



## DETERMINATION OF SERUM CHLORIDE ION CONCENTRATION IN PREGNANT WOMEN FROM MINJIBIR LOCAL GOVERNMENT AREA, KANO STATE NIGERIA

\*Mohammed, M.I. and Inuwa, Y.

Department of Pure and Industrial Chemistry, Bayero University, P.M.B. 3011, Kano – Nigeria  
[\\*musaimf@yahoo.com](mailto:musaimf@yahoo.com)

### ABSTRACT

**Serum chloride ion level in blood samples of pregnant women attending ante-natal care clinic in Minjibir was investigated. The mean and standard deviation of the ion in the samples is  $100.51 \pm 4.89$  mmol/L. The distribution is skewed towards high frequency of low concentrations and could be attributed to electrolyte disturbance in some of these women. This disturbance may be due to vomiting, low fluid intake, drugs and malnutrition.**

**Keywords:** Chloride ion, pregnant women, ante-natal

### INTRODUCTION

Blood is a specialised tissue consisting of several cells suspended in a fluid medium called plasma. The cellular constituents consist of red blood cells, which carry the respiratory gases, white blood cells, which fight the diseases, and platelets which aid in blood clotting (Roberts, 1983). Blood has a varied structure and performs several functions. The transport function is carried out by red blood cells and plasma (Roberts, 1983).

Chloride is essential for the control of hydration, osmotic pressure and acid/base equilibrium (Tietz, 1976). Its toxicity results from the fact that the chloride occurs as acid, hydrogen chloride. Chloride overdose may result in the accumulation of hydrochloric acid in the blood stream, resulting in acidosis (Young *et al.*, 2001). Low plasma chloride leads to decline in the acid content of the blood (alkalosis) (Klahr, 1996). The normal range of chloride is 98-106mM (Tietz, 1976).

Elevated serum chloride may be observed in dehydration, hyperventilation, congestive heart valve, prostatic and urinary obstruction (Anderson and Scotti, 1980). Increased level of chloride indicates dehydration but can occur with other problems causing high blood sodium or hyperventilated (Anderson and Scotti, 1980).

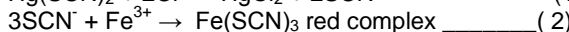
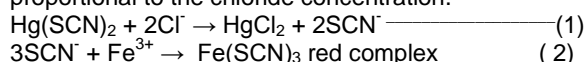
Decreased levels of serum chloride also occur with disorders that result in low blood sodium, prolonged vomiting or gastric suction, chronic diarrhea, with loss of acid from the body (Young *et al.*, 2001).

The aim of this study is to determine the level of chloride ion in blood serum of pregnant women from Minjibir local government area of Kano State. This would help at reducing the mortality rate and other complications as a result of problems generated by chloride in the serum of pregnant women.

The purpose of the study was explained to the two parties after which their consents were obtained.

### Principle of the procedure

This method is based on the modification of the colourimetric method of Skeegs and Hochestrasser (1964). Chloride ions form a soluble, non-ionized compound with mercuric ions and will displace thiocyanate ions from non-ionized mercuric thiocyanate. The released thiocyanate ions react with ferric ion to form a coloured complex that absorbs light at 480nm. The intensity of the colour produced is directly proportional to the chloride concentration.



### MATERIALS AND METHODS

One hundred and twenty(120) blood samples were collected from pregnant women with age range 15 – 45 years attending the ante-natal clinic at Minjibir General Hospital. Forty (40) apparently healthy female volunteers matched for age, comparing staff and students and not pregnant served as the control.

Blood was drawn from the vein, usually at the inside of the elbow or the back of hand (Post and Burton, 2001). 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. The needle was inserted in to the vein and 5cm<sup>3</sup> of blood was drawn. The process was repeated for each of the of the pregnant women.

#### Sample Treatment

Veinous blood (5cm<sup>3</sup>) samples were collected in the morning and were dispensed into a cleaned dry test tubes. Sera were isolated by centrifuging in a laboratory centrifuge at 2000rpm for three minutes immediately after blood clotting and retraction at room temperature. The sera were labelled and refrigerated at 4°C pending laboratory analysis.

#### Determination of Serum Chloride

A Cecil 7400 series UV visible spectrophotometre was used for the determination of chloride concentration in serum samples and the measurement was carried out at wavelength of 480nm.

