Factors associated with defaulting among hypertensive patients

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Abstract

Objective*(s)*: To determine factors associated with defaulting among hypertensive patients seen in outpatient departments.

Materials and Methods: An unmatched 1:1 case-control study design was used in the study. A total of 120 respondents were interviewed. Data was analysed through logistic regression with defaulting as the outcome.

Results*:* Experiencing side effects caused by antihypertensive medication of drowsiness (Adjusted Odds Ratio = 8.5; 95% CI: 2, 36.2), impaired vision (AOR = 10.4; 95% CI: 3.1, 34.8) and time spent at the health facility which was more that 1 to 7 hours (AOR = 9.1; 95% CI: 2.7, 30.3) were associated with defaulting. Knowledge of hypertensive retinopathy as a consequence of uncontrolled hypertension was the only independent risk factor associated

with reduced likelihood of defaulting among hypertensive patients (AOR = 0.1; 95% CI: 0.03, 0.3).

Conclusion: Increasing awareness of hypertensive complications may reduce defaulting.

Keywords: Antihypertensive, case-control, defaulting, hypertension.

1.0 Introduction

Hypertension is one of the biggest health care problems in the world, affecting at least 1.13 billion people world-wide. It is associated with stroke and heart disease which are the major causes of death in the developed world. Hypertensive complications are responsible for about 7.1 million deaths per year and 4.5% of the disease burden which translate to 64 million disability adjusted life years (DALYs). Thus, hypertension has become a public health problem in both developed and developing countries with serious morbidity and mortality.

Adherence to antihypertensive therapy is a major way to ensure control of the condition and prolong the hypertensive trajectory (Varleta et al., 2017). However, increasing pill burden along the course of the illness (Koffi et al., 2017) may contribute to reduced adherence to antihypertensive therapy. Thus, while there is a wide range of effective antihypertensive medicines, efforts to control the condition can be hampered by non-adherence to drugs and non-compliance with medical advice (Mafutha & Wright, 2013).

Treatment can control hypertension and reduce co-morbidities and costs of the diseases. But if patients cannot be diagnosed or be compliant with their treatment, the risks of co-morbidities and costs may increase. It was reported that 77.6% of hypertensive patients are aware that they have hypertension, but only 67.9% of diagnosed patients are receiving current treatment and only 38% of treated patients are compliant.

Non-compliance to antihypertensive medicine is a huge setback in sustainable control of hypertension. As low as 15% were found to be totally compliant to prescribed antihypertensive regiments (Koffi et al., 2017). Individuals who are non-adherent to antihypertensive medicine are more likely to have poor blood pressure control (Abegaz, Shehab, Gebreyohannes, Bhagavathula, & Elnour, 2017).

The purpose of this study was to determine factors associated with defaulting among hypertensive patients seen in outpatient departments. Predictors of adherence to antihypertensive therapy were based on the health belief model.

2.0 METHODOLOGY

The study was conducted through an analytical unmatched 1:1 case-control design. Cases were hypertensive patients with a history of defaulting antihypertensive therapy. Controls were people with hypertension who had never defaulted antihypertensive drugs and have been on antihypertensive medicine for at least six months. Chirumhanzu district has the highest prevalence of hypertension in Midlands province. The study was conducted in the 4 hospitals in Chirumhanzu District, Zimbabwe namely: Mvuma, Holy Cross, Muvonde and St Theresa hospitals. Chirumhanzu district has a catchment population of 77 954, which is approximately 5% of the population of Midlands Province (Zimbabwe National Statistics Agency (ZIMSTAT), 2012; Zimbabwe National Statistics Agency (ZIMSTAT), 2015; Zimbabwe National Statistics Agency (ZIMSTAT) & ICF International, 2016). An expected frequency of 15% of adherence to hypertensive drugs and those non-adherent were more likely to have defaulted due to hypertensive side effects Odds ratio 5.16 (1.13-23.66) (Hussain & Boonshuyar, 2009) was used to calculate sample size using EPI Info Stat Cal at 95% confidence interval level and power of 80%. Basing on a response rate of 90%. The required sample size (n) was 80; 40 cases and 40 Controls. In the current study, 60 cases and

60 controls were selected for interviews randomly using the hypertension attendance register as the sampling frame.

Cases: hypertension patients 15 years and above who missed treatment by not receiving medication for at least one month during the previous six months (June-Dec 2011) from any health facility be it Government hospital, clinic or private pharmacy.

Controls: hypertensive patients who had never missed treatment by collecting the monthly supply for six months (June-Dec 2011) from any health facility. Individuals with pregnancy-induced hypertension were excluded from the study as their condition was temporary, in most cases. Moreover, seriously ill patients were also excluded from participating in the study.

