

## Predictors of Occupational Health and Safety Management practices in the Building Construction Industry, Kakamega Kenya

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**Abstract:** Building construction industry is one of the fastest growing industries in Nakuru County due to rapid urbanization. It employs a large workforce to cater for the growing demand of offices and housing estates. The industry is however plagued by many health and safety problems and sometimes rated the most dangerous land-based industry. The objectives of the research were to assess the safety and health risks in building construction industry, establish the preventive measures used against safety and health risks, evaluate the level of training on safety and health risks among workers and evaluate the level of compliance with laws and regulations governing that industry. Descriptive research was used where a survey was conducted and data collected using non-systematic approach using observations, questionnaires and interviews. Data was analyzed using SPSS. It was found that there was no emphasis on health and safety issues hence many accidents health problems where 70.7% of the workers had experienced accidents at work. Accidents and injuries from various causes ranged from 10% to about 56%. Protection was minimal in most cases ranging between 0% and 33%. Training levels were found to be low for instance specialized formal training ranged from 3.2% to 33%. The trade was learnt mostly through apprenticeship while documentation was poor or lacking. Compliance levels were rather low with only 25% of sites getting high compliance rating due to low monitoring averaging at 2.3 visits, and poor enforcement. It was concluded that there was need for the government to come up with sector specific policies for the building construction industry and strengthen enforcement. It is recommended that safety and health issues be given priority in development issues and building construction be treated like any other trade. Joint efforts should be made when carrying out inspections and punitive fines implemented on those found not complying with provisions of the law.

**Keywords:** Buliding and construction, occupational health and safety, Kakamega county, Kenya

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### I. Background

The United Nations (UN) projects that the world's urban population will increase by more than 2 billion people by the year 2030 with half being born into poverty, and by 2050, two-thirds will live in cities and towns (UN, 2008; UNFPA, 2007). Developing countries are experiencing urban population growth at the rate of three times faster than rural population with a large proportion of the future population growth expected to be in urban areas (UN, 2008). In Africa, despite slow economic progress, cities are experiencing the fastest population growth rates, over 5% per year, and by 2030, urban population will be more than triple (UN, 2003 and 1998). The rapid urbanization rates result mainly from natural growth and net migration from rural areas (de Haan, 1997; Naylor and Falcon, 1995). The effect is strain on the capacity to provide basic services leading to problems such as poverty, unemployment, inadequate shelter, poor or non-existent sanitation, contaminated or depleted water supplies, many forms of environmental degradation, and congestion, among others. This will continuously place at risk the lives and health of the urban population especially the poor (Montgomery, 2008; UN-HABITAT, 2005; UN, 2003). Close to three billion people, or about 40% of the world's population by 2030 will need new housing (UN, 2008). Building construction is one of the fastest growing industries in the world and employs a very large workforce accounting for 10% of the Gross Domestic Product (GDP), which is about 180 million people or providing 7% of global employment (Murie, 2007; ILO, 2001). High urbanization leads to shortfalls in housing resulting in a dilapidated state of housing and human settlement. In Kenya, the housing demand outstrips the supply by far in urban areas leading to overcrowding and spread of slums and also compromising the quality of houses (Nubi, 2008). The cost of building materials, deficiency of housing finance arrangement, stringent loan conditions from mortgage banks and government policies amongst other problems have affected housing delivery significantly (Nubi, 2008).

People engaged in work or employments have their safety, health and welfare protected through Occupational Safety and Health (OSH) procedures. The aim of occupational safety and health programs is to foster safe and healthy work environment. As a multidisciplinary activity, it targets basic aspects such as prevention and control of occupational accidents and diseases. This ensures safe work environments, improvement of workers welfare physically, mentally and socially. It also ensures that workers enjoy productive lives and contribute to sustainable development (WHO 2010). Work productivity is promoted by a safe and healthy work environment and improves worker human dignity (ILO, 2010). Consideration of occupational safety and health practices is very important if building construction is to be conducted effectively with the health of the workers safeguarded (Kiganda, 2016). It is not a common practice to carry out assessment of construction impacts on the workers and therefore fatal accidents often occur at building construction sites. Workers are more concerned with getting the jobs than their working conditions. Mitulla and Wachira (2003), in their research found out that in Nairobi, 70% of the workers rated their working conditions from average (33%) to very poor (37%) while 27% rated working conditions as good simply because they had been in the building construction industry for long and therefore had adapted to the conditions and accepted them as unavoidable. They also found out that since workers were not in any trade union, they were not able to lobby for implementation of health and safety requirements for fear of dismissal. Most workers are employed on temporary basis and the employers tend to avoid issuing work permits or registering the workers with relevant authorities hence, the workers are not covered by any legislation including the Trade Dispute Act (1991), Occupational Safety and Health Act (2007)-Kenya, Workman's Compensation Act (1972) which regulates labour issues (Mitulla and Wachira, 2003). It is unfortunate that persons engaged at workplaces on casual basis are not regarded as employees (Ministry of labour-Kenya, 2013). Unfortunately, in Kenya, reliable data on accident cases in construction industry is not available because most contractors do not report all accidents (DOHSS Annual Report 2011). However, reports from unpublished sources provide some basic insights into the occupational hazards and risks in the building industry in Kenya. The reports indicate that fatalities and deaths have become common place in Kenya and Kenyans seem to resign to this fate (Omukubi, 2012). Newspaper reports are common such as "Ten men trapped as building collapses" reported by Amadala and Lumwamu in (2011). In Nairobi between 2006 and 2011, about four buildings were reported in the media to have collapsed such as in Kahawa Wendani, one of the Nairobi suburbs, a building under construction with some completed units housing tenants started sinking. The crumbling foundation and cracked pillars did not bother the managers which is an indication of disregard of safety in the building construction industry in a bid to maximize profits. In Embakasi another building collapsed killing and injuring people reported by Haron and Omukubi in (2012). The high demand for houses makes some developers collude with authorities to contravene regulations, have poor structural plans and materials which are substandard. The collapse of buildings reflects negatively on the City council and implies corruption among developers and authorities as stated by Haron, and Omukubi in (2012). Kemei et al, (2017) in their research done in Nairobi obtained data from DOSH on "occurrence of accidents in Nairobi County" between 2010 and 2014 as indicated in Table 1

