ABSTRACT

BACKGROUND
The prevalence of diabetes mellitus (DM) is rapidly increasing. Its burden on health sector resources and its toll on the quality of life of patients, morbidity, and mortality in both developed and developing nations is alarming. It is therefore imperative to nip this epidemic in its bud by regular screening to detect prediabetes and/or some of its determinants in especially those at increased risk. Several studies have shown that lifestyle changes can help to avert or slow progression to diabetes in those who are at risk.

AIM AND OBJECTIVES
Aim: To determine the prevalence and some determinants of glucose intolerance among first degree relatives of patients with type 2 DM in Zaria.

Objectives
1. To determine the prevalence of glucose intolerance among first degree relatives of patients with type 2 DM in Zaria.
2. To determine the relationship between indices of obesity and glucose intolerance among first degree relatives of patients with type 2 DM in Zaria.
3. To determine the prevalence of insulin resistance and its relationship with glucose intolerance among first degree relatives of patients with type 2 DM in Zaria.
4. To assess the use of glycated haemoglobin (HbA1c) as an alternative to diagnose glucose intolerance in first degree relatives of patients with type 2 DM in Zaria.
5. To assess the role of highly sensitive C-reactive protein (hsCRP) as a marker of inflammation among first degree relatives of patients with type 2 DM in Zaria.

METHODOLOGY
Approval was sought and granted from the Research and Ethics Committee of Ahmadu Bello University Teaching Hospital (ABUTH) Zaria. First degree relatives of patients with type 2 DM attending the endocrinology clinic of ABUTH Zaria were consecutively enrolled into the study. Age- and sex-matched controls were also enrolled. Informed consent was obtained from each subject.
The World Health Organisation (WHO)-3 steps format was used for relevant data collections including biodata; medical, medications, social history; family history of hypertension, diabetes, obesity etc. Measurements of weight, height, waist circumference, waist-hip ratio, blood pressure, and other systemic examinations were carried out on each subject. Fasting plasma glucose (FPG) and 2-hr post-prandial plasma glucose (2HPG) were determined following oral glucose tolerance test (OGTT). Glycated haemoglobin (HbA1c), fasting insulin and highly sensitive C-reactive protein (hs-CRP) levels were also assessed using specific assay kits.

Microsoft excel was used for data entry while statistical package for social sciences (SPSS) version 19 was used for data analysis. Results were expressed in means ± standard deviation at 95% confidence interval. Continuous and categorical variables were compared using student t-test and chi-square respectively.

Pearson’s Correlation was used to test for association between FPG/ 2HPG; and body mass index (BMI), waist circumference, waist-hip ratio, HbA1c, homeostasis model assessment of insulin resistance (HOMA-IR), and hsCRP. Multiple logistic regression was used to determine whether BMI, waist circumference, waist-hip ratio, insulin resistance, and hsCRP were significant determinants of glucose intolerance. Significance level was taken as p ≤ 0.05.

**RESULTS**

The prevalence of glucose dysregulation was 45.7% among first-degree relatives of patients with type 2 DM which is significantly higher than 7.0% found among healthy controls (p < 0.001). First-degree relatives also had significantly higher mean waist circumference (89.16 ± 0.88cm vs 86.67 ± 0.85cm, p = 0.044); waist-hip ratio (0.96 ± 0.01 vs 0.91 ± 0.01, p = 0.001); BMI (29.03 ± 0.41 vs 25.12 ± 0.38, p < 0.001); HOMA-IR (5.45 ± 1.56 vs 1.81 ± 0.16, p = 0.02); hs-CRP (6.58 ± 0.34 mg/L vs 2.86 ± 0.17 mg/L, p < 0.001); and HbA1c (5.51 ± 0.08 vs 4.22 ± 0.04, p < 0.001).

Furthermore, multiple logistic regression showed that significant determinants of glucose intolerance were body mass index (odds ratio[95%CI] = 4.2 [1.3-13.6], p = 0.018); waist circumference (odds ratio[95%CI] = 3.7 [1.3-10.3], p = 0.013); highly sensitive C-reactive protein (odds ratio[95%CI] = 1.6 [1.4-1.8], p < 0.001); and homeostasis model assessment of insulin resistance (odds ratio[95%CI] = 2.3 [1.8-3.0], p < 0.001). Waist-hip ratio (WHR) though, positively associated with glucose intolerance, was not shown to be a significant determinant (odds ratio[95%CI] = 1.1 [0.4-3.6], p = 0.828).

The American Diabetes Association (ADA) HbA1c criteria for the diagnosis of glucose intolerance missed 50% of subjects diagnosed by the OGTT criteria. This may be due to the fact that factors like anaemia (haemolytic, macrocytic) and genotype affect the half-life of red blood cells and thus, HbA1c levels.
CONCLUSION
The prevalence of glucose intolerance was higher among first degree relatives of patients with type 2 DM compared to controls. Furthermore, the prevalence of obesity was higher among subjects than controls and was found to be a significant determinant of glucose intolerance. The prevalence of insulin resistance and level of inflammation (hsCRP) were also significantly higher among first degree relatives than control and were significant determinants of glucose dysregulation.