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Low rate of proteinuria in hypertensives resident in a rural area of Plateau State, Nigeria

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Abstract

Background: Hypertensives are screened for proteinuria largely to detect kidney involvement. In most reports from urban areas, the burden is considerable. We decided to see the scenario in a rural setting with the opportunity presented by our cardiovascular disease (CVD) survey of a rural area in North Central Nigeria.

Methodology: In 2008 we surveyed a rural population in Mangu Local Government area of Plateau State for CVD risk factors using the protocol of the National survey of 1991; slightly modified. One in three subjects was sequentially randomized to have blood and urine examination. Blood tests included glucose, creatinine, uric acid, total and high density lipoprotein cholesterol. Blood pressures were also taken.

Results: Blood and urine tests were done on 282 subjects. Eight of them(2.84%) had proteinuria . Ninety-nine of the 282 (35.11%) were hypertensive. Seven out of the 99 hypertensives (7.07%) had proteinuria. Between those hypertensives (positive or negative for proteinuria), the following indices: glucose, HDL cholesterol, SBP and DBP differed significantly (p=0.000, p=0.015, p=0.000, p=0.000 respectively).

Conclusion: Compared with rates in urban centres of Nigeria, our population recorded low proteinuria rates both for the whole population and the hypertensive segment. It therefore appears that proteinuria in hypertension is not only a reflection of severity and burden of hypertension, but has some relation with residence. Rural areas have lower constellation of CVD risk factor (due to different life style) and lower incidence of hypertension. Consequently, their proteinuria rates are low.

Keywords: *Proteinuria, low, hypertension, rural, CVD risk factors*

Résumé

Contexte: Les hypertendus sont examinés pour la protéinurie en grande partie afin de détecter une atteinte rénale. Dans la plupart des rapports issus des zones urbaines, la charge est considérable. Nous avons décidé de voir le scénario dans un cadre rural grâce à nos enquêtes menées sur les maladies cardiovasculaires (MCV) en milieux ruraux au centre du nord du Nigeria.

Méthodologie: En 2008, nous avons effectué un sondage auprès de la population rurale dans la préfecture de Mangu dans l'Etat de Plateau pour le risque des facteurs de la MCV en utilisant la procédure du sondage national mené en 1991 mais légèrement modifiée. Un patient sur trois a été successivement choisi afin d'avoir du sang et un examen d'urine. Des tests sanguins incluant le glucose, la créatinine, l'acide urique, le cholestérol des lipoprotéines ont été faits et à haute densité. La tension artérielle a été également prise.

Résultats: Les tests de sang et d'urine ont été effectués sur 282 patients. Huit d'entre eux, soit (2,84%) avaient une protéinurie. Quatre-vingt-neuf des 282 (35,11%) étaient hypertendus. Sept des 99 patients hypertendus (7,07%) avaient une protéinurie. Entre ces hypertendus (positif ou négatif de la protéinurie), on note les indices suivants: le glucose, le cholestérol HDL, SBP et DBP diffèrent largement l'un de l'autre (p = 0,000, p = 0,015, p = 0,000, p = 0,000, respectivement).

Conclusion: En comparaison avec les taux dans les centres urbains du Nigeria, notre population a enregistré de faibles taux de protéinurie à la fois pour l'ensemble de la population et pour le segment hypertensif. Il apparaît donc que la protéinurie dans l'hypertension n'est pas seulement un reflet de la gravité et de la charge de l'hypertension, mais a une certaine relation avec la résidence. Les zones rurales ont moins de constellation de risque de facteurs du MCV (en raison du style de vie différent) et une plus faible incidence de l'hypertension. Par conséquent, leurs taux de protéinurie sont faibles.

Introduction

Routine screening for proteinuria in the general population though popular is said not to be cost effective, unless in high risk patient populations such as hypertensives [1]. Detection of protein in urine allows persons at increased risk of cardiovascular disease (CVD) to be identified [2], permitting initiation of effective prevention strategies. It also allows for identification of progression of chronic kidney disease (CKD) and success of therapy aimed at reducing renal protein loss. Individuals at increased risk of developing CKD, hypertensives being a major group,

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qualify for testing of markers of kidney damage one of which is proteinuria [3]. Albuminuria indicates target organ damage in hypertension [4] and is thought to be produced by elevation of intra-glomerular pressure leading to glomerulosclerosis [5]. Recently minor derangements in renal function of which proteinuria is one, are said to be associated both in the community and among hypertensives with clustering of CVD risk factors [6]. It therefore highlights those on whom individual and group prevention strategies should be instituted. A couple of studies have been done on proteinuria rate in the general population both locally [7] and in other countries [8]. We decided to analyse our data on CVD risk factors in a rural habitat in North-Central Nigeria, to contribute information on this topic but from a rural area known to have different rates of CVD risk factors when compared with urban areas.

