Antihypertensive medications pattern and their effect in blood pressure control in patients attending Bishoftu general hospital ambulatory ward, Debrezeit (Bishoftu), Ethiopia

Minyahil Alebachew Woldu[1*†], Dereje Fasil Shiferaw[2†], Jimma Likisa Lenjisa[2], Gobezie Temesgen Tegegne [2], Gurmu Tesafye[2], Hunduma Dinsa[2]

[1] Department of Pharmacology and Clinical Pharmacy, School of Pharmacy, College of Health Sciences, Addis Ababa University, Addis Ababa-Ethiopia and [2]Clinical Pharmacy Unit, Department of Pharmacy, College of Medicine and Health Sciences, Ambo University, Ambo-Ethiopia

ABSTRACT

Hypertension is an extremely common clinical problem, affecting approximately 1 billion individuals worldwide. Antihypertensive medications are a class of drugs that are used to treat hypertension. Recent studies have shown that prescribing practices of health providers for hypertension medication did not match the guidelines released by the Joint National Committee on Prevention, Detection, Evaluation and Treatment of high blood pressure (JNC VII & VIII). Hence, approximately half of the hypertension and various co-morbidities did not received from first-line treatments. A prospective cross-sectional study was conducted. Data was coded and entered into the Statistical Package for Social Science (SPSS) version 19 for Windows. A 5% sample pretest was performed on randomly selected patients before the beginning of the study. A total of 288 participants were recruited and studied. More than half of the participant patients were female 164 (56.9%) and that of male were 124 (43.1%). Among the study participants 166 (58%) were prescribed with monotherapy and the rest 122(42%) were received combination of medications. More than fifty percent of the participants were diagnosed to have HTN only; a total of 124(43.1%) patients had one or more concurrent diseases. patients with age in between 50 and 59 (p=0.032) were almost 16 times more prone to develop poor BP control [95% C.I (2.6-97.6)] compared to the other age groups. The single most common risk factor for poor BP control in our study was positive family history [(p=0.02) and 95% C.I (2.9-110)]. Patients who have positive family history of blood pressure had almost 18 times prone to develop poor blood pressure control compared to other studied risk factors like (use of high fatty diet, smoking and Diabetes Mellitus). The major determinants that contributed for poor blood pressure control were age greater than 50, BMI greater than 24.9, family history and the presence of other comorbidities. Females were affected more than males by hypertension in the study area and this result was consistent with a number of similar studies.

Keywords: Prescription Pattern, Antihypertensive Medications, Bishoftu General Hospital

INTRODUCTION

Hypertension (HTN) is an extremely common clinical problem, affecting approximately 1 billion individuals worldwide [1], and 66% of those affected are from low and middle income countries [2]. HTN is a leading contributor to the global burden of cardiovascular morbidity and mortality [3]. It is also about twice as common in patients with DM as in those without (8%) [4]. Antihypertensive medications are a class of drugs that are used to treat hypertension [5]. Six major categories of antihypertensive drugs generally are available, including angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), beta-blockers (BBs), calcium channel blockers (CCBs), diuretics, and others (all other antihypertensive classes including alpha-blockers) [6]. Antihypertensive therapy seeks to prevent the complications of high blood pressure such as stroke, myocardial infractions, coronary heart disease (CHD) and kidney failure [7]. Therefore, once hypertension is diagnosed, starting rational antihypertensive therapy on long term basis along with regular follow up is immensely important [8]. The problem is, irrational prescription of

Corresponding Author Address: Minyahil Alebachew Woldu, Addis Ababa University, College of Health Sciences, School of Pharmacy, Department of Pharmacology and Clinical Pharmacy. P.O. Box 9086. Addis Ababa, Ethiopia; E-mail: minwoldu@gmail.com

antihypertensive drugs is a common occurrence in clinical practices [9]. According to the ministry of health of Ethiopia, 10.6% of the population has been estimated to have HTN and so, listed as the 7th leading cause of death in the country. Approximately 30% of adults in Addis Ababa have hypertension above 140/90mmHg or reported use of anti-hypertensive medication [10].

