990s. WHO (2005) projection for the period 2005 to 2015 showed that countries like China and India would witness a drop of USD12,558 billion (0.93% of the GDP) and USD237 billion (about 1.5% of the GDP) respectively to non-communicable diseases, especially stroke, heart diseases and diabetes.

Audibert et al. (2010) examined the endogeneity of health indicators using growth convergence equations on 159 countries over the period of 1990-2004 and discovered a negative relationship between poor health and economic growth. In another development, Mahal, Karan and Engelgau (2010) employed Solow-type production functions to examine the effect of diseases in India. Their analyses suggest that non-communicable diseases constitute a significant economic burden on the Indian economy.

Bloom et al. (2011) identified cardiovascular disease and mental illness as the major determinants of economic burden as the estimated figures in monetary terms stood at USD27.8 trillion and USD6.2 trillion in China and India respectively. Jha et al. (2013) employed mixed methods – cost of illness approach, macroeconomic simulation method and value of statistical life approach – and discovered that heart disease, stroke, hypertension and diabetes posed a greater burden to economic growth and may evolve into a staggering one in the next two decades. The study also pointed out the hazard of smoking as a major cause of cardiovascular disease.

To explore the impact of diseases in the Caribbean regions, Chao (2013) undertook a household survey and his findings revealed that non-communicable diseases pose daunting challenges to some of the countries in the Caribbean regions. He alleged that output valued at about USD47 trillion are lost globally to non-communicable diseases and USD500 billion worth of output, which represents about 4% of GDP are lost annually in developing countries. The author stressed that in Jamaica, non-communicable diseases caused economic loss of about 3% of GDP in 2008.

2.2 Relationship between health burden of hypertension and productivity of patients

Leeders, Raymond and Greenberg (2003) established that the morbidity and mortality rates from non-communicable diseases are very high with disturbing socio-economic consequences. They projected cardiovascular disease to become a leading cause of death and disability worldwide by 2020 if not controlled.

Their study emphasized the epidemiological and economic impact of cardiovascular disease, especially heart attack.

In Nigeria, the study by Lambo (2007) on non-communicable diseases with emphasis on cardiovascular disease pointed out that heart-related diseases are emerging issues with socioeconomic implications. He alleged that tobacco smoking, physical inactivity, and diet are major risk factors for non-communicable diseases. He further stressed that those diseases were responsible for about 56% of most deaths in Nigeria. Macroeconomic simulation, cost of illness and value of statistical life were pointed out as some of the approaches for measuring disease burden (Lambo, 2007). These are in line with studies by Chao (2013) and Jha et al. (2012). Corroborating the findings of Abegunde and Stanciole (2006), Bloom, Canning and Sevilla (2004), Chao (2013), and Jha et al. (2012), Leeders et al. (2003) affirmed that the tremendous impact of diseases, most especially non-communicable ones, is too large to ignore.

2.3 Burden of hypertension and savings level of patients

Using mixed methods, Vongskan, Pongpanich and Samrongthong (2016) explored the effect of knowledge of health status and found that having early knowledge of hypertension encouraged early intervention among older adults in Bangkok Province, Thailand. Abegunde and Stanciole (2006) explored the macroeconomic consequences of premature mortality from chronic diseases. Their result revealed that non-communicable diseases led to decline in national income, savings and shortage of labour supply. The study indicated that the apparent loss in national income due to non-communicable diseases was USD18 billion in China, USD11 billion in Russia, USD9 billion in India, and USD2.7 billion in Brazil. Similarly, the estimated losses recorded were USD1.6 billion for the United Kingdom, USD1.2billion for Pakistan, USD0.53billion for Canada, USD0.4 billion for Nigeria and USD0.1 billion for the United Republic of Tanzania. The authors pointed out that more people will be lost to these diseases every year, especially in Nigeria.

2.4 Conceptual framework of the study

Economic burden of hypertension can be felt whether it (hypertension) becomes complicated or non complicated as both situations result in hospital visitations, absenteeism, drug regimentation. However, hypertension with complications

could lead to hospitalization, heart attack and other cardiovascular diseases that increase the burden of the disease via loss in income, productivity and savings of individuals.

The conceptual framework is schematically presented in figure 1.

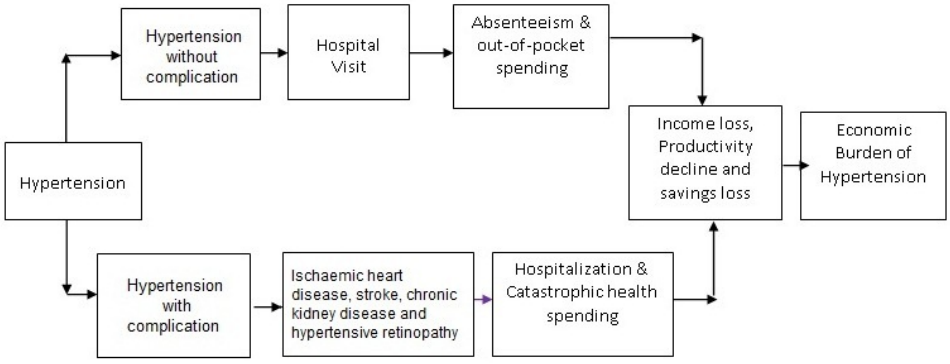

Figure 1. Diagrammatic presentation of the conceptual framework for the study.
Source: Authors' concept, 2018.

