Prevalence and Associated Factors of Pre-Hypertension Among Adults Visiting the Outpatient Department at Mizan Tepi University Teaching Hospital, Mizan-Aman, Ethiopia, 2021.

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Research Article

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Abstract

Background: Prehypertension is a systolic blood pressure (SBP) of 120-139 millimeters of mercury (mmHg) and a diastolic blood pressure (DBP) of 80-89 millimeters of mercury (mmHg) According to JNC-7 report the new added category. It is considered as a starting point for cardiovascular and many other morbidities. Little is known about the magnitude of prehypertension and its associated factors in study area.

Objective: To assess prevalence of Pre-hypertension and Associated factor among adults visiting the Outpatient department at Mizan Tepi university teaching hospital, Mizan-Aman, Ethiopia, 2021.

Methods: Institution based cross sectional study design was conducted in Mizan Tepi University Teaching hospital. Simple random sampling method was used to recruit study participants. Data was entered into Epi data version 3.1 and exported to SPSS version 23 for data analysis. The descriptive analysis of data was done and the result presented using frequency tables and graphs. Multivariable logistic regression model was fitted, Adjusted Odds Ratio (AOR) at 95% confidence interval and p-value <0.05 were estimated to determine statistically significant association between predictors and outcome variable.

Result: The prevalence of Prehypertension among adults visiting the Outpatient department at Mizan Tepi university teaching hospital was 30.7%. Significant association of prehypertension was found with age (AOR=1.22, 95% CI: 0.69, 2.15), educational status (AOR=0.32, 95% CI: 0.11, 1.00), physical exercise (AR=1.11, 95% CI: 0.57, 2.16) and Body Mass Index (AOR=4.14, 95% CI: 0.44, 39.34).

Conclusion: Pre-Hypertension is high in the study area. As a result, concerned body should take action to enhance patients visiting Mizan Tepi University Teaching hospital about impact of Pre-Hypertension on individual health and how to control it.

Introduction

In the recent JNC-7 report, pre-hypertension (Pre-HTN a new category including normal and high-normal blood pressure (BP) were added because normal or high-normal BP might be another condition related to the development of cardiovascular diseases (CVD) in the future Many researchers in public health and medicine agree to apply more aggressive measures and early lifestyle modification for the population with Pre-HTN, in order to prevent future CVD and hypertension (HTN) (1). The term Prehypertension was developed in 2003 by the American guideline on Hypertension to warn of the elevation of blood pressure and the risk of hypertension and cardiovascular disease (2).

In order to fulfill the criteria to be Prehypertension, a systolic blood pressure (SBP) or a diastolic blood pressure (DBP) should within 120–139 mmHg or 80–89 mmHg range respectively based on the seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood pressure (JNC-7) (3). Currently prehypertension is among a big public health problem because of its strong correlation with increased risk of chronic disease of cardiovascular such as hypertension and cerebrovascular accidents (4, 5). Prehypertensive individuals have a two-three fold higher risk of developing hypertension than those who are having normal blood pressure (6–9).

Many studies reveal that prehypertension is mostly associated with major organ dysfunction, such as plaque formation in artery, damage of small blood vessel, hardening of coronary artery, formation of new vasculature, and enlargement of left ventricle (10–15). So that, studying the prevalence of prehypertension and related risk factor could help to halt hypertension and major organ damage. It also common in high and low income country and associated with target organ damage (16–20). Modifications of lifestyle such as losing weight, increased physical activity, reduction in consumption of alcohol and modified diet for all people with pre-hypertension are recommended for control of pre-hypertension.

Study on prevalence of prehypertension and its associated factors in study area are limited. Comprehensive information on the burden of prehypertension is vital in developing their effective national control strategies. Therefore, this study determines the prevalence of prehypertension and their associated factors among patients visiting MTUTH OPD.

Methods And Materials

Study Setting and Design.

Institution based cross sectional quantitative study design was conducted from March 1-30, 2021 in Mizan Tepi University Teaching Hospital. This Hospital is located in Mizan-Aman town of Bench-Sheko zone, SNNPR, of Ethiopia. Mizan-Aman town is 565 km from Addis Ababa and 835 km from regional town, Hawassa. The hospital has 200 bed, 4 wards and 10 adult outpatient departments (OPD) serving over 8, 50538 peoples from surrounding area. MTUH has 6 specialists, 49 General practitioner, 89 nurse, 32 midwifery, 21 laboratory technician, 19 pharmacist, and 4 anesthetist. The OPDs serves around 400 patients per day (21).