2.1 Ethics

Only participants who gave documented voluntary consent were interviewed. Permission to carry out the study was granted by the District Medical Officer, Provincial Medical Director of Midlands Province and the Medical Research Council of Zimbabwe. All data was secured in locked cupboards and handled confidentially.

2.2 Data management

Data was collected in 4 weeks using a structured interview schedule. The interviews were conducted in private rooms. A checklist was used to identify resource availability for the follow up and treatment of hypertension. Data was analysed for descriptive statistics and multiple logistic regression using Epi Info software.

3.0 RESULTS

3.1 Demographic characteristics of the cases and controls

One hundred and twenty respondents were included in the study of which there were 60 cases and 60 controls. The response rate was 100 percent. Four cases were excluded and replaced because of dementia and ill health. Two controls were excluded as they had survived a recent stroke and had impaired speech and hearing acuity. They were replaced with 2 control participants.

The median age of the cases was 57 years (Q1=51:Q3=67) and of the controls was 60 years (Q1=28: Q3=69).there were more females (75% of the cases and 71.7% of the controls) as compared to males (25% of the cases and 28.3% of the controls.) The majority of the cases 43 (71.7%) and 49 (81.7%) controls lived in the rural or communal areas. There was some significance difference p=0.003 in the distribution of cases and controls with regard to residence in rural/communal areas. Of the controls 13.3% lived in urban/ mining areas as compared with 18.3% of the cases.

The majority of the respondents were married 36 (60%) of cases as compared to 28 (46.7%) of the controls. Educational level of the cases and controls was very low as 39(65%) of the cases were at primary level and below as compared to 26 (43.3%) of the controls. Twenty-one (35%) of the cases and 34 (56.6%) of the controls had attained at least secondary education. There was some statistical significant difference on χ^2 p-value 0.0006 in the religion of Catholics as 33 (55%) were cases as compared to 46 (76.7%) of the controls. The sociodemographic characteristics for the cases and controls are summarised in table 1 below.

Table 1: Comparison of Socio-Demographic Characteristics of Cases and Controls

Variable	**Cases** N=60(%)	**Controls** N=60(%)	***p* Value**
Age (median, IQR)	57 (51,67)	60 (28,69)	0.9
Gender			
Male	15 (25)	17 (28.3)	0.8
Female	45 (75)	43 (71.7)	
Area of residence			
Farming community	9 (15)	0 (0)	
Mining community	6 (10)	3 (5)	
Rural/ communal	43 (71.7)	49 (81.7)	0.003*
Urban	2 (3.3)	8 (13.3)	
Educational Level			
None	20 (33.3)	9 (15)	
Primary	19 (31.7)	17 (28.3)	0.06
Secondary	12 (20)	20 (33.3)	
Tertiary	9 (15)	14 (23.3)	
Religion			
Apostolic Faith Sects	0 (0)	5 (8.3)	
Catholics	33 (55)	46 (76.7)	0.0006*
None	1 (1.7)	0 (0)	
Pentecostal	13 (21.7)	5 (8.3)	
Protestant	3 (5)	4 (6.7)	
Traditional	10 (16.7)	0 (0)	
Employment Status			
Formally Employed	18 (30)	22 (36.7)	
Self Employed	6 (10)	8 (13.3)	0.5
Unemployed	36 (60)	30 (50)	
Marital status			

Variable	Cases N=60(%)	Controls N=60(%)	*p* Value
Cohabiting	0 (0)	2 (3.3)	
Divorced/ Separated	4 (6.7)	1 (1.7)	
Married	36 (60)	28 (46.7)	0.05*
Single	5 (8.3)	2 (3.3)	
Widowed	15 (25)	27 (45)	

*Fisher Exact Test**

3.2 Factors associated with defaulting among hypertensive patients

Residing in rural /communal area was not associated with defaulting among hypertensive patients [OR = 0.6; 95% CI = 0.22, 1.5) p=0.3]. Having primary education as highest level of education [OR = 2.4; 95% CI=1.2, 5.1) p=0.03] was statistically associated with defaulting among hypertensive patients. Being married or cohabiting [OR = 1.5; 95% CI=0.7, 3.1) p=0.4] was not statistically significant and was not associated with increased likelihood of defaulting among hypertensive patients. The following socio-economic factors were found to be associated with an increased likelihood of defaulting among hypertensive patients: income earned per month less than $250 [OR = 4.3; 95% CI= 1.9, 9.6 (p=0.0006)], considering the distance from the health facility to be far [OR = 13.2; 95% CI = 5.4, 32.5 (p=0.00)] and using the Bus going to hospital to collect antihypertensive drugs [OR=18; 95% CI= 6.1, 56.1 (p=0.00)] .