3. Methods

The study adopted the logistic regression econometrics technique and descriptive statistics to analyse the effect of the burden of hypertension on the income, productivity and savings of people living with hypertension (PLWH). The study was undertaken in Abuja. The choice of location was informed by the availability of representatives from the six geopolitical regions in the country, owing to the concentration of federal government establishments and it being the capital city of Nigeria.

3.1 Sample and sampling technique

A survey was conducted in two tertiary hospitals (National Hospital and University of Abuja Teaching Hospital) in the federal capital territory, Abuja. The instrument was a questionnaire which was randomly administered to patients who visited the hospitals from February to March 2018. Information was obtained on direct costs, including cost of drugs used, diagnostics,

consultation and transportation, and perceptions on indirect costs. The sample size of 233.99 for the study was derived from morbidity population of patients living with the disease as at 2016, which was estimated to be 607 hypertensive patients attending National Hospital, Abuja. This was assumed to be a finite number, which represents the entire population of the study. Given this, we were 95% confident that the percentage was estimated to be within + or – 5% value. This means that the allowable error accommodated in this study was 5% or 0.05. A formula based on the assumption of finite population was used, which is in line with Krejcie and Morgan reported in Kado, Bala & Dandajeh (2016).

The finite population formula is stated thus:

$$n = \frac{Z^2 * N * P * (1-P)}{ME^2 * (N-1) + (X^2 * P * (1-P)}$$

where:

n = expected sample size

Z^2 = the confidence level

ME^2 = desired margin of error

N = population size

P = proportion of the population (assumed to be 0.50 since this would provide the maximum sample size.

where Z^2 =1.96 as per table of area under normal curve for the given confidence level of 95%

ME^2 = 0.05 since the estimate should be within 5% of the true value

P = 0.50 as we want the most conservative sample size of the population

Note: N is the prevalence population of morbidity resulting from hypertension, which is 607 based on the year 2016 morbidity data from the National Hospital health records.

Employing the formula in the case of finite population, we have thus:

$$n = \frac{Z^2 * N * P * (1-P)}{ME^2 * (N-1) + (Z^2 * P * (1-P)}$$

$$= \frac{(1.96)^2*607*0.5(1-.5)}{0.05^2*(607-1)+(1.96^2*0.5(1-.5)}$$

$$= \frac{3.8025*607*0.25}{(0.0025*606)+3.8025*0.25}$$

$$= 577.029/1.515+0.951$$

$$= 577.029/2.466 = 233.99$$

Therefore, the most conservative sample size needed in this study is approximately 234. Given the sample size determined for this study, and for non-response purposes, 300 questionnaires were administered in the two hospitals. Out of the 300 questionnaires administered, 255 were returned. From the 255 returned, 22 were not completely filled, leaving about 233 for analysis. When subjected to a reliability test, a listwise exclusion of one (1) questionnaire was carried out by SPSS leaving 232, which represented 99.4% valid cases for analysis.

Guthman's coefficient of reliability (1 excluded questionnaire/valid cases for analysis) x 100

= 1/232 x 100 gave 99.57% indicating reliability of instrument used in the study.

3.2 Ethical approval

Prior to the administration of questionnaires, the researcher sought ethical approval and was granted by the two hospitals used in this study.

3.3 Theoretical framework of the study

This study benefited immensely from the modified augmented Solow human capital growth theory. The theory was further extended by Bloom et al. (2013; Webb and Conrad, 2012). The augmented Solow human capital model postulates that output level is a function of stock of physical capital (K), human capital (h),

labour force (L) and total factor of productivity (A). This model did not explicitly state the health and measurement of diseases burden as determinant of income, productivity and savings at micro level. However, it is the bedrock on which health, as one of the components of human capital, evolved. The augmented Solow model is specified thus:

$$Y = Ak^{\alpha}(hL)^{\beta} e^{u} \tag{1}$$

where:

Y = Output level

K = Stock of physical capital

h = Human capital

L = Labour force

A = Total factor productivity (TFP)

α = Elasticity of capital input with respect to output

β = Elasticity of labour input with respect to output

e = Base of natural logarithm

U = Stochastic error term

To facilitate the study of disease impact on output growth, Webb and Conrad (2012) extended and decomposed Solow model as:

$$Yt = K\alpha t,\ Ht^{\beta},(A,L) \tag{2}$$

They linearized the equation to have the following:

$$LogYt = \alpha_0 logKt + \alpha_1 logHt + \alpha_2 log(A,L) \tag{3}$$

where Kt = capital stock and Ht = human capital and their estimated equation is stated as:

$$LGDP = \alpha 0 + \alpha 1 LGCF + \alpha 2 LHCE + \alpha 3 LCPW \tag{4}$$

where (according to their variable descriptions):

