



# **Occupational Safety and Health Hazards in the Informal Non-food Manufacturing Sector in Kampala City, Uganda**

**Stephen Aurice Wekoye<sup>1\*</sup>, Wilkister Nyaora Moturi<sup>2</sup>  
and Stanley Maingi Makindi<sup>2</sup>**

<sup>1</sup>*Department of Chemistry, Faculty of Science, Kyambogo University, Kampala, Uganda.*  
<sup>2</sup>*Department of Environmental Science, Faculty of Environment and Resources Development, Egerton University, Nakuru, Kenya.*

## **Authors' contributions**

*This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

The informal non-food manufacturing sector is an engine of growth and development in both developed and developing countries. This particular sector is unregulated and unregistered in official government statistics. It is a heterogeneous sector found in open places, road reserves and marginal lands. However the sector is faced with occupational safety and health hazards without preventive measures. The study assessed occupational safety and health hazards in the informal non-food manufacturing sector in Kampala City, Uganda. The study adopted a cross sectional survey design that involved both qualitative and quantitative data collection techniques. A total of 424 firms were sampled from the 6 clusters of the informal sector. Primary and secondary sources using questionnaires, checklists and interview guide were used in data collection. Various types of hazards inherent in the informal non-food manufacturing sector in Kampala that included; physical, chemical, mechanical, biological, ergonomic and psychosocial hazards were identified. There are a lot of hazards in the informal non-food manufacturing sector with inadequate preventive measures.

\*Corresponding author: E-mail: [swekoye@kyu.ac.ug](mailto:swekoye@kyu.ac.ug);

Hence the urgent need to address the situation by creation of awareness, training, and provision of OSH regulations, inspection and enforcement by the relevant regulatory agency as well as proactive multi-media strategies to improve the situation.

*Keywords: Occupational safety and health; hazards; informal sector.*

## 1. INTRODUCTION

The informal non-food manufacturing sector is an engine of growth and development in both developed and developing countries. It is commonly known as the Jua-kali in Kiswahili. Yet, the sector is unregulated and unregistered in official government statistics. This sector which is heterogeneous is found in open places, road reserves, homestead backyards and wetlands or marginal lands. The sector is however rocked with occupational safety and health hazards without preventive measures. The informal sector is described by the International Labour Organization [1] as part of the national economy composed of a wide range of small scale economic units producing and distributing goods and services consisting largely of independent, self-employed producers in urban areas of developing countries. Generally, they are not registered or regulated and do not benefit from government support and subsidies. Safety and health issues are hardly considered, work accidents are rarely reported and compensated. It encompasses a range of economic units in urban areas that are mainly owned and operated by individuals, either alone or in partnership with family members of the same household, spanning a range of sectors that include; handcrafts, leather crafts, woodworks and carpentry, metal fabrication, electrical and electronics, ceramics and pottery, textiles and garments, hair dressing, printing and graphics, chemicals and pharmaceuticals, building materials and construction, food and beverages, and agro processing amongst others [2].

According to International Labour Organization (ILO) about 234 million people die each year from work-related accidents and diseases. Globally as many as 317 million non-fatal accidents occur and 160 million non-fatal work-related diseases emerge annually [3]. Many informal jobs are not only "flexible, precarious and insecure but are also hazardous and take place in unhealthy and unsafe environments [4]. Informal sector workers operate in inhumane conditions and makeshift places without sanitary facilities. Examples of such environments

include; road reserves, informal market places, wetlands and poorly serviced homes. These can expose the workers to environmental hazards, diseases, traffic accidents, fire hazards, crime, and assault as well as weather related discomfort and muscular- skeletal injuries. Despite the risks involved, due to its unconventional nature and location, informal workers in most African countries are not protected by the institutions that are mandated to protect them. Conventional OSH institutions have been designed to protect formal workers in the formal sector environments [5]. The informal workers operate in atypical and nonstandard workplaces that are excluded by definition, from occupational safety and health protection measures [6].

An occupational hazard is something unpleasant that you may suffer or experience as result of doing work or hobby [7]. Hazards exist in every workplace in many unusual forms; pointed edges, falling objects, flying sparks, chemicals, dust, fumes, noise and numerous potential hazardous situations [8]. The Occupational Safety and Health Administration (US OSHA) requires that employers protect their workers from workplace hazards that can cause damage to them [9]. The study assessed occupational safety and health hazards in the informal non-food manufacturing sector and their preventive measures.

