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Electrical Safety in Clinical Engineering

(The Lack of Earthing)

A Project Submitted In Partial Fulfillment for the Requirement of the Degree of B.Sc. (Honor) in Biomedical Engineering

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Abstract

The importance of this study stems from the significant role of earthing in electrical safety.

The purpose of this study is to provide an evaluation of earthing implementation in Khartoum hospitals.

Results indicated that the majority of Khartoum hospitals are partially used earthing, and Cardiology related departments are completely earthed.

The level of earthing system specifications is accepted according to the standards. However, there is a lack of earthing electrode regular maintenance (despite the use of conventional method) and regular grounding tests; therefor the effectiveness of earthing is doubtful.

المستخلص

تنبع اهمية هذه الدراسة من الدور الجوهري للتأريض في الامان الكهربي. الهدف من هذه الدراسة هو توفير تقييم لتطبيق التأريض الكهربي في مستشفيات ولاية الخرطوم.

اشارت النتائج الى ان غالبية المستشفيات تطبق التاريض الكهربي بصوره جزئية, اما الاقسام والمنشات المختصه بطب القلب تطبق التاريض بصوره كاملة.

على مستوى المواصفات, اشارت النتائج الى ان المستوى مقبول بناءا على المعايير, ولكن وجد ان اجراءات صيانة الكترود التاريض غير متوفرة (على الرغم من ان طريقة التاريض المستخدمة هي الطريقة التقليدية), بالاضافة الى عدم توفر الاختبارات الدورية لتاريض الاجهزة, ولذلك فإن الاداء الجيد امر مشكوك فيه.

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1.1 Introduction

The patient in hospital is the center of care, but he is also helpless in the center of potential dangers. Electrical safety is very important in hospitals as patients may be undergoing a diagnostic or treatment procedure where the protective effect of dry skin is reduced. Also patients may be unattended, unconscious or anaesthetized and may not respond normally to an electric current. Further, electrically conductive solutions, such as blood and saline, are often present .in patient treatment areas and may drip or spill on electrical equipment. Earthing and the quality of earthing, significantly impact the overall quality of electrical safety.

Earthing is defined as a conducting connection by which a circuit or equipment is connected to the earth. The connection is used for establishing and maintaining the potential of the earth, or approximately that potential, on the circuit or equipment connected to it.

1.2 Problem statement

Some incidents which might be related to the lack of earthing, like electrocutions, not accurate measurement and electrical apparatus damage were reported within some Sudanese hospitals , not officially; due to the lack of statistics.

-In addition, death from fibrillation induced via leakage currents in a catheter is very difficult to distinguish from death by natural causes (1). So we have a special interest in cardiology instruments, to study the possibility of the existence of such hidden cases in terms of the lack of earthing.

The motivation for this study is to provide an evaluation of electrical earthing in Sudanese hospitals and its associated impact in electrical safety.

1.3 The hypothesis

Is that there are indications of the lack of earthing due to financial reasons and/or lack of awareness.

1.1.1 1.4 The research objectives

1.2 1.4.1 General objective:

To evaluate the earthing implementation in healthcare facilities (case study on some Khartoum state hospitals) to improve the electrical safety

1.3 1.4.2 The specific objectives:

- To study the availability of earthing in healthcare facilities.
- To study the earthing types and quality.
- To study the reasons of the lack of earthing.
- To study the problems associated with the lack of earthing.
- To study the hazards of leakage currents in cardiology and possibility of fibrillation induced by leakage currents.
- To provide some suggested solutions with respect to the resent capabilities.

1.5 Study outline:

This study was divided into six chapters as the following:

1. Chapter one includes a general introduction to electrical safety and earthing in healthcare facilities, problem statement, hypothesis, study objectives and the study outlines.
2. Chapter two includes background studies.
3. Chapter three contains the theoretical fundamentals.
4. Chapter four contains the study methodology.
5. Chapter five contains the results and analysis.

6. Chapter six contains conclusions and recommendations.