LogYt = log of real output as gross domestic product (LGDP)

LogKt = log of capital representing gross capital formation (LGCF)

LogHt = log of human capital as a log of public medical costs of treating chronic non-communicable diseases (CNCDs)(LHCE)

LogLt = log of capital per worker represented as log of capital per worker (LCPW)

Bloom et al. (2013) emphasized that age-related non-communicable diseases are decreasing labour supply and productive investments are on the decline owing to diversion of resources to financing healthcare to deal with pandemic burdens of non-communicable diseases. Based on the above position therefore, the authors specified their model to reflect the channels through which non-communicable diseases affect the performance of an economy as follows:

$$Ki,t+1 = SYi,t - X^{C}i,t + (1-\delta)Ki,t \quad (5)$$

where:

K = aggregate capital,

S = saving rate,

C = treatment cost of disease,

X = fraction of health care financing out of individual savings and δ represent the rate of depreciation. The equation shows the positive relationship between savings rate and aggregate capital.

The human capital framework provides the appropriate model for analysing the impact of health on modern-day economies. Such analyses are in the form of the relationship between health and economic growth, labour productivity, employment, leisure etc, through direct health indicators like morbidity, mortality, and expenditure. Labour services represent the flow from a stock of human capital because they are the inputs supplied by the human in the production process. To enhance the quality of the services provided by the labour force, the human capital theory demands for improvement in the quality of life through adequate investment in health for maximum health outcome. Gardner and Gardner (undated) posited that work-hour or work-days, described as the productive hours or days a healthy worker puts into production, or contrarily the days he is absent from work as a result of ill health, can be used to measure human capital productivity.

3.4 Specification of model

The logistic regression model utilized by Mahal et al. (2010) was adapted and modified because of its superiority to the ordinary least squares. Their logistic regression model for the assessment of disease effect on households in India was compactly specified as:

$$Ij=\alpha+\sum\beta NCDij+ \theta jXj+ej \quad (6)$$

where:

I_j is the dummy variable which indicates whether health care resulted in household impoverishment,

NCDij is a dummy variable indicating the presence of major non-communicable diseases '*i*'in household '*j*'

Xj refers to other household characteristics used as controls.

To confirm the significance of logistic regression, Cox (1958), reported in Obansa (2011), stressed that logistic model is used to estimate the probability of a binary response based on one or more predictors or explanatory variables. These independent variable characteristics can be in the form of demographics such as sex, age, income and so on and information relating to medical spending on hypertension. The logit model becomes appropriate whenever a dependent variable is binary (dummy) which takes 0 or 1. The logit model estimates the probability of the dependent variable to be 1(Y=1), which implies the probability that an event happened (Gujarati, 2004; Hill, Griffiths & Lim, 2012; Rajulton, 2011). This is expressed functionally as:

$$Pr(Y=1|X_1, X_2,- - -X_k) = F(\beta_{0+} \beta X_{0+} \beta X_{0+}- - - + \beta_k X_k) \quad (7)$$

However, when the transformation function (*F*) is the logistic function, then response probabilities are given as:

$$Pr(Y=1|X_i) = e^{xi\beta}/1+ e^{xi\beta} \quad (8)$$

From the above, the logit model to be estimated in analysing the economic burden of hypertension on the income of the vulnerable patient is specified in equation 9 as follows:

$$lnY = \beta 0 + \sum \beta i Xi + ei \quad (9)$$

where:

$\ln Y$ = dependent dummy variable indicating the natural logarithm of the probability of the opinion of the individual regarding the income effect of burden of hypertension on the vulnerable patient.

βi = parameters to be estimated

Xi = stands for explanatory variables such as age, duration since patient has been diagnosed with hypertension, number of days patient is hospitalized and monthly spending on drugs, occupation, level of spending on drugs included in the model

where '*i*' represents the number of predictors which are defined as follows:

X_1 = age of the hypertensive patient

X_2 = duration since patients has been diagnosed with hypertension

X_3 = days patient is hospitalized

X_4 = monthly spending on drugs

e_i = the error term which is assumed to be normally distributed with zero mean and constant variance, that is $e_i \sim N[0,1/Nipi(1-Pi)]$

A priori, age (X_1) is expected to have a negative effect on the income of the hypertensive patient because as individuals grow older, the odds for spending more to control hypertension increase thereby depleting the patient's income. Again, the longer the duration since the patient has been diagnosed with hypertension (X_2), the higher the odds that the patient will spend more thereby impacting on his or her income negatively. Besides, the number of days a patient is hospitalized (X_3) negatively affects the income of individual. However, spending on drugs monthly (X_4) to control hypertension is expected to reduce the disease complication and improves health condition thereby having a positive impact on the income of the patient. Algebraically, X_1, X_2 are $X_3 < 0$ while $X_4 >$

0. The productivity effect of the hypertension equation to be estimated is specified in equation 10 as follows:

$$\ln P = \beta 0 + \sum \beta i Xi + ei \quad (10)$$

where:

$\ln P$ = natural logarithm of the probability of the opinion of the individual regarding the productivity effect of the economic burden of hypertension on the vulnerable patient.

