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Assessment of impaired fasting blood glucose staff in Kashim Ibrahim College of education Maiduguri, Borno state, Nigeria

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Abstract
This study assessed of impaired fasting blood glucose staff in Kashim Ibrahim College of Education Maiduguri, Borno state. Three hypotheses guided the study. Survey research design was used for this study. The population for the study comprised staff of Kashim Ibrahim College of Education Maiduguri numbering 566 (academic staff 216 and non-academic staff 350). A sample of 57 (males 37, females 20) staff were selected for the study using stratified sampling technique with proportionate method. The instruments used for data collection were Floride oxalate container (green cap), syringe (5ml) and needle (made in USA 2016 model), buffer or lyophilized enzymes, hydrogen peroxidase, Blank, standard solution and test solution was used to determine blood glucose of the participants; biodata sheet was used in recording the information of each participant. Analysis of data was done using descriptive statistics of mean, standard deviation, frequency counts and percentage. T-test and Analysis of Variance (ANOVA) was used to test hypotheses at 0.05 alpha level of significance. All the hypotheses formulated was retained. It was concluded that there is no significant difference in the hypotheses tested. Based on the results of this study, it was recommended that seminars, workshops and health talks should be organize by the College authority to create more awareness to the staff on dieting and the importance of healthy eating.

Keywords: Kashim Ibrahim College of education, Nigeria, blood glucose staff

Introduction

Impaired Fasting Glucose (IFG) is the presence of higher than usual levels of glucose in the blood after fasting. Impaired fasting glucose commonly known as pre-diabetes refers to a condition in which the fasting blood glucose level is consistently elevated above what is considered normal levels (WHO, 2007) [12]. The pre-diabetic state is the type 1 diabetes that is associated with insulin resistance and increased risk of cardiovascular pathology, although of lesser risk than impaired glucose tolerance. Nichols, Hillier and Brown (2007) [9] explained that impaired fasting glucose can progress to type 2 diabetes mellitus if lifestyle changes are not made. The World Health Organization (WHO) criteria for impaired fasting glucose differ from the American Diabetes Association (ADA) criteria. WHO (2007) [12] defined the upper limit of normal at under 6.1mml/l. However, fasting glucose levels of 5.6mml/l and higher have been shown to increase complication rates significantly. ADA (2011) [1] has lowered the upper limit of normal to a fasting glucose under 5.6mml/l.

WHO (2007) [12] stated that a person is said to have type 2 diabetes when is tested in a hospital and there is sudden sweating, confusion, thirst, hunger, heart palpitations, impaired speech, difficulty focusing as just a few signs and symptoms? Impaired fasting glucose is a risk factor for mortality due to the serious complications of type 2 diabetes mellitus. Diabetes is a multi-factor disease and it can affect many areas of the body and may lead to heart attack, stroke and blindness. When the blood glucose level is high, blood vessels in the retina, can be damaged by the formation of scar tissue or hemorrhage. It may also cause sensory nerve damage (neuropathy). When these elevated levels of blood glucose are chronic there is a potential that irreversible kidney damage can occur. The Canadian Diabetes Association (2011) [1] explained that diabetes mellitus type 2 can be prevented or reduced with proper education, healthy eating habits, physical activity, weight management and good lifestyle.

Lewington and MacMahon (1999) [8] explained that impaired fasting blood glucose (IFG), more commonly known as pre-diabetes refers to a condition in which the fasting blood glucose level is consistently elevated above what is considered normal levels, though it is not high enough to be diagnosed as diabetes mellitus. This pre-diabetic state is associated with insulin resistance and increased risk of cardiovascular pathology, although of lesser risk than impaired glucose tolerance (IGT). IFG can progress to type 2 diabetes mellitus if lifestyle changes are not made.

Leren (1970) [7] stated that there is a 50% risk over 10 years of progressing to overt diabetes. A recent study cited the average time for progression as less than three years. Fasting blood glucose levels are in a continuum within a given population, with higher fasting glucose levels corresponding to a higher risk for complications caused by the high glucose levels. Impaired fasting glucose is defined as a fasting glucose that is higher than the upper limit of normal (5.5mmol plasma), but not high enough to be classified as diabetes mellitus. Some patients with impaired fasting glucose can also be diagnosed with impaired glucose tolerance, but many have normal responses to a glucose tolerance test. High blood fasting glucose is a risk factor for

mortality due to the serious complications of type 2 diabetes mellitus (Leren, 1970) [7].

