

**AN ASSESSMENT OF CAUSAL FACTORS OF ACCIDENTS AND INJURIES IN POWERLINE
CONSTRUCTION PROJECTS IN UGANDA. A CASE STUDY IN LUUKA, KALIRO, IGANGA
AND BUGWERI DISTRICTS**

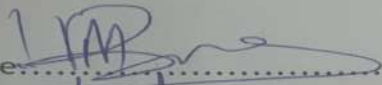
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DECLARATION

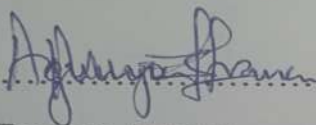
I Muhimbura Brian, hereby declare that this dissertation is my original work and it has not been submitted before to any other institution of higher learning for fulfilment of any academic award.

Signature.....

Date.....11/9/2023.....

APPROVAL

This is to certify that, this dissertation entitled “An Assessment of Causal Factors of Accidents and Injuries in Powerline Construction Projects in Uganda. A Case Study of Luuka, Kaliro, Iganga and Bugweri Districts” has been done under my supervision and now it is ready for submission.

Signature.....

DR. Miria Frances Agunyo

Date.....12/09/2023.....

DEDICATION

I dedicate this research to all those Health and Safety managers, supervisors and the workers in the Country who take an extra mile to make sure that worksites are safe before and during the execution of their mandates. For special mention to my Wife Mrs. Doreen Murungi Muhimbura for the prayers and moral support that she rendered unto me as I went through so many sleepless nights trying to make this a success. To my sons Jayden, Jerome and Jayson who always give me the motivation to work hard everyday.

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LIST OF ACYRNOMS

ILO	International Labour Organization
OHS	Occupational Health and Safety
OSHA	Occupational Safety & Health Administration
PPE	Personal Protective Equipment

ABSTRACT

Although, the construction industry contributes to national economic growth, it has been associated with unsafe working environments due to the exposure of workers occupational hazards and injuries. This study assessed the types, prevalence and causal factors of accidents amongst powerline construction workers in Eastern Uganda. A mixed research approach was employed and data collected using both structured and unstructured interviews. Descriptive statistics approaches including Chi-square tests and multiple regression model were employed to analyze quantitative data and qualitative data analyzed using thematic analysis. Occupational accidents at worksites included electrocutions, slip, falls from height, overhead power contacts, struck by, struck against and car accident. Injuries included skin pierces, skin peel-offs, swellings and skin cuts. Fatal cases originated from struck-by accidents in (76.4%) and car accidents (23.6%). Overhead power contacts (25.2%), struck-by accidents (23.2%) and electric shock (16.4%) accounted for most non-fatal accidents. Only 52% of workers had ever sustained an occupational accident while 69% of them workers had ever sustained an injury. Struck-by accidents (26.5%), struck against (25.7%) and slip accidents (18.6%) were more prevalent accidents while Skin pierce (26.5), skin peel offs (22.8%) and swellings (21.9%) formed the prevalent injuries. Low experience and expertise of workers (68.9%), poor weather conditions (33%), poor conditions & usability of equipment (20.4%), poor communication amongst the workers (25.2%) formed the originating, shaping and immediate influence on accidents. The Duration of work at the powerline construction worksite significantly influenced occupational accidents ($P= 0.014$). Monthly income ($P=0.015$), site location ($P=0.049$), electrician job ($P=0.048$) and mate electrician job ($P=0.034$) significantly influenced work-related injuries amongst workers. Investing in work place safeguards and promoting safety behaviour amongst employees should be prioritized by employers.

CHAPTER ONE: INTRODUCTION

1.1 Background

The construction sector accounts for a prime portion of the global GDP. The sector accounted for 4.1% and 6.8% of the 2019 GDP in United States of America (USA) and China respectively (Alaloul *et al.*, 2021). In the African continent and Sub Sahara Africa Sub region, the construction sector contributes 17.8% and 16.4% of the GDP respectively (Lopes, Oliveira and Abreu, 2017). However, the construction sector has also been characterized with increasing occupational safety challenges alongside (Balkhyour, Ahmad and Rehan, 2019; Gebremeskel and Yimer, 2019).

Over 350,000 million mortalities globally occur from more than 264 million accidents in the construction industry per annum (Rahmani *et al.*, 2013). Takala *et al.*, (2014) denoted that only 5-7% of the annual fatalities in developed countries are attributed to work-related injuries and illness. However, more than half of the reported accidents and mortalities occur in developing regions of the world like Sub-Sahara Africa (Kiconco *et al.*, 2019; Habibi and Nasir, 2020).

Constructions involving electric power and communication transmission lines are associated with higher occupational accident and injuries (Homce *et al.*, 2001; Rahmani *et al.*, 2013; Brenner, Cawley and Majano, 2020), due to related machines, aerial lifts using cranes and boom trucks, weight lift and direct or indirect exposure to electricity contacts (Batra and Ioannides, 2001; King, 2012s).

In Uganda, the construction sector is regarded as the third top sector with highest risk of occupational fatalities and injuries behind the manufacturing sector and service

sector (MGLSD, 2004; (Kiconco *et al.*, 2019)). This is caused by lack of personal protective gear (PPE) usage, poor working environments and behavioral factor of employees (Kiconco *et al.*, 2019). Unfortunately, the nature and causes of occupational accidents and injuries in some industries of the construction sector such as power line construction have not been adequately explored. Yet lack of adequate information on the nature and causes of occupational accidents has been observed as one of the reasons of the mismanagement and continued occurrence of accidents and injuries in the construction sector.

This study explored the different forms and common occupational accidents and injuries as well as their causes among power line construction workers in Eastern Uganda districts of Luuka, Bugweri, Kaliiro and Iganga.

1.2 Statement of the research problem

The construction industry has globally remained as one of the workplaces marred with high rates of job-related accidents owing to the high existence of unsafe occupational conditions (Albert and Hallowell, 2013; ILO, 2013; Habibi and Nasir, 2020). The unsafe working environments involve exposure to electrocutions from fatal electrical voltages falls and cuts among others (Brenner and Cawley, 2015). Indeed, some occupations within the such as casual labours, truck drivers, foremen and electricians have been associated accidents such as electrocutions, falls and overhead powerline contacts (Brenner, Cawley and Majano, 2020). In developing countries in the Sub-Saharan Africa such as Nigeria, Kenya and Ethiopia are occupational accidents and injuries have been associated to several factors ranging to organizational and

individual factors such as training on occupational safety (Hanna, Seid and Lamessa, 2017; Alemu *et al.*, 2020).

In Uganda, occupational accidents and injuries continue to be reported in on construction sites in Uganda (Kiconco *et al.*, 2019). Occupational injuries' prevalence of up to 32.4% was reported at construction sites within Kampala in 2019 (Kiconco *et al.*, 2019). This takes place regardless of the existence of various national and international guidelines aiming at eliminating occupational in the country. Earlier studies have argued that the actual number of occupational accidents in Uganda are possibly even higher than the reported current figures (Alinaitwe, Mwakali and Hansson, 2008; Kiconco *et al.*, 2019; UPF, 2019). This is because information on the prevalence accidents and injuries among workers in other sectors of the construction sectors such as power line construction still remains limited in Uganda. Unlike the power construction sector, majority of the studies have largely reported on occupational accidents and injuries of other sectors of Uganda's construction industry such as building constructions (Alinaitwe, Mwakali and Hansson, 2008; Irumba, 2014).

More so, information on the different contexts that lead to the different types of accidents is also lacking. There is need to provide information and improve records on occupational accidents in the construction industry in order to facilitate their adequate management. Based on this background, this study seeks to examine the nature and prevalence of occupational accidents and injuries among on ongoing power line construction workers in Eastern Uganda districts of Kaliro, Iganga, Bugweri and Luuka. The study also assessed the factors that cause occupational accidents and injuries among the power line construction project workers.

1.3 Purpose and Objectives of the study

1.3.1 Purpose of the Study

The main purposes of this study is to find out the different types of accidents and injuries within the power construction sector in Uganda as well as investigate their causative factors among the workers of the electricity power grid extension projects of the Rural Electrification Agency of the Ministry of Energy and Mineral Development Rural in central and Eastern territory districts of Luuka, Iganga, Kaliro and Bugweri. This will inform and support formulation of proper policies and regulations aimed at minimizing their occurrences and effects at both nationwide and regional scales

1.3.2 Objectives of the Study

The objectives of the study are

- i. To characterize the forms of accidents and injuries at powerline construction sites in the Eastern Uganda districts of Luuka, Iganga, Kaliro and Bugweri.
- ii. To examine the prevalence of different forms accidents and injuries incurred by powerline workers at respective construction sites in the Eastern Uganda districts of Luuka, Iganga, Kaliro and Bugweri.
- iii. To assess the casual factors of accidents and injuries among power line construction workers on the study sites.

1.4 Research Questions

The research questions of the study were:

- i. What are the different forms of accidents and injuries that occur at powerline construction sites
- ii. How common are the different forms of occupational accidents and injuries among workers at power line construction projects sites
- iii. What are the various factors that cause accidents and injuries among power line construction workers on the study sites

1.5 Scope of the Study

1.5.1 Content Scope

This study assessed the various types of occupational accidents amongst workers of powerline construction sites in the Eastern Uganda districts of Luuka, Iganga, Kaliro and Bugweri. The study also assessed the prevalence and causal factors of occupational accidents and injuries among the workers. The powerline construction sites were the electricity power grid extension projects of the Rural Electrification Agency (REA) of the Ministry of Energy and Mineral Development Rural in central and Eastern territory districts of Luuka, Kaliro, Iganga and Bugweri. The powerline construction sites visited were those managed by China Henan International Corporation (CHICO) and Tebian Electric Apparatus (TBEA).

1.5.2 Geographical Scope

Spatially, the study was conducted among electricity power grid extension projects of the in central and Eastern territory districts of Luuka, Kaliro, Iganga and Bugweri being implemented by the Rural Electrification Agency of the Ministry of Energy and Mineral Development. Although the powerline construction activities had been going

on for more than 2years starting from November 2019 in the study area, there was no information on the nature and cause of possible accidents sustained by the workers at the construction sites.

Observation of occupational guidelines and regulatory frameworks was expected to be given priority at the various project sites since the project was funded the world Bank which is an international institution supposed put good considerations on the health or workers (Benjamin, 2008).

1.5.3 Time scope

This study assessed the types, the prevalence and causal factors of occupational accidents and injuries among the workers between September and October 2021. This timeframe was sufficient for conducting the data collection, data analysis and dissertation writing.

1.6 Justification of the Study

Although the construction industry contributes to over 14% of the gross domestic (GDP), the industry is still reported among those with the most unsafe work places alongside other industries like manufacturing and service sector (MGLSD, 2004, 2016). Unlike past studies that have focused on accidents in other sectors of construction industry such as residual and commercial buildings and road construction (Izudi, Ninsiima and Alege, 2017; Kiconco *et al.*, 2019), this study aimed at assess accidents among workers of electricity power line construction projects.

Besides, within the construction industry itself, the nature and causes of occupational accidents associated with some sectors like power line construction have not been

fully explored. This has resulted into a lack of knowledge on the nature and causes of such accidents in the construction industry at both national involved the use of contemporary equipment such as cranes and boom trucks which have been highly associated with various types of accidents such as falls, electrocutions and struck by (Batra and Ioannides, 2001). Therefore, this study was important for bridging the gap between the different types and factors that lead to occupational accidents among power line construction workers in Uganda and Africa as a whole.

1.7 Significance of the Study

This study provides information on the different types of occupational accidents among workers of power line construction works in Uganda, find out their prevalence and the factors influencing their occurrence. The information from this study is important for addition to the existing body of knowledge on the different types and causes of accidents in the construction sector. The study assessed the project design, layout of the construction site and the existence of unsafe working conditions among others. This form of information might be important for assessing the level of compliance to the requirements prescribed in regulations and guidelines for occupation safe among power line construction projects in the country.

1.8 Conceptual framework

Three main aspects including psychological factors, organizational factors and Individual and socio-economic factors were considered as the independent factors that influence the different types of accidents and injuries amongst the powerline construction workers. Organization factors correspond to the international and

national guidelines and regulatory framework such as worksite safety policy, safety training, provisioning of personal protective gear (GOU, 2006; Benjamin , 2008). Previous research has underpinned the influence of organizational factors such as supervisors in influencing occupational safety (Lombardi et al., 2009; Jiang, Fang and Zhang, 2015). Supervisors and managers play a crucial role in prevention of workplace accidents since they have daily contact with workers and are in place to control unsafe conditions and acts that are result into accidents (Wong, Man and Chan, 2020).

Psychological factors included workers' attitude and knowledge that determine the safety behaviour of workers (Ammad *et al.*, 2021). Knowledge of worker about occupational accidents and injuries is also reported to influence the use of PPE (Izudi et al., , 2017) and following occupation safety guidelines about the various types of occupation behaviour that affects (Ammad *et al.*, 2021). Workers attitude towards the use personal protective gear and possess of knowledge about occupational risk hazards also significantly affects their safety behavior (Kiconco *et al.*, 2019; Rahouti *et al.*, 2020). It has been reported that PPE are sometime cited to be uncomfortable and interfering with the workers ability to conduct their work (Sehsah, El-Gilany and Ibrahim, 2020). Individual and socio-economic factors include age, gender, education level, work experience and job type. The type, exposure and severity of accidents and injuries among the different workers such as drivers, casual laborers and power line installers has been reported to vary, with some occupation being at high risk than other (Brenner and Cawley, 2015).

The intervening variables were considered as the factors that mediated between the independent variables and dependent variables (Freeman, 2017). The intervening variables ranged from environmental conditions, site constraints and project design were that are most likely to cause injuries and accidents to workers without their knowledge or that of their employers. Some independent factors such as attitudes and knowledge on work place safety are influenced by organization factors like strictness on safety policies, supervision and training (Hystad, Bartone and Eid, 2014). Injuries and accidents might also arise from falling equipment such as scaffoldings striking the head or any other body parts of workers during operations (Huang and Hinze, 2003). The quality and quantity of personal protective gear (PPE) provided to construction workers by employers has been reported with bearing both positive and negative safety outcomes amongst workers (Lombardi *et al.*, 2009).

Intervening variables were considered as accident-causing factors to which the workers had no control over because of being a primary responsibility of their respective employers. Examples of intervening variables in this study included environmental conditions at the site of work, site constraints, working schedules, risk management, project design, supervision, and safety culture such as the availability of company safety policy, trainings and drills, provision of PPE. Environmental conditions at the site of construction such as debris, uneven grounds, littering of sharp objects like wire/nails and walkways might create unsafe working conditions for workers (Suraji, Duff and Peckitt, 2001). Another issue is whether the construction

design conforms to the regulations and prescribed procedures and ensuring construction safety of the workers (Gharaie, Lingard and Cooke, 2015).

