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CHANGES IN CHLORIDE AND BICARBONATE CONCENTRATION IN THIRD TRIMESTER OF PREGNANCY IN NORMOTENSIVE AND PREECLAMPTIC PREGNANT WOMEN

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Abstract: **Increased presence of serum chloride and Bicarbonate concentration in preeclampsia may bring about increased osmolality leading to concealed dilatation of vessels and One of the probable reasons for the increase in the serum bicarbonate in preeclamptic group could be a decreased pCO2 leading to suppression of vasodilatation. however, the biochemical changes in renal function accompanying normal pregnancies and preeclamptic pregnant women in Nigeria as a whole and south west Region in particular are not well documented This study examine Chloride and Bicarbonate concentration in third trimester of pregnancy in Normotensive and Preeclamptic pregnant women. Thirty (30) pregnant women (15 normotensive and 15 preeclamptic women from Ondo town participated in the study. Five milliliters (5 ml) of venous blood was drawn from consenting participants and placed in a lithium heparin sample bottles for analysis. Result in fig 1 and figure 2 shows the serum levels of chloride and bicarbonate of normotensive pregnant women were (102 and 16mEq/L) respectively, where as in preeclamptic pregnant women were (104 and 18 mEq/L), however fig 1 show no statistically significant difference in chloride concentration in pre-eclamptic women compared to normotensive pregnant women ($p>0.05$) whereas Fig. 2 shows a statistically significant increase in bicarbonate concentration in pre-eclamptic women compared to normotensive pregnant women ($p<0.05$)**

Keywords: **Bicarbonate concentration, serum bicarbonate, preeclamptic pregnant women.**

1. INTRODUCTION

Increased presence of serum chloride in preeclampsia may bring about increased osmolality leading to concealed dilatation of vessels (Barman, *et al*., 2010).Preeclampsia is a multisystem disorder that is specific to pregnancy which affects 3-5% of pregnancies and negatively affects the health of the mother and fetus (Salomonsson, *et al*., 2017). Although its pathogenesis is unknown, the kidney plays a key role in its clinical manifestations (Kooffreh, *et al*., 2014). In addition, preeclampsia is regarded as the "disease of theories" as there are many hypotheses that explain its pathophysiology. However, some new markers can predict the disease, including soluble fms-like tyrosine kinase 1,

soluble endoglin, and the placenta growth factor (Polsani, *et al*., 2013). Preeclampsia is a multi-system disorder affecting approximately 5–7% of all pregnancies worldwide and it is the commonest, yet least understood disease of pregnancy (Ziaei, Ranjkesh *et al*., 2008). In developing countries, dietary deficiency of various mineral ions have been established to have a role in blood pressure regulation in pregnant women with a consequent development of preeclampsia (Aziz & Mahboob, 2014; Ephraim *et al*., 2014; Kanagal *et al*., 2014).

A study revealed that chloride and bicarbonate remained unchanged in the three trimesters of pregnancy and this suggest that, the pressure of the gravid uterus on the bladder and the altered neuromuscular function of the striated sphincter (Weidner et al., 2009) which leads to urinary urgency and incontinence (Van Brummen et al., 2006) do not alter the serum concentrations of chloride and bicarbonates of pregnant women. However, there are variations in this view; for instance, Akinloye et al. (2013) observed significant increase in chloride concentration in first and second trimester compared to non-pregnant controls. They also observed a significant reduction in bicarbonate in the first and second trimesters of pregnancy.

Nevertheless, they opined that these changes were normalized by the third trimester of pregnancy with the values comparable to non-pregnant controls. Studies have shown that the increase in electrolytes as from the third day of conception is accompanied by an increase in renal ionic excretion and that a net retention of chloride and did not occur until output of the ion is reduced. Contrarily, Manjareeka and Nanda, 2012, reported that the serum chloride and bicarbonate significantly elevated in preeclampsia. The alteration in the serum chloride are linked to an alteration in the serum sodium levels as an increase in serum chloride levels results from a delay in the renal excretion of sodium (Shrimanker & Bhattarai, 2019).In a study, a significant increase was observed in chloride and bicarbonate levels in pre-eclamptic women in comparison to normal pregnant women. Increase in chloride levels may probably be due to delay in excretion of sodium because of decreased renal blood flow (Dutta *et al*., 2000). One of the probable reasons for the increase in the serum bicarbonate in preeclamptic group could be a decreased pCO2 leading to suppression of vasodilatation. There may be other reasons for these effects which are not known at present. This is in accordance with the finding of Kashyap et al., 2006 and Manjareeka *et al*., 2012 who also observed that mean serum sodium, chloride and bicarbonate levels were significantly higher in proteinuric hypertensive patients as compared to normal pregnant women. However, this study is aimed to investigate the alteration in serum Chloride and Bicarbonate concentration in third Trimester of Pregnancy in Normotensive and Preeclamptic pregnant women.

2. MATERIALS AND METHOD

Sample size: The sample size was calculated using the Taro Yamanis formula;

$$n = \frac{n}{1 + N(d)^2}$$

Where:

n= sample size

N=population size

d= level of precision (0.05 at 95% confidence level). In this study, the finite population will be 33 mothers from Ondo town, and the level of precision assumed to be 0.05, the sample size will be calculated thus:

$$n = \frac{33}{1 + 33(0.05)^2}$$

n=30.48

Therefore, the sample for this study is 30 respondents who are normotensive and preeclamptic pregnant women from Ondo town.