Sample size and sampling technique

The sample size was determined by using single population proportion formula by using; prevalence (P) = 50 %, no previous study found with similar title in the study area, Confidence interval (CI) = 95%, margin of error = 5%, non-response = 10% and the total sample size was 422. The total sample sizes were distributed among 5 OPDs which is selected by lottery method from 10 adult OPDs found in MTUTH. Study units were incorporated in the study by using systematic sampling technique. The first study units were selected by lottery method and the remaining study participants were included every 5 patients until the required sample size was fulfilled.

Sample size also calculated for risk factor for pre-hypertension, however sample size calculated for prevalence results large sample size.

Sampling technique

Study units were incorporated in the study by using systematic sampling technique. The first study units were selected by lottery method and the remaining study participants were included every 5 patients until the required sample size was fulfilled (Fig. 1).

Data collection techniques and procedures.

The data was collected through interviewer administered questionnaire with structured tool. The questionnaire contains data related to socio-demographic characteristics and physical examination. Data was obtained from measuring physical body weight, height and BP. Five nurses were assigned for data collection with one supervisor.

Measurements

Blood pressure:- In order to take the blood pressure of study participants adult size mercury sphygmomanometer and stethoscope was used with three consecutive measurement was obtained, and the average BP of each individual was used at least 3 minute apart within each measurements. Data collector were rule out exogenous factor those elevate blood pressure like coffee, tea, Coca- Cola, smoking and doing exercise before each participant was measured. If they were used those substances elevating BP; measurement was taken after 30 minute of initial consumption. Each participant was measured while seated on a chair with a prior five-minute rest. Accordingly Prehypertension or high-normal BP status was based on the presence of either SBP of 130–139 mmHg and/or DBP of 85–89 mmHg according to International Society of Hypertension (ISH) 2020 guidelines (22).

Body mass index (BMI) categorized as underweight, normal weight, overweight and obesity if there BMI are < 18.5 kg/ m², 18.5–22.9 kg/m², 23.0–24.9 kg/m², and ≥ 25.0 kg/m² respectively according to Western Pacific Region of World Health Organization (WHO) criteria pertaining to obesity criteria (23).

Physical activity International Physical Activity Questionnaire (IPAQ) was used to assess physical activity done for the past 7 days (IPAQ-S7S). Based on this IPAQ scoring protocol tool physical activity is categorized as low moderate and high (24).

Weight standard apparatus scale was used to measure weight of study participants by considering the nearest kilogram (20).

Height for study participants height measurements Seca plastic height board was used by considering nearest the nearest millimeter (20).

Data Quality Management

A data was collected with Amharic version of questionnaire which has been translated back to English version to check the consistent. One week prior to the actual data collection, the questionnaire was pretested on 5% of the sample in Tepi hospital. The purpose of pretest is to ensure that the respondents are able to understand the questions and to check the wording, logic and skip order of the questions in a sensible way to the respondents. Modification was making accordingly after the pre-test. Six BSc Nurses were receiving 1 day training on data collection techniques. Data collection was supervised by 1 BSc Nurse, and each questionnaire was check for completeness by the supervisor on a daily basis. All apparatus was checked for functionality before starting collecting the data.

Data management and analysis

Data was entered into Epi data version 3.1 and exported to SPSS version 23 for data analysis.

Descriptive statistics was used to identify the distribution of socio demographic characteristic and physical finding of the study participants. It was processed by using descriptive

analysis, including frequency distribution, cross tabulation and summary measures. Binary logistic regression analysis was used to see the independent effect of independent variable on outcome variable. Those variables in Binary logistic regression analysis having P-value of ≤ 0.25 were candidate for multivariable analysis. Step wise back ward elimination model building procedure with likelihood ratio model comparison technique was used while building model. Among independent variables Multi-Collinearity was checked Prediction performance of predictors for prehypertension was checked using ROC curve. Hosmer and Lemeshow goodness of fit chi-square test was used to check final model fitness. Adjusted odds ratio (AOR) at 95% CI was used to assure statistical significance association between prehypertension and outcome variables with p-value ≤ 0.05 . Finally, finding of study was presented by using narration, table, Chart and graph.

