EVALUATION OF OCCUPATIONAL HEALTH PRACTICE IN THE LAUNDRY AND LINEN SERVICE AT KENYATTA NATIONAL HOSPITAL, NAIROBI CITY COUNTY, KENYA

SHARON JEBET (BSc. Environmental Health)
Q22/CTY/PT/37570/2016

A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE DEGREE IN OCCUPATIONAL HEALTH AND SAFETY, SCHOOL OF HEALTH SCIENCES, KENYATTA UNIVERSITY.

NOVEMBER, 2022

DECLARATION

I declare that this thesis is my original work and has not been presented for award of any degree qualification in any other university

Signature:..... Date: 22/11/2022

SHARON JEBET

Department of Environmental and occupational Health

We confirm that the work reported in this thesis was conducted by the candidate under our supervision as the University Supervisors.

Signature:..... Date: 23/11/2022

Dr. Peterson Warutere

Department of Environmental and Occupational Health.

Kenyatta University

Signature:..... Date: 22nd NOV, 2022

Dr. Judy Mugo

Department of Population, Reproductive Health and Community Resource Management.

Kenyatta University

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ABBREVIATIONS AND ACRONYMS

BMP	Best management practices
CCOSH	Canadian Centre for Occupational Safety and Health
CDC	Centre for Disease Control
CNS	Central nervous system
DSR	Domestic Service Room
EU	European Union
HACCP	Hazard Analysis Critical Control Point
HCT	Health Care Textiles
HPD	Hearing protection devices
ICU	Intensive Care Unit
ILO	International Labor Organization
JCI	Joint Commission International
KNH	Kenyatta National Hospital
NACOSH	National Council for Occupational Safety and Health
NIHL	Noise induced hearing
OEL	Occupational exposure limit
OSH	Occupational Safety and Health.
OSHA	Occupational Safety and Health Administration
OT	Operating Theatre
PNL	Permissible Noise levels
PPE	Personal protective equipment
SARS	Severe Acute Respiratory Syndrome.

SOP	Standard Operating Procedures
TRSA	Textile Rental Services Association
UON	University of Nairobi
WHO	World Health organization

OPERATIONAL DEFINITION OF TERMS

Dissemination of results: This is a process which entails choosing of targets and context of getting results, if possible, liaising comprehensively with makers of policies and other relevant stakeholders to enhance making decisions based results.

Hazard Analysis Critical Control Point: This involves hazard analysis, identification, and establishment of important points, reviewing procedures, remedial actions, keeping records and process authentication.

Heat stress: Refers to physiological steps in which the body is strained from excess heat. This results to cramps, fatigue, rash, or heat stroke, each presenting with different signs with its management protocols.

Hygienic Healthcare Standards Certification: Refers to giving a written assurance to health providers adhering to clean, hygienic standards of care verified through a unit's quality assessment. Quality assessment and re-assessment to identify if washing was ideal, drying, ironing packing and transportation , ensuring that adequate disinfection criteria is kept.

Laundry: Refers to a room in a house, hotel, or institution where clothes and linen can be washed and ironed.

Linen: Refers to articles such as sheets or clothes made, or originally made, of linen.

Occupational diseases: This is an ailment of body dysfunction emanating from job or job related circumstances. Thus it implies the ailment occurred as a result to interaction with harmful substances or situations within ones working area.

Occupational health and safety: It is diverse field whose core role is to assure safety and wellbeing of those involved in gainful employment. Its aims to ensure an ideal workplace for the occupier and workers.

Service: Refers to system supplying a public need such as transport, communications, or utilities such as electricity and water. In this case it implies laundry

ABSTRACT

Health facility laundry ensures provision of enough, dirt free and continuous provision of garments for medical use. Main activities involve: Arranging, thorough cleaning, disinfecting, packing and dispatch of blankets, uniforms, gowns, towels, bed sheets, clothing, and apparel for patients, drapes and scrub suits among others. Safety hazards are features in the workplace with a potential to cause harm. This study aimed at evaluating occupational health practice of laundry and linen services at Kenyatta National Hospital in the Nairobi City County, Kenya. Specifically, the study sought to ascertain potential hazards, determine adherence levels and establish wet bulb globe temperature of workers in the Laundry and Linen Service at Kenyatta National Hospital. Those employees of all cadres who consented and had worked for at least three months were included, while those who met the inclusion criteria but were unwell at the time of the study were excluded .Sample size was determined using Yamane's(1967) formula. The study adopted a cross-sectional analytical design through a questionnaire that was structured. One-forty (140) participants were recruited for interviewing through a systematic random sampling technique. Data was cleaned and analysis was done by use of version 22.0 of SPSS software. A Chi-test was calculated to show associations between variables. The results revealed that respondent's age was significantly associated with knowledge ($x^2(2) = 5.483$, $p = 0.045$, $p<0.05$) as well as association between religion and knowledge of common hazards within the laundry department (($x^2(1) = 4.172$, $p = 0.041$, $p<0.05$). The analysis of association revealed that age ($x^2(2) = 9.091$, $p = 0.011$, $p<0.05$), level of education attained ($x^2(1) = 10.76$, $p = 0.001$, $p<0.05$) and marital status ($x^2(2) = 9.768$, $p = 0.008$, $p<0.05$) were had a signification association with knowledge on environmental aspects in laundry and linen services. The study has provided a strong understanding on important aspects regarding occupational health and safety practices within the facility. There were various types of hazards identified, adherence to OSH protocols had gaps and there was an elevated WBGT in some areas of the laundry department. The hospital has made significant efforts in implementing various health and safety programs which can be adopted across different departments. This include programs such as safety and health audit, training committees on safety and health and Occupational health surveillance However there have been significant challenges regarding implementation and ensuring that there is high level of sustainability in terms of supplies, resources and available knowledge among employees within the hospital. The adoption of different programs within the hospital has been integral in maintaining strong focus on important changes which help in defining improved outcomes. The hospital management needs to ensure that workers are continuously trained on existing and emerging safety hazards, implementation of safety protocols and installation of AC system and improved ventilation within the laundry. The recommendations of this study need to be acted upon by the hospital management and policy makers in health in other facilities.

CHAPTER ONE : INTRODUCTION

1.1 Background information

Laundry services ensure every user is persistently provided with best, unbroken and clean linen. The main tasks involved include sorting of the linen, washing, extraction, drying, pressing, folding and delivering. In Modern day evolving hospital care, admitted persons require garment provision each passing day. This makes it a requirement for ensuring conformability and patient safety, as per services of national hospitals (Laico, 2016).

Procedures from the international perspective presume that secretions from sick individuals contain active microbial and viral disease agents. To prevent nosocomial infections, measures should be put in place to avoid contacts with from the secretions and other sick persons, care providers and members of the community. That is why all the linens used in healthcare facilities should be washed and dried using appropriate methods (Khalil, 2014).

The reason of garment washing is to get rid or remove microbial dirt. Water cleaning, microbial redundancy, and chemical thinning are the three cornerstones of the clothing cleaning process. These steps must be taken regardless of whether linen is used or if the patient is contagious. The procedures used during washing of linen include visible removal of contaminants, thermal/chemical disinfection and dilution to reduce viable pathogens. This should be followed by rinsing the materials at least twice enhancing removal of disinfectant and detergent effluent. Cleaning should not be done where other clean linen are stored to avoid contamination (Kirk's, 2013).

It is important to note that linen hampers need to be opened close to washing machine to avoid emptying onto the floor. Similarly, all clear polythene bags are discarded as hospital waste. When a moisture bag is present in the infectious linen, avoid opening it and instead place it directly into the washing machine. Place the usable hampers into the washing machine and follow the manufacturer's instruction based on the weight.

Wash the used and highly infectious materials using thermal decontamination. Elimination of pathogens is done by maintaining a temperature of 65°C for at least a sixth of an hour or 71°C for about three minutes. This procedure guarantees proper mixing and heat dispersion. According to Ford and Dan (2013) they argued that when utilizing machines with low degrees of loading less than 0.056kg/L, 4 minutes should be added and while those with more than 0.056kg/L degrees require an addition of at least 8 minutes to given timelines is recommended. The primary goal when developing occupational health and safety measures is to protect workers from being exposed to health hazards arising from the workplace. Employees should be protected from physical and psychological illnesses. It is the duty of management to ensure workers are protected from occupational risks in the workplace.

Laundries are responsible for delivering sterilized clothing across the hospital's various units. Lack of or delay in delivery of hospital clothing has an impact on hospital activities and the quality of health treatment, particularly in terms of patient safety and comfort. Operating rooms, the inpatient units, ICU, and other critical locations rely heavily on the laundry service's effectiveness, since a shortage of or delayed delivery of hospital linen can lead to significant difficulties in patients' care. Despite its importance,

several studies have shown increase in nosocomial infections through linen used in facilities.

Considering significance of laundry unit in containing nosocomial infections, little efforts have been put in place to address the safety and health of workers. Employees provide laundry services in hospitals perform arduous responsibilities and are subjected to a variety of occupational and environmental hazards, including puncture and laceration exacerbated by syringes and scalpels. Infections resulting from microbial, economic output expectations, autocratic professional relationships, which at times strain worker and supervisor's relationship hindering efficiency and physicochemical and biological hazards such as excessive heat, humidity, dust, fumes, steam, and loud sounds. Wounds created by syringes and other incision objects expose patients to infections through microorganisms in bodily fluids including blood. Stressors make it very difficult for personnel to conform with organizational procedures, leading to changes in daily routines that can occasionally result in health risks.

Management ought to put mechanisms in place in the workplace, communities surrounding the workplaces and wider environments to minimize risks associated with nosocomial infections. This is because this infections can be acquired during the process of receiving healthcare that was not present during admission .They should embrace adoption of appropriate laws and change attitude to workers to enhance commitment to health and safety issues. Existence of contaminants in the workplace poses risks to workers affecting their ability to provide quality services to clients. Physical and biological factors are also potential health risks. Health risks and human organisms can interact through the skin, ingestion and inhalation (Navrbjerg, etal 2019).

Other factors mentioned in the literature include worker discontent and too long working hours while standing up with no breaks, which might exacerbate psychical difficulties and cause diseases.

Treated linens should be kept clean and free of damage or discoloration. Processed linens which fail to meet the standards must be thrown of via domestic solid waste through linen service division or place of origin through notification if necessary. Laundry hamper should indeed be emptied as closely to a washing machine and it should not be emptied on the floor. Clear polythene bags should be discarded as medical waste. In case of water-soluble bag such as the infected linen, it should not be unsealed and must be directly placed into the machine. After dissolving the linens, put the reusable hamper into the machine. It is important following instructions as per the manufacturer based on the minimum and maximum loading weights.

1.2 Statement of the problem

Globally, linen handling in the healthcare industry has been undervalued despite its importance. There are standard operating procedures (SOPs) on how to handle dirty linen by healthcare facilities. This gives details how they should be collected from the user point, sorting, packing, laundry cleansing and package to be ready for use again by the patients and care providers. Before collecting and distributing, it is important to segregate all linen, bagged, label and store them separately. This might be a dirty place, such as sluices, or a distinct dirty linen facility. In the domestic services room, used/infectious linen must not be stored. Despite existence of SOPs of handling healthcare linen, they have not been keenly observed by those employees providing

laundry services. This may be ascribed to a variety of variables ranging from mindset, competence, or an inadequate skills support monitoring .Krishna etal, 2016.

A retrospective descriptive cross-sectional study of occupational injuries experienced by workers at a hospital laundry in Bulawayo found that 62 workers from a total of 153 were injured, with one fatal injury. About 40% of the injuries were pricks, whereas 16 percent involved sprained ankles and wrists. Contact with chemical substance was one of the risks discovered during the walk-through survey. Despite lack of records on accident causes, working interventions such as the implementation of SOPs, might have been established to avoid injuries (Gonese et al., 2016).

Hearing and respiratory protection were utilized sparingly and irregularly, according to the findings of a survey of SOPs use and safety behavior among 53 casual employees at Kentucky Hospital laundry in the United States. Half of the workers who used equipment did so while wearing safety earplugs and masks. Sixty percent of workers reported using equipment that had missing or broken earplugs or safety masks (Westneat and Kidd, 2016).

Noncompliance with SOP guidelines remained a problem in the workplace, according to a poll of safety specialists performed in 2006 and 2007. According to a poll of participants at the National Safety Council (NSC) Congress, 87 percent of respondents stated they witnessed personnel knowing the current dangers and having to wear PPE when they should have .Clarke & Kopps 2020.

Most African nations have indeed been destroyed by tropical illnesses, poverty rates are alarming wars, and conflicts have been continuous. As a consequence, public facilities including hospitals have taken full advantage of the crisis. Several hospitals have all had

poor management systems, and few studies are available on laundry and linens production, pickup, segmentation, use, and disposal, as well as associated environmental effect. As a consequence of recycling already contaminated clothing, occupational illnesses have become prevalent.

Kenya, as a young country, has faced the same challenges just like other third-world nations in terms of laundry and linen pickup, segregation, laundering, stitching adjustments, and usage. It has resulted in frequent transmission of occupational illnesses that could have been prevented. The research aimed to bridge the existing gaps inside the majority of public and private hospitals. This was done to identify possible hazards, environmental consequences, degrees of compliance, and also how the WBGT levels influence employees.

Every day, a large number of people are released and hospitalized at the Kenyatta National Hospital. There is a high chance on transmission of nosocomial infections to new admissions.

It has multi-disciplinary facilities with a large volume of linens usage. As a result, it is important to streamline the process to guarantee that the referral hospital has a consistent supply, segregation, cleaning, and usage of linen. This was done to guarantee that the laundry department's facilities were adequately utilized and that the frequency of occupational illnesses was reduced. This lowered hospital bills, reduced time wastage, sick offs, absenteeism due to injury, compensation and mitigating the wet bulb index levels that in turn reduced cases of heat strains and stresses witnessed inside the laundry department.

1.3 Justification of the study

Kenyatta National Hospital is the largest referral Hospital in Kenya serving a high population which leads to use of more linen. This justifies the study's aim of finding out whether the laid down SOPs are being adhered to. This is because many patients with different conditions and diseases get themselves into the facility increasing the risks of transmission of infections through poor management of laundry services. Little studies exists on attitude and knowledge among laundry workers towards observing SOPs. This study would provide useful literature for future reference.

