

Operating Factors in Health Sciences

By

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Predominant Ocular Challenges and Protective Eyewear Compliance among Welders in Port Harcourt Mechanic and Steel Villages, Rivers State, Nigeria

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Abstract

Welding is associated with several ocular and systemic hazards especially where adequate protective measures are not observed resulting in occupational eye challenges which constitutes an appreciable proportion of ocular morbidity. The purpose of this study was to ascertain the pattern of major ocular challenges (symptoms and signs) among welders in the Port Harcourt Mechanic and Steel Villages Rivers State, Nigeria. The study which took place at the work sites of the participants adopted a combination of physical eye examination and a survey to find out history of previous ocular injuries and predominant symptoms experienced. A total of 103 welders sampled from two study sites in two local government areas LGAs of Rivers State participated in the study which involved the use of a well-structured interviewer-administered pre-tested and validated questionnaire to ascertain frequently experienced ocular complaints and previous work related ocular injuries, followed by detailed external examination of the eyes and surrounding structures for signs of ocular surface abnormalities resulting from welding related activities. Only 5.8% of welders complied regularly, 60.2% complied occasionally, 28.2% complied sparingly while 5.8% have never used a protective eyewear before. Findings from this study can be used by government agencies, employers, vocational training institutions and other stakeholders to formulate policies and guide for welders and other artisans to inculcate better work ethics in order to enjoy the benefits of regular compliance to the appropriate protective eyewear and prevent the negative effects of poor compliance.

Keywords: *Compliance, Protective Eyewear (PEW), Ocular Assessment Ocular Injuries, Welders.*

INTRODUCTION

Welding is an important tool for maintenance and construction in domestic and industrial set ups but could be hazardous to the eyes and other parts of the body due to the physical activities and materials involved and the potentially harm from flying metals and harmful radiation it produces. The eye is one of the most sensitive sense organs of the human body and it plays an important role in our daily life (Oriowo, 2009). A seriously impaired eye either from injury or disease may not function well in terms of seeing but one can to some extent make use of a leg or hand that has suffered from a serious injury or disease (Franck, 2006). According to Mir *et al* (2014), the eye is the third most common organ affected by injuries after the hands and feet. Globally more than 2.5 million people succumb to eye injuries and more than 500,000 blinding injuries takes place annually (Ihekaire and Oji, 2017).

Occupational injuries particularly those involving the eyes are common among workers in the welding/metal fabrication industry and could have a major impact on their general health, wellbeing and livelihood. The hazards associated with the welding process depend on a number of factors among which include; the type of welding, the materials (base metals, surface coatings, electrodes) to be welded, the welding environment (outside or in a confined space), the technique adopted and dexterity of the weld operator (Sithole, Oduntan and Oriowo, 2009) It is vital that appropriate eye protection be used for all welding operations to protect the eyes from potential injuries and prevent avoidable blindness in line with the goals and strategies of the international agency for the prevention of blindness (IAPB) and the World Health Organization.

Regardless of the claim that all occupations are associated with some form of hazards, it is a well-known fact that some occupations are comparatively more hazardous or risky. The welding profession, especially in developing countries belongs to this category of hazardous occupations with a relatively high potential for the work force to suffer harm/ injury involving but not limited to the eyes. This is so because safety practices/ culture are lacking for unjustifiable reasons. This pose a major occupational health challenge as it involves the eyes, one of the most sensitive organs in the human body, playing a vital role in our day to day life. Injuries caused by metal and its products especially to the eyes can result to immediate and long-term problems to individuals involved, their dependent, relatives and society. Despite the large number persons, especially youths engaged in welding, there seem to be little

or no regulation and enforcement of compliance to protective eye devices by the appropriate government agencies and relevant stakeholders.

Welding and fabrication industry in Nigeria have witnessed a tremendous influx due to the current economic situation and a craving for entrepreneurial activities for sustainability purposes. Some health threatening hazards are encountered by welders during the welding process; resulting in ocular injuries such as; conjunctival degeneration, pterygia, pingueculae, photokerato conjunctivitis, corneal foreign bodies, burns, cataract and maculopathy (Douglas and Karoye Egbe, 2018). Metal fabrication plays a major role in human infrastructural development by designing metallic products used for rail construction of a variety of gadgets. The welders together with some allied professionals play a major role in the fabrication of metallic products for industrial and domestic purposes to suit human needs.

Similarly, a category of welders popularly referred to as Panel Beaters play a vital role in refurbishing the metallic frame (body) of dented vehicles and other automobile parts. The increasing demands for these products and services has led to a remarkable increase in the number of individuals venturing in to the welding profession with workshops mainly situated along the roadside in most cities and suburbs of Nigeria. Non industrial welders are not often seen with the requisite personal protective equipment (PPE) including the appropriate eye protection gear such as goggles, U-V filter glasses helmet, coveralls, face and neck shields, safety boots among a few. It is not uncommon to come across welders putting on sunglasses, fancy glasses or using their unprotected eyes to carry out their jobs.

