Asian Journal of Medical Sciences 5(2): 55-58, 2013
DOI:10.19026/ajms.5.5359
ISSN: 2040-8765; e-ISSN: 2040-8773

Submitted: February 15, 2013 Accepted: March 11, 2013 Published: April 25, 2013

Research Article

Effect of Vegetable Consumption on Fasting Blood Sugar and Lipid Profile Parameters of Pregnant Women in Adamawa State, Nigeria

[1]H.A. Umaru, [2]S. Faive, [3]A. Shugba and [3]E.O. Addy
[1]Department of Biochemistry, Modobbo Adama University of Technology Yola, P.M. 2076 Yola, Nigeria
[2]Chemical Pathology Unit, Specialist Hospital Yola, Adamawa State, Nigeria
[3]Department of Biochemistry, University of Maiduguri, P.M.B. 1069 Maiduguri, Nigeria

Abstract: An abnormal lipid profile is known to be strongly associated with atherosclerotic cardiovascular diseases. The study was carried out to determine some biochemical parameters in pregnant women with respect to vegetable consumption. A total of 520 pregnant women attending Antenatal Clinic at the Specialist Hospital were recruited in the study. Results obtained showed that Fasting Blood Sugar (FBS), Total Cholesterol (TC), low density lipoprotein (LDL), Triglycerides TG), Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) were found to be significantly lower ($p<0.05$) in pregnant women who Frequently Consume Vegetables (FCV) compared to pregnant women who Dislike Consuming Vegetable (DCV). While High Density Lipoprotein (HDL) and Packed Cell Volume (PCV) were found to be high in FCV group. Strong correlation was observed between age, weight, sugar, cholesterol, trimester, systolic and diastolic blood pressure. The change towards a more favorable dietary pattern was associated with improved lipid profile parameters. Consumption of vegetables should be encouraged during pregnancy since it has positive effect on lipid profile parameters.

Keywords: Anemia, Fasting blood sugar, lipid profile, pregnancy, vegetable

INTRODUCTION

Poor maternal nutrition is considered a major cause of ill-health worldwide. Maternal nutrition has been found to have a long and irreversible effect on both the physical and mental development of the baby (Abu-Saad and Fraser, 2010). Its consequences affect the heath and long time outcome of the population. It exerts longtime effects on health, morbidity and mortality risk in adult hood as well as on the development of neural functions and behavior (Tzanetakou *et al*., 2011).

Pregnancy is accompanied by significant variation in maternal lipid metabolism. There is increased body fat accumulation associated with both hyperphagia and increased lipogenesis while in late pregnancy; there is accelerated breakdown of fat depots which plays an important role in fetal development (Herrera, 2002). During pregnancy, maternal tissues are involved in providing energy for reproduction processes, which may affect blood serum chemistry. The levels of plasma cholesterol and triglycerides concentration rise by 20-40 and 25-50%, respectively (Saltar *et al*., 1997). Anemia is the commonest medical disorder in pregnancy. This is particularly a major health problem in developing countries where nutritional deficiency and malaria are common. Maternal anemia is considered a risk factor for adverse pregnancy outcome. It is responsible for 40-60% of maternal death in development countries (Gregory and Taslim, 2001).

In Adamawa state in particular, consumption of vegetables during pregnancy in the form of vegetable salad (kodo) has attracted a lot of attention with so much traditional beliefs attached to it. This study was therefore undertaken to elucidate any significant variation in the lipid profile, fasting blood sugar, packed cell volume, diastolic and systolic blood pressure with respect to vegetables consumption during pregnancy.

MATERIALS AND METHODS

The study was carried out within 6 months (March-August 2011). Five hundred and twenty pregnant (520) women aged 16-45 years participated in the study. Structured questionnaire was used to elicit information from participants. Informed consent was obtained from the participants prior to study. The approval of the hospital ethics committee was also obtained. Fasting blood sample was collected by venepuncture and the following parameters were estimated; PCV using hematocrit method. FBS and Serum lipid profile

Corresponding Author: H.A. Umaru, Department of Biochemistry, Modobbo Adama University of Technology Yola, P.M. 2076 Yola, Nigeria, Tel.: +23408022598931