1.4 Research questions

1. What are the potential hazards associated with laundry and linen services at Kenyatta National Hospital?
2. What are the adherence levels to the laundry and linen service standards at Kenyatta National Hospital?
3. What is the Wet bulb globe temperature index in the Laundry and Linen Services at Kenyatta National Hospital?

1.5 Objectives of the study

1.5.1 Broad objective

To assess the occupational health practice in the laundry and linen services at Kenyatta National Hospital in the Nairobi City County, Kenya.

1.5.2 Specific objectives

1. To identify the potential hazards associated with laundry and linen services at Kenyatta National Hospital.

2. To evaluate the adherence level to the laundry and linen services standards at Kenyatta National Hospital.
3. To establish the wet bulb globe temperature of workers in the Laundry and Linen Service at Kenyatta National Hospital.

1.6 Significance of the study

The results of this study would be useful to KNH management in improving linen handling in this premier facility. This would reduce direct and indirect costs associated with poor management of laundry services as outlined in the SOPs. Productivity would be enhanced as rates of absenteeism will be minimized as well as creating a good hospital reputation. The study results would form a knowledge base for future reference and benchmarking to other institutions and researchers.

1.7 Study Limitation

The study involved a small group of participants at laundry at Kenyatta National hospital. The findings from the study may not be representative of all laundry practice, but gave a clue to what may be happening in other areas regarding laundry practice.

1.8 Delimitation of the study

Studies with a bigger population and coverage that may involve more than one facility and a wider geographical area would be recommended for better comparison of the results.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter exonerates gaps existing in literature regarding linen and laundry practice and the necessary certification for referencing in order to mitigate injuries, infections, adherence to set SOPs and reduce cost of hospital bills. Compassionate laundry service companies go to considerable lengths to guarantee that healthcare facilities or other medical centers receive therapeutic textiles. Organizations must work in a safe manner. However, once inside the institution, launderers' responsibility in preserving hygiene is restricted and/or negligible (Lass, 2020). Healthcare linen service providers that comply with OSHA standards are certified via though laundry plant assessment and inspection by an expert in quantified biological testing.

Inspection and frequent re-inspection ensure all linens are laundered, left to dry, pressed, folded, packaged, and dispatched in accordance with essential sanitizing standards. Between the inspections, continuous microbiological testing quantifies hygiene and BMP adherence. Reports by Joint Commission International Standard PCI.7.(2020) showed "hospitals should minimize risk of infection through providing appropriate medical equipment disinfection, as well as effective laundering and fabric management."

This multinational association represents firms that offer washed clothing, costumes, linen, mats, bathrobes, as well as other items required for companies to thrive safely, efficient facilities while serving customers, and ensuring a neat, pleasant atmosphere and reputation. TRSA membership are the most investing heavily laundry, uniforms,

and facilities service companies in the health care industry, laundry an approximated ninety percent of North American clinical linen in volume.

2.2 Hygienic Healthcare Standards Certification

While washing techniques are approved, there are no regulations for the intent of protecting linens. "Instead of rigorous rules and regulations, proper sanitary as well as widely accepted storage and processing of tidy textiles is suggested" (CDC, 2007). "Recommendation for Isolation Precautions: Restricting Propagation of Contagious Substances in Healthcare Settings." It is also the responsibility of healthcare organizations administration to create a comprehensive policy handbook outlining the best practices for different components of HCT administration.

A handbook like this acts as a reference for training employees and should be used to review and assess the linen-handling operations. Treatment and disposal that provide the desired outcomes are critical since infection can occur anywhere at stage of the process. Each component which comes into contact with the health - care textile should be considered a factor of the textile's cleanliness.

2.3 Potential hazards in hospital associated with Laundry

According to studies, epidemics of contagious diseases linked to laundered public healthcare linens reportedly afflicted more than 350 patients internationally throughout the last 43 years. One of most major reason is vulnerability to clean fabrics to environmental pollution. A patient will have the most touch with linens and bedding coverings in a hospital (Moore, 2019). The document was created in collaboration with sanitary Clean Hospital accredited facilities for experts in infection prevention, risk assessment, ecological benefits, and quality assurance.

While clinics create and implement policies for appropriately warehousing and dispensing HCTs, and also instruct individuals who transport linens, Hygienic Hospitals are glad to share issues of management review including practices to assist the operations. Effective rules and practices guarantee that almost all linens is clean and sanitary whenever it reaches the laundry facilities. Beyond that, it is the responsibility of each and every person that handles, keeps, and dispenses the linens by following laid down procedures to ensure hygiene is preserved. Presumptions on any interaction during transport, warehousing, and distribution facilities might potentially infect the material.

It is critical to eliminate any chance of mixing washed linen and dirty clothes when transporting, warehousing, and dispersing them. The OSH Administration states that unhygienic linen ought not to be processed or rinsed it's being used; instead, it must be transferred to a laundry for disinfections as instructed by OSHA. Tainted textiles should indeed be placed and carried in appropriately labeled containers and cleaned fabrics should indeed be conveyed separately to dirty fabrics inside a truck.

With several essential sectors to evaluate, using the Hazard Analysis Critical Control Point (HACCP) system identifies critical elements for focusing suitable capabilities. These principles include, “Hazard analysis, Identifying critical control point, Establishing critical limits, Procedures for monitoring, Correction actions, Keeping of records and Procedures for verification.”

2.4 Previous related studies

Ahmed (2020) discovered that only 60% of workers in hospital laundry adhered to SOPs all of the time in a research performed at Al-Khobar to examine their understanding of safety and health practice with relation to preventative measures of occupational risks. The study revealed that workers' understanding of workplace risks and application of preventative measures was average. Almost 89.4 percent of those polled agreed that they should wear masks, boots, and protective clothes when working. Furthermore, 83.3 percent were aware that microbes may enter their bodies through three routes: ingestion, cutaneous contact, and inhalation. Furthermore, 45.5 percent of respondents were aware of the need of appropriate washing.

Another research on safety measures at the university hospital laundry, performed in the Capricorn District of Limpopo Province, found that 95 percent of female participants were aware of safety protocols, while 91 percent were aware of cross infections. Ninety percent of the male participants were aware of heat stress, and 72 percent were aware of work-related risks (Haifa, 2020).

Noncompliance with SOP guidelines remained a problem in the workplace, according to a poll of safety specialists performed in 2006 and 2007. According to a poll of participants at the National Safety Council (NSC) Congress, 87 percent of respondents stated they witnessed personnel knowing the current dangers and having to wear PPE when they should have (Dyer, 2019). Another research in 2017 found that 85 percent of respondents did not wear PPE due to them being unpleasant, unnecessary, too hot, did not fit well, and were ugly to look at (Raylesburg, 2018).

According to the Australian Department of Labour (2020 Revised), it was discovered that implementing safety protocols in public hospitals was difficult due to low adherence, and they contributed to the challenge of having recurring complaints of the occurrence of common accidents, particularly in tailoring and ironing zones. According to the study, managers should understand the differences between ambient, convective, and radiant heat in order to select the proper heat protective apparel for personnel.

Another OSH definition of risks and microbial reduction program in the United States provides the programs to address work hazards assessment. Implement engineering controls, teach staff on workplace risks, and emphasize the necessity of following safety standards to prevent hospital cross-infections. The Office of Training and Education at OSHA (2019). The Department of Environmental Safety at the University of Maryland has created a worker safety guideline (2020). Though not particular to the laundry industry, it illustrates the importance of reducing and preventing risks from impacting workers. This guideline includes a declaration demonstrating the institution's commitment to using protocols, the manner of selection, and directions on risk assessment, which include a list of the institution's dangers, the person's duty, and the parts of the body that require protection. It also emphasizes the necessity of educating the user about hazards and risk management.

The American Laundry Society (2020) offers a document that provides assistance on the selection and application of SOPs in laundry operations. This guideline covers particular concerns for isolation, selection, sorting, cleaning, and usage and allows business people to investigate ways to improve their own safety based on the available conditions.

Cox & Borgias, (2019) reported that, “The employer must verify that each affected employee has received and understood the required training through a written certification that lists the name of each employee trained; indicates the date(s) of training; and identifies the subject of the certification on effective workplace safety planning and the use of safety equipment. A risk assessment methodology, an evaluation of other control options to protect workers, such as selection criteria and procedures, performance criteria, user training requirements, storage, maintenance, and decontamination requirements, and auditing or program re-evaluation procedures, are all required”.

Increased comfort, greater worker productivity, and regulatory compliance minimize work-related injuries, which generate liability expenses, insurance premiums, and decreased production, as well as unfavorable publicity for the company. This is a finding by Sharma & Shray (2019), who also observed that laundry and linen services have their own set of requirements and urge detergent producers to position their products with an emphasis on specialized functionality in terms of laundry usage. According to them, manufacturers should continue to engage in research and development of multifunctional goods in order to increase end customer comfort.

A study done in Makassar, Indonesia, on Ergonomic and social demographic factors on use in hospital laundry denotes that education and duration of work have significance with safety protocol utilization where age has no significance. On the same study, workers training on OSH has significant factors in SOP utilization. In this study, workers took PPE as luxuries and others deduced that their employers did not supply them adequately. Lilah etal, 2017.

In India, Singh (2018) reported that hearing protection reduced hearing loss among workers working in the laundry. Anthropometries and ergonomic difficulties were reported in a 2018 research conducted in South Africa by Zungu. According to the study, it is appropriate to consider women's physical characteristics and comfort to ensure workers' safety and hygiene. It is crucial for the efficiency of PPE compliance with an individual's anthropometric characteristics, the task at hand, and the work environment. According to Hongwei (2019), equipment designers and producers should develop anthropometric applications for product design and increase product efficacy.

Another Ethiopian study concluded that SOP usage was low among hospital laundry staff in Addis Abeba. The primary reasons for SOP non-usage were inadequate resources and instructions on how to utilize them. The existence of user training manuals, safety training, safety orientation, and governmental monitoring were all variables related with the adoption of safety protocols. Continuous monitoring should be provided to guarantee that all personnel have the appropriate supplies and instruction on how to use them (Addisu, 2018).

A study was conducted in Uganda to determine employee use of safety rules in the provincial hospital laundry department, and the results revealed a relatively high level (70.1 percent) use of SOPs, a high positive attitude (95%) toward hazard reduction, and a high availability of guidelines or policies regarding heat stress in laundry. The findings reveal that hazard prevention was seen as important and required by the employees. The qualitative findings from the key informants corroborated these findings. To decrease risks, the authors suggested that ongoing sensitization and the availability of guidelines and policies must be firmly encouraged (Mildred, 2019).

In Kenya, a survey conducted by Waweru in 2012 found that 98% of workers were supplied with SOPs at work. He observed that the industries in the Nairobi Metropolis, where this study is being conducted, were compliant with the OSHA 2007 standard of providing workers with required working practices. Wearing hearing protection, such as earplugs and earmuffs, is essential for preventing noise-induced hearing loss (NIHL) in the workplace. The success of hearing protection devices (HPDs) in preventing NIHL is highly reliant on the equipment's proper usage, use, and compliance (Chauhan, 2015).

2.5 Environmental aspects prevalent in hospital laundry and linen service

Good rules and practices guarantee clean linen leave the washing facility. Following that, all laundry workers should adhere to correct protocols ensuring it remains sanitary. The easiest approach to do so is to presume that any interaction with the linen during the shipping, storage, and distribution processes might possibly contaminate it. It is critical to eliminate any chance of mixing clean linen with dirty linen while shipping, storing, and distributing it.

2.6 Prevention and control measures of workplace hazards

Safety is, without doubt, the most crucial investment we can make. Most managements do not put safety before profit without the knowledge that safety improves profits (Whorter, 2015). WHO advices organizations to initiate controls at planning stage as it contributes to effective and cheaper controls. Identifying and mitigating exposures to occupational hazards before work surveillance programs for the health problem k begins is the objective for every safety professional. Employers should aim at getting every worker involved in the lifecycle of production process to own hazard control systems (Spurlock, 2017).

2.7 Hazard control

This control tries to remove the hazard from the source by erecting a barrier between the hazard and the worker; it accomplishes this by enclosure or isolation, separation, and local ventilation. They are unaffected by the contact of the workers. They have no negative impact on the worker's comfort or productivity (CDC, 2015). According to Armstrong (2018), risk assessment identifies particular hazards and quantifies the risks associated with them. Audits of health and safety provides a comprehensive investigation of safety policies, procedures, and practices for the entire company or department. As a result, risk assessments analyze and forecast risks in qualitative and quantitative terms, with an emphasis on estimating the likelihood of consequences on the health of human and natural resources. As a result, the following goals are pursued: Hazard elimination via design improvements and manufacturing changes; Substitution through consumable replacement; administrative through warning systems, barriers among others and adequate use of PPEs.

In instances where a danger cannot be mitigated by other methods, all workplaces must show safety signs and signals. They should be in a convenient place where they are easily seen and understandable. Signs of safety need to indicate forbidden activities for example no smoking in this area. Safety signs may include warning, fire equipment, obligatory and prohibitive signs. There might be a safe condition indicator showing information on safe condition status. All symbols and signs have specifications which are regulated to ensure ease of understanding and they must be purchased at a cost.

2.8 Management of hazard control

Management controls include the following: safe work systems, training and information, welfare, and monitoring and supervision. They change the way work is done by implementing policies, regulations, and operating procedures, as well as training, housekeeping and personal hygiene practices, and emergency response systems. The Canadian Center for Occupational Safety and Health (CCOSH) is a non-profit organization that promotes OSH in Canada. Adoption of measures and processes to ensure employee safety in order to have a solid and effective management system. This means resources must be committed to achieve all these requirements (CCOSH, 2019). The implementation costs of OSH measures costs of developing and implementing health and safety measures will be borne in a variety of ways.