**Table 1: DOSH Data on accidents in Nairobi County for the period 2010-2014**

Division	Severity of accident (days off duty)					fatal	total
	<3 (minor)	4-10	11-20	>20			
<b>Kasarani</b>	6	24	10	16	2	58	
<b>Embakasi</b>	4	12	6	15	5	42	
<b>Westlands</b>	5	12	7	14	3	41	
<b>Kibera</b>	2	5	8	7	10	32	
<b>Nairobi</b>	0	5	5	8	3	21	
<b>Central</b>							
<b>Madaraka</b>	3	3	1	5	2	14	
<b>Pumwani</b>	1	1	2	7	2	13	
<b>Dagoreti</b>	0	3	1	3	5	12	
<b>Total</b>	21	65	40	75	32	237	

Source: Common Construction Site Hazards in Nairobi County, Kenya (Kemei et al, 2017).

Cole, (2003) indicated that every employer whose employees exceed five should prepare and keep updated statement of safety policy and ensure employees are aware of it. This would be an indication of commitment by the employer to safety and health of the employees. Safety and health programs at workplaces are necessary and should include risk assessment, safety and health audits, inspections among other things. In order to improve the construction industry, Kenya enacted an Act of Parliament referred to as The National Construction Authority Act, 2011. Under the act was established National Construction Authority (NCA) which

is mandated “to oversee construction industry and coordinate its development”. It is also expected to register contractors to ensure quality buildings (GOK, 2011).

A research on construction fatalities and injuries in 2003 indicated that mining, construction and transport sectors combined contributed 41% of accidents in Kenya (Nyakang'o, 2004). Danso(2005) found that in the year 2000, 902 accident cases were recorded in construction industry where 56 cases were fatal and 846 cases were non-fatal. He also found that in Nairobi alone 124 deaths were recorded in the period 1999-2004. These increased occupational risks are an indication of safety and health issues in the building construction industry that have not been addressed, either through responsible law and/or by stakeholders concerned. These problems can be addressed if underlying causes of hazards and risks are identified and addressed, which this research seeks to do. Therefore, this study opted to investigate factors affecting management of safety and health in building construction industry in Kakamega County.

## **II. Methods**

This study focused on gathering quantitative information through the implementation of a cross-sectional study design. Participants were excluded because of an incomplete questionnaire and others due to lack of a consent form. The purpose of the study and the procedures of the questionnaire were explained to the participants. Those who agreed to participate completed an informed consent form and the questionnaire. The participants completed the questionnaires in person enabling them to ask questions or withdraw from the study at any time during the data collection.No defined statistical method could be applied, like deciding on every nth site and therefore a random or non-systematic approach to locate the construction sites was used. This was because of the dynamic nature of construction industry. A preliminary survey was conducted first to identify areas of development and then transect walks across the areas done to pick out active sites. Data was collected from foremen, casual workers and permanent workers. Gender consideration was done wherever applicable whereas education levels were considered for the researcher to get a general picture of the literacy levels of the workers.

### **Participants**

The study targeted general workers who were normally unskilled and hired on casual basis, supervisors and/or foremen and managers who were involved in construction of the buildings sampled. The construction sites to be sampled were obtained from the total sites registered by the Physical Planning office in Kakamega.A preliminary survey was then conducted to establish the actual situation on the ground and to locate the construction sites. The survey found that out of the 893 approvals, only 300 sites translating to 33.6% of the sites were active. This was attributed to the following scenarios; some buildings had been completed due to their small sizes; some had stalled or suspended activities and still some registered ones had not commenced construction by the time of the survey. The sample size was therefore based on those construction sites that were active and the required sample size for the sites as derived using the Table in appendix 2 (Krejcie and Morgan, 1970) was therefore 169. Since building construction industry is highly dynamic the researcher devised a criteria to determine the construction sites to be used for data collection for purposes of this study as follows; the site

1. Must be authorized
2. Must have construction work ongoing
3. Must have at least 5 active workers

Criteria number one helped the researcher to keep to the recognized sites which were expected to be regulated; criteria two ensured the researcher was able to make observations for on-going processes and also had workers to participate in the research while criteria three ensured there were enough workers to participate in the interviews. Small construction sites had a bare minimum of 3 workers per site i.e. one casual worker, one semi-skilled/skilled worker and the foreman or employer giving the base figure of 900 target population. This figure rose and fell depending on type of activity at the construction site.The actual sample sizes varied from the initial target due to the fact that some building sites earlier identified in preliminary survey were inactive during the time of data collection and there were no workers on site to be interviewed. At the same time only sites that met the above criteria were included in the research.

