Research Article

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LIPID AND KIDNEY FUNCTION TEST PROFILES AND THEIR ASSOCIATED RISK FACTORS AMONG HYPERTENSIVE PATIENTS AT FELEGEHIWOT REFERRAL HOSPITAL, BAHIR DAR, NORTHWEST ETHIOPIA

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Abstract

Hypertension speeds up the process of hardening of the arteries which makes vulnerable to atherosclerosis formation and damages tiny blood vessels within the kidney. As a result, dyslipidemia becomes one of the most common risk modificator and quantitative risk categorization among hypertensive patients and hypertensive kidney disease becomes a major cause of morbidity and mortality. Although evidences present these, there is scarce data in Africa and as far as to our knowledge there is no data in Ethiopia about lipid and Kidney function test profiles among hypertensive patients. To determine prevalence of dyslipidemia, chronic kidney disease and each kidney function test profile abnormality and to identify their associated risk factors among hypertensive patients at Felegehiwot Referral Hospital from March 26- April 25, 2012. A cross-sectional study was conducted among all hypertensive patients (123) at Felegehiwot Referral Hospital hypertensive clinic from March 26- April 25, 2012. After getting consent from each study subject data was collected by trained data collectors and lab tests were performed by lab personnel to determine prevalence of dyslipidemia, chronic kidney disease and each kidney function test profile abnormality. Then the collected data was cleared and entered with statistical software Epi Info version 2002 and analyzed for proportion and association using SPSS version 16 by the principal investigator. While, there was very high dyslipidemia (78.0%) in at least one of the criteria and chronic kidney disease (96.7%); stage 1-2 46.3% and reduced Estimated glomerular filtration rate (Estimated glomerular filtration rate<60ml/min/1.73m^2) 50.4% among the study subjects according to adult treatment panel III and united states of national kidney foundation kidney disease outcome quality initiative by Cockcroft-Gault glomerular filtration rate equation respectively. Lipid alteration due to hypercholesterolemia, low high density lipoprotein cholesterol, total cholesterol/high density lipoprotein cholesterol $\geq$ 5, high low density lipoprotein cholesterol and hypertriglyceridemia was 39.0%, 26.8%, 18.7%, 45.5%, 35.0% while each kidney function test profile abnormality was 67.5%, 8.1%, 8.9%, 52.9%,14.6% for serum creatinine, serum urea,

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serum potassium, serum sodium and protein in urine respectively. There was very high burden of complications related to hypertension. Therefore, care for other risk factors as age increases and urban inhabitants are needed to reduce chronic kidney disease with reduced estimated glomerular filtration rate and dyslipidemia respectively.

Keywords: Hypertension, Dyslipidemia, Chronic kidney disease.

Introduction

Hypertension is a persistent elevation of systolic and/or diastolic blood pressure that asymptomatically affects many people in the world and leads to lethal complications like coronary artery disease, cerebro-vascular accidents, heart and kidney failures, and retinopathy mostly with unknown causes[1-3]. In Addition hypertension is estimated to affect approximately 1.5 billion people worldwide by 2025[4]. The evaluation of a person with hypertension must include assessments for other cardiovascular risk factors such as smoking, dyslipidemia, diabetes mellitus, old age (> 60yrs), family history of cardiovascular disease as well as examination to look for target organ damage or clinical cardiovascular disease[1,5].

Dyslipidemia or dyslipidaemia is an abnormal amount of lipids (e.g. cholesterol and/or fat) in the blood. Because high blood pressure speeds up the process of degeneration and hardening of the arteries in both large blood vessels such as the Adjusted odds ratiota and its major branches and the smaller arteries the inner walls of blood vessels becomes more vulnerable to a buildup of fatty deposits (atherosclerosis formation)[5].

As a result hypertension combined with dyslipidemia, becomes one of the most important predictors of cardiovascular diseases, as well as stroke, being present in more than70% of all cases[6]. Lipid profile or lipid panel is the estimation of total cholesterol, high density lipoprotein cholesterol, low density lipoprotein cholesterol and triglycerides that is used to identify dyslipidemia (various disturbances of cholesterol and triglyceride levels), many forms of which are recognized risk factors for cardiovascular disease[7,8]. It is recommended that healthy adults over 20 years of age with no other risk factors for heart disease be tested with a fasting lipid profile once every five years and for hypertensive patients in the initial evaluation and repeat measurements may be obtained after introducing a new antihypertensive agent and then annually or more frequently if clinically indicated[5, 7].

Kidney failure is a medical condition in which the kidneys fail to adequately filter toxins and waste products from the blood. Since sustained high blood pressure forces the kidneys to work harder eventually damages some of the tiny blood vessels (become ischemic and gradually atrophic) within the kidney and reduces the amount of blood available to the filtering units. The two forms of kidney failures are acute kidney injury and chronic kidney disease[5, 7].

Hypertensive kidney disease is a major cause of morbidity and mortality. Its pattern displays geographical and ethnic variations[3]. Over 1.1 million patients are estimated to have end-stage renal disease worldwide, with an addition of 7% annually[9]. In sub-saharan africa end-stage renal disease showed chronic kidney disease affects mainly young adults aged 20-50 years and is primarily due to hypertension and glomerular diseases. This indicates in Africa non-communicable diseases are coming to the forefront as the leading cause of death[10].

Kidney function test profiles include the estimation of creatinine, urea, electrolytes (sodium (Na^+), potassium (K^+)) proteinuria and hematuria that are used to identify kidney disease[7]. The aim of this study is to determine prevalence of dyslipidemia, chronic kidney disease and each kidney function test profile abnormality and to identify their associated risk factors among hypertensive patients at Felegehiwot Referral Hospital from March 26-April 25, 2012.

Materials and methods

Study design, period and area

A prospective cross-sectional study was conducted during the period from March 26- April 25, 2012 at Felegehiwot Referral Hospital. Felegehiwot

Referral Hospital is found in Bahir dar, capital city of Amhara National Regional State. It served the population with a total of 477 staff members; 269 health professionals, 191 administrative workers and 17 contract workers.

