

Proteinuria in School Aged Children in Uyo, Nigeria.

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ABSTRACT

Background: Proteinuria is probably the most common laboratory finding of renal disease and is the hallmark of many renal diseases. It is a risk factor for progressive decline in renal function in a variety of chronic diseases such as hypertension, type 1 and 2 diabetes and obesity. Its early detection along with haematuria may be utilized to help identify children at risk of renal disease. It was on this premise that urinary screening of school aged Nigerian children was carried out to describe its prevalence and factors associated with its presence.

Design: Prospective, cross sectional study involving 495 pupils.

Setting: Two privately owned primary schools in Uyo, a metropolitan city in South-South Nigeria.

Methods: Subjects were selected using the stratified sampling method. The weight(kg) was taken by a standardized weighing machine while height was measured using a calibrated bar. Proteinuria was tested on freshly voided urine by the authors, using dipstick method. For diagnosing obesity, the Body Mass Index was calculated by the formula: $Wt(kg)/Ht(m^2)$. Values above the 95th percentile was considered as obesity. The blood pressure measurements were taken by a mercury sphygmomanometer. Hypertension was diagnosed if blood pressure was more than 95th percentile for age. Family history of hypertension and renal disease, maternal education and parents' socio-economic status were extracted from entries in a self administered questionnaire of parents.

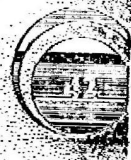
Results: Mean age of the 495 pupils (260 males and 235 females) was 81(26) months (range 30-150 months). Overall prevalence of proteinuria was 10.9%. A statistically significant association of proteinuria with female gender ($X^2 = 7.3, p=0.01$) and parents' socio-economic status ($X^2 = 6.93, p=0.04$) was noted. Prevalence of proteinuria was higher in obese as compared to non-obese children. This difference was however not statistically significant ($p=0.22$). Age, blood pressure, maternal education, family history of hypertension and family history of renal disease was not associated with proteinuria.

Conclusion: Prevalence of proteinuria in school aged Nigerian children is high, especially the female, obese children from the middle social class. Urine protein screening for proteinuria in these group of children is beneficial for early detection of renal parenchymal disease and subsequent institution of secondary preventive measures of end-stage renal disease.

Key Words: Proteinuria, obesity, renal disease, school aged children

INTRODUCTION

Proteinuria is probably the most common laboratory finding of renal disease and is the hallmark of many renal



diseases.¹ Several workers²⁻⁹ have in the past carried out urinary screening of asymptomatic populations including children for urinary abnormalities, for possible evidence of early renal parenchymal disease. It has been documented that early detection of these urinary abnormalities particularly proteinuria and haematuria may be utilized to help identify children at risk of renal failure in childhood.⁴

Proteinuria has been appreciated as a risk factor for progressive decline in renal function in a variety of chronic diseases.¹⁰ It's detection in patients with both types 1 and 2 diabetes and hypertension predicts nephropathy and cardiovascular complications and mortality.¹¹ It's association with obesity was first reported in 1974 by Weisinger.¹² Subsequent reports,¹³⁻¹⁶ mostly in adults, have consistently confirmed the presence of proteinuria and glomerulomegaly in obesity, often with focal segmental glomerulosclerosis (FSGS). A study of young adults¹⁷ recently showed the mean Body Mass Index (BMI) to be higher among those with albuminuria compared with those without. Abibtol and co-workers¹⁸ also recently demonstrated obesity related glomerulopathy in children especially those that had low birth weights at birth. Most of these studies emanate from the developed world. There is paucity of data about this relationship in children, especially in Africa.

As part of improving on this paucity of data on children from Africa, this study was carried out to screen for proteinuria in primary school children in Uyo metropolis, southern Nigeria, to determine its prevalence and identify the factors that are associated with its presence. This will help in early identification of subjects at risk of renal parenchymal disease, so that secondary preventive measures can be instituted.

SUBJECTS AND METHODS

Study Area: This cross sectional study was carried out in Uyo, the capital city of Akwa-Ibom State, south-south region of Nigeria. Uyo, as a growing city has an estimated population of 3,902,051 (2006 census figure)¹⁹ with more males (1,983,202) than females (1,918,849).

