Nigerian Journal Of Physiological Sciences 23 (1-2): 19-22 ©Physiological Society Of Nigeria, 2008
Available online/abstracted at http://www.bioline.org.br/np; www.ajol.info/journals.nips; www.cas.org

EFFECT OF MULTIPARITY ON ELECTROLYTE COMPOSITION AND BLOOD PRESSURE

A. O. OBEMBE and A. B. ANTAI

Department of Physiology, College of Medical Sciences, University of Calabar, Calabar, Nigeria. E-mail: agonaobembe@yahoo.com Tel: +2348073172523

Summary: Pregnancy affects the physiology of the pregnant woman particularly the endocrine, cardiovascular and the renal systems. This work was therefore set to ascertain the state of electrolytes in pregnancy and how it affects blood pressure using multiparity as a factor. One hundred and twenty (120) women were used in this study. The non-pregnant groups were the nulliparous (control) and grand multiparous women who have stopped gestation (GMS) for at least five years. The pregnant groups were made up of 30 primigravidae (PG) and 30 grand multiparous (GMP). The pregnant groups (PG and GMP) were further divided into first, second and third trimesters. The subjects were aged matched with controls. Serum electrolytes (Na^+, K^+ and Cl^-) were measured using standard methods. The results show that there was no significant difference in the electrolyte composition among the groups and between trimesters. There was also no significant difference in blood pressure among the groups and between trimesters in the pregnant groups irrespective of parity. Multiparity therefore may not pose any severe threat to health.

Key words: *pregnancy primagravidae, multiparity, grand multiparous serum electrolyte, blood pressure*

Introduction

Pregnancy alters the physiology of the pregnant woman. Pregnancy affects the endocrine (Banaczek, 1995), cardiovascular (DHawan *et al*, 2005) and other systems especially the renal system since it displays hypertrophy of functions, altered homeostasis and haemodynamic leakage of some substances as well as exaggerated response to posture (Korda, 1987). Many nephrologists believe in the possibility that prolonged period of increased single nephron filtration as in grandmultiparity may exert potentially damaging effect on the glomerulus especially the hyperfiltration and increased glomerular blood pressure (Hostetter *et al*, 1892).

In rats, multiparity increased the pressure response to acute stress due in part to change in the tone of splanchnic arterial vasculature (Dhanwan *et al*, 2005). Repeated pregnancy induces a long term reduction in splanchnic venous compliance and augments splanchnic venous reactivity and sympathetic tonic control of total body venous tone. The ability of the venous system to accommodate overload is therefore compromised. In patients with diabetic nephropathy, there was more than 40% chance of accelerated progression of the disease as a result of pregnancy and about 40% of the women had a permanent decline in glomerular filtration rate (GFR) in association with pregnancy (Irfrans *et al*, 2004). Studies by Obembe *et al* (2003) found increase in GFR in pregnancy irrespective of parity with the greatest GFR recording in the 2nd trimester. Expansion of the plasma volume is an important factor in the observed changes. Electrolyte concentration and blood pressure may be affected as well.

Pregnancy would be expected to waste K^+ because pregnant women eat and excrete normal quantities of Na^+ yet have a high aldosterone and other mineralocorticoids. This is in contrast to the non pregnant subjects who are resistant to kaliuresis provoked by combination of exogenous mineralocorticoids and a high sodium intake (Erlich and Lindheimer, 1972). This is contrary to the findings of Beausejour *et al*, (2003), that pregnant rats could not handle Na^+ load. The ability to conserve K^+ in the face of high concentration of sodium may be due to high levels of progesterone associated with pregnancy, a view that is not accepted by all (Brown *et al*, 1986). MacDonald and Good (1972) found a decreased K^+ and Na^+ concentrations from 10 – 20 weeks, in multiparous but not in primagravidae with both showing significant increase in K^+ concentration between 28 – 37 weeks with no change in Na^+ or Cl^-. Green and Halton (1987) found the handling of Na^+, K^+ and Cl^- same in pregnant conscious rats.