Bahir dar is situated on the southern shore of Lake Tana, the source of the Blue Nile that makes one of the leading tourist destinations in Ethiopia. The city is located approximately 578 km North-northwest of Addis Ababa, having an altitude of 1840 meters above sea level. According to the 2007 census Bahir dar special zone has a population of 221,991, of whom 108,456 are men and 113,535 women. With an area of 213.43 square kilometers, Bahir dar has a population density of 1,040.11: 180,174 or 81.16% are urban inhabitants[28].

Source population

The source population was all hypertensive patients who attend Felegehiwot Referral Hospital hypertensive clinic.

Study population

The study population was all hypertensive patients who attend Felegehiwot Referral Hospital hypertensive clinic from March 26- April 25, 2012.

Sample size determination

All hypertensive patients who attended Felegehiwot Referral Hospital hypertensive clinic from March 26- April 25, 2012 and fulfill the inclusion criterion was included.

Inclusion and exclusion criteria

Those hypertensive patients with severely ill, amputees, known pregnant women or children (<18 years) was excluded from the study.

Data collection

Data to determine associated risk factors was collected with face to face interview by trained data collector using structured questionnaire. In addition blood pressure and weight was taken by the same trained data collector (clinician) using checked blood pressure apparatus and weight scale. Whole blood was collected from vein puncture with plane vacutainer test tube by laboratory professional. It was waited for 15-30 minutes for clotting then centrifuged with 3000-4000 revolution per minute for 4-5 minutes to separate serum and analyzed for lab tests. And urine specimen was also collected by laboratory professional with wide mouthed, clean, dry and new urine cup and will be analyzed for urinalysis tests. Both specimens were collected from overnight fasting patient.

Laboratory investigation

Laboratory investigation for lipid profiles (low density lipoprotein cholesterol, high density lipoprotein cholesterol, total cholesterol and triglycerides) and kidney function test profiles (creatinine, urea, sodium and potassium) were performed by using serum sample. And, additional kidney function test profiles (protein in the urine and blood in the urine) were performed by using random urine sample.

Quality control

To ensure quality of data, pre-test of data collection questionnaire was done on the hypertensive patients who were not included in the main study by taking 6 respondents and necessary correction was done after the pre-test. Training was given to data collectors for half of a day then they were assigned to collect data from the study subjects. The collected data was checked out for the completeness, accuracy and clarity by the principal investigator. This quality checking was done daily after data collection and amendments was made before the next data collection measure. Data clear up and cross-checking was done before analysis.

Standard operational procedure and inserted leaflet was strictly followed for lab tests. Internal quality control for each type of tests was run.

Vacutainer blood sample collection technique for serum sample with plane test tube and dry, clean and new urine cup for random urine specimen collection was used.

Data management and analysis

The collected data was cleared and entered by using statistical software Epi Info version 2002 then it was transferred by Stat Transfer and analyzed by statistical software SPSS version 16. It was carried out at 5% level of significance and 95% confidence interval to compute the different proportion and relevant association. The association of risk factors was tested with chi-square test or Fishers exact test and the analysis were done with logistic regression.

Ethical considerations

Ethical clearance was taken from ethical committee of School of Biomedical and Laboratory Sciences, University of Gondar. Official letter was submitted to Felegehiwot Referral Hospital. The purpose and the importance of the study were explained & verbal informed consent was secured from each participant. Confidentiality was maintained at all levels of the study. Participant's involvement in the study was on voluntary basis; participants who were unwilling to participate in the study & those who wish to quit their participation at any stage were informed to do so without any restriction.

Table No. 01: Socio-demographic characteristics of study participants (Hypertensive clients) at Felegehiwot Referral Hospital from March 26 – April 25, 2012.

Associated risk factors	Frequency	Percent
Age		
18-39	19	15.4
40-59	58	47.2
≥ 60	46	37.4
Sex		
Male	54	43.9
Female	69	56.1
Residence address		
Rural	25	20.3
Urban	98	79.7
Level of education		
Illiterate	54	43.9
Elementary	32	26.0
High School	17	13.8
Higher Education	20	16.3
Occupation		
Gov. employee	28	22.8
Daily laborer	5	4.1
Private employee	7	5.7
House wife	42	34.1
Merchant	4	3.3
Farmer	22	17.9
Pension	7	5.7
Dependent	5	4.1
Others (student, prisoner)	3	2.4
Income		
<500	64	52.0
500-1499	41	33.3
≥ 1500	18	14.6
Duration from diagnosis as hypertensive case		
≤ 5 years	81	65.8
6-10 years	26	21.1
> 10 years	16	13.0
Perform regular programmed aerobic exercise		
No	102	82.9
Yes	21	17.1
How often per week		
≥ 3 days	14	11.4
<3 days	7	5.7
Incorporating fish & its product in meal		
No	87	70.7
Yes	36	29.3
Frequency to eat		
Usually	3	2.4
Sometimes	33	26.8

Table No. 02: Prevalence of dyslipidemia in at least one of the criteria with each associated risk factor among hypertensive patients at Felegehiwot Referral Hospital from March 26- April 25, 2012.

Associated risk factors	Dyslipidemia in at least one of the criteria		
	Yes Number (%)	No Number (%)	P value
Age			
18-39	11 (11.5)	8(29.6)	**0.032**
40-59	50 (52.1)	8(29.6)	
≥ 60	35 (36.4)	11(40.7)	
Sex			
Male	44 (45.8)	10(37.0)	0.416
Female	52 (54.2)	17(63.0)	
Residence address			
Rural	15(15.6)	10(37.0)	**0.015**
Urban	81(84.4)	17(63.0)	
Level of education			
Illiterate	39(40.6)	15(55.6)	0.104
Elementary	23(24.0)	9(33.3)	
High School	15(15.6)	2(7.4)	
Higher education	19(19.8)	1(3.7)	
Occupation			
Gov. employee	25(26.0)	3(11.1)	
Daily laborer	4(4.2)	1(3.7)	0.120
Private employee	6(6.3)	1(3.7)	
House wife	31(32.3)	1(3.7)	
Merchant	4(4.2)	0(0)	
Farming	13(13.5)	9(33.3)	
Pension	7(7.3)	0(0)	
Dependent	4(4.2)	1(3.7)	
Others	2(2.1)	1(3.7)	
Income			
<500	48(50.0)	16(59.3)	0.676
500-1499	33(34.4)	8(29.6)	
≥1500	15(15.6)	3(11.1)	
Duration from diagnosis			
≤5 years	64(66.7)	17(63.0)	
6-10 years	18(18.8)	8(29.6)	0.357
> 10 years	14(14.6)	2(7.4)	
Aerobic exercise			
No	78(81.3)	24(88.9)	0.563
Yes	18(18.7)	3(11.1)	
Fish			
No	65(67.7)	22(81.5)	0.165
Yes	31(32.3)	5(18.5)	

Table No. 03: Prevalence of dyslipidemia for each lipid profile test with each associated risk factor among hypertensive patients at Felegehiwot Referral Hospital from March 26-April 25, 2012.

