CHAPTER TWO

2. Materials and methods:

2.1 Materials

2.1.1 Study design:

This is a quantitative, descriptive analytical cross-sectional and hospital-based study.

2.1.2 Study area and period:

This study was conducted during the period from March 2014 to July 2014 at Aldosogi, a specialized hospital.

2.1.3 Study population:

The study included Sudanese male and female patients with hypertension disease, aged more than 40 years old.

2.1.4 Sample size:

The study sample size was (60) hypertensive patients were recruited for this study plus (40) healthy subjects were included to serve as control.

2.1.5 Inclusion criteria:

Sudanese patients with hypertension disease were included as a test group and a healthy subject as control.

2.1.6 Exclusion criteria:

Patient with renal disease, diabetes insipidus, diabetes mellitus, heart disease

2.1.7 Sample collection:

Blood samples were taken from all participants (both hypertensive + control) in containers containing anti-coagulants lithium heparin to estimate sodium and potassium.
2.1.8 Data collection:
Clinical data were obtained from the participated hypertensive patients by using a direct interviewing questionnaire

2.1.9 Ethical consideration:
- All participants were notified and excused before taken a sample.
- They were explained about the importance and the benefit of the outcome of this study

2.2 Methods:

2.2.1 Estimation of sodium and potassium:

Ion- selective electrodes (*Easy Leyte Plus*)

**Principle of the reaction:**
The flow-through sodium and pH electrodes contain glass tubing, specially formulated to be sensitive to sodium ions. The flow-through potassium and calcium electrodes employ a plastic tube, incorporating neutral carrier ionophores an ion selective electrode develops a voltage that varies with the concentration of the ion to which it responds. The relationship between the voltage developed and the concentration of the sensed ion is logarithmic, as expressed by the Nernst equation\[^{40}\]

\[
E = E^\circ + \frac{RT}{nF} \log (gC) \tag{1}
\]

Where:
- \(E\) = the potential of the electrode in sample solution
- \(E^\circ\) = the potential developed under standard conditions
- \(RT/nF\) = A temperature dependent “constant” termed the slope(s)
- \(n = 1\) for sodium, potassium, chloride, lithium and pH
- \(n = 2\) for calcium
- \(\log\) = Base ten logarithm function
g = Activity coefficient of the measured ion in the solution
C = Concentration of the measured ion in the solution

((EasyLyte operators manual))

**Procedure:**

Designed for fast, efficient use, the EasyLyte provides clinically accurate analysis for patient diagnosis and treatment. State-of-the-art, flow-through, ion selective electrodes measure the test sample. The analysis takes 55-60 seconds and requires only 100 µL of serum Na/K. The EasyLyte displays analysis results automatically. You will be guided through the display menu by pressing the yes or no button in response to questions and messages that appear on the display. Calibration is automatic.

All reagents and samples flow in one direction through the entire fluid path system. The fluid path is a closed loop which ensures that the electrodes will always be kept wet, an important requirement of ISE’s. All fluid path connections are simple push-on, air tight connections—no tools required. ((EasyLyte operators manual))

**2.2.2 Quality control**

The precision and accuracy of method used in this study were checked by commercially prepared control sample before its application for the measurement of test and control sample.

**2.2.3 Statistical analysis**

Data obtained from this study was analyzed using statistical package for the social sciences (SPSS) the mean and the standard deviation of serum levels in both hypertensive and control are obtained, T.test was used for comparison P.value equal or less than 0.05 considered as significant. Person regression analysis was used to assess correlation between Na⁺ and K⁺ with duration of hypertension.