To achieve a safe and healthy work environment, it is important safety systems are put in place to safeguard the welfare, well-being and safety of the worker. The challenging economic climate and high unemployment level in southern Nigeria has led to increase in self-employed artisanal trades of which welding is one of the preferred due to its seemingly lucrative attraction. Due to the poor attitude of the relevant regulatory bodies, the establishment and implementation of safety practices in this sector may be primarily dependent on the proprietors of these small-scale welding sites and the knowledge and safety practices of welders themselves. The poor enforcement of safety measures can result in an upsurge of preventable occupational eye injuries among this sub group if the status quo on the situation is maintained Davies *et al* (2007).

There is paucity of documentation regarding eye injuries and the use of protective eyewear among welders in Nigeria as a whole and specifically in Rivers state. Hence, this study on the epidemiology of eye injuries among welders in Rivers state provides information on the pattern of eye injuries among and identified factors which positively or negatively influence eye injuries. It also made appropriate recommendations to improve the health and safety of welding professionals. This study also provided information on occupational health and safety practices among welders with regards to the use of protective devices and could serve as a basis for advocacy targeted at the reduction of eye injuries suffered by welders through health protection/promotion education, occupational safety training and welfare with a view to mitigate the economic and social impact that eye injuries can cause to the nation, communities, families and individuals.

METHODOLOGY

This study was conducted between the months of February and July, 2021 at the Port Harcourt Auto Mechanic Village, Ikoikwu, Port Harcourt city local government area and the Port Harcourt Steel Village Obio/Akpor local government area of Rivers State with approval from the Research Ethics committee of the department of Public Health, Faculty of Health Sciences, School of Post Graduate Studies, Imo State University, Owerri Nigeria, in partial fulfillment of the requirements of the award of the doctor of philosophy (PhD) degree in Public Health. Permission to carry out the study was also obtained from the leadership of the local branches of the Nigerian welder's association as well as the Head/Proprietor of each welding sites involved in the study. Verbal consent was obtained from each participant after a detailed explanation of the procedures and purpose of the study. The confidentiality of all information obtained was also guaranteed by the researchers

The study involved a descriptive survey of frequently experienced ocular challenges associated with welding and direct observation of the eyes and surrounding structures for signs of injuries or degeneration/ changes from welding related activities. A pretested and validated interviewer administered questionnaire was employed to ascertain the participant's subjective complaints resulting from welding. This was followed by the use of a Pen Torch and Ophthalmoscope to examine the eye for prominent ocular signs/ changes related to welding activities.

For small scale welding sites hosting three welders or less, all subjects who consented to partake in the study were included while for workshops having

more than four welders, participants were selected through a balloting process. The subjects were issued study numbers after sampling and a detailed ocular history of each subject was extracted. This was followed by external examination of the eyes and surrounding structures for the presence of ocular anomalies related to welding. The most prominent objective finding was noted for each participant on the External Examination sheet attached to the questionnaire.

Reliability and Validity of Test Procedure

The questionnaire employed for this study was pre-tested using the test-retest procedure. 20 copies of the instrument were administered on 20 welders (10 each from the mechanic and steel villages). The instrument was re-administered 2 weeks later to the same subjects and the results of both exercises were correlated using the Pearson Moment Correlation and a reliability coefficient of 0.75 was obtained. The Ophthalmoscope employed examination of the eyes was of international standard approved for eye care practitioners by the World Council of Optometry (WCO) and the Optometrist and Dispensing Opticians Registration Board of Nigeria (ODORBN)

Data Analysis

Data collected from the study was entered into the Microsoft Excel spreadsheet (Version 2010) for inspection of variables and then exported to the Statistical Package for Social Sciences (SPSS) Version 25 software for descriptive and inferential analysis. Results were presented descriptively using tables and charts while Chi Square statistics was employed to test for statistically significant association at an alpha level of 0.05 ($p < 0.05$).

FINDINGS

The study involved 103 welders comprising of 50 (48.5%) electric (arc) and 53 (51.5%) gas welders. Their age ranged from 17 – 64 years with a mean age of 29.75 ± 9.03 (SD), with the 26 – 35 years age group constituting the largest proportion with 43.7 % ($n = 45$) followed by the 15 – 25 years group with 36.9% ($n = 38$) while the 56 – 65 years group constitute the least proportion with just 1% ($n = 1$) as shown in table 1 below; The participants comprised of 101 (98.1%) males and 2 (1.9%) females as shown in figure 1, with the females belonging to the youngest age group (16 – 25 years) as shown in Table 1.

