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FACTORS ASSOCIATED WITH UNCONTROLLED BLOOD PRESSURE AMONG PATIENTS WITH CHRONIC HYPERTENTION AT NEMBA DISTRICT HOSPITAL RWANDA.

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Abstract

Hypertension is a condition marked by elevated blood pressure, defined by a systolic value of ≥ 140 mmHg or a diastolic value of 90 mmHg or higher. It is the leading risk factor for mortality associated with cardiovascular diseases (CVD) globally. The findings from this study provided useful information and knowledge that would support decision-makers and healthcare providers by supplying knowledge on factors leading to poor blood pressure control. A cross sectional design was applied and a total of 407 participants selected. Probability sampling throughout systematic sampling technique was applied. The results of this study showed that five variables which are sex, age, education level, marital status and monthly income were statistically significant associated with uncontrolled blood pressure. The respondents aged between 40-55 years old and one aged 56 years old and above were more likely to have uncontrolled blood pressure [AOR=3.2; 95%CI=2.73-4.71 and $P < 0.001$] and [AOR=7.54; 95%CI=6.69-10.144 and $P < 0.001$] compared to respondents aged between <40 years old respectively compared to the respondents aged below 40 years old. The researcher recommended organizing the campaigns for the dissemination of information related to uncontrolled blood pressure for the community awareness.

Keywords: Blood Pressure, Chronic Hypertention, Nemba Hospital

Introduction

Hypertension (HTN) is a condition characterized by an increase of blood pressure (BP) above normal values. This means that systolic BP exceeds or equal to 140 mmHg and or diastolic blood pressure (DBP) is ≥ 90 mmHg (1). In 2020, an estimated 972 million people, including 639 million in developing countries was affected by hypertension. (2) Based on these data, the projections suggest that the number will increase by 60% in 2025. The World Health Organization reported that more than three quarters of global deaths related to cardiovascular diseases are from Low- and middle-income countries. (3)

Clinical survey conducted in Sapienza University in Italy shown that 32.5% of clinical worsening among uncontrolled hypertension was characterized by right intra ventricular desynchrony. Ventricular mechanical desynchrony is well-documented in cases of left ventricular (LV) failure, significantly impacting LV systolic performance. This desynchrony is a critical factor in cardiac resynchronization therapy, which has led to notable improvements in patients' functional capacity. Without appropriate medication to stabilize this condition, patient outcomes are often fatal. (4)

Hypertension is the most prevalent associated factor of mortality in Cardiovascular disease(CVD) cases worldwide. (5) All over the world, mainly from developing countries, the high number of hypertension cases while antihypertensive therapy clearly showed its contribution in reduction of cardiovascular and renal diseases. (6) According to the World Health Organisation (WHO), an approximate of one billion persons are living with uncontroled hypertension worldwide. (7) Many studies conducted from different countries shown that uncontrolled blood pressure is a common phenomenon occurred through various circumstances among hypertensive patients on treatment. Thus, blood pressure was controlled for only less than 50% of the hypertensive patients in Japan, 31.7% in Turkey, and 48% in Malaysia.(8)

A broad range of negative outcomes including heart attack, stroke and chronic kidney diseases could be established by uncontrolled blood pressure.(9) In Sub-Saharan Africa, it estimates 74.7 million individuals with hypertension, but the projection show an increase of 68% by the year 2025 with its great risk of cardiovascular diseases. (10) Consistent control of BP still challenging Africans where only 47.7% of the hypertensive patients on follow-up in Tanzania accomplished BP control, 35.9% in Uganda, 32.8% in Zimbabwe, 33.4% in Kenya, and 40.1% in Addis Ababa, Ethiopia.

In Rwanda, the prevalence of hypertension is lower than that of Africa. It was estimated between 15.3% and 17.5% among adult population compared to >30% in Africa. (11) According to Nahimana and his colleagues, their research findings revealed that the overall prevalence of hypertension stood at 15.3%.