The different types of occupational accidents and injuries were considered as the dependent variable which is influenced by both the independent and intervening variables. The occurrence of a given type of accident or injury at a power line construction can be influenced by both the workers influence such as lack of PPE use or weaknesses in management such power compliance to construction design guidelines and regulations (Health and Safety Executive, 2003). For instance, some types of accidents such as overhead power line contacts and struck-by have been reported influenced by job type such as casual laborers, rivers and site supervisors (Beavers *et al.*, 2006).

INDEPENDENT VARIABLES

- Psychological factors such as worker attitude and knowledge
- Individual and socio-economic factors e.g. Age, gender, education level, work experience and job type
- Organizational factors PPE supply, workers, supervision, safety training and organizational safety policy

DEPENDENT VARIABLE

Forms and prevalence of occupational injuries and accidents at powerline construction centers

INTERVENING VARIABLES

- Organizational factors such as safety culture and quality of PPE
- Environmental conditions, site constraints and project design

Figure 1. 1: Conceptual framework of the study

CHAPTER TWO: LITERATURE REVIEW

2.1 Defining accidents

2.1.1 Occupational accident

An accident refers to an unexpected incidence with the potential to cause injury, or lead to damage and disruption of activities. The international labour organization defines an occupational accident as an unexpected and unplanned incident, that arises in connection with work, and that results into one or more workers incurring a personal injury, disease or death (Benjamin O Alli, 2008).

The two broad categories of accidents included the fatal and non-fatal accidents (Hinze and Bren, 1996). Fatal accidents often involve the death of at least one person within 30 days from the time of occurrence of the accident while non-fatal accidents do not involve the death of any person within 30days (OSHA, 2018).

2.1.2 Occupational injury

An occupational injury refers to any injury that arises from a work accident or from an exposure comprising of a single incident in the working (Benjamin O Alli, 2008).

2.1.3 Worksite

A worksite refers to a physical area where workers are required to be or go to due to their work that is under the control of an employer (ILO, 2001).

2.2 Types of accidents and injuries in the construction industry and power line constructions

Information from numerous studies (OSHA, 1990; Batra and Ioannides, 2001; Brenner, Cawley and Majano, 2020) has shown that accidents within the construction industry

can be broadly categorized as falls from elevation, electrical shocks, caught in/between, struck-by, inhalation of toxic gases and burns as described below;

2.2.1 Falls from elevations

Fall accidents among workers in the construction sector involve unintentionally falling from elevated platforms onto the ground with sustained injuries such as concussions or a fractures and death in some cases (Huang and Hinze, 2003). Falls usually take place during operations involving climbing and or while using aerial lifts especially during work on tall buildings, electric pole and wire erections (Lette *et al.*, 2018). Majority of the fall accidents recorded in the construction have been reported to be as a result of misjudgment by the victims (Huang and Hinze, 2003). While some falls take place due to use of simple equipment like ladders and scaffolds other falls take place on sophisticated equipment such as boom trucks and cranes (Gharaie, Lingard and Cooke, 2015). Research has also shown that majority of the fall accidents take place at elevations of less than 9.15 m (Huang and Hinze, 2003).

2.2.2 Struck by accidents

Struck-by accidents within the construction industry have been reported primarily a result workers struck by equipment, private vehicles, falling materials, vertically hoisted materials, horizontally transported materials, and trench cave ins (Hinze, Huang and Terry, 2005).

2.2.3 Overhead power line contacts

Another prominent type of accident in the construction industry are unintended contacts with overhead power line (Homce *et al.*, 2005; Salehi *et al.*, 2014). Majority

of the overhead power line contact accidents are caused by contacts from working equipment used by construction workers such as steel or timber frame loads, cranes and boom trucks involving crane (Gharaie, Lingard and Cooke, 2015). According to Beavers *et al*, (2006), overhead power line contacts can also result from be direct on power lines by workers or ladders.

2.2.4 Fatal electrical shock/electrocution

Electric shocks take place when an electric of a particular current flows through human body and can causing impairment in muscle control or leading to death (Linja-aho, 2020). It has been reported that fatal accidents from electric shocks often involve continuous current ranging between 50 and 150 milliamperes (Cawley and Homce, 2008). However, the effect of electrical shocks have been found to vary between the affected workers based on the duration of the shock and the degree of the current (Cawley and Brenner, 2012; Neitzel, 2015).

2.2.5 Arch flash accidents

According to (Linja-aho, 2020), an arc flash accident occur when a high voltage current suddenly flows through the air due to an occurrence of a short circuit thereby discharging heat and visible light. Arc flash accident have been observed to result into shock waves, release molten metal particles, cause an acoustic bang and release poisonous gasses that expose workers to injuries (Linja-aho, 2020). Other uncommon accidents are burns injuries from electric shocks and contacts, struck against working equipment and caught in/between moving parts of machines or working equipment (Hinze, Huang and Terry, 2005).

2.3 Trends in occupational fatalities and injuries caused by on-job accidents in the construction

Findings from the construction industry in countries like Australia and the USA has shown that the occurrence of certain occupational accidents in the such as falls, electric shocks and struck-by accidents have been more prevalent in the recent decades compared to those reported in the eighteenth century (Huang and Hinze, 2003; Gharaie, Lingard and Cooke, 2015; Brenner and Majano, 2020; Lingard *et al.*, 2021). In the USA, fall fatalities accounted for only 33% of all the worker fatalities in the construction industry between 1985 to 1989 (Huang and Hinze, 2003). However, data from United States Department of Labor Occupational Safety and Health Administration (OSHA) reported that the proportion of fatalities cause by fall accidents in the construction industry rose from 33% in 1989 to 34.1% in preceding years to 1996 and to 38.4% by the 2001 (OSHA, 1990).

Hinze, Huang and Terry, (2005) reported that data from OSHA revealed that the proportion of fatalities resulting from “struck-by” accidents in USA construction industry raised from 22% of all construction-related accidents between 1985-1989 to 24.6% between 1997 to 2000. Crane related accidents such as electrocutions and falls accounting for accounts for 8% of the total fatalities in the USA construction industry (Beavers *et al.*, 2006). In the Australian construction industry only, (Gharaie, Lingard and Cooke, 2015) reported that over 359 workers were killed by work-related accidents just between in the 10 years between 2004 and 2013; During this same period, it is said that the construction industry accounted for 14% of the total worker fatalities registered (Gharaie, Lingard and Cooke, 2015).

Literature has also shown that the international statistics on some construction industry accidents like electrical related accidents greatly varies amongst different countries (Cawley and Homce, 2003, 2006). Electrical accident fatality rate ranges between 0.1-0.3 fatalities per 100,000 workers per year in the United States of America (USA) (ESFI, 2020), stands at 0.14 per 100,000 persons per year in Northern Ireland (Lucas, 2009), 1.29 per 100,000 persons per year in Bulgaria (Dokov, 2008) and 0.52 per 100,000 persons per year in Western Australia (Fatovich, 1992; Linja-aho, 2020). In Finland, the rate of fatalities from electrical accidents has been reported to have decreased from 0.29 per 100,000 people per year to 0.00-0.07 in recent decade since the 1890s (Linja-aho, 2020).

Previously, electrical fatalities were put in the sixth position among major cause of occupational fatalities in USA construction industry having accounted for the death of 2,287 workers from electrical shocks or electrical burn injuries between 1992 and 1998 (Cawley and Homce, 2003). In the proceeding periods of 1992-2002, the number of death resulting from on-job- electrical accidents was recorded at 3378 workers and electricity remained the sixth leading cause of fatalities caused by occupational based injuries (Cawley and Homce, 2008). Although this indicated that the number of occupational death caused by electricity reduced to 4.7% for the period 1992-2002 from 5.2% between 1992 and 1998, electrocution and contact with overhead power lines was reported to have accounted for 99.1% and 42% of the electricity related occupational death respectively (Cawley and Homce, 2008). Nonetheless, the construction industry's share of electrical fatality cases decreased from 2.2 to 1.5 per

100,000 workers between 1995 and 2002 even though it had accounted for 47% of all the electrical death between 1992 and 2002 (Cawley and Homce, 2008).

Kiconco *et al.* (2019) reported a prevalence of 32.4% of injuries among workers at building construction sites in Kampala, Uganda. An earlier assessment indicated the number of occupational accidents in Kampala the capital city of Uganda only was reported to have been 209 in 2001, 354 in 2002, 236 in 2003 (MGLSD, 2004). This implied that there was a 69% increase in occupational accidents between 2001 and 2002 before reducing by over 33% in 2003. Out of the 209 occupational accidents in the year 2001 only, 44% (91) of them resulted into fatalities with the construction sector coming second after the manufacturing sector with 18% of occupational injuries and 9% of occupational fatalities respectively (MGLSD, 2004).

2.4 Causes of power line accidents

The presence of uninsulated conductors anchored on electric towers or poles and contacts with uninsulated overhead electric power lines present one of the commonest causes of electrocution hazard to personnel in the power line construction sector (Doan, 2020). The failure of workers such as electricians to follow proper lockout/tag out procedures, direct contact with energized conductors through handheld conductive materials and contacts with handheld metallic objects such as aluminum ladders, pipes and poles commonly cause electrocutions is (Brenner and Majano, 2020; Doan, 2020). Low awareness and lack of sufficient training on work place safety and the proper handling of working tools and appliances among construction workers is also reported as a contributing factor to occupational

accidents and injuries (Brenner, Cawley and Majano, 2020). Batra and Ioannides (2001) denoted that electric accidents in the construction industry are primarily a technical issue that could be through better engineering process such as correct design and electrical installations during construction as training of workers.

Falls were responsible for accounting for 33% of all construction accident related fatalities in USA from 1985 to 1989, having accounted for 33% of injuries and fatalities. (OSHA, 1990). In the subsequent years from 1996 to 2001, falls from both high elevations and low elevations were responsible for 38.4% of all injuries in the USA construction industry. Based on the statistics on occupational accidents and injuries, struck-by accidents accounted for 24.6% of all fatalities recorded of all within the construction industry between 1997 and 2000 (Hinze, Huang and Terry, 2005). Struck-by accidents accounted for 22% of all fatalities recorded of all within the construction industry between 1985 and 1989 (OSHA, 1990).

Workers coming in contact with underground buried power lines during trench digging has been associated with up to 1% and 2% of fatal and nonfatal injuries in USA while contacts with electric current of machines, appliances, with transformers and with 36% and 34% of nonfatal electrical injuries respectively (Cawley and Homce, 2008). Salehi (2017) showed that contacts between overhead power lines and portable metal ladders often result into fatal injuries due to electrocutions to of the workers involved. Ladder contact with power lines during erection, lowering, or relocation of the ladder lead to often lead to the contacts with the overhead power lines (Salehi *et al.*, 2014).

Although the construction sector contributes to 17.8% and 16.4% of the GDP in the African continent and Sub Sahara Africa region respectively (Lopes, Oliveira and Abreu, 2017), the sector is still marred with a high number of occupational accidents (Balkhyour, Ahmad and Rehan, 2019; Gebremeskel and Yimer, 2019). At least 16,012 per 100,000 workers in Sub-Saharan Africa still get involved in occupational accidents while 21 per 100,000 workers have dies as a result of occupational accidents (Takala *et al.*, 2014). In Tanzania, fatal injuries occupational injuries are estimated at 36 per 1000 workers and causing death of 23.73 per 100,000 workers (URT, 2013). A study conducted at multiple construction sites in Uganda reported common occupational injuries amongst workers including as pierces from construction materials at 19%, cuts from sharp objects at 28% and strikes from falling objects at 8% (Kiconco *et al.*, 2019).

2.5 Policies and guidelines on occupational safety

Article 4 of the of the Occupational Safety and Health Convention, 1981 (No. 155) calls for national governments in consultation with employers and workers' organizations to establish, implement and periodically review a policy aimed at eliminating accidents and injury to health arising from or occurring during the course of work (ILO, 1981). In reflection to this same article (Article 4), elimination of hazards at their source is ought to be given priority at different levels including design, structural features, installations, repairs and maintenance and when making changes to means of egress at the workplace (ILO, 1988).

The 1988 Convention on Safety and Health in Construction provides guiding principles under which occupational safety can be promoted in the construction industry (ILO, 1988). Article 13 of the 1988 Convention calls for use of precautionary measures and safe means of access and egress at workplaces. Article 14 of the article calls for ensuring inadvertent movement while using scaffolds and ladders while Article 15 calls for all lifting appliance to be of good maintenance, construct and under good maintenance (ILO, 1988). Article 17 of the same article also calls for plant machinery and hand tools to be of good maintenance, construct and under good maintenance (ILO, 1988).

Internationally, It is well stipulated by (ILO, 1987, 2013) that it is the duty and responsibility of employers to ensure that precautionary measures that safeguard workers from workplace accidents and injuries are put in place. Article 18 of the fundamental principles of ILO occupational health and safety (Benjamin O Alli, 2008) implores employers to undertake all preventative measures that address emergencies and accidents such as the use of personal protective equipment (PPE) their workplaces. Similarly, employers are advise to invest in measures trainings and safety drills that are aimed at raising the knowledge, awareness and create positive attitude towards occupational safety and health among workers at no cost at all (ILO, 2008). Workers are not only expected to comply with observing the guiding principles but also to periodically conduct prepare occupational safety and health inspection reports that should be accessed by occupational safety and health officers of their (ILO, 2013).

In Uganda, one of the national statutory arrangements that addresses matters concerning occupational safety is the Occupational Safety and Health Act (2006) (GOU, 2006). It is stipulated in Section 57 that the work environments should provide for walk ways for workers and buildings installed with means of escape and doors that allow for in case of emergency (GOU, 2006).

2.6 Occupational accident casual factors in the construction industry

Scholars have shown that the causes of work-related accidents in the construction industry are influenced by very many factors ranging from individual factors, technical such as project design, to employers and contractors factors and policy and regulation (Abdelhamid and Everett, 2000; Chi, Yang and Chen, 2009; Gharaie, Lingard and Cooke, 2015; Kiconco *et al.*, 2019). According to (Abdelhamid and Everett, 2000) such as equipment type used, the nature of handling working materials such as steel loads, the time of work, poor follow up of the lockout/tag-out procedures and individual factors like age and sex of the workers were identified as secondary causes of accidents in the construction industry. In a study to establish determinants of occupational injuries among construction workers in Uganda, Kiconco *et al.* (2019) found out working in night shifts, age of the workers ($P= 0.009$, GLM), daily income ($P = 0.028$, GLM), job stress ($P= 0.004$, GLM), PPE provision and usage ($P= 0.002$, GLM) to be significantly associated with occupational injuries. Chi, Yang and Chen (2009) revealed that PPE usage, accident contacts with electric parts, insulations of conductors and appliances, poor working environments and lack of protective gear as some of the major causes of electric accidents in the construction industry.