## 2. MATERIALS AND METHODS

### 2.1 Study Design and Setting

The study employed a cross sectional survey design. It was carried out in Kampala City that lies on Latitudes 00°18'49" North of the Equator and Longitudes 32°34'52" East of Greenwich. It's bordered by Wakiso district on the south, west and north, by Kira Municipal Council on the east and Lake Victoria on the south. Administratively it's divided into 5 divisions (Municipalities) which include; Kampala Central, Nakawa, Kawempe, Rubaga and Makindye divisions, covering a total area of 189 Km<sup>2</sup> of which 169 Km<sup>2</sup> is land and 19 Km<sup>2</sup> water [10]. The study duration was four (4) months from May to August 2018 and comprised

of a sample size of 385 with a 10% non-response rate giving 424 enterprises.

## 2.2 Sampling

Cluster sampling technique was used to select the enterprises among the informal sector on which simple random sampling was done to get the study enterprises. These included; the manufacture of metal products, textile and clothing, bricks and concrete products, repair of equipment and machinery, recycling of paper and paper products and other manufacturing. The actual enterprises were selected proportional to size at enterprise level. The owner of the enterprise and one employee selected at simple random sampling were interviewed by the research assistants.

### 2.2.1 Sample size determination

The sample size of the study was determined using the following formula to yield a representative sample for large populations [11]

$$n = \frac{Z^2 pq}{e^2}$$

Where  $n$  is the sample size

$Z^2$  is the abscissa of the normal curve that cuts off an area  $\alpha$  at the tails ( $1 - \alpha$  equals the desired confidence level is 95% (1.96)

$E$  is the desired level of precision (0.05).

$P$  is the estimated portion of an attribute that is present in the population equal to 0.5 and  $q$  is the  $1 - p$

Therefore the sample size  $n = \frac{Z^2 pq}{e^2} = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2} = 385$  enterprises.

In the study, the sample size was 385 enterprises plus 10% for non-response rate to give 424 enterprises.

## 2.3 Study Population

The study population comprised 8,652 enterprises in the seven clusters based on the Census of Business Establishments (COBE) for Uganda [12]. They included manufacture of metal products, textile and clothing, bricks and concrete products, repair of equipment recycling

of paper and paper products and machinery and other manufacturing. At the firm level, the owner and one of the informal sector workers were considered for the study by simple random sampling and interviewed.

## 2.4 Data Collection

Relevant information for the study was obtained from both primary and secondary sources. The secondary data were obtained from relevant literature such as Scholarly articles, Annual reports, Acts of Parliament and text books. The primary data was obtained through the field survey using the questionnaires by research assistants from the informal non-food manufacturing sector employers, employees and key informants in the Ministry of Gender, Labour, and Social Development, Kampala Capital City Authority, National Organization of Trade Unions and Federation of Uganda Employees. Seven main clusters in the informal non-food manufacturing sector were selected. A walk through survey was also done using an International Labour Organization (ILO) adapted Workplace checklist at every selected enterprise to record the hazards and control measures in the workplace. Inclusion criteria consisted of those enterprises that had below 5 employees and were willing to participate in the survey. The study excluded workplaces that were not involved in the manufacturing of products from raw materials in the informal non-food manufacturing sector in Kampala City. People who were not employed in the sector like students and apprentices and those who had worked for less than one month and those who declined to participate in the study.

## 2.5 Data Management

Field checking of questionnaires was done after the field interviews, errors were immediately verified and corrected. The quantitative data was entered into Statistical Package for Social Scientists (SPSS) Version 20.0 software for analysis.

## 2.6 Statistical Analysis

Descriptive statistics were generated using SPSS statistical software for windows version 20.0 [13] for the demographic variables. Percentages and frequencies were reported in tables and graphical forms. The independent variables were; workplace hazards, legal

framework, administrative measures, and knowledge, attitudes on practices and acceptance levels while the dependent variable was adequate occupational safety and health at workplace influenced by the social environment and government regulation as the intervening variables.

## 2.7 Ethical Approval

The ethical approval of the study protocol was done by the Makerere University School of Social Sciences Research Ethics Committee and the Uganda National Council for Science and Technology. Permission was sought from the Ministry of Gender, Labour and Social Development and Kampala Capital City Authority. Participation of the study population was voluntary and each research participant signed a written informed consent form.