Materials and methods

We embarked on a survey of this rural area in Mangu Local Government Area of Plateau State, North Central Nigeria in 2008 after obtaining ethical clearance from the ethics committee of Jos University Teaching Hospital. This population was purposively selected as we were returning to re-survey it 17 years after it served as the Plateau State locus of the Federal Ministry of Health non-communicable diseases survey. Details of the study have been published elsewhere [9]. Briefly after mobilizing the population through their leaders, all subjects 15 years and above attended on each study day for examination. After registration, biodata and socio-demographic information were sought, namely: age, ethnicity, religion, civil status, educational attainment, occupation, smoking and alcohol history. Blood pressure, weight and height (from which Body Mass Index was derived) and Waist/hip ratio were measured in standard fashion. At the end, 1 out of 3 subjects randomized, in the order of arrival and registration underwent phlebotomy; and the blood collected was analysed for blood sugar, serum creatinine, serum uric acid, total and high density lipoprotein cholesterol. Phlebotomy was done at different times determined by the order of arrival and registration, with no consideration for time of last meal. This random sampling was for convenience as the fasting requirement has been shown to make it unnecessarily difficult for several patients world wide [10]; especially in the field during cross sectional population studies. The hitherto in use strict guidelines prescribing doing lipid profile on fasting specimen also allows for total and high density lipoprotein cholesterol in non-fasting specimen [11]. This is because these two fractions (which incidentally we were interested in) are not much different in fasting and non-fasting specimens. In individuals on normal food intake in the general population (as is the case with our cohort), lipids lipoproteins and apo-lipoproteins are said to change only minimally between fasting and non-fasting samples [10]. This finding which also was the experience of Sidhu and Nangler [12] led them to suggest that in a community based population, fasting for routine lipid levels is unnecessary. Urine was collected for proteinuria using Dipstix (Combi 2) on the spot. The last 2 of 3 blood pressure measurements taken at intervals of at least 5 minutes were averaged for use. The first reading was discarded as patients may not have calmed down sufficiently to eliminate any anxiety reaction of a strange setting. Values $\geq$ 140/90 mmHg defined hypertension. The mean values of blood sugar, serum cholesterol, serum uric acid, total and high density lipoprotein cholesterol, systolic and diastolic blood pressures were compared based on presence or absence of proteinuria.

Data were analysed at the Computer Centre of University of Jos with SSPS Version 17. Proportions were determined for categorical data and means for numerical data. A p value for difference in means < 0.05 defined statistical significance.

Results

The 282 who were randomized to have laboratory investigations are the subject of this report. Females were 186 in number while males were 96 making 65.9% and 34.1% of the cohort respectively. Their ages spanned from 18 to 104 years with a mean (SD) of 48.66(18.02) years. Systolic blood pressure spanned from 80 to 233 mmHg with a mean (SD) of 133.88(26.44) mmHg, while diastolic blood pressure ranged from 50 to 130 mmHg with a mean ((SD) of 81.17(12.58) mmHg. Ninety nine out of the 282 (35.11%) were hypertensive; that is blood pressure greater than or equal to 140/90 mmHg. Eight of them (2.84%) had proteinuria. When considered in the background of the 99 with hypertension, 7 (7.07%) had proteinuria. Smoking rate in the population was low and stood at 1.8%. The mean values of the following: blood glucose, serum creatinine, serum uric acid, serum total cholesterol, High density lipoprotein cholesterol, SBP, DBP and age based on the presence or absence of proteinuria were compared; as shown in Table 1. Blood glucose was significantly higher in those with proteinuria in whom also both blood pressure measures (SBP and DBP) and HDL-

Cholesterol were significantly higher. There was a tendency (which did not attain statistical significance) for those hypertensives with proteinuria to be older, have higher serum uric acid and total cholesterol than those without proteinuria. Interestingly the serum creatinine was slightly higher in those hypertensives without proteinuria though the difference did not attain statistical significance.

