Original Paper

Variation in Fasting in Blood Sugar Levels of Pregnant and non-pregnant women attending Federal Medical centre, Yenagoa, Bayelsa State, Nigeria.

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ABSTRACT

This is a descriptive study on variation in fasting blood sugar level of pregnant and non-pregnant women attending Federal Medical Centre (FMC) Yenagoa, Nigeria in March 2008. Blood sample was taken under strict aseptic technique and tested for fasting blood sugar. The findings were analyzed using t-test and correlation method of statistics. The results showed that fasting blood sugar level for pregnant women was 3.869 ± 0.823 while those of non-pregnant women was 3.784 ± 0.725. The t-test (cal) and t (α) for both pregnant and non-pregnant women were 0.484 and 1.670 respectively. Fasting blood sugar level increases with increasing age and the calculated α value for pregnant and non-pregnant women were 0.77 and 0.0653 respectively, which showed a negative correlation level. However the correlation was independent of pregnancy and the r values for pregnant and non-pregnant women were 0.9976 for both groups. This research showed that no significant difference in fasting blood sugar level exist between pregnant and non-pregnant women used for this study although blood sugar levels correlated with age, weight and level of education.

Keywords: **Diabetes, Fasting blood sugar, Hyperglycaemia, Hypoglycaemia.**

INTRODUCTION

Glucose is the end product of carbohydrate metabolism and it serves as the major source of energy, most especially the brain and the red blood cell which depend almost entirely on it (Ganong, 2005). Excess glucose which is not used for energy production is converted to glycogen and triglycerides which are then stored in the liver and muscle respectively (Guyton, 2000, Guyton and Hall, 2006).

Blood glucose concentration is maintained between 70mg/dL and 90mg/dL in fasting state in normal persons. In Nigeria, fasting blood glucose level is said to be normal when it is between 3.3mmol/L and 5.5mmol/L (Diabetes Association of Nigeria, 1998; Attah, 2002) while the range for Americans and other European Countries is between 3.9mmol/L and 5.5mmol/L (American Diabetes Association, 2004). High blood glucose level may indicate a disease condition or

metabolic abnormalities such as excessive food intake, insufficient amount of Insulin, impaired fasting blood glucose (110mgldL-26mg/dL), diabetes mellitus (higher than 126mgldL), pancreatic cancer, acromegaly, Cushing's syndrome, hypothyroidism or Injection of too much Insulin (NDIC, 2006).

High blood glucose concentration can exert high osmotic pressure in the extracellular fluid and if concentration rises to excessive values it may cause considerable cellular dehydration and loss of fluids and electrolytes. Long term increase in blood glucose may cause damage to many tissues especially the blood vessels, therefore vascular injury associated with uncontrolled diabetes mellitus may lead to increase risk of heart attack, stroke, end-stage of renal disease and blindness.

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Davy and Hambling (2001) and Afolabi *et al.* (2003) reported that optimal blood glucose levels in pregnant women ranges between 4.4 and 5.5 mmol/L whereas in non-pregnant women, signs of hypoglycemia begin when the blood glucose level drops to approximately 2.2mmol/L. Increased fasting blood sugar in pregnant women could indicate danger signs which poses a threat to both the woman and the foetus since glucose is an important substrate for metabolism (Famakinwa, 2002). A high increase in blood glucose during pregnancy could lead to gestational diabetes which is characterised by difficulty during delivery, abnormal foetal weight, adolescent obesity, neural tube defects, and neonatal hypoglycemia ((Green and Stephen 2002; Afolabi *et al.*, 2003; Mark, 2007). This study aims at finding out if there is any variation in the fasting blood sugar levels of pregnant and non-pregnant women in Yenagoa, Nigeria and to determine the age range mostly affected. We also intend to find out if economic status or educational level has any effect on fasting blood sugar level in these subjects.

METHODOLOGY
Study Population and Design
This descriptive study was carried out among all the pregnant and non-pregnant women that attended the ante-natal un
it of the Federal Medical Center Yenagoa, Bayelsa State, South-South Zone of Nigeria from 1st to 30th March, 2008. An average of one hundred and twenty (120) women attends the antenatal and prenatal clinics on weekly basis and the study population was random selected using non-probability sampling method. Sixty subjects (30 pregnant and 30 non-pregnant women aged between 18-40 years) participated in the study.

Blood Collection and Analysis
Blood collection from the subjects was done by venepuncture. The injection site was cleaned with alcohol and needle was inserted into the vein to draw blood into a clean sample bottle containing fluoride as anticoagulant. Sample collection was done between 7.00am and 9.00am while the participants were still in fasting state. Glucose estimation was done by glucose oxidase method using glucose test kit (glucose COD/PAP Liquid) as described by Tietz *et al.* (1994).

Data Analysis
Data collected was analysed using descriptive statistical methods. These include frequency distribution, tables and percentage while t-test and correlation method were used for the testing of the four hypotheses.

