

PREVALENCE OF HYPERTENSION AND ITS IMPACT ON GLOMERULAR RATE IN A POPULATION OF KERALA

Chitra Kuriakose¹, V. S. Sumadevi², Abraham Sebastian³, Annamma Kurien⁴

¹Assistant Professor, Department of Physiology, Government Medical College, Kottayam.

²Retired Professor, Department of Physiology, Government Medical College, Kottayam.

³Associate Professor, Department of Nephrology, Government Medical College, Kottayam.

⁴Retired Professor, Department of Physiology, Government Medical College, Kottayam.

ABSTRACT

BACKGROUND

Kidney function and hypertension are closely linked. What is the prevalence of hypertension and how one is affecting the other? Different studies show different results. Such a study in Keralite population is planned.

The objectives of the study are to find the prevalence of hypertension and prehypertension in a population of Kerala and its effect on GFR.

MATERIALS AND METHODS

A total of 519 subjects of all ages from the community are screened. Blood pressure and serum creatinine were assessed. e-GFR found using MDRD (modification of diet in renal disease) formula.

RESULTS

Prevalence of hypertension in the study population is 13.9% and prehypertension is 26.8%. Incidence of hypertension is increasing with age. Estimated GFR showed a decrease in hypertensives and prehypertensives.

CONCLUSION

Kidney function is affected by an increase in blood pressure.

KEYWORDS

Hypertension, prehypertension, e-GFR.

HOW TO CITE THIS ARTICLE: Kuriakose C, Sumadevi VS, Sebastian A, et al. Prevalence of hypertension and its impact on glomerular rate in a population of Kerala. J. Evid. Based Med. Healthc. 2018; 5(24), 1839-1841. DOI: 10.18410/jebmh/2018/383

BACKGROUND

Systemic hypertension is one of the common disorders in clinical practice. Different studies are conducted in different parts of India seeking the prevalence of hypertension and prehypertension. It is also found that elevated blood pressure is having an impact on glomerular filtration rate. GFR gives a rough estimate of the proper functioning of the kidney. The specific function of the present study is to find the prevalence of prehypertension and hypertension in a population of Kerala and its variation of incidence in different age decades. Attempts are made to find its relation with GFR. In certain studies, the overall prevalence of hypertension in India is found to be 29.8%¹ and prehypertension in Southern India to be 28.8%.² In different areas the prevalence varies. Blood pressure variation is also associated with changes in renal function. In this scenario such a study was done in Keralite population.

Financial or Other, Competing Interest: None.

Submission 07-07-2017, Peer Review 10-05-2018,

Acceptance 21-05-2018, Published 07-06-2018.

Corresponding Author:

Dr. Chitra Kuriakose,

Assistant Professor,

Department of Physiology,

Government Medical College, Kottayam.

E-mail: chitrasabin@yahoo.in

DOI: 10.18410/jebmh/2018/383



MATERIALS AND METHODS

After taking institutional ethical committee clearance a medical camp was organized in Kottayam district at two different panchayats. Total of 519 subjects were screened. Using a Performa, information regarding age, gender, history of kidney diseases, diabetes mellitus and hypertension were collected. Height was measured using measuring tape with patient standing straight with his or her occiput, buttocks & heels touching the wall. Weight was measured using portable weighing machine by instructing subjects to stand erect without footwear. Blood pressure was taken by making subjects sit comfortably in a chair with back support and arm resting at heart level. Appropriate sized cuff was used. Three readings were taken five minutes apart and was averaged.³ Those having systolic blood pressure greater than 140 mm of mercury and diastolic blood pressure greater than 90 mm of Hg were considered as hypertensive and those having systolic BP between 120-139 mmHg and diastolic BP between 80-89 mmHg were considered as prehypertensives.⁴ The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment Of High Blood Pressure (JNC 7) has designated the following classification system for BP for adults: normal BP (systolic <120 and diastolic <80 mm Hg), prehypertension (systolic 120 to 139 or diastolic 80 to 89 mm Hg), stage 1 hypertension (systolic 140 to 159 mm Hg

or diastolic 90 to 99 mm Hg), and stage 2 hypertension (systolic ≥ 160 or diastolic ≥ 100 mm Hg).⁵ Informed consent was taken 5 ml of blood was drawn under aseptic precaution and was sent to biochemical laboratory. Serum creatinine was assessed using Jaffe’s method. GFR was assessed using MDRD formula.

$$GFR = 186 \times (Se.Creat)^{-1.154} \times (Age)^{-0.203} \times (0.742 \text{ if female}) \times (1.210 \text{ if black})$$

National kidney foundation recommends estimating GFR by MDRD formula.^{6,7,8,9}

Analysis Collected data was entered in Microsoft excel and was analysed using statistical program SSPS using version 11.0. Continuous variables were expressed as mean and standard deviation while categorical variables as percentage. Association with hypertension and GFR was found using multiple regression analysis. P value less than 0.05 is taken as significant.