Results

Demographic and socio-economic characteristics

A total of 398 adults visiting the Outpatient department at Mizan Tepi university teaching hospital were included in this study with response rate of 94.3%. Out of the total 43.5% of study participant's age was between 25–34 years with the overall mean age of 28 year ($27 \pm 7SD$) and majority of them were married 82.7%. Regarding educational status, 31.9% has no formal education, which means unable to read and write. One hundred eighty two of the study participant's occupation was housewife and 25.1% of them acquire 1001–2000 Ethiopian birr monthly income (Table 1).

Table 1
Socio-Demographic characteristics of adults visiting the Outpatient department at
Mizan Tepi university teaching hospital, Ethiopia, 2021(n = 398).

Variables	Category	Frequency	Percentage
Sex	Male	225	56.5
	Female	173	43.5
Age	14–24 years	129	32.4
	25–34 years	173	43.5
	35- 44years	96	24.1
Education status	Unable to write and read	28	31.9
	Primary	95	25.6
	Secondary	135	23.9
	College and above	140	18.6
Marital status	Single	329	82.6
	Married	49	12.3
	Divorced	20	5.1
Occupation	Students	37	9.3
	House wife	182	45.7
	Government employee	73	18.3
	Merchant	80	20.2
	Farmer	26	6.5
Monthly Income (ETB birr)	< 1000	30	7.5
	1001–2000	100	25.1
	2001–3000	73	18.3
	3001–4000	80	20.2
	4001–5000	26	6.5
	> 5000	89	22.4

Dietary and exercise related characteristics of respondents

More than fifty percent of study participants never use alcohol (51.5%) and smoke (74.8%) cigarette. Of study participants, 93.2% use vegetable oil and 51.2% do medium exercise (Table 2).

Table 2
Dietary and exercise related characteristics of adults visiting the
Outpatient department at Mizan Tepi university teaching hospital,
2021(n = 398).

Characteristics	Frequency	Percentage (%)
Alcohol use	205	51.5
Never	151	37.9
Current	42	10.6
Previous		
Smoking	298	74.8
Never	13	3.3
Current	87	21.9
Previous		
Commonly used fat/oil	371	93.2
Vegetable oil	27	6.8
Butter		
Fruit consumption per week	42	10.5
None	215	54.1
1–3 days	141	35.4
4–7 days		
Vegetable consumption/week	31	7.8
None	229	57.5
1–3 days	138	34.7
4–7 days		
Physical activity	110	27.6
Low	204	51.2
Medium	84	21.2
High		

BMI Status

Regarding body mass index; among study participants, 13.6% categorized as underweight and 2.5% of them as obesity. The remaining 70.6%, 13.3% categorized as normal weight and pre-obesity respectively (Fig. 2).

Prevalence of Pre hypertension

The prevalence of Pre hypertension among reproductive age women's family planning user in the study area was 30.7%, (95% CI; 26.0–35.0) (Fig. 3).

Factors associated with pre hypertension

Those exposure variables with p-values < 0.25 were entered into multivariable logistic regression analysis. In bivariable logistic regression analysis, age, education status, marital status, occupation, doing exercise, BMI, Butter and salt consumption were have p-values < 0.25, so that entered into multivariable logistic regression analysis.

In multivariable logistic regression analysis age, educational status, doing physical exercise, and BMI were significantly associated with pre hypertension. The likelihood of pre hypertension was 1 times higher among adults visiting the Outpatient department at Mizan Tepi university teaching hospital in found in age group between 35–44 (AOR = 1.22, 95% CI: 0.69, 2.15) compared to in age group between 14–24.

In the current finding, adults visiting the outpatient department at Mizan Tepi university teaching hospital attending secondary education were 68% (AOR = 0.32, 95% CI: 0.11, 1.00) less likely to had pre hypertension compared to those unable to write and read

In the current finding those participants perform low physical exercise were more likely to have pre hypertension (AR = 1.11, 95% CI: 0.57, 2.16) as compared with those doing high physical activity per weeks.

Similarly, the odds of pre hypertension were higher among with obesity (AOR = 4.14, 95% CI: 0.44, 39.34) BMI compared to underweight BMI (Table 3).

Table 3

Bi-variate and Multivariate logistic regression analysis result of Pre-hypertension and Associated factors among adults visiting the Outpatient department at Mizan Tepi university teaching hospital, Ethiopia, 2021(n = 398).

