



# **Occupational Health and Safety Risks and Hazards among Workers in the Gambian Building Construction Sites: A Mixed-Method Study Design**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Background:** Providing occupational health and safety (OHS) services to employees has been a global problem for an extended period. A safe workplace should pose no avoidable risk to employees' physical, psychological, or social wellbeing and should provide opportunities for employees to improve and support their health. This study aimed to assess the occupational health and safety risks and hazards among workers at the construction sites in Kombo North District of the Gambia.

**Methods:** A mixed-method study design was conducted across construction workers in Kombo North District, West Coast Region of the Gambia. Data was generated using validated OHS risk assessment matrix, structured questionnaires, environmental and physical inspection and key informant interviews. Descriptive statistics, including a composite scoring system, were used to present the results of this study.

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**Results:** Of the 157 respondents in this study, 98.1% were males, and about one-third of these construction workers were 31-40 years of age. About 46% and 34.4% spent 1-5 and 6-10 years in the construction industry, while about 40.2% of the respondents never been to school. The study revealed that physical risks and hazards in the form of falling from a height, electric shock, etc. were the most common forms compared to other categories such as ergonomics, biological and chemical risks and hazards. There is no reporting system or registry in place across the study sites.

**Conclusion:** This study provides evidence that physical hazards reported being the most common across other forms of ergonomics, biological and chemical risk and hazards. There is an urgent need for reactivation and implementation of OHS advocacies, health education, and other preventive strategies to control common workplace risks and hazards in their various forms.

*Keywords: Occupational health & safety; risks; hazards; construction sites and practices.*

## ABBREVIATIONS

*IBM : International Business Machine;*  
*ILO : International Labor Organization;*  
*OHS : Occupational Health & Safety;*  
*PPE : Personal Protective Equipment;*  
*SPSS : Statistical Package for the Social Sciences;*  
*RASH : Risk Assessment of Safety and Health;*  
*RPN : Risk Proportionate Number;*  
*WHO : World Health Organization.*

## 1. BACKGROUND

Occupational Health and Safety (OHS) is a multidisciplinary concept that focuses on promoting the health, safety, and wellbeing of people who work or are employed [1]. Providing occupational health and safety (OHS) services to employees has been a global problem for an extended period. Both the International Labor Organization's (ILO) 1985 Convention No. 161 [2] and the World Health Organization's (WHO) 2008-2017 Global Plan for Action [3] reflect the international community's commitment to safety concerns. The Global Plan covers all facets of worker health, including primary prevention of workplace hazards, safety and promotion of worker health, working conditions, and strengthening health systems' response for better health outcomes. It does so by establishing a connection between occupational and public health. Regrettably, developing countries lagged well behind their developed counterparts in terms of providing occupational safety and health care to workers [4]. A safe workplace should pose no avoidable risk to employees' physical, psychological, or social wellbeing and should provide opportunities for employees to improve and support their health.

Predicting the disease burden associated with various risk factors is a valuable public health

method for measuring premature deaths and illness. Construction workers are more likely to experience health problems and illnesses than workers in various other sectors [5]. They are exposed to various physical, chemical, and biological agents, which puts them at risk for a variety of health problems, including burns, respiratory problems, dermatitis, musculoskeletal disorders, and gastrointestinal diseases [6,7]. The construction industries primary hazards include falls, noise, injuries, dust, fire, and electrocution. Noise and dust are the primary uncontrollable hazards that result in serious occupational ill health, while other hazards result in death [8]. Owing to the weight and discomfort of helmets, workers often disregard them. It is proposed that Risk Assessment of Safety and Health (RASH) be used to assess risk on a construction site because it takes into account both worker safety and health [8].