Associated risk factors	Dyslipidemia													
	Total cholesterol > 200mg/dL			HDL-C < 40 mg/dL			Total cholesterol/HDL-C ≥ 5			LDL-C ≥ 100 mg/dL			Triglycerides ≥ 150 mg/dL		
	Yes	No	P value	Yes	No	P value	Yes	No	P value	Yes	No	P value	Yes	No	P value
	Number (%)	Number (%)		Number (%)	Number (%)		Number (%)	Number (%)		Number (%)	Number (%)		Number (%)	Number (%)	
Age															
18-39	6 (12.5)	13(17.3)	0.447	2 (6.1)	17(18.9)	0.56	2 (8.7)	17(17.0)	0.153	9(16.1)	10(14.9)	0.938	7 (16.3)	12(45.0)	0.472
40-59	26 (54.2)	32(42.7)		21 (63.6)	37(41.1)		15 (65.2)	43(43.0)		27(48.2)	31(46.3)		23 (53.5)	35(43.7)	
≥ 60	16 (33.3)	30(40.0)		10 (30.3)	36(40.0)		6 (26.1)	40(40.0)		20(35.7)	26(38.8)		13 (30.2)	33(41.3)	
Sex															
Male	18 (37.5)	36(48.0)	0.52	16 (48.5)	38(42.2)	0.535	12 (52.2)	42(42.0)	0.375	26 (46.4)	28(41.8)	0.606	21 (48.8)	33(41.3)	0.419
Female	30 (62.5)	39(52.0)		17 (51.5)	52(57.7)		11 (47.8)	58(58.0)		30 (53.6)	39(58.2)		22 (51.2)	47(58.7)	
Residence address															
Rural	7(14.6)	18(24.0)	0.206	4 (12.1)	21(23.3)	0.171	2 (8.7)	23(23.0)	0.158	8 (14.3)	17(25.4)	0.128	6 (14.0)	19(23.8)	0.198
Urban	41(85.4)	57(76.0)		29 (87.9)	69(76.7)		21(91.3)	77(77.0)		48 (85.7)	50(74.6)		37 (86.0)	61(76.2)	
Level of education															
Illiterate	18(37.5)	36(48)		15(45.5)	39(43.3)	0.404	10 (43.5)	44(44.0)	0.496	22 (39.3)	32(47.8)	0.095	14 (32.6)	40(50.0)	**0.003**
Elementary	10(20.8)	22(29.3)	0.147	7(21.2)	25(27.8)		4 (17.4)	28(28.0)		11 (19.6)	21(31.3)		7 (16.3)	25(31.3)	
High School	10(20.8)	7(9.3)		3(9.1)	14(15.6)		3 (13.0)	14(14.0)		10 (17.9)	7(10.4)		10 (23.3)	7(8.7)	
Higher education	10(20.8)	10(13.3)		8 (24.2)	12(13.3)		6 (26.1)	14(14.0)		13 (23.2)	7(10.4)		12 (27.9)	8(10.0)	
Occupation															
Gov. employee	14(29.2)	14(18.7)		10(30.3)	18(20.0)	0.445	7(30.4)	21(21.0)	0.239	16 (28.6)	12(17.9)	0.688	16 (37.2)	12(15.0)	**0.024**
Daily laborer	2(4.2)	3(4.0)	0.614	1(3.0)	4(4.4)		2(8.7)	3(3.0)		3 (5.4)	2(3.0)		2 (4.7)	3(3.8)	
Private employee	2(4.2)	5(6.7)		3(9.1)	4(4.4)		3(13.0)	4(4.0)		3 (5.4)	4(6.0)		3 (7.0)	4(5.0)	
House wife	17(35.4)	25(33.3)		9 (27.3)	33(36.7)		5 (21.7)	37(37.0)		18 (32.1)	24(35.8)		11 (25.6)	31(38.8)	
Merchant	2(4.2)	2(2.7)		1(3.0)	3(3.3)		0(0)	4(4.0)		2 (3.6)	2(3.0)		1 (2.3)	3(3.8)	
Farming	7(14.6)	15(20.0)		4(12.1)	18(20.0)		2(8.7)	20(20.0)		7 (12.5)	15(22.4)		4 (9.3)	18(22.5)	
Pension	1(2.1)	6(8.0)		2(0.06)	5(5.6)		1 (4.3)	6(6.0)		2 (3.6)	5(7.5)		4 (9.3)	3(3.8)	
Dependent	1(2.1)	4(5.3)		3(9.1)	2(2.2)		2(8.7)	3(3.0)		3 (5.4)	2(3.0)		0 (0)	5(6.3)	
Others	2(4.2)	1(1.3)		0 (0)	3(3.3)		1(4.3)	2(2.0)		2 (3.6)	1(1.5)		2 (4.7)	1(1.3)	
Income															
<500	22(45.8)	42(56.0)	0.344	18 (54.5)	46(51.1)	0.625	12 (52.2)	52(52.0)	0.663	28 (50.0)	36(53.7)	0.888	16 (37.2)	48(60.0)	**0.042**
500-1499	18(37.5)	23(30.7)		9(27.3)	32(35.6)		8 (34.8))	23(23.0)		19 (33.9)	22(32.8)		20 (46.5)	21(26.3)	
≥1500	8(16.7)	10(13.3)		6(18.2)	12(13.3)		3(13.0)	15(15.0)		9 (16.1)	9(13.4)		7 (16.3)	11(13.8)	
Duration															
≤5 years	35(72.9)	46(61.3)		23 (54.5)	58(64.4)	0.599	17 (73.9)	64(64.0)	0.633	38 (67.9)	43(64.2)	0.699	28 (65.1)	53(66.3)	0.311
6-10 years	7(14.6)	19(25.3)	0.331	5 (15.2)	21(23.3)		4 (17.4)	22(22.0)		10 (17.9)	16(23.9)		7 (16.3)	19(23.8)	
> 10 years	6(12.5)	10(13.3)		5 (15.2)	11(12.2)		2 (8.7)	14(14.0)		8 (14.3)	8(11.9)		8 (18.6)	8(10.0)	
Aerobic exercise															
No	38(79.2)	64(85.3)	0.375	28 (84.8)	74(82.2)	0.732	19 (82.6)	83(83.0)	1.000	44 (78.6)	58(86.6)	0.241	32 (74.4)	70(87.5)	0.066
Yes	10(20.8)	11(14.7)		5 (15.2)	16(17.8)		4 (17.4)	17(17.0)		12 (21.4)	9(13.4)		11 (25.6)	10(12.5)	
Fish															
No	28(58.3)	16(21.3)	**0.016**	24 (72.7)	63(70.0)	0.768	16 (69.6)	71(71.0)	1.000	34 (60.7)	53(79.1)	**0.026**	30 (69.8)	57(71.3)	0.863
Yes	20(41.7)	59(78.7)		9(27.3)	27 (30.0)		7 (30.4)	29(29.0)		22 (39.3)	14(20.9)		13 (30.2)	23(28.8)	