Teco Diagnostic reagent (in ready to use form) for the quantitative colometric determination of chloride in human serum with the following composition was used:

Mecuric Nitrate 0.058mM  
 Mecuric Thiocyanite 1.75mM  
 Mecuric Chloride 0.74mM  
 Ferric Nitrate 22.3mM

#### Procedure

Test tubes were labelled blank, standards and samples. Chloride reagent ( $4.5 \text{ cm}^3$ ) was pipetted into each test tube and 30 microlitres of standards or samples were added to respective tubes, mixed and incubated at room temperature for 5 minutes. The spectrophotometre was set to 480nm and zero with reagent blank. The absorbance readings of all the tubes were obtained and recorded. From the readings a calibration curve of absorbance against concentration of chloride was plotted and the concentration of chloride ion in each of the samples was obtained from the calibration curve by extrapolation.

#### RESULTS AND DISCUSSION

The levels of chloride ion in blood serum of pregnant women collected within the study area are as shown in Fig. 1a - g. A total of 120 samples were collected, 40 samples from each of the three age groups (15-24, 25-34 and 35 and above) and each of the three trimesters (1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup>). The results of these analyses are discussed using the frequency distribution pattern of the chlorides in the blood samples. The mean concentration, standard deviation and percentile were employed in assessing the concentration levels. The value of chloride levels in the controls ranged from 98 – 106mg/L.

The frequency distributions pattern of serum chloride concentration in pregnant women collectively and by age groups is as shown in Fig. 1. Column 1 shows the distribution collectively, the distribution is normal with mean and standard deviation of  $100.56 \pm 2.4 \text{ mmol/L}$ . The proportion of those having serum chloride level below 98mmol/L and above 106mmol/L are 15.86% and 1.16% respectively.

The frequency distribution pattern of serum chloride concentration in pregnant women within the ages of 15 – 24 years is as shown in column 2. The distribution is normal with mean and standard deviation of  $100.66 \pm 7.69 \text{ mmol/L}$ . The proportion of those having serum chloride level below 98mmol/L and above 106mmol/L are 0.11% and 24.51% respectively.

The frequency distribution pattern for serum chloride concentration in pregnant women within the ages of 25 and 34 years is as shown in Column 3. The distribution pattern is normal with mean and standard deviation of  $100.2 \pm 5.01 \text{ mmol/L}$ . The proportion of those having serum chloride level below 98mmol/L and above 106mmol/L are 33% and 12.3% respectively.

The frequency distribution pattern of serum chloride concentration in women within 35 years and above is as shown in Column 4. The distribution pattern is normal with mean and standard deviation of  $101.5 \pm 4.89 \text{ mmol/L}$ . The proportions of those having serum chloride level below 98mmol/L and above 106mmol/L are 23.36% and 17.88% respectively.

The frequency distribution pattern of serum chloride concentration in first trimester is as shown in Fig. 1e. The distribution pattern is normal with mean and standard deviation of  $99.83 \pm 8.09 \text{ mmol/L}$ . The proportions of those having serum chloride level below 98mmol/L and above 106mmol/L are 40.9% and 22.36% respectively.

The frequency distribution pattern for serum chloride concentration in second trimester is as shown in Fig. 1f. The distribution is normal with mean and standard deviation of  $99.81 \pm 5.51 \text{ mmol/L}$ . The proportions of those having serum chloride level below 98mmol/L and above 106mmol/L are 37.07% and 13.62% respectively.

The frequency distribution pattern of serum chloride concentration in third trimester is as shown in Fig. 1g. The distribution is normal with mean and standard deviation of  $101.33 \pm 7.42 \text{ mmol/L}$ . The proportions of those having serum chloride level below 98mmol/L and above 106mmol/L are 32.64% and 26.13% respectively.

**Table 1: Mean and Standard deviation values**

	Mean(mmol/L)	Standard deviation(mmol/L)
15 – 24 years	100.66	$\pm 7.69$
25 – 34 years	100.20	$\pm 5.01$
35 and above	101.50	$\pm 4.89$
First trimester	99.83	$\pm 8.09$
Second trimester	99.81	$\pm 5.51$
Third trimester	101.33	$\pm 7.42$
Collectively	100.56	$\pm 2.40$