RESULTS

| Age Group | Normal Blood Pressure | | Hypertensive | |
|--------------|-----------------------|-------------|--------------|-------------|
| | Number | % | Number | % |
| <30 | 20 | 95.2 | 0 | 0 |
| 31-40 | 59 | 73.8 | 4 | 5 |
| 41-50 | 75 | 59.1 | 18 | 14.2 |
| 51-60 | 67 | 54.5 | 15 | 12.2 |
| 61-70 | 47 | 45.6 | 25 | 24.3 |
| >70 | 40 | 61.5 | 10 | 15.4 |
| TOTAL | 308 | 59.3 | 72 | 13.9 |

Table 1. Prevalence of Hypertension in Different Age Groups

Table 1 shows the prevalence of hypertension in various age decades. There is a wide variation in the distribution of study subjects. It shows an increase in the incidence of hypertension as age advances. The overall prevalence of hypertension is found to be 13.9%.

| Age Group | Prehypertensive | |
|--------------|-----------------|-------------|
| | Number | % |
| <30 | 1 | 4.8 |
| 31-40 | 17 | 21.2 |
| 41-50 | 34 | 26.8 |
| 51-60 | 41 | 33.3 |
| 61-70 | 31 | 30.1 |
| >70 | 15 | 23.1 |
| TOTAL | 139 | 26.8 |

Table 2. Prevalence of Prehypertension in Different Age Groups

Table 2 shows the prevalence of prehypertension of the subjects who attended the camp. It shows an increase with advancing age decades. The overall prevalence of prehypertension is found to be 26.8%.

| | No. of Subjects | Mean GFR (MDRD) ml/min | Standard Deviation |
|-------------------------------|-----------------|------------------------|--------------------|
| Normal | 308 | 63.69 | 19.7 |
| Prehypertensive+ Hypertensive | 211 | 57.56 | 16.52 |

Table 3. Effect of Blood Pressure on GFR

Table 3 shows there is a significant decrease in mean e-GFR in prehypertension and hypertension.

DISCUSSION

Systemic hypertension is associated with development of cardiovascular disease, stroke and kidney disease. Various studies has been conducted across the country to assess the prevalence of hypertension and prehypertension in different areas. In a study conducted by Anchela R¹ the prevalence of hypertension in rural northern India was found to be 14.5%, eastern India 31.7%, western India 18.1% and south India found to be 21.1%. The overall prevalence of hypertension in India was found to be 29.8%. V.R. Kutty carried out prevalence study of hypertension in rural Kerala and it was found to be 18%. Systemic hypertension in Chennai was found to be 20%. In our study the prevalence of hypertension was found to be 13.9%. Hypertension prevalence increases with advancing age.

Using the 18 to 39-year-old age group as the reference, the NHANES study found individuals aged 40 to 59 years to have a 6-fold higher prevalence of hypertension, and those 60 years and older to have a 27-fold higher prevalence.¹⁰ In our study also incidence of hypertension and prehypertension increase with age decades. Appropriate identification and treatment of hypertension clearly reduces the risk of complications. It is therefore imperative to carefully evaluate and classify hypertensive patients so that definite treatment can be rendered. Particular attention has to be given for presence of risk factors and has to identify primary cause for secondary hypertension especially that is reversible. Thorough dietary history and history of medications should be taken.¹¹ Renal vasculature is exquisitely sensitive to damage induced by elevated arterial pressure. It produces benign arterial nephrosclerosis. In early phase of hypertension GFR is normal, but abnormalities occur in renal blood flow.^{12,13,14} Another alteration in vascular function is increase in vascular resistance.^{15,16} It is by hypertension induced structural glomerular lesions. Finally, it results in focal and segmental glomerulosclerosis. There will be gradual loss of nephrons progressively reducing the renal excretory capacity. These are responsible for decreased glomerular filtration rate in hypertension.

