Frequency and determinants of the metabolic syndrome in apparently healthy adult Nigerians

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In this study *N. meningitidis* was confirmed by Gram stain and culture in 91.2% and in 88.2% of the CSF samples. Our isolation rates are higher than previous reports.[9] Due to ongoing outbreak in Delhi during the period of our study, the already sensitized clinicians and microbiologists took great care to collect samples prior to patients receiving antimicrobial therapy and processed the samples promptly which might well have affected our results.

LAT could have identified all suspected cases of meningococcal meningitis caused by *N. meningitidis.* However, although culture is the gold standard and Gram staining correlates with the culture fairly well, during an outbreak diagnosis cannot depend upon these alone as prior antimicrobial therapy can alter the results of both these methods. Hence, LAT can be used as a reliable method for the rapid diagnosis of meningococcal meningitis, but the high cost and non-availability of kits are major constraints in developing countries. Previous studies have advocated the use of LAT as an adjunct in the diagnosis of purulent bacterial meningitis.[10]

Except for a few of our isolates that exhibited resistance to penicillin and erythromycin, most were sensitive to the commonly used antimicrobial agents. In India, there are not many published studies on the antimicrobial sensitivity of *N. meningitidis*, but a few have reported sensitivity to the commonly used antibiotics. All isolates obtained from the early 2005 spurt of cases in Delhi were sensitive to penicillin, ampicillin, rifampicin and ceftriaxone, two-thirds were non-susceptible to ciprofloxacin and all were resistant to cotrimoxazole.[8]

Defining the risk factors and continuing the surveillance of this disease remain important public health goals for the control of meningococcal disease.

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Frequency and determinants of the metabolic syndrome in apparently healthy adult Nigerians

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SUMMARY Non-communicable disease conditions such as the metabolic syndrome further strain the already insufficient health resources in Africa, where communicable diseases such as malaria and HIV/AIDS are still causing significant morbidity and mortality. We studied the frequency and determinants of the syndrome in apparently healthy Nigerian volunteers in order to provide a basis for the establishment of a prevention programme.

Introduction

Metabolic syndrome is an emerging non-communicable health problem in the developing countries. Individuals with the syndrome are at a higher risk of developing type 2 diabetes,[1] while its presence is associated with increased risk of fatal and non-fatal cardiovascular disease.[2] Based on the Adult Treatment Panel III (ATP III) criteria,[3] the prevalence of the syndrome has been found to vary between communities and countries. It was reported to be 26.6% among Mexican men and women aged 20–69 years,[4] 21.8% in the United States with 57% higher prevalence in African American women[5] and 30% among black South African corporate executives.[6]

The emergence of non-communicable disease conditions such as the metabolic syndrome in Africa – where communicable diseases like malaria and HIV/AIDS are still causing significant morbidity and mortality – will put a strain on the already insufficient health resources. We studied the frequency and determinants of the syndrome in apparently healthy Nigerian volunteers in order to establish a basis for a public health education programme, which could also serve as a template for further research on the subject.

Patients and methods

This descriptive cross-sectional study was carried out in Katsina town in northwestern Nigeria from May to June

Table 1 Characteristics of the 321 volunteers (values are mean ± standard deviation and frequency [percentage])

Variable	*Overall, n (%)*	*Male, n (%)*	*Female, n (%)*	*P value*
Age	37.6 ± 10.6	38.0 ± 9.7	37.2 ± 11.2	0.54
BMI	26.0 ± 5.8	24.1 ± 4.0	27.5 ± 6.5	<0.001
WC	91.1 ± 14.5	87.6 ± 10.9	93.7 ± 16.2	<0.001
Systolic BP	120.4 ± 21.1	117.9 ± 18.9	122.3 ± 22.4	0.07
Diastolic BP	78.9 ± 13.5	77.4 ± 11.8	80.1 ± 14.6	0.10
History of HTN	48 (16.0)	13 (10.1)	35 (20.5)	0.02
History of DM	10 (3.3)	4 (3.1)	6 (3.5)	0.85
Current smoker	14 (4.7)	11 (8.5)	3 (1.8)	0.006
FPG	82.9 ± 20.9	82.9 ± 15.4	82.9 ± 24.2	0.99
TC	178.2 ± 38.0	172.8 ± 35.6	182.3 ± 39.4	0.03
HDL cholesterol	45.3 ± 21.7	40.1 ± 14.6	49.2 ± 25.1	<0.001
LDL cholesterol	106.8 ± 38.9	105.7 ± 38.1	107.7 ± 39.5	0.66
Triglyceride	101.3 ± 49.1	104.4 ± 46.2	99.1 ± 51.2	0.36

