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MICRO-ALBUMINURIA IN ADOLESCENT/YOUNG ADULT OFFSPRINGS OF HYPERTENSIVE NIGERIAN ADULTS – A Preliminary Report

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ABSTRACT

Objectives: To determine the prevalence of micro-albuminuria in adolescent/young adult offsprings of Nigeria hypertensive adults.

Background: On the premise that micro-albuminuria is a predictor of early stage hypertensive disease and the fact that heredity plays an important role in the aetiology of essential hypertension, the prevalence of micro-albuminuria in children of hypertensive adults was assessed.

Setting: Medical wards of the University of Benin Teaching Hospital, Benin City.

Subjects: Normotensive, non-diabetic, non-obese adolescents/young adult offsprings of known adult hypertensives, receiving in-patient care. Controls had similar characteristics but born to normotensive adults.

Design: Prospective, cross-sectional involving 42 subjects and 50 controls.

Results: Mean age of the 42 study subjects (24 males and 18 females) was 17.95±0.52years (range 13 – 24 years). Eight (19.0-%) had microalbuminuria as compared to 4(8.0%) in controls. Five (62.5%) of the micro-albuminuric subjects had fathers who were hypertensive while none had maternal history of hypertension. The incidence of microalbuminuria in subjects with positive paternal history of hypertension was 21.1% as against 0.0% in those with positive maternal history of hypertension. Parental history of diabetes mellitus did not enhance the risk of micro-albuminuria. Similarly, combined morbidities of hypertension and diabetes mellitus in either parents or both were unassociated with increased incidence of micro-albuminuria. Mean duration of paternal hypertension of 9.20± 2.09 years did not vary from 8.90±1.13years in the parents of those who were micro-albuminuria negative.

Conclusion: Microalbuminuria could be a predictor of early phase adolescent hypertensive disease and such may have more relevance in offsprings of Nigerians at risk of hypertensive fathers.

Recommendation: Longitudinal and more detailed work employing timed urine sample is advocated to further examine these relationships.

Key Words: Micro-albuminuria, Adolescents, Parental essential hypertension, Africans.

INTRODUCTION

Microalbuminuria is the excretion in urine of very small amounts of albumin slightly in excess of 20µg/minute.[1] In effect, urinary albumin in the range of 30 – 300mg/24 hours[2] - levels that require a sensitive radioimmunoassay for detection, is excreted in urine.[2] It is an acknowledged predictor of increased renal and cardiovascular risks associated with hypertension and diabetes mellitus.[3-6] Its early detection coupled with relevant intervention have been known to retard the rate of progression of the morbidity process in adult hypertensives.[7] In non-hypertensive and non-diabetic population presence of microalbuminuria is also known to be associated with increased levels of athrogenic factors and an increase in cardiovascular morbidities and mortality.[8] The prevalence of microalbuminuria is enhanced in patients with hypertension.[9] Besides, its prevalence is known to

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be commoner in normotensive children of one or two hypertensive parents implying that possibly microalbuminuria could identify an early stage hypertensive patients.[9] It is known that the racial variations existing in the morbidity profile and electrolyte metabolism in hypertensive is in favour of non-black population.[10] It is uncertain however, if such racial differences extend to microalbuminuria as a biologic marker. Besides, most of the studies available on the subject matter have emanated from the developed world. In contrast, studies on African populations are few and far apart,[11, 12] yet the burden of hypertension is worst with blacks and Africans.

As part of improving on this paucity of data from Africa and determining some aspects of the African's behaviour regarding hypertension and microalbuminuria, this study was undertaken amongst normotensive adolescent offsprings of hypertensive Nigerians.

PATIENTS AND METHODS

The study was conducted at the adult medical wards of the University of Benin Teaching Hospital (UBTH), Benin City between September and December, 2002. Study subjects consisted of normotensive, non-diabetic, non-obese, adolescent/young adult offsprings of known hypertensive parent(s) admitted for hypertension related morbidities or other illnesses. Individuals who met the age defining criteria and gave informed consent for the study were consecutively enrolled in the study. Controls of comparable ages and matched for sex were recruited from amongst offsprings of normotensive adults of comparable ages either accompanying their parents to Consultant Out-Patients' Clinic or drawn from amongst students of Adolo College, Benin City.