X_i = explanatory variables in the productivity model above which are:

- X_1 = perception on the cost of efficacy of drugs to controlling hypertension
- X_2 = types of drugs used by patient
- X_3 = effect of days patient is hospitalized
- X_4 = effect of monthly spending on drugs
- X_5 = distance covered from residence to hospital

A priori, the explanatory variables (perceptions of patient on cost of efficacy of drugs to controlling hypertension (X_1), types of drugs used by patient (X_2), days patient is hospitalized (X_3), and distance covered to hospital (X_5)) are hypothesized to have negative effect on productivity as they affect the patient's full participation in production activities. However, monthly spending on drugs (X_4) is expected to be positively related to productivity as it should lead to improvement in the health of the patient, thereby decreasing further spending and increasing full participation in production. The error term (e_i)is expected to be normally distributed with zero mean and constant variance. That is, $e_i \sim N[0,1/Nipi(1-Pi)]$.

The logit equation of saving effect of the burden of hypertension is specified in model 11 as follows:

$$\ln S = \beta 0 + \sum \beta i Xk + ei \quad (11)$$

where:

$\ln S$ = natural logarithm of the probability of the opinion of the individual regarding the saving effect of the economic burden of hypertension on the vulnerable patient.

X_1 = days patient is hospitalized owing to hypertension,

X_2 = effect of monthly spending on drugs,

X_3 = patient's out-of-pocket spending on medical care,

X_4 = distance covered by patient on each visit to hospital.

A priori, the explanatory variables (days patient is hospitalized owing to hypertension (X_1), patient's out-of-pocket spending on medical care (X_3), and distance covered by patient on each visit to hospital (X_4)) are expected to negatively impact on the savings of people living with hypertension as hospitalization leads to absenteeism which affects the earnings of the patients thereby reducing patients' savings. When out-of-pocket spending becomes catastrophic, it is expected to affect the income of patients thereby negatively affect patients' savings. On the other hand, distance covered reduces labour hour participation which affects income and in turn affects patients' savings. Algebraically, $X_2 > 0$ while $X_1, X_3,$ and $X_4 < 0$.

The error term (e_i) is expected to be normally distributed with zero mean and constant variance. That is $e_i \sim N[0, 1/Nipi(1-Pi)]$.

4. Results

The descriptive and logistic regression results of the economic burden of hypertension, as revealed by the study are presented hereunder.

4.1 Distributive results showing perceptions of respondents

Figure 2 presents the demographic characteristics of the respondents by state origin. Thirty-three states and Abuja, the federal capital territory, were represented in the study; Bayelsa, Yobe and Zamfara were the states not represented. Nevertheless, the survey is highly representative of all sections of Nigeria. Among the valid responses, which represent 99 percent of the total responses, Kogi State recorded 14.2% to top the states. This was followed by Edo with 7.7%, Imo with 6.0 %, Niger and Kaduna with 5.2% each, and Abia and Enugu with 4.7% each. Abuja, Plateau, Nasarawa and Delta recorded 3.9% each, Anambra, Kano and Osun recorded 3.4% each, and Benue and Ondo states recorded 3.0% each. Cross River, Ekiti and Rivers states had 2.1% each, Kwara and Oyo had a response rate of 1.7 per cent each, and Akwa-Ibom, Kebbi and

Taraba states with a response rate of 1.3% each. Adamawa, Borno, Ebonyi, Katsina and Ogun states had a response rate of 0.9% each while Bauchi, Gombe, Jigawa, Lagos, and Sokoto had the lowest response rate of 0.4% each.

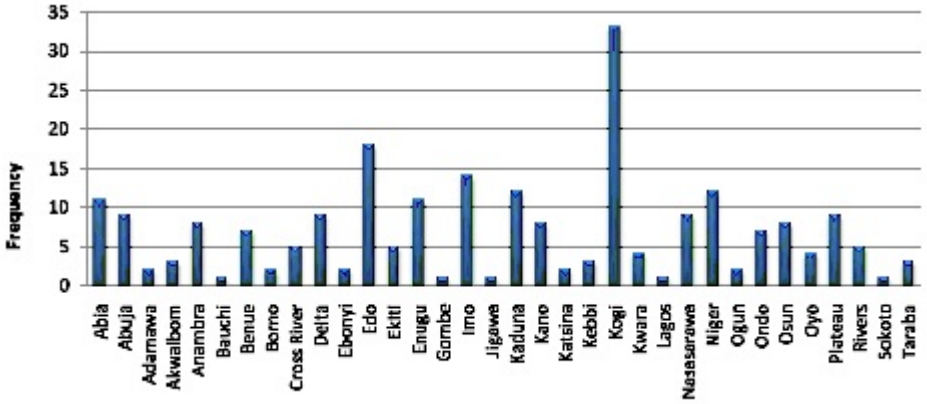

Figure 2. Distribution of respondents by state origin.