Table 1: Demographic and clinical characteristics of the groups

Parameters	FCV (n = 370)	DCV (n = 150)	p-values
AGE (years)	25.42±6.51	26.29±4.28	0.000
Weight (kg)	71.08±13.37	83.45±13.59	0.391
Height (cm)	158±5.49	159±4.48	0.006
BMI (kg/M^2)	28.47±4.43	33.01±3.37	0.025
SBP (mmHG)	104±11.73	116±9.47	0.013
DBP (mmHG)	79.27±12.61	90.47±13.62	0.02
PCV (%)	32.80±3.47	30.33±4.10	0.017
FBS (mg/dL)	75.95±4.19	94.78±5.28	0.000
TC (mg/dL)	200.17±11.50	238.83±12.23	0.023
TG (mg/dL)	152.65±10.14	188.83±7.28	0.000
HDL (mg/dL)	54.00±4.00	48.12±3.95	0.045
LDL (mg/dl)	115.76±13.60	156±14. 80	0.006

Table 2: Correlation between the various parameters

Variables	Age	Weight	Height	PCV	Sugar	Chol	TG	HDL	LDL	MP	Cystol	Diast	Tri
Age	1	0.455++	0.156++	0.038	0.409++	0.409++	0.0086	-0.025	-0.033	-0.046	0.111+	0.129++	0.188++
Weight	0.455++	1	0.252++	-0.08	0.128++	0.128++	0.173+	0.065	-0.072	-0.124++	0.101+	0.199++	0.201++
Height	0.156++	0.252++	1	0.146++	0.048	0.014	-0.013	0.073	0.008	-0.105+	-0.004	0.070	-0.021
PCV	0.038	-0.008	0.146++	1	0.069	0.069	0.103	-0.052	-0.058	-0.098+	0.047	-0.012	-0.21
Sugar	0.409++	0.128++	0.048	0.069	0.1	0.081	0.05	0.006	-0.082	-0.007	0.141++	0.001	179++

+ = strong correlation, ++ = very strong correlation

parameters (TC, LDL, HDL and TG) were analyzed by enzymatic method using Randox Kit and concentrations were calculated as the sum of the components (expressed in mg/dL).

Statistics: The analysis of variance (ANOVA) was used to test the significance differences among the different groups. Correlation between the different parameters was also carried using Pearson's Coefficient Software.

RESULTS

Baseline characteristics revealed the mean values for the 520 pregnant women (Table 1). Results obtained showed that 71% of the women frequently consume vegetables during pregnancy while 29% dislike vegetables. The FCV group have significantly lower ($p<0.05$) values of age (25.42±6.5), weight (71.08±13.37 kg), blood pressure (104/79±11.73/12.61 mmHG), FBS (75.95±4.19 mg/dL), TC (200.17±11.50 mg/dL), TG (152.65±10.14 mg/dL) and LDL (115.76±13.60 mg/dL). PCV and HDL were found to be significantly higher in FCV group compared to DCV group (Table 1).

DISCUSSION

The socio-demographic factors presented in Table 1 shows the age, height, weight and body mass index. The average age of the women (25.42±6.51 years) showed lower level of teenage pregnancy in the study area. Studies revealed that women age greater than 40 years have nearly two fold high threat of having pregnancy induced hypertension. Maternal age is one of essential risk factor in changing lipid metabolism in women with pregnancy induced hypertension. The US nationwide data 39 proposed that the danger of pregnancy induced hypertension increases by 30% for each additional year of age past 34 (Nazli *et al*., 2009). The average height was found to be adequate (158±5.49 cm). Maternal genomes have an important and specific influence over fetal growth. In particular maternal height which represents uterine capacity and the potential for growth is a major determinant of fetal size (Vanessa *et al*., 2005). Height and weight are function of body mass index. Results obtained revealed that women in FCV group were overweight with BMI 28.47±4.43 while pregnant women in DCV were obese with BMI 33.01±3.37. An ideal weight is recommended during pregnancy. Being overweight during pregnancy is associated with an increased risk of several complications including diabetes, pregnancy induced hypertension, pre eclempsia and congenital defects (Goldenberg, 2002). It is also associated with an increased risk of morbidity and mortality in new born infants (Williamson, 2006). There was significant variation in the systolic and diastolic blood pressure of the women. Lower values were observed in FCV group compared to DCV group. Vegetable pattern was clearly associated with characteristics commonly understood to indicate or be predictive of good health. Research has shown that there was a strong protective effect of dietary fiber on the risk of pre-eclampsia and cardiovascular disease. Moreover, diets rich in fruits and vegetables have been found to reduce the levels of plasma homocystein and the risk of preterm birth (Konstantinova *et al*., 2007). Pregnancy Induced hypertension is a common condition specific to pregnancy that mainly occurs after the 28th week of gestation and disappears after delivery. Pre-eclamsia usually causes high blood pressure in pregnant women. A number of trials have indicated that antioxidants

(e.g., vitamins C and E) could reduce the risk of pre-eclampsia (Rumbold *et al*., 2005).