Recent studies have shown that prescribing practices of health providers for hypertension medication did not match the guidelines released by the Joint National Committee on Prevention, Detection, Evaluation and Treatment of high blood pressure (JNC VII & VIII). Hence, approximately half of the hypertension and various co-morbidities did not received from first-line treatments [11]. Accordingly there is a need to assess the pattern of usage of antihypertensive drugs, to see if the current usage is rational, effective and tolerated and in accordance with the current guidelines for treatment. Thus, the purpose of the present study was to determine the patterns of antihypertensive medications and their effect in Blood pressure Control at Bishoftu General Hospital.

METHODS

Study area: The study was conducted at Bishoftu general hospital which is located in Oromiya regional state, Bishoftu town, Ethiopia. It is 47km away from Addis Ababa towards east. The hospital provides services for approximately 130,000 population of the town and surrounding population.

Study period: The study period was from Oct. 15/2014 to April-15/ 2014.

Study design: A prospective cross-sectional study was conducted using pretested and validated checklists.

Sample size and sampling techniques: A total of 288 patients were recruited using a systematic random sampling technique, considering the number of patients visiting ambulatory ward during the weekly schedule.

Study population: All patients attending Bishoftu general hospital, hypertension clinic during the study period

Inclusion criteria: All hypertensive patients visiting Bishoftu general hospital during the study period

Exclusion criteria
- Patients with age =/< 18 year
- Patients with no medication order

Study variable: The main study variables include antihypertensive agents pattern, Blood Pressure control, disease conditions or co-morbidities, age, sex, weight, height, marital status, and educational level.

Data organization, presentation and analysis: Data was coded and entered into the Statistical Package for Social Science (SPSS) version 19 for Windows. Figures and tables were used to present the findings. Chi-square and binary logistic analysis were used to further investigate any associations. A 95% CI and p-value of < 0.05 was considered to be statistically significant.

Data quality assurance: A 5% sample pretest was performed on randomly selected patients before the beginning of the study. A pretested and validated check list was used. All steps in data collection and recording were closely monitored by the principal investigator and daily collected data was, recorded and compiled for the next day study.

Ethical considerations: Ethical clearance was obtained from the Ambo University ethical review committee and official letter of co-operations was provided to Bishoftu general Hospital prior to data collection. Patient consent was obtained prior to data collection and no personal identity was disclosed. The raw data was not made available to anyone, and was not used as the determinant of any identity or subjects.

RESULTS

Socio-demographic and clinical data: A total of 288 participants were recruited and studied. More than half of the participant patients were female 164 (56.9%) and that of male were 124 (43.1%). The mean average age of the participants was 54.4+12. Most of the participants had accomplished high school level 162(56.2%). Majority of the participants were Orthodox Christians 190(66%), (Table 1).

Risk factors and behavioral characteristics: Among the patients participates in this study 162(56.2%) were use high fatty diet in regular base, while 136(47.2%) had positive family history for HNT, and 104(36.1%) positive for diabetes mellitus (DM) (Fig 1).

Antihypertensive medications: Among the antihypertensive medications, the prevalence of single drug prescription was 166(57.6%). And the most frequently prescribed single drug was Nifedipine 73(25.4%) followed by Hydrochlorothiazide 29(10.07%), Enalapril of 24(8.33%) and Captopril of 16(5.56%). The most

frequently prescribed dual therapy was 'Enalapril +HCT' 28(9.7%) while triple drug prescription with 'Atenolol +Enalapril + Furosemide' 6(2.1%) and 'Furosemide +Lisnopril + Nifedipine' were also encountered 4(1.4%), (Fig 2). Calcium channel blockers were prescribed in 136(47.2%) patients while ACEIs in 124(43.1%). One hundred twenty two (42.4%) of antihypertensive prescriptions were diuretics while 26(9%) and 16(5.6%) were BBs and others (other antihypertensive drugs including alpha-blockers), respectively. (Fig 3) Among the study participants 166 (58%) were prescribed with monotherapy and the rest 122(42%) were received combination of medications (Fig 4).

Co-morbidities and Compelling indications: Although more than fifty percent of the participants were diagnosed to have HTN only; a total of 124(43.1%) patients had one or more concurrent diseases. From these 92(31.9%) were DM. 28(9.7%) and 4(3.23%) of the participants were CHD and nephropathy, respectively (Fig 5).