There are a total number of 116 primary schools in Uyo, 21 being public and 95 private. The total student population figure is not documented. The public schools are mainly patronized by the urban poor while the affluent patronize the privately-owned schools. Using random sampling method, two privately-owned schools were chosen. A written consent was obtained from the Akwa-Ibom State Ministry of Education. The directors of the school were informed in writing about the project and the benefits to the screened pupils were also highlighted. Parental consent was also obtained at a Parents' Teachers Association meeting, after an enlightenment talk on the project. The co-operation of both staff and pupils was sought through personal visits to the schools.

Subjects: Sample size was determined by the method of Araoye²⁰, Suedncor and Cochran²¹. The class registers (with the assistance of the teachers) were used to select subjects from Nursery 1 to Primary 6 in each of the schools. A total number of 505 pupils constituted the sample size. Pupils who were ill, had a limb deformity, had concomitant proteinuria with leucocytes and nitrite in the urine or had attained puberty were excluded.

Data Collection: Using a self administered, semi structured questionnaire, the parents' socioeconomic status, family history of renal disease, hypertension, and maternal education were determined. The socioeconomic status was then classified into upper, middle and

lower social classes according to Oyedeji²². Body weight was measured using a calibrated portable bathroom scale (Hans scale, Model BR9011) with a sensitivity 0.5kg. The subjects were asked to stand erect on the scale without their shoes and the weight read. The scale was regularly checked for zero adjustment before and after each reading.

The standing height was measured using a stadiometer, well calibrated up to 2 meters. Each subject was asked to stand straight without shoes, looking ahead with the knees and legs together and the back of the head against the stadiometer. A movable board was then placed on the crown of the head and the height measurement taken at maximum inspiration to the nearest centimeter. The Body Mass Index (BMI) for each subject was calculated as weight(kg)/height(m²). A value of >95th percentile was defined as obesity²³.

Each subject was made to pass urine into a clean universal container, early in the morning after the school assembly. The urine was tested using a dipstick method, capable of testing for 10 different parameters including protein, blood, sugar, specific gravity, pH, nitrite, leucocytes (Multistix 10SG). Proteinuria of 1+ (30mg/dl)^{2,3,5} or more was regarded as significant. Subjects that had proteinuria and concomitant positive test for nitrite or leucocytes were excluded from this study so as to rule out those with Urinary Tract Infection(UTI).

The blood pressure was measured on a sitting position using the Accoson mercury sphygmomanometer. Appropriate sized cuff covering ⅔rd of the upper arm was used. The first korotkoff sound was recorded as the systolic blood pressure (SBP); the point at which the sounds were muffled (fourth korotkoff sound) was recorded as the diastolic blood pressure (DBP). Three readings were taken and the average was taken as the actual blood

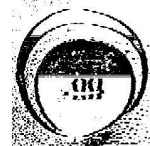
pressure. Hypertension was defined as average SBP and/or DBP that was greater than or equal to the 95th percentile for sex, age and height²⁴.

Statistics: Data was analyzed using the Statistical Package for Social Sciences(SPSS) version 15.0. Results are represented as simple tables and reported as percentages, mean and standard deviation. A *p* value of < 0.05 was regarded as significant.

RESULTS

Of the 505 pupils recruited into the study, 6 had concomitant proteinuria and positive nitrite on dipstick urinalysis while 4 had concomitant proteinuria and leucocyte. The remaining 495 pupils comprised 260(52.2%) males and 235(47.5%) females. They were aged between 30 months and 150 months with a mean(SD) age was 81(26) months. A greater percentage, 67.7% were aged 90 months and below. The mean weight of the study group was 25.80 ± 16.87 kg, mean height 123.40 ± 15.00cm with a mean BMI of 16.00 ± 2.57. The systolic blood pressure ranged from 80mmHg to 120mmHg while the diastolic blood pressure ranged from 40mmHg to 80mmHg. Only 23 (4.6%) had blood pressures greater than the 95th centile. Mean systolic blood pressure (SBP) and mean diastolic blood pressure (DBP) were 103 ± 8.86 and 61 ± 8.19 respectively. The mean blood pressures were in the normal range. 83.8% of the subjects belonged to the middle social class with 66.8% of the mothers having a tertiary level of education. 117(23.6%) of the parents reported a positive family history of hypertension while only 36(7.3%) reported a positive family history of renal disease.