The PCV of FCV group was higher than that of DCV group. The PCV of the two groups were below the normal PCV. Anemia is often classified as mild degree when the PCV is between 27-33% (9-11g/dL). Maternal anemia is a known risk factor for many maternal and fetal complications. It is responsible for 40-60% of maternal deaths in developing countries. It causes direct as well as indirect deaths from cardiac failure, hemorrhage, infection and pre-eclampsia (Jaleel and Khan, 2008). It also increases per natal morbidity and mortality rates due to increase in preterm birth and inter uterine growth restriction (Idowu *et al*., 2005; Lozoff *et al*., 2006). The fasting blood sugar of the pregnant women was within the normal range. The FCV have significantly lower ($p \leq 0.05$) values of fasting blood sugar. The fetus is known to have a considerable capacity to metabolically adapt to acute and chronic changes in glucose supply. Lower maternal blood glucose levels lead to reduced fetal growth rate and infant birth weight while a continuous high maternal blood glucose supply to the fetuse may lead to fetal over growth and Large for-Gestational Age (LGA) infants (Tzanetakou *et al*., 2011). Studies have also shown that high dietary fiber have beneficial effect on insulin sensitivity (Pereira *et al*., 2002). This probably accounts for the low blood sugar in FCV group. Studies by Idogun *et al*. (2008) revealed that high level of antioxidants could reduce the risk of fetal malformation as well as gestational diabetes.

Lipid profile parameters were significantly higher ($p \leq 0.05$) in DCV compared to the FCV group. The high vitamin C content of the vegetables used by the FCV group might be responsible for the lower levels of lipid profile parameters observed in the pregnant women. Studies by Brantsaeter *et al*. (2009) revealed that women who had frequent intake of vegetables had lower risk of pre-eclampsia than women with infrequent intake of vegetables. It has been demonstrated that a wide range of phytochemicals are associated with cardiovascular health benefits by cholesterol lowering mechanism (Okoye, 2011). Changes in the plasma lipids during pregnancy have been recognized and thought to be mostly due to alterations in hormonal milieu in the form of rise in insulin, progesterone, 17-B estradion and human placental lactogen. These changes occur as a result of increased metabolic demand by the mother. Increased lipid levels in pregnancy may increase the susceptibility of Polyunsaturated Fatty Acids (PUFA) to peroxidation damage by free radicals that may lead to increased production of Malondialdehyde (MDA), a marker of lipid peroxidation. The levels of LDL and HDL are related to circulating estrogen and progesterol (Bassi *et al*., 2011). Studies by Festus *et al*. (2011) reported that total cholesterol, triglyceride and LDL increased progressively throughout pregnancy with significantly higher values. The increase in the maternal lipid profile is in response to the maternal switch from carbohydrate to fat metabolism which is an alternative pathway for energy generation due to high energy demand. Significant correlation was observed between Age, weight, height, sugar, cholesterol, trimester, systolic blood pressure and diastolic blood pressure (Table 2).

A profound variation was observed between the FCV and DCV group. Consumption of vegetables during pregnancy significantly decreased the level of lipid profile parameters associated with metabolic complications during pregnancy. Thus the assessment of blood lipids may be helpful in the prevention of complications of pregnancy.

ACKNOWLEDGMENT

We thank all those women who took part in this study. We are also grateful to Damiel, Comfort and Jacob of Specialist Hospital Yola who helped in data collection and analysis.

REFERENCES

Abu-Saad, K. and D. Fraser, 2010. Maternal nutrition and birth outcomes. Epid. Rev., 32(1): 5-25.