Specifically, they noted 16.4% prevalence among males and 14.4% among females. (12) In their research, the Dukunde team determined that by 2025, the prevalence of hypertension is projected to rise to 17.82%, particularly influenced by factors such as tobacco use, overweight, or obesity. (13)

Therefore, it is with great importance to know the status of BP control, because it can inform policy makers and clinicians to design appropriate strategies in response of identified gap and there are no published data on poor blood pressure control at Nemba Hospital. In this regards, this study helped to assess the status of BP control and its contributing factors among adult hypertensive patients at NEMBA Hospital.

2. Materials and method

2.1 Study design

In this study, quantitative research was utilized using a cross-sectional study design as the framework to assess the prevalence of hypertensive patients with uncontrolled blood pressure, investigate the relationships between associated factors, and address the research questions posed by this study.

2.2 Study setting, population and sample size

The current study was carried out at Nemba District Hospital localized in Northern Province of Rwanda. Nemba District Hospital (NDH) is located in Gakenke District and belongs to the Catholic Church, Diocese of Ruhengeri. The study population of this study was 1875 hypertensive patients had been followed at NCDs Clinic of Nemba DH.

In this study, it assumed that margin of error was estimated at 5%. Therefore, our sample size for quantitative data was:

$$n = \frac{1875}{1 + 1875(0.05)^2} = 407 \text{ individuals}$$

2.3 Data Collection

To gather information on different variables as interested to, researchers used various tools of collection throughout an established systematic way which enabling to answer the research questions when evaluating an outcome. In this study, researcher used the data which were already in the patients' files. A designed questionnaire was used to record needed information from the respondents.

2.4 Data Analysis and Ethical Consideration

The process of data analysis began with data processing, which involved gathering questionnaires, entering data into the Statistical Package for the Social Sciences (SPSS V21), and cleaning and coding quantitative data. Subsequent analysis utilized different modules of the software to examine evaluated variables comprehensively. Univariate analysis was conducted using measures such as frequency, mean, and percentage. Associated factors contributing to uncontrolled blood pressure were identified through chi-square tests, and the strength of these associations was assessed using multivariate analysis. Statistical significance was determined at a confidence interval of 95% with a p-value of less than 5%.

After receiving approval from the MKUR Research Ethical Committee to conduct this research thesis, the researcher sought authorization from the authorities at Nemba Hospital before proceeding with any data collection. The consent form and questionnaire did not include participants' names to maintain confidentiality. Data from this research was kept confidential according the guideline of Mount Kenya University research ethical committee.

3. Results

Demographic Characteristics of Respondents

As shown in Table 1, these are the socio-demographic and socio-economic characteristics of all 407 respondents, who were reached and surveyed through face-to-face interviews using a questionnaire.

The Table 1 shows that the majority of respondents 281(69.0%) were females while the rest of them 126(31.0%) respondents were males. Of them 118 (29.0%) respondents were with no formal education, the majority of them 272 (66.8%) had primary level of education and a few number of 11 (2.7%) had secondary level of education. Almost all respondents 404 (99.3%) were living in rural area and of them 399 (98.0%) were farmers. A hundred percent of the participants agreed

that they had Community Health Based Insurance, 282 (69.3%) respondents belonged to the second category and 101 (24.8%) respondents were overweight.

Table1: Socio-demographic characteristics of respondents

Variable	Frequency	Percentage
Sex		
Male	126	31
Female	281	69
Age Group		
<40 Years Old	32	7.9
40-55 Years Old	73	17.9
56-70 Years Old	155	38.1
>71 Years Old and above	147	36.1
Education		
No formal education	118	29
Primary	272	66.8
Secondary	11	2.7
Tertiary	6	1.5
Marital status		
Single	6	1.5
Married	313	76.9
Separated	88	21.6
Place of Residence		
Rural	404	99.3
Semi urban	3	0.7
Occupation		
Employed	3	0.7
Self employed	1	0.2
Farmer	399	98
Unemployed	4	1
Health insurance		
CBHI	407	100
Social category		
Category one	92	22.6
Category two	282	69.3
Category three	33	8.1
BMI		
Underweight	71	17.4
Normal	235	57.7
Overweight	101	24.8

Source: Primary data, 2022

Prevalence of uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital, Rwanda.