## 3. RESULTS AND DISCUSSION

### 3.1 Socio-demographic Characteristics of Respondents

In Table 1, data was collected from 388 enterprises with a response rate of 92%. Results showed that 40.7% of the respondents were aged 30 years and below while slightly less than a quarter (20.6%) were aged 31-40 years and 41-50 with 20.4% as 18.3% represented those aged above 51 years. The mean age of the respondents was  $30 \pm 2.16$  years. Majority of the respondents were male (67.8%) compared to their female counterparts who were 32.2%. A considerable proportion of the respondents (70.9%) were reported married followed by 26% who were single whereas 2.1% were divorced. In terms of education, a half of the respondents 196(50.5%) had been exposed to at least some level of education equivalent to secondary level, 103(26.5%) had acquired primary level whereas those who possessed higher education (tertiary/vocational) were 55(14.2%) as well as 20(5.2%) with degrees, while those who had never attained any education level were the minority with 3.6%. It is notable that more than a quarter of respondents (31.3% and 34%) had spent 1-5 years and above 10 years respectively working in the informal sector (Juakali) as a related proportion of 31.7% suggested 6-10 years of work in Juakali. Furthermore, most employers engaged themselves in their businesses thereby not employing workers as shown by a percentage of 288(58.8%) whereas employers who employed between 1-3

employees were only 82(21.1%) and 4-5 employees with 78(20.1%).

In terms of work characteristics average worked for 1-5 years were 133(34.3%) while 132(34.0%) were above 11 years of service. Most of them worked for 9 hours 327(84.3%) per day with only 61(15.7%) working for 8 hours per day with a mean number of hours being  $8 \pm 1.86$  hours per day (40 hours/week) and 343(88.1%) worked for 6 days and above per week with a mean working rate of  $5 \pm 1.88$  day per week. These cause overworking in the informal sector leading to fatigue, stress and burnout hence leading to psychological hazards at the workplace.

### 3.2 Type of Working Premises in the Informal Non-food Manufacturing Sector

From the Table 2, data on 388 enterprises was collected using a checklist by a "walk through survey" technique. 218(56.2%) of the workplaces were open operating in hot sun (no roof, no walls/ no structure housing the workers), 129(33.2%) closed (enclosed in a structure with both roof and walls), 38 (9.8%) partially enclosed (structure present with only roof but no walls) and 118 (53.4%) mixed (some workers in the open while others under a shade). 139(63.8%) of the workplaces were inadequate. Overall only 79(36.2%) of the premises were adequate. Workplace environment 255(65.7%) were not clean and full of waste materials, 307(77.8%) floors surrounding the work station were dirty and full of waste, 316(81.4%) had dirty passages surrounding the workstation, 338(87.1%) did not regularly empty their waste containers while 324(83.5%) of the general environment around the workplace was dirty. Only 96(24.7%) had appropriate roofs, 90(23.2%) had appropriate walls and 65((6.8%) had emergency exits free from obstruction. In terms of sanitary facilities, resting facilities and running water, it was inadequate, sanitary facilities only 19(4.9%) while 334(86.1%) without, resting facilities only 14(3.6%) and running water only 8(2.1%) and 355(91.5%) without. Fire precautions were also almost non-existent with only 25(6.4%) with fire exits while 351(90.5%) without fire exits and 17(4.4%) possessing fire extinguishers in the premises and 367(94.6%) did not have. Waste disposal was found inadequate with 92% and drainage absent with 87.7%.

### 3.3 Occupational Safety and Health Hazards in the Informal Non-food Manufacturing Sector in Kampala City

A number of occupational safety and health hazards were imminent in the informal non-food manufacturing sector ranging from physical, chemical, biological, agronomic and psychosocial hazards. From the Table 3 all types of hazards are prevalent in the informal non-food manufacturing sector. Chemical hazards were highest with 299(77.1%) this is because of the grave dangers associated with chemicals especially in the welding and fabrication, furniture making and car repair resulting from volatile paints, thinners and furnishes. This is followed by mechanical hazards with 293(75.5%) as a result of machines and equipment used causing high level risk to workers while physical and biological were 269(69.3%) and 267(68.8%) respectively with ergonomic hazards accounting for 258(66.5%). However, these hazards ranged

from high, medium and low in the different sectors. For example, mechanical and chemical hazards were rated high risk in the welding and fabrication and furniture firms while the moderate risks were found to be in the repair of machinery and equipment, concrete and brick making and low risk associated with textiles and clothing and paper manufacture.

