Biochem. Cell. Arch. Vol. 20, Supplement 2, pp. 3315-3318, 2020 | www.connectjournals.com/bca | *ISSN 0972-5075*

MICROALBUMINURIA AS AN EARLY INDICATOR OF RENAL DISEASE IN PATIENTS WITH PRIMARY HYPERTENSION IN THI-QAR PROVINCE, IRAQ

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(Received 21 August 2019, Revised 28 January 2020, Accepted 1 February 2020)

ABSTRACT : Hypertension is one of the most challenging health problems in the world. Hypertension is closely related to kidney diseases. To investigate themicroalbuminuria , serum creatinine, serum potassium and serum lipid profile levels in hypertensive group in addition to measure systolic and diastolic blood pressures and compare these values with that of normotensive group. These parameters collectively may consider as early markers for renal dysfunction. This prospective study included 65 patients with primary hypertension and 60 controls. albuminuria, serum creatinine, serum potassium and lipid profile were taken from all participants in addition to blood pressure measurement of them were recorded. This clinical work was achieved in Al-Hussain teaching Hospital and private clinic and labs. Means of systolic and diastolic blood pressures, albuminuria levels, serum creatinine, triglyceride, VLDL levels of patients with primary hypertension were significantly higher than those of the control group ($p \leq 0.05$). Serum potassium and HDL cholesterol were lower in cases than control group. Microalbuminuria, high levels of serum creatinine, triglyceride, low- density lipoprotein as well as an elevation of blood pressure particularly systolic blood pressure findings, additionally low levels of both serum potassium and high density lipoprotein may consider collectively as an early predictor for renal disease.

Key words : Microalbuminuria, primary hypertension, renal disease.

INTRODUCTION

Hypertension is one of the most challenging health problems in the world. It has been estimated that, globally, almost one billion individuals have hypertension (WHO, 2002). Latest WHO statistics showed that hypertension is the leading cause of mortality worldwide (responsible for 13% of global deaths) (WHO, 2012). Hypertension is closely related to kidney diseases (Bidani *et al*, 2004). Primary hypertension is considered to be strongly associated with end-stage renal disease (ESRD). It has been found that progression to ESRD in subjects attending this tertiary/ secondary clinic is uncommon (only 1% of the population) (Mackinnon *et al*, 2008).

In patients with hypertension, certain structural and functional changes a rise in the kidneys and these changes are seen to be related to high cardiovascular morbidity and mortality. It has been indicated that endothelial dysfunction and increased renin angiotensin system activity play a role in the development of microalbuminuria (Bianchi *et al*, 1994; Pedrinelli *et al*, 2000).

Microalbuminuria is defined as 24-hour urinary albumin in the range of 30-299 mcg is often found in primary hypertension and represents a sign of renal and cardiovascular damage (Grandi *et al*, 2001). It has been proposed that microalbuminuria is a reflection of early kidney dysfunction and a marker of asymptomatic preclinical disease which precedes and predicts the occurrence of major morbid events (Devereux and Alderman, 1993). The published prevalence of microalbuminuria in hypertensive subjects ranges from 4.7% to 58.4% (Böhm *et al*, 2007).

The present study aimed to investigate the albuminuria, serum creatinine, serum potassium and lipid profile in addition to blood pressure measurement in patients with primary hypertension and compare the findings with that of normal healthy individuals.

MATERIALS AND METHODS

The current study is a kind of prospective study. The samples are obtained from the patients who participated in specialist clinics and the nephrology department in Al-Hussain teaching Hospital. The 65 samples of urine and blood were obtained from the patients of hypertension and 60 samples of urine and blood were obtained from normal individuals as a control group

Around five milliliters of blood was obtained and

permitted to clot at normal temperature for ten minutes in hollow disposable centrifuge tubes for the separation in a centrifuge at 3000 xg.

The samples of serum were stored and separated at the temperature of minus twenty-degree centigrade before analyzing for creatinine, potassium, cholesterol, triglyceride and high density lipoprotein levels.