### **Protocol**

Pre designed questionnaire and observation schedule was used to collect data. The tools were designed to capture all stages of the building construction that starts from foundation to final finishing.Data collection started with test run for nine sites to test validity and reliability of questionnaire. This was done in November 2019. The actual data collection was done from January 2020 to November 2020 where 32 sites were found active. Periodic checks in between had to be done for sites that were near completion so that they would not be left out. Data was collected using observation schedule, face-to face interviews and questionnaires developed by

the researcher as well as reviewing any available documents at the site. The instruments were designed to capture all items on each specific occupational health and safety issue. The researcher engaged and trained research assistants who assisted in administering the questionnaires. The workers, through their employers and supervisors, had been alerted in advance during site identification. The researcher and assistants went through the questions in the questionnaire with the interviewee and recorded the answers from the respondents. Different stages of development for the buildings were evaluated since different stages experienced different hazards and risks and had different requirements in relation to skills, materials, machinery equipment and PPEs required. All relevant authorities were informed of the study for their support. Contractors for the earmarked buildings were informed before commencing data collection for their consent to participate and involve their workers in the study. Confidentiality and integrity were maintained during the study. Data collection was done as per the objectives.

### III. Statistical Analysis

Data on compliance levels, hazards and risks to health and safety and challenges of managing the health and safety hazards and risks was analyzed using Statistical Package for Social Scientists (SPSS) version 25 and statistical tools were used to interpret the data. Chi-square used to establish any relationships of parameters used to health and safety in the building construction industry. The data was handled based on the objectives and the results were interpreted using tables, bar graphs and pie charts.

### IV. Results and Discussion

The research was conducted in 162 sites and involved 351 interviewees where 30.5% were foremen; 68.4% casuals, 0.6% on contract and 0.5% were permanent employees. Of all the respondents interviewed women constituted 0.9%. The research found that building construction industry within Kakamega County was dominated by men. This reflected the findings by ILO (1998) which also stated that traditionally building construction is a male domain in most African settings with women doing the lighter work of ferrying materials nearer to the building site and doing the thatch. Building construction requires a lot of energy and therefore undertaken by youthful adults, a fact also noted by Phoya (2012). Those below 18 years are expected to be in school while the older people shy away from the more strenuous work. Building construction is a process that ranges from ground preparation and material delivery all the way to final finishing that include painting and interior fittings and each of these stages has its issues. BWI (2006) found that people employed in construction industry were mostly low skilled, poor and vulnerable. Various skills are required at different stages of the building construction and the safety risks vary in frequency and severity.

#### Stages of building development of sampled sites

It was found that most buildings within the county were at the walling stage constituting 44.4 % followed by plastering with 26.5%. Metal work recorded the lowest with only 0.6%. The same trend was observed in the individual towns as shown in (Table 2). Metal work, roofing, painting and plastering are activities dependent on the completion of the walling. Foundations were almost immediately followed by walling and those factors in addition to the fact that walling was at different levels on different sites made it the most dominant activity. Metal work for doors and windows was least activity and only recorded in Kakamega town with only 1.2%. Metal structures were assembled elsewhere since the buildings under constructions lacked electricity connections for welding or owners simply preferred to buy readymade doors and windows to be fitted into the building which took a shorter time.

**Table 2: Location, number of sites, stage of building development and respondents**

Location	Stage of building development (%)						
	Foundation	Wall	Roof	Metal work	Paint	Plaster	Other
Kakamega town	3.7	48.1	6.2	1.2	6.2	29.6	4.9
Mumias	10.0	45.0	5.0		7.5	22.5	10
Butere	14.6	36.6	2.4		2.4	24.4	19.5

Total no. of sites=162; total no. of respondents=351

#### Level of education

Majority of the workers were between the ages 18-35 years followed by 36-55 making a total of 99.1%. Only 0.6% of the respondents were below 18 years which was an indication of child labour while 0.3% above 55 years. 0.6% of the respondents were found to have no education at all and distributed equally in age brackets 18-35 and 36-55 years while there were 1.4% respondents with university education spread in the ratio of 1:4 in the same age brackets of 18-35 and 36-55 years. The other graduates had taken to construction as a last resort

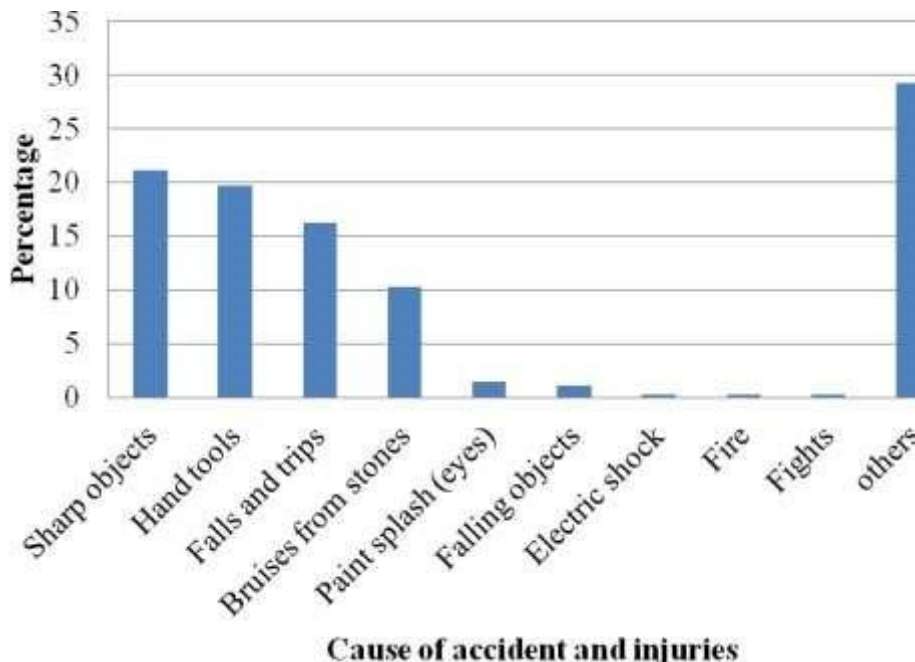
after missing out formal jobs which they still hoped for and others lost jobs and ended up in construction work. Majority of the workers had secondary education constituting 54.7% majority lying within age bracket 18-35 years. Some could not afford to continue their education while a good number had their young families or siblings, they were taking care of. Table 3 shows the age brackets and the education levels for the respondents. The workers were categorised as under age (below 18 years), youthful, middle age and above 55years.