The age and gender distribution of the respondents are presented in table 1. Most of the respondents were within the age interval of 31 – 60 years. This represents the modal class of the age distribution of the patients. Male respondents constituted 49.1% of the population, with a marginally higher figure of 50.9% for the female respondents.

Table 1. Age and gender distribution of the respondents

	Frequency	Percentage
Age (Years)		
15 – 30	10	4.3
31 – 60	165	71.1
> 60	57	24.6
Gender		
Female	118	50.9
Male	114	49.1

Source: Field survey, 2018.

Figure 3 shows the distribution of the respondents' annual income. The highest number of respondents (71) which constitute 30.6%, earned income less than or equal to ₦180,000 per annum. This was followed by the group that earned ₦1,000,000 and above per annum (51 respondents) constituting 21.9% and the group in the income range of ₦500,000 – ₦990,000 (44 respondents) which is 18.9%. The group that was the least fell within the income bracket of ₦190, 000 – ₦490, 000 per annum with 39 respondents made up 16.8% of the population. The respondents who did not specify their earned income were 27, which is about 11.6 percent of the study population.

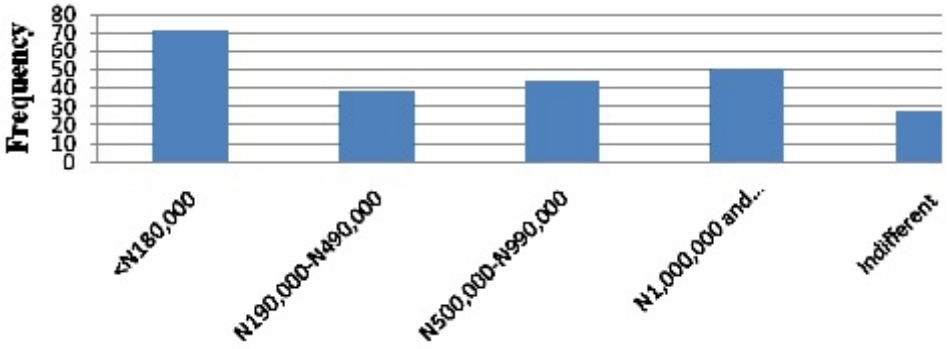

Figure 3. Distribution of Respondents' Estimated Annual Income

Source: Field survey,2018.

Table 2 shows the percentage distribution of respondents based on their perception of the effect of hypertension spending on income. Most of the respondents (84.9%) said "Yes" to the question relating to whether or not hypertension has an effect on the income of the individual patients.

Table 2. Distribution of respondents' perception on the effect of hypertension spending on income

Effect	Frequency	Percentage
No	35	15.1
Yes	197	84.9
Total	232	100

Source: Field survey, 2018.

Table 3 provides the distribution of respondents on enrollment in any government intervention programme in curtailing hypertension. The results show that the majority of the respondents (77.6%) were not enrolled in any government intervention for curtailing hypertension. The remaining respondents, which is 22.4 percent of the population of the study, were enrolled in government intervention programmes such as National Health Insurance Scheme (NHIS) in curtailing hypertension.

Table 3. Distribution of respondents enrolled in any government intervention programme in curtailing hypertension

Enrollment	Frequency	Percent
No	180	77.6
Yes	52	22.4
Total	232	100

Source: Field survey, 2018.

4.2 Annual average attributable costs and catastrophic spending per patient

The components of attributable cost used in this study are: monthly spending on drugs, transportation cost to hospital, consultation and diagnosis fee. The attributable money spent by the respondents is presented in table 4. It is observed that the minimum average of individual monthly spending is ₦12,090.51 while annually the individual patient spent ₦145, 086. 12 on the average. The total annual average was derived by taking the respective individual spending on drugs and transportation cost, which varies among individual patients depending on the type of drugs and the patient's location. The diagnosis fee was taken as a fixed amount which is paid once, while the consultation fee is assumed to be paid at least four times in a year at the time of visits for consultation annually. The total cost was obtained by taking the sum of the product of the 232 respondents' cost of consultation and diagnosis and the product of the cost of drugs of 220 respondents who know the cost of their medications. Patients with similar spending were grouped in the same class. To obtain the average monthly spending of the individual patients, the sum of the columns of the 7th row which are C3+C4+C5+C6 = C7, where the Cs represent columns as given in the above table 4. The total average annual individual spending on hypertension is

estimated by multiplying the individual average monthly spending by 12 as presented in the 8th row of column seven (C7)

Table 4. Computation of Average Annual Spending Attributable to Hypertension per Individual