The enzymatic colorimetric method by (UV/VIS spectrophotometer) analyzed creatinine, potassium (its kits were provided by Human, Germany), cholesterol, triglyceride and high density lipoprotein (the kits were provided by Biolabo, France).

Serum low density lipoprotein (LDL) is estimated through the below equation:

LDL = Total Cholesterol – (HDL + VLDL)

Serum very low density lipoprotein (VLDL) is estimated through the following equation:

VLDL = Triglyceride/5

For urine test, albumin ELISA kit was used to determine albumin level in urine. The enzyme-linked immunoassay technique was used to estimate urine albumin level using ELISA Reader. The kit was provided by "DRG" in the USA.

Statistics

The results of the experiment are presented in the form of mean ± standard deviations. The parameters in various studied groups were compared using one-way ANOVA-test. The P-values ($P \leq 0.05$) were taken very significant in this regard.

RESULTS

The present study was included 125 subjects, categorized into two groups: Hypertensive patients group which comprise sixty five patients which were compared with healthy control group, which composed of sixty individuals only without significant difference in age. The characteristic data for all studied groups shown in Table 1.

Table 1 : Characteristic data for studied groups.

Groups	N	Age (years) mean±SD	Gender male% (N)	Body mass index(kg/m²) mean±SD
Control	60	51.2±12.4	45(27)	23.2±3.0
Hypertensive	65	57.8±11.3	43(28)	27.4±1.0

DISCUSSION

Primary hypertension is one of the most common medical problems in the general population and is one of the most important modifiable renal risk factors.

Table 2 : Blood pressure measurement in both hypertensive patient and control groups.

Groups	N	Blood pressure (mmHg) mean ± SD	
		Systolic blood pressure	Diastolic blood pressure
Control	60	124.3 ± 10.1[b]	75.9 ± 2.2[b]
Hypertensive	65	149.7 ± 12.2[a]	93.3 ± 8.0[a]

Note: Each value represents mean ± SD values with non-identical superscript (a, b or c….etc), were considered significantly differences ($p \leq 0.05$).
N: number of subjects. SD: standard deviation.

Table 3 : Albuminuria measurement in both hypertensive and control groups.

Groups	N	Albuminuria (µg/ml) Mean ± SD
Control	60	13.2 ± 2.6[b]
Hypertensive	65	164.4 ± 36.6[a]

- Legend as in Table 2.

Table 4 : Serum levels of creatinine and potassium in both of hypertensive and control groups.

Groups	N	Serum creatinine (mg/dl) Mean ± SD	Serum potassium (mEq/L) Mean ± SD
Control	60	0.8 ± 0.1[b]	4.3 ± 0.2[a]
Hypertensive	65	1.3 ± 0.6[a]	3.1 ± 0.6[b]

- Legend as in Table 2.

In recent years, interest has shifted to testing for microalbuminuria in a variety of clinical diseases such as diabetes mellitus (Mohammad Zubair and Marai Mohammed Alamri, 2019) hypertension (Aleem, 2008; Shashi K Agarwal, 2017; Shashi K Agarwal, 2017) and sickle cell disease (SCD) (Al-Harbi *et al*, 1999).

Microalbuminuria is often found in primary hypertension and approved as one of the best indicators of poor renal outcomes of essential hypertension and cardiovascular damage (Grandi *et al*, 2001).

In present study, it was found that mean of both of systolic and diastolic blood pressures were significantly higher than that of control individuals. This finding is similar with that of many of previous studies (Sarnak *et al*, 2005; Wright *et al*, 2002), where the relationship of deterioration of renal function with hypertension has been established. However, it has been shown that a decline in renal function is more associated with a difference in the systolic blood pressure but not with the diastolic (Hirayama *et al*, 2015). This may indicate that blood pressure must be rigorously controlled in subjects with proteinuria as has been recommended (Mncia *et al*, 2013).

Table 5 : Serum levels of lipid profile in both of hypertensive and control groups.