According to the International Labour Organization (ILO), 2.3 million people die per year due to work-related injuries or illnesses, with 350,000 deaths due to workplace accidents. Additionally, the ILO reports that 264 million non-fatal injuries per year result in work-related illnesses, resulting in an average of three days of absenteeism from work [9]. According to a recent ILO publication, the ILO estimates that 860,000 workplace injuries occur daily, resulting in a direct or indirect expense of \$2.8 trillion for occupational illnesses and accidents worldwide [9]. Together, these few occupational risk factors result in 850 000 deaths and nearly 24 million Disability-adjusted life years (DALYs) lost per year. Each year, occupational accidents claim approximately 312 000 lives among the world's 2.7 billion employees in agriculture, manufacturing, and mining. Evidence shows that occupational exposures account for approximately 9% of all lung, trachea, and bronchus cancers and approximately 2% of all

leukemias [10], with most of these cases occurring in developing countries [11]. The nature of the industrial work, the hours worked, the low wages, the poor living conditions with a lack of basic facilities and separation from family, the lack of job security, and the lack of access to occupational health care all contribute to the deterioration of the situation [7,12].

Construction is a rapidly growing industry in the age of globalization, and little research has been conducted on the occupational health, risks, and psychosocial issues of these workers. Our literature review revealed a dearth of research on this subject in recent years, especially in developing countries such as The Gambia. It is against this backdrop that this study assessed the occupational health and safety risks and hazards among workers at the construction sites in Kombo North District, The Gambia.

## 2. MATERIALS AND METHODS

The study was based on a mixed-method approach that combines environmental observation and physical inspections within the construction sites, structured questionnaires and key informant interviews with selected workers and site supervisors. Additionally, triangulated methods of qualitative and quantitative approaches were used to adequately and explicitly describe the study variables as required. The entire data collection phase of the study was conducted from January 5, 2020, to March 25, 2020. A total of 157 construction workers were recruited for this study through random sampling, as shown in Table 1. The study was conducted in three construction sites along the coastal road construction sites in The Gambia. Permission was first obtained from these companies to collect data from their employees, specifically construction workers, per research ethics. With a total population of 157 for the three construction firms, all eligible workers were recruited for the study. In terms of the total number of workers in each of the construction sites, site A, B and C constitutes 57, 52 and 48 workers respectively as shown in Table 4. All the three sites were relatively at the sub-structure stage of their construction projects.

### 2.1 Background Information on Construction Sites

The study was conducted in Kombo North District in the current building construction sites. Kombo North District has a total population of 344 756, and about 52% were 15 – 49 years old

[13]. Based on the available statistics, it has the country's largest population. Beside its cosmopolitan settlement, the district has a strategic location for businesses especially selling of construction and building materials, the proliferation of estate agencies and firms in The Gambia. Thus, the surge of estate development firms/companies operating in the construction sector of the economy. Of the seven identified current building construction projects along Sukuta-Brufut highway, three construction sites were randomly selected for the study. Regarding the three selected construction sites, all workers whose consent were sought and found at the sites during the data collection phase, were recruited for the study.

### 2.2 Data Collection Tools

Throughout the construction establishments, environmental and physical inspections using a risk assessment matrixes were performed to assess the OHS risks and hazards among workers using a risk-based approach. Some of the specific areas include use of personal protective equipment, observance of safety procedures, availability of fire extinguishers, waste management, safety boxes, machines used, water and personal hygiene measures, physical risks like metals, broken glasses, etc. Thus, a site observation approach was conducted to observe the workers at their workplace [14]. Several construction projects within the three selected firms were observed during the visits, and a lot of issues were identified.

Key Informant Interviews (KII) were conducted for some selected work supervisors and workers such as masons, electricians, carpenters, laborers, welders, steel-tighter and plumbers within the construction sites. The tool focused on general OHS issues such as workers' perceptions and experiences on their roles, more specific issues such as workers' injuries and compensation procedure (if available), rights violations and exploitations, training matters, etc. Thus, an 'observe and ask' strategy was used to gain further insight into those practices from the lens of OHS [15].

### 2.3 Risk Assessment Matrix

A risk assessment matrix based on the potential physical, ergonomics, biological and chemical hazards was used during the site visits across the identified construction sites. A scale of

hazard rating matrix was adapted to determine the magnitude and severity of the identified hazards and risks at construction sites. The risk Level Estimator model was used to evaluate risk determination [16]. The risk of every hazard was calculated based on the equation below:

$$Risk\ Proportionate\ Number\ (RPN) = Possibility\ of\ occurrence\ (likelihood) \times Consequence\ (severity)$$

This model was adopted from EHS Singapore [17] and shown in Tables 1, 2, 3, 5, and 6.