C1. Ave. Unit Cost of Drugs (₦)	C2. No. of Respon-dents	1*2 = C3 Total Cost of Drugs (₦)	C4. Diagnosis fee (₦)	C5. Consultation Fee (₦)	C6. Ave. Transport cost (₦)	C7. Grand Total Ave. Annual Spending (₦)
3000	95	285000	20,000(231)	808.20(4)	550(99)=54,450	
8000	51	408000			1,550(56)=86,800	
13000	36	468000			2,550(35)=89,250	
18000	38	684000			5,450(17)= 92,650	
Total	220	1845000	462000	3232.8	408350	
Ave. Monthly Spending		C3 total/C2 total = 8,386.36	C4total/231= 20,000/12= 1,667	C5 total/12 = 269.40	C6 total/231 =1,767.75	12090.51
Total Ave. Annual Spending					C7*12	**145086.12**

Source: Field survey 2018/Authors' computation.

To determine whether or not individual spending on hypertension is a burden or not, the study estimated the ratio of out-of-pocket spending on hypertension to the income of the individual patients and further determined if spending on hypertension is catastrophic to patients. Catastrophic spending is defined as out-of-pocket spending for healthcare that exceeds a certain proportion of a household's income with the consequence that a household suffers the burden of disease (Ekman, 2007). The common thresholds to determine whether an individual's spending is catastrophic or not are 10% of total income or 40% of non-food income (Xu, Evans, Carrin & Aguilar-Rivera, 2005; Wagstaff & Doorslaer, 2003). Also, a household is said to have been impoverished when the patients' medical expenditure has caused the individual to fall below the poverty line. Xu et al. (2005) measured catastrophic spending based on capacity to pay and used 40% as the benchmark to which out-of-pocket spending on health may attain before it is regarded as catastrophic. Wagstaff and Doorslaer (2003) calculate catastrophic spending as the percentage ratio of total individual income

spending on health for a household *i* (*Ti*) to total expenditure on food for household *i* (*Xi*), that is,

Ti/Xi

where:

Ti = total out-of-pocket spending on health

Xi = total income (equal total expenditure less food expenditure).

In this study, our *Xi* is defined as the total annual income of the patients . This is calculated thus:

i. Catastrophic spending (CS) of patients with income less than ₦180,000/annum = Ti/Xi*100 = 145,086.12/180,000 × 100 = 80.60% .

   This result indicates that patients in the income bracket of less than ₦180,000 per annum spend about 80.6% of their annual income on the average which is greater than both 10% and 40% that are the lower and upper thresholds respectively (see Xu et al., 2005; Wagstaff & Doorslaer, 2003). This implies that hypertension-related expenditure is catastrophic to respondents with the lowest income who constitute 30.5% of the respondents. This shows that the low-income earner who undertakes out-of-pocket spending to curtail hypertension is more likely to experience significant burden of hypertension and also likely to be impoverished by the disease. This explains the reported cases of death of pensioners who are not paid their pensions regularly.

ii. Catastrophic spending (CS) of patients in the average annual income group of ₦340,000 = 145,086.12/340,000 ×100 = 42.67%. This implies that the attributable spending of members of this group (about 16.7% of the respondents) as presented in table 4 is catastrophic as the CS is greater than both thresholds of 10% and 40%.

iii. Catastrophic spending (CS) of patients with average annual income of ₦745,000 = 145,086.12/745,000 × 100 = 19.47%. This shows that those in this income group, who constitute 18.9% of the respondents as presented in table 4 undertake catastrophic spending as their CS is about 9.5% greater than the lower threshold but less than the higher benchmark of 40%. This indicates that the wealthier an individual becomes the less likely he or she

is to experience catastrophic spending and the less likely to experience burden of disease that may impoverish him/her.

iv. Catastrophic spending (CS) of patients with the average annual income of ₦1,000,000 = 145,086.12/1,000,000 = 14.51%. This signifies that about 21.9% of the respondents as presented in table 4, have catastrophic spending of about 4.5% (i.e. 14.5% -10%) indicating that the higher the income of the patients, the less the likelihood to experience catastrophic spending and be impoverished by out-of-pocket spending.

4.3 Discussion of logistic regression results

The results of the logistic regression are shown in table 5.

