Original Research Article

Prevalence of Proteinuria Among Hypertensive Patients in Khartoum State

ABSTRACT

Background: Hypertension is an increase in persistent blood pressure with systolic 140 mmHg and diastolic ≥ 90 mmHg. In Indonesia, hypertension ranks the 6th largest non-infectious disease, with a prevalence of 25.8%. Uncontrolled hypertension results in target organ damage, causing strokes, heart attacks, retinopathy, or kidney disorders. The presence of protein in urine can be a marker of kidney abnormality.

Aim: This study of prevalence of Proteinuria in hypertensive Sudanese patients in Khartoum state.

Methods: The descriptive-analytic cross-sectional study was conducted using a total sampling of 50 in hypertensive Sudanese patients. Samples were examined their blood pressure and urine of by cobas c311 systems. The data was collected by questionnaire, then analyzed by computer using SPSS version 23.

Results: most of them 52% of them were male and 48% were female. most of participant presented among age 35-45 years, majority of them had secondary level of education, and most of them were married ,most of them had duration of hypertension more than 10 years and had DM as other disease with hypertension, There was insignificant association between age group and Proteinuria (P.value was 0.343) , insignificant association between gender and Proteinuria (P.value was 0.546) ,insignificant association between other disease and Proteinuria (P.value was 0.373) and There was significant association between duration of disease and Proteinuria (P.value was 0.001).

Conclusion: There was a significant relationship between blood pressure and Proteinuria examination results.

Key words: Proteinuria,hypertension,blood pressure,kidney disorders

1. Introduction:

The current definition of hypertension (HTN) is systolic blood pressure (SBP) values of 130 mmHg or more and diastolic blood pressure (DBP) more than 80 mmHg. Most cases of

hypertension are idiopathic (essential hypertension) and it may due to other disease (secondary). More than one billion adults worldwide have hypertension with up to 45% of adult populace being affected with disease and the prevalence rises with age accounting for up to 60% of population above 60 years of age. [1]Hypertension is one of the most influential risk factor for mortality worldwide. Epidemiological studies have reported that hypertension is strongly associated with the risk of coronary heart disease, cerebrovascular disease and chronic kidney disease. However, there remains a lack of understanding of the determinants of hypertension[2].

Chronic kidney disease (CKD) is persistent kidney damage accompanied by reduction in the glomerular filtration rate (GFR) and the presence of albuminuria. In 2009, more than 57000 people in U.S were classified as having end stage renal disease (ESRD). The rise in incidence of CKD is attributed to an aging populace and increases in HTN, diabetes and obesity. It is associated with electrolyte imbalance, mineral and bone disorder, anemia, dyslipidemia and hypertension. Hypertension occurs in 85%to 95% of patients with CKD (stage 3_5). Uncontrolled hypertension is risk factor for developing CKD and rapid progression of CKD [1].

Microalbuminuria is an indicator and predictor of early kidney disease, marker of vascular dysfunction and predictor for morbidity and mortality of cardiovascular disease (CVD). The prevalence increase with disease duration. Some studies found that microalbuminuria related to the risk of hypertension whereas others indicated higher blood pressure predicted further risks of microalbuminuria. [3]In study done by Mani (2016) in rural Africans to study albuminuria in hypertensive patients, found that the prevalence of Proteinuria is about 40% in untreatedhypertensive population and about 25% among hypertensive patients treated with β-blockers. The prevalence increase with age, duration and severity of hypertension. [4]

1.1. Signs and symptoms of high blood pressure:

One of most dangerous aspect of hypertension is that you may not know that you have it, one third of people who has high blood pressure don't know it. The symptoms of high blood pressure include: severe headache, fatigue, vision problems, chest pain, difficulty breathing, irregular heartbeat and blood in urine. Untreated hypertension can lead to serious disease: stroke, heart disease, kidney disease and eye problems.[5]

1.2. Management and Treatment of hypertension:

Lifestyle adjustments are the standard first-line treatment of hypertension: regular physical exercise (at least 5 days of the week), stress reduction, reducing salt intake, managing body

weight, moderating alcohol consumption and use of medications include: diuretic (thiazides, chlorthalidone and indapamide), beta and alpha-blockers, calcium channel blockers, central agonists, vasodilators, angiotensin convertingenzyme inhibitors and angiotensin receptor blockers. The choice of medication depends on the individual and any underlying medical conditions they may experience.[6]

