Association of hypertension with microalbuminuria and lipid profile in the local population of Patan

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ABSTRACT

There is increasing prevalence of hypertension worldwide. Hypertension is an important risk factor for cardiovascular disease and renal disease which are the leading cause of death in the world. It is, therefore, very important to prevent progression of hypertension into these fatal diseases through appropriate treatment and monitoring. Microalbuminuria and dyslipidemia has been regarded as a predictor for cardiovascular and renal dysfunction in hypertension. In this study, we have included 130 hypertensive and 100 normotensive individuals of age ≥ 25 years. Patients with a history of urinary tract infection, hematuria, renal failure, women with menstruation at the time of sample collection were excluded from this study. Measurements of anthropometric parameters; blood parameters like lipid profile, fasting blood sugar (FBS), creatinine after 8 hrs fasting and urine parameters like microalbumin and creatinine were done. The prevalence of microalbuminuria and macroalbuminuria is 17.7% and 3.1% respectively in hypertensive patients. Also, there was 9% prevalence of microalbuminuria in normotensive people. There was a significant association of hypertension with microalbuminuria and dyslipidemia. triglyceride, low density lipoprotein, high density lipoprotein, microalbumin creatinine ratio (MCR), body mass index (BMI), waist circumference (WC) and waist hip ratio (WHR) were significantly higher in hypertensive than in normotensive persons. These higher lipid levels, WC and MCR in hypertensive patient are established risk factors for progressing into diabetes and cardiovascular diseases. Hence, monitoring of these parameters would be beneficial for hypertensive patients in preventing the disease progression in this population.

Keywords: Hypertension, microalbuminuria, lipid profile, obesity, Nepal.

INTRODUCTION

Hypertension affects about one billion people worldwide. A study has shown that 26.4% of the world's adult population, totaling nearly one billion, had hypertension in 2000, and this population will increase to 29%, 1.56 billion, by 2025.[1] There are also evidences of the rise in prevalence of hypertension in Nepal. First survey done in 1982 found the prevalence of 6% which had increased to 33.8% in 2007. It had also shown that there was increase in the hypertension in both the rural and urban population.[2] A study performed in a suburban area of Kathmandu by Sharma *et al* from Shahid Gangalal National Heart Center have found overall prevalence of hypertension is 19.7% and in the age group ≥ 40 years is 36%.[3]

Hypertensive individuals are at high risk of developing cardiovascular disease and renal disease. The presence of microalbuminuria predicts increased risk of cardiovascular and kidney disease in hypertensive patients.[4,5] According to the estimate by WHO 2001, CVD accounts for 29% of all deaths and 11% of disease burden in the South-East Asia.[6] Dyslipidemia is also the established risk factor for cardiovascular and renal tubular injury.[7] The decline of renal function is further accelerated when both blood pressure and lipids are elevated.[8] Also, the prevalence of microalbuminuria and the extent of albuminuria increase with the number of cardiovascular comorbidities (left ventricular hypertrophy, Coronary artery disease, cerebrovascular disease, carotid stenosis and peripheral arterial disease).[9]

A study showed that microalbuminuria is present in 10 to 40% of patients with essential hypertension.[10] Reducing albuminuria is a useful therapeutic goal to minimize the end-organ damage.[11] Therefore, European and American guidelines recommend microalbuminuria testing for hypertensive individuals.[12] There is established association of dyslipidemia with hypertension in the western Nepal.[13] We, therefore, intended to study the association of blood lipid level and urine microalbumin in hypertensive individuals in the local population of Patan so that preventive measures can be taken to control the progression of the disease.