To compute for the risk, we multiple the corresponding values (1 – 5) within the 5 categories for likelihood and the 5 categories for severity. The product of this 5x5 risk matrix generates the risk level, from 1 (Very Low Risk) to 25 (Very High Risk) as shown in Tables 3, 5 and 6.

## 2.4 Data Analysis

The study utilized descriptive summary statistics to analyze the construction workers' socio-demographic characteristics using percentages and proportions. Data generated from the risk assessment matrix were computed and categorized based on the adopted model schema as indicated earlier. Data analysis was done using IBM SPSS version 26.

## 3. RESULTS

### 3.1 Socio-Demographic Characteristics

The response rate for this study was 100%. Of the 157 respondents in this study, 39.3% were masons, 98.1% were males, and about one-third of these construction workers were 31-40 years of age and followed by those 20-30 age group at 29.3%. Slightly more than half of the respondents




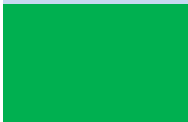
**Table 1. Likelihood descriptive scale**

Level	Likelihood	Description
1	Rare	Not expected to occur but possible (1 / year)
2	Unlikely	Not likely to occur (<2/ year)
3	Occasional	Sometimes occur (<3 / year)
4	Likely/Frequent	Common occurrence (<5 / year)
5	Certain	Continue or repeating (>5 / year)

**Table 2. Severity descriptive scale**

Level	Severity	Description
1	Negligible	Not likely to cause illness or injury
2	Minor	Minor illness or injury requires first aid box (bruises, minor cuts)
3	Moderate	Illness or injury requires medical treatment (burns, minor fracture)
4	Major	Serious injury leading to disability (major fracture)
5	Catastrophic	Fatality (death)

**Table 3. Action table for 5x5 risk matrix**

	Score	Risks	Action
	16 - 25	High	Unacceptable Activity Bring the process to a halt and examine the controls.
	12 - 15	Warning	Remedial intervention of the highest importance At all times, exercise strict caution. Emergency control steps shall be implemented.
	8 -10	Medium	Take appropriate corrective action at appropriate time Proceed cautiously. Additional surveillance is recommended. Within one month, an evaluation should be performed.
	1- 6	Warning	Reasonable risk: Residual risks There are no immediate threats. A system of frequent review shall be in effect, particularly in the event of changes in practices, materials, or the environment.

Sourced and adapted from Workplace Safety & Health (WSH) Council 2015 [18]

**Table 4. Socio-demographic characteristics of construction workers (N=157)**

<b>Variable</b>	<b>Frequency (n)</b>	<b>Percent (%)</b>
<b>Construction sites</b>		
Site A	57	36.3
Site B	52	33.1
Site C	48	30.6
<b>Forms of construction workers</b>		
Carpenter	15	9.6
Laborer	32	20.4
Mason	46	29.3
Welder	14	8.9
Steel-tighter	23	14.6
Plumber	11	7.0
Electrician	16	10.2
<b>Sex of the workers</b>		
Male	154	98.1
Female	3	1.9
<b>Age of workers (in years)</b>		
Below 20	25	15.9
20–30	46	29.3
31–40	54	34.4
41–50	21	13.4
51–60	8	5.1
Over 60	3	1.9
<b>Marital status</b>		
Single/Not married	89	56.7
Divorced	1	0.6
Married	67	42.7
<b>Tenure (in years)</b>		
Less than 1	7	4.4
1–5	72	45.9
6–10	54	34.4
11–15	16	10.2
Over 15	8	5.1
<b>Educational level of workers</b>		
Never been to school	63	40.2
Primary	50	31.8
Secondary	19	12.1
Tertiary	6	3.8
Vocational	10	6.4
Arabic education	9	5.7

were single/not married. About 46% and 34.4% spent 1-5 and 6-10 years in the construction industry as shown in Table 4. Overall, about 40.2% of the respondents never been to school, while only 32% had a primary level of education.