1.3. Proteinuria:

The Proteinuria refers to presence of relatively of protein in urine 30- 300mg/day which below the detection threshold of standard urine dipstick test. Now defined as urine Protein excretion between 20 and 200 µg/min or 30-300mg in overnight or 24-h urine collection. The importance of Proteinuria as an independent predictor of progressive renal disease and cardiovascular mortality was thereafter realized in number of prospective and epidemiological studies particularly in patients with diabetes and hypertension. [7]

1.3.1.Causes of Proteinuria:

Increased amounts of protein in the urine may be due to: defects in perm-selectivity of the glomerular filtration barrier to plasma proteins (glomerulonephritis or nephrotic syndrome), incomplete tubular reabsorption of proteins (interstitial nephritis), increased plasma concentration of proteins (multiple myeloma-Bence Jones protein, myoglobinuria) and urinary tract inflammation or tumor.[8] most probable cause for protein in hypertensive are changes in hemodynamic that cause an elevation in intra-glomerular pressure and a generalized angiopathy due to endothelial dysfunction that cause renal and systemic trans-vascular albumin leakage.[9]

2.Materials and Methods

This is an experimental case –control hospital based study.Study was confined on Sudanese hypertensive patients who included 30 Sudanese hypertensive patients –diabeticpatients attending to the hospital regulatory for follow up and from different regions of Khartoum state.Data was collected by using structured questionnaire specially designed for this research urine analysis for ACR serum sample for creatinine estimation to calculate GFR.

2.1. Quality controls and managements:

The cases were selected carefully. Urine and blood were collected with care and adequate safety precaution to ensure test results are reliable. Quality assurance and standard operating system

was followed for all biochemical tests to achieve validity and reliability of test results. Weight was estimated carefully after shoes and bag taken off by scale balance and readings less than has been rounded.

2.2. Sample collection and processing:

Sterile urine containers were used for spot urine sample (second voided) collection and the quantitative albumin and creatinine level determined for albumin: creatinine ratio calculation, Heparinized blood containers were used for blood sample collection to estimation of plasma creatinine for GFR calculation.

2.3. Statistically analysis:

The mean, standard deviation (SD), and the correlations between albumin age, duration of hypertension, DM with hypertension and controlled of hypertension. For all statistical comparisons a P-value of < 0.05 was considered statistical significant. All statistical procedures were performed using SPSS software, version 22.

4. Results and discussion:

Hypertension and Proteinuria occur in most patients with chronic kidney disease and are risk factors for faster progression of kidney disease [10]. The high blood pressure condition causes the damage of the renal blood vessels. The continuously high blood pressure will cause gradual deterioration of the vessel structures that form the filtration system. The vessel structure's damage will cause changes in the glomerular filtration system, failure of protein reabsorption in tubules, and protein filtration that exceeds the tubules' reabsorption capacity. All of those mechanisms will lead to kidney damage and causing Proteinuria [11].

Table 1: Correlation between gender and Proteinuria among study population

Gender	Proteinuria			P.value
	>300 mg/dl	<300 mg/dl	Total	
Male	16	8	24	**.546**
Female	18	8	26	
Total	34	16	50	

*Values are means ±SE, NS=not significant, * Denotes mean values significant at (P<0.05), **Significant=(P<0.01), *** Significant=(P<0.001).*

Uncontrolled hypertension could affect our vascular system and result in target organ damage, both in macrovascular and microvascular. One of the macrovascular complications is kidney failure. Kidney failure is marked by the presence of protein or Proteinuria. Proteinuria is defined as the presence of protein higher than the normal limit, which is about 150mg/24 hours in adults and 140mg/m3 in children. [8]In a normal condition, protein should be present in urine in a little amount about less than 10 mg/dl. In this study, we found a significant relationship between blood pressure with protein urine. Continually high blood pressure could induce barotraumas in the blood vessel and cytokine activation that led to blood vessel defects in the long term. [11]

Table 2: Correlation between age group and Proteinuria among study population

Age group	Proteinuria			P.value
	>300 mg/dl	<300 mg/dl	Total	
35-45	13	8	21	**.343**
46-55	7	1	8	
56-65	8	2	10	
more than 65	6	5	11	
Total	34	16	50	