Information bothering on biodata, personal and family histories of hypertension and diabetes mellitus were subsequently obtained from each subject and control. Equally documented were personal and family records of renal diseases including historical evidences of kidney abnormalities and diseases, history of significant cigarette smoking and physical activity levels, particularly on the day of investigation. Enquiries were also conducted into the presence of clinical features that would suggest urinary tract infection (UTI) and recent febrile illnesses.

Blood Pressure records representing mean values were obtained in sitting position and measured using the Accusson Mercury Sphygmomanometer. Systolic and diastolic blood pressures corresponded respectively to the appearance and disappearance of first and fifth korotkoff sounds. Normotension was defined as systolic and diastolic blood pressures of less than 140 mmHg and 90mmHg respectively.

With the aid of universal bottles, 5ml spot urine sample was obtained from each subject and control and tested first for albuminuria, within an hour of collection, using the Combi-10 multi-strips (Machery-Nagel, F67722, Hordt, Germany. Batch numbers 56010-56013). Samples negative for albuminuria were subsequently tested for microalbuminuria using the Micra-test strips (Batch numbers 172-28799432-4) and employing the methods as described by the manufacturers (Roche Diagnostics, H7V 4A2 Laval, Quebec Canada). Microalbuminuria was defined by varying shades of pink in the test strip that corresponded to a range of 20 – 250mg/l of urinary albumin. Results were then entered into a proforma that already contained subjects' biodata and other relevant information.

Subjects and controls that were found to have been engaged in recent physical activities or had features that were compatible with UTI and recent acute febrile illnesses were not recruited into the study.

Follow up

Subjects and controls that had proteinuria were enlisted into an ongoing longitudinal study designed to determine the outcome of the proteinuria by repeated assessment at regular intervals.

Statistical analysis

Data generated were analysed using the Epi-info Version 6. Means, standard error of mean (SEM) were derived for parametric variables. The strength of relation between differences in proportions was assessed using the chi-square test and t-test for means. A p-value less than 0.05 was considered significant.

RESULTS

Of the 42 subjects evaluated, 24(57.1%) were males while 18(43.9%) were females. The mean age (SEM) of the adolescents was 17.95 ± 0.52years range 13 – 24 years. Twelve (28.6%) of these were less than 16 years of age while 9(21.4%) were over 21 years of age (Table 1).

Eight (19.0%) of the 42 subjects had microalbuminuria in their spot urine as compared to 4(8.0%) of the 50 controls that also had microalbuminuria. Thirty-eight (90.5%) of the subjects had fathers who were either hypertensive when they were alive or were currently hypertensive. Corresponding figure for history of maternal hypertension was 9(21.4%). Regarding history of

paternal diabetes mellitus. 16(38.1%) cases were positive and corresponding figure with respect to positive history of maternal diabetes mellitus was 5(11.9%). Both parents were respectively hypertensive and diabetes in 6(14.3%) and 3(7.1%) cases. Only 3(7.1%) subjects had both parents who were hypertensives as well as diabetic.

History of renal diseases was elicited in 20 patients (18males,5 females, both parents,3). Five of the 8 micro-albuminuric adolescents/young adults had fathers who had renal diseases. Though micro-albuminuria occurred more in those with parental history of renal diseases than those without it, this was not statistically significant (X^2 = 0.03; p>0.05). The mean age of 16.75 ± 1.85years in those who were micro-albuminuria positive did not vary significantly from those who were negative (17.91±0.61 years) (t = 0.74; p>0.05). Of the 8 who were microalbuminuric, 5(62.5%) were males while 3(37.5%) were females. Gender specific prevalence was 20.8% in males as against 16.7% in females, suggesting no association between incidence of microalbuminuria and gender.

The incidence of microalbuminuria was more in the age bracket 16 – 18 years. All 8 patients with microalbuminuria had fathers who were hypertensive. In comparison, none of the eight micro-albuminuric adolescents had mothers who were hypertensive. Thus the incidence of micro-albuminuria in subjects who had positive paternal history of hypertension was 21.1% as against 0.0% in those with positive history of maternal hypertension. Only 1(6.3%) of the 16 that had history of paternal DM had microalbuminuria. None of the 5 with positive maternal history had microalbuminuria. Either morbidity of hypertension or DM in both parents or combined morbidities in both parents did not predispose unduly the adolescent to micro-albuminuria (Table II).