Table No. 04: Prevalence of each kidney function test profile abnormality and association with each associated risk factor among hypertensive patients at Felegehiwot Referral Hospital from March 26, 2012- April 25, 2012.

Associated risk factors	Abnormal serum creatinine level			Abnormal serum urea level			Serum potassium imbalance			Serum sodium imbalance			Proteinuria		
	Yes	No	P value	Yes	No	P value	Yes	No	P value	Yes	No	P value	Yes	No	P value
	Number (%)	Number (%)		Number (%)	Number (%)		Number (%)	Number (%)		Number (%)	Number (%)		Number (%)	Number (%)	
Age															
18-39	10(12.0)	9(22.5)	0.168	2(20.0)	17(15.0)	0.868	1(9.1)	18(16.1)	0.465	11(16.9)	8(13.8)	0.838	3(16.7)	16(15.2)	0.335
40-59	38(45.8)	20(50.0)		4(40.0)	54(47.8)		4(36.4)	54(48.2)		31(47.7)	27(46.6)		11(61.1)	47(44.8)	
≥ 60	35(42.2)	11(27.5)		4(40.0)	42(37.2)		6(54.5)	40(35.7)		23(35.4)	23(39.7)		4(22.2)	42(40.0)	
Sex															
Male	34(41.0)	20(50.0)	0.344	6(60.0)	48(42.5)	0.332	7(63.6)	47(42.0)	0.210	30(46.2)	24(41.4)	0.594	10(55.6)	44(41.9)	0.281
Female	49(59.0)	20(50.0)		4(40.0)	65(57.5)		4(36.4)	65(58.0)		35(53.8)	34(58.6)		8(44.4)	61(58.1)	
Residence address															
Rural	21(25.3)	4(10.0)	**0.048**	6(60.0)	19(16.8)	**0.005**	6(54.5)	19(17.0)	**0.009**	19(29.2)	6(10.3)	**0.009**	6(33.3)	19(18.1)	0.158
Urban	62(74.7)	36(90.0)		4(40)	94(83.2)		5(45.5)	93(83.0)		46(70.8)	52(89.7)		12(66.7)	86(81.9)	
Level of education															
Illiterate	42(50.6)	12(30.0)	0.126	5(50.0)	49(43.4)	0.901	4(36.4)	50(44.6)	0.184	27(41.5)	27(46.6)	0.899	4(22.2)	50(47.6)	**0.001**
Elementary	17(20.5)	15(37.5)		3(30.0)	29(25.7)		5(45.5)	27(24.1)		17(26.2)	15(25.9)		11(61.1)	21(20.0)	
High School	11(13.3)	6 (15.0)		1(10.0)	16(14.2)		0(0)	17(15.2)		9(13.8)	8(13.8)		3(16.7)	14(13.3)	
Higher education	13(15.7)	7(17.5)		1(10.0)	19(16.8)		2(18.2)	18(16.1)		12(18.5)	8(13.8)		0(0)	20(19.1)	
Occupation															
Gov. employee	21(25.3)	7(17.5)	**0.024**	2(20.0)	26(23.0)	0.386	2(18.2)	26(23.2)	0.462	16(24.6)	12(20.7)	0.493	4(22.2)	24(22.9)	0.837
Daily laborer	1(1.2)	4(10.0)		0(0)	5(4.4)		1(9.1)	4(3.6)		2(3.1)	3(5.2)		1(5.6)	4(3.8)	
Private employee	3(3.6)	4(10.0)		0(0)	7(6.2)		0(0)	7(6.3)		5(7.7)	2(3.4)		1(5.6)	6(5.7)	
House wife	28(33.7)	14(35.0)		2(20.0)	40(35.4)		3(27.3)	39(34.8)		18(27.7)	24(41.4)		5(27.8)	37(35.2)	
Merchant	3(3.6)	1(2.5)		1(10.0)	3(2.7)		1(9.1)	3(2.7)		2(3.1)	2(3.4)		1(5.6)	3(2.9)	
Farming	20(24.1)	2(5.0)		4(40.0)	18(15.9)		4(36.4)	18(16.1)		15(23.1)	7(12.1)		5(27.8)	17(16.2)	
Pension	3(3.6)	4(10.0)		0(0)	7(6.2)		0(0)	7(6.3)		2(3.1)	5(8.6)		1(5.6)	6(5.7)	
Dependent	3(3.6)	2(5.0)		1(10.0)	4(3.5)		0(0)	5(4.5)		3(4.6)	2(3.4)		0(0)	5(4.8)	
Others	1(1.2)	2(5.0)		0(0)	3(2.7)		0(0)	3(2.7)		2(3.1)	1(1.7)		0(0)	3(2.9)	
Income															
<500	41(49.4)	23(57.5)	0.166	7(70.0)	57(50.4)	0.316	5(45.5)	59(52.7)	0.642	33(50.8)	31(53.4)	0.735	12(66.7)	52(49.5)	0.400
500-1499	32(38.6)	9(22.5)		3(30.0)	38(33.0)		5(45.5)	36(32.1)		22(33.8)	19(32.8)		4(22.2)	37(35.2)	
≥1500	10(12.0)	8(20.0)		0(0)	18(15.7)		1(9.0)	17(15.2)		10(15.4)	6(10.3)		2(11.1)	16 (15.2)	
Duration															
≤5 years	58(69.9)	23(57.5)	0.374	8(80)	73(64.6)		5(45.5)	76(67.9)	0.163	42(64.6)	39(67.2)		12(66.7)	68(64.8)	
6-10 years	16(19.3)	10(25.0)		1(10.0)	25(22.1)	0.556	5(45.5)	21(18.8)		15(23.1)	11(19.0)	0.848	3(16.7)	24(22.9)	0.470
> 10 years	9(10.8)	7(17.5)		1(1008)	15(13.3)		1(9.1)	15(13.4)		8(12.3)	8(13.8)		3(16.7)	13(12.4)	
Aerobic exercise															
No	72(86.7)	30(75.0)	0.105	9(90.0)	93(82.3)	1.000	8(72.7)	94(83.9)	0.398	52(80.0)	50(86.2)	0.361	15(83.3)	87(82.9)	0.960
Yes	11(13.3)	10(25.0)		1(10.0)	20(17.7)		3(27.3)	18(16.1)		13(20.0)	8(13.8)		3(16.7)	18(17.1)	