*Values are means ±SE, NS=not significant, * Denotes mean values significant at (P<0.05), **Significant=(P<0.01), *** Significant=(P<0.001).*

In the current study most of participant presented among age 35-45 years, 52% of them were male and 48% were female, majority of them had secondary level of education, and most of them

were married, and also most of them had duration of hypertension more than 10 years and had DM as other disease with hypertension. There was significant different between duration of disease and Proteinuria (P.value was 0.000), these findings agree with Riska et al., [12]. Findings of this study in accordance in several studies, such as the study by Agarwal et al., [13] that suggest patients with 300 mg/dl and more or greater Proteinuria should trigger not only the appropriate evaluation of Proteinuria. The degree of Proteinuria is correlated with systolic and diastolic blood pressure without impact from glomerular filtration rate. This is consistent with our findings that found there is a relationship between high blood pressure with Proteinuria as well as other parameters [14] . The variations in the prevalence rate of Proteinuria can be attributed to differences in several factors such as; study design, source of study population, diagnostic criteria, as well as the methods of measurement of Proteinuria and urine collection, and presence of hypertension.

Table 3: correlation between Duration of disease and Proteinuria among study population

Duration of disease	**Proteinuria**			**P.value**
	>300 mg/dl	<300 mg/dl	Total	
less than 5	13	0	13	
5-10	17	6	23	**.001**
more than 10	4	10	14	
Total	34	16	50	

*Values are means ±SE, NS=not significant, * Denotes mean values significant at (P<0.05), **Significant=(P<0.01), *** Significant=(P<0.001).*

The high prevalence of micro-albuminuria and macro-albuminuria in patients with hypertension is attributed to the presence of hypertension many years before it is actually diagnosed .in this study population, age, gender, other disease and education were not observed to be significantly associated with Proteinuria. It seems that age is not important and what is important is the duration of hypertension [15] . In the present study 68 % had Proteinuria high that similar to study which reported participants who had both hypertensions, 77% had Proteinuria. [16] Participants aged older than 35-45 years had higher Proteinuria than other age group, another agreement to study conducted by Tannor et al., [17] .Our results and the results of a recent meta-analysis

showed there is no association between an individual's and the presence of hypertension [18] .In the current study, there were no significant associations between hypertension and the marital status, education level; no significant associations were found between hypertension and the marital status, education level, in Uganda[19] .

Table 4: correlation between present of other diseases and Proteinuria among study population

Present of other diseases	Proteinuria			P.value
	>300 mg/dl	<300 mg/dl	Total	
Yes	18	10	28	**.373**
no	16	6	22	
Total	34	16	50	

*Values are means ±SE, NS=not significant, * Denotes mean values significant at (P<0.05), **Significant=(P<0.01), *** Significant=(P<0.001).*

5. Conclusion

Finally we find that 52% of them were male and 48% were female was affected ,most of participant presented among age 35-45 years ,the majority of them had secondary level of education, and most of them were married. Most of the patients had duration of hypertension more than 10 years and had DM as other disease with hypertension. There was insignificant association between age group and Proteinuria (P.value was 0.343). There was insignificant association between gender and Proteinuria (P.value was 0.546). There was insignificant association between other disease and Proteinuria (P.value was 0.373).There was insignificant association between duration of disease and Proteinuria (P.value was 0.001).

References

1. Alharf, A., Cleland, S., Webster, J., Mclnnes, G.T. and Padmanabhan S. (2016) Microalbuminuria in Subjects with Hypertension Attending Specialist Blood Pressure Clinics. J Hum Hypertens.30. p:527-533
2. Bishop, M.L., Fody, E.P. and Larry. E.S. (2010) clinical chemistry principles techniques and correlations.6th Ed. lippincoll Williams and Wikins.Philadelphia. p:274-566.