Estimation of GFR gives approximate measure of the number of functioning nephrons. During onset of acute kidney disease RIFLE criteria helps to assess renal function.¹⁷ Studies show cumulative effect of risk alleles from six genes from pathways of blood pressure regulation show a decrease in GFR of 3 ml/min/1.73m² and protective alleles increase GFR of 4 ml/min/1.73m². e-GFR independently predicts hypertension and is a good predictor of onset of

hypertension in general population.¹⁸ Hypertension in acute renal insufficiency is due to vascular and glomerular pathology while in acute tubular necrosis, it is due to salt and water retention.¹⁹ Bomani and associates conducted a study of 262 patients with acute renal failure and 39% of all patients were hypertensive.

Early identification of hypertensives and prehypertensives allow early intervention. While hypertension can cause a decrease in e-GFR, a decrease in e-GFR can be indicative of developing hypertension. By early detection development of complications can be avoided. Limitation of the study is that the data for the study was obtained from a medical camp. The number of subjects attended the camp in early decade and last decade is much less so that there is variation in the prevalence of hypertension and prehypertension than expected.

CONCLUSION

The prevalence of hypertension in a Keralite population is 13.9% while that of prehypertension is 26.8%. The e-GFR is found to be decreased in a population of hypertensives and prehypertensives. The mean e-GFR of normal subjects is found to be 63.69 ml/min while that of hypertensives and prehypertensives is found to be 57.56 ml/min.

REFERENCES

- [1] Anchala R, Kannuri NK, Pant H, et al. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness and control of hypertension. *J Hypertens* 2014;32(6):1170-1177.
- [2] Ravi MR, Ashok NC, Renuka M. Prevalence of prehypertension in a rural district of southern India. *Int J Prev Med* 2015;6:84.
- [3] Frolich ED, Grim C, Laberthe DR, et al. Recommendation for human blood pressure determination by sphygmomanometers; report of special task force appointed by steering committee. *Circulation* 1988;77:502A-514A.
- [4] Chobanian AV, Bakris GL, Black HR, et al. The seventh report of the Joint National Committee on Prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. *JAMA* 2003;289(19):2560-2572.
- [5] Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee on Prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension* 2003;42(6):1206-1252.
- [6] Levey AS, Stevens LA, Schmid CH, et al. A new equation to estimate glomerular filtration rate. *Ann Intern Med* 2009;150(9):604-612.
- [7] Nyman U, Grubb A, Sterner G, et al. The CKD-EPI and MDRD equations to estimate GFR. Validation in the Swedish Lund-Malmö study cohort. *Scand J Clin Lab Invest* 2011;71(2):129-138.
- [8] Miller WG. Estimating glomerular filtration rate. *Clin Chem Lab Med* 2009;47(9):1017-1019.
- [9] Soares AA, Eyff TF, Campani RB, et al. Performance of the CKD Epidemiology Collaboration (CKD-EPI) and the Modification of Diet in Renal Disease (MDRD) study equations in healthy South Brazilians. *Am J Kidney Dis* 2010;55(6):1162-1163.
- [10] Ong KL, Cheung BM, Man YB, et al. Prevalence, awareness, treatment, and control of hypertension among United States adults 1999-2004. *Hypertension* 2007;49(1):69-75.
- [11] Ram V, Fenves A. Hypertension. In: Rakel RE, ed. *Conns current therapy 2000*. Philadelphia: Saunders 1999:303-315.
- [12] Goldring W, Chasis H, Ranges HA, et al. Effective renal blood flow in subjects with essential hypertension. *J Clin Invest* 1941;20(6):637-653.
- [13] Baldwin DS, Hulet WH, Biggs AW, et al. Renal function in separate kidney of man. II. Hemodynamics and excretion of solutes and water in essential hypertension. *J Clin invest* 1960;39:395-404.
- [14] Chasis H, Redish J. Function of separate kidneys in hypertensive subjects. *Arch Intern Med* 1942;70(5):738-748.
- [15] Bohlen HG, Gore RW, Hutchins PM. Comparison of microvascular pressures in normal and spontaneously hypertensive rats. *Microvasc Res* 1977;13(1):125-130.
- [16] Furuyama M. Histometrical investigations of arteries in reference to arterial hypertension. *Tohoku J Exp Med* 1962;76:388-414.
- [17] Bellomo R, Ranco C, Kellum JA, et al. Acute renal failure - definition, outcome measures, animal models, fluid therapy and information technology needs: the Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. *Crit Care* 2004;8(4):R204-R212.
- [18] Takase H, Dohi Y, Toriyama T, et al. Evaluation of risk for incident hypertension using glomerular filtration rate in the normotensive general population. *J Hypertens* 2012;30(3):505-512.
- [19] Bonomini V, Campieri C, Scolari MP, et al. Hypertension in acute renal failure. *Contrib Nephrol* 1987;54:152-157.