The objective one was to determine the prevalence of uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital and uncontrolled blood pressure was defined as $\geq 140/90$ mmHg. To confirm uncontrolled blood pressure, the data was collected twice and the patients with uncontrolled blood pressure were the one with consistence of high blood pressure at the second measurement.

The Figure 1 below presented the prevalence of patients with high BP, where 257(63.14%) respondents had normal BP and 150(36.86%) respondents had high BP.

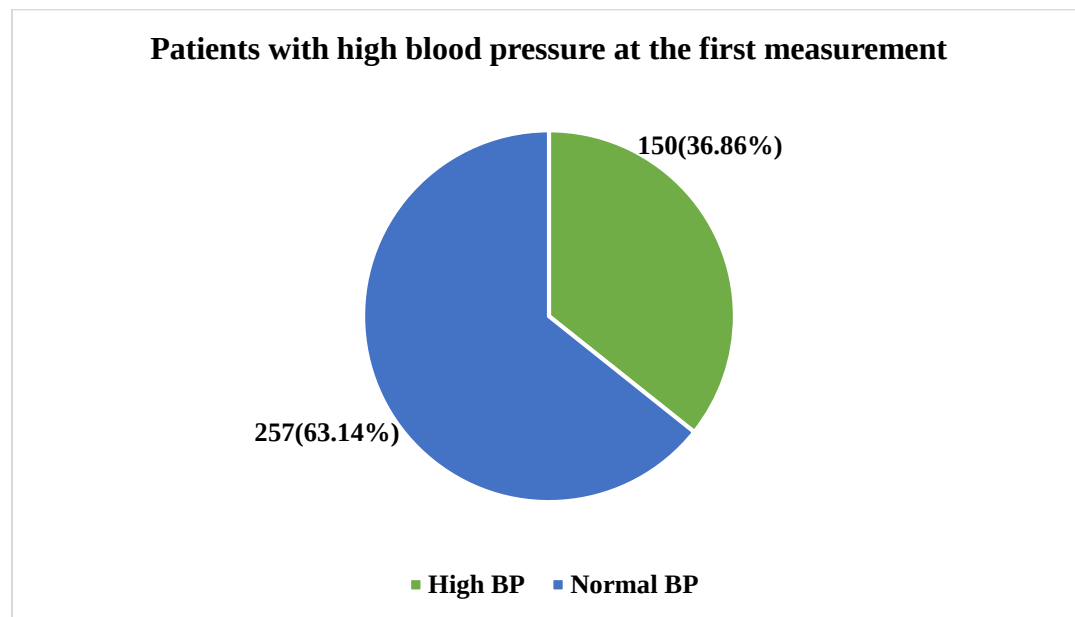


Figure 1 Patients with high blood pressure at the first measurement

The figure 2 below presented the prevalence of uncontrolled blood pressure where 134(32.92%) respondents had uncontrolled blood pressure and 273(66.08%) respondents had controlled blood pressure.