The overall prevalence of proteinuria in the study population was 10.9%. Table I shows the age and gender distribution of the subjects with proteinuria. Females had a higher prevalence rate than males (14.9% vs 7.3%) and this difference was



statistically significant ($p = 0.04$). The highest prevalence of proteinuria was seen among the 61month - 90month age group with the females significantly higher than the males (20.9% vs 7.7%, $p = 0.01$). Subsequently, the rates reduced with age in both sexes. 39 (7.9%) subjects in the study population were obese and out of these, 11 (28.2%) had proteinuria. Table II shows that the prevalence of proteinuria was higher in obese children as compared to non-obese children, but not significantly so ($p = 0.22$).

Table III shows the association of proteinuria with age, gender, BMI, blood pressure, maternal education, parents' socioeconomic status, family history of hypertension and family history of renal disease. There was no association between proteinuria and age ($X^2 = 3.68$, $p = 0.30$), BMI ($X^2 = 1.49$, $p = 0.22$), blood pressure ($X^2 = 2.33$, $p = 0.47$) maternal education ($X^2 = 0.001$, $p = 0.97$), family history of hypertension ($X^2 = 2.69$, $p = 0.56$) and family history of renal disease ($X^2 = 1.11$, $p = 0.29$). On the other hand, there was a significant association between proteinuria and gender ($X^2 = 7.3$, $p = 0.01$) and parents' socio-economic status ($X^2 = 6.93$, $p = 0.04$).

DISCUSSION

Urinalysis is a well established component of many screening programs. Testing urine with a dipstick accords with the accepted criteria of a screening test.²⁵ Yap et al⁸ suggest screening for proteinuria because of the high prevalence rate of proteinuria and the low cost of the screening test while others²⁶⁻²⁷ are reluctant to recommend urine screening because the most common finding is transient proteinuria. However, major and curable (or treatable) conditions such as diabetes mellitus, renal calculi, reflux nephropathy, silent bacteriuria and bladder or kidney tumours could be found as part of a routine work up. Early detection of such conditions is potentially

very beneficial to the afflicted individual. Urine is readily available and the testing procedure is simple, rapid and inexpensive.

In this study, we describe the current prevalence of proteinuria in a population of asymptomatic school aged Nigerian children and examine possible factors that could be associated with its occurrence. The overall prevalence rate of 10.9% we obtained is much higher than 0.8%¹⁷, 4.7%³, 5.4%² reported by other authors within and outside Nigeria but comparable to 8.6%²⁸ 10.5%⁶ and 10.6%⁹ found in Lagos, southern Nigeria, Taiwan and Mexico respectively. It is not likely that physical activity accounted for the much higher prevalence of proteinuria in this study since the urine testing was done early in the morning before the children undertook any form of exercise.

The observed decrease in the prevalence of proteinuria with age has been noted by other workers^{3,5}, although their findings were from the first half of the second decade while we noticed the decline from the 91month - 120month age group. In contrast, Akinkugbe², and Jin⁶ reported an increase in the prevalence with age. There are yet no explanations to this curious trend. In all the age groups, females had a higher prevalence of proteinuria than males. This is similar to the findings of other authors.^{2,6} This difference may not be attributed to the later onset of adolescence in males because subjects with features of puberty were excluded from this study. This finding could be pursued in a larger study that has more biochemical parameters.

Proteinuria has been reported in previous studies^{12,13,30} of obese adolescents and adults. In this study, proteinuria was seen more in the obese than the non obese children, although this difference was not statistically significant. This observation compares with the work of other authors^{17,18} who noted proteinuria to have

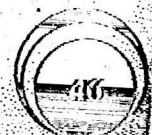
a strong association with increased BMI and reported early obesity as a major contributor to the emergence of obesity-related glomerulopathy. It therefore calls for urine protein analysis as a baseline investigation in all obese children whether symptomatic or not. If positive for proteinuria, further investigations of the renal system should be carried out for early identification of renal parenchymal disease and subsequent institution of secondary preventive measures, like early use of angiotensin blocking agents and a comprehensive weight control programme, including diet and exercise.

In our study population, the mean systolic and diastolic blood pressure was in the normal range. Also, the children with proteinuria did not have blood pressure levels above the 95th percentile. This finding compares favourably with a study³¹ of Australian children that found systolic hypertension of 1.5% and diastolic blood pressure of 0.2% but contrasts findings of other studies³²⁻³³ that have linked microalbuminuria with hypertension. These other studies were carried out in adolescents and adults when hypertension is more prevalent than the age group studied.

In conclusion, proteinuria is prevalent among school aged Nigerian children. It is commoner in females and obese children from the middle social class. Urine screening for proteinuria should be mandatory in these groups of children for early identification of renal disease and prompt institution of preventive strategies.

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