Table No. 05: Prevalence of each stage of chronic kidney disease and association with each associated risk factor among hypertensive patients at Felegehiwot Referral Hospital from March 26- April 25, 2012.

Associated risk factors	Stages of chronic kidney disease							
	Stage 0 N (%)	Stage 1 N (%)	Stage 2 N (%)	Stage 3 N (%)	Stage 4 N (%)	P value	Sum of stages 3-5 N (%)	P value
Total	4(3.3)	14(11.4)	43(35.0)	56(45.5)	6(4.9)		62(50.4)	
Age								
18-39	1(25.0)	7(50.0)	6(14.0)	4(7.1)	1(16.7)	**0.000**	5(8.1)	**0.000**
40-59	3(75.0)	6(42.9)	26(60.5)	22(39.3)	1(16.7)		23(37.1)	
≥ 60	0(0)	1(7.1)	11(25.6)	30(53.6)	4(66.7)		34(54.8)	
Sex								
Male	1(25.0)	8(57.1)	18(41.9)	24(42.9)	3(50.0)	0.774	27(43.5)	0.936
Female	3(75.0)	6(42.9)	25(58.1)	32(57.1)	3(50.0)		35(56.5)	
Residence address								
Rural	0(0)	2(14.3)	7(16.3)	14(25.0)	2(33.3)	0.533	16(25.8)	0.128
Urban	4(100.0)	12(85.7)	36(83.7)	42(75.0)	4(66.7)		46(74.2)	
Level of education								
Illiterate	1(25.0)	1(7.1)	17(39.5)	32(57.1)	3(50.0)	0.055	35(56.5)	**0.014**
Elementary	1(25.0)	6(42.9)	12(27.9)	11(19.6)	2(33.3)		13(21.0)	
High School	1(25.0)	4(28.6)	8(18.6)	3(5.4)	1(16.7)		4(6.5)	
Higher Education	1(25.0)	3(21.4)	6(14.0)	10(17.9)	0(0)		0(0)	
Occupation								
Gov. employee	2(50.0)	5(35.7)	8(18.6)	12(21.4)	1(16.7)	0.41	13(21.0)	0.378
Daily laborer	0(0)	0(0)	3(7.0)	2(3.6)	0(0)		2(3.2)	
Private employee	0(0)	2(14.3)	4(9.3)	1(1.8)	0(0)		1(1.6)	
House wife	2(50.0)	4(28.6)	14(32.6)	20(35.7)	2(33.3)		22(35.5)	
Merchant	0(0)	0(0)	1(2.3)	3(5.4)	0(0)		3(4.8)	
Farming	0(0)	1(7.1)	6(14.0)	14(25.0)	1(16.7)		15(24.2)	
Pension	0(0)	0(0)	4(9.3)	2(3.6)	1(16.7)		3(4.8)	
Elders	0(0)	0(0)	3(7.0)	1(1.8)	1(16.7)		2(3.2)	
Others	0(0)	2(14.3)	0(0)	1(1.8)	0(0)		1(1.6)	
Income								
<500	1(25.0)	6(42.9)	24(55.8)	27(48.2)	6(100.0)	**0.040**	33(53.2)	0.264
500-1499	1(25.0)	4(28.6)	13(30.2)	23(41.1))	0(0)		23(37.1)	
≥1500	2(50.0)	4(28.6)	6(14.0)	6(10.7)	0(0)		6(9.7)	
Duration from diagnosis								
≤ 5 years	4(100.0)	9(64.3)	28(65.1)	36(64.3)	4(66.7)	0.880	40(64.5)	0.881
6-10 years	0(0)	3(21.4)	10(23.3)	12(21.4)	1(16.7)		13(21.0)	
> 10 years	0(0)	2(14.3)	5(11.6)	8(14.3)	1(16.7)		9(14.5)	
Aerobic exercise								
No	3(75.0)	10(71.4)	35(81.4)	48(85.7)	6(100.0)	**0.042**	54(87.1)	0.215
Yes	1(25.0)	4(28.6)	8(18.6)	8(14.3)	0(0)		8(12.9)	

