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SERUM SODIUM AND POTASSIUM LEVELS IN PREGNANT WOMEN FROM MINJIBIR LOCAL GOVERNMENT, KANO – NIGERIA

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ABSTRACT
Blood samples collected from one hundred and twenty(120) pregnant women attending ante-natal care services in Minjibir General Hospital, Minjibir local government of Kano State and fourty(40) non-pregnant women as control were analysed for serum Na and K levels. The level of sodium in the blood samples range from 122mmol/L to 151mmol/L. The amount of potassium varied from 2.4mmol/L to 5.2mmol/L. The results show disturbance in the electrolytes in some of the pregnant women as the levels were not within the normal range (Na: 135mmol/L - 145mmol/L and K: 3.5 – 5.0mmol/L). The disturbance may be due to some reasons such as vomitting, low fluid intake, drugs and malnutrition.

Keywords: Serum Sodium and Potassium, Pregnant women, Blood

INTRODUCTION

Blood serum is blood plasma without fibrinogen or other clotting factors (Maton *et al*., 1993). Serum is a clear yellowish fluid that remains as liquid portion of the blood after clotting has taken place. Both plasma and serum contain protein, salts, sugars, waste product, vitamins, mineral salts, fats and hormones, but plasma also contains the protein fibrinogen and certain other elements necessary for clotting in it, and therefore clots as easily as whole blood. Serum which lacks the elements does not clot (Maton *et al*., 1993). Blood tests are used to determine physiological and biochemical states such as disease, mineral contents, drugs effectiveness, and organs function (Burtis and Ashwood ,1994). Blood test is used to evaluate kidney function, blood acid/base balance, sugar and electrolytes(Alexander ,2007).Although the term blood test is used, most tests are done on plasma or serum (Burtis and Ashwood ,1994).

In vertebrates, the various cells of blood are made in the bone marrow in a process called hemattopoiesis. During childhood, almost every human bone produces red blood cells; as adults red blood cells production is limited to larger bones(Williams *et al.,* 1989).

Blood performs many important functions within the body including: supply of oxygen to tissues(bound to haemoglobin which is carried in red cells),supply of nutrients such as glucose , amino acids e.t.c., removal of waste such as carbon dioxide, urea and lactic acid, regulation of body pH(normal pH range is 7.35 to 7.45), regulation of core body temprature, hydraulic functions, immunological functions, messenger functions, coagulation(Ann, 1994).

A substance that dissociates in to ions when fused or in solution, thus capable of conducting electricity is said to be an electrolyte(Churchill Livingstone, 1987). Electrolytes are chemical compounds that ionize when dissolved or molten to produce an electrically conductive medium (Churchill-Livingstone, 1987).An electrolyte is also said to be an ion or weakly charged element, that conducts reactions and signals in the body (Williams *et al.,* 1989).An electrolyte is also defined as a chemical substance which when dissolved in water or melted, dissociates in to electrically charged particles(ions), and thus is capable of conducting an electric current (Saunders,2007).

Positively and negatively charged molecules called ions, are found within cells, between cells, in the blood stream and in other fluids throughout the body. Electrolytes with positive charge include sodium, potassium, calcium and magnesium; the negative ions are chloride, bicarbonate and phosphate (George, 1954). Common electrolytes that are measured in blood testing include sodium, potassium, chloride and bicarbonate(George, 1954).

The ions and low molecular weight solutes in blood plasma are not fixed components but are in constant flux between blood and various tissues. Dietery uptake of the inorganic ions that are the predominant electrolytes of blood (Na^+,K^+ and Ca^+) are in general, counterbalanced by their excretion in the urine. For many blood components, something near dynamic steady state is achieved; the concentration of components changes a little ,although a continuous flux occurs between digestive tract, blood and urine. The plasma electrolytes level changes a little in response to dietery intake. Any significant departure from the normal values can result in serious illness or death(David and Michael ,2003). For a maintenance of health, there must be a proper distribution and normal balance of fluids and their electrolytes throughout the body-viz, in the intravascular, interstitial-lymph, and intracellular compartments. For the continuance of state of equilibrium, it is necessary that there be a normal circulation of blood and lymp and a constant, dynamic exchange of fluids and electrolytes among the body compartments through their permiable membranes.