BMI, body mass index; WC, waist circumference; BP, blood pressure; HTN, hypertension; DM, diabetes mellitus; FPG, fasting plasma glucose; TC, fasting total cholesterol; HDL, high-density lipoprotein; LDL, low-density lipoprotein

2006. Apparently healthy subjects who volunteered to participate in the study were consecutively recruited from local residents, hospital staff and the relatives of medical and surgical inpatients. They were screened at the Federal Medical Centre, Katsina, a tertiary health institution that serves as a referral centre for all the primary and secondary health institutions in Katsina State.

Information was obtained in a standardized manner using a pre-tested questionnaire. We recorded the weight, height, waist circumference and body mass index of each subject. The blood pressure was measured with a mercury sphygmomanometer in the left arm using the appropriate-sized cuff with the subject comfortably seated after at least a 5-minute rest. Venous samples were collected in order to estimate plasma glucose, triglyceride, total cholesterol and high-density and low-density lipoprotein (HDL, LDL) fraction after an overnight fast of 10–12 hours. The samples were analysed at the central laboratory of the hospital by the same medical laboratory scientist. Glucose was estimated using the glucose oxidase method. The plasma cholesterol and triglyceride were measured enzymatically. The HDL cholesterol was determined after the precipitation of the LDL fraction with dextran sulphate-magnesium.[7]

Metabolic syndrome was defined using the ATP III criteria, i.e. a subject with three of the following – truncal obesity, hypertension, impaired glucose tolerance, hypertriglyceridaemia and low HDL cholesterol – fulfilled the criteria for the diagnosis of the syndrome.

Table 2 Frequency of metabolic syndrome and the various components

Variable	*Overall (n = 300), n (%)*	*Male (n = 129), n (%)*	*Female (n = 171), n (%)*	*P value*
Metabolic syndrome	66 (22.0)	14 (10.9)	52 (30.4)	<0.001
Abdominal obesity*	131 (43.7)	16 (12.6)	115 (67.3)	<0.001
Hypertension†	102 (34.0)	39 (30.2)	63 (36.8)	0.232
Low HDL-c‡	178 (59.3)	67 (51.9)	111 (64.9)	0.024
Triglyceride ≥ 150 mg/dL	45 (15.0)	21 (16.3)	24 (14.0)	0.590
FPG ≥ 110 mg/dL	15 (5.0)	6 (4.7)	9 (5.3)	0.810

HDL-c, high-density lipoprotein cholesterol
*Waist circumference >102 cm and >88 cm in males and females, respectively
†Hypertension = blood pressure ≥130/ ≥ 85 mmHg
‡Less than 40 mg/dL and 50 mg/dL in males and females, respectively

Results

A total of 321 subjects volunteered for the study of whom 300 had complete data for analysis. There were 129 men and 171 women (ratio 1:1.3); and their ages ranged from 17–75 (mean 37.6 ± 10.6) years.

Table 1 shows the clinical, anthropometric and metabolic characteristics of the subjects. The overall mean BMI was 26.0 ± 5.8 kg/m^2 with the women having a significantly higher mean BMI of 27.5 ± 6.5 kg/m^2 compared to 24.1 ± 4.0 kg/m^2 in the men ($P < 0.0001$). The mean waist circumference and fasting serum total cholesterol were also significantly higher in the women (97.3 versus 87.6 cm, $P = 0.0003$ and 182.3 versus 172.8 mg/dL, $P = 0.03$, respectively). A history of hypertension was present in 16% and was also more common in the women (20.5% versus 10.1%, $P = 0.02$). Fourteen (4.7%) were current smokers with a significantly higher percentage among the men (8.5% versus 1.8%, $P = 0.006$). Overall, the mean HDL cholesterol was 45.3 ± 21.7 mg/dL. The mean HDL-cholesterol (HDL-c) was significantly higher in the women (49.2 ± 25.1 mg/dL versus 40.1 ± 14.6 mg/dL, $P < 0.0001$). Twenty-two percent (22%) of the subjects fulfilled the criteria for metabolic syndrome with a significantly higher frequency of 30.4% in females compared to 10.9% in males (Table 2).

