ORIGINAL ARTICLE

Prevalence of newly diagnosed high blood pressure among female adults aged 18 to 50 years in south western Nigeria

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Abstract

Background: High blood pressure is well known as a significant determinant for the development of cardiovascular disease and a major cause of death globally. It usually shows no symptoms thus the term 'Silent Killer'. Scientific investigations reveal that women diagnosed with elevated blood pressure levels are particularly vulnerable to experiencing a faster decline in kidney function compared to their male counterparts. *Aim and Objectives:* This research study aimed to evaluate the prevalence of high blood pressure in females who are oblivious to their blood pressure condition. *Material and Methods:* A semi-structured questionnaire was completed by 280 females who came for a free medical outreach in the Ikenne Local Government Area. Blood pressure was obtained in compliance with standard procedure Data were evaluated and shown as numbers and percentages for categorical variables while continuous variables were represented as average mean and standard deviation. The relationships among data variables were assessed using linear regression and ANOVA with the level of significance at $p < 0.05$. *Results*: The mean age of the participants was 38.75 ± 9.18 years. Around 24% of people in this research had elevated blood pressure levels. The average values for both systolic and diastolic blood pressure were 125.74 ± 21.53 mmHg and 76.59 ± 13.77 mmHg, respectively, with a significance level of $p < 0.05$. A significant correlation was identified between systolic blood pressure and both age ($r = 0.260$, $p < 0.05$) and body mass index ($r = 0.197$, $p = 0.02$). *Conclusion*: Elevated blood pressure levels are still prevalent among females in south-western Nigeria. It can be linked to contributing factors like body mass index and age. Therefore, public health agencies, as well as health care practitioners, can deliberate on health policies prioritizing the reduction of this deadly disease condition among females by providing proper monitoring and effective management as well as encouraging routine blood pressure checks.

Keywords: Newly Diagnosed, High Blood Pressure, Prevalence, Systolic Blood Pressure, Diastolic Blood Pressure

Introduction

High blood pressure is universally considered to be the major predisposing factor for the aetiology of Cardiovascular Disease (CVD), which is one of the major determinants of mortality globally [1]. It represents one of the key international health challenges that are widespread among the ageing and rising population which has been proven to cause damage to numerous organs, including the heart, arteries, brain, eyes, and kidneys [2]. Hypertension is a significant noncommunicable disease and a modifiable contributing factor for cardiovascular disease. Poor regulation of blood pressure levels can be attributed to various factors, including a lack of treatment adherence [3]. Hypertension is responsible for about 40% of the incidence of stroke, about 39% of myocardial infarction incidence, and about 28% of most late-onset renal illnesses in women [4]. Worldwide, research indicates that approximately 25% of adults are impacted by it [5]. In contrast to the pattern observed in advanced nations, Nigeria and other nations with Low or Middle Incomes (LMICs) tend to be the most affec-

ted, with comparatively greater case counts and lower rates of awareness, care, and prevention. In semi-urban areas of southwest Nigeria, the percentage of women with hypertension ranges between 10.0% and 47.3% [6]. Blood pressure is recorded in millimeters of mercury (mmHg), and levels persistently exceeding 130/80 mmHg must be controlled since untreated hypertension can elevate the dangers of severe health issues [7].

Several individuals with high blood pressure are asymptomatic, even when their blood pressure measurements are severely high, this is because high blood pressure might be asymptomatic for an extended period, however, this is dangerous [8]. Although there is an established association between increased blood pressure and cardiovascular illness, the diagnostic, therapeutic, and management options for hypertension may require heightened prioritisation, particularly in women [9]. This study aimed to determine the prevalence and extent of awareness of blood pressure levels of women in South Western Nigeria. This will offer valuable insights that will assist with the effective management of this disease, which has already become a pandemic.

Material and Methods

Study design and setting

The study utilized a cross-sectional design and was conducted across three rural communities in South-West, Nigeria. Two of the communities were from Ikenne local government they were Ilishan-Remo, Ogun State, and Iperu-Remo, Ogun State. The third community was Ede, Osun State. This research was carried out during a medical outreach conducted for one week at each location by Vision Centre Medical Outreach, a non-governmental organization. One of Ogun State's current local council areas, Ikenne Local Government Area is situated in the southwest of Nigeria in an area known for its tropical rain forest. Ede Local Government in Osun State, Nigeria, is located in the southwestern part of the country. The town is positioned along the Osun River on the Lagos railroad, about 180 kilometres southwest. It is located where roads from Osogbo, Ogbomosho, and Ile-Ife meet, in the Guinea Savannah zone at 7° 40′ North latitude and 4° 30′ East longitude.