The majority of the respondent cases and controls were walking 61.7% to hospital as compared to those who were using the bus 38.3%.

The socio-economic factors associated with decreased likelihood of defaulting among hypertensive patients were religion being Catholic [OR = 0.06; 95% CI = 0.16, 0.87 (p=0.02)], those who lived a distance of less than 10 kilometres from the hospital [OR=0.06;

95% CI = 0.02, 0.17 (p=0.00)], means of transport to hospital those who were walking to collect antihypertensive drugs [OR=0.06; 95% CI=0.01, 0.2 (*p*=0.00)] and spending less than one hour at the health facility [OR 0.06 (95% CI: 0.02,0.1)p=0.00].

The sociodemographic demographic predictors of defaulting are summarised in table 2.

Table 2: Socio-Demographic Factors Associated With Defaulting Among Hypertensive Patients

Risk factor Variables	**Cases N=60 (%)**	**Controls N=60 (%)**	**OR (95% CI)**	**p-Value**
Reside in rural area Yes	43 (71.7)	49 (81.7)	0.6 (0.22, 1.46)	0.3
No	17	11		
Education: none/ Primary	39 (65)	26 (43.3)	2.4 (1.2, 5.1)	0.03
Secondary/Tertiary	21	34		
Married/cohabiting	36 (60)	30 (50)	1.5 (0.7, 3.1)	0.4
Single/Divorced/widowed	24	30		
Employment: unemployed	24 (40)	30 (50)	0.7 (0.3, 1.4)	0.4
Employed	36	30		
Religion: Catholic Yes	33 (55)	46 (76.7)	0.4 (0.16, 0.87)	0.02
No	27	14		
Income <$250 per month	48 (80)	29 (48.3)	4.3 (1.9, 9.6)	0.0006
No	12	31		
Income>$250 per month	12 (20)	31 (51.7)	0.2 (0.1, 0.6)	0.0006
No	48	29		
Distance < 10km to Hospital	19 (31.6)	53 (88.3)	0.06 (0.02, 0.2)	0.00
No	41	7		
Distance > 10km to Hospital	41 (68.3)	7 (11.7)	16.3 (5.8, 48.2)	0.00
	19	53		
No				
Consider distance to be Far	42 (70)	9 (15)	13.2 (5.4, 32.5)	0.00
Near	18	51		
Transport means: Walking	20 (33.3)	54 (90)	0.06 (0.02, 0.2)	0.00
No	40	6		
Transport means: Bus	40 (66.7)	6 (10)	18 (6.1, 56.1)	0.00
No	20	54		
Time spent at facility< 1hr	17 (28.3)	52 (86.7)	0.06 (0.02, 0.2)	0.00
	43	8		
No				
Time at facility >1-7hrs	43 (71.7)	8 (13.3)	16.4 (6, 47.1)	0.00
	17	52		
No				

3.3 Clinical Factors Associated With Defaulting Among Hypertensive Patients

The comparison of medical history of cases and controls on the factors associated with defaulting among hypertensive patients shows the following factors were found to be associated with an increased risk of defaulting among hypertensive patients: taking only one drug [OR = 2.6; 95% CI=1.27,5.5 (*p*=0.02)], those respondents without co-morbidity involving other organs [OR=9.9; 95% CI= 3.9,25 (*p*=0.00)] taking nifedipine as an antihypertensive [OR=1.0; 95% CI=0.5,2.1 (*p*=1.0)] although it was not statistically significant at 5% level.

Those who were taking two or more antihypertensive drugs were associated with decreased likelihood of defaulting among hypertensive patients [OR= 0.4; 95% CI= 0.1, 0.9 (*p*=0.02)]. Participants having co-morbidity of hypertension and Diabetes [OR = 0.1; 95% CI= 0.01, 0.4 (*p*=0.0002)] and co-morbidity with heart diseases [OR = 0.2; 95% CI=0.1, 0.5 (*p*=0.001)] were less likely to default.

The cases had a median period on antihypertensive drugs of 4.5 years (Q1=3, Q3=8) and the controls 5 years (Q1=3, Q2=10). The factors associated with defaulting are summarised in table 3.

Table 3: Clinical factors associated with defaulting.