The mean duration of hypertension in parents of adolescents who had micro-albuminuria of 9.20 ± 2.09 years was longer than that obtained in adolescents who were not micro-albuminuric but had fathers who were hypertensive (8.90±1.13 years). The difference in duration was however, not statistically significant (t = 0.17; p >0.05).

Table I: ***Age distribution and prevalence of micro-albuminuria in study subjects***

Age (Years)	Males	Females	Total
≤ 15	6(1)	6	12(1)
16 – 18	7(1)	5(2)	12(4)
≥ 22	6(1)	3	9(1)
19 – 21	5(1)	4(1)	9(2)
Total	**24(5)**	**18(3)**	**42(8)**

(Figures in parenthesis represent those that were microalbuminuria positive)

Table II: **Medical characteristics of parents of study subjects and prevalence of micro-albuminuria**

Medical characteristics	*Number of parents Involved*	*Number of micro-albuminuric offspring (%)*
Hypertension.		
Paternal	38	8(21.1)
Maternal	9	0(0.0
Both parents	6	0(0.0)
Diabetes mellitus		
Paternal	38	1(6.3)
Maternal	5	0(0.0)
Both parents	3	0(0.0)
Combined morbidities		
(HBP + DM)		
Paternal	15	3(20.0
Maternal	3	0(0.0)
Both parents	3	0(0.0)

Figures are not mutually exclusive)

DISCUSSION

The microalbuminuria rate of 19% as recorded in this study is comparable to the 19.8% found by Lindeman amongst geriatric patients in Mexico, USA.[13] Our figure, however, varied markedly from the 9% noted by Hwang[11] in healthy Zimbabwean women and 61% documented in the works of Unuigbe et al among apparently healthy young adults.[12] It is not very certain why the sharp differences in microalbuminuria rates between the studies. Racial and age differences in the study subjects and methodology employed may be partly responsible. Quantitative assay of microalbuminuria utilizing double-antibody radioimmunoassay in timed urine has an edge over conventional urinalysis dipstick on spot urine in the sensitivity and specificity in microalbuminuria determination[14]. As with this study, urinalysis dipstick was employed by Lindeman et al[13] and by Unuigbe and co-workers[12]. Unlike the latter study, however, our subjects were not faced with any stressful events that could have caused an increase the rate of microalbuminuria.

Rate of microalbuminuria of 8% recorded amongst our controls was comparable to the 9% documented by Hwang[11]. It was markedly different

from the 19% obtained in our subjects who were offsprings of known hypertensives suggesting that children of hypertensive Africans have increased predisposition to microalbuminuria than those born to non-hypertensives. This finding is in agreement with what has been documented by a number of authors, that micro-albuminuria is linked to the pathogenesis of hypertension and serves as a predictor of hypertension.[9] Interestingly however, the predisposition to micro-albuminuria and by extension elevated blood pressure exhibited closer association with paternal hypertension than maternal cases. It is not readily apparent why this peculiar relationship should exist. Nonetheless, we speculate that a stronger genetic relationship existing between hypertensive male parents and their offsprings may be responsible. Microalbuminuria, though not significantly, was commoner in males than females – a trend that had been noted also by Lindeman et al.[13] This may be a reflection of female under-representation in hypertensive diseases in the general population.

DM alone, or as a co-morbidity did not increase the risk of microalbuminuria in offsprings. Though the incidence of microalbuminuria is higher in diabetic subjects representing an acknowledged predictor of diabetic nephropathy, our finding would tend to restrict microalbuminuria to the role of a marker rather than a predictor of diabetic nephropathy.[2,3] Our findings are thus at variance with those of Unuigbe et al[12] who found increased incidence of microalbuminuria in normoglycaemic young adults with positive family history of diabetes mellitus. The poor association between parental diabetes and micro-albuminuria in offspring was further corroborated by the fact that none of our microalbuminuric controls had family history of DM.

In conclusion, microalbuminuria may hold some potential in predicting hypertension in young adult offspring of Nigerian hypertensives particularly if such are males. Longitudinal, case-control studies to further examine this relationship are advocated.

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