Sample size

Daniel's formula [10] was utilized to compute the appropriate calculation of sample size, as shown below

$$n=\frac{Z^2 P(1-P)}{d^2}$$

$$n=\frac{1.96^2\times 0.213\times(1-0.213)}{0.05^2}=258$$

n represents the sample size; Z stands for Z statistics for a confidence level of 95%, with Z=1.96; P is the anticipated prevalence or proportion derived from prior research conducted by Ordinioha [11]; d = precision of 5%, d = 0.05.

Study participants

This is community-based descriptive cross-sectional study. A purposive sampling technique was utilized in selecting 238 female participants aged 18 to 50 years who were not previously diagnosed with hypertension and signed the written informed consent. Females with chronic diseases such as stroke, heart disease and dementia, pregnant women, females with severe acute illness during screening, were excluded.

Data collection

The participant's data were obtained and study factors were captured using a structured questionnaire consisting of a section for socio-demographic characteristics which included gender, age,

nationality, state of origin, hypertensive parents, hypertensive relatives, hypertension diagnosis, and hypertensive medication. Another section for lifestyle and dietary patterns included a section on physical activities and dietary recall. The information collected from the survey comprised: demographic details, weight, height, waist circumference, as well as participant's systolic and diastolic blood pressure. Blood pressure measurements were done once the participants had been seated and allowed to rest for at least 5-10 minutes. Measurement was done on the left arm using an aneroid sphygmomanometer. Blood pressure was categorized following the Seventh Joint National Committee Criteria [12];

Normal: Systolic BP < 120 mmHg, Diastolic BP < 80 mmHg

Pre-hypertension: Systolic 120-139 mmHg, Diastolic BP 90-99 mmHg

Stage 1 Hypertension: Systolic 140-159 mmHg, Diastolic BP 90-99 mmHg

Stage 2 Hypertension: Systolic > 160 mmHg, Diastolic BP > 100 mmHg

The measurement was taken two times and the mean was noted. A scale was utilized to determine the weight; it was placed on a flat surface and noted to the nearest 0.1 kg.The height of the participants was measured while standing straight against a wall without shoes, with their backs and heels contacting the wall. A collapsible metal ruler was utilized for the measurement of height, with the highest point of the subject's scalp being recorded to the nearest centimetres. Obesity was characterized by the Body Mass Index (BMI) which was measured in kilograms per square meter (kg/m^2). The BMI was grouped usingthe guidelines of the Centre for Disease Control and Prevention [13]. Participants were regarded as physically active if they engaged in purposeful physical activities which included brisk walking, skipping, and running for a minimum of about thirty minutes, on at least three occasions per week.

Data analysis

Statistical Package for the Social Sciences (SPSS) version 22.0 was used to assess the data obtained for this study. Categorical variables were presented as frequencies and corresponding percentages, while continuous variables were expressed as means with standard deviations. Relationships between variables were examined using linear regression analysis, with statistical significance set at $p < 0.05$.

Ethical consideration

The Babcock University Health Research and Ethical Committee approved this study (BUHREC 879/22). The participants provided informed verbal and written consent. Throughout the study, participant confidentiality and information were protected.

Results

Socio-demographic characteristics of the participants

Table 1 shows that a total of 238 female participants from the ages of 18 to 50 years took part in this study. Most participants in this study fall within the age range of 41-50 years old (25.3%), while the age group 26-30 has the smallest representation (10%). Only 39.6% of the participants were physically active, 20% knew a parental history of hypertension and 15% knew their other relative's history of hypertension. Only 1.4% of the individuals consumed alcohol, and none of the participants smoked. About 87.1% of participants were not on any specific or regulated diet, while 18.9% of the participants frequently added salt to already prepared food.