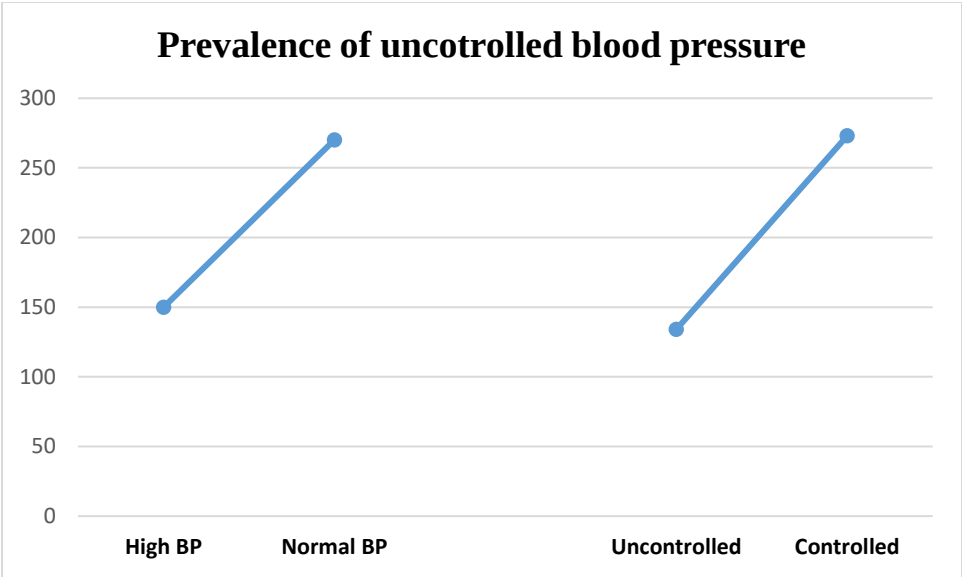


Figure 2. Prevalence of uncontrolled blood pressure

Lifestyle factors of hypertensive patients

The lifestyle factors which may influence the hypertension were assessed in this study. This include current smoking, consumption of alcohol, fruits and vegetable consumption, salt and physical activities.

The table below, presents the lifestyle of hypertensive patients at Nemba hospital. At the time of data collection, 51(12.5%) patients were smoking, while 30(7.4%) patients were using alcohol. Among the patients who could having fruits, 52(12.8%) of them used to do so three to four time a week.

Table 2 Lifestyle factors of hypertensive patients

Variables	Frequency	Percentage
Currently smoke any tobacco product		
Yes	7	1.7
No	400	98.3
If yes; on average how many tobacco		
One cigarette	1	0.2
Two cigarette	1	0.2
Three cigarette	5	1.2
Do you currently use alcoholic beverages		
Yes	30	7.4
No	377	92.6
How frequently have you had at least one alcoholic drink in the last month		

One time	5	16.7
Two times	5	16.7
Three times	6	20
Four times	10	33.3
Five times	4	13.3
Number of days of having fruits		
One to two days	28	6.9
Three to four days	52	12.8
Five days and above	28	6.9
Days of having vegetables in the past week		
One to two days	51	12.5
Three to four days	27	6.6
Five days and above	21	5.2
How often is salt added to food that has already been prepared?		
Two times	51	12.5
Three times	356	87.5
Do you frequently perform physical activities		
Yes	13	3.2
No	394	96.8

Source: Primary data, 2022

The clinical and comorbidities factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital.

The second objective of this study was to examine factors (clinical and comorbidities) associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital and was examined by assessing twelve variables under <0.05 P-value calculated to 95% CI.

A few number of participants 53(13.00%), agreed that they had chronic illness and of them 30(7.4%) participants suffered from diabetes. The majority of respondents 211(51.8%), reported that they have diagnosed high blood pressure since one year ago, 185(45.5%) respondents reported that they sometimes have the general body weakness and 63 (15.5%) respondents used to be hospitalized due to the hypertension and 388(95.3%) respondents often do blood pressure checkup.

Table 3 The clinical and comorbidities factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital.

Variable	Frequency	Percentage
Do you suffer from any other chronic illness		

Yes	53	13
No	354	87
If yes what is that illness		
Diabetes	30	7.4
Cardiovascular disease	7	1.7
Kidney Diseases	4	1
Mental illness	4	1
Asthma	5	1.2
HIV/AIDS	3	0.7
How many years ago were you first diagnosed high blood pressure		
One year	211	51.8
Two Years	167	41
Three Years	29	7.1
Weight gain in last six months		
Yes	3	0.7
No	404	99.3
If yes estimate weight gained in kg		
1 Kg gained	1	0.2
2 Kg gained	1	0.2
3 Kg gained	1	0.2
Severe headache		
Often	3	0.7
Sometimes	67	16.5
Never	337	82.8
Sudden loss of eye sight		
Often	1	0.2
Sometimes	42	10.3
Never	364	89.4
Sudden loss of eye sight		
Often	1	0.2
Sometimes	42	10.3
Never	364	89.4
Tachycardia		
Often	2	0.5
Sometimes	56	13.8
Never	349	85.7
Respiratory distress		
Often	2	0.5
Sometimes	5	1.2
Never	400	98.3
General body weakness		
Often	3	0.7
Sometimes	185	45.5