***Note**: Stage 0: Estimated glomerular filtration rate ≥ 90 mL/min/1.73m^2, Stage 1: Estimated glomerular filtration rate ≥ 90 mL/min/1.73m^2+, Stage 2: Estimated glomerular filtration rate = 60-89 mL/min/1.73mn, Stage 3: Estimated glomerular filtration rate = 30-59 mL/min/1.73m^2, Stage 4: Estimated glomerular filtration rate = 15-29 mL/min/1.73m^2 and Stage 5: Estimated glomerular filtration rate <15 mL/min/1.73m^2. The + plus sign shows as there were concomitant proteinuria, hematuria or electrolyte imbalance.*

Result

Socio-demographic characteristics of study participants

The study included a total of 123 participants whose age ranges from 22 to 108 years with mean of 53.85 years and standard deviation of 14.5 years. Of them no one smokes cigarette and 121(98.4%) were Amhara ethnic group. They also had a mean (standard deviation) of 5.33(6.35) years and 65.37(9.98) kilograms with minimum (maximum) values of 0(35) years and 38(90) kilograms for duration from diagnosis as hypertensive case and body weight respectively. All socio demographic characteristics of participants are presented as follows on table 1.

Dyslipidemia

In this study total cholesterol, high density lipoprotein cholesterol, total cholesterol/high density lipoprotein cholesterol $\geq$ 5, low density lipoprotein cholesterol and triglycerides tests had mean (standard deviation) value of 182(54.1) mg/dL, 55(23.8) mg/dL, 3.84(2.1) mg/dL, 99.8(49.8) mg/dL, 155(108) mg/dL with maximum (minimum) values of 339.1(50.5) mg/dL, 190.4(5.2) mg/dL, 17.6(1.2), 256.5(10.5) mg/dL and 607.8(24.2) mg/dL respectively. The overall prevalence of lipid alteration (dyslipidemia) in at least one of the criteria were 96(78%) according to the United States of America third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult treatment panel III)[29]. The prevalence of dyslipidemia for each lipid profile test is presented on figure 1.

From the associated risk factors which have significant values in Chi-square test or Fisher exact test age and residence address illustrated association with dyslipidemia in one of the criteria in multivariate logistic analysis with significant value of (Adjusted odds ratio) = 3.936, 95% confidence interval (CI) = 1.178-13.156, P = 0.026 adult age group (40-59 years) in reference to young age group (18-39 years), and Adjusted odds ratio = 2.748, 95% CI = 1.024-7.376, P = 0.045 inhabitant of urban in reference to rural) respectively. Dyslipidemia in at least one of the criteria association test with each associated risk factor is presented on table 2. From all the associated risk factors which had association in Chi-square test or Fisher exact test incorporating fish and its product in meal illustrated effect on dyslipidemia due to total cholesterol and low density lipoprotein cholesterol in multivariate logistic analysis with significant value of (adjusted odds ratio = 2.634, 95% CI = 1.188-5.842, P = 0.017) and (adjusted odds ratio = 2.45, 95% CI = 1.104-5.433, P = 0.027) respectively. Prevalence and association of each lipid profile test with each associated risk factor by using Chi-square test or Fisher exact test is presented on table 3.

Kidney function test profile abnormalities

Of the kidney function test profiles performed serum creatinine, serum urea, serum potassium and serum sodium had mean (standard deviation) value of 1.2(0.47) mg/dL, 26(15.1) mg/dL, 4.3(0.6) mmol//L, 144.1(19.7) mmol/L, 10(34.8) mg/dL, and 13.3(42.3) cells/µL of urine with maximum (minimum) value of 4(0.4) mg/dL, 123.5(9) mg/dL, 5.99(2.93) mmol/L and 240(89.5) mmol/L respectively. It also presented as there was very high prevalence of abnormal serum creatinine level (67.5%) and serum sodium imbalance (52.9%) among hypertensive patients at Felegehiwot Referral Hospital hypertensive clinic where as prevalence of abnormal serum urea level (8.1%) and potassium imbalance (8.9%) was low. Prevalence of each kidney function test profile abnormality is presented on figure 2.

Prevalence and association of each kidney function test profile with each associated risk factor by using Chi-square test or Fisher exact test is presented on table 4. Of all the study participants (123) prevalence of chronic kidney disease with reduced estimated glomerular filtration rate (Estimated glomerular filtration rate <60ml/min /1.73m^2) was 62(50.4%). It was concomitant on 60(48.9%), 8(6.5%), 30(24.4%), 7(5.7%), 11(8.9%), 11(8.9%) patients for abnormal serum creatinine level, abnormal serum urea level, serum sodium imbalance, serum potassium imbalance, proteinuria and hematuria correspondingly. The maximum and minimum value of estimated glomerular filtration rate was 197 and 15.6ml/min/1.73m^2 in that order. From all the associated risk factors which showed association with significant value (P<0.05) in Chi-square test or Fishers exact test only age had an effect on chronic kidney disease with reduced Estimated glomerular filtration rate on multivariate logistic

regression (adjusted odds ratio = 0.126, 95% CI = 0.037-0.425, P = 0.001 and adjusted odds ratio = 0.232, 95% CI = 0.100-0.539, P = 0.001 for young and adult patients respectively in reference to old age groups).

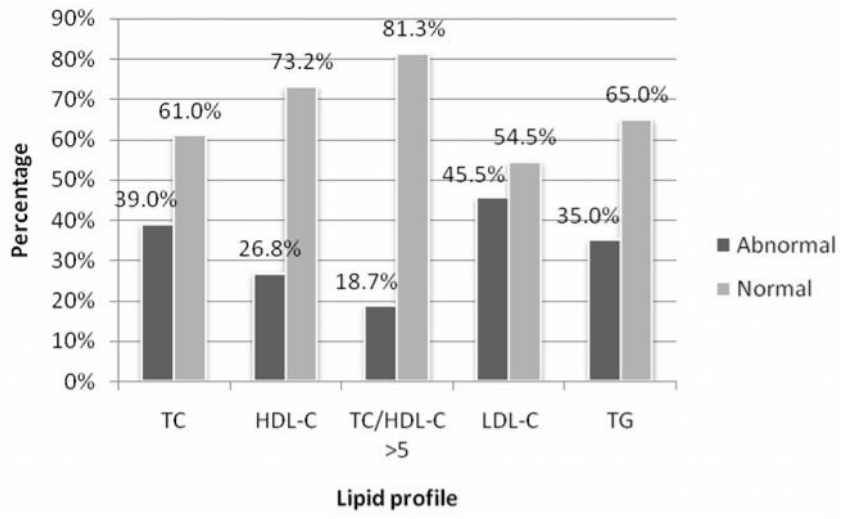

Fig. No. 01: Prevalence of dyslipidemia due to each lipid profile among hypertensive patients at Felegehiwot Referral Hospital from March 26- April 25, 2012.