Table 5. Summary Presentation of Estimated Logistic Results of the Three Models

	B	SE	Wald	Exp(β) OR	Sig. (P-value)
Model 1. Income Effect of Hypertension (Dependent) variable					
Constant	4.22	1.22	11.959	68.052	0.001*
Age	-0.027	0.016	2.89	0.973	0.089**
HLHY	-0.151	0.145	1.083	0.86	0.298**
DHL	-0.337	0.161	4.396	0.714	0.036*
HMDM	0.354	0.166	4.567	1.425	0.033*
Summary Stat.					
-2Loglikelihood(-2LL) =182.961; X^2= 13.869,df=4, p<0.008; Nagelkerke R^2=0.101(10.1%);					
Classification accuracy = 84.9%					
Model 2. Productivity effect of hypertension (Dependent variable)					
Constant	2.772	0.963	8.283	15.997	0.004*
DDUA	-1.713	0.589	8.453	0.18	0.004*
INDN	-0.115	0.085	1.803	0.892	0.179**
DHL	-0.197	0.092	4.563	0.821	0.033*
HMDM	0.46	0.116	15.602	1.583	0.000*
AC	-0.535	0.3	3.188	0.586	0.074**
Summary Stat.					
-2Loglikelihood= 288.313; X^2=31.581,df=5,p<0.000; Nagelkerke R^2=0.170(17.0%);					
Classification accuracy=65.5%					

	B	SE	Wald	Exp(β) OR	Sig. (P-value)
Model 3. Saving effect of Hypertension (Dependent variable)					
Constant	3.381	3.381	8.443	29.414	0.004*
DHL	-0.199	0.126	2.493	0.082	0.114**
HMDM	0.345	0.15	5.287	1.413	0.021*
IYHM	-0.154	0.117	1.739	0.857	0.187**
AC	-0.59	0.374	2.481	0.554	0.115**
Summary Stat.					
-2loglikelihood =194.218; X^2=28.225,df=6, p<0.000; Nagelkerke R^2=0.186(18.6%);					
Classification accuracy= 81.9%					

Source: SPSS output and Authors' computation.

4.3.1 *Discussion of Results*

In model I, which estimates the income effect of hypertension, the coefficient of days hospitalized due to hypertension (DHL) (β = - .337, p < 0.05) suggests a negative relationship between the income of the patient and days hospitalized. Therefore, taking the antilog of the slope coefficient of DHL, calculated as the Exp (B) column (the odds ratio), indicates that patients whose cases are chronic are by 0.714 or 1- 0.714 (29%) more likely to be exposed to adverse income effects than those who do not have chronic hypertension. This is statistically significant at 5% level. The effect of age (β = -0.27, Wald Stat.=2.890, p>0.05) implies a negative relationship between the age and income of the patients. The odds ratio (OR) indicates that patients aged 31 to 60 years are 0.973 or 2.7 % more likely to be vulnerable to hypertension and spend more of their income than those below and above that age bracket.

The length of time that the patient has been diagnosed with hypertension (HLHY) (β= -0.151, Wald stat.= 1.083, p > 0.5) indicates that there exists a negative relationship between the income of the patient and the duration since the patient was diagnosed with hypertension, but was non-significant at 5% level.

The amount spent on drugs monthly (HMDM) (β= 0.354, Wald stat. = 4.567, p < 0.05) indicates that a direct relationship exists between the amount spent to have good health (HMDM) and the income of the patient. This is statistically significant at 5% level. Therefore, the odds ratio denotes that patients who spend more on drugs are 1.425 or 43% more likely to have stable growth in their

income than those patients who do spend less on drugs monthly in the control of hypertension. This implies that an increase in monthly spending on drugs contributed to a growth in the income of the patient. This may be because the more expensive drugs are more efficacious than the less expensive ones and make it possible for the patient to be more productive as the health improves, thereby earning more income. The immediate health-care sought by spending on drugs to curtail the disease of hypertension improves the productivity of individual and avails the patients a more healthy life to improve his income. This confirms the findings of Gardner and Gardner (undated) and Bloom et al. (2004) which demonstrate that government intervention to support the purchase of more expensive drugs will be beneficial to the patients as effective drugs improve health and in turn the productivity of patients.

However, the estimated results from model 2 showed that change in the cost of hypertensive drugs negatively affected productivity. The predictor concerning efficiency of drugs in controlling hypertension (DDUA), $\beta = 1.713$, Wald stat.= 8.453, $p <= 0.05$, indicating a negative relationship between the cost of efficacious drugs and productivity of individuals. It is statistically significant at 5% level. The odds ratio of Exp.(B)=0.180(82.%) indicates that patients who react to increases in the price of a prescribed drug by reducing its intake are more likely to have their productivity decline by approximately 82% than those who continued taking them as prescribed. This provides adequate evidence to support the alternative hypothesis that there is a significant relationship between the burden of hypertension and the productivity of patients and rejecting the null hypothesis of the study.

The effect of the type of drugs used by patients (INDN) $\beta = - 0.115$, Wald sta.=1.803,$P >= 0.05$ shows a negative relationship between type of drugs taken and productivity of individual but non- significant at 5% level..

Again the variable representing the days patient is hospitalized due to hypertension (DHL) is $\beta = - 0.197$, Wald Stat.=4.563,$P = 0.033$, which is less than 0.05(5%), implies a negative relationship between days patient is hospitalized and productivity. It is statistically significant at 5% level. The odds ratio of the parameter is calculated as Exp(B)= 0.821(18%), which indicates that patients who are admitted in hospital for long periods owing to hypertension are 18% more likely to have their productivity decline than those who are admitted for short periods or not admitted at all.