Table 1: The sociodemographic characteristics of participants (n=238)

Variables	Number (%)
Age (Years)	
18-25	29 (12.2)
26-30	24 (10.1)
31-35	28 (11.8)
36-40	39 (16.4)
41-45	60 (25.2)
46-50	58 (24.3)
Physical activity	
Active	90 (37.8)
Inactive	147 (61.8)
Awareness of parents' history of hypertension	
Yes	50 (21)
No	188 (79)
Awareness of other relatives with hypertension	
Yes	36 (15.1)
No	202 (84.9)
Smoking Status	
Yes	0 (0)
Never	237 (99.6)
Ex-smoker	1 (0.4)
Alcohol	
Never	221 (92.9)
Rarely	12 (5.0)
Weekly	3 (1.3)
Daily	2 (0.8)
Regulated Diet	
Vegetarian Diet	6 (2.5)
Lacto-vegetarian	2 (0.8)
Low salt/sodium	5 (2.1)
Weight loss	10 (4.2)
Low cholesterol	6 (2.5)
Sugar-free	2 (0.8)
None	207 (87.0)
Add salt to already prepared food	
Very often	43 (18.1)
Occasionally	29 (12.2)
Rarely	5 (1.8)
Never	161 (67.6)
Preferred food type	
Boiled	214 (89.9)
Fried	21 (8.8)
Oven-baked	3 (1.3)

Continued...

Vegetarian Diet: excludes all meat, poultry, and fish but may include dairy and eggs, Lacto-vegetarian: Includes dairy products but excludes eggs, meat, poultry, and fish, Low salt/sodium: Diet consciously limited in table salt and processed foods high in sodium. Weight loss: Diet specifically chosen or modified to promote body weight reduction. Low cholesterol: Diet low in saturated fat and cholesterol-rich foods (e.g., egg yolk, red meat).Sugar-free: Avoids added sugars; may use natural or artificial sweeteners.

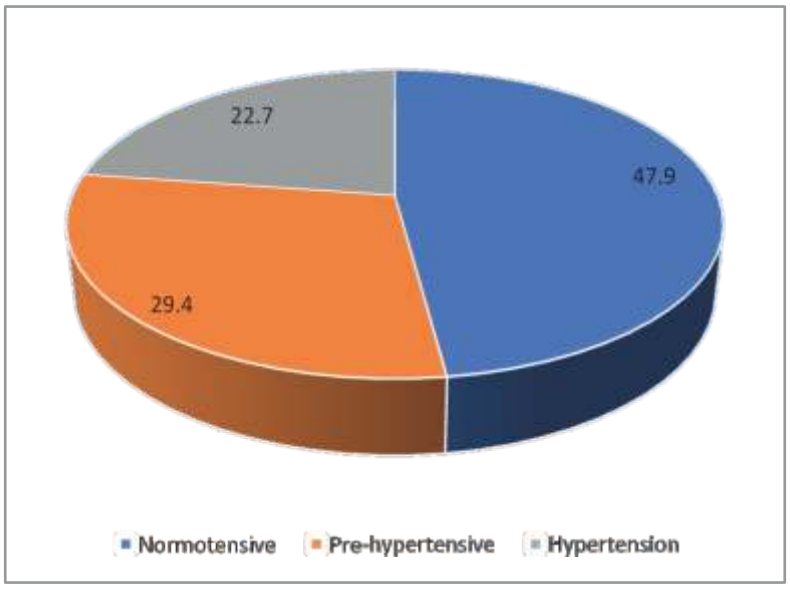

Figure 1: Prevalence of hypertension in south west, Nigeria

Prevalence of hypertension and participants blood pressure and BMI

The prevalence of high blood pressure, pre-hypertension and normotension was observed to be 22.7%, 29.4% and 47.9% respectively as represented in figure 1. The average systolic and diastolic blood pressures, as shown in Table 2, were 125.0 ± 21.59 and 76.22 ± 13.98, respectively. The mean BMI of the participants was 26.50 ± 7.24.

Table 2: Blood pressure and weight measurements of participants

Variables	Mean ± SD	Minimum	Maximum	CI (95%)	*p*
Systolic Blood Pressure (mmHg)	125.0 ± 21.59	64	188	123.23-127.56	0.01
Diastolic Blood Pressure (mmHg)	76.22 ± 13.98	39	123	74.54-78.03	0.01
BMI (Kg/m^2)	26.50 ± 7.24	14	65.67	25.36-27.04	0.01
Waist hip ratio	0.85 ± 0.08	0.70	1.00	0.834-0.886	0.05

The results are presented as Mean± Standard Deviation and Confidence Interval.

