Dedication

To my parents

Who have offered me everything without taking anything.

To my sisters and brother

Who supported me by all means.

To my teachers

Who taught me a lot.

To my colleagues

Who supported and encouraged me.

Acknowledgments

My first thankful is to Allah all of his affluences, appearing and disappearing. I greatly appreciate my supervisor Prof. Eltom Sirag Eldin for his precious advice, and guidance upon this study.

My special thanks & regards are extended to Mr. Amar Mohamed Ismail for his kind help, and the Centre for medical laboratory services personnel. My special thanks are also extended to Khartoum Teaching Hospital (Research & Laboratory Unit) personnel, and Prof. Eltom Sirag Eldin Laboratory personnel in Ommdurman, especially Mr. Altayeb Alhaj Al-Khalifa.

It is a pleasure to acknowledge the volunteers who were enrolled in this study, without them this work would not have been done.

Finally I would like to thank my colleagues and friends for their help and encouragement.

Abstract

A descriptive, cross sectional study conducted in Sudan, Khartoum State during the period of May to August 2007. Analytical and statistical methods were applied to compare results of Eppendrof flame photometer, IL-543 digital flame photometer and ion selective electrode, for measurement of sodium and potassium and assess the difference that can be found, also to check the accuracy and precision of the instruments.

Blood samples from a total of 55 apparently healthy adult males (volunteers) were taken randomly, and specimens (plasma) were analyzed for sodium and potassium concentrations by three different instruments. The results were statistically analyzed.

Results showed that the mean concentrations of sodium were 138±3.7 for the IL-543 digital flame photometer, 140±2.9 for the ion selective electrode and 136±3.6 for the Eppendrof flame photometer. And the mean concentrations of potassium were 3.7±0.3 for the IL-543 digital flame photometer, 3.9±0.4 for the ion selective electrode and 3.7±0.3 for the Eppendrof flame photometer.

In considering the IL-543 as the reference method, the data obtained by ANOVA test showed that, there was a significant difference between IL- 543 and ion selective electrode for the mean concentrations of plasma sodium where the p value was 0.008, as well as, the significant difference between the IL-543 and Eppendrof flame photometer where the p value was 0.001. Also there was a high significant difference between the ISE and Eppendrof were p value was 0.00.

Also ANOVA test showed that, there was a significant difference between IL-543 and ISE for the mean concentrations of plasma potassium, where the p value was 0.01, as well as, the highly significant difference between ISE and Eppendrof flame photometer, where the p value was 0.001. The test also showed that there was no significant difference between the IL-543 and Eppendrof flame photometer for plasma potassium where p value was 1.000.

This study concluded that there was a difference in results obtained by the three different instruments, which can be attributed to variation in plasma water, residual liquid junctions, binding of ions to protein or any other ligand or interference from other ions when using ISE, on the other hand source of error in using Eppendrof flame photometer due to fluctuations in the light sources. Further studies should be conducted for more accuracy and precision of any new introduced instrument.

اجريت هذه الدراسه الوصفيه في السودان في ولاية الخرطوم فى الفترة من مايو – أغسطس 2007 . أستخدمت طرق تحليلية و احصائية هدفت الي مقارنة نتائج جهاز الطيف اللهبي من النوع Eppendrof و النوع IL-543 وجهاز القطب الايونى الانتقائي الكهربائي والتي تعمل علي قياس تراكيز الصوديوم و البوتاسيوم و ذلك لتحديد –ان وجد- مدي الاختلاف بين النتائج و التاكد من دقة و ضبط الاجهزة الثلاثة.

تم أخذ 55 عينة دم عشوائيا من متبرعين ذكور اصحاء ظاهريا وحللت العينات لمعرفة تراكيز الصوديوم و البوتاسيوم باستخدام الاجهزة الثلاثة و قد تم تحليل النتائج باستخدام الطرق الاحصائية.