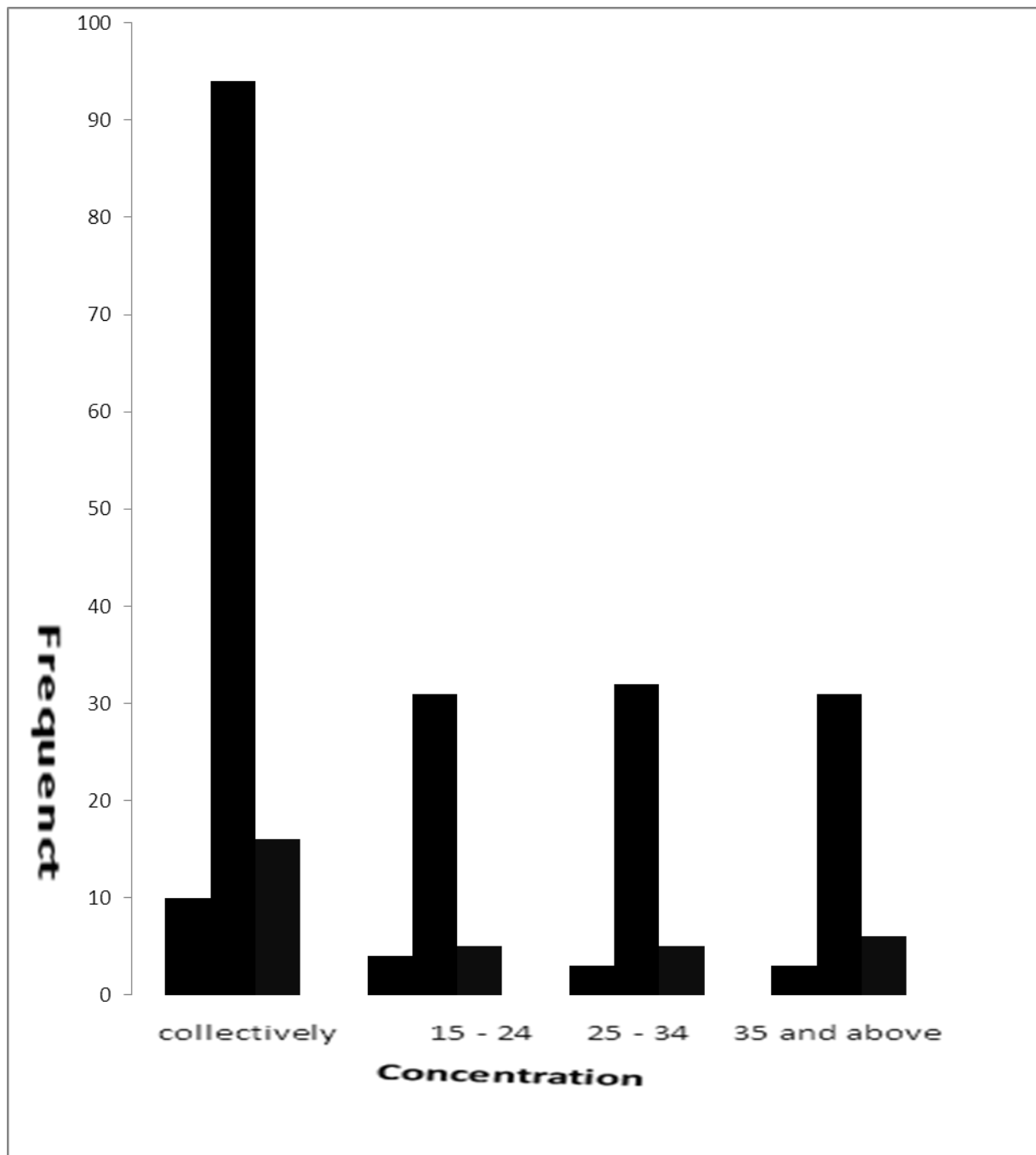


Figure 1: Frequency distribution pattern of serum Chloride in pregnant women (15-24, 25-34 and 35yrs and above)

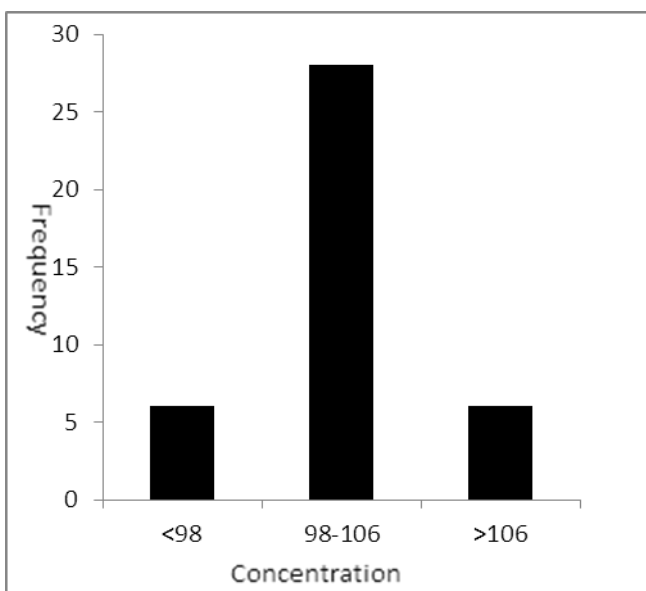


Figure 1e: Frequency distribution of serum chloride in pregnant women (First trimester)