Determinants of poor BP control: In this study we have identified that patients with age in between 50 and 59 (p=0.032) were almost 16 times poorly managed their BP with 95% C.I of (2.6-97.6) compared to the other age groups studied. Patients who have their BMI category in between 24.9-29.9 were also found poorly managed their BP compared to the other BMI categories (Table 2).
The single most common risk factor for poor BP control in our study was positive family history of blood pressure with (p=0.02) and 95% C.I (2.9-110). Patients who have positive family history of blood pressure had almost 18 times prone to develop poor blood pressure control compared to other studied risk factors like (use of high fatty diet, smoking and having DM). However, the presence of co-morbidities did significantly affected blood pressure control. Patients who were treated with mono (p=0.01) and dual (p=0.01) antihypertensive medication were also result in poor management of their BP control compared to patients on triple antihypertensive medication treatment. Patients who were treated with diuretics (p=0.03) and CCBs (p=0.00) antihypertensive medication were also result in 12 & 67 times more prone to develop poor BP control compared to patients on other antihypertensive medication with 95% C.I of (2.3-56.8 & 7.8-568.3), respectively (Table 2). From the three month aggregate systolic BP data obtained from our study, we investigated that four patients with normal BP were received monotherapy antihypertensive medications and 10 (5%) patients with prehypertension were received dual therapies (Table 3). This management approaches were not supported with any of the major guidelines and standard books. One hundred

twenty eight (44.4%) of patients in monotherapy were not received diuretics, this shows that these patients were receiving other antihypertensive medications other than diuretics (figure 6). This management approaches also showed the presence of clears irrational management in the study area.

DISCUSSION

In our study majority of the participants (56.9%) who encountered hypertension were female. This finding was in line with the study conducted in Saudi Arabia [12], Jordan [13] and India [14]. Whereas there was also anomalous finding in another Indian study [15]. Significant number patients who developed hypertension (38.2%) were age year in between 50 and 59 and this investigation was similar to the study conducted in Saudi Arabia [12]. Most of the patients BMI classification, 52.1% of them, were in between 24.9-29.9 (over weight) and this result also similar with the study conducted in Saudi Arabia [12]. Our study also demonstrated that hypertensive patients with co-morbidities have a better BP control than those with only HTN. The reason may be due to in uncomplicated disease conditions patients may not be forced to change their way of life style and may also not obliged to stop their habituated social drugs. As a result they will become poor adherence to the ordered medications. Besides these, health professionals could also be less concerned in counseling and ordering appropriate management for uncomplicated cases giving much of their time to more severe and life threatening conditions.

Our study also revealed that 42.4% of antihypertensive prescription was combination therapy and while 57.6% was monotherapy. This was in line with the study done in Nigeria where majorities of their participants were in monotherapy [16]. However, it was different from the study done in Southern India [17] and Saudi Arabia [12], which showed that maximum number of patients underwent dual therapy. These discrepancies in result may be due to the difference in number of patients' stage of hypertension classifications.

The single most commonly prescribed antihypertensive drug in our study was Nifedipine with 25.4%. This result was comparable to the study conducted in India [18] and Taiwan[19]. Different result from our study includes, study conducted in Jordan where ACEs was the leading [13]. Prescription of CCBs remained stable through 1998 (42%; 95% CI: 37% to 48%; of antihypertensive drug visits) but then decreased to 29% (95% CI: 25% to 33%) in 2000 [20]. According to the JNC guidelines, monotherapy is

likely to be successful more frequently for grade1hypertensive patients and thiazide-type diuretics are superior in preventing one or more major forms of cardiac events.

Our study further demonstrated that among the dual antihypertensive therapy the combination of 'Enalapril +HCT' was the leading with (9.7%), while triple drug prescription like 'Atenolol +Enalapril + Furosemide' with (2.1%) and 'Furosemide +Lisnopril + Nifedipine' with (1.4%) were also encountered. This finding quit different from other studies, where the combination of CCB and β-blocker was the leading in the Saudi Arabian study [12], India [14] and the combination of diuretic + β-blocker in the Jordan study [13]. And the combination of 'Diuretic + β-blocker + ARB' and 'Diuretic + ACE inhibitor +CCB' were the leading in the Jordan study [13]. These investigations clearly show that our study was not comparable with other studied articles, major standard text books and guidelines like the JNC VII & VIII, while selecting antihypertensive medications where diuretics has to be the first choice for stage 1hypertention and should have to also be incorporated as one of the drugs in dual or triple antihypertensive therapy [21]. The mean SBP and DBP in our study was 157.7 and 95.8, respectively; which was very much comparable to the study conducted in Jordan [13]. And 47.19% our study participants were in stage II hypertension, which was not consistent to the study conducted in Jordan [13].