According to an I.L.O (2014) guideline regarding implementation of OSH, hospital laundry should guarantee personnel are safeguarded at work. The execution of such guidelines is a managerial responsibility. According to the New Zealand Guidelines for Safe Work (2019), unmanaged laundry operations create a dangerous working environment, resulting in industrial losses through: production, workers, income and so on. Compensation for time loss results as a result of hiring unfamiliar temporary workers, fines, legal and investigative fees, loss of goodwill a drop in employee morale, suffering and pain results to incurring extra costs. As a result, both companies and individual workers should try to maintain safety via the adoption of correct laundry processes, which increases motivation and optimizes knowledge about workplace risk management.

Laundry methods are becoming more standardized in the EU. The standard is verified using a mechanism agreed upon by member nations and validated in accordance with European Safety rules via a particular product EC-Type inspection certificate (2018). This guarantees that the laundry consumables sold to the organization are of high quality, lawful, and not counterfeit. The Thermal Laundry Society (2017) in Europe established recommendations for the use of hospital laundry. It charges companies, workers, and supervisors for the training program. This is to guarantee that workplace assessment, supply, care, maintenance, and training are all in place. Employers should have policies in place, according to several of the ideas.

Management is liable and accountable for the performance of safety and health. Prior to employment, employees should be involved and trained in respect job aspects to ensure they dispense their duties in the workplace in a safe manner. Productivity increases with increased safety in the work environment. This is because this reduces unnecessary resources that may be incurred as a result of accidents occurring in the business environment. To achieve this, management of various business should have in place OSH procedures and must be of priority to them (Durnbak, 2020).

The Occupational Safety and Health Act of Kenya (2007) defines the steps that companies are required to follow in order to comply and enhance health and safety in the working environment by reducing the chances illnesses and injuries occurring. It specifies the quality and safety requirements for any manual or automated activity. Among these is a requirement pertaining to a safe and clean working environment in which employees are not exposed to dangers on the job. This has resulted in fewer accidents and illnesses at Kenyan workplaces as a result of the deployment of effective

risk management systems, according to Chepkener (2016). Because of a lack of required resources, the majority of these incidents that occur in the informal sector go unreported.

2.9 Legal framework

The International Labour Organization (ILO) has established worldwide norms and regulations to help member nations in developing their own safety and health standards and implementing them on a national and organizational level. The two ILO codes are concerned with employees' preventative and protective roles in all industries. They safeguard employees from occupational dangers and help to avoid or decrease work-related injuries, illnesses, and accidents. It also encourages efficient dialogue and collaboration between governments and employers' worker organizations in the development of occupational safety and health in the industrial environment and service production.

The ILO Code also suggests that all domesticated norms of practice should be consistent with all national requirements of that state, and that the people who choose them should be taught to choose suitable equipment to guarantee proper fit, acceptable comfort, and failure likelihood. The wearer's characteristics must be installed and replaced in accordance with the instructions. The ILO (2014) Code recognizes and investigates a variety of physical dangers that are regularly encountered in the laundry and linen industries. Noise, heat stress, tight spaces, dust, and gases are examples of these. The International Labour Organization's code of practice for industries that emit greenhouse gases.

The International Labour Organization (ILO) defines, “exposure to hazardous gases in production cannot be ensured by other means, such as eliminating the risk, controlling the risk at the source, or minimizing the risk, the employer should provide and maintain suitable practice in relation to the type of work and risks, in consultation with workers and or their representatives.”

2.10 The occupational safety and health Act 2007

The Act is applicable to all places of work, whether one is employed on permanent or temporary terms of service. Workplace refers to any land, premises, location, vessel, or thing where a worker is employed and may include premises, land, vessel, location or any other thing providing employment opportunity. The act's objective ensure employees are given protection against occupational dangers to their health, safety and overall welfare as a result of the activities they are engaged in their places of work. It also establishes National Council for Occupational Safety and Health (NACOSH) in the country. The employer (management) has a duty to ensure employees are safeguarded from hazardous activities which may jeopardize their safety and health by strictly putting in place measures to achieve such. The legislation requires people appointed as occupational safety and health officers to monitor compliance. Subsidiary laws are included in the legislation to help with compliance.

2.11 Rules adopted by occupational safety and health Act 2007

2.11.1 Hazardous substances rules 2007, L. NO.60 of 2007

This subsidiary legislation was established to reduce occupational exposure to dangerous or possibly harmful chemicals, to set exposure limits, and to reduce job

performance in hazardous situations or circumstances. This regulation says that in the event of airborne hazardous chemicals, the employee must supply appropriate respiratory PPE, and in the case of any absorbable hazardous substance, the employer must provide impermeable PPE to control the risks below the Occupational Exposure Limit (OEL). Employees must be supplied with information, guidance, and training on how to operate the equipment correctly. The employer should offer PPE storage and ensure that contaminated PPE is segregated and decontaminated in line with the procedures in place.

2.11.2 Noise prevention and control rule 2005. L. NO.25

This law states that, "no worker should be exposed to a noise level in excess of a continuous equivalent of 90 dB (A) in 8 hours within any 24-hour duration, and 140 dB (A) peak at any given time." Intermittent noise, the exposure shall not exceed 90 dB (A) in 8hours of any 24 hours. In offices that are non-production in nature, 50 dB (A) is the recommended level of noise at day time while at night it should be 45 dB (A). Any noise exceeding 85 decibels over 8 hours of work should have a noise preservation program which includes hearing protection by use of earmuffs or ear plugs.

2.11.3 Safety committees

Regulations pertaining to safety representatives include contain duties pertaining to the creation and operation of safety committees at the workplace. Safety committees' aim at promoting cooperation between workers and their employers by ensuring safety measures are implemented to boost and protect employee safety and health at their respective work areas (Mullen & Kelloway, 2018). The safety committees perform several tasks that improve health and safety of employees such as making corrective

recommendations to alter occurrence of accidents, safety report examination and discussion documented by different representatives. They can also review or propose new procedures to ensure health and safety rules are in place and monitor and evaluate the safety policy statements of organizations to include change and add other functions that are deemed necessary (Mullen & Kelloway, 2018).

2.11.4 Health safety and security

It is expected that occupiers should provide, a secure, healthy and safe environment for better employee performance. Occupational illnesses and accidents have been thought to be unavoidable by many organizations. This thought is still in existence in industrial notion may still exist in many industrial situations in developing nations. However, this is no longer an issue in developed countries which have focused on use of control and preventive measures to minimize or eradicate dangers in the workplace. Fortunately, major health and safety problems exist in many impoverished nations' workplaces. Approaches should be sought by management to ensure overall wellbeing of individuals is preserved. This would ensure employees are protected from dangers associated with their physical health and wellness (Masso, 2015).

Security of organizations encompasses those of employees and the facilities within organizational premises. A collaboration that exists between human resource manager and employee ensures a secure, safe and healthy work environment is created. Incidents should be investigated and training on safety initiated by the relevant authorities. Conditions at the work place should be safe and healthy, with wearing PPEs appropriates through the watch of supervisors and respective human resource personnel.

Employees need to be observed for use of drugs and other psychological issues which are a precursor to risks in their workplaces (Carter et al., 2019).

2.11.4.1 Role of employers in occupational health and safety

2.11.4.2 Organizational commitment and culture

According to Akpan (2017), employers are committed to creating a safety environment for conduct of an organization's daily job activities. This cuts across from management at the top most level and involvement of every company/organization member. The concerns of employees should be tabled for managerial action taking. The occupiers should ensure equipment, machines, and other places of work are free from potential risks and put mechanisms in place to prevent workers from hurting their bodies.

Machines should be fitted with guards and other devices of safety, switches for emergency provided, proper ventilation, mounting rails for safety, freeing aisles, adequate heating, lighting and conditioning of air makes the environment safe. Proper work design necessitates checking the physical nature of the work in question. Worker's interaction with the workplace have an impact on how well he or she performs on the job itself.

2.11.4.3 Maintaining a healthy working environment

According to Attridge (2020), an unhealthy work environment is a collective problem. This affects production since workers suffer from the occurrences in the work environment such as tearful eyes, complications in breathing, exposure to long-term hazardous materials in the work place. Maintaining a safe workplace ensures compliance and profitability to the employer. Office settings that include hazardous

airborne pollutants, pollution in indoors and asbestos have led companies to implement severe measures.

Kirk and Brown (2019) offer advice on how to maintain the workplace healthy including workers get enough unpolluted air. Supplying fresh air is cheaper when compared to the cost of cleaning pollution. Toxin testing of new structures prior to occupancy. Smoking zones should be provided at work places for the smokers with free air circulation. Maintaining the cleanliness and dryness of air ducts. Air ducts containing water provides room for growth of micro-organisms such as fungi needs to be serviced regularly to eliminate the micro-organisms before becoming harmful.

Specifications and dates for cleaning air ducts need to be written and records kept by respective employees who will undertake this. Workers provide adequate knowledge sources since they are frequently closest to the problems.

2.11.5 Occupational diseases and accidents

Any sickness connected with a certain employment or sector is referred to as an occupational disease. Such illnesses are caused by a range of chemical, psychological, biological and physical, variables in the workplace or which may be encountered in working within a given organization. The occupational medicine focuses on effects of labor work on health, efficiency and aptitude. Diseases related to occupation can be prevented as they arise from working conditions that exhibit faultiness. They can be avoided and are associated with poor constructed working environments. Diseases related to the occupations would be reduced by ensuring accidents and hazards within a given occupation are controlled. This should be in combination with boosting the

morale of employees thus reduce work absenteeism and higher efficiency in productivity (Tetrick and Peiró, 2020).

2.11.6 Functions and aims of occupational health service

The ILO/WHO in recommendation included disorders related to work alongside strictly occupational diseases as the basic objective of occupational health services. The services actually provided are primarily preventative in nature. The first one is on placement of people to respective jobs-: those who have medical conditions which are pre-existing sometimes are stigmatized in their employment settings. This can be detected by collecting information prior to employment or conducting assessments medically to prove the suitability of the new employees to be contracted. Individuals also undertake job reviews regularly to determine whether they fit to carry out specified duties. Airline pilots, for example, are subjected to frequent medical examinations since a pilot with deteriorating vision or a heart disease that may cause heart attack risks lives of many people. When a worker is judged to be unsuitable for a certain profession, the health service can provide useful advice on alternative employment (Niu, 2018).

Secondly, safety training to make employees aware on the dangers existing in the workplace. Employee health protection measures should be carefully described to enable workers comply limitations that may be uncomfortable including facemasks and protective gear use. There is need to structure facilities providing first aid services, and training workers in the preferred techniques in first aid in case of an emergency or accident. Thirdly, groups which are perceived to be high risk need to be supervised. This is because some job activities which are safe for other groups may be risky to others which are considered to be more vulnerable due to their nature. Recognized risks

in the workplace should be controlled to minimize sophistication of environmental systems and ensure they are monitored biologically. Chemicals that are deemed hazardous in the work environment by measuring exposure levels, recommend ways of reducing exposure and monitor those with overexposure symptoms. There is need for occupational health professional to prevent health hazards by designing and planning new factories and equipment.

Fourth, unrecognized risks must be identified. The occupational health services play a significant role in detecting emerging health dangers of all kinds. Clinical observation and research may show a link between occupational exposure and patterns of disease or mortality in groups of employees. Examples of dangers discovered in this method are such as nasal and lung cancer among workers in nickel industry and cases of lung cancer among people working with asbestos. Fifth, treatment. Workplace injuries and poisonings can be treated quickly and on-site to avoid complications and help recovery. This type of therapy can also save money through reduction of travel and time for waiting health services. Further, healthcare providers who don't have experience in the working situations of their patients need to keep their employees who have moderate injuries off the job for longer than required. A specialist counseling and health education service is available through an occupational treatment program. Another function is to ensure health education and surveillance in general is provided. In developing nations with few community health facilities, the services are required to offer overall care workers and their respective families. Occupational health service provides efficient and effective programs for provision of health education and counselling services. This will reduce chance of diseases and absenteeism from jobs

through provision of advice to workers. They should also ensure health surveillance projects towards employee protection regarding various health problems are established.

2.11.7 Effect of occupational safety and health on job performance

Lack of proper compliance to occupational health and safety negatively affects the performance of employees in the workplace. The performance of organization is greatly affected when employees are exposed to injuries and other risks. Consideration for workers' safety and health, as well as support of workers' consciousness and security, are apparent criteria. Due to assumptions that limits operative autonomy and hampers efficiency, working realities may limit productivity.

Increased performance in the Human resource activities acknowledge the importance of providing a good work environment in which employees feel physically and mentally safe indicating workers are appreciated and valued (Indakwa, 2017). According to Sikpa (2019), the hospital's existing occupational health and safety procedures are inadequate, and that administration, employees, patient, and other users are exposed to several of hazards and risks. According to the report, there could be no efficient OSH standards in cases where both employees and employers do not do their responsibilities as required.

Injuries are costly to both the individuals involved and the business. Therefore, there is need to bar them from occurrence in the working environment. The adoption of OSH programs is of benefit to performance of employees. The researchers indicated that workplace safety procedures have a good and substantial association with job efficiency, thus each firm should exercise or develop workplace health and safety programs if they want to increase performance. Jelimo (2013) asserted that OSH

measures with positive effects on employee production efficiency encompass firefighting and prevention, lighting and ventilation, protective gear, and maintenance of facilities, whereas furniture and seat amenities, kits of first aid and medical center, drinking water and services of sanitation were negatively correlated. Adoption of complete OSH standards promotes productivity by reducing absenteeism, turnover of staff, medical bills and claims of compensation to accidents. Continuous improvement of OSH standards positively enhances dedication of employees and happiness as profitable and productive activities are only focused on.

OSH is critically significant in working environments because human resources are arguably first most important commodity which a company has, and the presence of a poor OSH structure affects employee job production. Ensuring compliance to OSH, and the health and the quality of life workers are, determines the status of the productivity conditions and promoting sustainable development in the business industry.

2.12 Synopsis of literature and existing gaps

Reviewed literature has indicated that despite laundry services' providing key support to provision of health services in a hospital setting, not much has been done to ensure individuals working in such environments are safe. This is because the laundry workers are always at the exposure of several hazardous substances due to their interaction to linen which they process on a daily basis. This may place them at risk of infection due to underutilized laundry safety and health SOPs. Poor adherence to SOPs in the Laundry service provision has led to increased occurrence of nosocomial infections raising the cost of treatment as a result of their effects.