In multivariate analysis, the odds of having the syndrome in the presence of some baseline variables were as follows:

- being female 1.6 (confidence interval [CI] = 1.30–1.86, $P < 0.0001$);
- having a history of diabetes 8.03 (CI = 2.13–30.18, $P = 0.001$);
- having impaired fasting glucose 6.85 (2.43–19.34, $P < 0.001$);
- a history of hypertension 3.59 (CI = 2.17–5.93, $P < 0.0001$);
- generalized obesity 4.97 (CI = 3.20–7.73).

The odds were increased 3.48 (CI = 2.24–5.41, $P < 0.0001$) if the subject had a systolic blood pressure of >140 mmHg and by 4.24 (CI = 2.77–6.47, $P < 0.0001$) if they had a diastolic blood pressure of >90 mmHg.

Discussion

The overall frequency is comparable to the 21.8% reported in the USA,[5] but lower than the 30% reported in black South

African corporate executives,[6] using the same ATP III criteria. This is probably because the latter study was purely on corporate executives who were already likely to be at risk of developing the syndrome due to the sedentary nature of their jobs. However, our subjects were unselected.

Although the frequency of abdominal obesity in our women (67.3%) is comparable to the 62.1% reported in African American women in the USA,[5] the higher frequency of metabolic syndrome in our female subjects (30.4%) is possibly as a result of the fact that they had a significantly higher frequency of low HDL-c compared to the male subjects. Using the ATP III criteria, Gupta et al. also reported a higher prevalence rate of 47.8% in women compared to 36.2% in men.[8]

Our results show that the odds of having the syndrome are increased in women and in the presence of generalized obesity, systolic or diastolic hypertension. Also, the risk is increased about eight-fold in those with a history of diabetes mellitus and impaired fasting glucose increased the odds by about seven-fold.

These findings underline the need to take a holistic approach in the management of patients with any cardiovascular risk factor as the presence of one may be a pointer to their having an underlying metabolic syndrome. To stem the tide of this non-communicable health condition, we need to provide health education at all levels. As prevention is paramount, there is a need to promote a healthy lifestyle in our communities, including heart-healthy diets and increased physical activity.

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Pigs are the most important animal reservoir for *Tunga penetrans* (jigger flea) in rural Nigeria

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SUMMARY We examined the domestic animals and rodents in a community in rural Nigeria. Of the 133 animals examined, 29 (21.8%) were infested, the highest prevalence of infestation and highest parasite load was found in the pigs (prevalence 54.8%, median = nine embedded parasites), followed by dogs (45.5%; median = 4), *Rattus rattus* (29.4%; median = 2) and *Mus minutoides* (15.4%; median = 1.5). Of all the tungiasis lesions identified 83% were found in pigs. Our data confirm that tungiasis is a zoonotic disease, and that pigs are its most important animal reservoir in this endemic community.

Introduction

Tungiasis is a parasitic skin disease caused by the jigger flea *Tunga penetrans.* The disease is present in resource-poor communities in Central and South America, the Caribbean and sub-Saharan Africa.[1] Domestic animals, such as pigs, dogs and cats have been repeatedly considered as important animal reservoirs, but data are scarce.[2–5]

A recently conducted community-based study in rural Nigeria revealed a high prevalence of tungiasis (45%) in the human population. A particular high parasite load was found in children and the elderly, and considerable morbidity caused by the infestation.[6] The most important independent risk factor for tungiasis, identified by another epidemiological investigation in that area, was the presence of pigs in a household (adjusted odds ratio = 18), with a population-attributable fraction of 38%.[7] We investigated tungiasis in domestic animals and rodents in this endemic community in order to describe the importance of domestic animals and rodents as a reservoir for *T. penetrans.*

Material and methods

The study was carried out during the dry season in Erekiti, a rural community located about 50 km west of the city of