### **3.2 Identified Risks and Hazards at Construction Sites**

The study revealed that firm managers/leader exerts no efforts to maintain and control the working environment of the construction sites. In the aspect of ventilation, they have natural

means since the places were an open spaces. The work area was not clean, and the floor was not correctly cemented, which can cause slips and accidents. The use of mobile phones while working or operating machines distracts workers from concentrating, leading to injuries. There is no history of fatal accidents at the construction sites, but it was so poorly managed that workers can easily sustain injuries at any time. The firm does not observe the proper arrangement of construction sites to minimize risks and hazards. Some specific aspects of these tools are presented as follows:

**Table 5. Risk assessment and identification matrix**

Likelihood \ Severity	Rare (1)	Remote (2)	Occasional (3)	Frequent (4)	Almost Certain (5)
Negligible (1)			Inhalation of chemical		
Minor (2)	Noise		Bacteria, parasites infection	Vibration, dust	
Moderate (3)		Fire hazard	Temperature extreme		
Major (4)				Falling object hit worker	
Catastrophic (5)			Electrical shock	Falling from height	

Sourced and adapted from WSH Council 2015 [18]

### 3.3 Physical Hazards

The study presents the following physical hazards identified during field visits to the building construction site. The selected detail analysis matrix is shown in Tables 5 and 6.

#### 3.3.1 Slip, trip, and fall hazards

There are two kinds of surface falls revealed during the site visits. 'Trip and fall' is when a person trips over an unseen object in their path. 'Stump and fall' is where the person walks over an uneven or sticky surface that throws the person out of balance. Some of the reasons highlighted by construction workers regarding falling from a ladder include use of a defective ladder, failing to set up the ladder correctly, use of ladder for other purposes than which it was designed, losing one's balance, over-reaching while on the ladder and misstepping while climbing or descending. It was observed that one of the workers used an extension ladder as a ramp between two points that may lead to an accident.

#### 3.3.2 Electrical tools, equipment and machine hazards

Potential observed common electrical hazards in these construction sites were improper grounding of equipment, damaged tools, and equipment, damaged wire insulation, inadequate wiring or overloaded circuits, and operating electrical equipment in wet areas. None of these workers were found using the machine or related safety guidelines or manuals throughout the study. In most of the work that requires manpower, machines such as skid steer loaders, excavator,

backhoe, dumpers, crane to lift up heavy objects, and compressors were found to be used depending on the type and stage of construction works.

As indicated earlier, the firms majorly hired different machines, but they are not cleaned and checked regularly. This could be regarded as very dangerous since it may malfunction during operations and cause injuries and accidents. Some of the screws of the machines were already loose. There are no proper maintenance of these machines, which is not suitable for the firm for quality purposes.

#### 3.3.3 Fire hazards

Construction sites utilized various materials and tools prone to fire hazards if not used or stored properly. The study revealed that certain works such as welding and cutting torch generate sparks and heat, which could ignite the flammable vapor or substances near them. The majority of the workers did smoke and were found smoking at their workplaces which ultimately increases the risk of fire. The cigarette butts were improperly disposed off, and their supervisors identified no designated free smoking zone. With the presence of fuel, oxygen, and heat at all times of the day at workplaces, the fire could be ignited.

Even though these construction sites had zero-fire-related accidents since their establishment, there is no fire protection available. There were no fire extinguishers and only one water sprinkler was found in all the sites visited. There is no personnel assigned with the task and no licensed electrician who can check the outlets regularly.