Table 3: Systolic and diastolic blood pressure levels among participants based on their different BMI categories

BMI	Normotensive n (%)	Pre-hypertensive n (%)	Hypertensive n (%)	χ^2	*p*
Systolic Blood Pressure (mmHg)					
Underweight	18 (6.4)	5 (1.8)	2 (0.7)	27.22[a]	0.02
Normal weight	57 (20.4)	34 (12.1)	21 (7.5)		
Overweight	25 (8.9)	26 (9.3)	22 (7.9)		
Obesity	29 (10.4)	19 (6.8)	11 (7.9)		
Diastolic Blood Pressure (mmHg)					
Underweight	20 (7.1)	5 (1.8)	0 (0)	26.489[a]	0.15
Normal weight	75 (26.8)	22 (7.9)	15 (5.3)		
Overweight	43 (15.4)	16 (5.7)	14 (5.0)		
Obesity	43 (15.4)	12 (4.6)	14 (5.0)		

Socio-demographic factors associated with participants' blood pressure status

The percentage of hypertensive participants who had a positive history of parents with hypertension was 34.0%.The age range 41-45, had a higher percentage of individuals with hypertension (41.4%) compared to the age range 18 -25 which was 1.1%, a strong correlation was found between age and having hypertension ($p < 0.05$).

Association between age and blood pressure levels

Figure 2 displays the correlation between participant's age and systolic blood pressure levels, while figure 3 illustrates the connection between participants' age and their diastolic blood pressure**.**

Correlation between BMI and blood pressure levels

Figure 4 shows the correlation between participant's BMI and systolic blood pressure levels, while Figure 5 shows the relationship between participants' BMI and their diastolic blood pressure.

Table 4: The relationship between selected socio-demographic factors and hypertension status

Variables	Normotensive n_1 (%)	Pre-hypertensive n_2 (%)	Hypertensive n_3 (%)	χ^2	*p*
Age range (Years)					
18-25	23 (8.2)	9 (3.2)	3 (1.1)	39.890	0.002
26-30	16 (5.7)	7 (2.5)	5 (1.9)		
31-35	17(6.1)	10 (3.6)	17 (1.1)		
36-40	19 (6.8)	18 (6.4)	9 (3.3)		
41-45	29 (10.4)	21 (7.5)	20 (7.1)		
46-50	25 (8.9)	19 (6.8)	26 (9.3)		
Parent history of hypertension					
Yes	19 (34.0)	19 (33.9)	18 (32.1)	9.611	0.022
No	48 (21.4)	65 (29.0)	111 (49.6)		
Relatives with hypertension					
Yes	13 (31.0)	15 (35.7)	14 (33.3)	5.609	0.132
No	54 (22.7)	69 (29.0)	115 (48.3)		