When the Pearson moment correlation was calculated Table 4, physical hazards showed to be significantly associated with the informal non-food manufacturing sector. The means and standard deviations for the main study variables are reported in Table 4 below. The interrelationships between the study variables from the table indicate physical hazards to correlate positively with safety behaviour ( $r=0.51$ ,  $p<.01$ ). There were inter-correlations such that high perception of work in the informal non-food manufacturing sector was negatively associated with chemical hazards ( $r=-0.28$ ,

**Table 1. Socio-demographic characteristics of respondents (n=388)**

Characteristic	Variable category	Frequency	Percent (%)
Sex	Male	263	67.8
	Female	125	32.2
Age category of respondents	30 Years & Below	158	40.7
	31-40 Years	80	20.6
	41-50 Years	79	20.4
	51 years & Above	71	18.3
	Mean age		30 ±2.16
Marital Status	Single	101	26.0
	Married	275	70.9
	Divorced	8	2.1
	Widowed	4	1.0
Education	None (informal)	14	3.6
	Primary	103	26.5
	Secondary	196	50.5
	Tertiary/Vocational	55	14.2
	Degree level	20	5.2
Period working in Juakali	1-5 Years	133	34.3
	6-10 Years	123	31.7
	10 Years & Above	132	34.0
Number of employees at work	0 Employees	228	58.8
	1-3 Employees	82	21.1
	4 or 5 employees	78	20.1
Working hours / day	1-8 Hours	61	15.7
	9 Hours & above	327	84.3
	Mean Hours		1.84
Working days / week	1-5 days	45	11.6
	6 days and above	342	88.4
	Mean Working days		1.88

Source: Primary data

**Table 2. Type of working premises in the informal non-food manufacturing sector**

Item		Yes n(%)	No n(%)	N/A n(%)	Total n(%)
Type of work environment	Open	218(56.2)	170(43.8)	0(0.0)	388(100.0)
	Closed	129(33.2)	259(66.8)	0(0.0)	388(100.0)
	Partially closed	38(9.8)	350(90.2)	0(0.0)	388(100.0)
	Premises fenced /enclosed	8(2.1)	380(97.9)	0(0.0)	388(100.0)
Kept clean and free from waste	Work station	131(33.8)	255(65.7)	2(0.5)	388(100.0)
	Floors surrounding work station	86(22.2)	302(77.8)	0(0.0)	388(100.0)
	Passages surrounding work station	68(17.5)	316(81.4)	4(1.0)	388(100.0)
	Stairways giving access to workstation	30(7.7)	140(36.1)	218(56.2)	388(100.0)
	Waste containers regularly	40(10.3)	338(87.1)	10(2.6)	388(100.0)
	General environment	54(13.9)	324(83.5)	10(2.6)	388(100.0)
	Floors and passages dry and in good repair	91(23.5)	279(71.9)	18(4.6)	388(100.0)
	Floors free from obstruction	64(16.5)	302(77.8)	22(5.7)	388(100.0)
	Appropriate roof used	96(24.7)	172(44.4)	120(30.9)	388(100.0)
	Appropriate walls used	90(23.2)	171(44.1)	126(32.7)	388(100.0)
	Emergency exits free from obstruction	65(16.8)	221(57.0)	102(26.3)	388(100.0)
	Electric lightings and fittings in good working order	42(10.8)	240(61.9)	106(27.3)	388(100.0)
	Adequate sanitary facilities	19(4.9)	334(86.1)	35(9.0)	388(100.0)
	Resting facilities at the work place	14(3.6)	120(30.9)	254(65.5)	388(100.0)
Running water on the premises	8(2.1)	355(91.5)	25(6.4)	388(100.0)	
Fire Precautions	Routes and exits free from obstruction	25(6.4)	351(90.5)	12(3.1)	388(100.0)
	Fire extinguishers available and serviced regularly	17(4.4)	367(94.6)	4(1.0)	388(100.0)

Source: Field data

**Table 3. Types of hazards in the informal non-food manufacturing sector**

Type of hazard	Yes n (%)	No n (%)	N/A n (%)	Total
Physical	269(69.3)	119(30.7)	0(0.0)	388 (100.0)
Chemical	299(77.1)	89(22.9)	0(0.0)	388 (100.0)
Biological	267(68.8)	104(26.8)	17(4.4)	388 (100.0)
Mechanical	293(75.5)	95(24.5)	0(0.0)	388( 100.0)
Ergonomical	258(66.5)	130(33.5)	0(0.0)	388 (100.0)
Psychological	291(75.0)	96(24.7)	1(0.3)	388 (100.0)

Source: Primary Data

**Table 4. Correlation of hazards associated with the informal non-food manufacturing sector**

Variable	Yes	No	Mean	SD	1	2	3	4	5	6
1 Physical	269(69.3)	119(30.7)	92.85	5.60	—	—	—	—	—	—
2 Chemical	299(77.1)	89(22.9)	13.78	5.24	-0.28*	—	—	—	—	—
3 Biological	267(68.8)	104(26.8)	16.35	3.97	0.40*	0.60*	—	—	—	—
4 Mechanical	293(75.5)	95(24.5)	16.61	4.74	0.60*	0.24*	0.34*	—	—	—
5 Ergonomic	258(66.5)	130(33.5)	35.02	6.02	0.31*	0.17*	0.22*	0.45*	—	—
6 Psychological	291(75.0)	96(24.7)	21.20	5.33	0.51*	0.49	0.19	-0.37	0.29	—