Based on the Loughborough University accident causation model, three broad categories of causal factors of accidents are identified as shaping factors, immediate circumstances and originating influences (Health and Safety Executive, 2003). Immediate circumstances that cause construction accidents involve the conditions of the working environment such as absence of walkways and means of egress and local weather conditions, the safety behavior of workers, the nature of lighting at the work site, motivations to the workers, , type of equipment used, suitability, usability and conditions of tools such as ladders and scaffolds (Health and Safety Executive, 2003). Shaping factors entails factors that are majorly supposed to be implemented by the employer at a workplace to safe guard the workers.

The shaping factors include putting in place worksite design that conforms to the guiding policies and laws, ensuring safe guard against work hazards through PPE usage, putting in places measures for supervision of workers on PPE usage and safety behavior through supervision, providing enough working space and safe working environments and site constraints and establishing communication means amongst work teams (Health and Safety Executive, 2003). According to the (Health and Safety Executive, 2003), include the permanent design of the construction structures, technical skills of the contractors, economic climate in the workplace and inadequate hazard risk mitigation measures at the workplace are the major originating factors that cause accidents.

2.7 Research Gap

Numerous occupation safety challenges and work-related accidents have continued to be associate with the construction industry (Tolera, 2016; Sehsah, El-Gilany and Ibrahim, 2020). Previous studies have put much emphasis on accident causations in some sectors of construction industry such as residual and commercial build and road construction (Izudi, Ninsiima and Alege, 2017; Kiconco *et al.*, 2019). However, the nature and causes of occupational accidents associated with some sectors like power line and communication line construction have not been fully explored. There is an existing dearth of knowledge on the nature and causes of accidents within the power line construction sector at yet it is reported among the highly accident risk sectors at both national and regional scales. This study was important for closing the gap between on the different types and factors that lead to accidents among power line construction workers in Uganda and Africa as a whole.

CHAPTER THREE: METHODOLOGY

3.1 Research Design

This study employed a mixed research design involving both qualitative and quantitative approaches (Cresswell, 2006). The qualitative approaches were used to pose questions on the different types and possible causes of accidents among the workers at different power line construction sites. Qualitative approaches are found important for facilitating proper understanding of the real-life contexts and perspectives on the different nature and possible causes of accidents among the workers at different sites (Creswell, 2012). The quantitative approaches are important for understanding the trends in a given phenomenon under investigation (Creswell, 2012). The quantitative approach in this study were therefore used to assess the frequency, severity and magnitude of the occupational accidents reported.

3.1.1 Area of study

The study was conducted on the REA projects extending grid electric power connections in the central region districts of Luuka, Kaliro, Iganga and Bugweri districts. The two power line construction sites are also under the management of two different contractors. This offered an opportunity for the researcher to assess whether there was a difference or similarity in the types and factors influencing occupational accidents under different management and supervision. The projects were funded by the Government of Uganda through a loan secured from the World Bank and it is therefore expected that occupational safety is given a priority. Additionally, the projects are expected to involve the use of contemporary

technologies such as cranes and boom trucks which have been that have been high associated with various types of accidents such as falls, electrocutions and struck by (Batra and Ioannides, 2001).

3.1.2 Sources of Information

The primary data of this study was collected empirically from the power line construction workers on the two sites. Secondary data for this study was obtained from pre-existing literature materials such as published journal articles, reports, research books and literature from the internet such as government reports and statutory instruments through desk review.

3.1.3 Population and Sampling Techniques

3.1.3.1 Population

The population of this study was the power line construction workers working REA projects extending grid electric power connections in the eastern and central region districts of Luuka, Kaliro, Iganga and Bugweri districts. Lists of all the workers found on the two construction sites was obtained from the respective Human Resource Managers in order to establish the total number of the workers.

3.1.3.2 Sample Size

The sample size of this study was calculated from the population of the power line construction workers working on both contracts in the three districts of Luuka, Kaliro, Iganga and Bugweri using the Krejcie and Morgan (1970) method of determination the sample size of a study (formula 1). The Krejcie and Morgan method is widely used for

sample size determination at the desired confidence level of 95% and margin error of 5 (Krejcie and Morgan, 1970).

$$n = \frac{X^2 NP (1 - P)}{d^2 (N - 1) + X^2 P (1 - P)} \dots\dots\dots \text{Equation 1.}$$

Where;

n = required sample size.

X² = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size.

P = the population proportion (assumed to be .50 that should provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (0.05)

Using this method of sample size determination, the sample size of this study was calculated as 100 respondents from a total population of 140 powerline construction workers in the districts of Bugweri, Luuka, Iganga and Kaliro.

3.1.3.3 Sampling Technique

Both probabilistic sampling such as purposive sampling and non-probabilistic including simple random and stratified sampling techniques were applied during this study. Unlike the non-probabilistic sampling procedures, probabilistic sampling procedures

do not give every member of the population an equal chance of selection. Stratified sampling method was used to first categorize the population of the workers into different strata corresponding to their different work sites. The different powerline construction site across the districts of Luuka, Kaliro, Iganga and Bugweri each formed a stratum. Stratified sampling technique is important for organizing the population under study into small manageable and homogenous sub-groups from which selection through non-biased measures such as simple random sampling can be utilized (Pathak, 1988; Etikan, 2017).

After organizing the workers at different sites into manageable strata, simple random sampling was conducted to select the workers that were interviewed in this study. Simple random sampling was used because it is an efficient and reliable method of minimizing bias during the selection of respondents from a finite population by giving every respondent an equal chance of selection (Kothari, 2004). Purposive sampling techniques were used to select key informant interviewees of the study such as site managers and supervisors of the respective power line construction sites in Luuka, Kaliro, Iganga and Bugweri. Key informants such as site managers and supervisors were purposively selected for the key informant interviews because they were involved in management and administration of the powerline construction sites and thus held unique information. Purposive sampling enables the researcher to obtain in-depth information from the interviewees (Wilson, 2014).

3.1.4 Variables and Indicators

To measure different independent variables in this research, information on different aspects including worker attitudes and motivation, worker knowledge and skills on

occupational safety, PPE usage culture, type of equipment and socio-economic factors such as age, gender, education level, work experience and job type during the field survey at the different construction sites. Frequencies were calculated for the dependent variable such as the causes of the different types of occupational accidents among the power line construction workers. Information on the intervening variables such as the project design, the project site lay out plan and the type and quality of PPE provided to workers at the respective construction sites in Luuka, Kaliro, Iganga and Bugweri and checked for their compliance with the existing occupation safety policies and guidelines.

3.1.5 Procedure for Data Collection

Both primary and secondary data was collected for this study. Primary data was collected through methods such as participate observation, structured interviews with key informants and semi-structured interviews with workers using an interview guide and semi-structured questionnaire respectively. Secondary data was collected through desk reviews of literature materials such as journal articles, books, book chapter, governmental and non-agency reports related to the objectives of the study. Some of the secondary data called included national and international statutory arrangements on occupation safety policies and guidelines of power line construction projects.

3.1.5.1 Objective one: Characterizing the forms of accidents and at powerline construction sites in the Eastern Uganda districts of Luuka, Iganga, Kaliro and Bugweri

To collect data on the types of accidents and injuries among the workers of the power line construction projects on the study sites, both structured and semi-structured

interviews was conducted with construction workers, supervisors and managers. Structured interviews mainly are usually designed mainly comprising of closed-ended questions that are often pre-scripted, containing prompts and probes (Phellas, Bloch and Seale, 2011). Semi-structured interviews involves a mix of both open-ended and closed ended questions. Open-ended questions allow for logic reasoning and elaboration of ideas by respondents while closed ended questions limit the responses of the respondent to particular scripted prompts and probes (Phellas, Bloch and Seale, 2011). Interviews are efficient and reliable methods of acquiring first-hand information from the respondents during research (Phellas, Bloch and Seale, 2012; Wilson, 2014).

Questions about the occurrence of different types of accidents such as fall accident, struck by accidents, electrocutions, burns and cuts by sharp objects was posed among the workers and project managers and supervisors at their respective site was asked. A questionnaire (Appendix 9) and interview guide (Appendix 9) were used as tools for conducting the structured and semi-structured interviews respectively. A questionnaire is a data collection tool that consists of short and precise questions and allows the researcher to gather information from a particular number of respondent in a convenient manner (Jenn, 2006). In the case of this research, the questionnaire entailed questions on the types, prevalence and factors that cause accidents and injuries among the target power line construction workers in Luuka, Kaliro, Iganga and Bugweri districts. The interview guide majorly consists consist of

3.1.5.2 Objective two: Prevalence of different forms accidents and injuries incurred by powerline workers at respective construction

Data on the prevalence of accidents and injuries among power line construction workers on the study sites was collected through structured and semi-structured interviews conducted with construction workers, supervisors and managers. Questions about the frequency of occurrence of different types of accidents, the occupations at risk of accidents and the type of workers that are frequently involved in accidents was asked among the workers and project managers and supervisors at their respective site was asked. Similarly, questionnaires and interview guides were used as tools for conducting the structured and semi-structured interviews respectively.

Focus group discussions were also conducted with workers to obtain information on the prevalence of accidents at the construction sites. Focus group discussions (FDGs) can be conducted with more than 6 participants and are important for obtaining an in-depth understanding about a phenomenon under study (Yin, 2015). A total of four FDGs, including one within each of the four different districts were conducted.

3.1.5.3 Objective three: causative factors of accidents and injuries among power line construction workers on the study sites

Data on the causes of accidents and injuries among power line construction workers on the study sites was collected through semi-structured interviews with construction workers. Data on the attitudes, motivations and knowledge of workers on safety towards occupational accidents as well as their socio-demographic data like age, work experience and type of occupation was acquired. Structured interviews were conducted with supervisors and managers to obtain information on the safety

behavior of their works, the availability of management strategies to avoid accidents, the project design, site layout plan and the compliance with statutory requirements. Focus group discussions were also conducted to obtain in-depth understanding and data on the various causes of accidents among the workers at the different powerline construction sites (Yin, 2015).

3.1.6 Quality/Error control

The research instruments such as questionnaire and the interview guides were first pre-tested for their validity and reliability in order to obtain quality and relevant data as follows:

3.1.6.1 Validity Tests

Content validity: The questionnaire was subjected to content validity tests using the workers powerline construction workers at one construction site and experts in the health and safety field who were mainly supervisors in the construction industry. Questions in the data collection tools were first pre-tested to check whether they were good for collected the required information. This involved administering the questionnaire to six respondents and the interview guides to four randomly selected respondents respectively. Each question in the questionnaire and the interview guides were also checked in order to establish the validity of the tools. Editing and realignment was done for any particular question that necessitated following the pretesting. Deletion or additions to the questionnaire and the interview guides was done following review from the researcher and his assistants.

Convergent and Divergent Validity Measures: attention was paid to assess how the responses of one individual worker corresponds or diverges from the responses of other workers or their managers and supervisions.

3.2 Unit of inquiry and Unit of analysis

The unit of inquiry for this particular research was the individual construction worker involved in the study on from the two respective study sites. The socio-economic data such as age, work experience and type of occupation was acquired. The data was collected at individual level amongst the different workers, technical personnel and management members.

3.3 Strategy for Data Processing and Analysis

Processing of the collected data involved cleaning the data, editing, and coding and tabulation procedures. Coding numbers to responses in order to classify them into related classes or categories. Editing of the data was done to check and remove any errors and omissions in the responses. Data was analyzed using the Statistical Package for Social Sciences (SPSS) to run both descriptive and inferential statistical analyses.

3.3.1 Objective one: Characterizing the forms of accidents and at powerline construction sites in the Eastern Uganda districts of Luuka, Iganga, Kaliro and Bugweri

Descriptive statistics approaches was used to analyze data on the different types of accidents identified amongst the workers. Descriptive statistics was conducted using

the Statistical Package for Social Science software (SPSS) to calculate frequencies and percentage of the respondents on the aspects asked (Kothari, 2004).

3.3.2 Objective two: Prevalence of different forms accidents and injuries incurred by powerline workers at respective construction

Data on the prevalence of accidents and injuries among power line construction workers was analyzed using both thematic analysis and descriptive statistics. Descriptive statistics was used to calculate frequencies and percentage of the respondents on the different types and severity of accidents at the construction sites (Kothari, 2004). The Chi-square tests were conducted to run a cross-tabulation on to assess the nature of association between the type of work done by the powerline construction worker on the study sites and their involvement in occupational accidents and injuries. The Chi-square tests is important for checking for a statistically significant relationship between two categorical variables (Delucchi, 1983; Donald, 2015).

Thematic analysis was used conducted to analyze qualitative data obtained from the key informant interviews and FGDs (Braun, 2006). Thematic analysis involved transcribing, coding, interpretation and building themes with in the qualitative data before analyzing in SPSS (Braun, 2006).

3.3.3 Objective three: causative factors of occupational accidents and injuries among power line construction workers on the study sites

Descriptive statistics were used to analyze the data on the perceived common immediate, shaping and originating factors that caused occupational accidents

amongst workers on the study sites. The Multiple Linear Regression Model was used to analyze data on the factors that cause accidents and injuries among power line construction workers on the study sites. The Multiple Linear Regression Model is Ordinary Least-Squares Regression (OLS) that estimates the relationship between a dependent variable and two or more independent variables Formula 2 (Marill, 2004).

$$y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} \dots + \beta_p X_{ip} + \epsilon \dots \dots \dots \text{equation 3}$$

Where,

y_i = the dependent variable

x_i = the independent variables

β_0 = the y-intercept (constant term)

β_p = the slope coefficients for each predictor variable

ϵ = the model's error term (residuals)

Qualitative data obtained from the key informant interviews and focus group discussions (FGDs) on the possible cause of occupational accidents among the power line construction sites was analyzed using thematic analysis (Braun, 2006).

3.4 Ethical Considerations

The researcher observed all the relevant ethical values during the process of this study. The researcher obtained an introductory letter from the University and used it to introduce himself and the research study to the local leaders as well as to the managers and administrators of the different powerline construction sites in Iganga, Bugweri and Luuka districts. The researcher presented the introductory letter from

the University and also sought permission in writing from the contractors of the different power line construction sites before accessing their sites and engaging their respective workers. The researcher also prepared a consent form which was read out to the respondents explaining the purpose of the study to them and seeking their permission for involvement in the study. The consent form also gave the opportunity for the respondents to withdraw from participating in the study at any point they felt like not continuing with it. The research also assured and maintained confidentiality of the views of the respondents and maintained them for only academic purposes.