The current study therefore sought to evaluate the practice of OSH in laundry linen service provision among workers in KNH. This would improve the capacities within the institutional structures to train those working in the laundry sector on best approaches of managing and handling linen processed in the facility. This formed policy making basis and act as a reference point to therapeutic organizations within a country. Solutions to workplace hygienic issues may include controlling the hazardous now at origin via architecture and processing methods, separating dangerous procedures and chemicals because then employees are not exposed to it, and modifying the procedures or chemicals utilized to offer stronger protections or risk elimination from the source point.

Protective gear supply, with designed or specifications are insufficient to entirely eliminate the hazard, teaching employees to prevent risk, and excellent maintenance to keep facilities and machines clean and clear of hazardous substances, prior employment, clinical assessment, as well as frequent checkups on those who are at risk, are required. Guaranteeing that ergonomic concerns are factored in design specifications, establishing working practices as well as coaching, and preserving and preventing medical programs which develop health for every work and include auditing of potential health risks as well as frequent exams for everyone at threat.

2.13 Conceptual framework

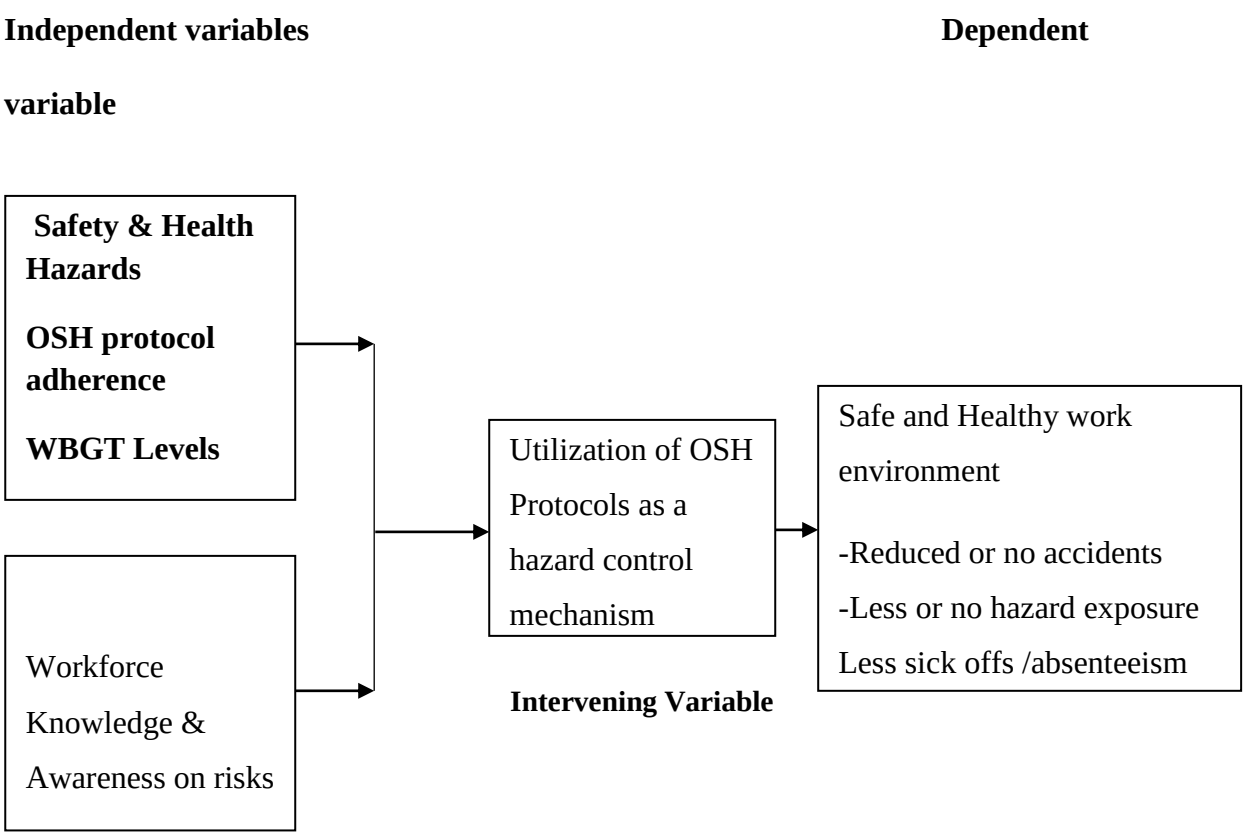

Figure 1: Conceptual framework.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Introduction

In this chapter, protocols and methodologies were employed to come up with quality analysis and presentation of the actual situation as it presents. The methods used were to enlighten on the tools or techniques for research design, data collection, the population and sampling techniques, and data sources, data collection instruments, and eventual data analysis.

3.2 Scope of the Study

The research was undertaken at Kenyatta National Hospital (KNH). This hospital is located at Upper Hill area along Ngong Road, Nairobi Kenya. Kenyatta National Hospital management has significantly emphasized development of occupational health and safety practices across departments and thus provides a better setting to evaluate the occupational health practices that have been put in place.

3.3 Research Design

In this study, a cross sectional analytical design was adopted to collect data from Kenyatta National Hospital. This was preferred to other designs as it enabled collection of information which answered the questions and preciseness of the investigation under consideration. Analtyical part was used in testing of surface swabs from benches trolleys and door handles in the laundry.

3.4 Target Population

The study targeted 140 laundry staff at Kenyatta National Hospital. It focused on the laundry at KNH in order to determine the level of engagement across all cadres in the

department. This includes managers, housekeepers, tailors, attendants and Maintenance. Out of the 140 targeted laundry staff, 114 met the criteria.

3.4.1 Inclusion criteria

Employees of all cadres who consented and worked in the facility, at least three months were recruited for participation.

3.4.2 Exclusion criteria

All employees who met the inclusion criteria but were unwell or absent at the time of the study.

3.5 Sampling technique

The study employed a cluster sampling technique. This enabled the researcher to obtain non biased response from each selected cluster. The total population was divided into job Cadres of staff working in the laundry department;

Table 1: Job cadre distribution at Laundry department

Job Cadre	**Study population**	**Sample size**
Managers	8	7
Housekeepers	16	13
Attendants	72	58
Tailors	32	26
Maintenance	12	10
Total	**140**	**114**

The target number in each of these cadres was arrived and based on the number of staff physically present during the study.

3.6 Sample Size Determination

Sample size was determined using Taro and Yamane's formula (1967)

Yamane formula

$$n = \frac{N}{(1 + Ne^2)}$$

Where

N=was the total population size of 140

e=was the level of significance which is 0.05

n=the sample size

n=140/1+140(0.05)2

n=104

The researcher added 10(10%) of the calculated sample size to cater for attrition = 114

3.7 Research instrument

A structured questionnaire was used by the researcher to collect relevant information regarding the study. The questions that were included in the questionnaire were be both open and closed to allow for variety of responses. A pretest was done at Mbagathi district hospital

3.8 Validity and Reliability of the instrument

Internal consistency was being applied to check reliability of the instruments used in this study. This ensured that the scores were replicated on checked items (Belvoir, 2013). Confidence was realized by pre-analyzing information assembling that was to provide ideal data with insight in confidence of the analysis methods. The information

assembled was assumed a spot procedure in order to reduce error making sure that results are concrete.

3.9 Information assembling

Information assembling was started after approval from relevant authorities, followed by data analysis. Primary data collection procedure was employed. The researcher recruited trained assistants to help in this exercise. The Staff who expressed unwillingness to participate in the study were not coerced to do so. Only the persons who consented and signed the informed consent proceeded with filling the questionnaire as directed by a research assistant. Consent forms were issued where respondents signed to show their approval for engagement. The participants were not required to provide any personal information since they had to participate under an eye of anonymity. The assisting personnel were trained to make sure that the participants understood the data collection process fully and on guiding the participants during the data collection. The requirements of the research assistants were a KCSE certificate and a better understanding of the Kenyatta National Hospital structures.

3.10 Noise level measurements

A noise survey involved measuring noise level at selected locations in the three laundries to identify noisy areas. This was done with a sound level meter (SLM). Decibels were used to measure noise exposure, A-weighted sound levels (dBA). The data from the three laundries was tabulated. Locations in the three laundries were picked randomly to avoid bias

3.11 Carbon dioxide measurements

Carbon dioxide levels were measured using an in-door carbon dioxide meter for each drying circle of linen within the hospital laundries.

3.12 Measurement of Wet bulb globe temperature.

A black globe thermometer was used in the measurement of wet bulb globe temperature.

The thermometer was allowed 15 minutes to adjust to conditions of the Laundries before taking measurements. A thermometer wrapped in a wet cotton sleeve was used to measure temperatures. A cooling effect as a result of unceasing water evaporation simulated sweat evaporation (wet bulb temperature). Evaporation of sweat is quicker whenever there is low air humidity and vice versa.

3.13 Surface swabs collection and testing for micro-organisms

Swabs were obtained from door handles, trolleys, Tailor machines, benches in the laundry. A total of 65 swabs were obtained. All were subjected to microbial culture at the National Reference Laboratories to obtain and isolate bacteria.

(i) Sample collection procedure:

Swabs were collected from door handles, trolleys, benches tailoring machines and linen. Observational checklist, forms and records from laboratories were used to provide information for the participants. To avoid contamination of cultured samples, data was obtained in a systematic manner. This information was recorded in the appropriate forms. Swabs were subjected to culture and gram staining to distinguish the different types of bacteria. The materials (sterile gloves, sterile swabs, forms for laboratory requests, a trolley which was sterilized and biohazard plastic bags) were set

prior to conducting the procedure. The laundry staff signed the forms for consent as a measure of their privacy. The investigator washed his hands and wore sterile gloves, mask and a lab coat.

The investigator did 5 horizontal swabs and 5 vertical swabs in each area and returned the swab to the transport tube and broke the media ampule at the base of the tube to moisten the swab. The technique used to identify samples was standard microbiology. Specimen for surface swab were prepared in line with the National Reference Laboratory guidelines. The surface swabs cultured were subjected to the Microbiology procedure.

(ii) Inoculation and isolation techniques

Identification number for laboratory was used to label CLED/Macconkey agar plates. Dipping of a calibrated sterilized loop was done vertically into a specimen of swab which was well-mixed. One loop was streaked down the center of the plate. Without flaming cross streaks at 90 degrees were made perpendicularly to the original streak. This was done for all samples. The plates which were inoculated were later incubated at temperatures of at 35^0c within a period of 24 hours.

(iii)Bacterial identification and interpretation of cultures

Colony count was done after 24 hours to determine bacterial growth on the plates. More than 125 per ml signified heavy growth of pure culture. To some extent, other several progressions were deliberated as poisons. Isolates of possible pathogens found in substantial quantities were detected using BD Phoenix 50 equipment utilizing national reference laboratory identities.

(iv) The equipment's Principle

Fifty percent of the BD Phoenix compact uses an automated microbiological identification device. It uses improvement technologies to produce very precise and reliable outcomes. The system devise is fitted in the colorimetric agent with LIS, QC, and Panel code, which that are automatically cultured and analyzed. It has an automated pipetting made up of dilution options for antimicrobial susceptibility (AST cards).

Table 4: Recommended specimens and materials for quality control (QC)

Equipment	Supplies	Reagents
-BD Phoenix 50. -BD Phoenix plus meter -Adjustable volume dispenser - 150 µl pipette -300µl pipette	-80 × 16 mm polystyrene tubes (single use only) - BD standard kit -0.45% saline solution -Bar-coded 10 well cassette card holders -Internal carousel for card holder - Sterile cotton swabs -Pipette tips	-Supplemental Media -Gram's stain reagents BD test kits (ID/ AST cards)

The Ecological and Safety controls

The officers/researchers who were doing the assessment used appropriate PPEs. This included gloves, aprons, goggles, lab coats, masks and eye protectors when they handled the specimen. It is imperative for the expert to perform the expected

precautions which are mandatory when managing infectious substances. The assessment expert disposed the waste resources according to local infection anticipation and control procedures.

(v) Calibration

The laboratory technician measured BD Phoenix using a fifty tool which is serviced yearly stipulated in the agreement of preventative maintenance. Monthly, the BD Phoenix 50 was validated against the calibrators.

How to set zero reading in the plastic tubes

First, press the button as indicated MENU. The READ button is pressed with a purpose of moving the upper triangle that flashes on the plastic. When saving the setting, the MENU button is pressed. Insert and turn the absolute malleable brackish tube on a one full rotation. In case the recordings fail to occur, it is advisable to press the READ button to start reading and tuning the saline tube. Consequently, if there is no ZERO reading, it is necessary to hit the "ZERO" key and turn the blank saline tube once again. Failure of the calibration means non-use of the reader and hence should be repaired before using it again.

Table 2: Standard acceptable range

Requisite panel lot	Biological ranges
0.0	0.00 - 0.00
0.5	0.44 - 0.56
2.0	1.85 - 2.15
3.0	2.79 - 3.21

1. Used the BD Phoenix 50 meter with the calibration standards:

   The lab technologists did not vortex BD Phoenix 50 standards, inverted tube to re-suspend.

   NOTE: the tubes were rotated during reading.

(vi) Using the equipment

1. Pressed the POWER button.
2. Pressed the MENU button.
3. Pressed the green READ button to move the upper flashing triangle to "GLASS".
4. Pressed the panel login tap
5. Selected QC panel
6. If desired in the accession number field typed in an accession number
7. In the sequence number field typed in panels sequence number
8. Selected QC organism in the selection box. Highlight the desired QC
9. For yeast ID panels selected media field.
10. In the Tech ID field entered the identification of the user performing the QC.
11. In the first panel lot entered the expiry details of the reagents.
12. Saved the information.

(vii) Panel Login

1. Pressed the panel login and select critical.
2. To receive special notification when results are obtained selected critical.
3. In the accession number field typed in an accession number.
4. In the sequence number field typed the panels sequence number.