Never	219	53.8
Hospitalized due to hypertension crisis		
Often	1	0.2
Sometimes	63	15.5
Never	343	84.3
Stopped some works you usually do		
Often	0	0
Sometimes	63	15.5
Never	344	84.5
Blood pressure checkup		
Often	388	95.3
Sometimes	17	4.2
Never	2	0.5

Source: Primary data, 2022

The clinical and comorbidities factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital (Bivariate analysis).

The table below, of bivariate analysis, shows that among clinical and comorbidities related variables which were expected to be the factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital, only one variable which is the general body weakness was statistically significant associated with uncontrolled blood pressure under <0.05 P-value calculated to 95% CI. The researcher could not undergo further analysis of multivariable analysis with only one significant variable.

Table 4 The clinical and comorbidities factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital (Bivariate analysis).

Variables	uncontrolled BP		Chi-Square	P-Value
	Yes(%)	No(%)		
Do you suffer from any other chronic illness			0.144	0.705
Yes	48(90.60)	5(9.40)		
No	326(92.10)	28(7.90)		
If yes what is that illness			4.326	0.633
Diabetes	26(86.70)	4(13.30)		
Cardiovascular disease	7(100.0)	0(0.00)		
Kidney Diseases	4(100.0)	0(0.00)		
Mental illness	3(75.00)	1(25.00)		

Asthma	5(100.0)	0(0.00)		
HIV/AIDS	3(100.0)	0(0.00)		
How many years ago were you first diagnosed high blood pressure			1.558	0.459
One year	196(92.90)	15(7.10)		
Two Years	153(91.90)	14(8.40)		
Three Years	25(86.20)	4(13.80)		
Weight gain in last six months			0.267	0.606
Yes	3(100.0)	0(0.00)		
No	371(91.80)	33(8.20)		
If yes estimate weight gained in kg			0.267	0.966
1 Kg gained	1(100.0)	0(0.00)		
2 Kg gained	1(100.0)	0(0.00)		
3 Kg gained	1(100.0)	0(0.00)		
Severe headache			0.827	0.661
Often	3(100.0)	0(0.00)		
Sometimes	60(89.60)	7(10.40)		
Never	311(92.30)	26(7.70)		
Sudden loss of eye sight			0.149	0.928
Often	1(100.0)	0(0.00)		
Sometimes	39(92.90)	3(7.10)		
Never	334(91.80)	30(8.20)		
Tachycardia			0.857	0.652
Often	2(100.0)	0(0.00)		
Sometimes	53(94.60)	3(5.40)		
Never	319(91.40)	30(8.60)		
Respiratory distress			0.628	0.73
Often	2(100.0)	0(0.00)		
Sometimes	5(100.0)	0(0.00)		
Never	367(91.80)	33(8.30)		
General body weakness			6.618	0.037
Often	3(100.0)	0(0.00)		
Sometimes	163(88.10)	22(11.90)		
Never	208(95.00)	11(5.00)		
Hospitalized due to hypertension crisis			2.179	0.336
Often	55(87.30)	8(12.70)		
Sometimes	318(92.70)	25(7.30)		
Never	1(100.0)	0(0.00)		
Stopped some works you usually do			0.092	0.955
Often	1(100.0)	0(0.00)		

Sometimes	55(91.7)	5(8.30)	0.3	0.861
Never	318(91.7)	28(8.10)		
Blood pressure checkup				
Often	356(91.80)	32(8.20)		
Sometimes	16(94.10)	1(5.90)		
Never	2(100.0)	0(0.00)		

Source: Primary data, 2022

Socio-demographic and economic factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital.

The socio-demographic and economic factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital was examined by assessing ten variables under <0.05 P-value calculated to 95% CI.