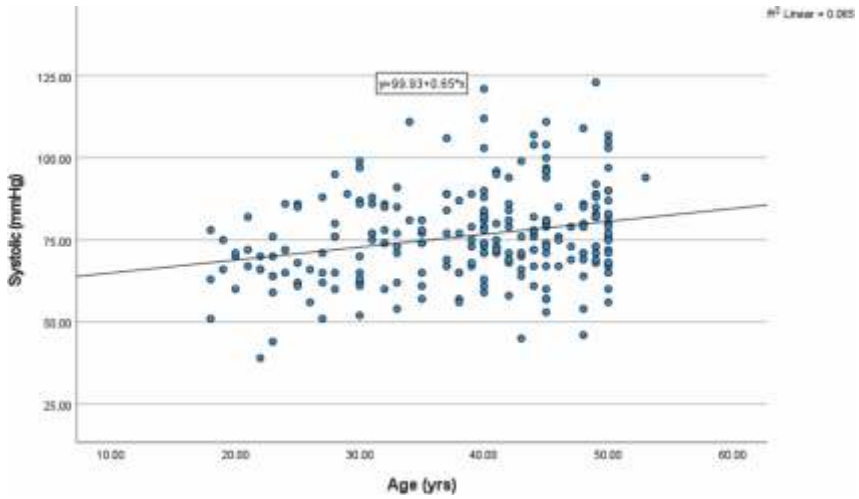

Figure 2: Correlation between age and systolic blood pressure among participants

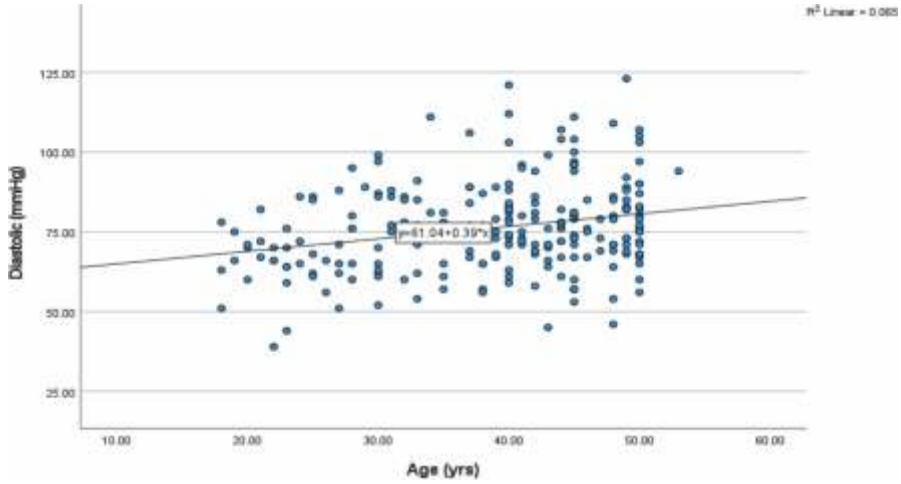

Figure 3: Correlation between participants diastolic blood pressure and age

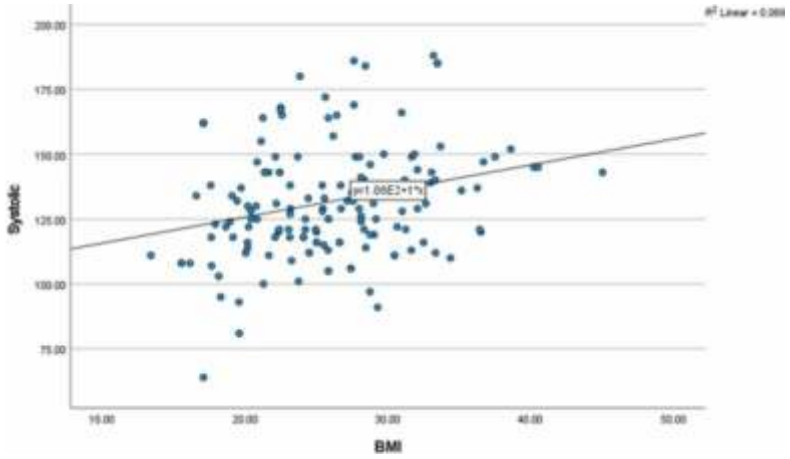

Figure 4: Correlation between participants systolic blood pressure and BMI

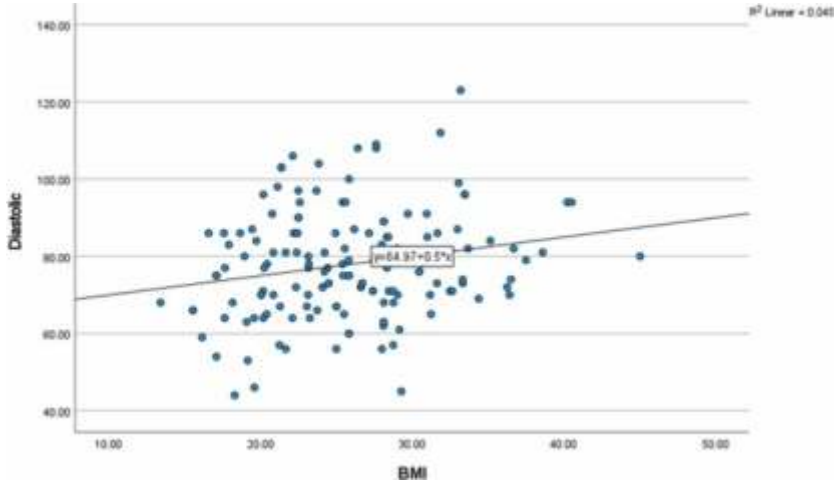

Figure 5: Correlation between Participants Diastolic Blood Pressure and BMI

Discussion

Hypertension has been on the rise for the last 20 years, particularly in Nigeria, where awareness levels remain low. This study found that 24% of participants had high blood pressure. In research carried out across several communities in sub-Saharan Africa, most females with elevated blood pressure lack awareness of their condition, with unawareness being more common among women compared to men [13]. The rise in prevalence of hypertension from about 8.2% in 1990 to about 32.5% in the year 2020 has been documented in Nigeria [14].Research conducted within a locality in Lagos state, Nigeria reported a prevalence rate of 35.3% for hypertension [15]. In Rivers state, Nigeria, the prevalence of hypertension was reported as 33.4% [16]. In this study, the proportion of physically active participants was low. In Nigeria, physical activity is declining, posing a threat to health by leading to different co-morbidities [17]. This is because physical activity plays an important role in preventing certain non-communicable diseases like diabetes and hypertension as observed in a systematic study carried out by Adeloye and colleagues [18], it was shown that the number of inactive individuals in Nigeria has increased over the years from 14.4 million to 48.6 million within the years 1995 and 2020.