Limitations of the study: All the important information may not be recorded well or available as expected. For some critical cases patients' charts may be unavailable for data collection. In most of patients charts' the complication data and previous drug therapy may not be available.

CONCLUSIONS

In conclusion, in our study the major determinants that contributed for poor blood pressure control were age greater than 50, BMI greater than 24.9, Family history and the presence of other comorbidities. This study also investigated the presence of clear limitations in ordering antihypertensive medications in the study area to the patients based on the severity of their illnesses while compared to the recommendations of major study articles, standard text books and guidelines. Females were affected more than males by

hypertension in the study area and this result was consistent with a number of similar studies. Majority of the prescription for hypertension management in our study was a single drug prescription and nifedipine was the most frequently ordered drug. Our study further demonstrated that among the dual antihypertensive therapy the combination of 'Enalapril +HCT' was the most common. The study of the prescription pattern of antihypertensive drugs and its impact on blood pressure control, to the best of our knowledge, was not previously well investigated in Ethiopia. Such type of studies could give an opportunity to evaluate the effectiveness of the management of hypertension and the commitment of the physicians to the recommendations from approved international guidelines.

Operational Definitions

Rational Prescription: is the prescription of drugs at the right dose, right duration, and right time, for the right disease and for the right patient.

Co morbid: is either the presence of one or more additional disorders (or diseases) co-occurring with a primary disease or disorder, or the effect of such additional disorders or diseases.

Compelling indication: is the use of certain agents for patients with certain complications.

Combination therapy: Is either the use of more than one medication or other therapy or multiple therapies to treat a single disease.

The Seventh Report of Joint National Committee on the Detection, Evaluation and Treatment of high blood pressure (**JNC-7**): is the most prominent evidence based clinical guideline in the United States for the management of hypertension supplemented by the 2007 American Heart Association.

Table 1: Socio-demographic distribution in patients attending Bishoftu general hospital, Ambulatory ward, Bishoftu, Ethiopia 2014

Variables	Category	Frequency (%)
Sex	Female	164(56.9)
	Male	124(43.1)
Age	19-29 years	4(1.4)
	30-39 years	18(6.2)
	40-49 years	66(22.9)
	50-59 years	110(38.2)
	>=65 years	90(31.2)
Educational status	Illiterate	50(17.4)
	Primary school	76(26.4)
	High school	106(36.8)
	College	56(19.4)
Marital status	Single	18(6.2)
	Married	208(72.2)
	Divorced	22(7.6)
	Widowed	40(13.9)
Religion	Orthodox	190(66)
	Muslim	36(12.5)
	Protestant	30(10.4)
	Catholic	22(7.6)
	Others	10(3.5)

Table 1: Multiple Logistic Regressions showing the association between 'blood pressure control' versus the different variables affecting blood pressure in patients attending Bishoftu general hospital, Ambulatory ward, Bishoftu, Ethiopia; 2014.

Variables	Controlled BP	uncontrolled BP	Sig.	aOR	95.0% C.I.for EXP(B)	
					Lower	Upper
19-29	4	0	.003*			
30-39	18	0	.999	.0	.000	.
40-49	40	26	.998	.0	.000	.
50-59	98	12	.002*	16	2.658	97.621
>/=60	72	18	.006*	.06	.007	.436
under weight	0	2	.005			
Normal	66	10	.999	.0	.000	.
over weight	118	32	.001*	.013	.001	.192
obesity	48	12	.187	.321	.059	1.735
Positive Family history	102	34	.002*	18	2.937	110.759
Patients having Diabetes mellitus	76	28	.034	.1	.009	.835
Diagnosed with only hypertension	124	40	.082			
Diagnosed with hypertension + diabetes mellitus	80	12	.998	.0	.000	.
Diagnosed with hypertension + congestive heart failure	28	0	.998	.0	.000	.
Diagnosed with hypertension + nephropathy	0	4	.998	.0	.000	.
monotherapy	138	28	.001*			
Dual therapy	84	22	.001*	.0	.000	.034
Two or more antihypertensive medications	10	6	.052	.03	.001	1.030
Patients on diuretics	92	30	.003*	12	2.320	56.820
Patients on calcium channel blocker	122	14	.000*	67	7.890	568.318
Patients on other medications	16	0	.997	.0	.000	.

