

Fasting Blood Glucose Level Among Apparently Healthy Adults in Maiduguri North-Eastern Nigeria

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ABSTRACT

Background: For the past decades there has been an increase in type 2 diabetes mellitus worldwide including this environment, subsequently, baseline data is needed particularly in environment dependent on transferred reference values to access the level of fasting blood glucose. **Objectives:** This study was conducted to evaluate fasting blood glucose in apparently healthy adults in Maiduguri, Nigeria. **Methodology:** This is a cross-sectional study involving 308 participants: 258 apparently healthy non-pregnant adults, comprised of 162 males and 96 females and 50 pregnant women. A structured questionnaire was administered to those that consented and the subjects did overnight fast (between 10 and 12hours) before blood sampling. Blood glucose was measured using standard methods. Mean values of fasting blood glucose and body mass index were presented as mean \pm standard deviation. **Results:** There was no significant difference in the fasting blood glucose of male (4.38 ± 0.67 mmol/L) and female (4.38 ± 0.60 mmol/L) subjects, ($p = 0.93$). The body mass index of female subjects 24.57 ± 5.01 kg/m² was significantly higher than their male counterparts 23.39 ± 4.46 kg/m² ($p = 0.05$). There was an increasing trend of fasting blood glucose level ($p = 0.85$) and body mass index ($p = 0.01$) and also with increasing parity among the pregnant women. **Conclusion:** The fasting blood glucose level increases with weight, age, gestational age, and parity in pregnant women.

Keywords: fasting blood glucose, age, parity BMI.

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Introduction

Diabetes is a chronic metabolic disorder, characterized by high blood glucose (hyperglycaemia), associated with impaired carbohydrate, fat and protein metabolism, resulting from either insufficient or no release of insulin by pancreas in the body.¹ Diabetes mellitus, based on requirement of insulin treatment, is divided in to two groups namely insulin dependent diabetes mellitus (IDDM) and non-insulin dependent diabetes mellitus (NIDDM). This disorder is associated with several metabolic defects.² Most important among them are hyperglycaemia, diabetic ketoacidosis, hyperosmolar hyperglycaemic state, and hypertriglyceridemia. Diet, exercise and drugs are the management options in diabetes. Approximately 50% of

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the new cases of diabetes can be adequately controlled by diet alone. Oral antidiabetic drugs like sulfonylureas and biguanides are used for treatment but have side effects. The World Health Organization (WHO) estimates that diabetes mellitus affects over 366 million people worldwide, and many are without efficacious diabetes care.

Immediately after a high carbohydrate meal, glucose is rapidly absorbed into the blood causes rapid secretion of insulin. The insulin in turn causes rapid uptake, storage, and use of glucose by almost all tissues of the body. If the normal physiology is distorted it can lead to hyperglycaemia.

Normal value ranges may vary slightly among different race, gender, environment and laboratories. Many factors affect a person's blood glucose level, a body's homeostatic mechanism, when operating normally, restores the blood glucose level to a narrow range of about 4.4 to 6.1 mmol/L (79.2 to 110 mg/dL).³ The normal fasting glucose level for non-diabetics, should be between 3.9 and 5.5 mmol/L (70 to 100 mg/dL). The mean normal blood glucose level in humans is about 5.5 mmol/L (100 mg/dL).⁴ However, this level fluctuates throughout the day. Blood glucose levels for those without diabetes and who are not fasting should be below 6.9 mmol/L (125 mg/dl).⁴ The blood glucose target range for diabetics, according to the American Diabetes Association, should be 5–7.2 mmol/l (90–130 mg/dl) before meals, and less than 10 mmol/L (180 mg/dl) after meals.⁵

In the United States, 8% of the population has been diagnosed with diabetes, and 4% has diabetes that remains undiagnosed. Current projections suggest that the prevalence of diabetes will increase to 20–30% of the population by 2050.⁶ Diabetes is, and will remain, a primary care medical issue, with

>80% of patients with type 2 diabetes being managed by primary care providers (PCPs). Although diabetes is common, PCPs have found it to be one of the most challenging problems for which they provide care.⁷ In the past decade, there have been 18 new medications approved for glycaemic control in the United States and six new classes of anti-hyperglycaemic medicines.⁸

Gestational diabetes mellitus (GDM) is increasingly acknowledged as a public health problem in developing countries, resulting in both immediate and long-term health consequences for mothers and their newborns.^{9,10} Maternal and foetal complications of GDM range from adaptation problems of the newborn (e.g., asphyxia, respiratory distress, and hypoglycaemia) to major obstetric complications such as shoulder dystocia, prolonged or obstructed labour, pre-eclampsia, or postpartum haemorrhage.^{11,12} In low-resource settings, where shortages of health care providers as well as lack of skills to manage such complications prevail,¹³ untreated GDM and its associated conditions can endanger the life of mothers and their newborns.

Screening and management of GDM often is not part of routine care in the majority of low-resource settings. Therefore, data on the prevalence of GDM and the incidence of related obstetric and newborn complications are scarce. Most of the research on GDM to date has been conducted in high-income countries where GDM screening is already an established part of antenatal care, and specific procedures are clearly defined in national guidelines.