Table-1: Prevalence of microalbuminuria in different conditions

		Microalbuminuria						
		Yes N (%)	No N (%)	Total N	Odds Ratio	Confidence Interval	Chi-square	p-value
Gender	Male	15 (19.2%)	63 (80.8%)	78	1.72	0.76-3.87	2.05	0.15
	Female	18 (12.1%)	130 (87.9%)	148				
	Total	33	193	226				
Hypertension Status	Yes	23(17.7%)	103(79.2%)	124	2.26	0.94-5.58	3.93	0.04
	No	9(9%)	91(91%)	100				
	Total	36	194	226				
Dyslipidemia Status	Yes	17 (20.5%)	66(79.5%)	83	2.20	0.97-4.99	4.31	0.03
	No	15(10.5%)	128(89.5%)	143				
	Total	32	194	226				
Abdominal Obesity Status	Yes	27 (16%)	138(84%)	165	2.44	0.75-6.85	2.44	0.11
	No	5 (8%)	56(92%)	61				
	Total	32	194	226				

MATERIALS AND METHODS

The study is an analytical cross sectional quantitative clinical and laboratory based study conducted in year August 2010 to September 2011. A pre-tested semi-structured questionnaire is administered to hypertensive and normotensive individuals. Palpitatory method of blood pressure measurement was used first which was followed by auscultatory method with a properly calibrated and validated instrument. Individuals were allowed to seat quietly for at least 5 minutes in a chair. Systolic Blood Pressure (SBP) was recorded at the point at which the first of 2 or more sounds is heard and Diastolic Blood Pressure (DBP) at the point before the disappearance of sounds.[14]

BP measurements were done in three different occasions, a week apart, and BP above systolic 140 and/or diastolic 90 was taken as hypertension.[15]

INCLUSION CRITERIA_

1. Adult individuals (25 years and above) with SBP <120 mm of Hg and DBP <80 mm of Hg were included as normotensive individuals.

Table-2: Comparison of different parameters between hypertensive and normotensive individuals

	Hypertension status					
	Yes			No		
Chi-square Test						
Gender % (male/female)	62.0 / 53.6 ^{NS}			38.0 / 46.4		
Parametric: Independent Sample T Test						
	Number	Mean	SD	Number	Mean	SD
AGE (years)	130	52^{a}	11	100	42	11
SBP (mm of Hg)	130	148^{a}	19	100	120	11
DBP (mm of Hg)	130	93^{a}	11	100	81	8
TC (mg/dl)	130	192^{NS}	41	100	190	36
TG (mg/dl)	130	166^{c}	91	126	143	82
LDL (mg/dl)	126	31^{b}	13	97	27	11
VLDL (mg/dl)	126	117^{NS}	37	126	119	34
FBS (mg/dl)	130	96^{NS}	16	100	93	24
MCR (mg/gmcreatinine)	130	37^{b}	82	100	12	16
Non-Parametric: Mann-Whitney Test						
	Number	Median	IQR	Number	Median	IQR
BMI (Kg/m^2)	130	26.34^{b}	4.08	100	25.31	4.50
WC (cm)	130	91^{b}	13	100	87	15
WHR	130	0.93^{b}	0.13	100	0.91	0.11
HDL (mg/dl)	130	44^{c}	8	100	44	10

Note: a=p-value≤0.001, b= p-value≤0.01, c=p-value≤0.05

Table-3: Comparison of different parameters between hypertensive individuals with and without microalbuminuria

	HTN without Microalbumiuria			HTN with Microalbuminuria		
Chi-square test						
Gender % (M/F)	36.8/ 63.2 NS			43.4/66.6		
Parametric: Independent Sample T Test						
	N	Mean	SD	N	Mean	SD
DBP(mm of Hg)	103	93	11	23	97	9
FBS (mg/dl)	103	95	12	23	102	26
SCRET (mg/dl)	103	0.78	0.16	23	0.79	0.20
MCR(mg/gmcreatinine)	103	8	7	23	60	53[a]
Non-Parametric: Mann-Whitney Test						
	N	Median	IQR	N	Median	IQR
AGE (years)	103	50	18	23	50	16[NS]
SBP (mm of Hg)	103	140	25	23	150	38 [NS]
BMI (Kg/m^2)	103	26.30	4.22	23	25.72	5.04[NS]
Waist (cm)	103	91	13	23	90	16 [NS]
WHR	103	0.94	0.12	23	0.93	0.13 [NS]
TC (mg/dl)	103	192	43	23	200	75 [NS]
TG (mg/dl)	103	143	73	23	152	116 [NS]
HDL (mg/dl)	103	44	9	23	44	11 [NS]
LDL (mg/dl)	103	29	15	23	30	23 [NS]
VLDL (mg/dl)	103	121	37	23	121	70 [NS]