However, the effect of amount spent on drugs monthly (HMDM) is β = 0.460, Wald Stat. =15.602, $p < 0.05$, which is less than 0.05(5%), showed that the amount spent on drugs monthly to have improved health led to an increase in the productivity of the patient by 0.460. This indicates a positive relationship between the amount hypertensive patients spend on drugs monthly and their productivity. It is statistically significant at 5% level. The odds ratio of Exp(B) =1.583 (58.3%) which denotes that patients who spend high amounts on drugs monthly to curtail their blood elevation are approximately 58% more likely to have their productivity enhanced than those who do not spend on drugs monthly to curtail their blood elevation.

AC is used to capture the distance covered by the patients to the hospital and the area council in which the hospital is situated. Therefore, the estimated result of AC is β = - 0.535, Wald Stat =3.188, P = 0.074, which is greater than 0.05(5%) and depicts that distance covered by the patient negatively impacted productivity, reducing it by 0.54%. It is however not significant at 0.05% level. Therefore, the odds ratio of Exp(B) = 0.586(41.4%) calculated shows that patients who travel long distances to the hospital to seek health care are 41.4 % likely to have their productivity decline than those patients who travelled short distances.

Model 3 of the savings effect of hypertension indicates that (DHL) β = -0.199, Wald Stat.=2.493, P =0.11 is greater than p-value of 0.05(5%) indicates negative relationship between the days hospitalized due to hypertension and the savings level of the patients but non-statistically significant at 5% level. The odd ratio(OR) of 1-0.0820 calculated gives 0.918(91.8%) indicating that patients who spend more days in the hospital are likely to have their saving decline more than patients who spend less days in the hospital owing to hypertension

The amount spent on drugs monthly (HMDM) was β=0.345, Wald Stat =2.493 with p value = 0.021 and statistically significant at 5% level implying that higher monthly spending on hypertensive drugs increased the individuals savings. This shows by its odd ratio of 0.413(41.3%) calculated that patients who spend more on drugs monthly are likely to have improved health that increases their savings more than patients who spend less on drugs and have their health complicated thereby increasing spending which leads to decline in savings.

Again, out-of- pocket spending variable denoted by (IYHM) was β = -0.154, Wald Sta. = 1.739, with P – value > 0.05. This means that out-of-pocket

spending by the patients led to a 0.154 decrease in savings. It is however, not statistically significant at 5 %. The odds ratio of 0.143(14.3%) shows that patients who spend more out of pocket are likely to have their savings decline more than patients who spend less out-of-pocket.

Area council (AC), as one of the explanatory variables proxied as distance covered to hospital is β= -0.590, Wald Stat. = 2.481, with P – value > 0.05 indicates that distance covered by patients impacts negatively on their savings as it leads to about 0.590 decrease. This is also not statistically significant at 5% level. However, the odds ratio of 0.44(44.6%) indicates that patients who covered long distances to hospital were likely to have their savings decline more than patients who covered short distances as that involved more time and money, which led to reduction in savings.

5. Conclusion

The study investigated the economic burden of hypertension in Nigeria and sought answers to the following questions: does hypertension have any effect on the income of affected person?; Is there any relationship between the burden of hypertension and productivity of the patients?; Does hypertension have any effect on the savings level of affected individual?; It used descriptive analysis and logistic regression equations to estimate the effects of hypertension on the income, productivity and savings of the individual patients.

The study revealed that hypertension poses a burden to the sufferer as it leads to catastrophic spending, especially in the case of low income earners who may have their income reduced below the poverty line and are not on any government intervention programme. However, the study revealed that spending on drugs monthly to achieve good health enhances productivity, income and savings of individuals, while discontinuation of a specific drug regimentation as a result of higher cost of drugs results in low productivity and low savings. This finding is in line with that of Bloom et al. (2004).

Again, it was established by the study that out-of-pocket spending undertaken by patients, negatively impacted on their savings. However, this finding was not statistically significant due to the fact that spending is relative to individual income.

These findings reveal that the economic burden of hypertension among hypertensive Nigerians is becoming a public health challenge that affects not only the income of the patients but also their productivity and savings which, by extrapolation, has adverse effects on overall economic growth and development of nations. However, if patients are assisted to maintain their drug regimentations as prescribed, their productivity will be enhanced and the adverse consequences will be mitigated. It is therefore recommended that both government and other health-care providers like non-governmental organisations (local and international) should increase efforts to incorporate into their health policy and planning programmes to check the economic burden resulting from hypertension. This may entail counselling, establishing community health centers, National Data Survey on Hypertension (NDSH) so as to monitor the trends of hypertension, and financial intervention measures to encourage patients to keep to their prescribed drugs and attend regular check ups. Also creating awareness on the consequences of not keeping to drug regimentation, and the benefits of lifestyle changes will stem the tide of hypertension epidemiology and reduce poverty caused by catastrophic spending in Nigeria.

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