The table below, of bivariable analysis, shows that among socio-demographic and economic related variables which were expected to be the factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital, five variables which are sex, age, education level, marital status and Monthly income were statistically significant associated with uncontrolled blood pressure under <0.05 P-value calculated to 95% CI.

Table 5 Socio-demographic and economic factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital (Bivariate analysis).

Variables	Uncontrolled BP		Chi-Square	P-Value
	Yes(%)	No(%)		
Sex			2.2	<0.001
Male	112(88.90)	14(11.10)		
Female	262(93.20)	19(6.80)		
Age Group			3.04	<0.001
<40 Years Old	105(89.00)	13(11.00)		
40-55 Years Old	252(92.60)	20(7.40)		
56 Years Old and Above	17(100.00)	0(0.00)		
Education			3.084	0.03
No formal education	105(88.00)	13(12.00)		
Primary	250(92.60)	20(7.40)		
Secondary	11(100.0)	0(0.00)		

Tertiary	6(100.0)	0(0.00)		
Marital status			1.141	0.005
Single	6(100.0)	0(0.00)		
Married	289(92.30)	24(7.70)		
Separated	79(89.80)	9(10.20)		
Place of Residence			0.267	0.6
Rural	371(91.80)	33(8.20)		
Semi urban		3 0(0.00)		
Occupation			0.211	0.646
Employed	7(87.50)	1(12.50)		
Farmer	367(92.00)	32(8.00)		
Health insurance				
Without HI	0(00.0)	0(00.0)		
CBHI	374(91.90)	33(8.10)		
Social category			4.265	0.119
Category one	82(89.10)	10(10.90)		
Category two	264(93.60)	18(6.40)		
Category three	28(84.80)	5(15.20)		
Monthly income			6.789	0.034
0-10000	60(84.50)	11(15.50)		
10000-20000	218(92.80)	17(7.20)		
20000 and above	96(95.00)	5(5.00)		

Source: Primary data, 2022

This study revealed that females were more likely to have uncontrolled blood pressure [AOR=1.65; 95%CI=1.31- 2.78 and P=<0.001] compared to males. The respondents aged between 40-55 years old and one aged 56 years old and above were more likely to have uncontrolled blood pressure [AOR=3.2; 95%CI=2.73-4.71and P=<0.001] and [AOR=7.54; 95%CI=6.69-10.144 and P=<0.001] compared to respondents aged between <40 years old respectively compared to the respondents aged below 40 years old. Respondents with primary and secondary level of education were less likely to have uncontrolled blood pressure [AOR=0.7; 95%CI=0.62- 0.78and P=<0.001] and [AOR=0.59; 95%CI=0.50- 0.69and P=<0.001] compared to the respondents with no formal education respectively.

Table 6 Socio-demographic and economic factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital (Multivariate analysis).

Variables	AOR	95%CI	P-Value
Sex			
Male	Ref		
Female	1.65	1.31- 2.78	<0.001
Age Group			
<40 Years Old	Ref		
40-55 Years Old	3.2	2.73-4.71	<0.001
56 Years Old and Above	7.54	6.69-10.144	<0.001
Education			
No formal education	Ref		
Primary	0.7	0.62- 0.78	<0.001
Secondary	0.59	0.50- 0.69	<0.001
Marital status			
Single	Ref		
Married	0.79	0.10-1.26	0.125
Monthly income			
0-10000	Ref		
10000-20000	1.36	1.19-1.56	0.691
20000 and above	1.2	1.01 -1.43	0.301

Source: Primary data, 2022

4. Discussion

The present study aimed at assessing the factors associated with poor blood pressure control among hypertensive patients attending at Nemba District Hospital. The findings of this study indicated that the prevalence of uncontrolled blood pressure among the participants was 32.92%.

The reported finding is higher than those in previous studies in Rwanda which showed prevalence of 15,3%. (11) It is also lower than the pooled prevalence in Africa which is 17% The observed differences in prevalence between the present study and the earlier ones in Rwanda could be explained by the differences in the study population. While the current study was conducted among hypertensive patients who were attending Nemba District Hospital at the time of data collection. The other study had its setting among the general population of hypertensive patients in Rwanda.