Diabetes is a multi-factor disease and it can affect many areas of the body. The depositions of plaque in the arteries known as atherosclerosis are the potential risk that is elevated in diabetic individuals. This may lead to heart attack or stroke. Blindness is another concern associated with type 2 diabetes. It is caused by microvascular disease in which high blood glucose levels damage blood vessels in the retina by the formation of scar tissue or hemorrhage. Not only do these high levels cause vision loss, they may also cause sensory nerve damage (neuropathy) (Jeng, Lee & Chang, 1998) [5].

Hypotheses

Ho_1: There is no significant difference in impaired fasting blood glucose between male and female staff of Kashim Ibrahim College of Education Maiduguri.

Ho_2: There is no significant difference in impaired fasting blood glucose among staff of different age groups in Kashim Ibrahim College of Education Maiduguri.

Ho_3: There is no significant difference in impaired fasting blood glucose between academic and non-academic staff in Kashim Ibrahim College of Education Maiduguri.

Methodology

Survey research design was used for this study. A survey is a method of research that involves the characteristics of individuals, groups, objects or situation. Survey research method is concerned with the collection of data for the purpose of describing and interpreting existing conditions or practice, beliefs, attitudes and so on. Survey design, according to Thomas and Nelson (1990) [10] is a technique that seeks to determine the practices or opinions of a specified population on one or more variables. Corner and Norman (2004) [2] stated that the purpose of survey research method is to describe systematically the facts, qualities or characteristics of a given population, event or area of interest concerning the problem under investigation. The use of this design was considered appropriate because of its importance which suits a study of this nature that sought to determine the prevalence of biomedical health risk factors among staff of Kashim Ibrahim College of Education Maiduguri.

The population for this study comprised five hundred and sixty-six (566) staff of Kashim Ibrahim College of Education Maiduguri (KICOE Establishment Unit, 2015). Out of this population two hundred and sixteen (216) were academic staff comprising 77 females and 139 males, and three hundred and fifty (350) non-academic staff comprising 119 females and 231 males. Stratified sampling technique with proportionate method was used to sample ten percent (10%) of the population for the study. Ten percent (10%) of the entire population is 56.6 which was approximated to 57 because fractions of human beings cannot be obtained. Twenty-two (22) academic staff comprising 8 females and 14 males, and thirty-five (35) non-academic staff comprising 12 females and 23 males were selected for the study. The selection of the sample was based on Krejie and Morgan (1979) who stated that in a large population, ten percent (10%) will be appropriate. Cost implication and the willingness of the participants to partake in the study, which involved taking blood sample was taken into consideration for the selection of 10 percent of the population as a sample.

The research instruments used in collecting data for this study were as follow:

Floride oxalate container (green cap), syringe (5ml) and needle (made in USA 2016 model), buffer or lyophilized enzymes, hydrogen peroxidase, Blank, standard solution and test solution was used to determine blood glucose of the participants.

An introductory letter containing the purpose of the research was obtained from the Head of Department, Physical and Health Education of the University of Maiduguri to the Registrar, Kashim Ibrahim College of Education Maiduguri for permission to conduct the research in the college. After obtaining the permission from the college authority the participants were briefed by the researcher about the testing procedures and it benefits. The researcher provided biodata sheet (Appendix B) to record the age, sex, tag number, glucose level, cholesterol level, height and weight of the participants. Fifty-seven tags numbering from 01 – 57 were provided for easy identification of the participants. The participants came up for the testing exercise in the morning 7.30 to 9:00am at the college clinic. Two (2) trained research assistants were used to assist the researcher in data taking, a trained Nurse took the blood pressure, height and weight of the participants.