Risk factor Variables		Cases N=60 (%)	Controls N=60 (%)	OR (95% CI)	p-Value
No of hypertensive drug	Drug:1 drug	40 (66.7)	26 (43.3)	2.6 (1.2, 5.5)	0.02
	No	20	34		
Type of hypertensive Drug	:>2 drug	20 (33.3)	34 (56.7)	0.4 (0.1, 0.9)	0.02
	No	40	26		
Co-morbidity with Diabetes		1 (1.7)	16 (94.1)	0.05 (0.01, 0.4)	0.0002
	No	59	44		
Co-morbidity with heart Diseases		6 (10)	22 (36.7)	0.2 (0.1, 0.5)	0.001
	No	54	38		
None Co-morbidity	Yes	53 (88.3)	26 (43.3)	9.9 (3.9, 25)	0.00

Risk factor Variables		Cases N=60 (%)	Controls N=60 (%)	OR (95% CI)	p-Value
	No	7	34		
Drug type Nifedipine	Yes	20 (33.3)	20 (33.3)	1.0 (0.5, 2.1)	1.0
	No	40	40		
Drug type Captopril	Yes	6 (10)	12 (20)	0.4 (0.6, 1.3)	0.2
	No	54	48		
Period on hypertensive Drugs(median, IQR)		4.5 (3, 8)	5 (3, 10)		0.1

3.4 Number of drugs taken by participants

Most of the cases (66.7% as compared to controls43.3%) were on a single antihypertensive drug and 23% of cases were on two drugs as compared to 50% of controls as shown in figure 1.

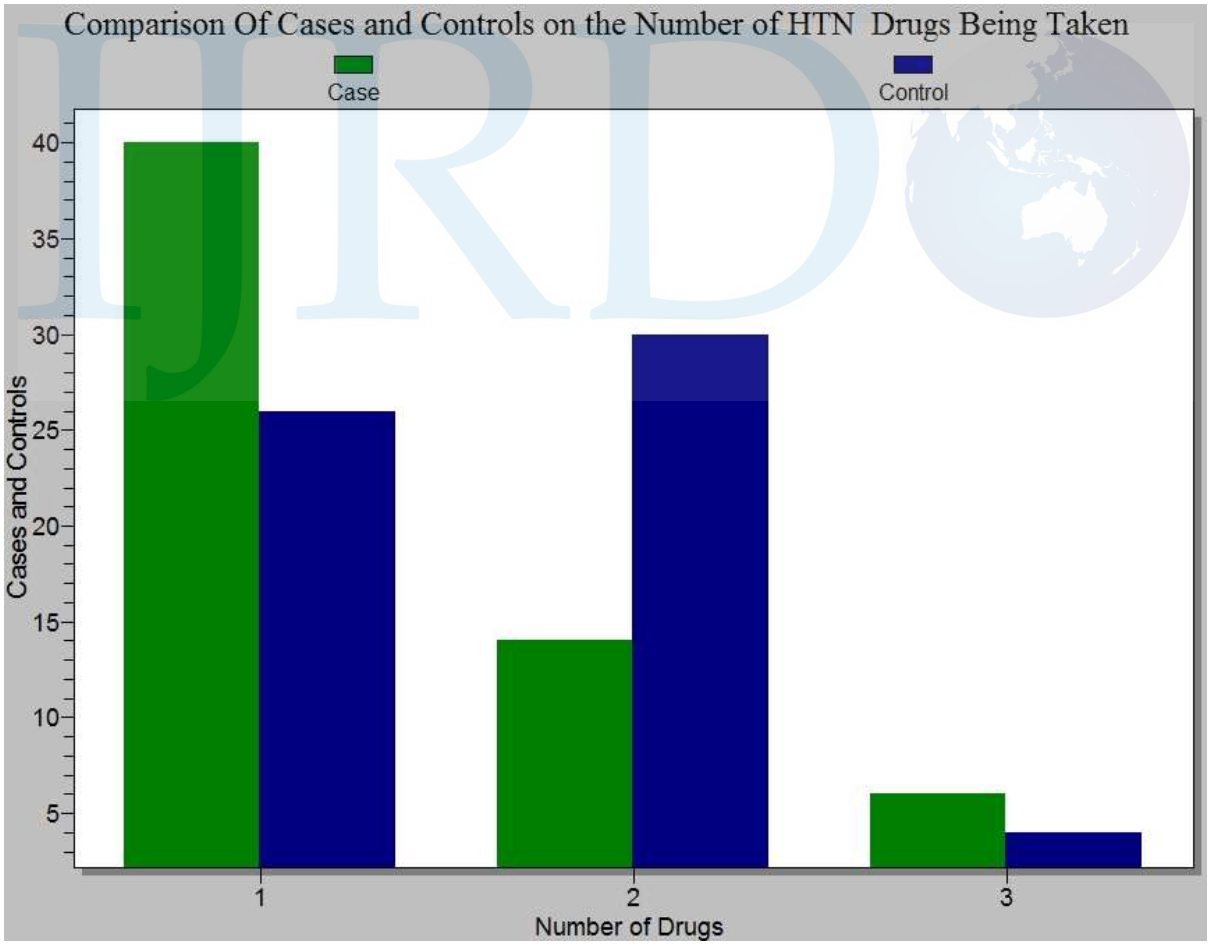

Figure1: Comparison of Cases and Controls on the Number of hypertensive Drugs Being Taken