5. The isolate number field defaulted to isolate number 1. Typed in the isolate valid number 1-20
6. If only the ID or AST portion of a combination panel was being used disabled the part of the panel not being used.
7. If ID is disabled or if an AST only or BD phoenix emerge panel is not being used, the organism ID field appeared
8. For yeast panels selected the media type in the media field.
9. Saved the information.

Results

For test panels

- Growth occurred for all concentration of antimicrobial

<- No growth occurred in any concentration of anti- microbial

Interpretations

S – Susceptible

I -Intermediate

R- Resistant

N- Not susceptible (indicates that the antimicrobial organism does not have an upper breakpoint. This occurs when there is an absence of or a rare occurrence of resistant strains of an organism. In this case if the MIC is below the lower break point the SIR results can be reported as susceptible but if the MIC is above the lower breakpoint only the result is reported N)

X – Cannot produce interpretation

Blank – Invalid

Observation

Even though the results gave out sensitivity reports these were left out when the assessment expert seemed to be interested with the various organisms in the isolation with no drug susceptibility.

Procedures for Gram Staining

Gram staining was done on the pure culture cell that had been separated. Gram staining is also used in distinguishing two main groups of bacterial primarily using the differing cell wall constituents, to assess the Gram response of microorganisms, and to aid in the choice of a spectrum of reagents kits for use in identifying the antimicrobial susceptibility. In summary, a smearing of both the labeled culture or substance was done and dried at room temperature before being fixed by passing a current over a flames either once thrice or 95 percent Acetone until the methylated is evaporated. The stain is therefore thoroughly cleaned with clean water. I turned off the water and applied grams iodine on the smear for a period lasting one minute. Clean water as used to remove iodine after this. De-colorization was done quickly using acetone after which safe water was used for cleaning. For 1 minute, the smear was coated with dye solution. The discoloration was therefore wiped away using fresh water and allowed to dry naturally.

Inoculum Preparation

For the ID cards:

1. Transfer aseptically three ml of about 0.45% saline into a 12 by 75 mm of a clear plastic or using a polystyrene tube.

2. Use a swab that is well selected with solute colonies and emulsify the mixture into the prepared saline.
3. Check the optical density using a lot panel kit. (See table 2)
4. Place the ID card together with the saline tube into the existing cassette

3.14 Data analysis technique

After the data collection process, the study was done based on both qualitative and quantitative techniques. The quantitative analysis focused on test for association between the study variables. SPSS version was used for analysis of data which median, mean, mode, the variance and standard deviation. The results were presented in charts, percentages and frequency tables. Inferential statistics that were included in this case were measure of association where a chi square test was integrated to provide an understanding on the association of occupational health and safety practices and other factors in the study such as demographic factors.

3.15 Dissemination of results

A report of the findings will be submitted to the KNH research and programs office and the research findings presented to KNH management through departmental heads. The findings will also be forwarded for publishing in referred journals.

3.16 Ethical issues considerations

This study was authorized through obtaining an ethical approval from University of Nairobi/Kenyatta National hospital Ethics office. Permission for data collection was obtained from KNH administration. The respondents were informed that it was not mandatory to participate in this exercise. Confidentiality of the participants was highly monitored where participants were not required to provide any personal information.

There were no known risks in participating in the study and those who were involved were given an optioning of withdrawing from the study or not answering questions which affected their morals and values in a negative manner. Data collection was done randomly to enhance privacy of the study participant.

CHAPTER FOUR: RESULTS

4.1 Introduction

The chapter presents results on occupational health practices in the laundry and linen services at Kenyatta National Hospital in Nairobi City County, Kenya. This included the study's objectives; identification of potential hazards, adherence levels and wet bulb globe temperature index of workers.

4.2 Response rate

A total of 114 questionnaires were issued. Four of the questionnaires were not returned for analysis. Only 110 questionnaires were correctly filled representing 96% response rate as shown in Table 3.

Table 3: Response rate

Total sample size (n)	Returned for Analysis (n)	Response rate (%)
114	**110**	**96%**

4.3 Socio demographic characteristics of the study respondents

The analysis showed that, 66(60%) of the respondents were female and 44(40%) were male. More than half, 58 (52.7%) of the respondents were aged between 31 and 50 years, 29 (26.4%) were aged between 20 and 30 years while 23(20.9%) were aged above 50 years. in assessing the level of education, 59(53.6%) had secondary level of education whereas 51(46.4%) had tertiary education. Majority, 101 (91.8%) of the respondents were employed on permanent basis. Analysis of marital status showed that 68(61.8%) were married, 31(28.2%) were single and 11(10%) were either divorced or

separated. The findings also showed that 102(92.7%) were Christians as shown in Table 4.

Table 4: Socio-Demographic characteristics of study participants

Characteristic	Category	Frequency	Percent
Gender	Male	44	40
	Female	66	60
Age group	20 - 30 Years	29	26.4
	31 - 50 years	58	52.7
	Above 50 years	23	20.9
Education level	Secondary	59	53.6
	Tertiary	51	46.4
Employment status	Permanent	101	91.8
	Contract	9	8.2
Marital status	Single	31	28.2
	Married	68	61.8
	Divorced/separated	11	10
Religion	Christian	102	92.7
	Muslim	8	7.3
Years worked in the laundry Department	Less than 5 years	30	27.3
	5 - 10 years	37	33.6
	More than 10 years	43	39.1

4.4 Objective 1: Potential hazards associated with laundry and linen services at Kenyatta National Hospital.

4.4.1 Knowledge of any occupational hazards associated with linen and Laundry

The respondents were asked whether they had knowledge on any occupational hazards that are associated with laundry and linen industry, 95(86%) of the respondents affirmed to knowing potential hazards while 15(14%) said they did not know of potential hazards in laundry and linen services department as shown in Figure 2.

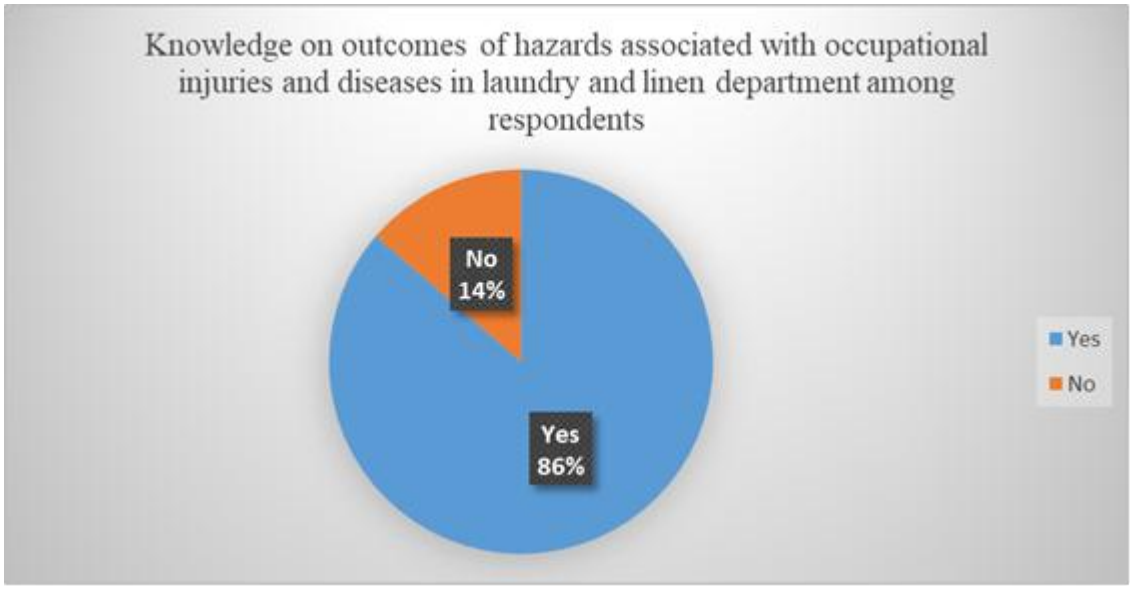

Figure 2: Knowledge on outcomes of hazards

Table 5 lists the numbers of laundry staff either aware or not about various hazards within their working environment at the laundry and linen department at Kenyatta National Hospital.

Table 5: Hazard awareness among laundry staff

Variable	Response	No of staff	Percentage (%)	Chi-Square Test of Proportionality
Noise	Aware	90	78.94	χ^2= 4.96 p= 0.046
	Not aware	24	21.0	
	Total	114	100	
Exposure to microbes	Aware	108	94.7	χ^2= 4.03 p= 0.0097
	Not aware	6	5.3	
	Total	114	100	
Extreme temperatures	Aware	96	84.2	χ^2= 6.38 p= 0.004
	Not aware	18	15.8	
	Total	114	100	
Particulate dust	Aware	104	91.2	χ^2= 5.030 p= 0.0162
	Not aware	10	8.8	
	Total	114	100	
Non disposed waste	Aware	106	92.9	χ^2= 5.72 p= 0.0031
	Not aware	8	7.01	
	Totals	114	100	

4.4.2 Knowledge of any occupational hazards associated with linen and Laundry

Half of the respondents, 57(51.8%) identified occupational accidents and injuries in the department as the common incidences, 38(34.5%) identified hearing loss while 15(13.6%) highlighted communicable disease as the common hazards in laundry department as shown in Figure 3.

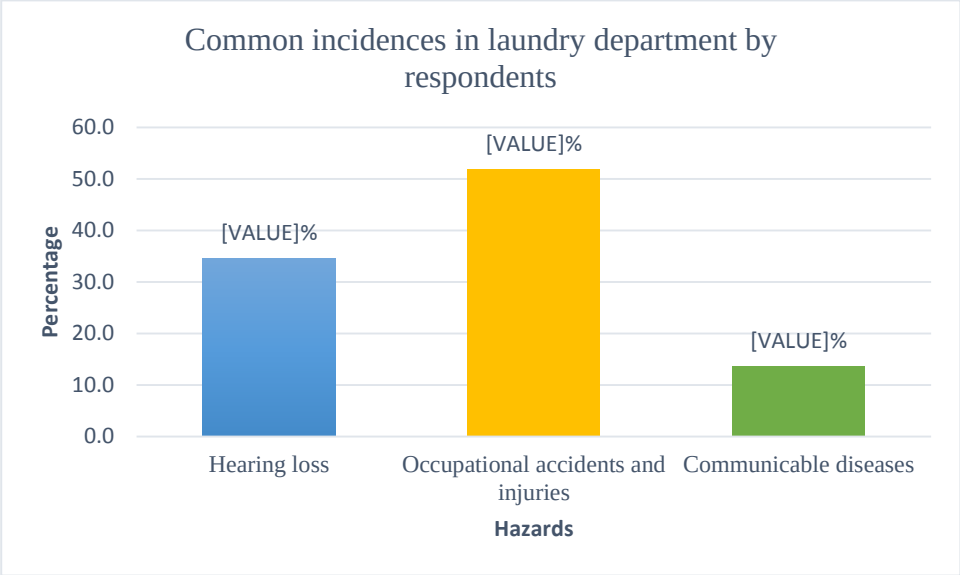

Figure 3: Common incidences in laundry department by respondents

4.4.3 Association between respondent socio-demographics and knowledge on the potential outcomes of hazards associated with laundry and linen services at Kenyatta National Hospital

A chi-test for association was conducted to determine the association between respondent socio-demographic factors and knowledge of the common incidences in laundry department. The findings showed that there was significant association between age and knowledge of the respondents ($x2(2) = 5.483$, $p = 0.045$, $p<0.05$) as well as association between religion and knowledge of common hazards within the laundry department (($x2(1) = 4.172$, $p = 0.041$, $p<0.05$). There was no association between other socio demographic factors, gender, ($p = 0.197$), Education level ($p = 0.078$), employment status ($p = 0.104$) and marital status ($p = 0.756$) and years worked ($p =0.148$) with knowledge of common potential hazards within the laundry and linen service department as shown in Table 6.

Table 6: Association between Socio-demographic characteristics and knowledge of common hazards outcomes in laundry and linen service department

Socio-demographic variable	Df	Chi-Square	P-value
Gender	**1**	**1.287**	**0.197**
Age group of the respondents	2	5.483	0.045
Level of Education	1	2.879	0.078
Employment status	1	3.229	0.104
Marital status	2	0.559	0.756
Religion	1	4.172	0.041
Years worked	2	3.814	0.148

4.4.4 Environmental aspects prevalent in laundry and linen services at Kenyatta National Hospital

4.4.4.1 Knowledge that activities in the laundry department affect the immediate environment

Most of the respondents, 92(84%) of the respondents were aware that activities in the laundry department affect the immediate environment while 18(16%) of the respondents were not aware of the impact of laundry services to the immediate environment as shown in Figure 4.

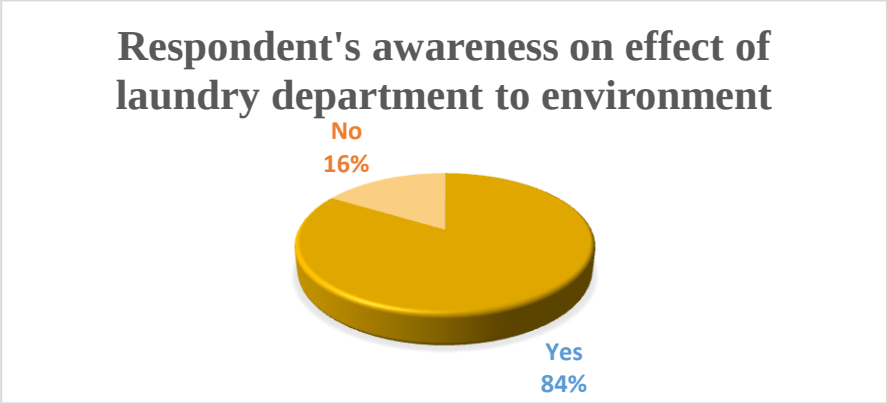

Figure 4: Respondent's awareness on effect of laundry department to environment

4.5 Socio-Ways in which laundry department activities affect immediate environment

Respondent's provided different ways they thought the laundry department activities affect the immediate environment, 29(26.4%) of the respondents asserted that the release of harmful gases and chemicals into the environment, 26(23.6%) identified increase in the risk of bacterial and viral infection, 11(10%) identified increase in bacterial and fungal cross-infection among laundry workers as the major ways laundry activities affect immediate environment as shown in Figure 5.