Determination of Fasting Blood Glucose

To determine impaired fasting blood glucose, the participants were asked to fast for twelve hours. To collect the blood sample, floride oxalade container (yellow cap), 5ml syringe and needles were used, and the blood was collected from the cephalic vein (located at the upper arm) four mills. The blood collected was kept in the yellow cap floride oxalate container. Sodium oxalate was mixed without coapulent to prevent the blood from clotting. To centrifuge the blood, the plasma was used (the watery part of the blood that stayed at the top of the container). The methodology for the testing was enzymatic. The reagent used was buffer or lyophilized enzymes (which was also divided in two parts the glucose oxidase and hydrogen peroxidase). Standard solution was used for concentration, until it was 5.55 mmol/dl or 100mg/dl. The powdered enzymes was added to the Buffer and mixed. It became the glucose working reagent. Three containers were provided, the blank in which 2ml of water bath was put in it and standard solution was put also, then the test container 2ml and 20% of the plasma, mixed and incubated at 37ºC (degree centigrade) for 15minutes using water bath. It became ready for reading using spectrophotometer. The wavelength is 520 – 530mm. The blank was read first to set the instrument to 0.00 obserlence. The standard was read at 0.11, the test at 0.10 optical density (OD) which determined the glucose level at 5.6mml/l as normal level (White, 2016) [11].

Descriptive statistics of mean, standard deviation, frequency counts and percentage were used to describe the bio-data of the participants and answer research questions. One-way ANOVA and t-test were used to test hypotheses. All hypotheses were tested at 0.05 alpha level of significance.

Results

Table 1: Demographic Variables of the Participants n = 57

Variable	Frequency	Percentage
Age (Years)		
20 – 30	8	14.0
31 – 40	13	22.8
41 – 50	19	33.3
51 – 60	14	24.5
61 above	3	5.26
Sex		
Male	37	64.9
Female	20	35.1
Staff Cadre		
Academic Staff	22	38.6
Non-Academic Staff	35	61.4

Table 1 contains the demographic variables of the participants. Three variables were displayed in the table namely age, sex and staff cadre. Breakdown of age brackets shows that there were 8 (14.0%) participants aged 20 – 30 years, 13 (22.8%) aged 31 – 40 years. Those in age bracket of 41 – 50 years were 19 (33.3%), those within the age bracket of 51 – 60 years were 14 (24.5%) and participants aged 61 and above years were 3 (52.6%). This means that most of the participants were between the age bracket of 41 – 50 years 19 (33.3%) followed by age bracket 51 – 60 years 14 (24.5%), then age bracket 31 – 40 years 13 (22.8%), and age bracket 20 – 30 years 8 (14.08), lastly age bracket 61 and above years 3 (52.6%).

With regards to sex of the participants 37 (64.9%) were males, while 20 (35.1%) were females. This means that most of the participants were males (64.9%). With regard to staff cadre, 22 (38.6%) were academic staff while 35 (61.4%) of the participants were non-academic staff. This means that most of the participants were non-academic staff.

Ho_1: There is no significant difference in the prevalence of impaired fasting blood glucose between male and female staff of Kashim Ibrahim College of Education Maiduguri

Table 2: Summary of t-test on Fasting Blood Glucose (mmol/l) of male and female Staff of Kashim Ibrahim College of Education Maiduguri n = 57

Participants	Number	$\bar{x}$	s	df	T	P. Value
Male	37	4.912	±1.385			
				55	0.917	0.363
Female	20	4.535	±1.648			

Table 2 shows impaired fasting blood glucose of male and female staff of Kashim Ibrahim College of Education Maiduguri. t-test was applied to test the null hypothesis at 0.05 alpha level. The result showed that there was no significant difference in fasting blood glucose between male and female staff of Kashim Ibrahim College of Education Maiduguri ($P > 0.05$), therefore the null hypothesis was retained. Hence, the null hypothesis was accepted.