Table 6. 5x5 risk assessment matrix

Hazard Identification			Risk Evaluation					Risk Control						
Ref	Work Activity	Hazard	Possible Injury/ Ill-health	Existing Risk Controls	S	L	RPN	Additional Risk Controls	S	L	RPN	Responsible Person	Due Date	Remarks
1	Installation of balcony railing	Falling from height, physical hazard	Disability, fatality	Fencing system	5	4	20	Safety nets	5	1	5	Work supervisor	15/2/20	
2	Crane lifts materials	Falling object hit worker, physical hazard	Disability, severe injuries	Fall arrest safety nets	4	4	16	Safety helmet	2	4	8	Work supervisor	15/2/20	
3	Cut wood plank using electric saw	Electrical shock, physical hazard	Fatality	Standardized plug & socket	5	3	15	Machinery safety notices	5	2	10	Safety officer	15/2/20	
4	Break up concrete use jackhammer	Vibration, dust, physical hazard	Neurological and motor disorders (hand)	Job rotation	2	4	8	Face mask	3	1	3	Work supervisor	18/2/20	

Note: S: Severity; L: Likelihood; RPN: Risk Proportionate Number

### **3.3.4 Poor ergonomic practices**

In terms of ergonomic practices, the firm has not oriented the workers about the proper organization of tools. There are no designated storage areas for the tools. The workers would normally place the tools on the floor of one of the rooms without organizing them. These tools are mixed up with other unnecessary objects or objects that are not even among those that are to be used by other workers at the site like wires, wiring tool kits, electrical tool kits, etc. that are stored together with the related tools that are currently in used.

### **3.3.5 Temperature extremes (heat) stress and hazards**

These building construction sites are open-aired with air ventilation during the study. The majority of workers reported being uncomfortable in hot conditions, which makes them sweat for the day long. A 33 years old male worker reported that about 4 months preceding the study, he had fainted/collapsed due to dehydration and heat exhaustion, which are regarded as a non-life-threatening incident.

### **3.3.6 Noise and vibration hazards**

There were a lot of noise generated by all kinds of machines, such as cranes, vehicles, power saw, sanders, routers and rivet guns at the sites. The noise affects the worker operating the machine and all workers close by, including the neighbours in the environment. Some respondents pointed noise can distract workers, which can lead to accidents, as the workers may not hear any warning or sound of danger. The majority of heavy machine operators reported experiencing temporal loss of hearings for a few hours due to prolonged exposure to loud noises but gradually regained after some time. Moreover, the hand-held or manually guided machines, such as demolition hammers, angle grinders, hand-held circular saws, etc., were reported to be used by workers sometimes and could cause hand-arm vibrations in the process. The excavators, site dumper, fork-lift truck, scrapers used on uneven terrain may cause whole-body vibration to the workers. Thus, the workers are exposed to a high level of vibration from the machinery.

### **3.3.7 Poor management of solid & liquid waste**

Concerning the waste generated at the construction sites, they were not segregated into

biodegradable and non-biodegradable wastes considering that the waste from the workplace is hazardous because of some chemicals used. There was no trash bin available at the construction sites, resulting in the indiscriminate dumping of wastes throughout the workplace's surroundings. The immediate environments of the workplaces were not fenced and cleaned, which frequently brought the garbage from the outside to enter the work area if the weather is windy. The work supervisors and the rest of the workers did not pay much attention to their garbage and untidy surroundings. They have no proper disposal of wastes which could probably result in poor production because the wastes in the surroundings are very disturbing.

### **3.3.8 Chemical hazards**

Some potential chemical hazards in these construction sites were dust, fumes, or gases, depending on the type and stage of the construction. The chemicals such as sulfur and dithiocarbamates were not stored correctly in these construction sites. Workers were exposed to potential chemicals through inhalation and skin absorption, resulting in systemic poisoning or contact dermatitis. They were also very likely to be exposed by smoking, ingested with food or water, contacted with eyes. Inconsistent use of Personal Protective Equipment (PPEs) such as goggles, overall apron/clothing, boots, etc., across the sites.

### **3.3.9 Biological hazards**

Some of the workers were observed to have a very mild form of skin rashes which was not clinically examined to determine the specific skin condition/category. General personal hygiene measures' practice status were the least desirable, which cut across the dirty and torn clothing wore while at work, bad state of their shoes, etc. It is hypothesized that, in a case of contagious diseases such as eczema, influenza, tuberculosis, if one of the workers acquire the infection could also transmit it to other workers within the construction sites regardless of the sections.