Note: a=p-value≤0.001, b= p-value≤0.01, c=p-value≤0.05

2. Adult individuals (25 years and above) clinically diagnosed with hypertension (SBP ≥140 mm of Hg and/ or DBP ≥90 mm of Hg) or an individual with antihypertensive medication were included as hypertensive individuals.

EXCLUSION CRITERIA

1. The individuals with proven case of secondary hypertension, congestive heart failure, urinary tract infection, renal disease, raised serum creatinine, fever, ischemic heart disease and diabetes were excluded from the study. Suspected secondary hypertension during clinical examination and history taking was also excluded.[14]
2. The hypertensive individuals who were in ACE inhibitors, ARB, Diltiazem, NSAIDS and steroids were excluded as it affect in albumin excretion.
3. The person whose routine urine microscopic examination showed >5 pus cells/hpf and/or >3 RBCs/hpf were excluded form the study.

Ethical approval was obtained from the Patan Academy of Health Science Institutional Review Board. Informed written consent was taken prior to the study from the study population. For biochemical analysis, blood was collected overnight fast (9-12hours) for analysis of lipid profile, blood sugar and creatinine and random urine sample was taken for the measurement of urine microalbumin and creatinine and urine microalbumin creatinine ratio (MCR) was calculated.

Microalbumin was measured from Ichroma which was based on the immunofluorescence method from Boditech Med Inc, Korea. Creatinine was measured by Jaffes method for both the urine and serum sample. Fasting blood sugar (FBS) was estimated by glucose oxidase peroxidase method; total cholesterol and triglyceride were measured by enzymatic method and HDL-cholesterol was measured by the precipitation method. The reagents were from Quimica Clinica Aplicada SA, Spain. LDL-Cholesterol and VLDL-Cholesterol was calculated by Friedwald Formula. These parameters were obtained form semiautoanalyzer Hospitex diagnostics semiautoanalyzer, Germany.

MCR less than 30 mg/gm creatinine was considered to be normoalbuminuric, MCR 30-300 mg/gm creatinine was considered to be microalbuminuric and MCR more than 300 mg/gm creatinine was considered to be macroalbuminuric.[16] People with waist circumference (WC) ≥ 90 cm for male or WC ≥ 80 cm for female was considered to have abdominal obesity.[17] People with triglyceride (TG) ≥ 200mg/dl or HDL< 40 mg/dl was considered to be dyslipidemic.[18,19] Data was entered, cleaned and analysed using SPSS software version 16.0 for Windows.

RESULT

Of 238 people participated in the screening program, one was found to have persistent albumunuria and 7 had pus cells >5 pus cells/hpf. Therefore these subjects

were excluded from our study. The prevalence of microalbuminuria and macroalbuminuria was 17.7% and 3.1% respectively in hypertensive individuals. Also, there was 9% prevalence of microalbuminuria in normotensive people.

There was a significant association of hypertension and dyslipidemia with microalbuminuria. Although we found a positive correlation between abdominal obesity and gender with microalbuminuria but it did not reach statistical significance (Table-1).

TG, LDL, HDL, MCR, Body Mass Index (BMI), WC and WHR (Waist Hip Ratio) were significantly higher in hypertensive than in normotensive persons. Males have higher prevalence of hypertension compared to females. TC (Total cholesterol), VLDL and FBS were not significantly different. There was higher prevalence of hypertension in male compared to female but was not statistically significant (Table-2). Hypertensive individuals showed significantly more often MCR in HTN with microalbuminuria and Females had higher prevalence of microalbuminuria compared to males in hypertensive individuals (Table-3).