Independent variable		Frequency	Pre hypertension		Univariate	Multivariate	P-value
			Yes	No	COR (95%CI)	AOR (95%CI)	
Age in years	14–24	129	4	125	1	1	
	25–34	173	73	100	0.04(0.01, 0.11)	0.08(0.03, 0.27)	0.49
	35–44	96	45	51	0.83(0.50, 1.37)	1.22(0.69, 2.15)	< 0.001**
Marital status	Divorced	20	9	11	1	1	
	Unmarried(Single)	49	12	37	0.54(0.22, 1.35)	0.93(0.31, 2.80)	0.90
	Married	329	101	228	0.40(0.13, 1.19)	1.21(0.29, 5.09)	0.79
Occupation	Student	37	4	33	1	1	
	House wife	182	62	120	0.83(0.35, 1.92)	1.14(0.37, 3.54)	0.81
	Government	73	24	49	0.78(0.31, 1.98)	0.73(0.20, 2.63)	0.63
	Merchant	80	22	58	0.19(0.05, 0.71)	0.70(0.11, 4.43)	0.71
	Farmer	26	10	16	0.61(0.24, 1.54)	0.98(0.29, 3.32)	0.97
Educational status	Unable to write and read	28	10	18	1	1	
	Primary	95	48	47	1.83(0.77, 4.34)	1.69(0.56, 5.11)	0.35
	Secondary	135	29	106	0.45(0.20, 1.18)	0.32(0.11, 1.00)	0.04*
	College and above	140	35	105	0.60(0.25, 1.42)	0.45(0.15, 1.36)	0.16
Physical activity	High	84	37	47	1	1	
	Medium	204	39	165	0.33(0.20, 0.55)	0.50(0.27, 0.96)	0.75

P-value of * < 0.05 and ** < 0.01, AOR = Adjusted Odds Ratio.

	Low	110	46	64	1.10(0.62, 1.94)	1.11(0.57, 2.16)	0.03*
BMI	< 18.5	45	1	44	1	1	
	18.5–24.9	253	69	184	0.20(0.01, 3.58)	0.21(0.01, 4.43)	0.67
	25-29.9	90	51	39	3.37(0.42, 27.13)	1.62(0.17, 15.06)	0.21
	30-34.9	10	1	9	11.77(1.43, 96.85)	4.14(0.44, 39.34)	0.01*
Butter consumption	3tsp	57	16	41	1	1	
	1tsp	159	56	103	1.39(0.72, 2.70)	2.19(0.46, 10.38)	0.32
	2tsp	182	50	132	0.97(0.50, 1.88)	0.90(0.36, 2.24)	0.82
Salt consumption	3tsp	52	13	39	1	1	
	1tsp	116	41	75	1.64(0.79, 3.42)	2.11(0.86, 5.19)	0.10
	2tsp	230	68	162	1.26(0.63, 2.51)	1.74(0.75, 4.01)	0.20
P-value of * < 0.05 and ** < 0.01, AOR = Adjusted Odds Ratio.							

Discussion

This study has tried to assess the prevalence and associated factors of pre hypertension among adults visiting the Outpatient department at Mizan Tepi university teaching hospital. Accordingly the prevalence of pre hypertension found to be 30.7%, (95% CI; 26.0–35.0). The prevalence found in this study is lower than the prevalence reported from Tanzania 37.2 (95% CI 34.0–40.6) (3). This variation could be due to age category of target population, setting and sample size. This study was conducted in health facilities, but study conducted in Tanzania was community based. Similarly, participants involved in this finding were lower than participants involved in the Tanzania. Similarly study conducted in Uganda on prevalence of pre hypertension is 33.9%, which is greater than the current finding (20). The possible explanation for this discrepancy might be due to sample size difference, study setting and socio demographic differences. Study done in Uganda were involving large sample size by using survey.

The current study finding is nearly similar with study conducted in Zhengzhou, middle China, which is the prevalence of pre Hypertension was 30.3% (25). The possible explanation for this similarity might be due to tool used, study setting and variable considered.

In comparison with study conducted in Brazil 20.6% (26), the prevalence is higher. The possible explanation for this discrepancy might be due to sample size difference, study setting and socio demographic differences.

In addition study conducted in Brazil solely involves women, while the current study involves both male and women.