The fact that they were attending the hospital could explain why the prevalence was comparatively high. This study's findings provided useful information and knowledge that would support decision-makers and healthcare providers by supplying knowledge on factors leading to poor blood pressure control.

The current study aligns with research conducted in Thailand, which reported a high prevalence of hypertension. In accordance with the Thailand National Health Examination Survey of 2015, one in four Thais had hypertension. The study also found that in the rural communities of central Thailand, approximately a half of patients with the hypertension had uncontrolled blood pressure. A cross-sectional study conducted by Lertthanaporn, revealed that the uncontrolled hypertension prevalence was 54.4% in these areas.(9)

The second objective of this study was to examine factors associated with uncontrolled blood pressure among hypertensive patients and the findings revealed that among clinical and comorbidities related variables which were expected to be the factors associated with uncontrolled blood pressure among hypertensive patients. Understanding the relationship between hypertension and comorbidities is a critical health concern that should be recognized and addressed.

The blood pressure levels can vary depending on the presence of additional health conditions, as discussed in Tran's study. They noted that patients diagnosed with hypertension tend to have lower blood pressure readings when they have multiple health conditions, and this difference in initial blood pressure persists for several years following diagnosis. While there was a significant decrease in blood pressure in the first year after diagnosis, subsequent changes were minimal, suggesting no indication of a faster decline among those with specific or multiple comorbidities. The blood pressure levels can vary depending on the presence of additional health conditions, as discussed in Tran's study. They noted that patients diagnosed with hypertension tend to have lower blood pressure readings when they have multiple health conditions, and this difference in initial blood pressure persists for several years following diagnosis. While there was a significant decrease in blood pressure in the first year after diagnosis, subsequent changes were minimal, suggesting no indication of a faster decline among those with specific or multiple comorbidities.(14)

The studies conducted by Mercurio which assessed the risk factors for hypertension and its clinical impact was contrary with the present study and it revealed that uncontrolled BP caused severe complications where 13% developed arterial hypertension and atrial arrhythmias, and most of them

presented other similar co-morbidities for cardiopulmonary disease like hypo/hyperthyroidism. (15) .

Regarding the socio-demographic and economic factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital, the study revealed that among socio-demographic and economic related variables which were expected to be the factors associated with uncontrolled blood pressure among hypertensive patients attending Nemba District Hospital, five variables which are sex, age, education level, marital status and monthly income were statistically significant associated with uncontrolled blood pressure. This study revealed that females were more likely to have uncontrolled blood pressure compared to males. Results showed that respondents aged between 40-55 years old and one aged 56 years old and above were more likely to have uncontrolled blood pressure compared to respondents aged between <40 years old respectively. The respondents with primary and secondary level of education were less likely to have uncontrolled blood pressure compared to the respondents with no formal education respectively.

The research conducted in Settat City, Morocco, revealed significant associations between uncontrolled blood pressure (UBP) and factors such as age, gender, and monthly income. Advanced age has consistently been identified as a risk factor in various studies, possibly due to several factors including increased health complexities such as impaired motor skills, cardiovascular vulnerabilities, and weakened immune responses. These factors contribute to the complexity of blood pressure control, often necessitating more intensive medication management, exacerbated by age-related increases in blood vessel stiffness(16)

5. Conclusion

The purpose of this study was to assess the factors associated with uncontrolled blood pressure among hypertensive patients attending at Nemba District Hospital. The study revealed that 32.92% respondents had uncontrolled blood pressure and 66.08% respondents had controlled blood pressure and that sex, age, education level, marital status and monthly income were statistically significant associated with uncontrolled blood pressure. The results can't be generalized for whole country in consideration of the study design, sample size and the characteristics of study population in one rural District area can differ from those characteristics in other Districts as well as urban population. The Ministry of Health in collaboration with the Ministry of Education should

reinforce education on prevention of Non-communicable diseases, regular health checkup and the importance of adhering to the instructions given by Health professionals

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