Categorization of hypertension with abdominal obesity and dyslipidemia into different categories suggests HTN with abdominal obesity (Table-4) and HTN with dyslipidemia (Table-5) showed significantly higher association with MCR, lipid level, BMI, WC and WHR rather than hypertension alone. There was significantly higher age in the only hypertensive individuals and hypertensive with abdominal obesity or dyslipidemia compared to the normal individuals.

The duration of hypertension was not in significant correlation with the occurrence of microalbuminuria in hypertensive individuals. There was no significant association of smoking, alcohol drinking, dietary habit and family history of hypertension in hypertensive individuals.

DISCUSSION

The prevalence of microalbuminuria in the hypertensive population was 17.7% which was lower than the prevalence study done in an Indian population reported by Hitha *et al* which was 26.67%[15] and a Japanese population which was 36.1%.[20] Other studies showed 21.2% prevalence of microalbuminuria in hypertensive

Table-4: Comparison of different parameters between individuals without obesity and hypertension with only obesity, only hypertension and both obesity and hypertension\

	Without Abdominal obesity and HTN			Abdominal obesity without HTN			HTN without Abdominal obesity			Abdominal obesity and HTN		
Parametric: Independent Sample T Test												
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
AGE (years)	31	43	14	66	42 NS	9	30	50 b	12	103	52 a	11
SBP (mm of Hg)	31	120	12	66	121 NS	11	30	142 a	22	103	149 a	19
DBP (mm of Hg)	31	79	10	66	82 NS	7	30	90 a	13	103	94 a	11
TG (mg/dl)	31	133	95	66	149 NS	76	30	132 NS	59	103	175 c	96
LDL(mg/dl)	30	24	11	64	28 NS	11	30	27 NS	12	99	32 b	13
FBS (mg/dl)	31	93	27	66	93 NS	23	30	90 NS	9	103	97 NS	17
MCR (mg/ gmcreatinine)	31	10	8	66	13 NS	19	30	18 NS	25	103	42 c	90
Non-Parametric: Mann-Whitney Test												
	N	Median	IQR	N	Median	IQR	N	Median	IQR	N	Median	IQR
BMI (Kg/m^2)	31	21.89	3.78	66	26.51 a	4.35	30	23.60 NS	3.07	103	27.11 a	3.85
Waist	31	77	7	66	93 a	11	30	79 NS	13	103	93 a	9
WHR (cm)	31	0.81	0.13	66	0.94 a	0.09	30	0.87 NS	0.15	103	0.95 a	0.11
TC (mg/dl)	31	186	47	66	189 NS	42	30	187 NS	45	103	197 NS	51
HDL (mg/dl)	31	46	13	66	43 NS	10	30	44 NS	13	99	43 NS	8
VLDL (mg/dl)	30	121	45	64	117 NS	39	30	117 NS	35	103	121 NS	44
SCRET (mg/dl)	31	8.76	10.17	66	6.46 NS	8.13	30	9.80 NS	15.32	103	14.71 NS	21.86

Note: a=p-value≤0.001, b= p-value≤0.01, c=p-value≤0.05

Table-5: Comparison of different parameters between individuals without dyslipidemia and hypertension with only dyslipidemia, only hypertension and both dyslipidemia and hypertension