Table 3: Systolic BP classifications Vs antihypertensive prescription patterns in patients attending Bishoftu general hospital, Ambulatory ward, Bishoftu, Ethiopia; 2014

| antihypertensive prescription pattern	systolic BP classifications											Total	
	normal BP		Pre-hypertension		Stage 1 hypertension		Stage 2 hypertension		hypertensive Crisis				
	count	%	count	%	count	%	count	%	count	%		count	%
Mono	4	1.39	12	6	74	25.7	68	23.6	8	2.78		166	57.64
Dual	0	0	10	5	14	4.86	64	22.2	18	6.25		106	36.81
Three & more drugs	0	0	0	0	2	0.69	4	1.39	10	3.47		16	5.556
Total	4	1.39	22	11	90	31.25	136	47.19	36	12.5		288	100
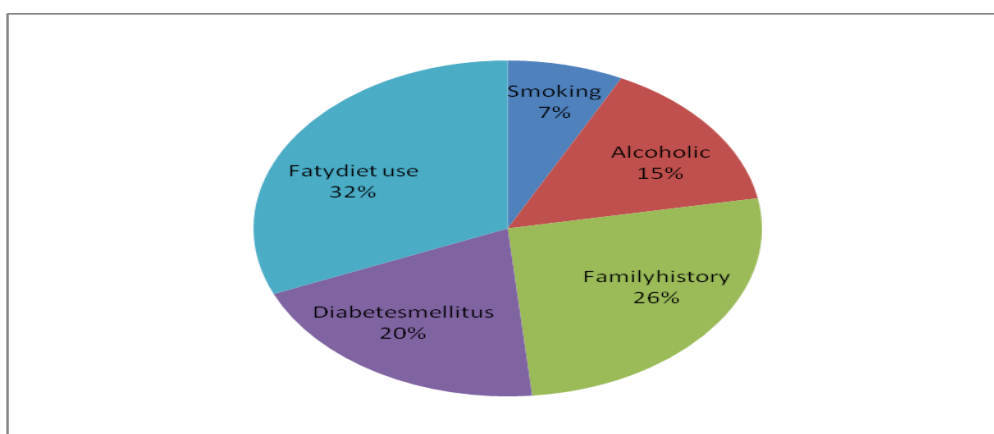
Figure 1: Identified Risk factors that may have positive contribution for development hypertension in patients attending Bishoftu general hospital, Ambulatory ward, Bishoftu, Ethiopia; 2014.   (n=176)
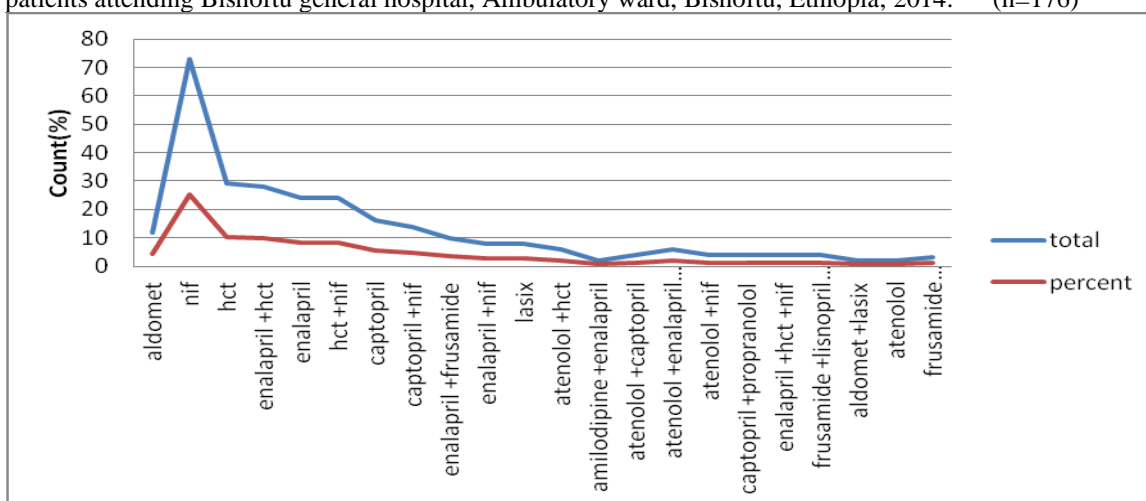

