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## Dietary Adherence among Hypertensive Patients at Khartoum State – Sudan (2021-2024)

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### ABSTRACT:

**Introduction:** Hypertension nowadays is a major community health problem. It is high prevalence, which becomes an important area of research, which is also a major possibility for circulatory diseases and other complications. The study aims to Adherence of diet among Hypertensive patients at Khartoum State – Sudan (2021-2024).

**Methodology:** hospital-based longitudinal surveillance study carried out among 203 patients with hypertension, who admitted/attended to Khartoum Governmental hospitals during the period from 2022 year. Data collected through direct interviewed questionnaire, Analysis was done by using SPSS 26.0 version software, descriptive statistics with the use of frequency and percentages, inferential statistics with Chi-square test, and *P* value  $\leq 0.05$  considered as significant.

**Results:** Majority of them 79(38.9%) within age group  $>50$  years, 131(64.5%) were male, 141(69.5%) were married. The duration of hypertension was 1 – 5 years in majority. Controlled blood pressure was reported in 59(29.1%). The overall patients knowledge regarding hypertension disease in majority 81(39.9%) was poor, followed by 63(31%) was fair, and 59(29%) was good. Diet adherence was poor in majority 117(57.6%), and good in 26(12.8%). Regarding follow up, 89(43.8%) had regular follow up. Most of patients with good diet were had normal blood pressure or first stage hypertension. (*p* value=0.021). Exercise adherence was associated with patients age (*P* value= 0.001), marital status (*P* value= 0.001), and education level (*P* value= 0.009). Stage e of hypertension was not associated with good patients exercise. (*P* value=0.339).

**Conclusion:** Patients with good knowledge are more likely to adhere to their medication regimen, and good dietary adherence is significantly associated with better blood pressure control, this emphasizing the importance of educational interventions and indicating that dietary management is crucial for hypertension control

**KEYWORDS:** hypertension, diet, physical activity, adherence, blood pressure, knowledge, anti-hypertension medications.

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### INTRODUCTION:

Hypertension, also known as high or raised blood pressure, is a condition in which the blood vessels have persistently raised pressure. Blood is carried from the heart to all parts of the body in the vessels. Each time the heart beats, it pumps blood in to the vessels. The force of blood pushing against the walls of blood vessels as it is pumped by heart creates blood pressure. <sup>(1)</sup> Hypertension is a major risk factor for coronary heart disease, congestive heart failure, stroke and renal disease <sup>(2,3)</sup>. The incidence of hypertension becomes more prevalent with age and hypertension is found in about 50 % of individuals above 55 years in many industrialized countries <sup>(4)</sup>. In low and middle-income countries (LMICs) HTN, estimated prevalence is 31.1 %, which is relatively high compared to 28.5% in the high-income countries <sup>(5)</sup>.

HTN control in LMICs affected by the socioeconomic status. The peak prevalence of HTN globally reported is in Africa. Approximately 80% of mortalities in LMICs are due to cardiovascular disease, which is the most common complication of HTN <sup>(6,7)</sup>. Prevalence of HTN in Sudan is rising in response to behavioral changes associated to risk factors, due to rapid urbanization. It is the second-highest prevalence of HTN in North Africa, with one in four people with a non-communicable disease having HTN <sup>(8)</sup> In addition, it is one of the main risk factors for disability and death from cardiovascular disease. Worldwide, hypertension affects around one billion people and is responsible for 7.5 million deaths a year. It's accounted for more than half of global deaths and disability-adjusted life years for ischemic heart disease and cerebrovascular disease in 2016 <sup>(9)</sup>. Consuming a healthful diet is an important approach to lower blood pressure (BP). This was shown definitively in the Dietary Approaches to Stop Hypertension

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(DASH) trial, which demonstrated that consuming a diet rich in fruits, vegetables, and low-fat dairy products and reduced in saturated fat and cholesterol lowered the blood pressure (BP) <sup>(10)</sup>.