	Without dyslipidemia and HTN			Dyslipidemia without HTN			HTN without Dyslipidemia			Dyslipidemia and HTN		
Parametric: Independent Sample T Test												
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
SBP (mm of Hg)	65	120	12	34	121 NS	9	79	146 a	20	52	151 a	18
DBP (mm of Hg)	65	80	9	34	82 NS	6	79	92 a	12	52	95 a	11
HDL (mg/dl)	65	49	14	34	38 a	6	79	47 NS	5	52	40 a	6
FBS (mg/dl)	65	94	29	34	91 NS	9	79	95 NS	15	52	97 NS	17
MCR (mg/gmcreatinine)	65	9	8	34	17 NS	24	79	34 b	78	52	42 b	87
Non-Parametric: Mann-Whitney Test												
	N	Median	IQR	N	Median	IQR	N	Median	IQR	N	Median	IQR
AGE (years)	65	39	19	34	40 NS	11	79	50 a	18	52	52 a	15
BMI (Kg/m^2)	65	24.44	4.93	34	26.18 NS	3.11	79	26.37 b	4.33	52	26.30 b	4.69
Waist (cm)	65	86	18	34	90 NS	10	79	90 c	13	52	91.5 a	11.5
WHR	65	0.91	0.14	34	0.92 NS	0.09	79	0.92 NS	0.11	52	0.95 b	0.14
TC (mg/dl)	65	192	40	34	178 c	43	79	200 NS	46	52	187 NS	59
TG (mg/dl)	65	116	68.5	34	127 c	117	79	125 NS	61	52	203 a	100
LDL (mg/dl)	65	23	14	34	25 NS	23	79	25 NS	13	52	41 a	19.5
VLDL (mg/dl)	65	122	41.5	34	106 c	41	79	128 NS	40	52	107 c	43
SCRET (mg/dl)	65	0.81	0.16	34	0.80 NS	0.13	79	0.8 NS	0.2	52	0.80 NS	0.26

Note: a=p-value≤0.001, b= p-value≤0.01, c=p-value≤0.05

population.[21,22] The prevalence of macroalbuminuria in the hypertensive population was 3.1% which was comparable to the Japanese population prevalence of 2.1%.

Hypertension and dyslipidemia had been reported to be independently associated with microalbuminuria.[8,23,24] Our study also showed that hypertension and dyslipidemia significantly predicts the risk of developing microalbuminuria. Moreover, we observed the composite effect of hypertension and dyslipidemia / abdominal obesity to be a stronger predictor of developing microalbuminuria compared to their individual effect which was similar to the study done by Sanad *et al*.[24]

This study which was conducted in the population of Central Nepal showed a significant association with the deranged lipid profile with hypertension which was similar to the study done in the Western[13] and Eastern[25] Nepal. Therefore, in Nepalese population deranged lipid profile can be the important risk factor for progressing hypertension into diabetes and cardiovascular disease.

The hypertensive individuals were categorized into two, based on the presence of abdominal obesity. There was significant association of hypertension with abdominal obesity with deranged lipid profile compared to the hypertensive patient without abdominal obesity. It, therefore, indicates that hypertension and abdominal obesity is stronger predictor of deranged lipid profile than hypertension alone.

The result also showed the higher prevalence of hypertension in elderly individuals with males affected more which was comparable to study done by Ohmaru *et al*.[20] There was also no significant difference in age between the microalbuminuric and normoalbuminuric hypertensive individuals unlike Ohmaru which showed significant microalbuminuria in higher age groups.

These results indicate that it is very important to do preventive intervention in hypertensive individuals to minimize the risk factor. Moreover, early intervention would prevent hypertensive individuals from developing other complicated diseases like diabetes and cardiovascular diseases which would be very expensive not only for the patient himself/herself but would be great loss for the country too. Further, cohort study would be necessary in the study population so that its impact of intervention could be known which then could be translated in other population to minimize the progression of hypertension to complicated diseases.

In hypertensive persons the prevalence of

microalbuminuria is significantly higher than in normotensive persons. There is significantly higher lipid levels, WC and MCR in hypertensive patient which are established risk factors for progressing into diabetes and cardiovascular diseases. The prevalence of microalbuminuria is also higher in persons with dyslipidemia and abdominal obesity. The combination of dislipidemia and abdominal obesity in hypertensive individuals is highly predictive for microalbuminuria.

ACKNOWLEDGEMENTS

The research grant for this study was awarded from Faculty Research Grant 2065/2066, University Grant Commission (UGC), Sanothimi, Nepal in the category of Medicine and Nursing. I would like to thank UGC for the support and suggestions to accomplish this project.

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