When disturbances arise, they are either; abnormalities of body water and electrolytes and/or edema, dehydration, electrolyte deficits and excess, hyperemia and shock, or disorders interfering with the circulation of blood(Anderson and Scotti ,1980).
Other researchers worked on blood and electrolytes : Carin and Thomas (2001) studied Caffeine-induced Hypokalemic paralysis in pregnancy. Young et al., (2001) studied another case of excessive caffeine and hypokalemia in pregnancy. Pakravan et al.,(2007) studied the Effect of acute paracetamol overdose on changes in serum and urine electrolytes. Alazin et al., (2006) studied the unusual causes of hypokalemia and paralysis.

Location Of The Study Area
The study area(Minjibir) is defined by longitude 12.18^{o}E and latitude 8.66^{o}N. The vegetation is that of tropical savana. There are two dinstict seasons, the wet and the dry seasons. The main occupation of the people is subsistence farming(mainly guinae corn and millet),with animal husbandary. Other professions and/or activities such as civil service, trading and weaving are practiced also.

MATERIALS AND METHODS
One hundred and twenty(120) blood samples were collected from pregnant women aged 15 – 45 years by random seletion who were attendees at the ante-natal clinic of Minjibir General Hospital.
Control
Fourty (40) apparently healthy female volunteers matched for age and sex , comparising of staff of Minjibir general hospital and students of school of health technology living in Minjibir who were non pregnant served as the control.
The purpose of the study was explained to both the pregnant women and the volunteers after which informed consents were obtained.
Blood was drawn from a vein, usually from the inside of the elbow or the back of the hand. The site was cleaned with germ-killing solution(methylated spirit). Elastic band or tourniquet was applied around the upper arm to cause pressure to the area and make the vein swell with blood. Then needle was gently inserted in to the vein and 5cm^3 of blood was drawn.
Sampling and Sample Pre-treatment
Veinous blood (5cm^3) was collected in the morning, the blood was dispensed into cleaned dry test tubes. Sera were isolated by centrifuging in a laboratory centrifuge at 2000rpm for 3 minutes immediately after blood clotting and retraction at room temprature. The sera were labelled and refrigerated at 4^{o}C, pending laboratory analyses.

Determination of Sodium and Potassium in the Serum
A Jenway model PFP7 low temperature, single emission flame photometer was used for the determination of sodium and potassium using their respective filters(Mayer and Starkey, 1977).
Procedure
The drain trap was pushed fully down on its clip, and was ensured that it has solution in it and that no air locks were present. Fuel adjust valve was open, and fuel supply at source i.e cylinder was turned on. Electrical power was switched on by depressing the power switch, ignition switch was then depressed and held till when the flame indicator was illuminated. Filter select control was set to the desired position. Deionized water was aspirated and the readout was set to zero by adjusting the blank control. A standard solution that has a slightly higher concentration than expected in the samples awaiting analysis was aspirated. The fine and coarse controls were adjusted until a positive reading was obtained. Fuel adjust control was adjusted until a peak reading was obtained. For the optimum performance the instrument was allowed for 15 minutes to warm-up and during the period deionized water was aspirated.
A procedural blank and a set of standards for each element were determined each time a series of samples were run. Average readings of both standards and samples were corrected with blank reading. A calibration curve was prepared using standard solutions containing known concentrations of sodium and potassium. The concentrations of each element in each sample under investigation in millimoles per litre(mM/L) were determined from calibration curve of its standard by extrapolation.

RESULTS
The levels of sodium and potassium in blood serum of pregnant women collected within the study area are as shown in the figures and tables. A total of 120 samples were collected, 40 samples from each of the three age groups(15-24, 25-34 and 35&above) and each of the three trimesters(1st, 2nd and 3rd). The results of these analyses are discussed using the frequency distribution pattern of the electrolytes in the blood samples. Mean concentration, standard deviation and percentile(using Z-Table) were employed in assessing the concentration levels.
Sodium
The distribution in all cases is normal and mean±standard deviation are shown in table 1.