Groups	N	Total cholesterol (mg/dl) Mean ± SD	Triglyceride (mg/dl) Mean ± SD	HDL (mg/dl) Mean ± SD	LDL (mg/dl) Mean ± SD	VLDL (mg/dl) Mean ± SD
Control	60	184.9±52.3	112.3±11.1 [b]	62.2±4.1 [a]	88.9±21.0	22.3±4.1[b]
Hypertensive	65	203.9±26.5	193.8±15.4 [a]	40.7±6.7 [b]	95.1±10.4	39.6±3.0[a]

- Legend as in Table 2.

In agreement with several published clinical trials (Hirayama and Konta *et al*, 2015) (Nagah A Mohammed and Hamad, 2012) (Polonia *et al*, 2017), urinary albumin excretion (albuminuria) levels in idiopathic hypertension was significantly higher than that of healthy control individuals which reflects renal dysfunction due to increased its permeability. Presence of microalbuminuria increases risk of renal disease compared to its absence.

From the side of outcomes of serum creatinine levels in the current study of patients hypertensive patients were increased significantly from that of the normal persons which consistent with outcomes of the several published studies (Alker *et al*, 1992; Nagah A Mohammed and Hamad, 2012; Ishida *et al*, 2001; Pooja and Mittal, 2014). From the other side the potassium levels in hypertensive patients were decreased significantly when compared with that of others (Anand K and Shrishti, 2017; Priyanka *et al*, 2014), where the renal handling of potassium also play an important role in pathogenesis of essential hypertension.

As observed by others (Kamrun Nahar Choudhury, *et al*, 2014; Islam A Majumd *et al*, 2012; Vaziri, 2003; Sarkar *et al*, 2007) the results of the current study found that serum lipid profile levels were differed when compared between hypertensive patient group and control group. Serum triglycerides and VLDL were greater in hypertensive than those of normotensive and in case of serum HDL cholesterol, it was less in hypertensive than those of normotensive with significant difference.

CONCLUSION

This study demonstrates that microalbuminuria is accurately assessing the renal dysfunction in primary hypertensive patients. Thus, microalbuminuria being an important tool for early diagnosis and evolution of renal disease. Its lowering in idiopathic hypertension may stop the progression and even persuades the regression of renal disease.

ACKNOWLEDGEMENTS

I would like to thanks to College of Science, University of Thi-Qar, Iraq and specialist clinics and the nephrology department in Al-Hussain teaching Hospital to help me in this study.

REFERENCES

Aleem A (2008) Renal abnormalities in patients with sickle cell disease: a single centre report from Saudi Arabia. *Saudi J. Kidney Dis Transpl*. **19**(2), 194-199.

Al-Harbi N, Annobil S H and Abbag F (1999) Renal reabsorption of phosphate in children with sickle cell anemia. *Am J Nephrol*. **19**(5), 552-554.

Alker G, Neaton J, Cutler J A, Neuwirth R and Cohen J D (1992) Renal function change in hypertensive members of the Multiple Risk Factor Intervention Trial: racial and treatment effects. *JAMA* **268**, 3085- 3891.

Anand Kumar and Shrishti Dhar Prasad (2017) Evaluation of serum sodium and potassium levels in levels in newly diagnosed patients of essential hypertension at Rims, Ranchi, Jharkhand, India. *IROS-JDMS* 16-19.

Bianchi S, Bigazzi R, Baldari G, Sgherri G and Campese V M (1994) Diurnal variations of blood pressure and microalbuminuria in essential hypertension. *Am. J. Hypertens*. **7**(1), 23–29. doi:10.1093/ajh/ 7.1.23.

Bidani A and Griffin K (2004) Pathophysiology of hypertensive renal damage. *Hypertension* **44**, 595-601.

Böhm M, Thoenes M, Danchin N, Bramlage P, La Puerta P and Volpe M (2007) Association of cardiovascular risk factors with microalbuminuria in hypertensive individuals: the i-SEARCH global study. *J. Hypertens.* **25**, 2317- 2324.

Devereux R B and Alderman M H (1993) Role of preclinical cardiovascular disease in the evolution from risk factor exposure to the development of morbid events. *Circulation* **88**, 1444-5.

Grandi A M, Santillo R and Bertolini A (2001) Microalbuminuria as a marker of preclinical diastolic dysfunction in never-treated essential hypertensives. *Am. J. Hypertens.* **14**, 644-648.