Treatment of hypertension the purpose of HTN treatment is to prevent CVD caused by increased BP and to reduce mortality by controlling high BP. In patients who already have established CVD, treatment aims to control BP to prevent progression or recurrence of disease in order to decrease mortality and improve quality of life. HTN treatment provides greater benefit in patients who are at higher risk for CVD. Most clinical studies of HTN have found that lowering SBP by approximately 10–20 mmHg or DBP by approximately 5–10 mmHg can reduce the occurrence of stroke by 30–40% and that of ischemic heart disease by 15–20% <sup>(11,12)</sup>. In this study, we aimed to assess the Adherence of diet among Hypertensive patients at Khartoum State – Sudan.

### **METHODS**

**Study setting and design:** The study was carried out at Khartoum state, Khartoum State is one of the eighteen states of Sudan. Although it is the smallest state by area (22,142 km<sup>2</sup>), it is the most populous (5,274,321 in 2008 census). It contains the country's second largest city by population, Omdurman, and the city of Khartoum, which is the capital of the state as well as the national capital of Sudan. The capital city contains offices of the state, governmental and non-governmental organizations, cultural institutions, and the main airport. Khartoum Governmental hospitals included were Omdurman teaching hospital, Ombada hospital, Hag Elsafi teaching hospital, Bhri hospital, Ibrahim malik teaching hospital, and Bashaeir teaching hospital.

**Population and eligibility:** The source population for this study consisted of Patients with hypertension, who admitted to hospital and/ or came to outpatient clinic to checkup during the time of the study 2022. Patients diagnosed as hypertension on antihypertensive medications for at least six months with or without other co-existing medical conditions, who agreed to participate were included, and Patients who did not agree to participate and patient drawback after study were excluded. In this study 203 patients were included.

**Methods of data collection:** Data was collected by two materials, an interview using structural questionnaires designed by the researcher as a tool. And tool of assessment calculation of BMI using the formula:

**Weight (lb) / [height (in)]<sup>2</sup>**

Data collected in two phases: phase one the initial data collection, phase two measure the height and weight to calculate BMI, assessment of knowledge regarding hypertension, and treatment adherence, diet adherence, and measure exercise adherence.

### **Validity and reliability of Tools:**

The tools examined by expertise in field of the study and analyzed to obtain alpha Cronbach result

### **Study variables**

The primary focus of this research was to examine the level of adherence to dietary guidelines, which served as the dependent variable. Dietary adherence was operationalized as individuals who reported regularly consuming a high frequency diet like vegetables, grains, and fruits, spices while rarely or never consuming salt, foods rich in saturated fat, at least three times per week.

To assess adherence, a Likert scale rating of 1 to 5 was assigned to each of the six items. If respondents obtained a total score of  $\geq 23$  out of 30, indicating a score above 75% on recommended dietary adherence, and they were classified as adherent. Conversely, non-adherence was defined as respondents who scored  $< 23$  out of 30, signifying a score below 75% on recommended dietary adherence.

### **Statistical analysis**

Data collected for the study were inputted into an electronic database and subsequently exported to SPSS version 26 for further analysis. The study findings were then presented and elucidated through the use of text, tables, and figures. To provide a comprehensive overview, various descriptive statistics such as proportions, frequency distributions, means, and standard deviations were employed. In order to address missing data, an analysis was conducted using to exclude cases with missing data and focus on the available data. To examine the relationship between the dependent and independent variables, a binary logistic regression was conducted.

### **RESULTS:**

Two hundred and three hypertensive patients were included in this study, majority of them 79(38.9%) within age group  $>50$  years, followed by 56(27.6%) within age group 41 -50 years, 45(22.2%) within age group 31 – 40 years, and 23(11.3%) within age group 20 – 30 years. Males showed predominance among participants were 131(64.5%), while female were 72(35.5%). The majority of

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patients were married 141(69.5%), while divorced/ widowed were 40(19.7%), and unmarried was 22(10.8%). The education level of majority, 61(30%) was primary school level, followed by 58(28.6%) was secondary school level, and 44(21.7%) were illiterate or having traditional education (Khalwa). Not working was 63(31%), followed by self-employment was 60(29.6%), work in governmental sector was 31(15.2%), work in private sector was 35(17.2%), and retired was 14(6.9 %). Over half of patients did not have Health insurance 107(52.7%), while 96(47.3%) have health insurance. (Table-1)