3.5 Perceived susceptibility to the negative consequences of Hypertension

This construct was measured by a 11 item bipolar Likert scale asking cases and controls whether they consider themselves to be at risk at developing complications of hypertension or not. The mentioning of consequences of uncontrolled hypertension caused by omitting antihypertensive medication was used as an indicator of low or high perceptions. The side effects being experienced was used to measure perceived severity of hypertension.

The majority of the cases and the controls had a high risk perception of developing complications of hypertension (73.3%) of cases and 80% of controls respectively with an Odds Ratio = 0.7 (95% CI: 0.3,1.6) (p=0.5).The majority of the cases and controls also agreed that it was likely for life threatening complications to occur 59(98.3%) of cases as compared to 55(91.7%) of controls although it was not statistically significant [OR =5.4; (95% CI = 0.6,47.3 (p=0.1)].

On the side effects the majority of the cases (93%) and controls (91.7 %) said they experienced headache although it was not statistically significant [OR=1.3; 95% CI=0.3, 5 (p=0.5)].

The side effects which were associated with increased likelihood of defaulting among hypertensive patients were experiencing drowsiness [OR= 4.7; 95% CI=1.8, 12.1 (p=0.002)], impaired vision [OR = 9; 95% CI=3.9, 20.5 (p=0.000001)], increased urine flow as a side effect [OR=2.3; 95% CI=1.1, 4.7 (p=0.04)], experiencing of night mares or sleeping difficulties [OR =3.9; 95% CI=1.4, 10.6 (p=0.01)].

The side effects which were associated with increased likelihood of defaulting were flushing/ dizziness [OR=3.3; 95% CI=1.4, 7.8 (p=0.008)] and palpitations [OR=4.3; 95% CI=1.8, 10.4 (p=0.001)]. The following side effects were being experienced and associated with increased

likelihood of defaulting among hypertensive patients but they were not statistically significant at 5% level, ankle oedema [OR=2; 95% CI=0.2, 23 (p=0.5)], impotence/ loss of libido, [OR=3.8; 95% CI=0.8,17.2 (p=0.08)]. This is summarised in table 4.

Table 4: Comparison of Perceived Susceptibility for Cases and Controls

Risk factor Variables		**Cases N=60 (%)**	**Controls N=60 (%)**	**OR (95% CI)**	**p-Value**
Am at risk of complications of hypertensive :		44 (73.3)	48 (80)	0.7 (0.3, 1.6)	0.5
Agree		16	12		
Disagree					
Most likely Complication to occur to me					
Agree		59 (98.3)	55 (91.7)	5.4 (0.6, 47.3)	0.1*
Disagree		1	5		
Side effects as being Experienced by respondents					
Headache	Yes	56	55 (91.7)	1.3 (0.3, 5)	0.5
	No	4	5		
Drowsiness	Yes	23 (38.3)	7 (11.7)	4.7 (1.8,12.1)	0.002
	No	37	53		
Impaired vision	Yes	45 (75)	15 (25)	9 (3.9,20.5)	0.001
	No	15	45		
Increased Urine flow	Yes	35 (58.3)	23 (38.3)	2.3 (1.1,4.7)	0.04
	No	25	37		
Night mares/sleeping difficult	Yes	18 (30)	6 (10)	3.9 (1.4,10.6)	0.01
	No	42	54		
Flushing/Dizziness	Yes	24(40)	6 (10)	3.3 (1.4, 7.8)	0.008
	No	36	50		
Ankle Oedema	Yes	2 (3.3)	1 (1.7)	2 (0.2, 23)	0.5 *
	No	58	59		
Palpitations	Yes	26 (43.3)	9 (15)	4.3 (1.8, 10.4)	0.001
	No	34	51		
Impotence /loss of libido	Yes	7 (11.7)	2 (3.3)	3.8 (0.8, 19.2)	0.08 *
	No	53	58		

**Fisher Exact Test*

3.6 Perceived barriers indicated by Cases to defaulting among hypertensive patients.

The major reasons mentioned by cases as barriers which contributed to defaulting among hypertensive patients which were lack of funds to purchase drugs 33(55%), long time spend at the health facility 37(61.6%), feared that hypertensive drugs causes diabetes 33(55%),

antihypertensive drugs were out of stock 32(53%) and fear of getting used to hypertensive medication 32(53.3%).