3.9 Limitations of the study

The field survey involved driving on long distance to trace down workers of the powerline construction since these moved to different working sites on a daily basis. This increased the cost of the research as well as extending the days required to interview the required number of participants. Some respondent opted not to participate in the structured interviews.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.0 Introduction

This section comprises of the key findings of study. The various occupational accidents reported at powerline construction sites included electrocutions, slip/fall on same level, fall from height, overhead power contacts, struck-by, struck-against, electric arch flash accidents, caught between and car accident injuries. Fatal and non-fatal accidents. The various occupational injuries include skin pierces, skin peel-offs, swellings, skin cuts, burns, simple fractures, snake bites and compound fractures. Only 52% of workers had ever incurred an occupational accident while 69% of the workers had ever incurred an injury. Struck-by accidents 26.5% were the most common accidents among workers while skin pierces were the most common injuries among workers (26.5). The experience at work significantly influenced the forms of occupational accidents among workers while injuries were significantly influenced by monthly income, site location, electrician job and mate electrician job.

4.1 Socio-demographic characteristics of the powerline construction workers at the study sites

Following the sample size determination method presented in (sub section 3.1.3.2), the sample size of this study was estimated at 100 respondents. The biggest percentage (95.1%) of the powerline construction workers included in this study were males while the female only accounted for 4.9% (Figure 2).

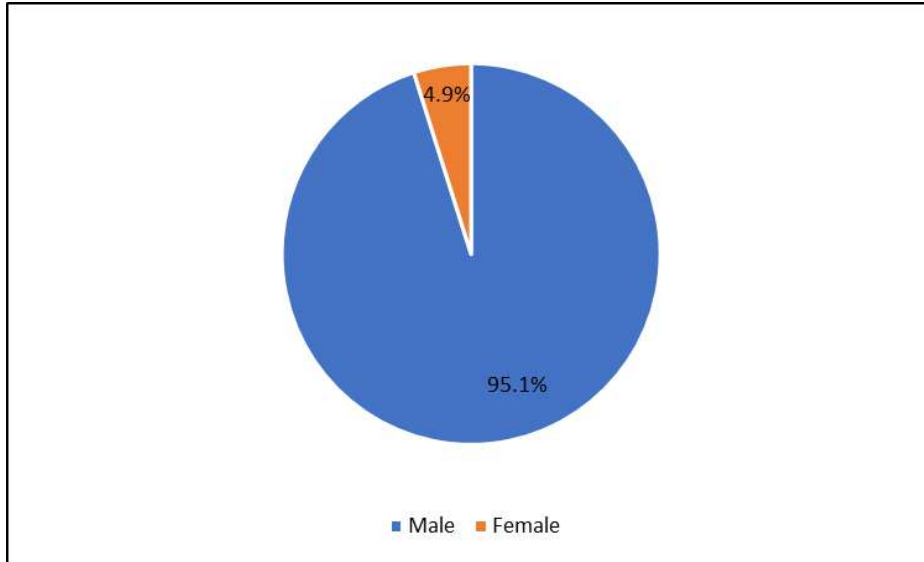


Figure 4. 1: Gender of the respondents

Most of the respondents were casual laborers (66%) while mates accounted for 9.7%, Linesmen 7.8%, Foremen 6.8%, Truck drivers 2.9% and Food Vendors 2.9%, Electricians 1.9% and Supervisors 1.9% respectively (Figure 4.2).

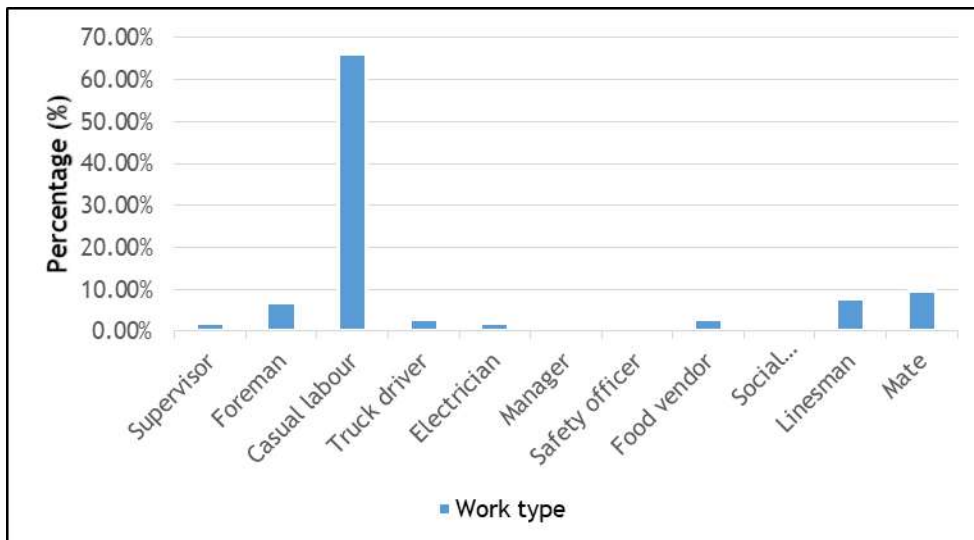


Figure 4. 2: The work type of respondents

Results showed that 54.4% of the powerline construction workers were not married while 45.6% of them were married and none of them neither divorced nor widowed (Table 4.1). All the powerline construction workers interviewed had attended school with the biggest percentage (56.3%) having attended secondary, 21.4% attended primary, 21.4% holding a vocational certificate or diploma and the least percentage (1%) having attained a degree. All the powerline construction workers interviewed were camping at the site (100%) and none of them commuted from home.

Table 4. 1: Socio-demographic characteristics of the powerline construction workers at the study sites

Socio-demographic characteristics		Frequency	Percentage %
Marital status	Single	56	54.4%
	Married	47	45.6%
	Divorced/separated	0	0.0%
	Widowed	0	0.0%
Education attained	Never attended school	0	0.0%
	Primary	22	21.4%
	Secondary	58	56.3%
	Vocational or diploma	22	21.4%
	Degree	1	1.0%
Residence	Commutes from home	0	0.0%
	Camped at site	103	100.0%
Shift	Night shift	0	0.0%
	Day shift	103	100.0%

The mean age of the powerline construction workers included in this study was 26years while the minimum and maximum age was 18 and 54 years respectively (Table 4.2). The average working experience of the powerline construction workers involved in this study was 8months while the minimum and maximum was 2months and 3years respectively (Table 4.2). The average monthly salary of the powerline construction workers involved in this study was 447752.8 while the minimum and

maximum was 300000 Uganda shillings and 1,500,000 Uganda shillings respectively (Table 4.2).

Table 4. 2: Descriptive statistics results of age, duration of work and monthly income of the powerline construction workers at the study sites

Descriptive Statistics				
Variable	Sample size	Minimum	Maximum	Mean
Age	103	18	54	26.07
Work duration	103	2	32	8.0
Monthly income	103	300000	1500000	447752.8

4.2 Characterizing the forms of accidents and at powerline construction sites in the Eastern Uganda districts of Luuka, Iganga, Kaliro and Bugweri

An inquiry into the different forms of occupational accidents (sub-section 2.1.1) at powerline construction workers included struck-by accidents (22.3%) struck-against 19% accidents and caught between accidents (17.4%). The other forms of occupational accidents powerline construction sites included Slip/fall on same level accidents (17.0%), fall from height accidents at 14.6%, car accidents at 4.5%, electrocutions at 2.4%, electric arch flash accidents at 1.6% and the overhead power contacts at 1.2% respectively (Table 4.3).

Table 4.3: different forms of occupational accidents reported powerline construction sites in the study area

§Accidents ever witnessed on site Responses			
	Type of accident	Frequency	Percent
1a	Electrocutions	6	2.4%
	Slip/fall on same level	42	17.0%
	Fall from height	36	14.6%
	Overhead power contacts	3	1.2%
	Struck by	55	22.3%
	Struck against	47	19.0%
	Electric arch flash accidents	4	1.6%
	Caught between	43	17.4%
	Car accident	11	4.5%
	Total	247	100.0%

a Dichotomy group tabulated at value 1.

The different forms of occupational accidents reported at powerline construction sites varied among the workers based on their occupation/job type including mate electricians, drivers, supervisors and casual workers (Appendix 1). Supervisors and managers were mainly associated with struck-by (33.3%) and caught between (33.3%) accidents, casual labourers were associated with struck-by (21.8%), slip (19%), struck against (19%) and caught between accidents (19%).

Responses from the powerline construction workers revealed that skin pierces (23.8%), skin peel-offs (22.4%) and swellings such as blisters (20.6%) were the occupational injuries powerline reported at powerline construction sites. These were

followed by skin cuts/tearing (18.2), burns (5.9%), simple fractures (3.3%), snake bites (2.1%) and compound fractures (0.5%) (Figure 4.3).

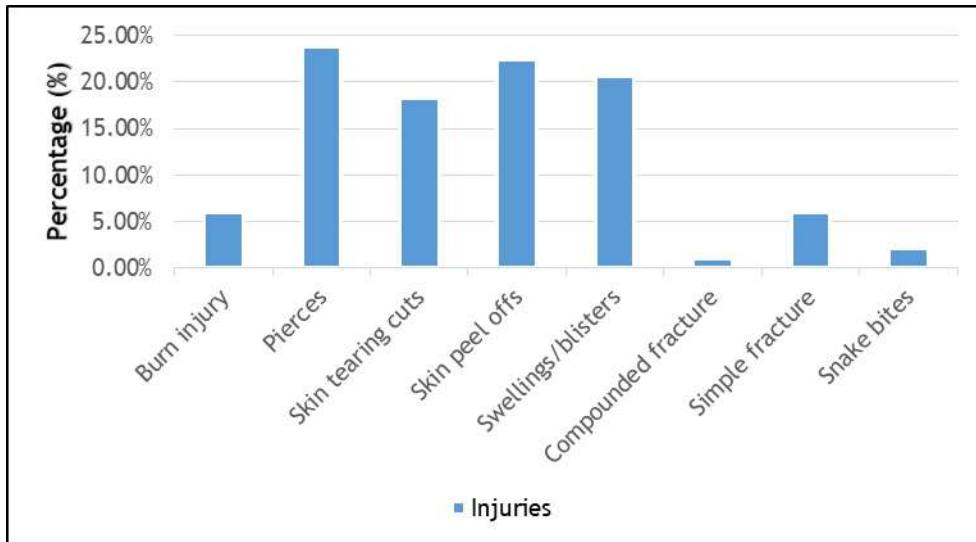


Figure 4. 3: Types of Injuries sustained by the workers at the different powerline construction sites

In the current study, different forms of accidents such struck by, caught between, falls from height occurred amongst powerline construction workers on the different study sites. Elsewhere, findings have reported similar results to this study and accidents such struck by, caught between, falls from height, falls on same level/slip and struck against accidents amongst electricity transmission and distribution workers (Batra and Ioannides, 2001; Cawley and Homce, 2003; Rahmani *et al.*, 2013).

Table 4. 4: Comparisons with types of accidents and injuries reported by other studies

Source	Type of accidents	Type of injuries
Batra and Ioannides, 2001	Electrocutions, Overhead power contacts, Fall from height, Struck by, Electric arch flash accidents, Struck against,	Electric burns
Rahmani <i>et al.</i> , 2013		Electrical burns, Fractures
Cawley and Homce, 2003	Overhead power contacts, Struck by, Struck against, Caught between, Falls, Electrocutions, Contact with underground powerlines, Lightning/ electric arch flash accidents, air and watercraft accidents	Electric burns
Hinze, Huang and Terry, 2005	Falls, Electric shocks, Struck-by, Caught-in/between	

Source: (Batra and Ioannides, 2001; Cawley and Homce, 2003; Hinze, Huang and Terry, 2005; Rahmani *et al.*, 2013)

The revelation by the powerline construction workers that certain types of accidents such as struck-by, struck against and caught between accidents were common amongst them can be attributed to the nature of the activities done at the powerline construction sites. Such activities range from digging of holes by the casual laborers, erection of poles and stringing of the power distribution cables. These activities also involve the use of machinery and tools such as boom trucks, drum jacks, pick axes, crowbars cranes that expose the workers to these kind of accidents during their daily operations. Indeed, scholars like Hinze, Huang and Terry (2005) have shown that struck by accidents not only involve workers being struck by work equipment, but by

other vertically hoisted materials also. No wonder some of the powerline construction workers on the casual labourers involved in the digging of holes were often complaining of the crowbar usually striking their chests during the digging of the holes. This calls for a lot of vigilance and the use of personal protective gear by the workers in order to overcome the menace of some such as struck-by and caught between accidents.

Elsewhere, an investigation on the occupational accidents among workers of an electricity distribution company by Rahmani *et al.* (2013) revealed fractures, electrical burns as the common injuries amongst the workers. The findings of Rahmani on such types of injuries amongst workers of an electricity distribution works were in agreement with the findings of the current study.

Results on the investigation on the existence and types of fatal and non-fatal occupational accidents amongst the powerline construction workers at the study sites are presented in (Figure 4.1 below). Responses from the powerline construction works indicated that struck-by accidents were the common forms of fatal occupational accidents (76.4%) followed by car accidents (23.6%) respectively. Overhead power contacts accounted for the highest percentage (25.2%) of non-fatal accidents followed by struck-by accidents (23.2%), electric shock (16.4%), car accidents (15.7%), slip/fall on same level accidents (12.6%) and caught between accidents (3.8%) respectively (Figure 4.4 below).