**Table 3: Age versus level of education for building construction workers**

Age (years)	Level of education in percentage				
	None	Primary	Secondary	Tertiary	University
Below 18	0	0	0.6	0	0
18-35	0.3	10	38.7	10	0.3
36-55	0.3	5.7	15.4	17.4	1.1
Above 55	0	0	0	0.3	0

**Health and safety risks and hazards**

Safety and health risks and hazards in building construction industry experienced by workers were various (Fig. 1). The results indicated that 70.7 % had experienced certain forms of accidents at work while 29.3 % recorded no accidents. None reported escaping accident narrowly. Injuries from sharp objects constituted 29.8 % of all accidents reported followed by injuries from hand tools which accounted for 27.9 % and falls and trips 23.0 %. The results indicated that there was not much emphasis on safety and health issues in the industry giving rise to accidents and health problems which agreed with a research by Weil, (2001). It was not routine for employers to discuss with workers health and safety issues when inducting them to work, their expectations being work output. It was found that the careless manner in which tools and building materials were stored on sites exposed workers to injuries such as cuts, stripping and falls, pricks and related injuries which agreed with findings of Murie, (2007). Observations showed that there was a lot of repetitive work and manual lifting of heavy weights that could easily lead to musculoskeletal disorders as found out by Phoya, (2012) and The Eastman Kodak Company, (2004) in their researches.



**Figure 1: Common causes of accidents and injuries in building construction sites**

The research found that workers who had stayed longer in the industry had experienced varied injuries and accidents indicating that work experience did not translate to reduced accidents and injuries as indicated by the analysis of the results (Table 7) showing no relationship between duration the workers had been in construction industry and accidents experienced. The following facts made this part of the research rather tricky: it was not possible to establish the exact duration workers had been on the job; injuries resulting from manual handling such as blisters and back pain were not reported as injuries because they were viewed as normal component of building construction work. Minor bruises were often ignored or forgotten since workers felt they

were too minor to be reported and not even probing could make them accept they were issues; construction work being so temporary meant that workers did not work continuously throughout the duration worked and even then, the work was not consistent but varied with the site and type of work available at any one particular time. Those factors contributed to the relatively low number of workers who reported involvement in accidents and a clear relationship was not possible.

**Table 4: Worker’s involvement in accidents in relation to duration of exposure within current sites**

Status	Duration of exposure	
	Short (up to 3yrs)	Long (>3 yrs)
Not Involved in accident at workplace (%)	10.9	78.4
Involved (%)	0.6	10.1

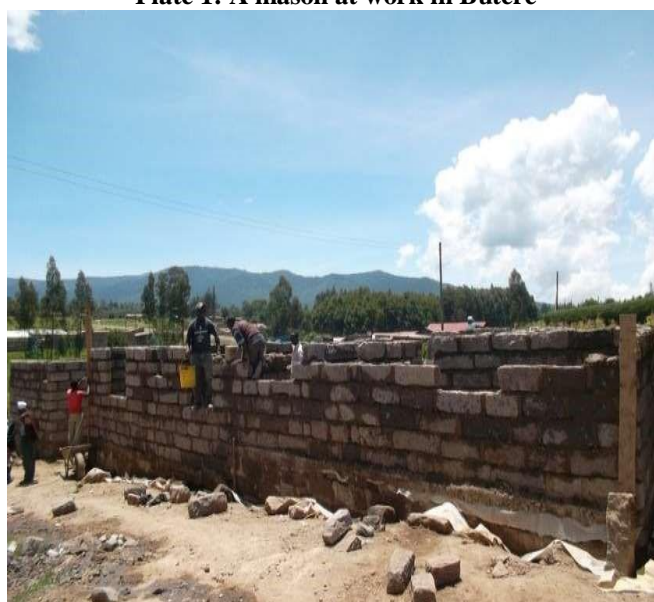
Total respondents = 348; (X<sup>2</sup> value-1.50; p-0.219)

(For the purpose of this research, Short duration means up to 3 years: Long from 3 years and above) Workers who reported having been involved in accident at workplace were 89.4%. Those who reported no accidents or injuries were found to be either new employees recruited at the time of study or those who worked in concrete mix and wheeling materials on wheelbarrows. Phoya, (2012) found that the workers perception of the risks involved was low hence the attitude. In line with Phoya’s findings, workers were found to be ignorant of the health implications of the injuries yet they could lead to health problems like tetanus and other life-threatening conditions. 29.8% of the workers reported being injured by sharp objects and 37.5% got injured by tripping over objects. This was reflected by the fact that sharp objects were observed to be common occurrences on construction sites with no organised storage exposing the workers to injuries which also agreed with findings of Murie, (2007). It was also clear that hand tools especially hammers, saws and stone chipping chisels frequently caused injuries. Falls were as a result of tripping over haphazardly stored building materials, slipping over wet surfaces, tipping over of items used to step on to reach heights, ladders, careless parching on walls and roofs without safety harnesses which was in line with what Maddox, (2014) and Phoya, (2012) found in their research. It was observed that there was a lot of lifting of building materials that sometimes fell on the workers’ feet hence bruising them as reported by 16.1% of the workers. At about one and half metres, the workers worked at height mostly using improvised platforms and those exposed the workers to falls a fact that was also observed by Lam and Kam, (1998). Scaffolds were poorly constructed and bound with nails and ropes with platforms that were not fully planked further exposing the workers to hazards. The workers fell when climbing up or down the stepping items and at the same time the workers got injured when they landed on sharp objects which agreed with findings of the US Department of Labour, (2009). There were no records kept on accidents and injuries at the construction sites to be reviewed and data was purely gathered from the building construction workers an issue which was also noted by ILO, (2001). This was attributed to lack of training.