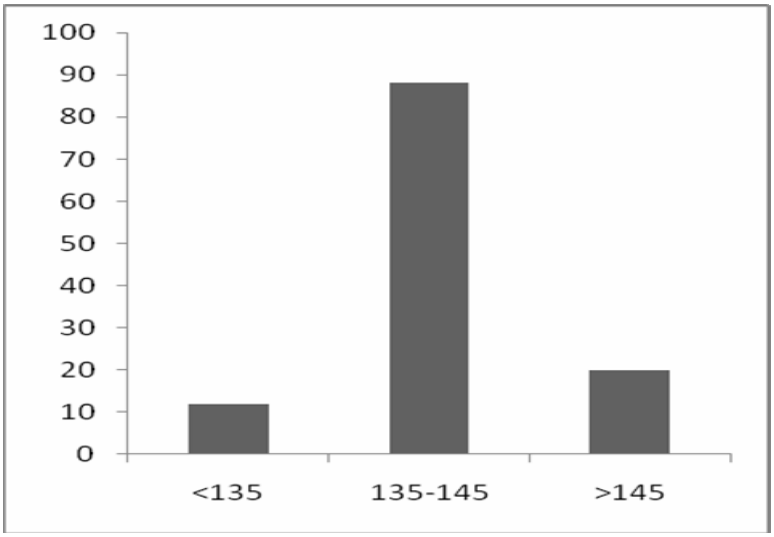

Figure 1a: Frequency distribution pattern of serum sodium in pregnant women according to Age.

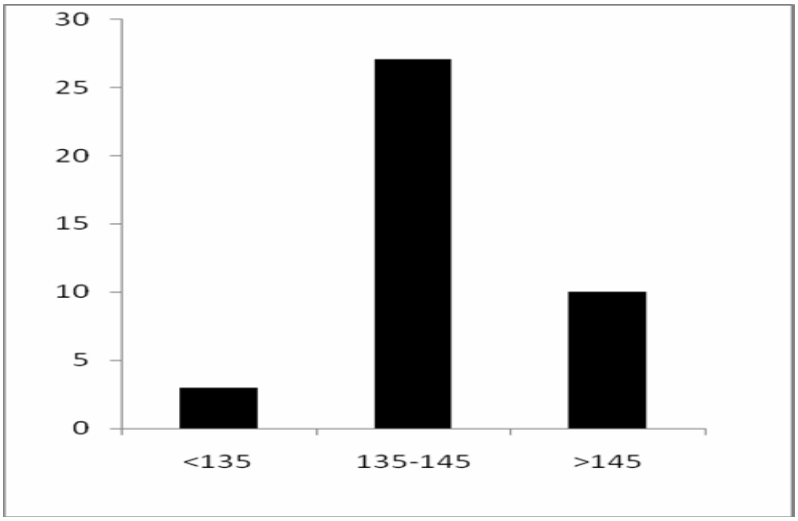

Figure 1b: Frequency distribution pattern of serum sodium in pregnant women according to gestational Age.

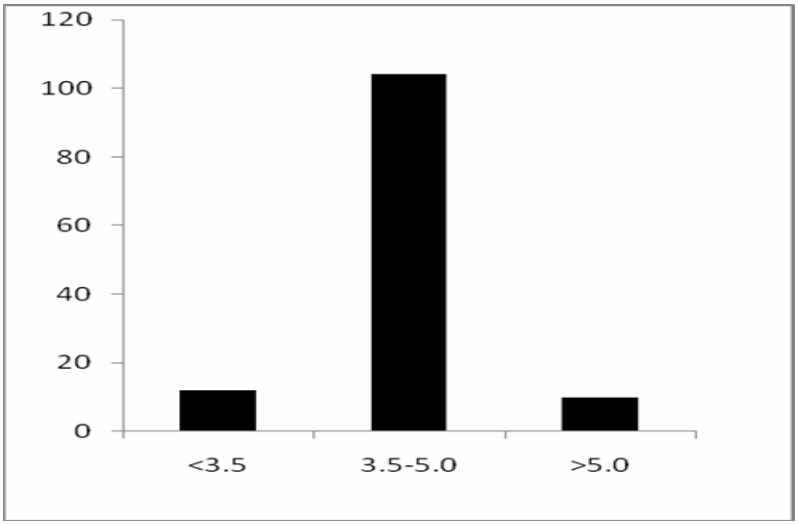

Figure 2a: Frequency distribution pattern of serum potassium in pregnant women according to Age.