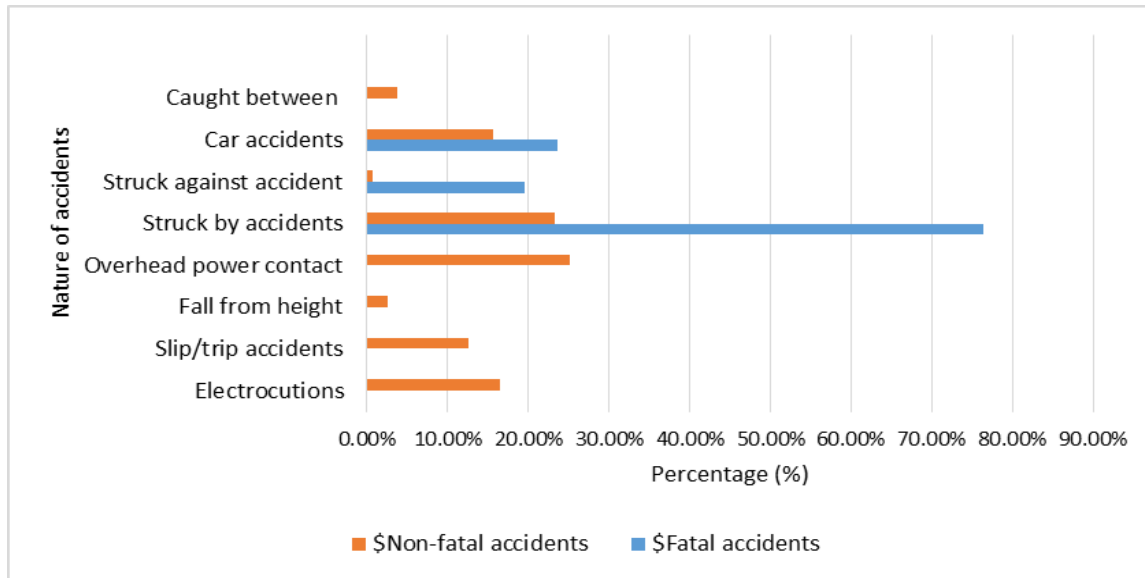


Figure 4. 4: The percentage of fatal and non-fatal occurrence amongst the powerline construction workers at the study sites

Struck-by accidents represented that highest percentage of occupational fatalities in the current study. Similar to the findings of the current study, struck-by accidents have been reported as the leading cause of occupational fatalities in USA accounting for up to 26.4% of the different types of occupation accidents in the country (OSHA, 1990; Hinze, Huang and Terry, 2005). This implies that both employees and employers have to be keen towards the different types of potential accidents at their respective work places. However, more peculiar action should be taken against the most common accidents such as the struck-by accidents where possible. Indeed, the soundness and proactive action of workers toward accidents risks has been fronted as an important initial measure in eliminating work place accidents (Suraji et al., 2001; Williams et al., 2019).

Table 4. 5: Comparison with prevalence of different types of occupational accidents by other studies

Source	Proportion of different types of accidents
Hinze, Huang and Terry, 2005	Struck-by (22%), falls (33%), electrical shock (17%), caught-in/between (18%), other (10%)
OSHA, 1990	Struck-by (22 %), caught-in/between (18%), falls (33%), electrical shock (17%), Struck-against (1%), Bites/scratches/stings (0%)

Source: (OSHA, 1990; Hinze, Huang and Terry, 2005)

Struck-by accidents are particularly fatal because they involve workers being dangerous struck by falling work equipment, trench cave-ins and vertically hoisted materials like electric poles (Hinze, Huang and Terry, 2005). For instance, Gharaie, Lingard and Cooke (2015) reported that most of the crane related fatalities amongst construction workers in Australia were struck-by accidents. Regardless of representing small percentage of fatal accidents in the construction industry, scholars such as (Batra and Ioannides, 2001) have argued that accidents involving electricity have the particularity of being fatal.

Findings from countries such as USA have shown that non-fatal accidents are on the rise much more than the fatal accidents (ESFI, 2020). Even though the non-fatal accidents might not necessarily lead to loss of lives, they have been associated with causing severe complications such as compound fractures that might lead to limb amputation. Therefore precaution must be taken to eliminate chances of any type of accidents from befalling to any worker at any particular construction site (Salehi *et al.*, 2014). This can be achieved through measures such as putting in place safety

guidelines at workplaces and promoting safety behavior amongst workers such as the use of personal protective gear (Choudhry and Fang, 2008; Hystad, Bartone and Eid, 2014; Birhane *et al.*, 2020).

4.3: Prevalence of different forms accidents and injuries incurred by powerline workers at respective construction sites

Results showed that 52% of the powerline construction workers from the study sites had ever been involved in a work-related accident while 48% of the workers had never been involved in any form of work-related accident (Figure 4.5). Results also showed that majority (69%) of the powerline construction workers from the study sites had ever sustained a work-related injury while 31% of the workers had never incurred any form of work-related injury (Figure 4.5).

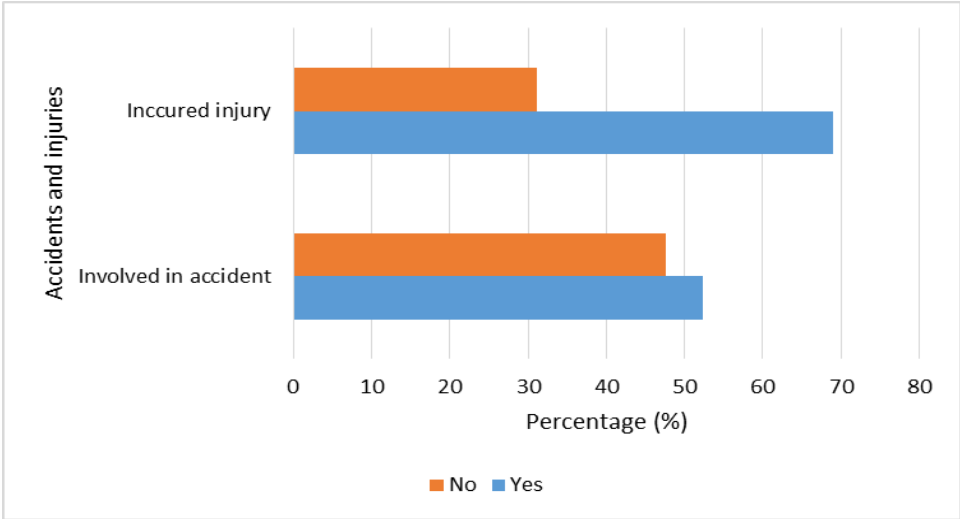


Figure 4. 5: Workers who had ever been involved in some form of work-related accident and injury at the work sites.

Based on the responses from the powerline construction workers on the study sites, it was observed that majority of the workers (26.5%) had ever incurred a struck-by

accidents. Struck against accidents (25.7%) appeared as second commonest occupational accidents, followed by Slip/fall on same level accidents (18.6%), caught between accidents (15.9%), fall from height accidents (4.4%), Electrocutions (3.5%), overhead power contact (1.8%), arc flash accidents (1.8%) and car accidents (1.8%) respectively (Figure 4.6).

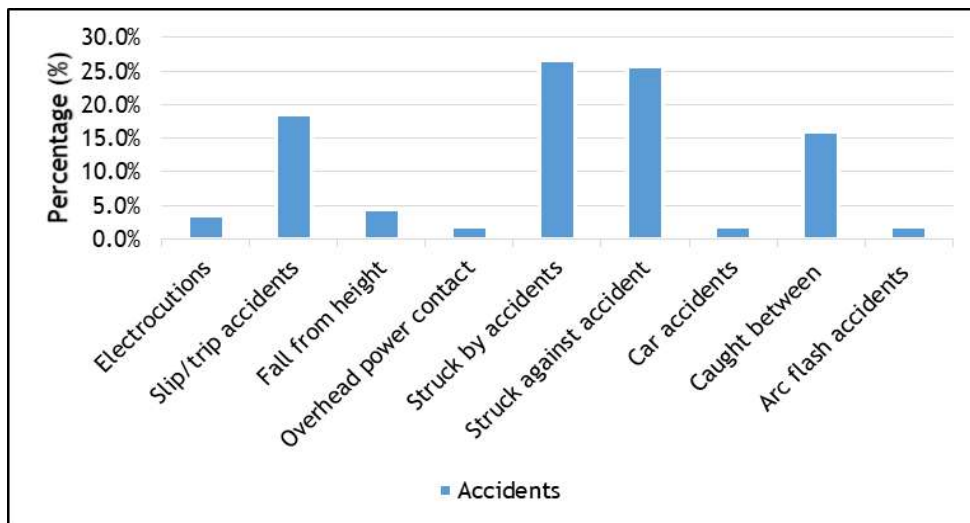


Figure 4. 6: Occupational accidents reported to have ever been sustained by a given powerline construction worker from the work sites

The most prevalent occupational accident incurred by foremen at powerline construction mainly included slip accidents (50%) while casual labourers mainly incurred struck-by (28.2%), struck against (25.6%) and slip (20.5%) accidents. The prevalence of occupational accidents incurred by workers of other occupations such as drivers and mate electricians are shown in (Appendix 2).

Responses from the powerline construction workers showed that skin pierces (26.5), skin peel offs (22.8%) and swellings such as blisters (21.9%) were the three most prevalent occupational injuries which a given worker commonly experienced

respectively. Skin cuts and tearing (19.5), burns (5.1%) simple fractures (3.3%), compound fractures (0.5%) and snake bites (0.5%) were the other occupational injuries reported to have been ever incurred amongst the powerline construction workers from the study sites (Figure 4.7).

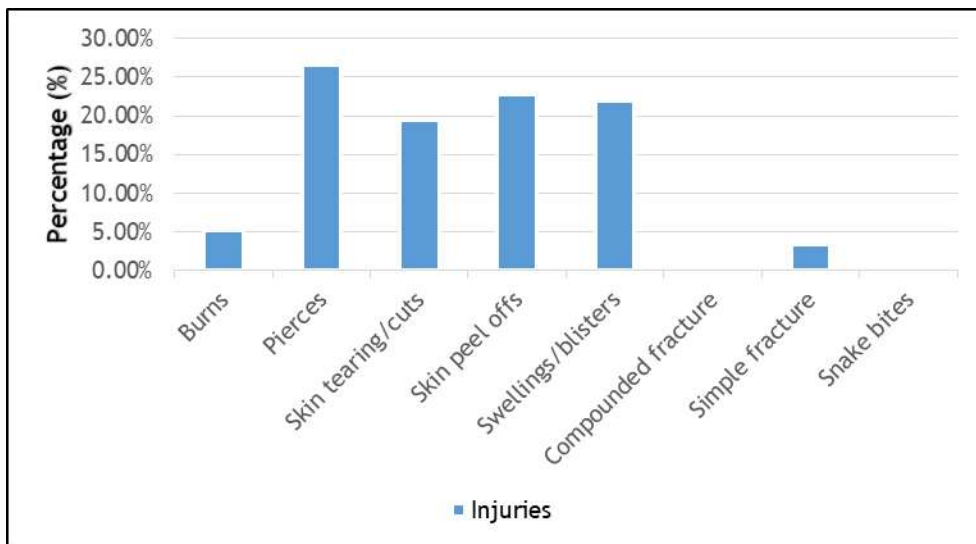


Figure 4. 7: Occupational injuries reported to have ever been incurred by a given powerline construction worker from the work sites

The most prevalent occupational injuries incurred by supervisors and managers at powerline construction included scalds (25%), skin cuts (25%), skin peel-offs (25%) and swellings (25%). Casual labourers mainly incurred skin pierces (28%) and skin peel-offs (25%) injuries. The prevalence of occupational injuries incurred by workers of other occupations such as drivers and mate electricians is shown in (Appendix 3).

Besides the powerline construction involving working at elevated heights (Figure 4.8), the prevalence of fall accidents was found very low in the current study unlike what has been reported in from other countries like China where falls from heights are prominent (Huang and Hinze, 2003). The scenario of low prevalence of fall accidents

in the current study can be attributed to safety measures such as strap belts and climbers' shoes by the powerline construction workers on the study sites. Safety measures such as the use of seatbelts and properly maintained equipment have been associated with increasing safety among the construction workers (Huang and Hinze, 2003; Kazan and Usmen, 2018). Similarly, the proper use of safety guidelines amongst workers in the current study can be attributed to the low incidences overhead power contact which have been reported to be very high amongst workers in Iran (Salehi *et al.*, 2014).



Figure 4. 8: Digging of the hole using a crowbar and hammers (right) and erection of electricity poles (Left) by workers on the worksites

Skin pierce, skin peel offs and swellings such as blisters Electrical were the most common occupational injuries in the current study. An earlier investigation into causes of accidents among workers in the construction industry of Uganda also reported injuries such as burns, skin cuts and pierces among the workers (Lubega, Kiggundu and Tindiwensi, 2000). Similarly, Kiconco *et al.* (2019) observed that more than quarter of the construction workers that experienced injuries in Kampala city had been either been cut by sharp objects or pierced equipment.

Burns were not found to be dominant among the powerline construction workers in the current study, contrary to the findings of Rahmani *et al.* (2013) who reported that electrical burns were found as the dominant injuries amongst electricity distribution company workers in Iran. Unlike findings from Gholizadeh And Esmaeili (2019) that reported fractures to be the most common form of occupational injuries amongst electrical contractors, fractures were found among the least common injuries amongst the powerline construction workers in the current study. Such as difference can be attributed to the difference in the working environments of the workers which exposes them to different occupational risks just as denoted by (Salehi *et al.*, 2014).

Results of the Chi-Square tests results revealed that there was no statistically significant association observed between the nature of the work done by the powerline construction workers and their involvement in occupational accidents ($P=0.492$) (Table 4.6). The null hypothesis that assumed equal variance was therefore accepted. Similarly, there was no a statistically significant association observed between the nature of the work done by the powerline construction workers and their

involvement in occupational injuries (P=0.296). The null hypothesis that assumes equal variance was therefore accepted (Appendix 3). This implied that all the workers had equal chances of being involved in an occupational accidents and sustaining injuries regardless of the type of work they performed at their respective worksites including mates, casual labourers, supervisors, foremen and truck drivers.

Table 4. 6: The association between the type of work done by powerline construction workers and their involvement in occupational accidents

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.558a	7	0.592
Likelihood Ratio	6.419	7	0.492
Linear-by-Linear Association	0.959	1	0.327
N of Valid Cases	103		

a 13 cells (81.3%) have expected count less than 5. The minimum expected count is .95.

The Assumption of the current study while running the chi-square tests was that the occupation or type of work done by a given worker at the powerline construction site influenced the nature of accidents and injuries sustained by the worker. Although the study by Brenner and Cawley (2015) associated occupations such as the casual labour, electricians, supervisors and truck drivers amongst those at high risk of occupational accidents and injuries in the powerline sector, the findings of the current study were opposed to this notion. All the workers in the current study were found with equal chances of incurring an occupational accident or injury.

4.4 Causative factors of accidents and injuries among power line construction workers at the study sites

An inquiry into the perceived occupational accidents and injuries causative factors revealed poor weather conditions (33%), lack of use of personal protective equipment (PPE) amongst workers (29.1 %), poor working conditions & usability of equipment (20.4%) and low awareness & knowledge on risks (9.7%) as the immediate factors causing accidents amongst workers at the study sites (Figure 4.9). Site constraints such as lack of safety policies and PPE at the site (64.1%), poor communication amongst the workers (25.2%), limited supervision at the construction worksites (8.7%) and poor worksite design 1% were the shaping factors that commonly caused accidents and injuries respectively. Amongst the originating factors that caused occupational accidents and injuries at the study sites, low experience and expertise of workers (68.9%) and poor type of project construction design (30.1) were the commonly reported respectively.