## **3.4 Control Measures of Observed Physical Hazards**

Control mechanisms are characteristics of a facility that remove, avoid, minimize, or reduce the risk to health, safety, and property posed by potential major incidents. Control mechanisms



**Table 7. Control Measure of physical hazards**

Physical hazard	Potential physical hazard	Control measure		
		Engineering	Administrative	PPE
Slip, trips and fall	Falling hazard in a form of slips, trips, and falls	*Install floor slip-resistant *Ensure adequate lighting	Slip, trips and fall	Falling hazard with associated with slips, trips, and falls
Electricity	Electrical hazard caused by the use of power cords and appliances	*As used near water bodies, ground fault circuit interrupters.	Electricity	Electrical hazard associated with the use of power cords and appliances
Tools and machinery	Cuts from sharp instrument or machine	*Avoid the use of sharps unless necessary. *machine guarding	Tools & machinery	Cuts from sharp instrument or machine
Heat Stress	Works in a hot environment	* Drink plenty of water * Wear loose clothes in light colours.	Heat Stress	Works in a hot environment
Noise	Noise from machine or equipment	* Enclose the machine or piece of equipment that is causing the noise. * Reduce the amount of noise produced by the machine by changing it to operate more quietly. * Place a barrier between the noise source and the employee	*Perform regular maintenance *Worker education and awareness sessions	*earplug * earmuffs
Vibrations	Vibration when using machine or equipment	* restrict the time vibrating tools are used * alternate between vibrating and non-vibrating tools	*maintain and service the tools in good working order * safe work procedures	
Fire	Burns sustained when handling newly heat-sterilized equipment	*Creating a work procedure to control equipment turnover	*Workplace safety protocols *worker training	*Heat resistant gloves

come in various shapes and sizes, including physical equipment, process control systems, management structures, operational or repair procedures, an emergency plan, and key personnel and their actions. Hazards should be avoided wherever possible. Hazards must be regulated if it is not feasible. Control refers to lowering the danger to the degree that it poses no risk to the workers' health. As shown in Table 7, controls include technical controls, administrative controls, and personal protective equipment (PPE).

#### 4. DISCUSSION

Physical hazards are one of the biggest threats to the personal safety of workers in construction industries. It is documented that visible physical hazards such as sharp objects, machines, and tools could hurt workers and other forms of energy such as vibrations, noise, radiation, extreme temperatures, and much more [19]. Physical hazards have many effects in the short term or long term. The short-term effects are falls, bruises, sprain, fractures and much more

[20,21]. At the same time, long-term effects are hearing loss, back injuries, and others [22,23]. Continuous exposure to heavy noise could have temporal or permanent hearing loss to the workers, including their colleagues at the worksite [24]. This study agrees with the common fact that chemical hazards are harmful to workers' health either in short or long-term exposures. Several chemical hazards caused by diseases related to construction are silicosis, asbestosis, bronchitis, skin allergies, and neurologic disorders [25,26]. However, slips, trips, and falls were the most underestimated hazards in any construction site. It was found that almost 19% of all-hazard was caused by falling off a ladder or tripping over objects. The consequence of a fall can be based on three major factors that include the velocity of initial impact, impulsive force upon impact, and position upon impact [27].

In the construction industries, the major activities involve using of machines [28]. Heavy machinery like dumpers, cranes, etc. may create a lot of potential hazards if not used properly. Workers have the possibility of being crushed or decapitated by the machine every day. An accumulation of increased/extremely heat stress could be observed due to machine heat and environmental circumstances. These could be attributed to high temperature, high humidity, minimal airflow, heavy physical work, and improper clothing [29]. Heat stress occurs when the condition starts to harm a worker. Thus, dozens of workers die each year from heat-related causes [30]. Furthermore, electrical hazards such as electrocutions are considered the fourth leading cause of traumatic working fatalities globally, and over 2000 workers a year are sent to burn centers with electrical-related incidents [31]. This could explain the commonalities of these risks and hazards reported in this study.