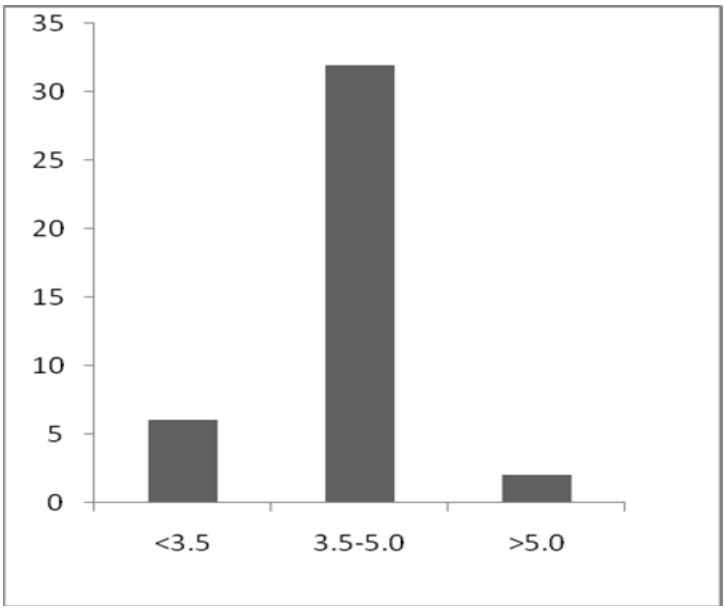

Figure 2b: Frequency distribution of serum potassium in pregnant women according to gestational Age.

Tables 1 and 2 show the means and standard deviations of serum sodium and potassium levels in different year groups and in different trimesters and also in controls.

Table 1 :Serum Sodium and Potassium Levels(Mean±SD) in study subjects According to Age

	N	Na(mmol/L)	K(mmol/L)
15 – 24 YRS	40	139.85±7.08	3.95±0.57
25 – 34 YRS	40	137.55±6.03	3.68±0.37
35 & Above	40	139.95±6.20	3.73±0.48

Table 2 : Serum Sodium and Potassium Levels(Mean±SD) in study subjects According to Gestational Age.

	N	Na(mmol/L)	K(mmol/L)
1st Trimester	40	141.28±6.45	3.82±0.60
2nd Trimester	40	138.70±4.71	3.69±0.65
3rd Trimester	40	139.83±6.11	3.72±0.48
Control	40	141.5±11.5	3.80±0.90

DISCUSSION

The low concentration of serum sodium observed in some pregnant women may be due to polyuria, metabolic acidosis and renal disease as reported by Tietz ,(1976) ; (Henry ,1974). It was reported that During normal gestation serum sodium decreases by 5mMol/L(Davison *et al.,*1988). Hyponatremia may also be caused by low intake of sodium and excessive perspiration which is in accordance the findings of Davison *et a.l(,*1988). Low sodium level can lead to nausea, headache, edema, paralysis and seizures/coma(Moritz and Ayus, 2004).

High levels of serum sodium(hypernatremia) may be due to excessive fluid loss or vomiting and inadequate water intake (Klahr, 1996). This can lead to thirst, irregular heart beat, fatigue and muscle twiching (Klahr, 1996).

Low serum potassium level(hypokalemia) is more common than hyperkalemia.this was also reported byMark *et al.,* (1985). Duirng pregnancy, in most women serum potassium levels are either normal or on average,0.3mMol/L lower than values in women who are not pregnant(Lindheimer et al,1987), this is in accordance with the findings of this work. Low level of serum potassium can be caused by inadequate intake(as in starvation) or by excessive loss of potassium from the body(as in vomiting, diarrhea and diuretics)(Anderson and Scotti, 1980). Mild hypokalemia can lead to muscle weakness and severe can lead to paralysis, inability to breath and cardiac arythmias(Anderson and Scotti, 1980).

Excessive ingestion of caffeine can induce hypokalemia, which affects neuromuscular system and can lead to paralysis(Carin and Thomas, 2001). Hyperkalemic paralysis can be induced by large amount of cola consumption(Lee *et al.,* 2007).

Conclusion

From the results of this study , the levels of electrolytes viz: sodium and potassium in most of the pregnant women were within normal range, indicating no threat. The proportions of pregnant women having serum serum sodium concentration below 90mmol/L and above 145mmol/L are 6.81% and 18.14% respectively. The proportion those having serum potassium level below 3.5mmol/L and above 5.0mmol/L are 29.81% and 0.57% respectively. However , some have significantly abnormal values that need proper and adequate management which depends on the underlying cause of the disorder and the type of electrolyte involved.

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