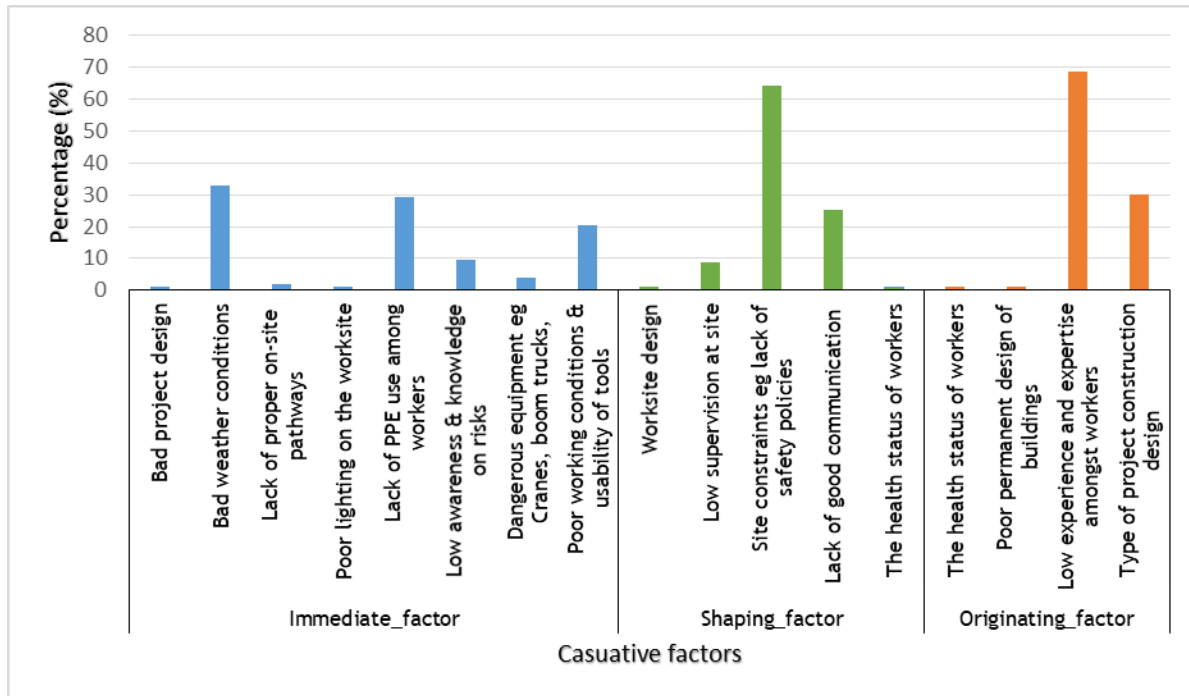


Figure 4. 9: The immediate, shaping and originating factors that perceived to commonly lead to occupational accidents and injuries at the study sites

Similarly to the findings of the current study, an earlier study by Gharaie, Lingard and Cook (2015) reported factors such as lack of sufficient working space, physical site constraints and design of the construction processes and inadequate risk management systems as the immediate, shaping and originating influences on accidents amongst construction workers in Australia. From the findings of this study, it is evident that accident causation on the work site were caused by multiple factors and could not be pointed to a single source. However, recent reviews from literature have continuously listed factors such as unsafe site conditions and inappropriate construction planning and operations that expose the workers to occupational accident risks (Suraji, Duff and Peckitt, 2001). According to earlier studies conducted in Uganda (Lubega, Kiggundu and Tindiwensi, 2000) and Europe (Kazan and Usmen, 2018), faulty and malfunctioning of machinery and Lack of PPE use have been associated with causing

injuries amongst workers in the construction. It is observable that some workers have a bad attitude and poor knowledge on PPE use. However, this points to the fact that such workers have probably not been well trained and educated on the advantages of PPE use at their respective worksites. In this regard, scholars like (Neitzel, 2018) have recommended training of personnel to equip them with skills and knowledge for promoting safe operations such as carrying out maintenance of equipment to increase their reliability.

Results of the multiple regression model revealed that the work experience in terms of years spent working at a given worksite significantly influenced the workers' involvement in an occupational accident ($P= 0.014$) such as falls, struck-by and struck-against (Table 4.7). Other socio-economic factors such as gender ($P=0.085$), age ($P=0.365$) and the company managing the construction site ($P=0.396$) did not significantly influence the workers' involvement in an occupational accident.

Table 4. 7: Factors influencing the occurrence of occupational accidents amongst the powerline construction workers on the study sites

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-0.432	1.06		-0.408	0.685	-2.555	1.69
	Gender	1.012	0.577	0.45	1.752	0.085	-0.144	2.168
	Age	-0.009	0.01	-0.131	-0.912	0.365	-0.03	0.011
	Company of work	-0.136	0.159	-0.139	-0.856	0.396	-0.455	0.182
	Work experience	0.014	0.006	0.348	2.539	0.014	0.003	0.026
	Monthly income	1.36E-07	0	0.064	0.168	0.867	0	0
	Aware of on-site risks	0.115	0.404	0.045	0.285	0.776	-0.693	0.923
	Training on risks	0.626	0.451	0.2	1.388	0.171	-0.277	1.53
	PPE use	0.44	0.53	0.1	0.832	0.409	-0.62	1.501
	Luuka	-0.213	0.192	-0.178	-1.111	0.271	-0.597	0.171
	Bugweri	0.117	0.171	0.105	0.681	0.498	-0.226	0.459
	Kaliro	-0.104	0.265	-0.056	-0.395	0.695	-0.634	0.425
	Primary	-0.26	0.167	-0.222	-1.555	0.125	-0.595	0.075
	Vocational/ Diploma	-0.049	0.172	-0.042	-0.285	0.777	-0.394	0.296
	Degree	-0.446	0.524	-0.101	-0.852	0.397	-1.494	0.602
	Supervisor	0.021	0.863	0.007	0.025	0.98	-1.706	1.748
	Foreman	-0.194	0.489	-0.086	-0.397	0.693	-1.174	0.785
	Truck driver	0	0.648	0	0	1	-1.298	1.298
	Electrician	-0.544	0.629	-0.123	-0.865	0.391	-1.804	0.715
	Food vendor	-0.962	0.674	-0.373	-1.428	0.159	-2.31	0.386
	Linesman	-0.059	0.427	-0.034	-0.138	0.89	-0.915	0.796
	Mate	-0.058	0.269	-0.036	-0.217	0.829	-0.598	0.481
a Dependent Variable: Involvement in occupational accidents								

This finding implied that there was a difference in the risk of exposure to occupational accidents between the newly recreated workers and the long serving workers at a given powerline construction worksite. Experienced workers have been hailed for growing knowledge and skills for maintaining a safe behavior during their daily operations (Chi, Yang and Chen, 2009; Tolera, 2016; Wong, Man and Chan, 2020). No wonder work experience significantly influenced the occurrence of accidents amongst the powerline construction workers at the study sites ($P=0.014$). Even though experienced workers might be hailed for growing knowledge for maintaining a safe behavior at their work stations, this points to the need for safety officers and project managers to pay attention to the safety needs of less experienced employees with probably lesser knowledge on occupational safety.

The disparities observed in occupational accidents levels between long serving workers and newly recreated ones might also be an indicator to the inconsistencies in the level of safety training and awareness creation amongst the workers. This calls for employers and workers such as the electricians and the mates that seemed to be involved in occupations at higher risks of occupational to prioritize safety such as ensuring tap out procedures and proper use of personal protective gears like gloves, safety shoes and helmets. Therefore, there is need for employers to ensure that all their workers are equally trained on maintaining a safety behavior regardless of the time a given employee has spent working at the worksite. This is in line with the national and international policy recommendations that call up employers to invest in the safety of their workers (GOU, 2006; Benjamin O Alli, 2008).

Monthly income ($P=0.015$), site locations in Bugweri district ($P=0.049$), working as an electrician ($P=0.048$) and mate electrician ($P=0.034$) significantly influenced the workers' involvement in work-related injuries (Table 4.8). These findings clearly showed that the extent of occupational injuries amongst workers with lower monthly income was significantly different from that of the workers with a higher monthly income.

Some scholars have reported that employees' wages tend to increase as work-place risks also increase (De-Shalit, 2004). It is speculated that high-risk jobs seem to be offered at higher pay by employers in order to attract workers' interest (Kiconco *et al.*, 2019). Therefore, workers end up getting exposed to unsafe environments that increase the prevalence of occupational accidents and injuries amongst them. However, little payment to workers can also deter them from investing in purchase of PPE especially where the employers do not provide any or sufficient PPE to their workers. This is most likely to happen amongst workers such as casual labourers whose assurance of occupational safety and health protection by employers is not legally well streamlined (Izudi, Ninsiima and Alege, 2017; Kiconco *et al.*, 2019). Regardless of the amount paid to workers working in high risk occupations or not, employers must always ensure provisioning of sufficient protective gears to all the workers at their respective work sites.

Table 4. : Factors influencing the occurrence of occupational injuries amongst the powerline construction workers on the study sites

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.322	0.774		1.708	0.093	-0.227	2.871
	Gender	0.111	0.421	0.062	0.263	0.794	-0.733	0.954
	Age	-0.001	0.008	-0.021	-0.157	0.876	-0.016	0.014
	Company of work	-0.138	0.116	-0.177	-1.193	0.238	-0.371	0.094
	Work duration	0.001	0.004	0.039	0.313	0.755	-0.007	0.01
	Monthly income	1.48E-06	0	0.875	2.515	0.015	0	0
	Awareness on risks	-0.509	0.295	-0.248	-1.728	0.089	-1.098	0.081
	Training on risks	0.32	0.329	0.128	0.972	0.335	-0.339	0.98
	PPE Usage	-0.264	0.386	-0.075	-0.684	0.497	-1.038	0.509
	Luuka	-0.231	0.14	-0.243	-1.652	0.104	-0.512	0.049
	Bugweri	0.251	0.125	0.283	2.015	0.049	0.002	0.501
	Kaliro	-0.103	0.193	-0.07	-0.536	0.594	-0.49	0.283
	Primary	-0.13	0.122	-0.139	-1.067	0.29	-0.375	0.114
	Vocational/ Diploma	-0.089	0.126	-0.095	-0.707	0.482	-0.341	0.163
	Degree	0.743	0.382	0.212	1.945	0.057	-0.022	1.508
	Supervisor	-0.894	0.63	-0.358	-1.42	0.161	-2.154	0.366
	Foreman	-0.656	0.357	-0.366	-1.838	0.071	-1.371	0.059
	Truck driver	-0.128	0.473	-0.051	-0.271	0.788	-1.075	0.819
	Electrician	-0.929	0.459	-0.265	-2.024	0.048	-1.849	-0.01
	Food vendor	-0.142	0.492	-0.069	-0.289	0.774	-1.126	0.842
	Linesman	-0.557	0.312	-0.403	-1.784	0.08	-1.181	0.068
	Mate	-0.428	0.197	-0.329	-2.176	0.034	-0.821	-0.034
a Dependent Variable: Ever incurred an injury on-site								

The statistically significant association observed between injury occurrences and some occupations such as electricians and mate electricians implied that electricians and mate electricians were more vulnerable to occupational injuries compared to other workers such as drivers and casual labourers at the different worksites. Similar to the findings of the current study, Brenner *et al.*, (2020) associated certain occupations such as casual labourers, mates, electricians and truck drivers with higher risks of accidents due to the nature and proximity of the workers to hazardous environment such as running machines and high electric voltages. Findings from Iran also shown that type of employment had a significant relationship with type of injuries (Rahmani *et al.*, 2013). Findings from Kazan and Usmen (2018) also showed that being an equipment operator also increased chances of electrical accidents.

The influence of the site location in Bugweri districts on occupational injuries amongst workers in this study could be attributed to the variations in supervision by managers and site inspections by relevant authorities with other locations such as Iganga and Kaliro district. The national policy on occupational health and safety in Uganda encourages local governments and other relevant authorities to ensure compliance to occupational health and standards at construction sites (GOU, 2006). Additionally, the link between site location and occupational injuries amongst workers in this study could be attributed to the number of hours workers at different work stations were required to spend at their workplaces in a day. Altogether, workers working for extended periods of work time are also at risk of being involved in occupation accidents. Extended working periods have been associated with some increasing the prevalence of accidents among workers. Employees often spend much time at their workplace than in their own homes, making

workplaces part of their daily life and yet workplaces have higher risks for occupational injuries than their homes (Ekpenyong and Inyang, 2014).

Some other socio-economic factors such as age of the workers ($P= 0.876$), gender of the workers ($P= 0.794$), duration spent working at a given worksite ($P= 0.755$), awareness on work-related accident risks ($P= 0.089$), prior training on work-related safety risks ($P= 0.335$) and PPE usage (0.497) all had no significant influence on sustaining work-related injuries amongst the powerline construction workers at the study sites. Working for any of the two different companies managing the powerline construction that is either CHICO or TBEA had also no significant ($P= 0.238$) influence on sustaining work-related injuries amongst the powerline construction workers at the study sites. This implied that workers across different age structures, gender, training level and powerline construction worksites were all equally exposed to challenges of occupational injuries at their respective worksites. The R^2 value of 0.353 showed that the incurring occupational injuries amongst workers was responsible for 35.3 % of the variance observed in this particular model. The overall model on the incurrence of occupational related injuries amongst the powerline construction workers generally showed no significant value $F= (4.304, 7.884), =1.508, p =0.111, R^2 = 0.353$). This meant that the regression model was good in predicting the factors that influenced occupational injury occurrences amongst workers at the study sites.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1: Conclusions

This study assessed the causal factors of accidents and injuries amongst powerline construction workers within Luuka, Kaliro, Iganga and Bugweri districts in Eastern Uganda particular. The specific aim of the study was to examine the types of accidents and injuries amongst the powerline construction workers, determine the prevalence of accidents and injuries among workers and find out the casual factors of accidents and injuries among them. Data of the study was collected through both structured and semi-structured interviews and analyzed using descriptive statistics, chi-square tests and multiple regression model. With utmost focus to the objectives and main findings from this assessment, the key conclusions drawn from this study are as follows;

- The findings of this study that powerline construction sites expose workers to various occupational accidents and injuries. Up to nine different types of occupational accidents were identified at the powerline construction sites including electrocutions/electrical shocks, slip on same level, falls from height, overhead power contacts, struck by, struck against, electric arch flash accidents, caught between and car accident. Eight form of injuries including skin pierces, skin peel-offs, swellings such as blisters, skin cuts/tearing, burns, simple fractures, snake bites and compound fractures. However, both the occupational injuries and accidents seemed to vary based on the respondents' views and the sites they were working on. This was a clear indication that the different site and worker

characteristics are most likely to influence the nature of occupational accidents and injuries.