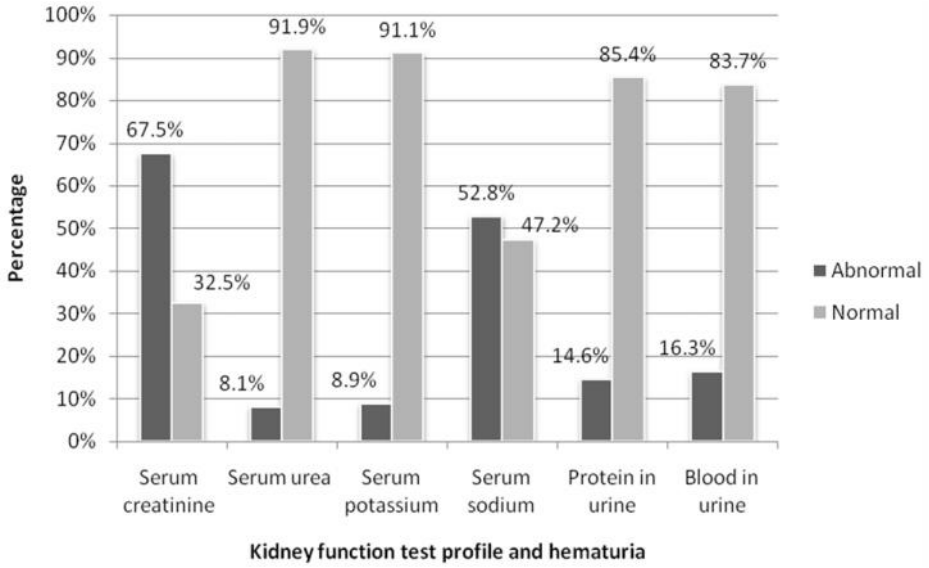

Fig. No. 02: Prevalence of each kidney function test profile abnormality among hypertensive patients at Felegehiwot Referral Hospital from March 26, 2012-April 25, 2012.

Prevalence of chronic kidney disease with its stages according to guidelines developed in the United States of the National Kidney Foundation Kidney Disease Out comes Quality Initiative by using Cockcroft-Gault glomerular filtration rate equation,

$$GFR = \frac{(140 - age\,[y]) \cdot (Body\ weight\,[Kg])}{72 \cdot Serum\ Creatinine\ [mg/dL]}$$

Multiply by 0.85 for female) is presented on table 5[5,7].

Discussion

This study was conducted among 123 hypertensive patients at Felegehiwot Referral Hospital hypertensive clinic from March 26-April 25, 2012 to determine prevalence of dyslipidemia, chronic kidney disease and each kidney function test profile abnormality and to identify their associated risk factors. These study findings are very important because lipid alteration in hypertensive patients is the most risk modificator and has quantitative impact in risk categorization, and kidney disease is

not priority on health agenda in Africa (it remains a forgotten condition) even though it is more frequent than in developed countries. In addition, as to our knowledge there was no research done on this objective before in the study area. Therefore this research was done to fill the existing gap in literature review in our country, to keep patients safety and to prioritize resources.

The overall prevalence of dyslipidemia among hypertensive patients at Felegehiwot Referral Hospital was 78.0%, 39.0%, 26.8%, 18.7%, 45.5%, 35.0%, for dyslipidemia in at least one of the criteria, hypercholesterolemia, low HDL-C, total cholesterol/high density lipoprotein cholesterol ≥ 5, high low density lipoprotein cholesterol, and hypertriglyceridemia respectively.

This study depicted as there was very high dyslipidemia (78.0%) in comparison to studies conducted in Turkish arm of the good survey (nearly half of hypertensive patients) and in Portugal (22%, 47% in primary care and hospital care respectively)[4, 13]. This variation might be due to way of difference in living style and adherence for medication. The study conducted in Portugal also used different study design (retrospective) with age of 18-75 years where as our study finding was almost equal when we weigh against dyslipidemia due to total cholesterol (39%) to that was done in Sao Paulo, Brazil (38.7%) with telephone survey[12].

On this study prevalence of hypercholesterolemia was higher (39.0%) but hypertriglyceridemia (35.0%) was lower than a study conducted on another place to assess and compare the prevalence of obesity, hyperlipidemia and hyperuricemia among hypertensive of out-patient department at Shahina Jamil Teaching Hospital, Abbottabad, Pakistan had 27.9% hypercholesterolemia and 66.3% hypertriglyceridemia[11]. This discrepancy could be difference in living standard.

Overall prevalence of chronic kidney disease among hypertensive patients at Felegehiwot Referral Hospital was (96.7%); stages 1-2 46.3% and chronic kidney disease with reduced Estimated glomerular filtration rate (Estimated glomerular filtration rate<60ml/min/1.73m^2) 50.4% and each kidney function test profile abnormality was 67.5%, 8.1%, 8.9%, 52.9%, 14.6% for serum creatinine, serum urea, serum potassium, serum sodium and protein in urine respectively.

When these results are compared with a study conducted in Italy by I-Memand (approximately 50% had chronic kidney disease and 25% had proteinuria) it gave an idea about as there were very high chronic kidney disease and lower proteinuria among hypertensive patients at Felegehiwot Referral Hospital[14]. Another study by I-Memand proved as there was lower chronic kidney disease (42%) and reduced estimated glomerular filtration rate (26%) and higher proteinuria (27%). Concomitant of proteinuria and reduced estimated glomerular filtration rate was 11% that was higher than the finding of our study (8.9%)[15]. The difference in prevalence of chronic kidney disease could be due to method or numbers of tests used to classify for stage zero and stage one that is our study used proteinuria, hematuria and electrolytes but they used only proteinuria in addition to that of living standard, geographical and medical follow up differences.