Studies with pregnant hypertensive women did not even show any relationship between severity of the disease and electrolyte concentration and no difference was found in biochemical tests of renal efficiency between primigravidae and multiparous pregnancies (Banaczek, 1995). It is in view of these differences in findings on the handling of electrolytes and their effect on blood pressure in pregnancy that this work was carried out to ascertain the state of electrolytes in pregnancy and how this affects their blood pressure especially after several births.

Materials and methods

Subjects

A total of 120 women of 20 – 46 years were used in this study. The choice was by random sampling of women attending antenatal clinics within Calabar metropolis. The control women were taken randomly within the same age range. Medical cover was provided by doctors who helped identify from case notes pregnant from non pregnant groups. The project was approved by the Medical Ethical Committee of College of Medical Sciences, University of Calabar, Nigeria.

Four groups of women were studied as follows: nulliparous (control), primigravidae (PG) pregnant, grandmultiparous pregnant (GMP), and grandmultiparous non-pregnant (GMS) women with no pregnancy for at least five years preceding investigation. Each group consisted of 30 women. Women with renal, cardiovascular and respiratory disorders were excluded. The electrolytes and blood pressure were determined as a measure of the fitness of the renal system in handling pregnancy. The pregnant and non-pregnant women were age matched. Ages were taken from case notes of the pregnant subjects and also by oral interview and were considered to the nearest decade because the illiterate subjects among them were not too sure of their ages.

Collection of blood samples

Blood samples were collected by standard aseptic methods into sample bottles and allowed to clot. Serum was collected for analysis by centrifuging at 2000 revolutions per minute (rpm) for 5 minutes. The serum collected was analyzed for electrolyte level.

Determination of serum Na^+, K^+ and Cl^-

Sodium and potassium ion levels in serum were determined using a flame photometer (model 410C, Petracourt Ltd, England) at a wavelength of 598 nm and 769 nm for sodium and potassium ions respectively. Chloride ion in serum was determined by endpoint colorimetric titration following Kolthoft *et al* (1967) method.

Measurement of blood pressure

Following a rest period of about 30 minutes in the clinics, the systolic and diastolic pressures were measured in each subject on the brachial artery using the auscultatory method. Diastolic pressure was determined as the disappearance of the Korotkoff's sound.

Statistical analysis

Data are presented as mean± standard error of mean (SEM). Data obtained were subjected to computerized statistical package for social science (SPSS) computer software. A two-way analysis of variance was performed on groups with trimesters (PG and GMP) for comparison and a p value of < 0.05 was considered significant.

Results

Age

The mean ages for controls, primagravidae (PG), grandmultiparous (GMP) pregnant and grandmultiparous non pregnant (GMS) were 31.0 ± 1.02, 31.0 ± 1.20, 35.0 ± 1.09 and 36.0 ± 1.08 years respectively. The mean ages for the grandmultiparous groups (GMP and GMS) were both significantly higher than that for control and primagravidae ($P<0.05$). There was however no significant difference between control and primagravidae or between grandmultiparous pregnant and grandmultiparous non pregnant women.

Serum electrolytes

The serum electrolytes measured were Na^+, K^+ and Cl^-. The mean serum concentration of Na^+, K^+ and Cl^- in all the groups studied is as illustrated in Fig. 1. There was no significant difference between groups. There was no significant difference also between the pregnant and non pregnant groups. When the pregnant groups were compared (PG and GMP), there was no significant difference between trimesters or within trimesters in the same groups. This is illustrated in Fig. 2.

Mean arterial pressures

The blood pressures for all the groups were considered using their mean arterial pressures within the groups and within the trimesters in the pregnant groups. These are as illustrated in Fig. 3 and 4. There was no significant difference between the groups. There was also no significant difference between trimesters in PG or GMP group or between trimesters in the different pregnant groups compared.