Forgetting to take hypertensive medication was indicated by 40% and fear of side effects of hypertensive drugs was mentioned by 23(38.3%). Eighteen (30%) of the cases thought that they were cured and 11(18.3%) say they had normal blood pressure during the previous visit. None of the cases mentioned reason of refilling drug scripts as shown in table 5.

Table 5: Barriers Contributing to Defaulting Among Hypertensive Patient Cases

Perceived Barrier	**Cases N=60 (%)**
Forgetting to take medicines	24 (40)
Fear of side effects of the Drugs	23 (38.3)
Lack of funds to purchase drugs	33 (55)
Normal blood pressure during the previous visit	11 (18)
Time spend at the health facility	37 (61.6)
Drugs out of stock	32 (53.3)
Fear of getting used to medication	32 (53.3)
Problem of refilling script	0 (0)
hypertensive drugs causes diabetes	33 (55)
Thought was Cured	18 (30)

3.7 Multivariate Analysis: predictors of defaulting.

Experiencing side effects caused by antihypertensive medication of Drowsiness [AOR =8.5; 95% CI=2,36.2 (p=0.004)], impaired vision [AOR=10.4; 95% CI=3.1, 34.8 (p=0.0002)] and time spent at the health facility which was more than 1 to 7 hours [AOR=9.1; 95% CI=2.7,

30.3 (p=0.0003)] were independent risk factors associated with defaulting among hypertensive patients seen at outpatients in Chirumhanzu District.

Table 6: Independent risk factors associated with defaulting among hypertensive patients

Term	Odds Ratio	95% C.I.		Coefficient	S. E.	Z-Statistic	P-Value
Eye Problem (Yes/No)	0.01	0.03	0.3	-2.3541	0.6390	-3.6839	0.0002
Drowsiness (Yes/No)	8.5	2.0	36.2	2.1363	0.7406	2.8845	0.0039
Impaired vision (Yes/No)	10.4	3.1	34.8	2.3375	0.6190	3.7763	0.0002
Time spent at health facility	9.1	2.7	30.3	2.2049	0.6158	3.5805	0.0003
CONSTANT	*	*	*	-3.7392	1.0145	-3.6857	0.0002

3.8.1 The resources for hypertension services

Chirumhanzu District's four hospitals had a total of 6 doctors and one clinical officer who were commencing and monitoring hypertensive patients. During the study period the four hospitals had a total of 6 sphygmomanometers in outpatient departments and only 4 were working. Stethoscopes were available as they are used individually. Adult scales were only one per each outpatient department. Snell's charts were 3 out of 4 hospitals.

3.8.2 Availability of Antihypertensive drugs

During the study all the four hospitals had adequate minimum stock of hydrochlorothiazide (HCT) drug and they did not experience any stock out of this drug in the past six months. Nifedipine drug was only available at one of the four hospitals only. Atenolol drug was available at 3 out of the four hospitals, those institutions with this drug, they had a minimum stock. One out of four hospitals had a supply of methyldopa. Two hospitals had a supply of Captopril and the other two had adequate supply of the drug. None of the four hospitals had a supply of Amlodipine drug.

3.8.3 Fees Charged for Hypertension services

The fees charged to hypertensive patients varied within the hospitals. One hospital was charging $ 4 per each monthly visit including drugs. Another hospital was charging for consultation $2 and an extra $1 for each type of medication and another was charging $5 for consultation and $1 per pack of one month supply of drugs. The other was offering free for all drugs and consultations on hypertensive services.

There were no IEC materials on hypertension displayed or available at any of the four hospitals visited.

3.8.4 Challenges on providing hypertension services.

The major challenges cited during the study by health workers were that most of the patients were not affording to come to the hospitals for routine blood pressure check-ups and ended up sending relatives for resupply of antihypertensive drugs. One of the hospitals indicated that they were attending to patients with who were not from their catchment area as some come from neighbouring District of Masvingo Province hence it was difficult for follow up of defaulters.