Table 1: Comparison of mean values of selected CVD risk factors between hypertensives differentiated by proteinuria

Index	Proteinuria	No Proteinuria	p
Blood glucose(mmol/l)	9.11	4.48	0.000*
Serum Creatinine(mmol/l)	111.25	118.86	0.575
Serum Uric Acid(mmol/l)	260.25	220.27	0.304
Total Cholesterol(mmol/l)	4.85	4.40	0.250
HDL-Cholesterol (mmol/l)	1.63	1.31	0.015*
SBP (mmHg)	174.88	132.68	0.000*
DBP (mmHg)	98.13	80.67	0.000*
Age (years)	58.88	48.37	0.104

*implies statistical significance

Discussion

The prevalence of proteinuria in this random selection of the studied population was 2.84%. This is low when compared with 29.7% in a market population in Ile-Ife, Nigeria [7] and 9.4% in a representative adult population of China [8]. Why this was so intrigued us. Initially we thought that all the difference could be as a result of their rural habitation. Comparing between those hypertensives with proteinuria and those without, we found significantly higher values for glucose, SBP and DBP. Albuminuria indicates nephropathy in diabetic patients and target organ damage in hypertensives [4]. Although this paper focused on proteinuria in hypertensives, the prevalence of diabetes in this population was 3.9% (11/282). Seven of the diabetics were equally hypertensive (results not shown). With the higher blood glucose in those hypertensives with proteinuria, it could be assumed that the 7 diabetics among them may have developed diabetic nephropathy. Since rates of diabetes are higher in the urban than rural areas [10], even among hypertensives, it could be understood why proteinuria rates in a rural area should be less. The higher SBP and DBP in those with proteinuria follows from the same explanation that albuminuria in hypertensives is an indication of target organ damage. This is expected to be greater in those with more severe blood pressure elevation who are more likely to be urban residents. Again albuminuria in hypertensives is related to sodium intake [11]. High sodium intake results in stimulation of local rennin angiotensin aldosterone system (RAAS) receptors in the kidney [12]. The excess aldosterone among other factors exerts a direct vasoconstrictive effect on the efferent renal arteriole without affecting the afferent arterioles [13]. The consequence is increased renal vascular resistance and intra-glomerular capillary pressure. A hyperfiltration state which promotes urinary protein excreation is thus created [14]. Apart from hypertension being more prevalent and severe in urban areas, urban residents are more likely to be on westernized urban diets, use more salt. Their level of proteinuria should then actually be more than their compatriots in rural areas. In the Ile-Ife study [7], an urban area, a higher percentage of hypertensives had proteinuria; 43.5% compared to 7.07% in the present rural study.

There may also be other reasons for such low rates of proteinuria in this rural population. Being rural, certain life styles injurious to the kidneys obtainable in urban areas may be minimal. It has been found that sugary soda drink consumption impacts on kidney function especially when consumed in excess [15]. Poor economic status and restricted access to such drinks in the rural areas ensures that amounts capable of causing renal damage are not consumed. Economic status has been found to be associated with presence of albumin in urine in China [8]. Our population is rural with poor economic means. It could therefore be seen why proteinuria rates would be low here. Another life style that may contribute to proteinuria is cigarette smoking. This association is more consistent for hypertensives, where both active and passive smoking are contributory to the presence of proteinuria [16]. Cigarette smoking also increases the incidence and degree of proteinuria in diabetic nephropathy [17]. In the population under review, population prevalence of cigarette smoking was low, standing at 1.8%. This could also explain the low rates of proteinuria. Other life styles more common in the urban areas which stand to increase proteinuria rate both generally and in hypertensives include use of skin lightening cosmetic products and dyes for hair beautification [18,19]. These are not commonplace in rural areas.

Finally proteinuria is said to predict future development of hypertension among normotensive individuals [20]. With incidence of hypertension being more in urban than rural areas, it is only natural that rural areas have lower rates of proteinuria in her population of normotensives and hypertensives. The similar mean serum creatinine values in those with and without proteinuria in our study (where actually those with proteinuria had the lower value) suggests that for this population, the diabetics had no significant

nephropathy and the hypertensives no significant target organ (kidney) damage. What we are seeing here (as regards proteinuria) may be brought about by reduced clustering of CVD risk factors even among diabetics and hypertensives in this rural area. It confirms the position of Segura *et al* that proteinuria in the community and among hypertensives reflects the degree of clustering of CVD risk factors [6]. It also implies that as suggested by Inoue *et al* [20], future development of hypertension among normotensives would be low here; less than populations with higher proteinuria rates not withstanding residential status.

In conclusion, inhabitants of rural areas would record lower rates of proteinuria indicating lower rates and degrees of diabetes and hypertension. Their poor economic means and low rates of nephropathy related life styles could also explain the low proteinuria rates; with or without hypertension. As urbanization catches up with rural areas in our environment, life style medicine aimed at keeping these adverse non-communicable diseases down as shown by Das *et al* [21] should be emphasized.

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