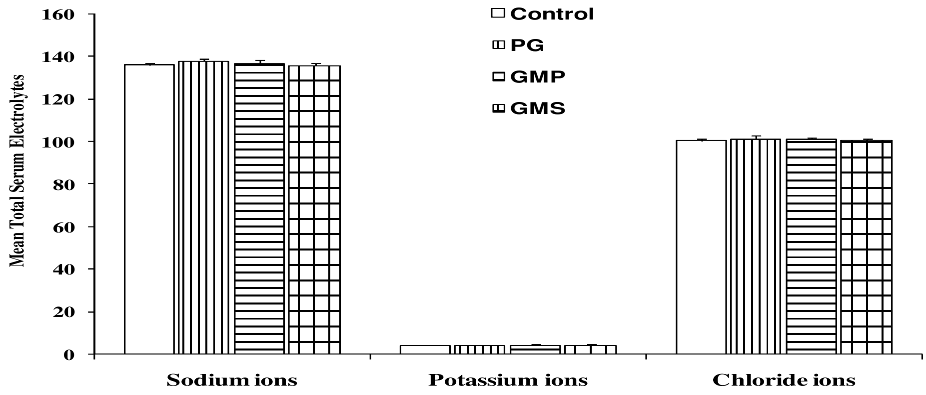

Fig. 1 Mean total serum electrolytes for the different experimental groups. PG = primigravidae pregnant, GMP = grandmultiparous pregnant, GMS = grandmultiparous non-pregnant.

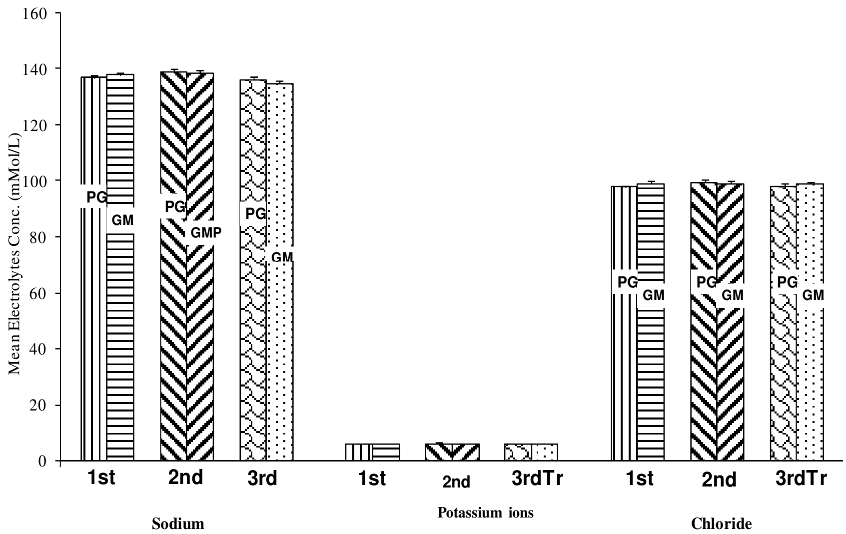

Fig. 2: Electrolyte concentration in the different experimental groups at different trimesters. PG = primigravidae pregnant, GMP = grandmultiparous pregnant.

Discussion

In human, pregnancy is associated with many physiological and morphological changes to suit the needs of the growing foetus. These changes accompanying each pregnancy are feared to have deleterious effects as the number of gestations increase. The renal change which involves the enlargement of the kidney (Sheeman and Lynch, 1973) is attributed to increase in the number of cells during pregnancy. Glomerular filtration rate (GFR) may be altered (Obembe *et al*, 2003). The hormonal changes that take place during pregnancy may affect the handling of electrolytes, volume expansion and resultant vasodilation (Brenner *et al*, 1972). All of these may invariably affect the cardiovascular system (Dhawan *et al*, 2005) and by implication the blood pressure.

The findings in the work did not show any significant difference in electrolys (Na^+, K^+ and Cl^-) composition between the pregnant and non pregnant groups neither was there any difference in electrolyte composition between trimesters in the pregnant group (or different trimester within a pregnant group irrespective of parity). These findings are in tandem with those found in pregnant conscious rats (Green and Halton, 1989), and by Banaczek (1995). There was also no significant change in blood pressure among the pregnant and non pregnant groups neither was there any blood pressure change between the pregnant groups (PG and GMP) irrespective of parity. The electrolytes may have played a vital role in maintaining the blood pressure.