Bassi, R., M. Kaur and S. Sharma, 2011. Study of changes in lipid profile, lipid peroxidation and superoxide dismutase during normal pregnancy. Indian J. Fund. App. Life. Sci., 1(3): 249-254.

Brantsaeter, A.L., M. Hangen, S.O. Samuelsen, H. Torjusen L. Trogstad J. Alaxander, P. Magnus and H.M. Mettzer, 2009. A dietary pattern characterized by high intake of vegetables, Fruits and vegetable oil is associated with reduced risk of preeclampsia in Nulliparous pregnant Noweigian women. J. Nutr., 139: 1162-1168.

Festus, O.O., O.B. Idonije, M.A. Eseigbe, O. Okhiai, F. Unuabonah and M. Dike, 2011. Comparative study of lipid profile of normal pregnant women in different trimesters. Arch. App. Sci. Res., 3(3): 528-532.

Goldenberg, G., 2002. Nutrition in Pregnancy and Lactation through the Life Cycle. In: Shetty, P. (Ed.), Leatherhead Publishing, Leatherhead, UK, pp: 63-89.

Gregory, P. and A. Taslim, 2001. Health status of Pakistan population: A health profile and comparison with the United States. Am. J. Public Health., 91: 93-8.

Herrera, E., 2002. Lipid metabolism in pregnancy and its consequences in the fetus and newborn. Endocrine, 19: 43-45.

Idogun, E.S., M.E. Odiegwu, S.M. Momol and F.E. Okonofna, 2008. Effect of pregnancy on total antioxidant capacity in Nigerian women. Pak. J. Med. Sci., 24(2): 292-295.

Idowu, O.A., C.F. Mafiana and S. Dapo, 2005. Anemia in pregnancy: A survey of pregnant women in Abeokuta, Nigeria. Afr. Health Sci., 5(4): 295-299.

Jaleel, R. and A. Khan, 2008. Severe anemia and adverse pregnancy outcome. J. Surgery, 13(4): 147-150.

Konstantinova, S.V., S.E. Vollset, P. Bertad, P.M. Ueland, C.A. Drevon, H. Rufsum and G.S. Tell, 2007. Dietary predictors of plasma total homocyskin in the hordaland homocyskin study. Por. J. Nutr., 98: 201-210.

Lozoff, B., J. Beard, J. Connor, B. Felt, M. Georgieff and T. Schallet, 2006. Long lasting neural and behavioral effects of iron deficiency in infancy. Nutr. Rev., 64: 34-90.

Nazli, R., R.J. Muhammad, S. Jasmin, A. Tasleem, R. Jamilur and K. Mudassar Ahmad, 2009. Changes in lipoprotein concentration of primiparous women with pregnancy induced hypertension. Pak. J. Med. Res., 48(4): 83-87.

Okoye, Z.S.C., 2011. Nutraceuticals nutrional biochemical with demonstrated potential medicinal benefits. Trans. Nig. Soc. Biochem. Mol. Biol., pp: 25-35.

Pereira, M.A., D.R. Jacobs, J.J. Pins, S.K. Raatz, M.D. Gross, J.L. Slavin and E.R. Seaquist, 2002. Effects of whole grains on insulin sensitivity in overweight hyperinsulinemic adults. Am. J. Clin., 75(5): 846-55.

Rumbold, A., L. Duley and C. Crowther, 2005. Antioxidants for preventing pre-edemsia. Cochrane Database Syst. Rev., 2005(4): CD0042:27.

Saltar, N., I.A. Greer, J. Louden, G. Lindsay, M. McConnell, J. Shepherd and C.J. Packard, 1997. Lipoprotein subtraction charges in normal pregnancy: Threshold effect of plasma triglyceride on appearance of small, dense low density lipoprotein. J. Clin. Endoc. Met., 82(8): 2483-2491.

Tzanetakou, I.P., D.P. Mikhailidis and N.P. Pespina, 2011. Nutrition during pregnancy and the effect of carbohydrates on offspring's metabolic profile: In search of the "Perfect maternal Diet". Open Card Med. J., 5: 103-109.

Vanessa, E.M., S. Roger, B.G. Warwick and L.C. Vivki, 2005. Endocrine regulation of human fetal growth, the role of the mother, placenta and fetus. Endocrine, 27(2): 145-69.

Williamson, C.S., 2006. Nutrition in pregnancy. British Nutr. Bull., 31: 28-59.