4.0 Discussion

4.1 Demographic characteristics and factors associated with defaulting among hypertensive patients.

On Bivariate analysis having primary education as highest level of education was significantly associated with defaulting among hypertensive patients. Those with primary level were 2.4 times more likely to default hypertensive treatment. This association was also found to be modified with knowledge variables on whether HTN was controlled without taking medication as those with secondary/ tertiary level of education were 10.3 times more

likely to know that HTN cannot be controlled without taking medication. This finding is consistent with findings in Mangalore where knowledge about hypertension was poor among the lowly educated (Joseph et al., 2016). Knowledge about the hypertensive treatment regimen is a known predictor of medication adherence (Abel, Joyner, Cornelius, & Greer, 2017; Joseph et al., 2016). However, a Jordanian study found low education to be directly correlated to adherence to antihypertensive medication (Al-Daken & Eshah, 2017). The paradoxical Jordanian results can be attributed to convenience sampling which was used for the quantitative study design.

On Bivariate analysis those who earned an income of less than $250 per month were 4.3 times more likely associated to defaulting among hypertensive patients as compared to those earning more than $250 as 77% of the cases were associated with reduced likelihood of defaulting among hypertensive patients. Less income, as well as long transport time to the nearest health facility have been reported to impinge on adherence to antihypertensive therapy (Kakumani & Waingankar, 2016). Hypertensive patients who were travelling more than 10 kilometres to the health facility were 16 times more likely to default hypertensive medication in this study as compared to those who lived less than 10 kilometres. In this study those using the bus to come to collect their drugs were 18 times more likely to be associated with defaulting among hypertensive patients as compared to those who were walking as it was protective from defaulting.

4.2 Knowledge on complications of Hypertension

In this study, there was general lack of knowledge on hypertension complications and how it can be controlled to avoid end organ damages. The respondents needing knowledge improvement in hypertension were 6 times more likely associated with defaulting hypertensive drugs as compared to controls on bivariate analysis. Knowledge is a well-established predictor of adherence to antihypertensive drugs (Li et al., 2016).

Thus, patient knowledge is crucial in the management of hypertension and yet is an area that is frequently neglected.

4.3 Individual perceptions on hypertension

4.3.1 Perceived susceptibility to hypertension

There was a high risk perception of developing complications of hypertension in this study as 73.3% of cases and 80% of the controls perceived they were at risk. Perceived susceptibility to hypertensive complications has been found to reduce defaulting (Kamran, Ahari, Biria, Malpour, & Heydari, 2014).

4.4 Likelihood of Action

4.4.1 Perceived benefits of controlling hypertension

On multivariate analysis mention of prevention of eye problem as a complication of uncontrolled hypertension was independently associated with decreased likelihood to the result of uncontrolled hypertension caused by defaulting anti-hypertensive medication as the majority 90% of the cases were less likely to default among hypertensive patients as compared to 10% of the controls Adjusted Odds Ratio [0.1 (95% CI: 0.03, 0.33) p=0.0002].

This finding is consistent with a Sudanese study where 75% of patients knew that uncontrolled hypertension could lead to stroke and heart disease; one third was aware it could lead to kidney failure; a few (15%) knew that hypertension can cause retinopathy and peripheral vascular disease (5%) (Hussain, Elzubier, & Ahmed, 1999; Hussain & Boonshuyar, 2009). This implies that the benefits of prevention of stroke and prevention of peripheral vascular diseases need to be communicated to the patients to avert the increase of strokes being caused by defaulting antihypertensive medication.

4.5 Perceived barriers to defaulting antihypertensive drugs by cases.

The majority of the cases 37(61.6%) indicated that the reason for defaulting was of the long time spent at the health facility and 33(55%) it was due to lack of funds to purchase drugs. Drug stock out was mentioned by 32(53.3%). These major reasons are health care system related problems. Mutual provider-patient negotiation has been found to reduce defaulting (Schoenthaler, Knafl, Fiscella, & Ogedegbe, 2017).

4.6 Cues to Action

In this study being reminded of next date for review was not significantly associated with reduced likelihood of defaulting among hypertensive patients but the majority of both cases and controls were not reminded their next date of appointment they were just told to return for resupply after a month. Despite mounting evidence for telemedicine in improving compliance, telephone reminders have not yielded significant effect sizes in improving adherence to antihypertensive medication. This may be due to operational challenges and poor compliance to telemedicine itself (Harrison & Wild, 2017; Wood, Boulanger, & Padwal, 2017).

Research emphasizing the cost effectiveness of controlling blood pressure and treating organ damaged by defaulting medication should be performed to find out the extent of economic loss due to treatment and rehabilitation of hypertensive patients with damaged organs.

In this study, attitude and practices of the doctors and nurses towards hypertensive patients.

4.7 Conclusion

Factors associated with defaulting antihypertensive drugs included having only primary education, a monthly income of less than US$250, lack of knowledge about management of hypertension, walking more than 5km to the health facility or unsatisfactory delays during health facility visits. People with hypertension need more health education to reinforce

understanding of drug side effects and consequences of defaulting. Clinics dedicated to non-communicable diseases may reduce attendance time and improve quality of care for hypertensive individuals.