\* P<0.01 (1-tailed). Extraction method: factor analysis, KMO and Bartlett's test sphericity

p<.01). Nonetheless, biological and mechanical hazards were associated with physical hazards (r=0.40, p<0.01), (r=0.60, p<.01) and ergonomic hazards positively correlated with physical hazards (r=0.31, p<.01). Psychological hazards correlated negatively with ergonomic (r=-0.37, p < .01). Overall, chemical and mechanical hazards were more pronounced in the informal sector over the other hazards.

### 3.4 Specific Hazard Exposure in the Informal Non-food Manufacturing Sector

From Table 5, most of the enterprises were exposed to high uncomfortable postures (ergonomic hazards) with 381(98.2% followed by confined spaces with 372(95.9%) while repetitive movement/ motion accounted for 366(94.3%) and chemical exposure in terms of solvents and paints were 339(87.4%) and 313(80.7%) respectively. this may be attributed to the lack of control measures but the root cause is lack of information and knowledge of occupational safety and health. Dust and gaseous exposure were also high in the enterprises with 93.3% and 341(87.9%) respectively arising from poor working areas uncemented and some of the enterprises being located on the roadsides with heavy traffic as well as the use of machinery in the welding and furniture industry. Heavy lifting was also identified to be prevalent in the workplaces with 344(88.7%) this is because the informal sector lacks information on safe lifting techniques and doesn't have capacity to

purchase lifting equipment or use mechanical power resorting to manual lifting which has repercussion in terms of musculoskeletal disorders. The lowest exposures were that related to inadequate ventilation and lighting with 131(33.8) and 122(31.4%) respectively. This because most of the enterprises are in the open and therefore do not require any ventilation and lighting.

### 3.5 Preventive Measures of Occupational Safety and Health Hazards

As can be seen in Table 6, most preventive measures of occupational safety and health hazards variables averaged more than 3.5 on a scale of 1 to 5 thus revealing a relatively high level of preventive measures. Training and awareness and good housekeeping evidenced by the highest mean values of all of the variables used to prevent and mitigate occupational safety and health hazards in the informal non-food manufacturing sector as indicated by mean of 4.55 and 4.36 respectively. Both of these were indicators of the existence of measures of occupational safety and health hazards. However, apart from good housekeeping which is relatively easy to implement, Training and awareness is always not the norm in the informal sector. The preventive measures may not necessarily translate to actual practice in the workplace. The second highest mean value was adequate/appropriate use of PPE and occupational safety measures as shown by means of 4.28 and 4.12 respectively but the

quality of PPE is inferior and inappropriate and in most cases it is the apron or overcoat used cosmetically. Fire extinguishers and carrying out risk assessment were found to have the same mean value of 3.59. It was further established that hazard identification as well as ensuring adequate supervision had different mean values

of 3.78 and 3.58 while two indicator variables of Incident reporting/registering and Workplace insurance evidenced the lowest levels of dispersion showed means values of 2.97 and 2.94 respectively. This is true that recording and reporting as well as insurance are not common in the informal sector due lack of information.

**Table 1. Specific workplace hazard exposure in the informal non-food manufacturing sector (n=388)**

Workplace hazard	Frequency			Means	Std. Dev.
	Yes n(%)	No n(%)	N/A n(%)		
Extreme heat	207(53.7)	180(46.4)	1(0.3)	1.46	0.504
Extreme Weather	235(60.6)	153(39.4)	0(0)	1.39	0.489
Extreme noise	283(72.9)	105(27.1)	0(0)	1.27	0.445
Excessive optical radiation	125(32.2)	248(63.9)	15(3.9)	1.60	0.564
Unsuitable lighting	122(31.4)	177(45.6)	89(22.9)	1.23	0.797
Inadequate ventilation	131(33.8)	166(42.8)	91(23.5)	1.19	0.792
Body vibration	274(70.6)	102(26.3)	12(3.1)	1.23	0.491
Slippery floors	286(73.7)	100(25.8)	2(0.5)	1.25	0.447
Metals used (fumes)	29(7.5)	88(22.7)	3(0.8)	1.22	0.432
Solvents used	313(80.7)	73(18.8)	2(0.5)	1.18	0.400
Chemicals/paints used	339(87.4)	48(12.4)	1(0.3)	1.12	0.335
Dust generated	362(93.3)	25(6.4)	1(0.3)	1.06	0.252
Gases generated	341(87.9)	45(11.6)	2(0.5)	1.17	0.330
Heavy lifting/carrying	344(88.7)	44(11.3)	0(0)	1.17	0.317
Confined space	372(95.9)	15(3.9)	1(0.3)	1.04	0.200
Repetitive movements	366(94.3)	20(5.2)	2(0.5)	1.05	0.234
Uncomfortable postures	381(98.2)	7(1.8)	0(0)	1.02	0.133
Mechanical sharps/edges	362(93.9)	25(6.4)	1(0.3)	1.06	0.252
Insects, viruses and bacteria	288(74.2)	6(1.5)	32(8.2)	1.09	0.500