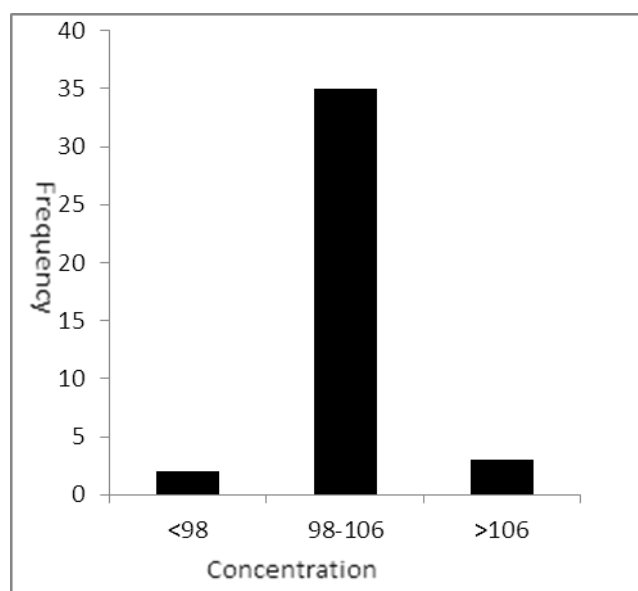


Figure 1f: Frequency distribution of serum chloride in pregnant women (Second trimester)

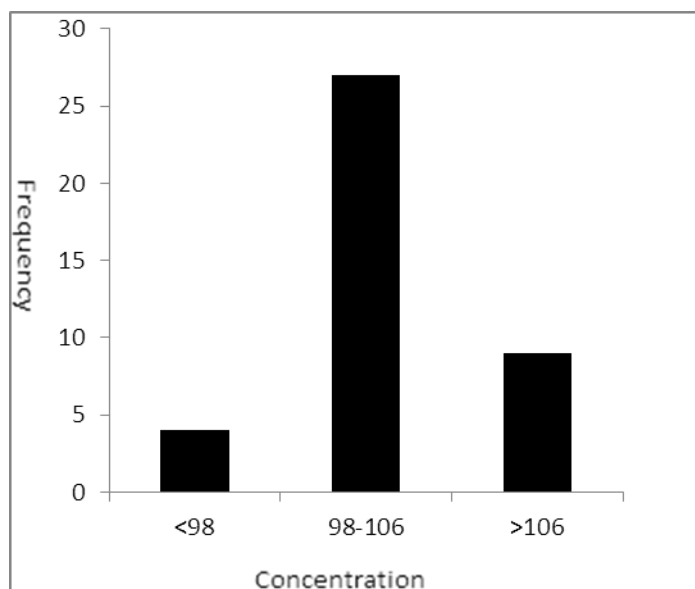


Figure 1g: Frequency distribution of serum chloride in pregnant women (Third trimester)

Chloride disturbance was observed in the blood of some pregnant women. The mean serum chloride level was lower in pregnant women than in the controls. This was lower in younger pregnant women than the elderly and in the first and second trimesters than the third. Serum chloride levels are unchanged during pregnancy (Lindheimer *et al.*, 1987), but increase or decrease in serum

chloride levels can occur with other problem that may cause high or low serum sodium level respectively. (Anderson and Scotti,1980). Hyperchloremia leads to weakness, headache, nausea and cardiac arrest while hypochloremia can lead to mental confusion, slowed breathing, paralysis and muscle tension (Post and Burton, 2001).

**CONCLUSION**

The results of this study has shows chloride disturbance in some of the women as the chloride concentration level was not within the normal range. This disturbance could be due to reasons, such as vomitting, low fluid intake, drugs and malnutrition

(Klahr, 1996).Though, the level of chloride in most of the women was within normal range, no immediate threat was observed, . however, some have significantly abnormal values that require immediate attention.

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