Figure 2: The pattern of antihypertensive medications prescription in patients attending Bishoftu general hospital, Ambulatory ward, Bishoftu, Ethiopia; 2014.
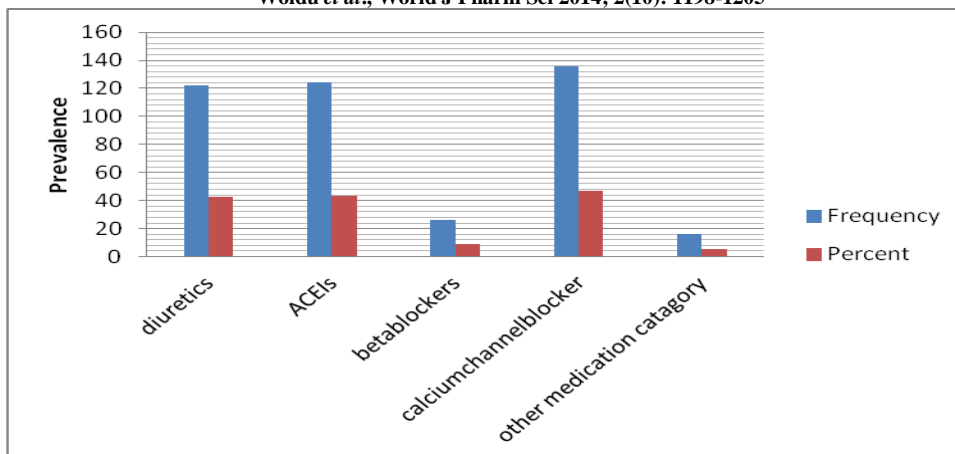
Figure 3: Classes of the major antihypertensive agents prescribed in patients attending Bishoftu general hospital, Ambulatory ward, Bishoftu, Ethiopia; 2014.
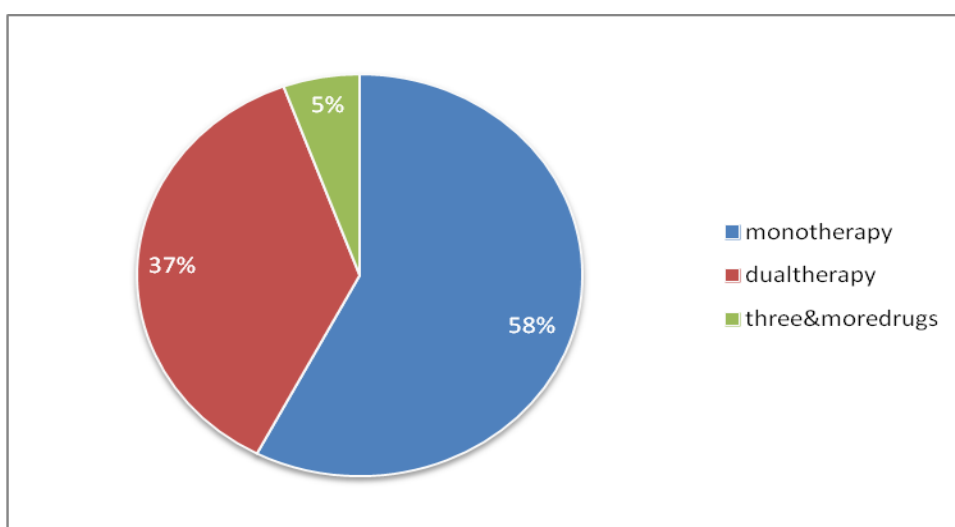