The finding of this study for prevalence of chronic kidney disease with reduced Estimated glomerular filtration rate (50.4%) was higher than the two studies conducted in Poland on consecutive hospitalized patients to evaluate the predictors for chronic kidney disease, and to assess the frequency of chronic kidney disease according to assessed values of Estimated glomerular filtration rate in patients with arterial hypertension chronic kidney disease with reduced estimated glomerular filtration rate was found in 42% of patients[16, 18]. But this difference might be due to method of estimated glomerular filtration rate calculation they used that was MDRD (Modification of Diet in Renal Disease), living style and medical adherence.

Our study finding was also higher than the finding of another study conducted in Spain with an external audit of clinical charts had chronic kidney disease with diminished estimated glomerular filtration rate 25.7% and a study which assessed traditional risk factors of cardiovascular disease chronic kidney disease was found in 42% of patients[17]. This divergence might be due to the different methodology they used (audit of clinical charts), time, race and geographical location dissimilarity.

On this study there were very high overall chronic kidney disease; stages 1-2 and stages 3-5 in comparison to in Accra, Ghana 46.9%; 19.1% and 27.8% respectively. But prevalence of proteinuria was high in Ghana (28.9%)[19]. But the discrepancy could be due to the calculation they used to estimate estimated glomerular filtration rate (protein/creatinine ratio) and geographical variation.

On our finding there were no patients with end-stage renal disease (stage 5 chronic kidney disease) where as it was 21% in sub-saharan africa of patients on renal replacement therapy in the South African Registry[20]. This dissimilarity could be due to non inclusive criteria for patients in our study for severely ill patients.

This study finding for reduced estimated glomerular filtration rate was almost twice the finding in Nigeria (23.1%)[23]. This disparity could be due to the reason of their study included only newly diagnosed hypertensive patients. In comparison to our study findings that were very high dyslipidemia (78.0%) and target organ damage a study conducted in Spain showed high dyslipidemia (62.2%) and high prevalence of target organ damage[24]. Another similar study in Spanish explained more than half percent had chronic kidney disease with reduced Estimated glomerular filtration rate (53.4%) and 25.7% masked chronic kidney disease (serum creatinine < 1.2 mg/dL). Those who develop chronic kidney disease, increased with age, had more frequently dyslipidemia[9]. Chronic kidney disease with reduced glomerular filtration rate in our study also increased with age, reduced estimated glomerular filtration rate was concomitant with 50(40.7%) dyslipidemia and there was 2(1.6%) masked reduced Estimated glomerular filtration rate. The discrepancy of reduced estimated glomerular filtration rate could be their inclusion of aged study subjects.

The same study conducted in Spain on treated hypertensive patients had very high (73.6%) lipid alterations approaching to the finding of our study result (78.0%). Abnormality in renal function (24.1%) was lower to that of the findings on our study[25]. In similar prospective survey conducted on treated Chinese hypertensive patients had 24.5% dyslipidemia[26]. The reason for those lower results in comparison to our study finding could be inclusion of treated patients only.

In our study finding as income increased dyslipidemia was decreased (<500=48(50.0%), 500-1499=33(34.4%), and ≥ 1500=15(15.6%)) even though didn't reach significance value and had no proportional participants in each category which was similar to a study conducted in Nigeria to evaluate and compare risk factors for cardiovascular disease in hypertensive subjects grouped by income presented dyslipidemia was 77.8 and 71.6% of low- and high-income earners respectively[27]. Proteinuria was also decreased as income increase in both studies which could be increase in care on high income earners.

From the listed associated risk factors association was observed on dyslipidemia in at least one of the criteria with age and residence address; total cholesterol and low density lipoprotein cholesterol with incorporating fish and its product in meal; Triglycerides with level of education, occupation and income; abnormal serum creatinine level with residence address and occupation; abnormal serum urea level with residence address; serum potassium and sodium imbalance with residence address; chronic kidney disease with age, income and regular aerobic exercise; proteinuria with level of education; and chronic kidney disease with reduced Estimated glomerular filtration rate with age and level of education by using Chi-square test or Fisher exact test.

From the above observed associations multivariate logistic regression result revealed incorporating of fish and its product in meal had preventive effect on dyslipidemia due to total cholesterol and low density lipoprotein cholesterol. It also explained being becoming in the adult age group (40-59 years) in relative to young age group (18-39 years) and inhabitant of urban in relative to rural was in higher risk for dyslipidemia in at least one of the criteria. In addition younger age and adult age groups were preventive for chronic kidney disease with reduced Estimated glomerular filtration rate (Estimated glomerular filtration rate< 60ml/min/ $1.73m^2$) compared to that of old age (≥ 60 years) group. The possible reason for increased risk of dyslipidemia in urban could be workload difference which needs much energy in rural and difference in eating habit.

Limitation of the study

- Unable to control confounding factors.
- Taking of serum creatinine once only to calculate estimated glomerular filtration rate.

Strength of the study

- Our study carried out all the tests for lipid and kidney function test profiles.

Conclusion

- There were very high prevalence of dyslipidemia in at least one of the criteria, chronic kidney disease and chronic kidney disease with reduced estimated glomerular filtration rate (estimated glomerular filtration rate<60ml/min/1.73m^2).
- Incorporating fish and its product in meal had significant preventive effect on dyslipidemia (total cholesterol (hypercholesterolemia) and high low density lipoprotein cholesterol).
- Risk of dyslipidemia increased significantly in urban inhabitants and adult age groups.
- Risk for chronic kidney disease with reduced estimated glomerular filtration rate was increased with age.

Recommendation

- Amhara National Regional State Health Bureau and Felegehiwot Referral Hospital should advocate incorporation of fish and its product in meal has preventive effect on dyslipidemia.
- Care for other risk factors is needed as age increases to reduce chronic kidney disease with reduced estimated glomerular filtration rate.
- Further research is needed to find out the root causes for high burden of complications related to hypertension.

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