3. Haile, D. G., Sharew, N. T., Mekuria, A. D., Abebe, A. M., &Mezemir, Y. (2021). Prevalence of Hypertension and Associated Factors Among Adults in DebreBerhan Town, North Shoa Zone, Ethiopia, 2020. Vascular health and risk management, 17, 203.
4. Buffet, L. and Ricchetti, C. (2012) Chronic Kidney Disease and Hypertension: A Destructive Combination.US Pharm J. 37(6). P: 26-29.
5. Jordan, J., Kurschat, C. and Reuter, H. (2018) Arterial Hypertension. DtschÄrzteb Int.1115(33-34). P:557-568.
6. Kitt, J., Fox, R., Tucker, L.K. and Manus, R.J. (2019) New Approaches in Hypertension Management: A Review of Current and Develop Technologies and Their Potential Impact On Hypertension Care. CurrHypertens Rep. 21. p:44.
7. Pedersn, E.B and Kornerup, H.J. (1976) Renal Haemodynamics and Plasma Renin in pateints with Essntial Hypertension. ClinSciMol Med. 50(5): 409-414.
8. Salgado, J.V., França, A.K., Cabral, N.A., Lages, J., Ribeiro., VS., Santos, A.M. and Salgado, B.J. (2013) Cystatin C, Kidney Function and Cardiovascular Risk Factors in Primary Hypertension. REV ASSOC MED BAS. 59(1). P:21-27.
9. Singh, A. and Satchell, S.C. (2011) Microalbuminuria: Causes and Implications. PediatrNephrol. 26(11). P:1957-1965.
10. Pertiwi GAR, Aryawangsa AAN, Prabawa IPY, Manuaba IBAP, Bhargah A, Budiana IPG. Factor associated with visit-to-visit variability of blood pressure in hypertensive patients at primary health care service, Tabanan, Bali, Indonesia. FMCH. 2018;6(4):191-199.
11. Mundt LA. Graff ’s Textbook of Urinalysis and Body Fluids 2nd Edition. 2011
12. Riska Pertiwi, G.A., NgurahAryawangsa, A.A., Prabawa, I., Putra Manuaba, I.B.A., Bhargah, A., Sri Ratni, N.W. and Budiana, I., 2018. Factors associated with visit-to-visit variability of blood pressure in hypertensive patients at a Primary Health Care Service, Tabanan, Bali, Indonesia. Family Medicine and Community Health, 6(4), pp.191-199.
13. Agarwal R, Panesar A, Lewis RR. Dipstick proteinuria: can it guide hypertension management?. AJKD. 2002;39(6):1190-1195.
14. Jafar TH, Stark PC, Schmid CH, Landa M, Maschio G, De Jong PE, Levey AS. Progression of chronic kidney disease: the role of blood pressure control, proteinuria, and

angiotensin-converting enzyme inhibition: a patient-level meta-analysis. Ann. Intern. Med. 2003;139(4), 244-252.

15. Tatapudi, R.R., Rentala, S., Gullipalli, P., Komarraju, A.L., Singh, A.K., Tatapudi, V.S., Goru, K.B., Bhimarasetty, D.M. and Narni, H., 2019. High prevalence of CKD of unknown etiology in Uddanam, India. Kidney international reports, 4(3), pp.380-389.
16. Yokota, Fumihiko, Ashir Ahmed, Rafiqul Islam, Mariko Nishikitani, Kimiyo Kikuchi, YasunobuNohara, Hiroshi Okajima, Hironobu Kitaoka, and Naoki Nakashima. "The Relationships and Risk Factors Associated with Hypertension, Diabetes, and Proteinuria among Adults from BheramaraUpazila, Bangladesh: Findings from Portable Health Clinic Data, 2013–2016." International Journal of Medical Research & Health Sciences 7, no. 2 (2018): 1-12.
17. Tannor, E.K., Sarfo, F.S., Mobula, L.M., Sarfo-Kantanka, O., Adu-Gyamfi, R. and Plange-Rhule, J., 2019. Prevalence and predictors of chronic kidney disease among Ghanaian patients with hypertension and diabetes mellitus: A multicenter cross-sectional study. The Journal of Clinical Hypertension, 21(10), pp.1542-1550.
18. Bosu WK, Reilly ST, Aheto JMK, Zucchelli E. Hypertension in older adults inAfrica: a systematic review and meta-analysis. PLoS One. 2019;14:e0214934.
19. Chin JH, Twinobuhungiro A, Sandhu A, Hootsmans N, Kayima J, KalyesubulaR. Determinants of hypertension in urban Uganda: a community-basedcase-control study. Ethn Dis. 2017;27:15.