**Accidents experienced at different stages of development**

The research collected data on the stage of development and the type of accidents (Table 5). At the foundation stage the common accidents were injuries from hand tools accounting for 56.5% of the accidents recorded at that stage. The stage involved trenching, lying of foundation stones and slab, erecting columns and other related work. Tools used were hoes, spades, wheelbarrows, hammers and chipping chisels subjecting the hands to blistering, hammer bruises, cuts and other related injuries. The walling stage had the highest number of total accidents, 43.9% of all accidents recorded during the research. Of the accidents and injuries recorded for the walling stage, 34.6% were injuries by sharp objects and 31.5% were hand tools while 26.8% were bruises from stones. There were lots of activities at the walling stage and use of varied tools and materials as well as lifting of building stones that sometimes fell on the workers’ feet hence bruising them. At about one and half metres, the masons started working at height and in some cases working from the ground with risk of falling objects (Plate 1) and in other instances stepping on improvised platforms or the wall itself with injuries constituting 24.3%. Scaffolds were poorly constructed and bound with nails and ropes with platforms that were not fully planked. Plastering stage recorded 30.5% injuries from hand tools, 18.6% falls and trips and 16.9% bruises from stones. The activity involved working at height on constructed platforms, ladders or improvised stepping items. Those painting got paint in their eyes causing discomforts.

**Plate 1: A mason at work in Butere**



**Table 5: Percent accidents and injuries experienced at various stages of buildings under construction**

Accident/injury	Stage of construction of building						
	Foundation	Walls	Roofing	Metalwork	Painting	Plastering	Others
Injuries from falls and trips	26.1	24.3	44.4	15.4	15.4	18.6	21.2
Bruises from stones	23.0	26.8	11.1	5.0	-	16.9	9.1
Injuries from hand tools	56.5	31.5	22.2	9.0	30.8	30.5	17.3
Injuries from sharp objects	4.3	34.6	33.9	15.4	1.4	11.1	39.4
Injuries from falling objects	0	4	11.1	0.9	-	10	-
Eye injuries from paint	-	-	-	-	38.5	-	-

**General challenges encountered by building construction workers**

The research found that there were general challenges encountered by the building construction workers in the course of their work (Table 9). Top on the list were lack of safe drinking water at the work site reported by 95.7% of the workers, lack of toilet facilities reported by 94.6% and 92.3% workers reported delayed payments. Water for drinking was obtained from the same source as the water for construction work. Workers drank water directly from the source, sometimes using their capped hands which were poorly washed.

Toilet facilities were rarely provided forcing the workers to use the bush, fence and even against building walls; and where facilities were provided, they were in pathetic conditions with no maintenance or basic cleaning. This also exposed the workers to health risks. Other significant challenges experienced by the workers were non- assurance of daily work recorded by 43% of the workers and non-payment of extra work done reported by 39.65%. The low wages which were sometimes irregular with no payment of extra work done forced the workers to live in situations of very low standards. This situation also ensured that the workers were always at the mercy of the employer as found by ILO, (2001) and the non- assurance of daily work saw to it that there was no continuity or regularity of livelihood of the workers as stated by SEWA, (2011).

Lack of first aid facilities was reported by 39.3% while limited access to meals was reported by 31.6%. Poor meals or going without meals meant that the health of the worker was poorly maintained and this had a direct impact on work output and even concentration at work making the worker vulnerable to accidents and injuries. Harassment at work was reported by 7% of the workers. This mainly arose from fellow workers who used bad language or picked fights. Others felt harassed when given double work and when harsh language was used on them by supervisors if work was not completed on time. Still others cited harassment by council officers and all that. Harassment reduced workers morale making them less careful in their work. A research by Roto et al., (1996) found that alcoholism was common among construction workers. This was attributed to stress from lack of control over employment prospects, heavy workload and social isolation. Workers did not think much

about Issues of PPEs, training and information as a result of their ignorance as to their significance, a finding that agreed with Farooqui et al., (2009). Workers felt that experience was adequate and so there was no need of getting formal technical training or seeking information. All those factors reduced the safety of the works which made them prone to accidents and injuries. 39.3% saw provision of first aid facilities as an issue meaning that many of the workers did not treat it as an issue and did not realise that contractors should provide the facilities. Many workers just let injuries pass unattended and this impacted negatively on their health. Generally, construction workers were not aware of what provisions they should get from their employers and let the situation rest as it had always been. The problems were viewed as part and parcel of construction work and the workers did their best to cope and carry on with work. Although communication was not a problem to majority of the workers, issues of health and safety was not part of the agenda and not priority issues for the employer.