Figure 4: The pattern of mono, dual and multiple antihypertensive medications prescription in patients attending Bishoftu general hospital, Ambulatory ward, Bishoftu, Ethiopia; 2014.
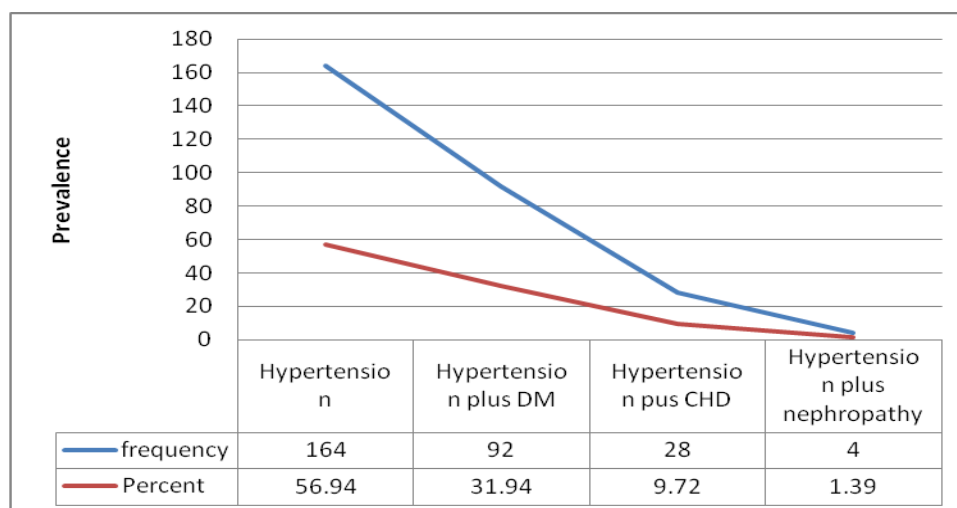

	Hypertension	Hypertension plus DM	Hypertension pus CHD	Hypertension plus nephropathy
frequency	164	92	28	4
Percent	56.94	31.94	9.72	1.39

Figure 5: Co-morbidity and compelling indications in patients attending Bishoftu general hospital, Ambulatory ward, Bishoftu, Ethiopia; 2014.
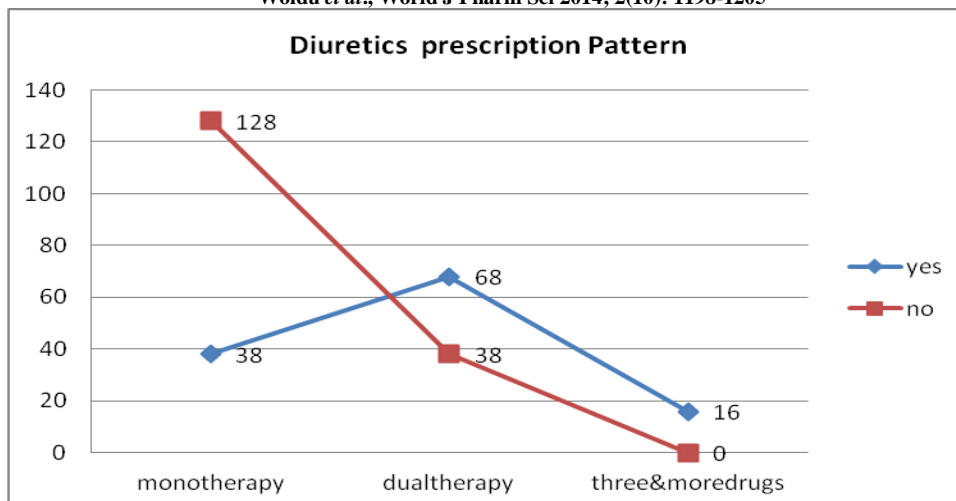
Figure 6: Diuretics prescription pattern versus mono, dual and multiple antihypertensive drug prescriptions in patients attending Bishoftu general hospital, Ambulatory ward, Bishoftu, Ethiopia; 2014.