In this research, about 18.9% of participants added salt to already prepared food. This act is very deleterious to the health and it raises the likelihood of heart-related illnesses. This is in agreement with the results of a study conducted by Ma and his team [19], which indicates that decreasing salt consumption can reduce the risks of developing heart problems. Therefore, the excessive consumption of salt is seen to be linked with hypertension and such individual has a higher chance of cardiovascular disease mortality and morbidity. Individuals should be encouraged to minimize the intake of sodium in the diet.

In this study, the average diastolic blood pressure was 76.59 mmHg with a standard deviation of 13.77 and the average systolic blood pressure was 125.74 mmHg with a standard deviation of 21.33. According to research by Wright and colleagues [20], all age groups in the study had average systolic and diastolic blood pressures of 122 mmHg and 71 mmHg, respectively. Another study on hypertension found that the average systolic and diastolic blood pressure levels were 116.26 ± 15.13 mmHg and 74 ± 9.65 mmHg, as well as 116.71 mmHg ± 13.58 and 78.80 mmHg ± 8.69 [21]. The average BMI in this study is noted to be 26.19 kg/m^2. This is however above the healthy range. Other studies reported the average BMI of participants with hypertension to be 25.6 ± 4.3 kg/m^2 [30] and 25.8 ± 17.60 kg/m^2 [22]. In this study, an upward trend in the proportion of obese people with advancing age was observed. Age-related increase in fat accumulation was detected with increasing age up until the age of 60, indicating a steady rise in the prevalence of obesity from puberty through middle life [23]. This is in agreement with research carried out in China, where the highest percentage of obesity was seen from 40 years and above [24]. Other studies report a similar trend [25].

This study found a strong association between BMI and participant's blood pressure status based on systolic blood pressure measurement. The largest

percentage of participants with hypertension were overweight. This occurs because a major factor that increases the likelihood of developing non-communicable diseases such as hypertension is BMI. A likely cause for this occurrence is that in obese hypertensive individuals, elevated and aberrantly distributed free-fatty acid levels were found, which boosted vascular α-adrenergic sensitivity and, in turn, increased α-adrenergic tone [26]. Elevated insulin levels, activation of the renin-angiotensin-aldosterone system, increased sympathetic nervous system activity, abnormal adipokine levels, including leptin, and an altered cytokine spectrum affecting the vascular endothelial level may all contribute to a rise in high blood pressure levels in obese people [27].

Age and blood pressure have a clear association, with blood pressure rising as people age. Blood pressure is usually associated with age. An increase in blood pressure is an important cardiovascular contributing factor that can be reduced on a global scale in obesity. This occurrence can be linked to the fact that ageing is a continual and progressive process which leads to a reduction in the physiologic function across the various organ systems resulting in an increased exposure to infection and disease leading to a high mortality risk [28]. In various studies, age was seen to possess a consistent positive and linear association with systolic blood pressure [29]. The primary root cause of this condition is the gradual changes in vascular structure and function that come with ageing. The progressive stiffness of significant arteries, especially the aorta, as a result of arterial calcification, increased collagen deposition, and elastin fibre fragmentation is one of the main causes [30].

Limitation

The questionnaire was designed in English and a major percentage of the participants could not read in English, therefore, an interpreter was employed in the course of this study. Some important information would have been communicated wrongly.

Conclusion

The study identified key factors contributing to hypertension among participants, including age, gender, and a family history of hypertension. BMI, alcohol consumption, and a high-salt diet are also influential factors in the onset of hypertension. The high incidence of high blood pressure and the increased mortality risk associated with it are major concerns for the health sector. Therefore, public awareness on ways to control this disease condition should be done regularly, individuals should be advised to be physically active as well as maintain a healthy BMI, low salt intake as well a healthy diet should be encouraged.

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