

## **Dedication**

To my great parents: Ekhlās Omer Ali Taha and Abd elhameed Eltoom  
who are behind any success in my life.

To my honest husband Mohammed Omer and my lovely kids  
Fatima and Omer.

To my sisters: Eslām, Ehsan, Tawheed and brothers: Mohamed, Yousif  
and Mostafa for their support and encouragement throughout my life.

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## ACRONYMS AND ABBREVIATIONS

<b>CB</b>	<b>circuit breaker</b>
<b>RCD</b>	residual-current device
<b>RCCB</b>	<b>residual current circuit breaker</b>
<b>GFCI</b>	<b>ground fault circuit interrupter</b>
<b>RCBO</b>	<b>residual current operated circuit-breaker with integral over-current protection</b>
<b>ECG</b>	<b>Electro Cardio Game</b>
<b>CT Scan</b>	<b>Computed Tomography Scan</b>
<b>SELV</b>	<b>separated/safety extra-low voltage</b>
<b>LIM</b>	<b>line-isolation monitor</b>
<b>UPS</b>	<b>Uninterruptable power supply</b>
<b>BESS</b>	<b>Battery Electric Storage System</b>
<b>EPSS</b>	<b>Emergency power supply system</b>
<b>NEC</b>	<b>National Electrical Code</b>
<b>GFCIs</b>	<b>Ground-fault circuit interrupts</b>
<b>ADS</b>	<b>Automatic Disconnection of Supply</b>

## **Abstract**

The importance of this study being discussed offer one of the most important electrical safety requirements (electrical grounding) in health care facilities, where the lack of grounding system in these important facilities leads to damage and electrical hazards (damages in medical devices lead to a wrong diagnosis or treatment, burns, Electric shocks to the patient and the device's user ).

The purpose of this study is to evaluate the application of the grounding system in hospitals and find out the reasons for the absence of such regulations on these important facilities and then search for solutions to these reasons. Sixteen hospitals have been surveyed (Three in Khartoum state and thirteen hospitals in different states), using a checklist designed by the researcher as a first stage and then the results were analyzed using the statistical program SPSS. In the second stage, the researcher conducted field visits to do a visual scan for seven hospitals to determine the current status of the application of grounding systems. The third and final stage is to search for an alternative metal to pure copper used in the wedge grounding in attempt to reduce the cost of the grounding system.

The results showed that most of the hospitals that have been surveyed either had not contain a grounding system, or the grounding system does not function because it's old or due to not knowing it's place , in some cases the system exists and is enabled but doesn't meet all the need for the hospital .also the researcher has reached to the possibility of using steel metal after painted electrochemically with copper instead of using pure copper earthing system, which led to reduce the cost of rod from 800 pound to 50 pound.

## المستخلص

تأتي أهمية هذه الدراسة كونها تناقش توفر احد اهم متطلبات السلامة الكهربائية (التأريض الكهربائي) في مرافق الرعاية الصحية ، حيث ان عدم توفر نظام التأريض في هذه المرافق الهامة يقود الى اضرار واطار كهربائية (اضرار في الاجهزة الطبية تقود الي التشخيص او العلاج الخاطئ ،حروق ، صعقات كهربائية للمريض ومستخدم الجهاز).

الغرض من هذه الدراسة هو تقييم تطبيق نظام التاريزض في المستشفيات ومعرفة اسباب غياب تلك الانظمة عن هذه المرافق الهامة ومن ثم البحث عن حلول لهذه الاسباب. وقد تم مسح عدد ١٦ مستشفى (٣ من ولاية الخرطوم و ١٣ من ولايات مختلفه) وذلك باستخدام قائمة تدقيق مصممة من قبل الباحث كمرحلة اولى ثم تحليل النتائج باستخدام البرنامج الاحصائي SPSS ، في المرحلة الثانية قام الباحث بزيارات ميدانية للقيام بفحص مرئي لعدد ٧ مستشفيات للوقوف علي الوضع الراهن لتطبيق نظم التأريض ، المرحلة الثالثة والاخيرة وهي البحث عن معدن بديل للنحاس الصافي المستخدم في وتد التأريض وذلك في محاوله لتقليل تكلفة نظام التأريض. اوضحت النتائج ان معظم المستشفيات التي تم مسحها وزيارتها إما لاتحتوي علي نظام للتأريض او ان نظام التأريض لايعمل نتيجة لقدمه او نتيجة لعدم معرفة مكان وجوده وفي بعض الحالات فإن النظام موجود ومفعّل لكنه لايفي كل حاجة المستشفى.كما تم التوصل الي امكانية استخدام معدن الإستيل بعد طلائه كهروكيميائيا بالنحاس بدلا عن إستخدام النحاس الصافي في نظام التأريض مما أدى لتقليل تكلفة القضيب من ٨٠٠ جنيه الي ٥٠ جنيه.



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