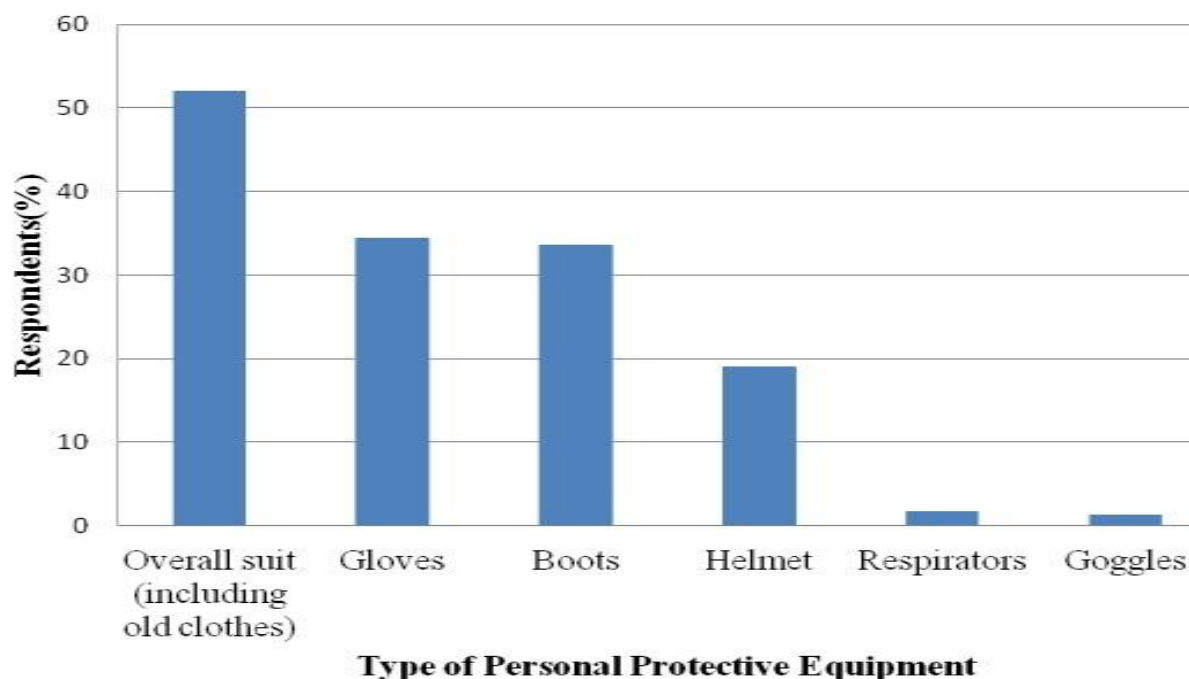
**Table 6: Respondents who reported having no access to health, safety and welfare facilities**

Lack of provision of facilities	(%) respondents
Safe drinking water	95.7
Toilet facilities	94.6
Paid on time	92.3
Assured of work daily	43.0
Paid for extra time worked	39.6
First aid facilities	39.3
Meals	31.6
Personal Protective Equipments	15.7
Clear channel for communicating grievances	10.8
Information and training	9.4
Personal Prot,Eqs readily and timely replaced	9.1
Harassment at workplace	2.0

### **Use of Personal Protective Clothing**

Many workers did not have personal protective equipment (PPEs) and were using ordinary and old clothing, a situation which increased the exposure of the workers to the risks. Out of the 351 respondents interviewed 54.1% had some form of PPE while 45.9% had no PPEs. It was observed that 52.1% had overall suits that included old clothing, 34.5% had gloves while those with boots accounted for 33.6% and 19.1% had helmets (Fig.4). None of the workers were observed to have complete set of PPEs. The foot wear referred to as boots were mostly worn-out ordinary shoes that were converted to work wear. The respirators were of the disposable type while the goggles were the simple ordinary type worn against the sun. The gloves, helmet, respirators and goggles were mostly found on commercial construction sites managed by contractors. While some workers argued that PPEs were not necessary or were cumbersome and that they were more comfortable with ordinary clothes, which was echoed in the findings of Farooqui et al., (2009), others said they were not provided and expressed the desire to have them to make them less vulnerable to injuries but the PPEs were too expensive for them to buy. Where PPEs were available supervisors were not keen to ensure that workers used them which explained why none of the workers was fully dressed in PPEs. This finding agrees with that of Phoya (2012) and Farooqui et al., (2009) who found that 90% of workers believed wearing PPEs reduced productivity and would not wear them to prevent injuries especially when time was pressing.





**Figure 2: Personal Protective Equipment distribution by type among construction workers.**

There was more use of PPEs in Kakamega town which is the County Headquarters. The law enforcement officers and their supervisors were based at the headquarters and therefore the high probability of noticing non compliance. It was also observed that use of helmets here was adopted more than in either Mumias or Butere and the same applied to gloves while use of boots was far less in Mumias (Table 7). There was no significant difference in the use of goggles, respirators and overalls in the three towns.

