

Dedication

To the spirit of my father,
As well as my mother, wife,
brothers, sisters and My SON.

I dedicate this Research

Acknowledgments

Thanks and gratitudes to those who cooperated to complete this study,
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Abstract

The Importance of this study is presented in discussing the availability of electrical safety requirements at the healthcare facilities according to the directions and recommended standards by organizations and associations in field of electrical safety such as NFPA, IEC, NEC, and AMMI, because the not available of electrical safety

requirements and absence of awareness, and knowledge about the electrical safety lead to electrical hazards (burns, electrical shock, misdiagnosis, inadequate therapy) which .effect on patient, medical equipment, and medical staff

The main purpose of study is evaluation of electrical safety implementation in medical departments (ICU, operating room, medical imaging, and hemodialysis) in Khartoum Hospitals, and investigates if the level of safety is different between departments according to the priority. The number of surveyed departments is 41 in 15 Hospitals (state, .(military, and non- state

The data was collected by many methods which include direct visits to Hospitals, visual inspection for electrical installations by using electrical safety checklist, as well as making interviews with engineers and technicians.

.SPSS program is used to analyze the results

The results indicated that the level of electrical safety in Khartoum Hospitals was middle in terms of power system and power distribution, grounding system, and application of electrical safety program. The level of electrical safety was low and may be absent in terms of using testing and protective devices, and the safety level was high in terms of electrical cords and extension cords. Also, the results revealed that the level of electrical safety doesn't differ between the medical departments in Khartoum Hospitals .according to the priority

المستخلص

تأتي أهمية هذه الدراسة كونها تناقش توفر متطلبات السلامة الكهربائي في مرافق الرعاية الصحية بناءً على التوجيهات والمعايير العالمية الموصى بها NFPA , من قبل المنظمات والجمعيات في مجال السلامة الكهربيه مثل حيث ان عدم توفرها وغياب الوعي والمعرفة ينتج عنه IEC, NEC, AMMI, أضرارواخطار كهربائية (حروق , صعقات كهربيه, تشخيص خاطيء, والعلاج غير المناسب) والتي تؤثر سلباً على كل من المريض والجهاز الطبي . والعاملين في المستشفى .

الغرض من هذه الدراسة هو تقييم تطبيق السلامة الكهربائي في الاقسام الطبيه (العناية المكثفه, العمليات, التصوير الطبي, والغسيل الكلوي) بمستشفيات ولاية الخرطوم, والتحقق فيما اذا كان مستوى السلامة الكهربيه متفاوت فيما بين الاقسام الطبيه بالمستشفى حسب الاولويه للقسم. وقد تم مسح 41 قسم من الاقسام الطبيه أعلا في 15 مستشفى حكومي وخاص بولاية الخرطوم.

استخدمت أدوات لجمع البيانات تمثلت في الزيارات الميدانيه الى المستشفيات والقيام بالفحص المرئي للتركيبات الكهربيه وجمع المعلومات عن السلامة الكهربائية بإستخدام قائمة فحص من تصميم الباحث, إضافة الى اجراء بعض المقابلات الشخصيه مع المهندسين والتقنيين والموظفين. وقد تم SPSS. تحليل النتائج بإستخدام البرنامج الاحصائي.

اوضحت النتائج ان مستوى السلامة الكهربيه كان متوسطاً فيما يتعلق بأنظمة الطاقه الكهربيه وتوزيعها ونظام التأريض وتطبيق برنامج السلامة الكهربيه في الاقسام الطبيه بالمستشفيات, وكان المستوى ضعيفاً ويكاد يكون معدوماً بالنسبه لإستخدام ادوات الحمايه الكهربيه وادوات اجراء اختبارات السلامة. بينما كان المستوى عالي ومقبولاً فيما يتعلق بالاسلاك والوصلات الكهربيه ولكن ليس بالشكل المثالي, و أوضحت النتائج ان مستوى السلامة الكهربيه لا يتفاوت بين الاقسام الطبيه في مستشفيات الخرطوم حسب الاولويه ونوع الاجراءات الكهربائيه في القسم الطبي.

Abbreviations

Abbreviation	Complete words
ANSI	American National Standards Institute.
AWG	American Wire Gauge.
ANOVA	Analysis of Variance.
AAMI	Association for the Advancement of Medical Instrumentation.
ATS	Automatic Transfer Switch.
CCU	Coronary Care Unit.
CI	Confidence Interval.
DF	Degree of Freedom
ESPIME	Electrical Safety Priority Index for Medical Equipment
ECG	Electrocardiogram.
EPSS	Emergency Power Supply System.
FDA	Food and Drug Administration.
GFCIs	Ground Fault Circuit Interrupters.
IEEE	Institute of Electrical and Electronics Engineering.
IPEM	Institute of Physics and Engineers in Medicine.
IMD	Insulation Resistance Monitoring Device
ICU	Intensive Care Unit.
IV	Intravenous.
IPS	Isolation Power Systems.
IT	Isolation Transformer.
JCAHO	Joint Commission on the Accreditation of Healthcare Organizations.
kVA	Kilovolt-ampere.
LIMs	.Line Isolation Monitors
mA	Milliampere.
MCBs	Mini Circuit Breakers.
NEC	National Electrical Code.

NEMA	National Electrical Manufacturers Association.
NFPA	National Fire Protection Association.
NC	Normal Condition.
OSHA	Occupational Safety and Health Administration.
PPE	Personal Protective Equipment.
RCD	Residual Current Device.
SELV	Safety Extra Low Voltage.
SFC	Single Fault Conditions.
SPSS	Statistical Package for the Social Sciences.
IEC	The International Electrotechnical Commission
UL	Underwriters Laboratory.
UPS	Uninterruptible Power Supply.
UK	United Kingdom.
U.S	United State.

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