In this study, among adults visiting the Outpatient department at Mizan Tepi university teaching hospital found in age between 35–44 was 1 times more likely to experience pre hypertension than those found age category of 14–24. This is supported by study conducted in Uganda (20), Bangladesh (27), and Indonesia (28). This might be explained by as age increase blood pressure become elevated due reduced elasticity vasculature, increased viscosity of blood, due to aging process, atherosclerotic changes occur in the blood vessels which in combination with other factors may contribute to this. In order to avert this problem regular physical exercise, weight loss and using DASH food is recommended. In the contrary age had no significant association with prehypertension in study conducted in Southern Tanzania (29).

In the current finding, adults visiting the outpatient department at Mizan Tepi university teaching hospital attending secondary education were 68% less likely to had pre hypertension compared to those unable to write and read. This finding is harmony with study done in Ghana (19). Obviously, education has positive impact on the prevention of prehypertension. Lack of awareness regarding the risk factors for developing hypertension and inadequate knowledge about appropriate preventive measures could lead to delay in diagnosis and inadequate control of blood pressure. However, study done in Uganda (20), Brazil (26) and Indonesia (28) did not show a significant association between educational status and prehypertension.

This study demonstrates an association between prehypertension and lack of physical exercise. Based on these finding adults visiting the outpatient department in the study area performing low physical exercise per week were one times more likely to had prehypertension than who doing high physical exercise per week. Similarly, study conducted in Ghana supported these findings. It is clear that regular physical exercise by itself reduces individual body weight, reduces blood pressure level, and boosts protective high density lipoprotein level in the blood. Unlike the current finding, research work in Brazil (26) and Indonesia (28) did not show a significant association between physical exercise and prehypertension.

On other hand in current finding those participants, being obese was 4 times more likely to experience pre hypertension as compared to underweight. This is supported by study conducted in Bangladesh (27), Uganda (20) and Indonesia (28). This might be due to obese individuals heave more cholesterol in their body which have high tendency to form plaque in the vasculature and hindering laminar blood flow by doing so increase blood pressure. In the contrary BMI had no significant association with prehypertension in study conducted in Malaysia (30).

Standardized tools which were tested for their measurements according were employed to assess prehypertension. Those study participants had prehypertension were linked with health facility to got needed treatment.

This study is not free from limitations, recall and social desirability bias could be one of the limitations of the study. Furthermore, though intensive training, regular supervision and measurement standardization the study was not free from measurement error.

Conclusion

Pre-Hypertension is high in the study area. Age, educational status, doing physical exercise, and BMI were significantly associated with pre hypertension Therefore, efforts should be taken to enhance patients visiting Mizan Tepi University Teaching hospital about impact of Pre-Hypertension on individual health and how to control it.

Abbreviations

BMI: Body Mass Index

DBP: Diastolic Blood Pressure

JNC-7: The Seventh Report of the Joint National. Committee

MTUTH: Mizan Tepi University Teaching hospital

mmHg: Millimeters of Mercury

SBP: Systolic Blood Pressure

Odds Ratio; COR: Crude Odds Ratio

WHO: World Health Organization

Declarations

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Availability of data and materials

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Author contributions

MG: Solely responsible conceptualization, design, software, data acquisition and analysis, drafting and preparing the manuscript, and accountable for all aspects of the work.

Competing interests

The authors declare that there is no competing interest.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of Mizan Tepi University (Ref No. Nur/0070/13). Ethical clearance and official permission letter was secured from the Mizan Tepi university teaching hospital. The verbal consent was approved by the ethical committee since the study does not obtain biological sample after explaining the objective of the study, the risk and benefit, issues of confidentiality and the right of participation. Assurance was given for participants to withdraw or not to participate in the study without any prejudice. I confirmed that this study was conducted in accordance with the declaration of Helsinki.

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Figures

Figure 1

Diagrammatic illustration of sampling technique for assessment of prevalence of Pre-hypertension and Associated factors among adults visiting the Outpatient department at Mizan Tepi university teaching hospital

Figure 2

Body Mass Index status among adults visiting the Outpatient department at Mizan Tepi university teaching hospital, Ethiopia, 2021(n=398).

Figure 3

Prevalence of pre hypertension among adults visiting the Outpatient department at Mizan Tepi university teaching hospital, Ethiopia, 2021 (n=398).