**Table 7: Percent use of Personal Protective Equipment by respondents by town**

PPE	Location			X <sup>2</sup>	P-value
	Kakamega town	Mumias	Butere		
Helmet	27.8	8.8	11.3	18.23	0.00*
Gloves	42.2	25.3	27.5	9.916	0.007*
Goggles	2.2	1.1	-	2.040	0.361
Respirators	2.8	1.1	-	2.816	0.245
Overalls	55.6	49.5	47.5	1.795	0.407
Boots	37.8	20.9	38.8	8.957	0.011*

**Preventive measures against accidents at various construction stages**

It was generally observed that most of the sites had no preventive measures such as scaffolds, ladders, fences and PPEs for accidents exposing the workers further to hazards (Table 8). The preventive measures applied at various stages of construction included measures against falling from height which were recorded in 33.3% sites which were either at walling or roofing stage or were storey buildings. The measures used were ladders and/or scaffolds; there were no preventive measures against falling objects at 85.8% sites at various stages of construction other than the foundation stage. There were no measures against noise or cuts at all the sites and only 0.2% sites being plastered or painted had provided respirators while no measures were taken against welding fumes. The research showed that there was negligible preventive measure for workers involved in manual handling whereby only workers at 2.5% sites had been provided with gloves. 1.2% sites had put up a fence as preventive measure against being hit or crushed by vehicles. There was no written contract between the workers and their employers and no insurance covers and therefore the employers felt no obligation to respond to workers health needs. No medical records were found on site and therefore illnesses arising from the construction activities are not taken into account and this could also explain why the workers overlooked some of the health problems they were coping with which was similar to what Phoya, (2012) found. Most of the workers reported that they avoided the risks by just being cautious. The research findings therefore indicated that building construction workers were highly exposed to health and safety risks.

**Table 8: Summary of observed preventive measures applied on various stages of building construction**

Risk	Preventive measure	% application	Remarks
Falling from height	Ladders, scaffolds	33.3	Walling, roofing, storey
Building collapse	Good planning before beginning to build	0.6	Walling, roofing, storey
Falling objects	Helmet, Slanted iron sheets, scaffolds	85.8	All stages except foundation
Electric shock	Switch off electricity during work	0.6	Metal work, renovations, finishing
Hazardous substances	Respirators	0.2	All stages except roofing
Welding fumes	-	-	Metal work
Noise	-	-	All sites
Hit or crushed by vehicle	Fence	1.2	All sites
Manual handling	Gloves	2.5	All sites
Cuts	-	-	All sites

All the construction sites in all the towns had no preventive measures against electric shock, noise, welding fumes and cuts (Table 9). A wider variety of preventive measures were observed in Kakamega than in Mumias or Butere towns. For example, there were 69.8% sites that had ladders and scaffolds as preventive measures against falls from height in Kakamega town as opposed to 10.5% and 31.3% for Mumias and Butere respectively. Kakamega town also had 7.7% of sites protecting against falling objects, 1.3% against hazardous substances and 4.9% of sites protecting against manual handling whereas Mumias and Butere had none. Preventive measures like warning signs, good planning, gloves, scaffolds, respirators, fencing off sites were observed only in Kakamega town. It was also found that these were found in large construction sites within town centre and the high class residential areas. Ladders and scaffolds were most commonly used in all the three towns. It was also observed that the measures applied were not necessarily effective in preventing accidents.

**Table 9: Preventive measures (%) against risks in construction sites by town**

Risk	Preventive measure	Kakamega town	Mumias	Butere
Fall from height	Ladders & scaffolds	69.8	10.5	31.3
Building collapse	Good planning	2.3	-	-
Falling objects	Helmet	2.6	-	2.9
	Iron sheets	7.7	-	-
Electric shock	Scaffolds	2.6	-	-
	None	100	100	100
Hazardous substances	Warning signs	1.3	-	-
Welding fumes	Respirators	1.3	-	-
	Nothing	100	100	100
Noise	Nothing	100	100	100
Hit or crushed by vehicles	Fence site	1.2	-	-
Manual handling	Gloves	4.9	-	-
Cuts from objects	Nothing	100	100	100

**Responses towards accidents**

Responses to accidents that occurred were found to be first aid (5%), workers taken to health facility (10%) or nothing done to the injured workers (85%) who were simply relieved of their duties to go home and nurse their injuries. The responses were mainly taken up by the injured workers themselves, their fellow workers or the foreman. Workers in only 1.2% of sites reported that first aiders or management took responsibility when accidents occurred. That happened on large construction sites and only when significant accidents and injuries occurred (Fig. 3).

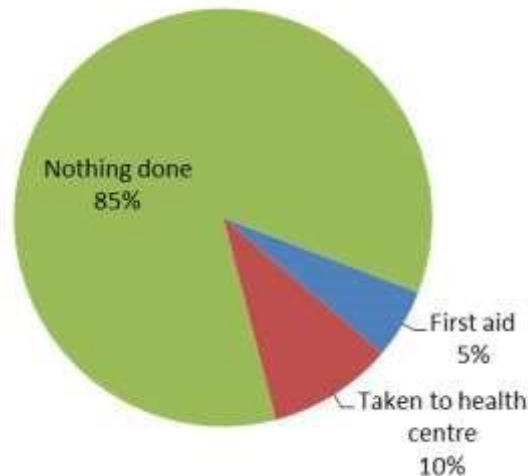


Figure 3: Action taken after the accidents at building construction sites

**Training on Building Construction as a Profession**

The study found that some workers had received some form of training before they started construction but a good number had no training at all (Table 13). It was also found that there were workers who got further training while on the job through apprenticeship or sought technical training to enhance their skills and get higher pay. There were also some workers who started construction without training but felt they needed training to cease from being just labourers to more marketable workers. A minimal number of workers got trained in safety and health while working in building construction industry. (Data on training status of the workers aimed at establishing if training had impact on the level of understanding of the workers on safety and health aspects. The assumption here was that a learned person would be able to read and interpret the laws, procedures codes of practice etc and relate these to his welfare at work.). The results indicated that 55% of the workers received some training before they started work and 45.3% received training during the course of their work. Of those 55% workers who had been trained before starting work, only 38.3% received further training during the course of their work while 61.7% had no further training. The training was mainly received from fellow workers and supervisors. Only 14.8% of the respondents had received training on health and safety and this was received from the Red Cross, seminars and workshops, college and on the job. Training on safety and health was very brief and concentrated on first aid and through personal initiatives.