Prolonged exposure to hand-arm vibration can result in neurological and motor problems in the hands and fingers and circulatory problems in the fingers. Prolonged usage of a vibrating tool like a drill or a jackhammer can cause a significant impact on the person holding it [32]. In the long run, exposure to vibrations in excess will increase the possibility of having Parkinson's syndrome. Workers exposed to prolonged whole-body vibration can experience lower back pain, sensory dysfunction, or poor fine-motor coordination [33]. These may also cause poor posture, awkward movements, too much force

exertion, injuries from manual handling positions, and musculoskeletal disorders.

The study indicated that there was moderately low commitment and motivation towards implementing quality work among various sections of the construction teams. Thus, workers perceived that work supervisors and team leaders should have an appropriate and adequate continuing relationship to ensure a healthy workforce. As a result of these factors, withdrawal behaviors such as absenteeism and high turnover can manifest. This result is consistent with the findings of Sinclair et al. [34], who discovered that when organizations fail to fix unsafe working conditions such as unnecessary noise, hostile supervision, poor visibility, and dusty conditions, workers' continued loyalty to the organization decreases. As a result, workers believe that the cost of remaining with their organization outweighs the cost of leaving. In other words, to attract committed workers to work in high-risk organizations such as the various parts of the construction team, effective safety and health programs that protect employees' health and safety are needed.

Process engineers and line managers should receive adequate knowledge and training on identifying workplace hazards and implementing primary preventive measures. Additionally, the workplace promotes fitness and promotes the prevention and management of communicable and non-communicable diseases. The workplace can encourage and motivate individuals to make healthier choices about physical activity, diet, and tobacco use. Employee assistance, fitness, and substance screening services should be offered in addition to, not in lieu of, key preventive initiatives for workplace hazards. Protecting employee health and safety is the employer's primary obligation [35].

#### **4.1 Strengths and Limitations of the Study**

In general, semi-quantitative risk matrices were argued to be very effective, inexpensive, and mostly used for risk assessment and improved decision-making on risk management. This paper had applied current theories in practice to examine the quality status of OHS risk assessment in construction industries of the Gambia. Thus, it would greatly help and compel construction firms, regulatory authorities, and policymakers to make effective choices regarding setting priorities on OHS risk reduction measures

and robust safety standards. The need for frameworks to assist policymakers in setting goals has grown in importance and development over the last decades.

Despite its strength, the risk matrix also has some limitations worth mentioning in this paper. While it should not be used in isolation, it complements other tools/approaches such as using various experts, counterfactuals, and fixed value techniques. It is difficult to demonstrate whether the manner in which this risk evaluation was conducted and organized aided in improving the accuracy of the result. Given that the current risk matrices in Gambian OHS settings have some shortcomings and none of the construction workers had previously gone through any similar risk assessment studies or projects, we can conclude that the standard has improved. Additionally, some participants made spontaneous verbal statements, but these are difficult to track in this article.

## 5. CONCLUSION

Generally, a significant number of OHS risks and hazards were observed to be high among construction workers in the Gambia. Physical hazards in the form of falling from a height, electric shock, etc., reported being common across other forms of ergonomics, biological and chemical risk, and hazards. There is no reporting system or registry in place across the sites visited during the study. Thus, they lead to serious under-reporting of risk, hazard, safety, and injury cases and negligence of duties. This could cause high morbidities associated with these workers. There is an urgent need for reactivation and implementation of OHS advocacies, health education, and other prevention strategies to control common workplace risks and hazards in their various forms. Interventions are required to improve the working conditions of building construction workers by ensuring the availability of personal protective equipment (PPE), proper housing, and sanitation facilities on-site. A health screening system and routine surveillance of construction workers have to be set up. More inclusive population-based intervention programs on safety education and implementation across construction industries in the Gambia and beyond are needed.

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our

area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## AVAILABILITY OF DATA AND MATERIALS

The data used to support the findings of this study are available upon reasonable request from the authors.

## CONSENT AND ETHICS APPROVAL

The study protocol was reviewed and ethical clearance was issued by the University of The Gambia. Before the commencement of the study, ethical approval was obtained from the construction company managers and individual workers of the sampled firms. Participation in the study was entirely voluntary and only those that accept to be part of the study were recruited. A written informed consent form was signed/thumbed-printed by each participant who accepted to be enrolled in the study.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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