**Table 1: Socio-demographic characteristics of hypertensive patients**

Variables	Categories	Frequency(n)	Percent (%)
Sex	Female	72	35.5
	Male	131	64.5
Age	20 - 30 years	23	11.3
	31 - 40 years	45	22.2
	– 50	56	27.6
	>50years	79	38.9
Marital Status	Unmarried	22	10.8
	Married	141	69.5
	Divorced/Widowed	40	19.7
Level of Education	illiterate	44	21.7
	Primary school	61	30.0
	Secondary	58	28.6
	University and above	165	19.7
Work Status	Self employed	60	29.6
	Work in private sector	35	17.2
	Government employed	31	15.2
	Not working	63	31.0
	Retired	14	6.9
Residence	Inside Khartoum state	100	49.3
	Outside Khartoum state	103	50.7
Have health insurance	Yes	96	47.3
	No	107	52.7

### Health profile:

The duration of hypertension was varied between zero – 5 years was 92(45.3%), 6 – 10 years in 68(33.5%), 11 – 15 years in 21(10.4%), and more than 15 years in 22(10.8%). The overall knowledge regarding high blood pressure in majority 81(39.9%) was poor, followed by 63(31%) was fair, and 59(29%) was good. Regarding comorbidities, 93(45.8%) of patients had diabetes mellitus, 25(12.3%) had renal disease, 13(6.4%) had thyroid disease, 13(6.4%) had heart failure, and 12(5.9%) had ischemic heart disease.

Regarding follow up, 89(43.8%) had regular follow up, 91(44.8%) when symptoms appear, and 7(3.5%) had daily follow up. While 16(7.9%) never follow up. The majority 62(30.5%) of patients attend health care for follow up, 42(20.7%) in private centers and hospitals. The majority 113(55.7%) of patients had normal body mass index, followed by 60(29.5%) were overweight, 19(9.4%) were obese, and 10(4.9%) were underweight. Controlled blood pressure was reported in 59(29.1%). (Table-2)

**Table 2 Health profile characteristics of hypertensive patients**

Variables	Categories	Frequency (n)	Percent (%)
Duration of hypertension	0 - 5	92	45.3
	6 - 10	68	33.5
	11 - 15	21	10.4
	> 15	22	10.8
Knowledge of HTN	Good Knowledge	59	29.1
	Fair knowledge	63	31.0

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	Poor Knowledge	81	39.9
Comorbidity	Yes	189	93.4
	No	14	6.9
Type of Comorbidity	DM	93	45.8
	CVD	31	15.2
	Renal diseases	25	12.3
	Thyroid disease	13	6.4
Follow up	Daily	7	3.5
	Regularly	89	43.8
	When symptoms appear	91	44.8
	Never	16	7.9
Body Mass Index (Kg/M2)	Underweight	10	4.9
	Normal	113	55.7
	Over Weight	60	29.5
	Obesity	20	9.9
Blood Pressure Status	Controlled	59	29.1
	Uncontrolled	144	70.9

### Diet adherence:

The majority 93(45.8%) of patients were often eats salt, 87(42.9%) never eats fats, 71(34.9%) often eats oils, 93(45.8%) often takes Beverages (stimulants), 69(34%) always eats starchy foods, 102(50.2%) often eat vegetables, and 89(43.8%) often eats fruits. **(Table-3)**

**Table-4** showed that the majority of patients 121(59.6%) do not followed specific diet for hypertension, 12(5.9%) avoid certain food due to cultural beliefs related to high blood pressure, 81(39.9%) avoid certain food due to personal preference, 94(46.3%) use herbal treatment for hypertension, and 63(31%) experienced a sudden increase in blood pressure due to not eating the right food.

**Table 3: Diet consumption among hypertensive patients.**

Consumption	Free use	Use with cautions	Limited use	Never use	Total
Salt	24(11.8%)	<b>93(45.8%)</b>	52(25.7%)	34(16.7%)	203(100%)
Fats	21(10.3%)	47(23.2%)	48(23.6%)	<b>87(42.9%)</b>	203(100%)
Oils	56(27.6%)	<b>71(34.9%)</b>	41(20.2%)	35(17.1%)	203(100%)
Beverages (stimulants)	44(21.7%)	<b>93(45.8%)</b>	44(21.7%)	22(10.8%)	203(100%)
Starchy foods	<b>69(34.0%)</b>	54(26.6%)	61(30.1%)	19(9.3%)	203(100%)
Vegetables	67(33.1%)	<b>102(50.2%)</b>	19(9.3%)	15(7.4%)	203(100%)
Fruits	54(26.6%)	<b>89(43.8%)</b>	53(26.1%)	77(37.9%)	203(100%)