Reference List

Abegaz, T. M., Shehab, A., Gebreyohannes, E. A., Bhagavathula, A. S., & Elnour, A. A. (2017). Nonadherence to antihypertensive drugs: A systematic review and meta-analysis. *Medicine (Baltimore), 96,* e5641.

Abel, W. M., Joyner, J. S., Cornelius, J. B., & Greer, D. B. (2017). Self-care management strategies used by Black women who self-report consistent adherence to antihypertensive medication. *Patient Prefer.Adherence., 11,* 1401-1412.

Al-Daken, L. I. & Eshah, N. F. (2017). Self-reported adherence to therapeutic regimens among patients with hypertension. *Clin.Exp.Hypertens., 39,* 264-270.

Harrison, C. E. & Wild, K. (2017). Using telehealth in the management of hypertension. *Nurs.Stand., 31,* 44-49.

Hussain, A. A., Elzubier, A. G., & Ahmed, M. E. (1999). Target organ involvement in hypertensive patients in Eastern Sudan. *J Hum.Hypertens., 13,* 9-12.

Hussain, S. M. & Boonshuyar, C. (2009). Non-adherence to drug treatment in patients of essential hypertension. *Bangladesh Med Res.Counc.Bull., 35,* 76-78.

Joseph, N., Chiranjeevi, M., Sen, S., Singh, P., Saini, M., & Beg, S. (2016). Awareness on Hypertension and its Self-Management Practices Among Hypertensive

Patients Attending Outreach Clinics of a Medical College in South India. *Kathmandu.Univ Med J (KUMJ.), 14,* 202-209.

Kakumani, K. V. & Waingankar, P. (2016). Assessment of Compliance to Treatment of Diabetes and Hypertension amongst Previously Diagnosed Patients from Rural Community of Raigad District of Maharashtra. *J Assoc.Physicians India, 64,* 36-40.

Kamran, A., Ahari, S. S., Biria, M., Malpour, A., & Heydari, H. (2014). Determinants of patientΓÇÖs adherence to hypertension medications: application of health belief model among rural patients. *Annals of medical and health sciences research, 4,* 922-927.

Koffi, J., Konin, C., Gnaba, A., NGoran, Y., Mottoh, N., & Guikahue, M. K. (2017). [Usefulness of patient education in antihypertensive treatment compliance in black Africans]. *Ann.Cardiol.Angeiol.(Paris).*

Li, Y., Wang, J. L., Zhang, X. C., Liu, D., Shi, W. H., Liang, X. F. et al. (2016). Effectiveness of Adherence to Standardized Hypertension Management by Primary Health Care Workers in China: a Cross-sectional Survey 3 Years after the Healthcare Reform. *Biomed.Environ.Sci., 29,* 915-921.

Mafutha, G. N. & Wright, S. C. (2013). Compliance or non-compliance of hypertensive adults to hypertension management at three primary healthcare day clinics in Tshwane. *Curationis., 36,* E1-E6.

Schoenthaler, A., Knafl, G. J., Fiscella, K., & Ogedegbe, G. (2017). Addressing the Social Needs of Hypertensive Patients: The Role of Patient-Provider Communication as a Predictor of Medication Adherence. *Circ.Cardiovasc.Qual.Outcomes., 10.*

Varleta, P., Acevedo, M., Akel, C., Salinas, C., Navarrete, C., Garcia, A. et al. (2017). Mobile phone text messaging improves antihypertensive drug adherence in the community. *J Clin.Hypertens.(Greenwich.)*.

Wood, P. W., Boulanger, P., & Padwal, R. S. (2017). Home Blood Pressure Telemonitoring: Rationale for Use, Required Elements, and Barriers to Implementation in Canada. *Can.J Cardiol., 33*, 619-625.

Zimbabwe National Statistics Agency (ZIMSTAT) (2012). *Zimbabwe Population Census 2012* Harare, Zimbabwe: Population Census Office.

Zimbabwe National Statistics Agency (ZIMSTAT) (2015). *Zimbabwe Multiple Indicator Cluster Survey 2014, Final Report.* Harare, Zimbabwe.: Zimbabwe National Statistics Agency (ZIMSTAT).

Zimbabwe National Statistics Agency (ZIMSTAT) & ICF International (2016). *Zimbabwe Demographic and Health Survey 2015: Final Report* Rockville, Maryland: Zimbabwe National Statistics Agency (ZIMSTAT) and ICF International.