This study was conducted to establish the normal blood glucose level in Maiduguri, north-eastern Nigeria. There is a need to establish the normal reference values for this environment. Currently medical practitioners



rely on values obtained from other Nigerian populace or even that of Caucasians. It is well known that physiological values are affected by environment, diet, genetic make-up and even social life. Therefore, the aim of this study is to establish reference values for this environment.

Methodology

This is a cross-sectional study conducted at the University of Maiduguri and University of Maiduguri Teaching Hospital. A total of 308 subjects were enrolled into the study: 258 apparently healthy non-pregnant adults comprising of 162 males and 96 females and 50 pregnant women. Pregnant women were grouped according to their parity as primigravida, multiparous and grand multiparous (those that have above four deliveries). The subjects were apparently healthy individuals with no history of diabetes and hypertension. Ethical clearance was obtained from ethics and research committee of the UMTH, consent of the subjects were obtained using consent form.

The subjects were asked to fast overnight from 10 pm to 8 am when the blood sample was obtained. Two millilitres of blood was collected from each subject into a fluoride bottle under aseptic condition for the determination of fasting blood glucose level. Samples were analysed at the University of Maiduguri Teaching Hospital, Chemical Pathology Department using the glucose oxidase method.¹⁴ The FBG of the subjects were thus determined and compared between males and females. Weight and

height were obtained, and the BMI was calculated from the weight and height. Data was collected and collated into SPSS, the results obtained was presented in a tabular form and significant level was determined by student t-test. P value was set at <0.05

Results

The results of the study showed that the age range of the healthy non-pregnant adults was 18 to 62 years and the age range of the pregnant women was 16 to 40 years. The mean age for males and females were 32.01 ± 10.62 years and 33.00 ± 11.85 years respectively; there was no significant difference. From this value there was no difference between sexes. The weight of males and females were 67.60 ± 12.49 Kg and 64.33 ± 12.65 Kg respectively which showed significant difference between the sexes ($p < 0.05$). The average height for males was 1.70 ± 0.07 and that of females was 1.62 ± 0.06 which is also significant ($p < 0.05$). The BMI showed that males have 23.39 ± 4.66 Kg/m² while females have 24.57 ± 5.01 Kg/m² which showed significant difference ($p < 0.05$). Mean values of FBG for both males and females were 4.38 ± 0.67 mmol/L and 4.38 ± 0.60 mmol/L respectively. The BMI for both sexes was 23.39 ± 4.46 Kg/m² and 24.57 ± 5.01 Kg/m² (Table 1). For the pregnant women the mean FBG were 3.7 ± 0.62 mmol/L, 3.8 ± 0.64 mmol/L and 3.9 ± 0.41 mmol/L for primigravida, multiparous and grand multiparous, respectively, while the mean BMI were 24 ± 0.50 Kg/m², 25 ± 0.42 Kg/m² and 29 ± 0.53 Kg/m² respectively (Table 2).



Table 1: Showing FBG and BMI of normal subjects

Parameter			Male n=162 (Mean± SD)	Female n=96 (Mean± SD)	p-value
Fasting	blood	Glucose (mmol/L)	4.38 ± 0.67	4.38 ± 0.60	0.93
Body mass index (Kg/m ²)			23.39 ± 4.46	24.57 ± 5.01	0.05

Table 2: Showing FBG and BMI of Pregnant Women According to Parity

Parameter	Primipara	Multipara	Grand multipara	p-value
FBS	3.7 ± 0.62	3.8 ± 0.64	3.9 ± 0.41	0.85
BMI	24 ± 0.50	25 ± 0.42	29 ± 0.53	0.01*

*Statistically significant

Discussion

The normal range of blood glucose level in Caucasians is about 2.5 - 5.5 mmol/L (100 mg/dL).⁴ This current study revealed that the range for non-pregnant adult of both sexes is 2.6 - 5.9 mmol/L (mean = 4.38mmol/L), this should be considered as normal in our environment for both males and females.

Sociodemographic, diet, and cultural behaviour are factors which may account for higher level in our environment. Comparison of mean values of FBG among age group revealed increasing trend in FBG level as the age increase as demonstrated by the fact that the FBG level of age group 18 - 26 years (4.23 ± 0.69 mmol/L) was significantly lower than age group of 54 - 62 years (4.93 ± 0.39mmol/L) (p<0.05). This may be attributed to higher physical activities among the young age group compared to sedentary lifestyle and dietary habit of the older age group. However, the study showed no significant difference in the FBG level of age groups 27 - 35 years, 36 - 44 years, 45 - 53 years and 54 - 62 years.

This study showed an association between the fasting blood glucose level and body mass index and parity among the pregnant women. There was increasing trends of fasting blood glucose level and body mass index with increasing parity. Our study revealed that there was a significant difference in the body mass index of pregnant women with regards to parity.

Conclusion: The study demonstrates higher FBG in the area of study compared to that of Caucasians calling for the need for establishing a reference range for this environment; result from the study may serve as a pilot for larger studies.

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