Hirayama A, Konta T and Kamei K (2015) Blood pressure, proteinuria, and renal function decline: associations in a large community-based population. *Am. J. Hypertens.* **28**(9), 1150–1156.

Ishida K, Ishida H, Narita M, Sairenchi T, Saito Y, Fukutomi H, Takahashi H, Yamagata K and Koyama A (2001) Factors affecting renal function in 119985 adults over three years. *QJM* **94**, 541-550.

Islam A K and Majumder A A (2012) Hypertension in Bangladesh: a review. *Indian Heart J*. **64**(3), 319–323.

Kamrun Nahar Choudhury, Mainuddin A K M, Mohammad Wahiduzzaman and Sheikh Mohammed Shariful Islam (2014) Serum lipid profile and its association with hypertension in Bangladesh. *Vasc. Health Risk Manag*. **10**, 327–332.

Mackinnon B, Padmanabhan S, Murray L, Sloan W, Meredith P and Reid J (2008) Is end stage renal disease a common outcome among patients attending a hypertension clinic? *J. Hypertens* **26**, S112.

Mancia G, Fagard R and Narkiewicz K (2013) ESH/ESC guidelines

for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *Eur. Heart J*. **34**(28), 2159-2219.

Mohammad Zubair and Marai Mohammed Alamri (2019) Assessment of BMI, Duration of Diabetes, Fasting lipids, S. Creatinine and Microalbuminuria in Glycemic Control: A 10 year's follow-up study. *Med. Sci.* **23**(95), 86-92.

Nagah A A Mohammed and Hamad H M (2012) Serum creatinine, albumin, and urine protein in hypertensive patients. *Indian J. Basic Appl. Med. Res*. **1**(4), 292-295.

Pedrinelli R, Dell'Omo G, Penno G, Bandinelli S, Bertini A, Di Bello V and Mariani M (2000) Microalbuminuria and pulse pressure in hypertensive and atherosclerotic men. *Hypertension* **35**(1 Pt 1), 48-54.

Polonia J, Azevedo A, Monte M, Silva J A and Bertoquini S (2017) Annual deterioration of renal function in hypertensive patients with and without diabetes. *Vasc. Health Risk Manag*. **13**, 231-237.

Pooja and Yashoda Mittal (2014) Serum creatinine level in hypertensive patients : A study from Uttarakhand, India. *IJSPR* **5**(7), 2955-2959.

Priyanka D, Dilip M Rampure, Praveen Ch and Rama Rao S (2014) A Study on Serum Sodium and Potassium Levels in Newly Diagnosed Primary Hypertension. *SJAMS* **2**(5E), 1848-1853.

Sarkar D, Latif S A, Uddin M M, Aich J, Sutradhar S R, Ferdousi S, Ganguly K C and Wahed F (2007) Studies on serum lipid profile in hypertensive patient. *Mymensingh Med J.* **16**(1), 70-6.

Sarnak M J, Greene T and Wang X (2005) The effect of a lower target blood pressure on the progression of kidney disease: long-term follow-up of the modification of diet in renal disease study. *Ann. Intern. Med*. **142**(5), 342–351.

Shashi K Agarwal (2017) Prediabetes in hypertensive patients: a common and dangerous co-morbidity. *Med. Sci.* **21**(87), 253-258.

Shashi K Agarwal (2017) Salt Intake: Cardiovascular Concerns and Controversies. *Sci. Tech.* **3**(10), 140-145.

Vaziri N D (2003) Molecular mechanisms of lipid disorders in nephrotic syndrome. *Kidney Int.* **63**, 1964 –1976.

WHO (2002) Reducing Risks, Promoting Healthy Life. [Online]. Geneva, Switzerland: World Health Organization.

WHO (2012) World Health Statistics 2012 [Online]. Geneva, Switzerland: World Health Organization.

Wright J T Jr, Bakris G and Greene T (2002) Effect of blood pressure lowering and antihypertensive drug class on progression of hypertensive kidney disease: results from the AASK trial. *JAMA* **288**(19), 2421–2431.