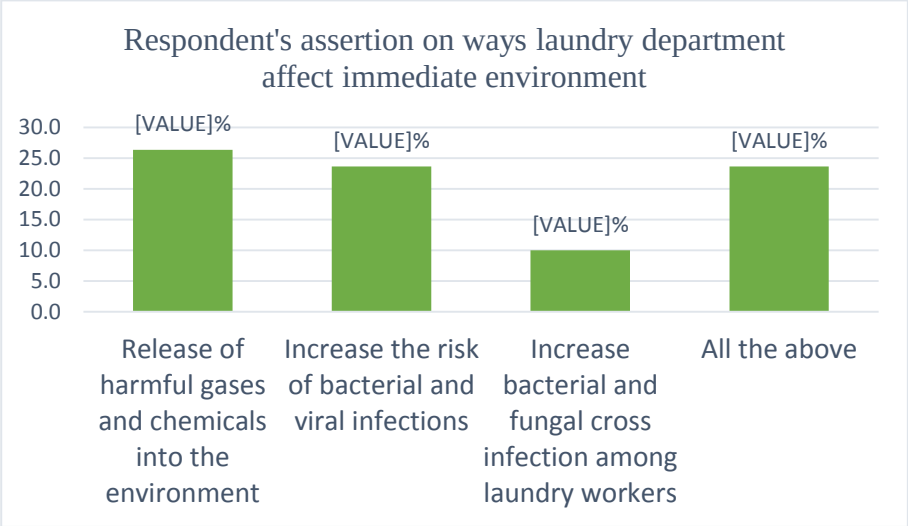

Figure 5: Ways laundry department affect immediate environment

4.6 Gases emitted from Laundry

Carbon dioxide was identified as the most common greenhouse gas emitted from laundry at 1.8kg per washing per drying cycle. Each drying cycle took 30-45 minutes. There were 7 drying cycles every week translating to 12.6 kgs and 50.4 kgs of carbon dioxide weekly and monthly respectively.

4.7 Noise levels

Departmental averaged noise levels comparing all the three laundry blocks at the laundry, were recorded as shown in table 10 the recorded levels are compared to stipulated occupational expected limits (OSHA 2007).

From this information it is noted that there were high levels of noise emitted and this could result to mild, severe or total hearing loss depending on the exposure to high noise levels if mitigation measures are not put in place.

Table 7: Measured Noise levels

	Laundry 1	Laundry 2	Laundry 3	OELs (Osha 2007)	Acceptable: Yes(Y)/ No(N)
Reception area	50.1-53.6dB (A)	51.3-54dB(A)	52-54.8dB (A)	75dB(A)	Y
Loading area	61.5-85dB ((A)	59-84.9dB (A)	62.8-85.1dB (A)	90dB(A)	Y
Tailoring area	88.6-97dB (A)	84.3-98dB (A)	81.5-94.4dB (A)	90dB(A)	N
Store	68.6-82.7dB (A)	72.2-86.5dB(A)	78.7-87.5dB (A)	90dB(A)	Y
Boiler areas	89.2-96.3dB (A)	88-98.6dB (A)	90-94.4dB (A)	90dB(A)	N
Ironing area	78-88.9dB (A)	85.1-89 dB(A)	83.6-88dB (A)	90dB(A)	Y

Table 8: Organisms isolated

Site of swabbing	No. of swabs taken	Results after culture	Frequency of isolated organisms	Type of organism
Door handles	14	Growth obtained	2(14%) 3(21%)	Pseudomonas stutzeri Staphylococcus spp.
Laundry benches	12	Growth obtained	2(16%)	Aerobic spores
Trolleys	17	Growth obtained	4(23.5%) 3(17.6%)	Pseudomonas stutzeri Aerobic spores
Hospital garments	22	Growth obtained	8(36.4%)	Serratia marcescenes.
Totals	65			

Nearly all these bacteria and spores isolated have been reported to be disease causing putting the laundry staff at risk of infection. Pseudomonas stutzeri is known to cause infections in immune compromised patients while Staphylococcus species cause skin

infections. Serratia marcescenes cause urinary tract infections. Spores may make toxins against the body.

Out of these 48(74%) samples, a growth was obtained indicating presence of bacteria, while in 17 (26%) samples no growth was obtained. This indicated most surfaces within the laundry department harbor pathogens as shown in figure 6.

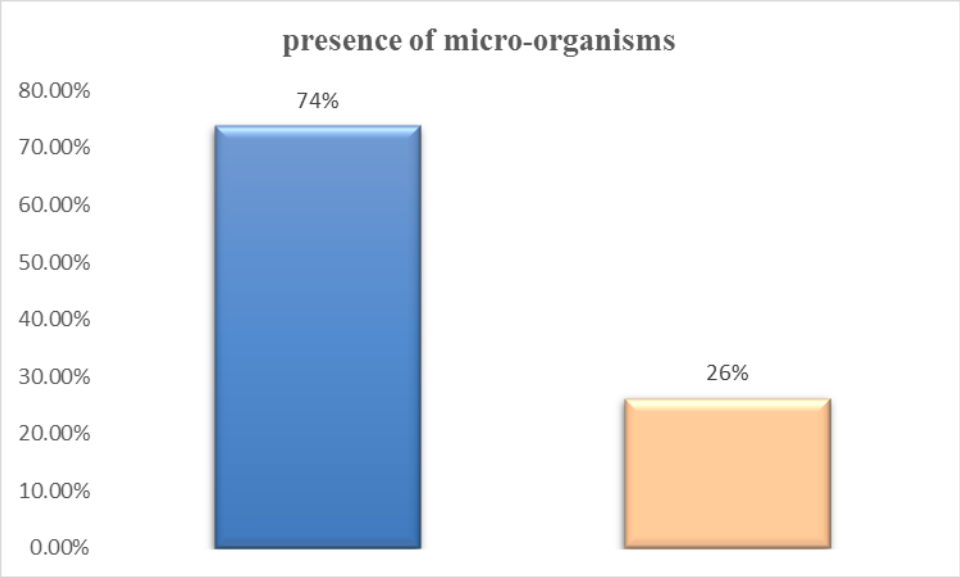

Figure 6: Presence of disease-causing micro-organisms from surface swabs

4.8 Association between respondent socio-demographics and knowledge on environmental aspects in laundry and linen services at Kenyatta National Hospital

The analysis of association showed that there was a statistically significant association between age, ($x^2(2) = 9.091$, $p = 0.011$, $p<0.05$), education level, ($x^2(1) = 10.76$, $p = 0.001$, $p<0.05$) and Marital status, ($x^2(2) = 9.768$, $p = 0.008$, $p<0.05$) and knowledge on environmental aspects in laundry and linen services. There was no association between

employment status (p = 0.548), religion (p = 0.227) and years worked (p = 0.543) and knowledge on environmental aspects in laundry and linen services as shown in Table 12

Table 9: Association between Socio-demographic characteristics and knowledge on environmental aspects in laundry and linen services at Kenyatta National Hospital

Socio-demographic variable	Df	Chi-Square	P-value
Gender	1	3.056	0.072
Age group of the respondents	2	9.091	0.011
Education level	1	10.76	0.001
Employment status	1	0.198	0.548
Marital status	2	9.768	0.008
Religion	1	1.688	0.227
Years worked	2	1.222	0.543

4.9 Objective 2: Levels of adherences to the laundry and linen services standards at Kenyatta National Hospital.

4.9.1 Knowledge of any standard operating procedures in the laundry and linen department

Among the respondents, 69(63%) of the respondents asserted that they are aware of the standard operating procedures in the laundry and linen service department, 41(37%) of the respondent highlighted that they are not aware of the standard operating procedures in the department as illustrated in Figure 6.

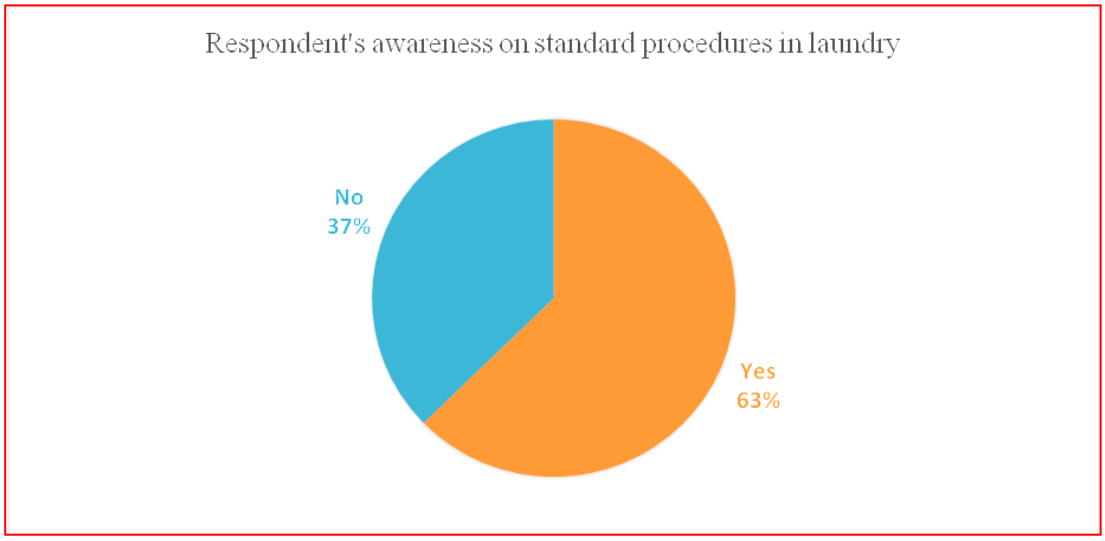

Figure 6: Respondent's response of awareness on standard procedures in laundry

Adherence to Standard Operating Procedures among respondents

From the respondents who had knowledge on operating standard procedures in laundry and linen department, Figure 8 shows that, 50(45.5%) of the respondents adhered to the Standard Operating Procedures while 18(16.4%) did not adhere to the standard operating procedures despite having knowledge that they exist in the department.

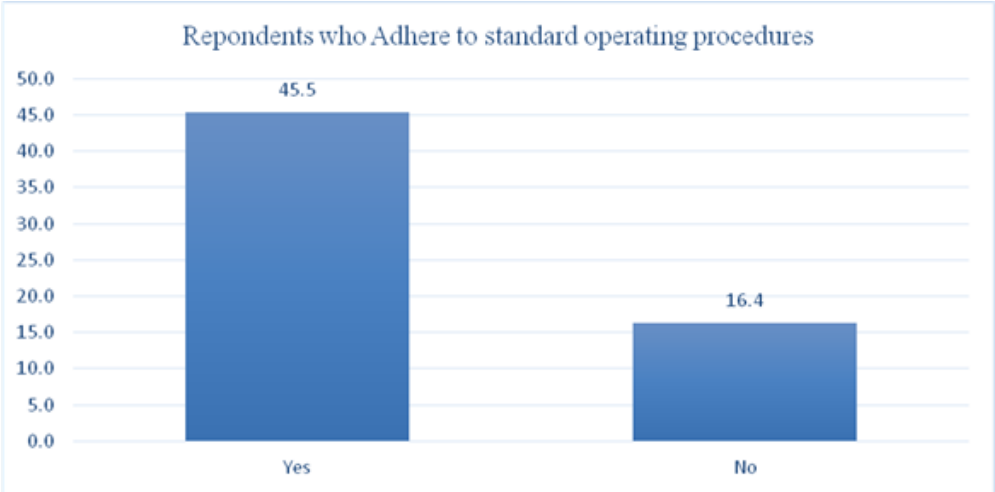

Figure 7: Respondents' who adhere to standard operating procedure

4.9.2 Challenges respondents' face in relation to SOP implementation

The respondents in the study were also asked to identify challenges that they face which limit adherence to the standard operating procedures in the department. The common challenges that were identified include no re-trainings and updating on the standard operating procedures and knowledge of changes among new employees within the department. There was no supervision or follow up by the hospital management to ensure that the standard operating procedures were effectively implemented by the newly employed. Respondents also stressed that they are unaware of any new or updated guidelines hence making it difficult for them to follow.

4.9.3 Association between respondents' social demographics and adherence to standard operating procedures in laundry and linen department at Kenyatta National Hospital

The analysis of association shows that there was a statistically significant association between, gender, ($x2(1) = 4.06$, $p = 0.043$, $p<0.05$), level of formal education, ($x2(1) = 5.789$, $p = 0.001$, $p<0.05$) and years worked in laundry department, ($x2(2) = 5.006$, $p = 0.027$, $p<0.05$) with adherence to standard operating procedures in laundry and linen services. There was no association between age of the respondents ($p = 0.067$), employment status, ($p = 0.557$), marital status ($p = 0.198$) and religion, ($p = 0.399$) and adherence to standard operating procedures in laundry and linen services as shown in Table 10

Table 10:. Chi square test of proportionality for respondents' social demographics and adherence to standard operating procedures in laundry and linen at KNH

Social demographic		No of staff.	Percentage (%)	Chi-Square Test of Proportionality
Gender	Male	44	38.59	χ^2= 4.06
	Female	60	52.63	p= 0.043
	Total	114	100	
Age of the respondent (years)	18-29	22	19.29	χ^2= 3.96
	30-39	26	22.8	p= 0.067
	40-49	39	34.2	
	50-59	25	21.92	
	60 and above	0	0	
	Total	114	100	
Level of education	Primary	12	10.5	χ^2= 5.78
	Secondary	59	51.7	p= 0.001
	Tertiary	33	28.9	
	Total	114	100	
Marital status	Single	26	22.8	χ^2= 6.530
	Married	73	64.03	p= 0.0198
	Widowed	8	7.01	
	Divorced	7	6.01	
	Total	114	100	
Years worked	0-10	5	56.9	χ^2= 5.006
	11-20	33	28.4	p= 0.0027
	20 and above	76	14.7	
	Total	114	100	

4.10 Objective 3: Wet bulb globe temperature among respondents working at laundry department

Heat stress indices; WBGT was calculated using the TLV of Time Weighted Average (TWA). TWA is defined by time- weighted average for a normal 8 hours' workday or 40 hours work week, to which nearly all workers can be exposed, day after day, without adverse effects. Temperatures obtained were tabulated as follows in table 11.