Source: Primary data

**Table 2. Preventative measures of occupational safety and health hazards in the informal non-food manufacturing sector**

Preventive measure	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Dev.
Training and awareness	6(1.5%)	15(3.9%)	10(2.6%)	85(21.9%)	272(70.1%)	4.55	0.848
Adequate/appropriate use of PPE	6(1.5%)	36(9.3%)	5(1.3%)	135(34.8%)	205(52.8)	4.28	0.988
Fire Extinguishers	43(11.1%)	73(18.8%)	10(2.6%)	138(35.6%)	124(32%)	3.59	1.389
Hazard Identification	8(2.1%)	36(9.3%)	27(7%)	278(71.6%)	39(10.1%)	3.78	0.826
Occupational safety measures	1(0.3%)	12(3.1%)	28(7.2%)	246(63.4%)	101(26%)	4.12	0.683
Good housekeeping	14(3.6%)	10(2.6%)	8(2.1%)	145(37.4%)	211(54.4%)	4.36	0.929
Incident reporting and registering	76(19.6%)	101(26%)	12(3.1%)	158(40.7%)	41(10.6%)	2.97	1.370
Ensure adequate supervision	26(6.7%)	72(18.6%)	10(2.6%)	211(54.4%)	69(17.8%)	3.58	1.173
Carrying out risk assessment	26(6.7%)	58(14.9%)	13(3.4%)	243(62.6%)	48(12.4%)	3.59	1.092
Workplace Insurance	103(26.5%)	63(16.2%)	14(3.6%)	171(44.1%)	37(9.5%)	2.94	1.431

Source: Primary data



#### 4. DISCUSSION

All types of hazards are prevalent in the informal non-food manufacturing sector. Chemical hazards were highest with 299 (77.1%) (Chemical exposure in terms of solvents and paints were 339(87.4%) and 313(80.7%) respectively) this is because of the grave dangers associated with chemicals especially in the welding and fabrication, furniture making and car repair resulting from volatile paints, thinners and furnishes. This is followed by mechanical hazards with 293 (75.5%) as a result of machines and equipment used causing high level risk to workers while physical and biological were 269 (69.3 %) and 267(68.8%) respectively with ergonomic hazards accounting for 258(66.5 %) these ergonomic hazards included exposure to high uncomfortable postures with 381(98.2% confined spaces with 372(95.9%) while repetitive movement/ motion accounted for 366(94.3%). However, these hazards ranged from high, medium and low in the different sectors. For example, mechanical and chemical hazards were rated high risk in the welding and fabrication and furniture firms while the moderate risks were found to be in the repair of machinery and equipment, concrete and brick making and while low risk was associated with textiles and clothing and paper manufacture. Other hazards arose from the nature of the premises. Workplace environment 255(65.7%) were not clean and free from waste materials, 307(77.8%) floors surrounding the work station were dirty and full of waste, 316(81.4%) had dirty passages surrounding the workstation, 338(87.1%) did not regularly empty their waste containers while 324(83.5%) of the general environment around the workplace was dirty. Only 96(24.7%) had appropriate roofs, 90(23.2%) had appropriate walls and 65((6.8%) had emergency exits free from obstruction.

In terms of sanitary facilities, resting facilities and running water, it was inadequate, sanitary facilities only 19(4.9%) while 334(86.1%) without, resting facilities only 14(3.6%) and running water only 8(2.1%) and 355(91.5%) without. Fire precautions were also almost non-existent with only 25(6.4%) with fire exits while 351(90.5%) without fire exits and 17(4.4%) possessing fire extinguishers in the premises and 367(94.6%) did not have. 61.4%. While toilets was also adequate with 98.1% but waste disposal was inadequate with 92% and drainage was absent with 87.7%. Fire hazards were also imminent in the informal non-food manufacturing sector.