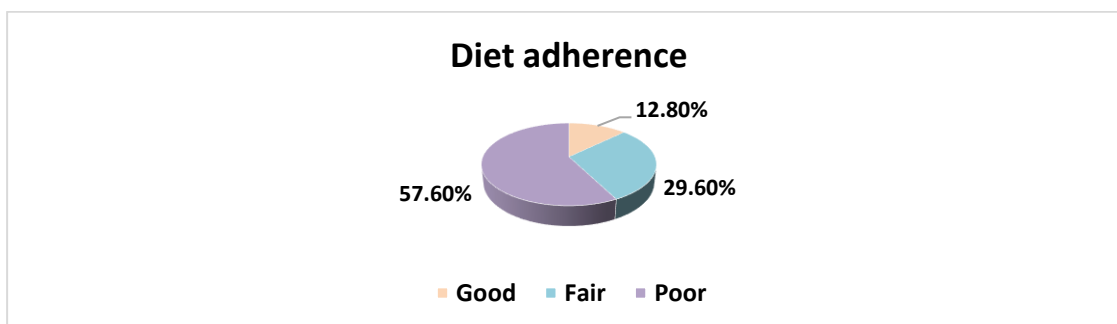
**Table 4 Dietary behaviour among hypertensive patients**

Behaviour	N	%	
Follow a specific diet	Yes	82	40.4
	No	121	59.6
Avoid certain food (cultural)	Yes	12	5.9
	No	191	94.1
Avoid certain food (personal)	Yes	81	39.9
	No	122	60.1

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Herbal treatment	Yes	94	46.3
	No	109	53.7
Experienced a sudden increase in blood pressure (due to wrong eat)	Yes	63	31.0
	No	140	69.0

Diet adherence was poor in majority 117(57.6%), fair in 60(29.6%), and good in 26(12.8%). **(Figure -1)**



Moreover, adherence to diet was not associated with specific age group, Gender, Marital status, education level ( $P$  value  $>0.05$ ). There is significant association between having good diet adherence, and controlled of hypertension most of patients with good diet were had normal blood pressure or first stage hypertension. ( $p$  value = 0.021) **(Table-5)**

**Table 5: Sociodemographic and diet adherence associations**

Sociodemographic information	Diet adherence				P value	
	Poor	Fair	Good	Total		
Age	20 - 30	15(7.4%)	5(2.5%)	3(1.5%)	23(11.3%)	0.841
	31 - 40	28(13.8%)	12(5.9%)	5(2.5%)	45(22.2%)	
	40 - 50	33(16.3%)	15(7.4%)	8(3.9%)	56(27.6%)	
	>50	41(20.2%)	28(13.8%)	10(4.9%)	79(38.9%)	
Sex	Male	82(40.4%)	38(18.7%)	11(5.4%)	131(64.5%)	<b>0.072</b>
	Female	35(17.2%)	22(10.8%)	15(7.4%)	72(35.5%)	
Marital Status	Married	81(39.9%)	41(20.2%)	19(9.4%)	141(69.5%)	0.211
	Unmarried	17(8.4%)	3(1.5%)	2(1.0%)	22(10.8%)	
	Divorced widowed	19(9.4%)	16(7.9%)	5(2.5%)	40(19.7%)	
Education	Nil \ traditional	23(11.3%)	14(6.9%)	7(3.4%)	44(21.7%)	0.496
	Primary	34(16.7%)	17(8.4%)	10(4.9%)	61(30.0%)	
	Secondary	35(17.2%)	15(7.4%)	8(3.9%)	58(28.6%)	
	University above	25(12.3%)	14(6.9%)	1(0.5%)	40(19.7%)	
Blood pressure	Controlled (normal)	28(13.8%)	19(9.4%)	12(5.9%)	59(29.1%)	<b>0.021</b>
	First stage	85(41.9%)	39(19.2%)	11(5.4%)	135(66.5%)	
	Second stage	3(1.5%)	2(1.0%)	1(0.5%)	6(3.0%)	
	Third	1(0.5%)	0(0.0%)	2(1.0%)	3(1.5%)	
<b>Total</b>		<b>117(57.6%)</b>	<b>60(29.6%)</b>	<b>26(12.8%)</b>	<b>203(100.0%)</b>	