اوضحت النتائج ان متوسط تركيز الصوديوم هو 3.7±138 لجهاز الطيف اللهبي من النوع IL-543, 2.9±140 لجهاز القطب الايونى الانتقائي الكهربائي و 3.6±136 لجهاز الطيف اللهبي من النوع Eppendrof.وان متوسط تركيزالبوتاسيوم **هو** 0.3±3.7 لجهاز الطيف اللهبي من النوع IL-543, 0.4±3.9 لجهاز القطب الايونى الانتقائي الكهربائي و 0.3±3.7 لجهاز الطيف اللهبي من النوع .Eppendrof

اوضحت نتائج اختبار التباين الاحادى وبالاخذ فى الاعتبار ان جهاز الطيف اللهبي من النوع IL-543 هو الجهازالمرجعي انه توجد فروقات ذات دلاله احصائية بين متوسطات تراكيز الصوديوم بين جهاز الطيف اللهبي من النوع IL-543 و وجهاز القطب الايونى الانتقائي الكهربائي بقيمة احتمالية 0.008 ويوجد فرق ذو دلالة احصائية بين جهاز الطيف اللهبي من النوع IL-543 و جهاز الطيف اللهبي من النوع Eppendrof بقيمة احتمالية 0.001, كما اوضح الاختبار ان هنالك اختلاف معنوي كبير ذو دلالة احصائية بين جهاز القطب الايونى الانتقائي الكهربائي و جهاز الطيف اللهبي من النوع Eppendrof بقيمة احتمالية 0.00.

اوضح الاختبارايضا انه توجد فروقات ذات دلاله احصائية بين متوسطات تراكيز البوتاسيوم بين جهاز الطيف اللهبي من النوع IL-543 و جهاز القطب الايونى الانتقائي

الكهربائي بـ قيمة احتمالية 0.01 و فرق معنوى كبير ذو دلالة احصائية بين جهاز الـ قطب الايونى الانتـ قائي الكهربائي و جهاز الطيف اللهبي مـن النـوع Eppendrof بـ قيمة احتمالية 0.001, و قد اوضح الاختبار انه لا يوجد فرق بين متوسطات تركيز البوتاسيوم بين جهاز الطيف اللهبي من النوع IL-543 و جهاز الطيف اللهبي من النوع Eppendrof حيث كانت الـ قيمـة الاحتماليـة 1.000.

خلصت الدراسه بوجود فرو قات بين النتائج المتحصلة من الاجهزه الثلاثه و يعزي ذلك الي اختلاف المحتوي المائي للبلازما, ملتـ قي السائل المتبـ قى فى الجهاز ,ارتباط الايونات بالبروتين او بمختلف انواع الروابط او بسبب تداخل الايونات الاخري و ذلك عند استخدام جهاز الـ قطب الايونى الانتـ قائي الكهربائي , اما الفرق الناتج عند استخدام جهاز الطيف اللهبي مـن النوع Eppendrof يعزى الي التذبذب فى مصدر الضوء.

أوصت الدراسه بضرورة اجراء كل المعايير المطلوبة لدقة وضبط الاجهزة.

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List of Abbreviations

Abbreviations

AAS	Atomic absorption spectrophotometry
ACTH	Adenocorticotrophic hormone
ADH	Antidiuretic hormone
ADP	Adenosine diphosphates
ANOVA	Analysis of variance
ANP	Atrial natriuretic peptide
CLIA	Clinical Improvement Amendments
ECF	Extracellular fluid
ECG	Electrocardiogram
Ej	Liquid junction potential
HCO_3^-	Bicarbonate
ICF	Intracellular fluid
IFCC- EP	International Federation of Clinical Chemistry's Expert Panel on Nomenclature and Principles of Quality control in Clinical Chemistry
IL-	Instrument laboratory
ISE	Ion selective electrode
IV	Intravenous
IV RTA	Renal tubular acidosis
NIST	National Institute of Standard and Technology
ONPG	o-nitro phenyl- ß-D-galactopyranoside
QC	Quality control
RE	Random Error

SE	Systematic Error
TE	Total error

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