Multiparity therefore may not lead to altered electrolyte composition or increase in blood pressure. All values fell within normal range. It can therefore be concluded that even though each pregnancy may be accompanied by physiological and morphological changes, multiparity may have no cumulative deleterious effect on electrolyte composition and blood pressure.

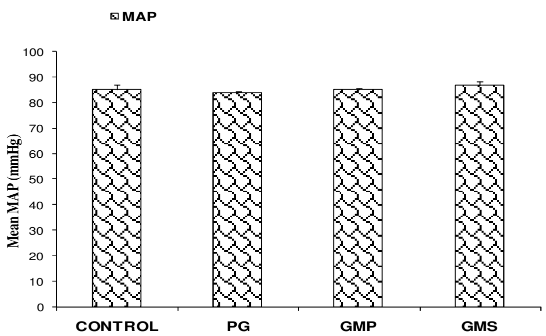

Fig. 3: Comparison of mean arterial pressure in the different experimental groups PG= primagravidae pregnant, GMP = Grandmultiparous pregnant, GMS = grandmultiparous non-pregnant.

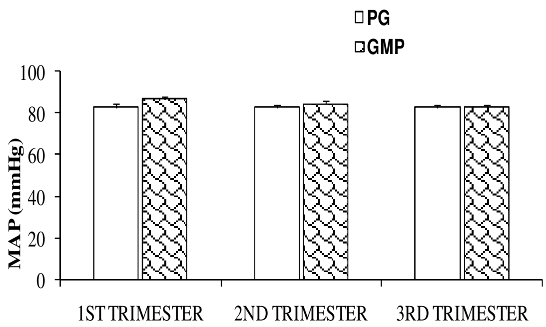

Fig. 4 : Comparison of mean arterial pressure between PG (primigravidae pregnant) and GMP (grandmultiparous pregnant) at first, second and third trimesters.

References

Banaczek, Z. (1995). The effect of hypertension severity in pregnant women and during birth on renal function. *Ginekol Pol.* 66: 9 – 10.

Beausejour, A., Auger, K., St. Lous, J.and Brochu, M. (2003). High sodium intake prevents pregnancy induced decrease of blood pressure in rats. *Am. J. Physiol. Heart Circ. Physiol.* 285 (1): H375 – H 383.

Brown, G. P. and Venuto, R. C. (1986). Angiotensin II receptor alteration during pregnancy in rabbits. *Am. J. Physiol.* 251: E58 – E64.

Dhawan, V., Brookes, Z. L. S. and Kanfman, S. (2005). Repeated pregnancies (multiparity) increase venous tone and reduces compliance. *Am. J. Physiol. Regul. Integr. Comp. Physiol. Doi.* 10.1152/9 JP reg. 00034.

Ehrlich, E. N. and Lindheimer, M. D. (1972). Effect of administered mineralocorticoid of ACTH in pregnant women. *J. Clin. Invest.* 1301 – 1309.

Green, R. and Halton, T. M. (1987). Renal tubular function in gestation. *Am. J. Kid. Dis.* 9: 265 – 269.

Hostether, T. H., Rennke, I. and Brenner, B. M. (1982). The case for intrarenal hypertension in the initiation and progression of diabetic and other glomerulopathies. *Am. J. Med.* 75: 375 – 380.

Irfan, S., Arain, T. M., Shaukat, A. and Shahid, A. (2004). Effect of pregnancy on diabetic nephropathy and retinopathy. *J. Cell Physicians Surg. Pak.* 14: 75 – 78.

Kolthoft, I. M. and Elving, J. (1967). Treatise on analytical chemistry. Vol. 1. New York, W. B. Saunders.

Korda, A. R. and Horvath, (1987). *Renal Physiology of the Fallopian Tube and Myometrium.* Publ. Harper and Rom, New York.

MacDonald, H. N. and Good, W. (1972). The effect of parity on plasma, total protein, albumin, urea and a-amino nitrogen levels during pregnancy. *Int. J. Obst. Gyn.* 79(6): 518 – 525.

Obembe, A. O., Antai, A. B. and Ibu, J. O. (2003). Renal function in pregnant and non pregnant women in Calabar – Nigeria. *Niger. J. Health Biomed. Sci.* 2(2): 73 – 77.