**Table 10: Training status of building construction workers**

Status of training of respondent	Respondents (%)
Trained before joining work	55.0
Not trained before joining work	45.0
Trained during the course of work	45.3
Not trained during work	54.7
Trained before joining and during work	38.3
No continued training at work	61.7
Trained in S and H in the course of work	14.8
No training in S and H in course of work	85.2

**V. Conclusion**

It was concluded from the research that building construction industry in Kakamega town County was actually plagued by many health and safety issues which are normally not taken into account by the building construction employers. Workers have low perception and poor attitude towards risks and just like the employers also ignore safety and health issues. This was reflected in the poor ways of material storage, where no site provided for proper storage; poor improvised stepping items and working platforms and lack of harnesses while working on the roofs where only 33.3% sites provided means of protection and/or prevention. A variety of accidents and injuries occur at walling stage while sharp objects caused highest number of injuries ranging from 24.3% to 34.6% occurrence. There were no available documents on construction sites about activities and issues like accidents or injuries; medical records; inspections among others. Use of injury and

accident protection measures like PPEs and preventive structures were largely missing for instance ladders and scaffolds were used in only 10.5% of sites in Mumias, 31.3% in Butere and 69.8% in Kakamega town. Protection from falling objects was only observed in Kakamega town on 7.7% sites with iron sheets and 2.6% sites with scaffolds. There was no protection against noise, welding fumes and cuts. First aid facilities, drinking water and sanitary facilities were lacking and workers who got injured were left to sort themselves out or get assisted by their fellow workers.

Kenya lacks legal guidelines or basic requirements for one to become a contractor. At the same time most contractors are not qualified in building construction and therefore are not sensitive to safety and health aspects. It has also been noted that construction contractors tend to be conservative and this affects the choice of building materials, research and investment. In addition, low levels of monitoring and law enforcement contributed to minimal investment in preventive and protective measures at construction sites hence exposing the construction workers to safety and health hazards. The sectoral nature of laws and regulations which are not harmonized contributed to low compliance levels. Lack of training requirement to obtain construction jobs resulted to a workforce with low levels of education and highly limited in technical skills which were gained through apprenticeship. This in addition to the temporary nature of work meant that the building construction workers had no empowerment to speak out against violations on their safety and health entitlements and their aim was just to earn a living.

Training in health and safety was very limited. Majority of the workers were casuals representing 68.4%. Casuals are normally assembled whenever required and are not formally trained to suit the jobs they would undertake as required by OSHA (2007). Workers who indicated they had gone through formal technical training did not seem to benefit from the knowledge to safeguard themselves from accidents and injuries. This implied that the training was inadequate in addressing safety and health in practical perspective or that the elements of safety and health were not incorporated in the training. The normal education system does not cover safety and health issues and so those with high education levels remained exposed to accidents. Work experience had little impact on vulnerability reduction. Low supervision, low monitoring and poor law enforcement contributed to repeat violation of laws while lack of legal documents on site as reference materials for employers did not help the situation. It was therefore concluded that there was no single factor adequate enough to cushion the workers against safety and health issues when applied in isolation. Application of a combination of factors is necessary to safeguard the building construction workers and the combination that can offer even the bare minimum need to be investigated and thereafter enforced to protect the workers.

## **VI. Recommendations**

From the research the following recommendations were made; There is need for the government to come up with policies to specifically address building construction industry with strong enforcement procedures. It is also important that more research be carried out in the dynamics of building construction industry in Kenya to enable safety and health issues to be given priority in development agenda and the sector to be treated like any other trade. It is recommended that building construction workers should undergo basic technical training on building construction with an elaborate safety and health component and obtain at least a certificate in their area of preferred specialization. The Government, through the National construction Authority, should have a policy on minimum requirements to be met by construction workers and contractors. Employers in building construction should ensure that before any worker is engaged, they should have those minimum qualifications. In addition, it should be mandatory for workers to undergo induction training for specified duration before they get engaged at building construction sites. Formal education should incorporate basic safety and health component for learners to gain basic skills and to appreciate the importance of application of knowledge in real practice to safeguard them in life.

There is need to investigate why there is low law enforcement in Kakamega town County. This regard ensuring employers are registered and workers organized with operational safety and health committees in place to make them more responsible in managing risks. The Government should therefore require employers to take up workers on permanent or even contractual basis and this will make the industry be structured. Communication on risks and risk management should be established between the workers and the employers. It should be mandatory to carry out risk assessment and then design risk management procedures which should be implemented throughout the project cycle. This requires that the contractor should always have someone in charge of safety and health at the construction site to ensure implementation of procedures. The same person would be in charge of documentation of health and safety issues and be answerable for the same.

### **Declarations**

#### **Ethics Approval**

Ethical clearance was obtained from Masinde Muliro University of Science and Technology Ethics Committee. Consent.

### Competing interest

The authors declare that they have no competing interests.

### Authors& contributions

Micky Olutende Olooand Issah Kweyu conceived the paper, designed and performed the study. Dr. Maximilla Wanzala contributed the analysis software and analyzed the data. Prof Edwin Wamukoya was the paper's peer reviewer. All authors read and approved the final manuscript.

### Disclaimer

The findings and conclusions presented in this manuscript are those of the authors and do not necessarily reflect the official position of Masinde Muliro University.

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