From the checklist results, most respondents agreed that fire extinguishers were important at workplaces in mitigation of fire outbreaks with 267(67.6% mean 3.59 and a standard deviation of 1.389. It was evident especially in the furniture industry and garages (repair of machinery) that fire could easily break out, however there were no fire extinguishers, fire alarms to mitigate the fires outbreaks in case there was an emergency. Causes of fires are electrical incidents, unattended charcoal stoves left behind and suspected arson activities. Most of the enterprises were exposed to high uncomfortable postures (ergonomic hazards) with 381(98.2% followed by confined spaces with 372(95.9%) while repetitive movement/ motion accounted for 366(94.3%) and chemical exposure in terms of solvents and paints were 339(87.4%) and 313(80.7%) respectively. This may be attributed to the lack of control measures but the root cause is lack of information and knowledge of occupational safety and health. Dust and gaseous exposure were also high in the enterprises with 93.3% and 341(87.9%) respectively arising from poor working areas not cemented and some of the enterprises being located on the roadsides with heavy traffic as well as the use of machinery in the welding and furniture industry. Heavy lifting was also identified to be prevalent in the workplaces with 344(88.7%) this is because the informal sector lacks information on safe lifting techniques and doesn't have capacity to purchase lifting equipment or use mechanical power resorting to manual lifting which has repercussion in terms of musculoskeletal disorders. The lowest exposures were that related to inadequate ventilation and lighting with 131(33.8) and 122(31.4%) respectively.

These hazards are typical in the informal sector in terms of poor working conditions and high exposure to hazardous substances in the informal sector [14]. Poor work organization, poor access to clean water and sanitation, ergonomic hazards, strenuous hand tools and exposure to dust and chemicals as major risk factors identified in the African informal sector. These hazards were also classified as chemical, physical, mechanical, biological and psychological [15]. Similarly, these same types of hazards were identified as environmental stressors on which industrial hygiene focus can be divided into four broad categories: chemical, physical, biological, and ergonomical hazards. The author further said typical chemical hazards include; mists, vapours, gases, dusts and fumes;

physical hazards include noise, vibration, extreme temperatures and excessive radiation (electromagnetic or ionising), while biological hazards come from moulds, fungi bacteria and insects which may be introduced to the work place through sewage, food waste, water or insect droppings/infestation. While ergonomic hazards are related to the design and condition of the work place. Poorly designed tools workstations and / or tools are ergonomic hazards [16],

Sanitation facilities are a result of engineering controls provided to work places during construction. The informal non-food manufacturing has inadequate sanitary facilities at the workplaces. The workers incur personal costs to get sanitary / welfare services like toilet / latrine and getting drinking water. Employees have to cope-up with the situation but results in psychological hazards of stress, fatigue, burnout, poor personal and environmental hygiene, a precursor for many occupational injuries and illnesses. The findings further concur with study that found out that most of the informal sector establishments are located in makeshift structures, open spaces, road reserves, wetlands/ marginal lands and poorly planned premises without toilets, running water, means of solid waste disposal and blocked drainage systems. These provide breeding places for vectors and produce intolerable stench to workers. Sanitation facilities are non-existent at roadside and open air enterprises. Workers near rivers face additional problems of mosquito bites, malaria fever and poorly lit and ventilated workplaces. There is lack of safe drinking water and washing facilities. The same clothes are used both at home and the workplace [17].

This findings are also consistent with a study which established that most of the informal establishments are poorly located, cannot be easily accessed by fire fighters and most of them do not have fire hydrants and extinguishers to quickly control the fire outbreaks, the same study also found out that fire hazards result from the use of paraffin, Liquefied Petroleum Gas, unsafe electrical connections and heaters, coupled with clutter of boxes and other inflammable materials in stalls. Lack of firefighting appliances means that a number of fire outbreaks cannot be controlled [17]. The informal workers operate in atypical and nonstandard workplaces that are excluded by definition, from occupational safety and health protection measures [18]. The informal non-food manufacturing sector is a

haven of physical, mechanical, chemical, biological and psychological hazards without risk assessment and inadequate occupational safety and health management practices despite the abatement efforts from the sector. In addition [19], All workplaces have unlimited hazards that can affect workers, caused by obvious unsafe acts resulting from the behaviour of workers themselves, unsafe conditions such as unguarded machinery, slippery floors, poorly lighted and ventilated premises, lack of fire precautions to mention but a few. Poor work environments, unhealthy life style, and work related exposures and demographic factors influence workers health. The informal sector is characterised by poor working conditions and high exposure to hazardous substances. Poor work organization, poor access to clean water and sanitation, low knowledge on hazards, strenuous hand tools and exposure to dust and chemicals are major risk factors identified in the African informal sector [14]. This results are in contrast with a study that found out 16(4%) respondents reporting hazards exposure while 388(96%) had no exposure to hazards among Oil Rig workers in Pakistan. This is due to the fact that Oil industry is potentially hazardous industry, highly regulated with international standards and safety is treated with high priority with resources for implementing occupational safety and health activities as compared to the informal sector which is unregulated and poorly resourced [8], but consistent with a similar study that found out that exposure to irritant dust and fumes may also make steelworkers more susceptible to reversible narrowing of the airways (asthma) which, over time, may become permanent [20].