Ethical Issues
Approval for the study was obtained from the ethical committee of the hospital. Informed consent was sought from the participants after explaining to them thoroughly and adequate measure was ensured for participant's confidentiality

RESULTS

Table 1: Range of fasting blood sugar (FBS) in pregnant women

FBS Range (MEq/L)	Mid Value	Frequency F	Deviation d	d^2	fd^2
2.5-2.9	2.7	3	-1.17	1.3689	6.8448
3.0-3.4	3.2	2	-0.67	0.0489	0.0978
3.5-3.9	3.7	12	0.17	0.0289	0.3468
4.0-4.4	4.2	6	0.33	0.1089	0.6534
4.5-4.9	4.7	1	0.83	0.6889	1.3778
5.0-5.4	5.2	2	1.33	1.7689	3.5378
5.5-5-9	5.7	2	1.82	3.3489	6.6978
$Fd^2 =$					19.5562

Table I shows the fasting blood sugar (FBS) level range for pregnant women. It can be seen that majority (14 participants) ranges between 3.5 and 3.9MEq/L with a mid value of 3.7 while six (6) pregnant women ranged between 4.0 and 4.4MEq/L with a mid value of 4.2. Three (3) participants range between 2.5 and 2.9MEq/L with a mid value of 2.7. The mean fasting blood sugar level of the pregnant women was 3.869 ± 0.823.

Table 2: Range of fasting blood sugar in non pregnant women

FBS Range (MEq/L)	Mid Value	Frequency F	Deviation D	d^2	fd^2
2.5-2.9	2.7	Nil	-1.08	1.1664	1.1664
3.0-3.4	3.2	8	-0.58	0.3364	2.6912
3.5-3.9	3.7	15	0.08		0.096
4.0-4.4	4.2	4	0.42	0.1764	0.7056
4.5-4.9	4.7	Nil	0.92	0.8464	0.8464
5.0-5.4	5.2	3	1.42	2.0164	6.0492
5.5-5.9	6.7	Nil	1.92	3.6864	3.6864
fd^2 =					15.2412

Table 2 shows fasting blood sugar range for non-pregnant women. Majority of the participants (15 participants) ranges between 3.5 and 3.9MEq/L with a mid value of 3.7. Eight (8) participants had range between 3.0-3.4MEq/L with a mid value of 3.2. Four (4) participants ranged between 4.0-4.4.MEq/L with a mid value of 4.7. The mean fasting blood sugar level for non-pregnant women was 3.784 ± 0.725.

Tables 3 and 4 showed the correlation between fasting blood sugar level and age in pregnant and non pregnant women (r=0.59 and 0.39 respectively) indicating a positive correlation. Tables 5 and 6 showed the correlation between fasting blood sugar level and weight in pregnant and non pregnant women r= -2.89 and -0.35 respectively indicating a negative correlation. Table 7 shows the correlation between fasting blood sugar level and educational status in pregnant and non pregnant women (r = 0.9976) indicating a positive correlation.

Table 3: Correlation between fasting blood sugar level and age in pregnant women

Class	FBS (MEq/L)	Age	X_B	Y_B	$X_B y_B$	$X^2 p$	Yp^2	Xp^2	Y^{2p}	$XpYp$
A	3.48	17	-0.52	-9	4.68	0.2704	81	12.11	289	**59.16**
B	3.78	22	-0.22	-4	0.88	0.0484	16	14.29	484	**83.16**
C	3.84	27	-016	1	-0.16	0.0256	14.75	729	729	**103.68**
D	3.61	32	-0.39	6	-2.34	0.1521	36	13.03	1024	**115.52**
E	4.13	37	0.13	11	1.43	0.0169	121	17.06	13696	**152.81**
F	**3.60**	**42**	**-0.40**	**16**	**6.40**	**0.160**	**256**	**12.96**	**1764**	**151.20**

r = 0.59. Correlation existed

Table 4: Correlation between fasting blood sugar level and age in non-pregnant women

Class	FBS (MEq/L)	Age	X_B	Y_B	X_By_B	X^2p	Yp^2	Xp^2	Y^{2p}	$XpYp$
A	3.48	17	-0.3	-10	3	0.09	100	12.11	289	59.16
B	3.78	22	0	-5	0	0	25	14.29	484	83.16
C	3.84	27	0.06	0	0	0.0036	0	14.75	725	103.68
D	3.61	32	-0.17	5	-0.85	0.0289	25	13.03	1024	115.52
E	4.13	27	0.35	10	3.5	0.1225	100	17.06	1369	152.81
F	3.60	42	-0.12	15	-1.8	0.0142	225	12.96	1764	151.20

r = 0.368. Correlation existed

Table 5: Correlation between weight and fasting blood sugar level in pregnant women

Class	FBS (MEq/L) Y	Mean weight X	¨Y	¨X	¨Y¨X	¨Y²	¨X²	Y²	X²	YX
A	3.81	52	0.06	-16	-0.96	0.0036	256	14.516	2704	**198.12**
B	3.93	57	0.06	-11	-6.6	0.0036	121	15.945	3249	**224.01**
C	3.53	62	-0.34	-6	2.04	0.1156	36	12.461	3844	**218.86**
D	3.52	67	-0.35	-1	-0.35	0.1225	1	12.390	4489	**235.84**
E	**3.96**	**72**	**0.09**	**4**	**0.36**	**0.0081**	**16**	**15.682**	**5184**	**285.12**

r = -2.89. Correlation existed

Table 6: Correlation between weight and fasting blood sugar level in non pregnant women