Table 11: Wet bulb globe temperature among respondents working at laundry department

Hours	**WBGT-Index**		
	Laundry 1	**Laundry 2**	**Laundry 3**
1	28.08	26.64	26.5
2	29.12	26.61	27.6
3	28.20	26.46	27.2
4	27.85	26.27	27.1
5	28.60	26.00	26.9
6	29.11	26.46	26.8
7	29.37	26.21	26.6
8	29.02	26.22	26.5
Mean	**28.67**	**26.36**	**26.9**
Standard deviation	**0.53**	**0.49**	**0.511**

Threshold Limit Value (TLV) sets by the ISO 7243 Standard is WBGT = 28°C for acclimatized person. The WBGT-Index at Laundry 1 is above the Threshold Limit Value at WBGT = 28.67˚C in average and could endanger the workers' health. The value of WBGT gained from this study is definitely higher than the reference value suggested by the ISO 7243 Standard. The analysis found that, 30(27%) of the respondents had been affected by heat stress while, 80(73%) were not affected by the heat stress at one particular moment of their working period as illustrated in Figure 9.

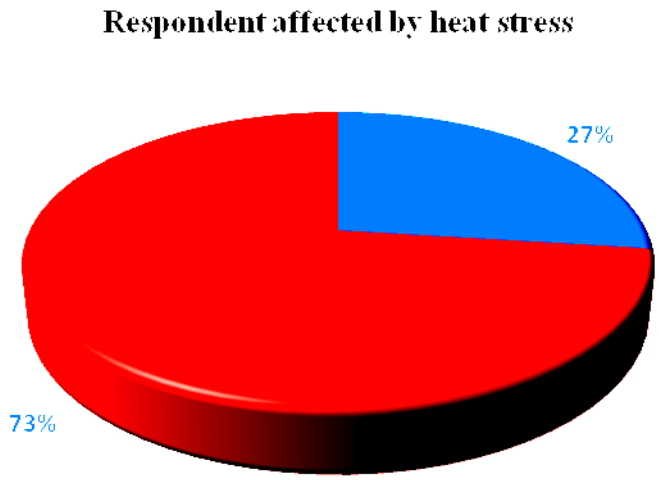

Figure 8: Respondents affected by heat stress

4.10.1 Knowledge of the effects of wet bulb globe temperature among respondents

The respondents were also asked whether they had knowledge on the effects of wet bulb globe temperature levels within their workplace, 61(55%) had knowledge of the effects of WBGT whereas, 49(45%) of the respondents did not have knowledge on the effects of WBGT levels in workplace. Shown in Figure 10

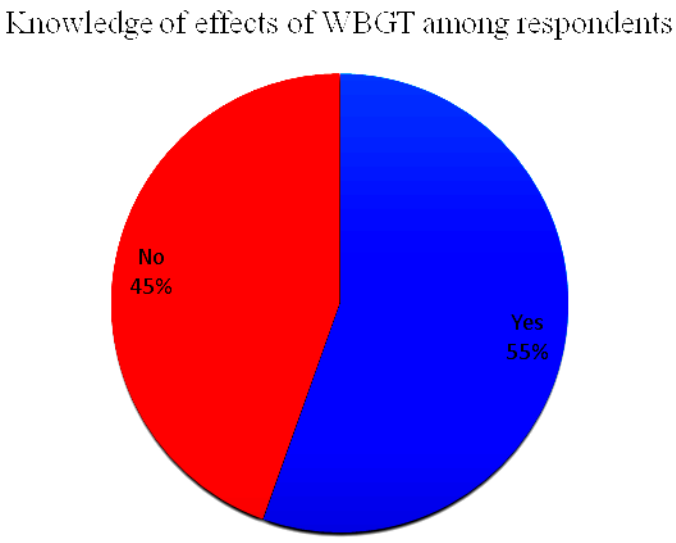

Figure 9: Knowledge of effects of wet bulb globe temperatures index among respondents

4.10.2 Challenges of WBGT at work among respondents

The respondents were asked to identify common challenges of heat stress at work. Most of the respondents identified sweating as a major challenge among employees working in the laundry department.

4.10.3 Association between Socio demographic characteristics and WBGT index awareness among respondents in laundry and linen services at Kenyatta National Hospital

The analysis as shown in Table 15 identify that there was statistically significant association between gender, ($x2(1) = 19.097$, $p = 0.000$, $p<0.05$), employment status, ($x2(1) = 3.953$, $p = 0.047$, $p<0.05$) and the level of heat index awareness in laundry and linen services, ($x2(1) = 3.953$, $p = 0.047$, $p<0.05$). There was no association between age ($p = 0.754$), education level ($p = 0.569$), marital status ($p = 0.087$), religion ($p = 0.139$), years worked ($p = 0.916$) and level of heat index awareness in laundry department.

Table 12:Association between Sociodemographic characteristics and WBGT index awareness among respondents in laundry and linen services at Kenyatta National Hospital

Socio-demographic variable	Df	Chi-Square	P-value
Gender	1	19.097	0.000
Age group of the respondents	2	0.565	0.754
Education level	1	0.002	0.569
Employment status	1	3.953	0.047
Marital status	2	4.892	0.087
Religion	1	0.134	0.139
Years worked	2	0.176	0.916

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.

5.1 Introduction

This chapter covers the discussion, conclusions and recommendations based on the findings of the study.

5.2 Discussion

Results from the study indicated that most (60%) respondents in laundry and linen service department in hospital are female compared to men (40%). The results further show that majorities (52%) of them are aged between 31 and 50 years, 53% had secondary education, and 91.0% were employed permanently. Regarding marital status, 61.8% of them were married and 92.7% of the respondents were Christians. These findings are comparable to Michael et al (2017) which found that 65% of the employees in laundry department were women. Additionally, the study revealed that most of the respondents were over 35 years of age. Heudorf et al (2017) also found that majority of women preferred working in laundry department and majority of them had high school level qualification. Working in laundry department requires less focus on academic requirement based on the basic nature of the responsibilities within the department. The lower level of qualification requirement means that most people are able to successfully work in the department across all age groups.

Laundry department within a hospital setting is vital and present a stronger focus on the need to maintain an improved commitment on the common occupational safety practices that are needed. The study found that 86% of the respondents stressed that they have knowledge on the common potential hazards that are associated with laundry

and linen service industry which included occupational accidents and injuries, hearing loss as a result of excessive noise from laundry machines and spread of communicable diseases. These findings are comparable to Belvoir (2013) who found that the surfaces in hospital and the gowns and linen worn by patients suffering different diseases are mixed and taken to the laundry department for cleaning which increases the risk for communicable diseases among the laundry employees. Omoijiade (2018) also found that common hazards in laundry department are classified in five groups which include physical, mechanical, chemical, bacterial and psychosocial hazards. The common physical hazards noise, vibration, radiation and heat. Mechanical hazards such as injuries. Chemical hazards include solid, liquid and vapors, bacterial hazards are viral, bacterial and fungal. Exposure to any of these hazards can cause occupational diseases and work accidents. The knowledge of employees in laundry department on common hazards differs based on different factors. The research findings showed that age and religion were significantly associated with knowledge on potential hazards in laundry department. In a study conducted by Johnson (2008) found an association between knowledge on hazards and employee experience, education level and religion. Employees with higher experience were more likely to have an understanding on common potential hazards within the laundry department.

5.2.1 Potential hazards associated with laundry and linen services at KNH

Study results depicted that there were potential hazards such as disease-causing pathogens emanating from contaminated laundry garments and equipment used in laundry. This in turn makes workers to be potential patients leading to call for sick offs hence delayed optimal performance of laundry department. Non disposed waste could

result in blockage of drainage systems; High noise levels could have a long-term effect on loss of hearing while particulate dust could be agents of respiratory illnesses.

In a study conducted by Johnson (2008) found an association between knowledge on hazards and employee experience, education level and religion. Employees with higher experience were more likely to have an understanding on common potential hazards within the laundry department.

The laundry department deals with many hazardous components which present the need to ensure that employees understand these effects and develop better protective measures. This study indicated that 84% of participants were aware of the immediate effect of the laundry activities to the immediate environment. The common ways that the laundry activities affect the immediate environment included the release of harmful gases and chemicals into the environment, increase in the risk of bacterial and viral infection and increase in bacterial and fungal cross-infection among laundry workers. This study has also identified that 90% of the respondents knew that linen in laundry harbor disease causing micro-organisms. These findings are related to Michael et al. (2017) who asserted that, pathogens are easily transmitted to the environment which also serves as a reservoir. Laundry facilities process stained medical linens used by patients' fluids and substances that can cause detrimental impact laundry workers.

Stress, low productivity and lack of concentration are some of the health risks associated with exposure to excessive or long-term noise. Other problem includes having difficulty with communication as well as experiencing extreme fatigue associated with inadequate sleep. Severe side effects may include cardiovascular complications, serious cognitive impairment, and loss of hearing. In contrast, Fontoura

et al. (2012) discovered that approximately half of medical laundry employees had already been subjected to noise exposure in a study carried out in Brazil titled "Noise effects on healthcare laundry employees' auditory."

According to the researchers, the excessive subjection to noise among the laundry employees in the present research is associated with the use of heavy machinery within the laundering areas, especially the dryers and gas compressors, as well as the limited surface space, ceiling, and acoustic noise generated by faulty electrical laundry appliances in some healthcare washrooms included in the research.

Omoijiade (2018) also found that common hazards in laundry department are classified in five groups which include physical, mechanical, chemical, bacterial and psychosocial hazards. The common physical hazards noise, vibration, radiation and heat. Mechanical hazards such as injuries. Chemical hazards include solid, liquid and vapors, are viral, bacterial and fungal. Exposure to any of these hazards can cause illness.

5.2.2 The levels of adherences to the laundry and linen services standards at KNH

Adherence to OSH protocols were low despite workers being aware, while some never new of their existence while others ignored, these has led to exposure to hazards and injuries to laundry staff, this pointed to a laxity in either new staff not being properly oriented or poor appraisal or updating of safety protocols. Kumar (2018) found similar results where adherence to OSH protocols where not fully followed putting the laundry workers at safety and health at risk. Adherence to standard operating procedures in laundry department is important in controlling the influence of common

occupational hazards to employees within the department as well as the immediate environment.

This study has found that 45% of the respondents adhere to standard operating procedures in laundry department, 63% of the respondents were not aware of the standard operating procedures in the laundry department. The low level of adherence was mainly caused by lack of employee training on the standard operating procedures and knowledge of changes among employees within the department. These results are similar to Gul and Esen (2018) which found that most hospitals do not follow up the operating guidelines especially in non-clinical departments such as laundry.

Issues of hazardous material disposal and poor personnel training were identified. Female gender, longer years worked and higher education level were associated with higher level of adherence. There are challenges of handling hazards in public health facilities which require high management of OHS procedures. As much as results from this study showed improved practice regarding OSH, there were reported cases of negligence predisposing staff to risks in the laundry services. Management has also failed in its role in OSH hence challenges in attaining better outcomes. Accountability was also identified as a main shortcoming whereby management does not give first priority to OSH adherence in the facility. To ensure long-term improvement, management in public hospitals should cultivate a culture of safety of the employees.

There was reported limited understanding of emergent risks and existing ones by respective departments and overall management of the facility. There was no evidence of reduction of risks in public facilities as demonstrated by managerial activities. There was poor cooperation between DOSH and the hospital management which showed gaps

in reducing OSH risks. There is need for good leadership which can be enhance through establishing working quality assurance and safety inspection systems to check on this. To ensure that there are some improvements in addressing OSH risks, there is need for future assessments of public health facilities to check whether their employees are protected. A number of indicators when considered together project that OHS activities are not prioritized in public facilities. These include; acceptance culture of risks associated with OSH, limited resources to ensure compliance with OSH techniques, policies and worker's safety, provision of scanty information on OSH to its staff, unsatisfactory staff training and managers.

5.2.3 Wet bulb globe temperature of workers in the Laundry and Linen Service at KNH

Wet bulb globe temperature was above average in some sections of the laundry leading to increasing working temperatures in this area which in turn affected the output of the workers. This increased sweating levels and fatigue amongst the laundry staff. One of the key physical hazards in the laundry is stress due to heat. This is because it can lead to syncope, discomfort, heart stroke and in severe cases, death may result. On awareness of heat index level, it was reported that 73% of those interviewed were aware with just only 55% had knowledge on the effect of high heat index. Sweating and heat rashes were the common effect of high heat index as identified by the respondents. Venugopal et al. (2016) found comparable results that 82% of employees in laundry department were exposed to larger hotter periods. Employees who reported more health related issues were those with heavy and more workloads. The common effects of high heat stress index were dehydration, heat rashes, and symptoms of urinogenital.

Provision of better personal protective equipment is essential in controlling the negative outcomes of high heat stress index level.

High temperatures results to heat edema, exhaustion, syncope, stroke, dehydration or even death. The most at risk people are those with underlying medical conditions which predispose them to injuries at the work place. Exposure to heat and manifestation of illnesses of heat may affect the central nervous system. This further destabilizes coordination of the CNS leading to dizziness and fatigue which might result to worsening the risk of injuries.

Dehydration which is common among employees in environments which are hot, heightens the risks of illnesses related to heat hypernatremia and rhabdomyolysis. Chronic Kidney Disease is sometimes associated with dehydration which resulted to deaths of many people especially in Latin America (Denilson , 2012). It has also been conjectured that muscle cramps, fatigue and dehydration are physiological factors that predisposes workers to injuries during the hot weather conditions. Research findings from Spain revealed that about 3% of all work-related injuries were as a result of working in areas with high temperatures. A research conducted in China's Guangzhou, revealed that working in high temperatures of 30 ◦c had a relative risk (RR) of work-related injuries of 1.15 times compared to 25 ◦c work environments.

