

بسم الله الرحمن الرحيم

**Sudan University of Science and Technology**  
**College of Graduate Studies**

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Comparison of Plasma Sodium and Potassium  
Results Obtained by the Flame photometer and Ion  
Selective Electrode Techniques.

**مقارنة نتائج الصوديوم والبوتاسيوم في البلازما  
المتحصل عليها بتقنية جهاز الطيف اللهبى وجهاز  
القطب الايونى الانتقائى الكهربائى.**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال الله تعالى

قَالَ رَبِّ اشْرَحْ لِي صَدْرِي { 25 }  
وَيَسِّرْ لِي أَمْرِي { 26 } وَاخْلُ عُنُقَهُ  
مِنْ لِسَانِي { 27 } يَفْقَهُوا قَوْلِي {  
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صدق الله العظيم

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# Dedication

*To my family, teachers, colleagues and  
friends*

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## LIST OF ABBRIVIATIONS

<b>ADH</b>	Antidiuretic Hormone
<b>ADP</b>	Adenosine Diphosphate
<b>ATP</b>	Adenosine Triphosphate
<b>CLIA</b>	Clinical Improvement Amendment
<b>DM</b>	Diabetes Mellitus
<b>DW</b>	Distilled Water
<b>ECF</b>	Extracellular Fluid
<b>E<sub>j</sub></b>	Liquid Junction Potential
<b>ISE</b>	Ion Selective Electrode
<b>NIST</b>	National Institute of Standard and Technology
<b>PVC</b>	Polyvinyl Chloride
<b>RE</b>	Random Error
<b>SE</b>	Systematic Error
<b>SPSS</b>	Statistical Package for Social Sciences
<b>TE</b>	Total Error

## **ABSTRACT**

This study was carried to compare results of plasma sodium and potassium that, measured by flame photometer and ion selective electrode (ISE). The analysis was done in International Private Hospital (diagnostic center) and Ombdda Teaching Hospital.

Fifty specimens were included in the study, 20 specimens with normal sodium and potassium, 15 specimens with low sodium and 15 specimens with high potassium levels. The specimens (plasma) were measured by both techniques (flame photometer and ISE) and the results presented in tables and figures.

Statistical analysis of the result (independent t-test) showed there was a significant difference obtained by the two instruments, which was due to variation in plasma water, interference from other ions, residual liquid junction and binding of ion to protein or other legend when using ISE.

Fluctuation in light source may be the cause in the variation of results when using flame photometer.

The results show that ISE is better than flame photometer in determination of plasma sodium and potassium.

Further studies must be done for accuracy and precision for any new methods.

## ملخص الأطروحة

أجريت هذه الدراسة لمقارنة نتائج قياس الصوديوم والبوتاسيوم في البلازما، والتي تم قياسها بجهاز الطيف اللهبى وجهاز القطب الأيوني الانتقائي الكهربائي بالمستشفى الدولي الخاص (المركز التشخيصي) ومستشفى أمبدة التعليمي.

إشتملت الدراسة على 50 عينة، 20 عينة ذات مستوى طبيعي للصوديوم والبوتاسيوم، 15 عينة ذات مستوى منخفض للصوديوم، 15 عينة ذات مستوى عال للبوتاسيوم. تم تحليل العينات بكلتا الطريقتين (جهاز الطيف اللهبى وجهاز القطب الأيوني الانتقائي الكهربائي) وتم عرض النتائج في شكل جداول ورسومات بيانية.

بين التحليل الإحصائي (إختبار "ت" المستقل) أن هناك فرقاً ذو دلالة إحصائية بين الطريقتين أعلاه، ويعزى ذلك إلى إختلاف المحتوى المائي للبلازما، التداخل مع الأيونات الأخرى، إلتقاء متبقي السائل في الجهاز، إرتباط الأيونات بالبروتين أو بالروابط الأخرى وذلك عند إستخدام جهاز القطب الأيوني الانتقائي الكهربائي.

من المحتمل أن التآرجح في المصدر الضوئي هو سبب الإختلاف في النتائج عند إستخدام جهاز الطيف اللهبى.

النتائج أثبتت ان جهاز القطب الايوني الانتقائي الكهربائي افضل من جهاز الطيف اللهبى فى قياس الصوديوم والبوتاسيوم.

أوصت الدراسة بضرورة إجراء المعايير المطلوبة لدقة وضبط الطرق الجديدة.



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