REFERENCE

1. Joseph Varon, Paul E Marik: Clinical review: The management of hypertensive crises. *Critical Care* 2003, 7:374-384.
2. PK KPWMRKMPW: analysis of worldwide data.Lancet. *JGlobal burden hypertension* 2005:analysis of worldwide data.Lancet.
3. Arshad H. Mohd, Uday V. Mateti, Venkateswarlu Konuru, Mihir Y. Parmar a, Kunduru BR: A study on prescribing patterns of antihypertensives in geriatric patients. *Perspect Clin Res* 2012 3: 139-142.
4. McInnis NH FG, Lum-Kwong MM, Leenen FH. : Antihypertensive medication use and blood pressure control: a community-based cross-sectional survey (ON-BP). University of Ottawa Heart Institute, Ottawa, Ontario, Canada. . *Am J Hypertens* 2008.
5. JA. W: world health organization (WHO)/international society of hypertension (ISH) statement on management of hypertension. *World health organization, international society of hypertension writing group J Hypertension* 2003, 21:1983-1992. .
6. The Seventh Report of the Joint National Committee (JNC7) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. U.S. Department of Health And Human Services. *, National Institutes of Health, National High Blood Pressure Education Program, NIH Publication* 2003, 3:5233.
7. Joseph Arimathea Kizzie-Hayford BP: Evaluation of drug management of essential hypertension in the University Of Cape Coast Hospital, Ghana. 2010.
8. Bajaj J.K1., Sood M1., And SSJ, P. J: Prescription Patterns Of Antihypertensive Drugs And Adherence To JNC Vii Guidelines In A Tertiary Care Hospital In North India. *International Journal of Medical and Clinical Research* 2012, 3:118-120.
9. Ramsay LE.: Bridging the gap between clinical pharmacology and rational drug prescribing. *Br J Clin Pharmacol* 1993, 35:575-576.
10. Habtamu Abera Hareri MA: Assessments of Adherence to Hypertension Medications and Associated Factors among Patients Attending Tikur Anbessa Specialized Hospital Renal Unit, Addis Ababa, Ethiopia 2012 *International Journal of Nursing Science* 2013, 3(1).
11. Homes JS, Shevrin M., Goldman, B., Share.D.: Translating research in to practice: Are physicians following evidence-based Guidelines in the Treatment of Hypertension? . *Medical Care Research and Review* 2004, 61(4):453-473.
12. Fowad Khurshid, Mohammed Aqil, Mohammad Shamshir Alam, and PK, Pillai KK: Antihypertensive Medication Prescribing Patterns In A University Teaching Hospital In South Delhi *IJPSR* 2012, 3:2057-2063.
13. Essam Al-Drabah, Yacoub Irshaid, Nada Yasein, Zmeili S: Prescription pattern of antihypertensive drugs in Family Practice Clinics at Jordan University Hospital *Medicine Science* 2013, 2:469-488.
14. Tiwari H, Kumar A, SK. K: Prescription monitoring of anti-hypertensive drug utilisation at the Panjab University Health Centre in India. *Singapore Med J* 2004, 45:117-120.
15. Jhaj R, Goel NK, Gautam CS, Hota D, Sangeeta B, Sood A, al. e: Prescribing patterns and cost of antihypertensive drugs in an internal medicine clinic. *Indian Heart J* 2001, 53:323-327.
16. 1E. Etuk SAI, 1A. Chika, 1J. Akuche and 1M. Ali: Prescription Pattern of Anti-Hypertensive Drugs In A Tertiary Health Institution In Nigeria. *Annals of African Medicine* 2008, 7:128-132.
17. Ansari K.U SS, Pandey R.C. : Prescription Pattern of Anti Hypertensive Drugs in Shri Sathya Sai Medical College & Research Institute ,India. *Medical College and Research Institut* 2012.
18. Anand Kale, Maniyar YA: Prescribing Patterns of Antihypertensive Drugs in A Tertiary Care Hospital. *Sch Acad J Pharm* 2013, 2:416-418.
19. Pang-Hsiang Liu, Wang J-D: Antihypertensive medication prescription patterns and time trends for newly-diagnosed uncomplicated hypertension patients in Taiwan. *BMC Health Services Research* 2008, 8:133.
20. Jun Ma, and K-VL, Stafford RS: Changes in Antihypertensive Prescribing During US Outpatient Visits for Uncomplicated Hypertension Between 1993 and 2004. *Hypertension* 2006, 48:846-852.
21. Al-Azzam SI, Najjar RB, YS. K: Awareness of physicians in Jordan about the treatment of high blood pressure according to the seventh report of the Joint National Committee (JNC VII). *Eur J Cardiovasc Nurs* 2007, 6:223-232.