5.3 Conclusions

The study provided a strong understanding on important aspects regarding occupational safety and health practice at the laundry and linen department at the Kenyatta National Hospital. The hospital management has made significant effort in implementing various health and safety programs which have been adopted across different departments.

However there have even significant challenges regarding implementation and ensuring that there is high level sustainability in terms resources and OSH knowledge amongst employees in the laundry and linen department.

5.3.1 Potential hazards in the laundry and linen service department.

Hazards identified were Microbes, Non- disposed waste, Noise, particulate dust and carbon dioxide gas. Each of these hazards poses a different threat to the health and safety of laundry and linen workers. These results are similar to Johnson (2018) where varying microbial agents were isolated.

5.3.2 The levels of OSH adherence to laundry and linen service

Standard operating procedures were not well articulated and followed. This concurs with a similar study Kumar (2018). Consistent healthcare audits have been instrumental in maintaining strong focus on development and implementation of better health and safety practices across different departments. Thus, the level of compliance to the health and safety practices among employees has been increasing steadily based on increased awareness although there is need to ensure that the implemented programs are sustained to create a strong environment where employees can perform their tasks effectively to attain the healthcare goals defined within the hospital charter.

5.3.3 The Wet bulb globe temperature at linen and laundry service department

The wet bulb globe temperature was high in some sections. This resulted to sweating and easy fatigability amongst the workers. This resulted to low output therefore mitigation measures are required. Venugopal et al. (2016) found comparable results that 82% of employees in laundry department were exposed to larger hotter periods.

Workers with heavy workloads reported more heat-related health issues and reduced productivity.

If put in place, this department will maximize its potential thus lowering cost of doing business.

5.4 Recommendations

5.4.1 Recommendations from the study

The adoption of different programs within the hospital has been integral in maintaining strong focus on important changes which help in defining improved outcomes. Health and safety audit programs, Health and safety policy programs, Wellness programs, Health and safety committees and Occupational health surveillance. High level of commitment and implementation of these programs within healthcare environment will be critical in maintaining high quality healthcare and increased level of employee satisfaction which are key management objectives. The evaluations of these processes are important and provide a unique understanding on the changes that are being implemented.

5.4.1.2 To minimize effect of Potential hazards associated with laundry and linen services at Kenyatta National Hospital

Ensure proper sorting, segregation, transportation and washing of Hospital linen need to be enhanced. This has to be implemented by laundry staff. Proper disposal of non-reusable materials is paramount, and public health officers in the hospital are recommended to effect.

Designing of devices through engineering has been discussed as a human centered intervention for performance improvement. In the hospital set-up, this calls for mechanisms of exposure avoidance by individuals and pathogen colonization through space designing as an administrative control measure. This would identify primary sources and contributors to OSH issues. This is past training and education which are focused on to prevent infections, modification of individual perspective such that desired actions are attained in case of default decisions. This uses environmental designs including washing of hands or setting up disinfectant stations at points of exit. This calls for better leadership for oversight and implementation of OSH procedures and policies. To increase effectiveness in cleaning rooms and disinfection which reduces bacterial bio-burden in the rooms of the patients, there is need to apply the models of human factor engineering systems together with auditing and feedback.

Sometimes strategies put forth to mitigate pollution through carbon dioxide fails to solve the situation. This calls for preventive approaches through promotion of measures that are effective before pollution reaches levels of criticality (Bandyopadhyay et al., 2014). To capture this, it is recommended that KNH management should supports monitoring of air pollution using new technologies (Mishra et al., 2015). To ensure safety and health of laundry workers, it is recommended that distribution of spatiotemporal air pollution is monitored using established networks. According to Knox et al (2013) and Sofia et al (2018), sensor networks provide the potential to monitoring pollution of air that reflects high temporal and spatial predictability of levels of pollutants. This would provide room for adoption of measures to reduce pollution

related to carbon dioxide when the target limit is exceeded by the pollutants and all sources established. However, to make informed decisions, it is advisable to apply models of air quality prediction (Vicente et al., 2018). This is the best approach in ensuring compliance with regulations as pertained to the quality of air (Blackcoats et al., 2011).

To reduce workplace exposure to noise, it is recommended to apply engineering and administrative controls. In engineering control, modifications or replacement of equipment or adopting physical changes at the source and minimizing noise exposure at the workplace has been shown to be effective. Examples in this may include; choice of machinery and tools with low-noise levels, lubricate and maintain equipment and machinery, placing a barrier between the source of noise and the worker and isolating or enclosing the source of noise. In administrative control, there is need to adopt changes that make the work environment less risky such as schedules that may minimize or eliminate noise exposure to workers. This may include; noisy machines to be operated in shifts, limited exposure time at the source of noise and provision of areas of quietness for relief of workers exposed to sources with hazardous noise.

The simplest and cheapest administrative control mechanism for exposure to noise is through distance. Noise is reduced by 6 dB whenever distance between the worker and the source is doubled.

5.4.1.3 In order to effect adherences to the laundry and linen services standards at Kenyatta National Hospital, the management should:

- Increase the Hospital, the frequency of health audits across all departments to help improve on compliance and adoption of OSH practices.
- Ensure that there are operational health and safety committees.
- Ensure that employees are highly engaged in development and implementation of health and safety programs.

5.4.1.4 To mitigate effect of wet bulb globe temperature of workers in the Laundry and Linen department.

This study recommends the management to install AC equipment and proper ventilation. This will go a long way in improving air circulation within the laundry building.

5.4.2 Recommendations for further studies

This study proposes other researchers to study occupational safety and health practice at this hospital facility in order to complement the findings. This will go a long way in improving the overall performance of the entire institution to the benefit of the public.

Further studies should be conducted to establish reporting rates after implementing the above recommendations.

More studies should be conducted across all hospitals laundry in the Country to make the reporting process hassle-free and harmonize laundry and linen practice.

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APPENDICES

Appendix I: Consent Form

Informed Consent Explanation/Form

My name is Sharon Jebet (Adm No. Q22/CTY/PT/37570/2016). I am researching on "**Evaluation of occupational health practice in the laundry and linen service at KNH, Nairobi city County Kenya".** The study aims at evaluating occupational health practices in the laundry and linen Services at Kenya's Premier Hospital. You are advised to read and comprehend the information contained herein prior to your agreement to be involved in the study. For clarity purposes, you can make enquiries to enable you understand better choices pertaining to your involvement.

Procedure of the study

To collect this information, participants will be administered with questionnaires. This will be done with the assistance of trained research assistants to guide the filling of questionnaires.

Study risks

The researcher confirms that there are no identifiable risks would be incurred in taking part for the current study.

Benefits of the study

You may not get a direct value for taking part in the study, however, this would inform the management on the key issues relating to occupational health and safety.

Study costs to the interviewee

There will be no costs to be incurred in your participation. Taking part in the study is absolutely free of charge.

Research related injuries

There no injuries associated with this study. However, in case of any questions, information will be provided free of charge.

Confidentiality

The information you will provide is basically to assist the researcher in completion of study requirements only. The collected information will be securely stored with others restricted from accessing it, except the researching team.

Voluntarism

Your taking part in the study is not mandatory. You may opt to pull out of the exercise at any given time. You will not be intimidated if you engage in this exercise of data collection.

Contacts

In case of any questions concerning this research, please feel free to contact either me .

Mobile No: 0722626167

Email:jsharonstone@gmail.com

P.O BOX 307556- 00100, Nairobi

Or the Secretary, KNH-UoN ERC

Principal investigator

Signature……. Date……

Declaration of the study by participant

I hereby freely consent to include me in this study entitled Evaluation of health practice in the laundry and linen service ant Kenyatta National Hospital in Nairobi City County Kenya. I have read and understood the information in part A of this document. All my concerns and questions concerning this research have been satisfactorily answered. I understand that participation is voluntary and that I may refuse to participate or withdraw my consent and stop taking part at any time without any penalties.

I hereby freely consent to take part in the study.

Signature ……Date …….

Appendix II: Questionnaire

Part A: **Socio demographic information**

1. Age of the respondent: in years specify…….
2. Kindly tell me your level of education

a. Primary ☐

b. High School ☐

c. University or equivalent ☐

d. other specify

3. Employment status, specify_____

4. Marital status, state type of marriage

a) Monogamous ☐

b) Polygamous ☐

c) Not married yet ☐

d) Divorced ☐

e) Not living with Partner ☐

5. Religion…….

6. Kindly tell me your occupation……

PART B: Occupational Hazards

1 Are you aware of any occupational hazards associated with linen and Laundry?

YES ☐ NO ☐

2. Which Hazards do you know that are common in the laundry department

Hearing loss ☐

Occupational accidents and injuries ☐

Communicable diseases ☐

3 Mention any other occupational hazards known to you

……..

……

3. Briefly mention any measures that can be put in place to mitigate this hazard.

……..

……..

PART C: Environmental factors

1. Are you aware that activities in the laundry department affect the immediate environment?

YES ☐ NO ☐

If yes mention a few ways

……

……

……

2. Are you aware that some linen can harbor disease causing microorganisms?

YES ☐ NO ☐

If yes mention a few

……

……

3. Is there proper disposal of non-re-usable items in the laundry?

YES ☐ NO ☐

4. Mention ways which can be used to mitigate this problem.

……

……

……

PART D: Adherence levels

1. Are you aware of any standard operating procedures in the laundry and linen department?

YES ☐ NO ☐

1 Do you follow these procedures at all times when at work?

YES ☐ NO ☐

2 Mention any challenges you face in relation to SOP implementation

……

……

……

3 Mention ways that can be done to improve SOP Adherence

……

……

……

PART E: Wet bulb globe temperatures levels.

1 Are you aware of Wet bulb globe temperature levels?

YES ☐ NO ☐

2. Do you know how Wet bulb globe temperature levels affect your work?

YES ☐ NO ☐

1 State the challenges of wet bulb globe temperature in relation to your work

……

……

……

2 Suggest how can these challenges be mitigated

……

……

Appendix III: Focus Group Discussion Guide

There will be two focus groups**,** one made laundry loading staff at the wards and clinics, the second made up of staff stationed at the Laundry department

1. What are the potential hazards associated with laundry and linen services at Kenyatta National Hospital?

2. What are the levels of adherences to the laundry and linen services standards at Kenyatta National Hospital?

3. What is the Wet bulb globe temperature levels of Workers in the Laundry and Linen Services at Kenyatta National Hospital?

Appendix IV: Key Informant Interview Guide

1. What are the potential hazards associated with laundry and linen services at Kenyatta National Hospital?

2. What are the levels of adherences to the laundry and linen services standards at Kenyatta National Hospital?

3. What is the Wet bulb globe temperature levels of workers in the Laundry and Linen Services at Kenyatta National Hospital?

Appendix V: Letter of approval of research proposal

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Dean, Graduate School **DATE:** 15th November, 2019

TO: **Ms. Sharon Jebet**
C/o Department of Environmental & Occupational Health

REF: Q22/CTY/PT/37570/2016

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board, at its meeting on **6th November, 2019**, approved your Research Proposal for the M.Sc. Degree entitled, **"Evaluation of Occupational Health Practice in the Laundry and Linen Service at Kenyatta National Hospital in Nairobi City County, Kenya."**

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

Thank you.

EDWIN OBUNGU
FOR: DEAN, GRADUATE SCHOOL

CC. Chairman, Environmental & Occupational Health Department

Supervisors:

1. Dr. Peterson N. Warutere
   C/o Department of Environmental & Occupational Health
   Kenyatta University

2. Dr. Judy Mugo
   C/o Department of Population, Reproductive Health & CRM
   Kenyatta University

EO/pww

Appendix VI: Ethics Approval (Front Page)

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

APPROVED
29 JAN 2020
KNH/UoN-ERC

Ref: KNH-ERC/A/35

29th January 2020

Sharon Jebet
Reg. No.Q22/CTY/PT/37570/2016
Dept. of Environmental and Occupational Health Science
School of Public Health
Kenyatta University

Dear Sharon

RESEARCH PROPOSAL: EVALUATION OF OCCUPATIONAL HEALTH PRACTICE IN THE LAUNDRY AND LINEN SERVICE AT KENYATTA NATIONAL HOSPITAL, NAIROBI CITY COUNTY KENYA (P971/12/2019)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 29th January 2020 – 28th January 2021.

This approval is subject to compliance with the following requirements:

a. Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b. All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
c. Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
d. Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
e. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
f. Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

Protect to discover

Appendix VII: Ethics Approval (Rear Page)

For more details consult the KNH- UoN ERC website**http://www.erc.uonbi.ac.ke**

Yours sincerely,

PROF. M. L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Assistant Director, Health Information, KNH
Supervisors: Dr. Peterson Warutere, Dept. of Environmental and Occupational Health, Kenyatta University
Dr. Judy Mugo, Dept. of Population, Reproductive Health and Community Resource Management, Kenyatta University

Protect to discover

Appendix VIII: Research permit from National Council for Science, Technology and Innovation

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 409930

Date of Issue: 18/March/2020

RESEARCH LICENSE

This is to Certify that Ms.. SHARON JEBET of Kenyatta University, has been licensed to conduct research in Nairobi on the topic: EVALUATION OF OCCUPATIONAL HEALTH PRACTICE IN THE LAUNDRY AND LINEN SERVICE AT KENYATTA NATIONAL HOSPITAL IN NAIROBI CITY COUNTY, KENYA for the period ending : 18/March/2021.

License No: NACOSTI/P/20/3873

409930

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is Guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014

CONDITIONS

1. The License is valid for the proposed research, location and specified period
2. The License any rights thereunder are non-transferable
3. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research
4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies
5. The License does not give authority to transfer research materials
6. NACOSTI may monitor and evaluate the licensed research project
7. The Licensee shall submit one hard copy and upload a soft copy of their final report (thesis) within one of completion of the research
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice

National Commission for Science, Technology and Innovation
off Waiyaki Way, Upper Kabete,
P. O. Box 30623, 00100 Nairobi, KENYA
Land line: 020 4007000, 020 2241349, 020 3310571, 020 8001077
Mobile: 0713 788 787 / 0735 404 245
E-mail: dg@nacosti.go.ke / registry@nacosti.go.ke
Website: www.nacosti.go.ke

Appendix IX: Map showing the location of study area