Ethical approval and informed consent: Ethical clearance (REC Approval No: UNIMEDTH/REC/2020/030) was obtained from the Research Ethics Committee of University of Medical Science Ondo, Ondo State. Written informed consent was obtained from subjects prior to commencement of the study.

Subjects: Thirty (30) consenting pregnant subjects were recruited from the University of Medical Sciences Teaching Hospital, Ondo State. These subjects consist of 15 normotensive pregnant women in the third trimester of pregnancy with blood pressure below 130/90 mm/Hg without presence of proteinuria and 15 (fifteen) preeclamptic women in their third trimester of pregnancy classified as having preeclampsia according to their blood pressure measure was above 130/90 mm/Hg with the presence of proteinuria taken two consecutive times at presentation at the antenatal clinic of the hospital.

Blood sampling: Five milliliters (5 ml) of venous blood was drawn from consenting participants and placed in a lithium heparin sample bottles. Blood samples was spun in a bucket centrifuge at 2500 RPM (rounds per minute)for10 minutes after which plasma was collected and stored frozen in plain sample bottles and was analyzed for Chloride and Bicarbonate level.

Experimental protocols: After the subjects where identified and recruited into the study, they were taken to the lab where their blood samples was collected by venipuncture and taken to the chemistry laboratory for analysis.

Inclusion and Exclusion criteria: Included in this study were normotensive and pre-eclamptic pregnant women in the third trimester of pregnancy, within the age range of 25 to 35years. The pregnant women were also those who had given birth before and were pregnant for the second time. However, normotensive and pre-eclamptic pregnant women who were on drugs and with a known history of hyperlipidemia, gestational Diabetes and other comorbidity, and who did not meet any of the inclusion criteria, were all excluded.

Study area/population: The study was conducted for two months at University of Medical Sciences, Teaching Hospital Ondo, Ondo State Nigeria. Department of Obstetrics and Gynecology

Statistical analysis: Data analysis was done with GraphPad prism 8.1 Statistical software. The results were expressed as means ± SEM and analysed using Student t-test. $P < 0.05$ was considered statistically significant

3. RESULTS

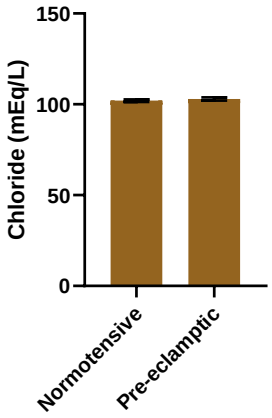

Fig. 1: Chloride Concentration in the third trimester of pregnancy of normotensive and preeclamptic pregnant women (N=15; ±SEM)

Result in Fig. 1: show no statistically significant difference in chloride concentration in pre-eclamptic women compared to normotensive pregnant women ($p>0.05$)

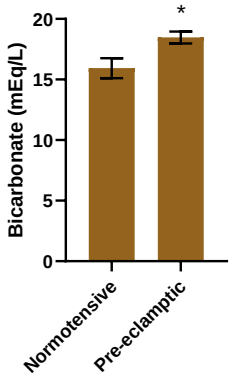

Fig. 2: Bicarbonate Concentration in the third trimester of pregnancy of normotensive and preeclamptic pregnant women (N=15; ±SEM)

Result in Fig. 2: show a statistically significant increase in bicarbonate concentration in pre-eclamptic women compared to normotensive pregnant women ($p<0.05$)

4. DISCUSSION AND CONCLUSION

Preeclampsia is a pregnancy specific condition that increases maternal and infant morbidity and mortality.15 It is proposed to be a two stage disease, stage I is characterized by reduction in perfusion and stage II is a maternal syndrome. A predominant pathophysiological factor is critically reduced perfusion of all the organs, may be due to vasoconstriction, microthrombi formation and reduced circulating plasma volume.16 The estimation of serum electrolytes in Pregnancy induced hypertension (PIH) provides a useful index for the study of physiological and pathological changes in pregnancy.

Result in fig 1 and figure 2 shows the serum levels of chloride and bicarbonate of normotensive pregnant women were (102 and 16mEq/L) respectively, where as in preeclamptic pregnant women were (104 and 18 mEq/L), however fig 1 show no statistically significant difference in chloride concentration in pre-eclamptic women compared to normotensive pregnant women ($p>0.05$) whereas Fig. 2 shows a statistically significant increase in bicarbonate concentration in pre-eclamptic women compared to normotensive pregnant women ($p<0.05$).the aforementioned result of chloride shows similarity with the study of Njoku *et al*., 2020 whose research also reported a non statistically significant significant difference in chloride concentration in pre-eclamptic women compared to normotensive pregnant women ($p>0.05$) but also reported a non statistically significant significant difference in bicarbonate concentration. Contrarily to the report of this study, Manjareeka and Nanda, 2012 reported that the serum chloride and bicarbonate significantly elevated in preeclampsia. The changes in the serum chloride are linked to an alteration in the serum sodium levels as an increase in serum chloride levels results from a delay in the renal excretion of sodium.

CONCLUSION

In conclusion the serum bicarbonate may play a significant roles in the pathogenesis and severity of preeclampsia. however The serum chloride in the present study demonstrated no significant relationship with BP changes. Other factors not stated in this study may also play essential roles in the disease progression. Therefore, the need for further studies on renal biochemical markers on preeclampsia is imperative.

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