## DISCUSSION

## Dietary Adherence among Hypertensive Patients at Khartoum State – Sudan (2021-2024)

This study identified some major themes relating to hypertensive adults' lack of knowledge of normal blood pressure values, duration, Risk factors, diet, and ways to control hypertension, alternative beliefs for HPT control. Few studies have reported on hypertensive adults' knowledge of normal blood pressure values; however, some studies have investigated knowledge about hypertension as a health condition<sup>(13,14,15)</sup>. In this study we observed that 88(43.3%) know the meaning of hypertension, the overall knowledge in majority 81(39.9%) was poor, followed by 63(31%) was fair, and 59(29%) was good. In line *Sekome K, et al;*<sup>(16)</sup> study found that hypertensive adults have little to no knowledge about high blood pressure normal values. *Wolde M, et al;*<sup>(17)</sup> study observed that the majority (55.3%) of the patients had a low level of knowledge, 17.9% had a moderate level of knowledge whereas 26.8% had a high level of knowledge about hypertension. While higher frequency of good knowledge reported by *Worku Kassahun C, et al;*<sup>(18)</sup> that 215 (56%) had good knowledge towards hypertension. This variation could be due to differences in educational interventions, healthcare access, and demographic factors.

Dietary approaches to stop hypertension (DASH) is a globally recommended approach to dietary habits for hypertension control, which has been in existence for over 25 years<sup>(19)</sup>. The DASH diet is considered the golden standard in high blood pressure control, and it emphasizes foods rich in potassium, protein, fiber, magnesium, and calcium<sup>(20)</sup>. Such foods may include fruits and vegetables, nuts, beans, whole grains, low-fat dairy and limiting food high in saturated fat. However, the daily diet consumed by participants in our study indicates lack of variety of different food types. Participant's diet appears mainly rich in starch, which is high in carbohydrates consumed daily. Thus, unsurprisingly diet adherence was poor in over half of patients 57.6%, fair in 60(29.6%), while only 12.8% had good adherence to recommended diet. Similar findings reported in Saudi Arabia, by *Elbur Al. Et al;*<sup>(21)</sup> was 11.8%. Higher proportion reported by *Abera B, et al;*<sup>(22)</sup> that 28.30% (CI: 23.9, 33) of participants were found to be adherent to the recommended diet. Poor diet adherence can exacerbate health problems, reduce the effectiveness of medical treatments, and increase the risk of complications.

Moreover, Patients adherence to diet was not associated with specific age group, Gender, Marital status, and education level, while significant association between having good diet adherence, and stage of hypertension most of patients with good diet were had normal blood pressure or first stage hypertension. (P value=0.021). In contrary *Abera B, et al;*<sup>(22)</sup> found factors like participation education, level of knowledge, respondents' ages, gender and length of time since hypertension diagnosis showed a strong association with adherence to recommended dietary guidelines. This indicates that patients in the early stages of hypertension might be more motivated to adhere to dietary recommendations to manage their condition effectively. The variation in adherence rates could be attributed to differences in study settings, socioeconomic, cultural eating habits, and the seasonality and availability of foods during data collection. These variations may also be attributed to differences in measurement tools, cultural eating practices, and dietary habits across countries.

### CONCLUSION:

The study reported that the majority of the patients suffering from hypertension consisted of older dudes who had poor adherence to dietary guidelines and follow-up procedures. Although a considerable number had attained blood pressure control, the majority were still in the early stages of the disease, which implied that treatment was still challenging. Generally, there was widespread lack of awareness about hypertension, which made effective management and lifestyle modification even more complicated. Dietary management was emphasized in the treatment of hypertension because there is a strong correlation found between improved hypertension control and good dietary adherence. Therefore, it is recommended that educational programs should be implemented to increase knowledge about hypertension, its risk factors, symptoms, and the importance of regular monitoring. And encourage regular follow-ups through reminders and support systems to ensure consistent monitoring and management of hypertension. In addition, further research could use longitudinal or experimental designs, such as randomized controlled trials (RCTs), to better establish causal relationships.

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