- The prevalence of the occupational injuries and accidents was found to be relatively high among the workers of the powerline construction in this study. Moreover, only some forms of occupational accidents such as struck-by, falls, slips and caught between as well as injuries such as pierces, cuts, skin peel-offs and skin swellings seemed to be common among the workers. Furthermore, these various accidents and injuries showed a differentiated prevalence among the works of different occupations such as supervision, casual labour, foremen, drivers and mate electricians. This indicated that certain occupational accidents and injuries need to be expected to be relatively common amongst certain type of occupation such as casual labour and mate electricians based on the nature of the jobs and environment being worked in such as elevated and slippery grounds. This most likely calls for vigilance and emphasizing protection against the most expected
- Based on the empirical results, both environmental factors such as poor weather conditions and organizational factors such as lack of personal protective equipment (PPE) were leading causes of occupational accidents and injuries. Workers' characteristics such as monthly income and job type were also associated with work-related injuries and accidents. These findings also illustrated that occupational accidents and injuries at powerline construction sites were most likely entrenched in failure of both employers and their workers to implement the safety guidelines in place. This was also probably exacerbated by failure to develop context and site-specific measures at the various construction sites.

Therefore, there was an observed need to put environmental dynamics into consideration while planning for occupational safety as well as the need for workers and employers to undertake their responsibilities for ensuring workplace safety is required by the workplace safety guidelines.

- Conclusively, it was observed that there were several occupational accidents and injuries that were incurred by the powerline workers at their respective worksites. There were observed variations in the prevalence of occupational accidents and injuries among the different worksites as well as the different types of workers including the supervisors, casual labourers. Empirical results showed that the workers attribute some of the occupational accidents and injuries to the failures in personal protection as well as individual factors such as limited knowledge. This pointed to need for multifaceted actions from both employers and workers towards the reduction of occupational accidents and injuries as indicated in the recommendations below.

5.2: Recommendations

- i. Different forms of occupational accidents and injuries were observed among the workers at the different powerline construction sites. Measures that can reduce occupational injuries and accidents such as training on safety guidelines and proper handling of equipment should be done by the employers in conjunction with trained personnel like safety officers in order to reduce on the chances of occupational accidents and injuries. This will minimize the occurrence of

occupational accidents and injuries out of ignorance and lack of experience amongst powerline construction workers and hence lower down the safety concerns within the construction industry.

- ii. Due to high prevalence occupational accidents and injuries, employers are advised to invest in providing adequate and appropriate protective gear to their workers and put in place measures such as safety points and penalties that ensure use of such protective gear. This will reduce on the prevalent accidents and injuries such as struck-by accidents, skin pierces, cuts and blisters. This can as well help in contributing to the attainment of the sustainable development goal eight (SDG8) which aims at ensuring decent and economic growth by 2030.
- iii. It was observed that the worksite in some areas such as Bugweri district were associated with occupational accidents and injuries. It is recommended that companies and employers establishing powerline construction sites should be checked for their compliance to occupational safety and standards by relevant bodies such as The National Environment Management Authority. Periodic safety audits should also be conducted by both the employers and relevant bodies such as The National Environment Management Authority. This will increase compliance to the Occupational safety and health guidelines in the country. Subsequently, emphasis should be put in ensuring equal and timely training of all workers recruited into the powerline construction operations at all times in order to eliminate the variations in safety conditions amongst workers at different sites, belonging to different age groups and with different working experiences.

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Appendices

Appendix 1: Different forms of occupational accidents associated with different occupations at powerline construction sites

Work type	Accident	Frequency	Percent
Supervisor	Struck by	2	33.3%
	Struck against	1	16.7%
	Caught between	2	33.3%
	Car accident	1	16.7%
Total		6	100.0%
Foreman	Electrocutions	2	7.4%
	Slip	4	14.8%
	Fall from height	5	18.5%
	Overhead power contacts	2	7.4%
	Struck-by	4	14.8%
	Struck against	4	14.8%
	Electric arch flash accidents	2	7.4%
	Caught between	2	11.1%
	Car accident	2	3.7%
	Total		27
Casual labour	Electrocutions	4	2.8%
	Slip	27	19%
	Fall from height	20	14.1%
	Struck-by	31	21.8%
	Struck against	27	19%
	Electric arch flash accidents	1	0.7%
	Caught between	27	19%
	Car accident	5	3.5%
	Total		142
Truck driver	Slip	1	20%
	Struck-by	2	40%
	Struck against	1	20%
	Car accident	1	20%
Total		5	100%
Electrician	Struck against	1	100%
Total		1	100%
Food vendor	Struck-by	3	38.1%
	Struck against	3	38.1%
	Caught between	1	23.8%
Total		7	100%
Linesman	Slip	3	12.5%
	Fall from height	4	16.7%
	Overhead power contacts	1	4.2%

	Struck-by	5	20.8%
	Struck against	5	20.8%
	Electric arch flash accidents	1	4.2%
	Caught between	3	12.5%
	Car accident	2	8.3%
Total		24	100%
Mate	Slip	7	20%
	Fall from height	7	20%
	Struck-by	9	25.7%
	Struck against	6	17.1%
	Caught between	5	14.3%
	Car accident	1	2.9%
Total		35	100%
a Dichotomy group tabulated at value 1.			

Appendix 2: The prevalence of different forms of occupational accidents among the workers of different occupations at powerline construction sites

Work type	Accident	Frequency	Percent
Foreman	Electrocutions	1	25%
	Slip	2	50%
	Electric arch flash accidents	1	25%
Total		4	100%
Casual labour	Electrocutions	3	3.8%
	Slip	16	20.5%
	Fall from height	2	2.6%
	Struck-by	22	28.2%
	Struck against	20	25.6%
	Electric arch flash accidents	1	1.3%
	Caught between	12	15.4%
	Car accident	2	2.6%
Total		78	100.0%
Truck driver	Struck-by	1	33.3%
	Struck against	1	33.3%
	Caught between	1	33.3%
Total		3	100%
Electrician	Fall from height	1	20%
	Struck-by	1	20%
	Struck against	2	40%
	Caught between	1	20%
Total		5	100%
Food vendor	Fall from height	1	33.3%
	Overhead power contacts	1	33.3%

	Struck against	1	33.3%
Total		3	100.0%
Linesman	Slip	2	20%
	Struck-by	3	30%
	Struck against	2	20%
	Caught between	3	30%
Total		10	100.0%
Mate	Electrocutions	1	10%
	Slip	3	30%
	Struck-by	4	40%
	Struck against	1	10%
	Caught between	1	10%
		10	100.0%
Total			
a Dichotomy group tabulated at value 1.			

Appendix 3: The prevalence of different forms of occupational injuries among the workers of different occupations at powerline construction sites

Work type	Accident	Frequency	Percent
Supervisor	Scald	1	25%
	Skin tearing/cuts	1	25%
	Skin peel-offs	1	25%
	Swellings/blisters	1	25%
Total		4	100%
Foreman	Scald	1	6%
	Pierces	4	24%
	Skin tearing/cuts	4	24%
	Skin peel-offs	3	18%
	Swellings-blister	4	24%
	Compounded-fracture	1	6%
Total		17	100%
Casual labour	Scald	4	3%
	Pierces	38	28%
	Skin tearing/cuts	28	21%
	Skin peel-offs	34	25%
	Swellings/blisters	29	21%
	Simple fracture	3	2%
Total		136	100%
Truck driver	Simple fracture	1	100%
Total		1	100%
Electrician	Burns	1	50%
	Pierces	1	50%

Total		2	100%
Food vendor	Burns	1	17%
	Pierces	1	17%
	Skin_peel_offs	1	17%
	Swellings/blisters	2	33%
	Simple fracture	1	17%
Total		6	100%
Linesman	Scald	1	5%
	Pierces	4	21%
	Skin tearing/cuts	4	21%
	Skin peel-offs	4	21%
	Swellings/blisters	4	21%
	Simple fracture	2	11%
Total		19	100%
Mate	Scald	2	7%
	Pierces	9	30%
	Skin tearing/cuts	5	17%
	Skin peel-offs	6	20%
	Swellings/blisters	7	23%
	Snake bites	1	3%
Total		30	100%
a Dichotomy group tabulated at value 1.			

Appendix 4: The cross tabulation results Occupational injuries reported to have been ever incurred amongst the powerline construction workers from the study sites

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.186a	7	0.41
Likelihood Ratio	8.433	7	0.296
Linear-by-Linear Association	1.23	1	0.267
N of Valid Cases	103		
12 cells (75.0%) have expected count less than 5. The minimum expected count is .62.			

Appendix 5: Model summary on factors influencing the occurrence of occupational accidents amongst the powerline construction workers on the study sites

Model Summary								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			

					R Square Change	F Change	df1	df2	Sig. F Change
1	.479 a	0.229	-0.05	0.50519	0.229	0.821	21	58	0.684
a Predictors: (Constant), Mate, Work duration, Degree, Training, Electrician, PPE use, Supervisor, Food vendor, Foreman, Kaliro, Linesman, Primary, Company, Truck driver, Participation, Age, Vocational/Diploma, Bugweri, Luuka, Gender, Monthly income									
b Dependent Variable: Involvement in accident									

Appendix 6: ANOVA on factors influencing the occurrence of occupational accidents amongst the powerline construction workers on the study sites

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.398	21	0.209	0.821	.684b
	Residual	14.802	58	0.255		
	Total	19.2	79			
a Dependent Variable: Involvement in accident						
b Predictors: (Constant), Mate, Work duration, Degree, Training, Electrician, PPE use, Supervisor, Food vendor, Foreman, Kaliro, Linesman, Primary, Company, Truck driver, Participation, Age, Vocational/Diploma, Bugweri, Luuka, Gender, Monthly income						

Appendix 7: Model summary on factors influencing the occurrence of occupational injuries amongst the powerline construction workers on the study sites

Model Summaryb									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.594a	0.353	0.119	0.36868	0.353	1.508	21	58	0.111
a Predictors: (Constant), Mate, Work duration, Degree, Awareness on risks, Electrician, PPE use, Supervisor, Food vendor, Foreman, Kaliro, Linesman, Primary, Company, Truck_driver, Participation, Age, Vocational/ Diploma, Bugweri, Luuka, Gender, Monthly income									
b Dependent Variable: Incured_injury									

Appendix 8: ANOVA on factors influencing the occurrence of occupational injuries amongst the powerline construction workers on the study sites

ANOVAa						

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.304	21	0.205	1.508	.111b
	Residual	7.884	58	0.136		
	Total	12.188	79			
a Dependent Variable: Incurred injury						
b Predictors: (Constant), Mate, Work duration, Degree, Awareness on risks, Electrician, PPE use, Supervisor, Food vendor, Foreman, Kaliro, Linesman, Primary, Company, Truck driver, Participation, Age, Vocational/ Diploma, Bugweri, Luuka, Gender, Monthly income						

- (e) Tertiary (Diploma)
- (f) Degree

8. Which tribe do you belong to?

- (a) Muganda
- (b) Munyankole
- (c) Mukiga
- (d) Musoga
- (e) Others (specify)

9. How far is your household from this site?

10. What time of the day do you do your work?

- a. Day shift
- b. Night Shift
- c. Alternate day and night shifts

12. What is your AVERAGE MONTHLY income earned at this project (UGX)?

- (a) < 100,000
- (b) 100,000 - 400,000
- (c) 400,001- 700,000
- (d) 700,001 - 1,000,000
- (e) Above 1,000,000

PART II: TYPES AND OCCURRENCE OF ACCIDENTS

14. Mention any type of accidents you have witnessed among any worker since you started working on this project/site (Choose all applicable).

- i. Electrocutions/electrical shocks

- ii. Slip/fall on same level/fall on the same level
- iii. Fall from height
- iv. Overhead power contacts
- v. burns
- vi. Struck by a falling object
- vii. Struck against object/Appliance
- viii. Electric Arc flash accidents (Sparks, flames, smoke, gases and ash)
- ix. Caught between
- x. None

15. Have you witness a non-fatal accident (Killed the victim) at this site

- a. Yes
- b. No

16. What was the nature of the accident that did not kill the victim?

- i. Electrocutions/electrical shocks
- ii. Slip/fall on same level/fall on the same level
- iii. Fall from height
- iv. Overhead power contacts
- v. Burns
- vi. Struck by a falling object
- vii. Struck against object/Appliance
- viii. Electric Arc flash accidents (Sparks, flames, smoke, gases and ash)
- ix. Caught between
- x. None

17. Have you witness a fatal accident (Killed the victim) at this site

- a. Yes b. No

18. What was the nature of the accident that killed the victim?

- i. Electrocutions/electrical shocks
- ii. Slip/fall on same level/fall on the same level
- iii. Fall from height
- iv. Overhead power contacts
- v. burns
- vi. Struck by a falling object
- vii. Struck against object/Appliance
- viii. Electric Arc flash accidents (Sparks, flames, smoke, gases and ash)
- ix. Caught between
- x. None

19. Have you personally been involved in any form of accident while working at this site?

- a. Yes b. No

20. What type (s) of accident (s) occurred to you? (Choose all applicable)

- i. Electrocutions/electrical shocks
- ii. Electrocutions/electrical shocks
- iii. Slip/fall on same level/fall on the same level
- iv. Fall from height
- v. overhead power contacts
- vi. Burns

- vii. Struck by a falling object
- viii. Struck against object/Appliance
- ix. Electric Arc flash accidents (Sparks, flames, smoke, gases and ash)
- x. Caught between
- xi. None

21. Did the accident force you to take leave/spend some days off work

- a. Yes
- b. No

22. How many days did you spend off work following your last accident?

24. Have you incurred any injury while work at this site?

- a. Yes
- b. No

23. Tick the type of injury you have been incurred while working at this site

- i. Burns
- ii. Scald
- iii. Pierces
- iv. Skin tearing/splits
- v. Skin peel offs
- vi. Swellings
- vii. Compounded fracture
- viii. Simple fracture
- ix. None

PART II: PREVALENCE OF ACCIDENTS

- v. overhead power contacts
- vi. Burns
- vii. Struck by a falling object
- viii. Struck against object/Appliance
- ix. Electric Arc flash accidents (Sparks, flames, smoke, gases and ash)
- x. Caught between
- xi. None

29. Mention the different types of accidents you have ever been involved in while working at this project site

- i. Electrocutions/electrical shocks
- ii. Electrocutions/electrical shocks
- iii. Slip/fall on same level/fall on the same level
- iv. Fall from height
- v. overhead power contacts
- vi. Burns
- vii. Struck by a falling object
- viii. Struck against object/Appliance
- ix. Electric Arc flash accidents (Sparks, flames, smoke, gases and ash)
- x. Caught between
- xii. None