Class	FBS (MEq/L) Y	Mean weight X	¨Y	¨X	¨Y¨X	¨Y²	¨X²	Y²	X²	YX
A	3.81	52	0.03	-12	-0.36	.0009	144	14.146	2704	**198.12**
B	3.93	57	0.15	-7	-1.05	0.0225	49	15.945	3249	**224.01**
C	3.53	62	-0.25	-2	0.50	0.0625	4	12.461	3844	**218.86**
D	3.52	67	-0.26	3	-0.78	0.0676	9	12.390	4489	**235.84**
E	**3.96**	**72**	**0.18**	**8**	**1.44**	**0.0324**	**64**	**15.682**	**5184**	**285.12**

r = -0.35. Correlation existed

Table 7: Correlation between educational status and fasting blood sugar level in pregnant and non-pregnant women

Class	FBS (MEq/L)	d	d^2	FBS (MEq/L)	d	d^2
	Pregnant Women			**Non pregnant women**		
A	3.88	2.88	8.2944	3.88	2.88	**8.2944**
B	3.61	1.61	2.5921	3.61	1.61	**2.5921**
C	3.11	0.11	0.0121	3.11	0.11	**0.0121**
D	**3.85**	**-0.15**	**0.0225**	**3.85**	**-0.15**	**0.0225**

r = 0.9976. Correlation existed

DISCUSSION

Four null hypotheses were used for this study using t-test and correlation coefficient measures.

Hypotheses 1: There is no significant difference in the fasting blood sugar level of pregnant and non-pregnant women investigated. This could be due to metabolic factors whereby the metabolism of glucose increased due to increase demand by babies. In addition, the women with low fasting blood sugar level could be in their early part of first trimester and second trimester as suggested by Green and Stephen (2002). From the beginning of the third trimester, foetal growth slowly peaks leading to a corresponding decrease in plasma concentration of maternal and foetal hormonal factors that stimulate and regulate glucose mobilization. Some were slightly higher with 13.3 percent ranging from 5.0-5.9mmol/L. In non-pregnant women, there were signs of hypoglycemia when the blood glucose level drops to approximately 2.2mmol/L and 10% were in the range of 4.5–5.9mmol/L which could be as a result of hormonal changes (diabetes higher than 126mg/dL) (Bray *et al.*, 2000).

Hypotheses 2: Age of the pregnant and non-pregnant women has no significant effect on their fasting blood sugar level. The risk for gestational diabetes increases with age above 25 years and similarities exist with National Interview Survey in Oxford, Massachusetts (2002) which states that from 50 years, the ability to adapt to glucose diminishes with aging. In this study, it was also observed that the age of the pregnant and n on-pregnant women has no influence on their fasting blood sugar level. According to Famakinwa (2002), the factors could be due to hormonal, genetic and environmental constraints.

Hypotheses 3: Weight of the pregnant and non-pregnant women has no significance effect on their fasting blood sugar levels. WHO (1998) predicted that the number of diabetic cases will double over the next 30 years with over 75% increase with weight. In this study, fasting blood sugar level has some relationship with weight. World Health Organisation explained that fasting blood sugar level increases gradually with weight while the critical weight ranges between 65 and 74kg. Results obtained in this study showed the highest values in the weight class of 70-74kg and above which supports the World Health Organization (WHO) standard. Increased weight in pregnant women is directly related to rapid foetal growth and may explain the need for higher plasma glucose levels (Betscher *et al.*, 1996). The result of the analysis showed that negative correlation exist because r has a value of 0.0353 closer to minus one (-1) than plus one (+1).

Hypotheses 4: Educational status of pregnant and non-pregnant women has no significant effect on their fasting blood sugar level. Fasting blood sugar levels in non-formal education and primary school leavers were higher than in secondary and tertiary institutions in both pregnant and non pregnant participants. The result indicated a value of 0.9976 for both pregnant and non-pregnant women, indicating that a very strong positive correlation exists between level of education and fasting blood sugar level regardless of the presence or absence of pregnancy. The difference may be due to the knowledge acquired about practice of good nutrition in the course of education (Davy *et al.*, 2002). The result showed a strong positive correlation between level of education and fasting blood sugar level in both groups hence the hypothesis was rejected.

CONCLUSION

This study showed that fasting blood sugar level increases with increasing age. It also indicated that no significant difference in fasting blood sugar level exist between pregnant and non-pregnant women in the group analysed although blood sugar levels correlated with age, weight and level of education. We hereby recommend that pregnant and non-pregnant women should be educated on adequate and healthy dietary intake to maintain their fasting blood sugar level. Routine analysis of blood sugar level should also be encouraged for all pregnant women at ante-natal clinics.

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