The result also concur with a study that the proliferation of uncomfortable and dangerous conditions whether created by job designs or unfriendly technologies widely recognised as harmful productivity, quality and worker safety and health. Minimising the amount of physical stress in the worker place requires continuous study of the ways in which people and technology interact. The insight learned from this study can be used to improve the interaction [16]. Similarly in another study, poor workplace design, awkward body mechanics or postures, repetitive movements and other ergonomic hazards were found to induce or contribute to staggering number of cumulative musculo-skeletal trauma [21]. In a similar study it was found out that poor posture was identified as the commonest ergonomic hazard [22]. Supported by a similar study that found out that working in

awkward positions as a result of poor working station designs was observed in traders lifting heavy loads and at times over long distances. Many workers do not have seats or use non-ergonomically designed chairs [18].

The informal non- food manufacturing sector is faced with hazardous exposures of physical, biological, chemical, mechanical, and ergonomic hazards. There are few measures if any in terms of preventive measures to mitigate the hazards. This may be attributed to low occupational safety and health knowledge/ awareness, lack of occupational safety and health training, lack of adequate PPE and government regulation in the sector.

### **3.3 Control / Preventive Measures**

Preventative measures/mitigation of occupational safety and health hazards variables averaged more than 3.5 on a scale of 1 to 5 thus revealing a relatively high level of preventative measures/mitigation. Training and awareness and good house keeping evidenced by the highest mean values of all of the variables used to prevent and mitigate occupational safety and health hazards in the informal non-food manufacturing sector as indicated by mean of 4.55 and 4.36 respectively. Both of these were indicators of the existence of measures of occupational safety and health hazards. However apart from good housekeeping which is relatively easy to implement, training and awareness is always not the norm in the informal sector. This preventive measures may not necessarily translate to actual practice in the workplace. The second highest mean value was adequate/appropriate use of PPE and occupational safety measures as shown by means of 4.28 and 4.12 respectively, but the quality of PPE is inferior and inappropriate and in most cases it's the apron or overcoat most used cosmetically. Fire extinguishers and carrying out risk assessment were found to have the same mean value of 3.59. It was further established that hazard identification as well as ensuring adequate supervision had different mean values of 3.78 and 3.58 while two indicator variables of Incident reporting/registering and Work place insurance evidenced the lowest levels of dispersion showed means values of 2.97 and 2.94 respectively. This is true that recording and reporting as well as insurance are not common in the informal sector due lack of information. This in line with another study conducted in Raghistan

reported that the use of safety measures during working hours was not adequate to prevent hazards and that the non-use of safety measures is primary associated with non-availability and non-affordability of the devices in the market. These findings indicated that there is knowledge on preventative measures/mitigation of occupational safety and health hazards in the informal non-food manufacturing sector but their applicability and use varies according to the activities being carried out [23]. The fundamentals of hazard prevention and deterrence include the following; elimination of the source of the hazard, substitution of less hazardous substances, reduction of the hazard at source, removal of the employee from the hazard, isolation of the hazard, dilution of the hazard, application of management practices, (administrative controls), use of Personal protective Equipment, training and practice of good housekeeping [16].

### **4. CONCLUSION**

The informal non- food manufacturing is faced with hazardous exposures of physical, biological, chemical, mechanical, and ergonomic hazards. There are few measures if any in terms of preventive measures to mitigate the hazards. This may be attributed to low occupational safety and health knowledge/ awareness, lack of occupational safety and health training, lack of adequate PPE, lack of firm top management commitment and lack of government regulation in the sector. The sector requires urgent action to address the situation by the regulatory agency, Kampala City Capital Authority and relevant stakeholders.

### **CONSENT**

Participation of the study population was voluntary and each research participant signed a written informed consent form.

### **ETHICAL APPROVAL**

The ethical approval of the study protocol was done by the Makerere University School of Social Sciences, Research Ethics Committee and Uganda National Council for Science and Technology. Permission was sought from the Ministry of Gender, Labour and Social Development and Kampala Capital City Authority.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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