PART IV: ACCIDENT CASUATIVE FACTORS

30. Are you aware of the risk to occupational accidents among power line construction worker?

- a. Yes b. No

31. Have you ever received any occupational safety trainings and drills at this site?

- a. Yes b. No

32. Do you participate in occupational safety trainings and drills?

- a. Yes b. No

33. Are you supplied with PPE?

- a. Yes b. No

34. Do you use your PPE?

- a. Yes b. No

35. Do you think PPE usage is reduces the risks of occupational accidents and injuries at this site?

- a. Yes b. No

36. What do you think are the common cause of accident at this site?

- i. Contact with ground cables during drilling
- ii. Contact with overhead power (When using cranes, ladders and boom trucks)
- iii. Contact with tools and appliances
- iv. Under/over estimation of distances
- v. Using dump electric appliances
- vi. Contact with live transmissions on ground and
- vii. Contact with uninsulated poles/transmission pole/towers Faulty and damaged appliances

- viii. Inadequate follow-up of lockout/Tapped out procedures
- ix. Inadequate training
- x. unsafe working procedure
- xi. Incorrect design and construction of electrical installations
- xii. Not following safe working procedures

37. Select the immediate circumstances that cause occupational accidents and injuries at this site?

- i. Bad project design,
- ii. Poor site layout
- iii. Bad weather conditions
- iv. Lack of pathways at the site
- v. Lack of warnings and means of egression
- vi. Poor lighting in the working environments,
- vii. Use of unprofessional
- viii. Lack of use of safety gear/PPE among workers
- ix. Low awareness/knowledge on work place risks
- x. Type of equipment eg Cranes, boom trucks, pliers, screws
- xi. Suitability, usability and conditions of tools (working condition)

38. Tick the shaping factors that cause occupational accidents and injuries at this site?

- i. Worksite design
- ii. Supervision level at the construction site
- iii. Site constraints eg lack of PPE provision and safety policies
- iv. Lack of good communication amongst work teams

v. The health status of workers

39. What do you think is the originating factors that cause occupational accidents and injuries at this site?

- i. The permanent design of buildings/structure,
- ii. The experience and expertise of the personnel,
- iii. Economic/financial climate of the project
 - i. The type of project construction design

Appendix 10: Key informant interview guide

1. Mention the types of accidents you have witnessed among any worker since you started working on this project/site
2. Mention the common non-fatal accident at this site
3. Mention the common fatal accident at this
4. What do you think are the common causes of occupational accident among the workers of this power line construction project?
5. What do you think is Originating influences factors that cause occupational accidents and injuries at this site? (Originating influences factors include the permanent design of building/structure, construction education, economic climate, and the quality of project in the construction project)
6. What do you think is the immediate circumstances that cause occupational accidents and injuries at this site? (Immediate circumstances accidents involve the conditions of the working environment such as its layout, weather conditions, the nature of lighting, capabilities and motivations of the workers, workers' behavior, and type of equipment used, suitability, usability and conditions of tools)
7. Select the shaping factors that cause occupational accidents and injuries at this site? (Shaping factors include Worksite design, Supervision level at the construction site, Site constraints eg lack of PPE provision and safety policies, Lack of good communication amongst work teams, the health status of workers).

Appendix 11: Clearance Letter from the Institute allowing me to proceed for data collection



Institute of Petroleum
Studies - Kampala

September 2, 2021

TO WHOM IT MAY CONCERN

Dear Sir/Madam

INTRODUCTION FOR MR. MUHIMBRA BRIAN TO CONDUCT RESEARCH IN YOUR ORGANISATION

Greetings in the precious name of our Lord.


I wish to introduce to you the above named person, who is a masters student pursuing Masters of Science in Environmental Health and Safety, of Uganda Christian University in affiliation with The Institute of Petroleum Studies Kampala (IPSK).

His proposal has been approved by our vetting committee and is in the process of collecting data. Mr. Muhimbura would wish to conduct research in your organization.

The title of his research is "An assessment of casual factors of accidents and injuries in powerline construction projects in Uganda: A case study of Construction Projects in Luuka, Kaliro, Iganga and Bugweri districts."

By copy of this letter, all respondents are notified that this study is for academic purposes and as an Institution, we request you to cooperate in facilitating this very interesting research project.

Sincerely,


James Mugerwa
Dean of Studies



Plot 6207 Rose Lane, Off tankhill road Muyenga Kampala - Uganda
Tel: 0414695610 Email: info@ipsk.ac.ug Website: www.ipsk.ac.ug

APPENDIX 13: CONSTRUCTION SITE ACCESS PERMISSION SEEKING LETTERS TO PROJECT MANAGERS

Muhimbura Brian
BSc. Environmental Science
MSc. Environmental and Natural Resources
muhii86@yahoo.com
+256 774 202 151

The Project Manager
M & T CONSTRUCTION CO. Ltd
PLOT 2D/E NAKASERO HILL ROAD
Tel: 0772-826954 / 0701 826954
Email: operations@mt-construction.com
Attn: Mr. Tukamushaba Hillary



Dear Sir/Madam,

RE: RESEARCH FOR Mr. MUHIMBURA BRIAN AT YOUR PROJECT

My name is Muhimbura Brian, a student at Uganda Christian University in affiliation with the Institute of Petroleum Studies-Kampala (IPSK). I am conducting research on "An assessment of causal factors of accidents and injuries in powerline construction projects in Uganda. A case study of construction projects in Luuka, Kaliro, Iganga and Bugweri districts".

Therefore, the purpose of this letter is to seek your permission and clearance to undertake interviews and issue questionnaires among the few selected workers. This activity will take only 2 weeks starting 13th September to 24th September 2021.

The data collected will be kept confidential and used strictly for academic purposes only. Also, the attached is the introduction letter from IPSK for your records.

I will be grateful for your assistance.

Yours Sincerely

Muhimbura Brian
CC. Contract Manager-REA

Muhimbura Brian (+256 774 202 151)
BSc. Environmental Science
MSc. Environmental and Natural Resources
muhii86@yahoo.com
3rd September 2021

The Managing Director
TUMO Technical Services
Plot 1468
Kissasi Road, Bukoto
Kampala
Tel: 0772 697 320/0702 697 320
Attn: Mr. Tumusiime Moses



Dear Sir/Madam,

RE: RESEARCH FOR Mr. MUHIMBURA BRIAN AT YOUR PROJECT

My name is Muhimbura Brian, a student at Uganda Christian University in affiliation with the Institute of Petroleum Studies-Kampala (IPSK). I am conducting research on "An assessment of causal factors of accidents and injuries in powerline construction projects in Uganda. A case study of construction projects in Luuka, Kaliro, Iganga and Bugweri districts".

Therefore, the purpose of this letter is to seek your permission and clearance to undertake interviews and issue questionnaires among the few selected workers. This activity will take only 2 weeks starting 13th September to 24th September 2021.

The data collected will be kept confidential and used strictly for academic purposes only. Also, the attached is the introduction letter from IPSK for your records.

I will be grateful for your assistance.

Yours Sincerely

A handwritten signature in black ink, appearing to read 'Muhimbura Brian', written over a horizontal dotted line.

Muhimbura Brian



UGANDA CHRISTIAN UNIVERSITY

A Centre of Excellence in the Heart of Africa

UGANDA CHRISTIAN UNIVERSITY

SCHOOL OF RESEARCH & POSTGRADUATE STUDIES

DISSERTATION CORRECTION COMPLIANCE REPORT BY THE CANDIDATE (POST VIVA FORM)

Date: 12/09/2023

Name of Candidate: MUYIMBURA BRIAN Reg. No: M20/M16/008

Title of Dissertation: AN ASSESSMENT OF CAUSAL FACTORS OF ACCIDENTS AND INJURIES IN POWERLINE CONSTRUCTION PROJECTS IN UGANDA: A CASE STUDY IN LUUKA KALIRO IGANGA & BUGWERI DISTRICTS

SN	COMMENTS BY EXTERNAL EXAMINER	ACTION TAKEN	INDICATOR/page numbers
1	There is need to ensure that the abstract is with a brief introduction to the study	A brief introductory statement added to the abstract as follows "Although, the construction industry contributes to national economic growth, it has been associated with unsafe working environments due to the exposure of workers occupational hazards and injuries."	Page xii

2	The candidate has an overly long background to the study (> 2 pages). He should reduce this to not more than 1.5 pages. The write up of this background should follow the "inverted triangle concept."	The introduction was revised and reduce this to not more than 1.5 pages. The concept of the inverted triangle focusing on international, national and local perspectives was done,	Page 1
3	In the problem statement, occupational causes and effects need to be briefly but clearly articulated.	The problem statement was re-written to remove repetitions of the background and to provide connection in the causes and effects of occupational accidents	Page 2
4	Regarding the scope of the study (section 1.5), rationale should be provided for selecting the geographical scope as the powerline construction sites in Eastern Uganda districts of Luuka, Iganga, Kaliro and Bugweri.	The rationale was added as occupational guidelines and regulatory frameworks were expected to be given priority at the various project sites in Eastern Uganda districts of Luuka, Iganga, Kaliro and Bugweri; since the project was funded world Bank which is an international institution supposed put good considerations on the health or workers	Page 6
5	<p>Section 1.8 (Theoretical framework) should be omitted from the write up and only Section 1.9 (Conceptual framework) is considered which should be numbered as Section 1.8.</p> <p>Section 1.8 (Theoretical framework) should be omitted from the write up and only Section 1.9 (Conceptual framework) is considered which should be numbered as Section 1.8.</p> <p>The write up on the conceptual framework is overly long! There is need to revisit this write up to briefly but clearly bring out the connectivity between the various variables that were operationalized in the study.</p>	<p>Theoretical framework was omitted from the write up, replaced with the Conceptual framework and Section 1.9 (Conceptual framework) was numbered as Section 1.8.</p> <p>The write up of the conceptual framework was shortened and the conceptual framework variables revised accordingly</p>	Pages 7 and 8

6	The candidate has made use of literature which is relatively comprehensive but largely drawn from scholarly works of more than 10 years old. However, the presented literature is largely drawn from other people's work without the candidate providing the implication of some of this to their study.	Old literature wa replaced with new literature and the implication of the literature to the study drawn	Pages 12-23
	It was noted though under section 3.1.5.2, the candidate needs to clarify who were the participants of the four (4) Focus Group Discussions that were held	It was indicated that participants of the Focus Group Discussions were workers at the respective powerline construction sites	Page 30
	In section 3.1.6.1, Hence what did the candidate do in as far as pretesting of these tools is concerned to make sure that the targeted respondents will understand what he was asking?	Procedures on the pre-testing of the tools following the questions in Appendix 9 and 10 provided.	Page 31
	There is need for the candidate to consider including a section on "Limitations of the study" and delete what they have called "anticipated methodological constraints."	Sub-section on Limitations of the study was added and the one that indicated anticipated methodological constraints deleted	Page 35
	As pointed out in the dissertation, there is need to have the illustrations (figures) following some text where they are referred to. Figure 4.7, 4.9 are without X-axes labels. These should be included as guided in the reviewed soft copy of the dissertation.	Figure were brought closer to the text where they have been cited Axes of all figures were clearly shown	Pages 43, 46 48, 53
	In some areas, the discussion of results is in isolation and where this is the case, substantiation of presented arguments is asked for in the soft copy of the reviewed dissertation.	The discussion of the results was revised accordingly	Pages 36-59

<p>In this your study end by summing up your arguments and drawing a conclusion about what you've been investigating). Those drawn conclusions are what you should present under the conclusions section.</p> <p>The candidate should ensure that the recommendations presented follow from the conclusions made and the discussion of the results presented in Chapter 4</p>	<p>The conclusions were revised to sum up the findings of the study and was drawn from each of the specific objective.</p> <p>The recommendations were revised to follow the conclusions made and the discussion of the results presented in Chapter 4</p>	<p>Pages 61-62</p> <p>Pages 63-64</p>
<p>The candidate should ensure that the write up of these in the main text and in the list complies with the recommended University guideline style of referencing for consistency</p>	<p>The references were edited and all the information including the Journals and links added</p>	<p>Pages 64-73</p>
<p>Whatever is presented in the appendices of the dissertation was not referred to by the candidate in the main text</p>	<p>Appendices were cited in the respective texts</p>	<p>Pages 74-92</p>

SN	COMMENTS BY INTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1			e.g. Cover page
2			Page 1, etc corrected
3			
4			
5			

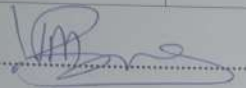
SN	COMMENTS BY VIVA VOCE PANNEL	ACTION TAKEN	INDICATOR
1	The data used in Literature review is old (this was specific for the MGLSD 2004, that we were refering to in our problem statement, they confirmed there are more recent publications about the construction industry in Uganda.	More recent literature was cited (Kiconco, 2019 et al, UPF, 2019 and Irumba 2014)	Page 2 paragraph 1 and 2, Pages 3 and 12
2	Differentiate between objective 1 and 2 as they seem to be the same	Objective 1 and 2 were distinguished from each other as objective one is "characterization of different forms of occupational accidents and injuries powerline construction sites" while Objective two is "Examine prevalence of the different forms of accidents among workers at powerline construction sites".	Pages 4, 28, 29, 30, 32 and 33

3	Cluster workers according to their nature of work and their probable accidents since we can't expect supervisors, foremen, cooks to be impacted by similar accidents.	Data was re-analyzed based on the clusters workers according to their nature of work and to identify their probable accidents in sections 4.2 and 4.3	Pages 40,47 and 48, then pages 75-78
4	Please correct the title of your research. The "Construction" in the first part is okay but not necessary to be in the second part.	The title was corrected to read as "An Assessment of Causal Factors of Accidents and Injuries in Powerline Construction Projects in Uganda. A Case Study of Construction Projects in Luuka, Kaliro, Iganga and Bugweri Districts"	Cover page
5	Recommendations did not have the results in them, please ensure that each of your objectives has a recommendation based on your results.	These have been addressed with each objective clearly given a highlight as based on the conclusions and results of the study	Section 5.2 on pages 63 and 64
6	Revise the conceptual framework, Intervening seem to be the independent variables	The write up of the conceptual framework was shortened and the conceptual framework variables revised accordingly	Illustration on pages 7-11
7	Caption the tables and figures of objective 1 to be precise and clearly understood as the results of the first table and the graph seem to be the same. (This I highlighted that the table was for general injuries and the graph was for the fatal)	These ones have clearly been labelled to give a clear illustration of the findings.	Section 4.2 on pages 39 and 40
8	Highlight the difference between an injury and accident more (This has been clearly differentiated and responded to in the background and the literature review.	Pages 1 and 2
9	Give a summary of each objective in	This has been done at the end of	From pages 36, then 39 to 59 and also in the

	your findings	each finding of sections 4.2, 4.3 and 4.4	recommendations
10	10. Remove the word high and most from your conclusion	This has been removed	Page 61-63

MUTHUMBURA BRIAN

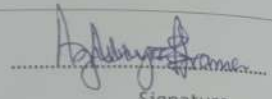
Candidate's Name



Signature

Dr. Lucia F. Azuma

Supervisor's Name



Signature