Ho_2: There is no significant difference in fasting blood glucose among staff of different age groups in Kashim Ibrahim College of Education Maiduguri

Table 3: Summary of One-Way ANOVA on Fasting Blood Glucose of Staff of Different Age Groups in Kashim Ibrahim College of Education Maiduguri (mmol/l) n = 57

Sources of Variance	Sum of Squares	df	Mean squares	F	P. Value
Between groups	17.498	4	4.375		
				2.166	0.86
Within groups	105.017	52	2.020		
Total	122.515	56			

Table 3 presents summary of one-way ANOVA on fasting blood glucose of staff of different age groups in Kashim Ibrahim College of Education Maiduguri. One-way ANOVA was applied to test the null hypothesis at 0.05 alpha level. The result revealed that there was no significant difference in fasting blood glucose among staff of Kashim Ibrahim College of Education Maiduguri ($P > 0.05$), hence the null hypothesis was retained. Therefore, the null hypothesis was accepted.

Ho_3: There is no significant difference in impaired fasting blood glucose between academic and non-academic staff of Kashim Ibrahim College of Education Maiduguri

Table 4: Summary of t-test on Fasting Blood Glucose of Academic and Non-Academic Staff of Kashim Ibrahim College of Education Maiduguri (mmol/l) n = 57

Staff Cadre	Number	$\bar{x}$	s	Df	t	P. Value
Academic Staff	22	5.350	±1.847			
				55	2.426	0.19
Non-Academic Staff	35	4.417	±1.059			

Table 4 contains summary of t-test on fasting blood glucose between academic and non-academic staff of Kashim Ibrahim College of Education Maiduguri. t-test was applied to test the null hypothesis at 0.05 alpha level. The result

revealed that there was no significant difference in fasting blood glucose between academic and non-academic staff of Kashim Ibrahim College of Education Maiduguri ($P > 0.05$), hence the null hypothesis was retained. Hence, the null hypothesis was accepted.

Discussion

Leren (1970) [7] stated that there is a 50% risk over 10 years of progressing to overt diabetes. A recent study cited the average time for progression as less than three years. Fasting blood glucose levels are in a continuum within a given population, with higher fasting glucose levels corresponding to a higher risk for complications caused by the high glucose levels. Impaired fasting glucose is defined as a fasting glucose that is higher than the upper limit of normal (5.5mmol plasma), but not high enough to be classified as diabetes mellitus. Some patients with impaired fasting glucose can also be diagnosed with impaired glucose tolerance, but many have normal responses to a glucose tolerance test. High blood fasting glucose is a risk factor for mortality due to the serious complications of type 2 diabetes mellitus (Leren, 1970) [7].

The natural history of both IFG and IGT is variable, with 25% progressing to diabetes, 50% remaining in their abnormal glycemic state, and 25% reverting to non-glucose tolerance over an observational period of 3–5 years. Individuals who are older, overweight, and have other diabetes risk factors are more likely to progress to type 1 diabetes. Moreover, low insulin secretion and severe insulin resistance identify individuals more likely to progress to diabetes. With longer observation, the majority of individuals with IFG or IGT appear to develop diabetes (Hawis, Donahue, Rathore, Frame, Woolf & Lahr, 2003).

The prevalence of IFG and IGT varies widely, with recent data from the U.S. indicating the prevalence of IFG to be 26% and somewhat older data showing a 15% prevalence of IGT (Feig, Palda & Lipscombe, 2005) [3]. Both are expected to increase in the foreseeable future. The prevalences of IFG and IGT vary considerably among different ethnic groups. IFG and IGT also differ significantly in their age and sex distribution; the prevalence of both metabolic disorders increases with advancing age. IGT is more frequent in women than in men. Unfortunately, most of the published literature on IFG is based upon the older cut point (110–125 mg/dl).

The natural history of both IFG and IGT is variable, with 25% progressing to diabetes, 50% remaining in their abnormal glycemic state, and 25% reverting to non-glucose tolerance over an observational period of 3–5 years. Individuals who are older, overweight, and have other diabetes risk factors are more likely to progress to type 1 diabetes. Moreover, low insulin secretion and severe insulin resistance identify individuals more likely to progress to diabetes. With longer observation, the majority of individuals with IFG or IGT appear to develop diabetes (Hawis, Donahue, Rathore, Frame, Woolf & Lahr, 2003).

Recommendations

Based on the conclusion of this study, the following recommendation were made:

1. Seminars, workshops and health talks should be organize by the College authority to create more awareness to the staff on dieting and the importance of healthy eating.

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