Table1: Age and Gender Distribution of Participants

Age group	Gender of participants		Total
	Male	Female	
15 – 25 years	36 (35.0)	2 (1.9%)	38 (36.9%)
26 – 35 years	45 (43.7%)	0	45 (43.7%)
36 - 45 years	14 (13.6%)	0	14 (13.6%)
46 – 55 years	5 (4.9%)	0	5 (4.9%)
56 – 65 years	1 (1.0%)	0	1 (1.0%)
Total	101 (98. %)	2(1.9%)	103 (100%)

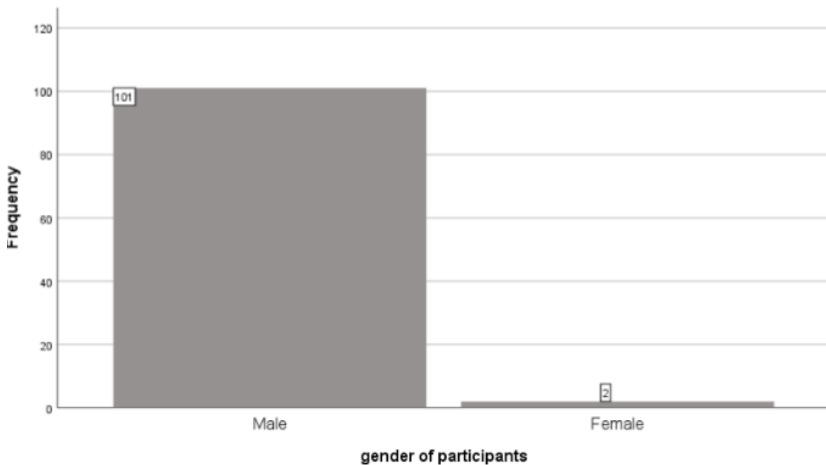


Figure 1: Gender Distribution of Welders

Level of Compliance to the Use of Protective Eyewear

The level of awareness of the hazardous nature of welding (Response to the question “do you think that welding can cause harm to your eyes”) revealed that 88.3% (n = 91) responded “Yes”, 7.8% (n = 8) responded “No” while 3.9% (n = 4) had no idea as shown in figure 2

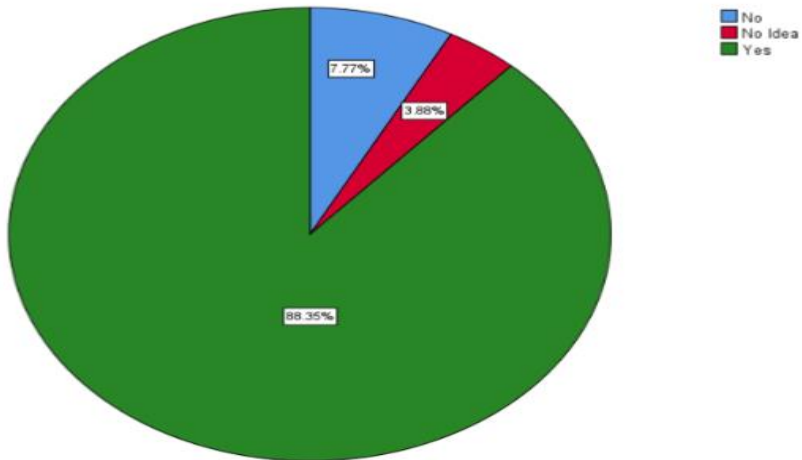


Figure 2: Knowledge of the Hazardous Nature of Welding and Benefit of Protective Eyewear

(Response to the question “do you know if welding can cause harm to the eyes which can be prevented by protective eyewear)

Compliance to Protective Eyewear

Assessment on the level of compliance to protective eyewear revealed that only 5.8% (n =6) complied always, 60.2% (n=62) complied occasionally, 28.2% (n=29) complied sparingly while 5.8% (n=6) have never used a protective eyewear before. All (100%) of the welders who have never complied fall within the youngest age group (16 – 25 years) with fewer years of work experience as shown in Table 2a. However, Chi Square test for association between age of welders and level of compliance revealed that there is no statistically significant association between the age of welders and compliance to protective eyewear ($p < 0.05$) as shown in table 2b.

Table 2a: Proportionate Levels of Compliance to the Use of Safety Eyewear among Different Age Group

Age groups	Level of compliance to the use of protective eyewear				
	Never	Sparingly	Occasionally	Always	Total
15 – 25 years	6(5.8%)	10(9.7%)	21(20.4%)	1(1.0%)	38(36.9%)
26 – 35 years	0	12(11.7%)	30(29.1 %)	3(2.9%)	45(43.7%)
36 – 45 years	0	6 (5.8%)	6(5.8%)	2(1.9%)	14(13.6%)
46 – 55 years	0	1(1.0%)	4(3.9%)	0	5(4.9%)
56 – 65 years	0	0	1(1.0%)	0	1(1.0%)
Total	6(5.82%)	29(28.2%)	62(60.2%)	6(5.8%)	103(100.0%)

Table 2b: Chi-Square Test for Association between Level of Compliance and Age Group

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.363 ^a	12	.175
Likelihood Ratio	18.229	12	.109
N of Valid Cases	103		

Statistical significance is considered at an alpha level of 0.05 ($p < 0.05$)

Relationship between Years of Welding Experience and Level of Compliance

The level of compliance to protective eyewear with reference to years of work experience shows slight variation among the different groups of welders as shown in Table 3a, however, Chi Square test for statistically significant association between both variables revealed that there is no statistically significant association between the years of work experience and the level of compliance to eye PPE at a 0.05 level of significance ($p < 0.05$) as shown in Table 3b

Table 3a: Level of Compliance in Relation to Years of Work Experience

Work experience	Level of compliance to the use of protective eyewear				Total
	Never	Sparingly	Occasionally	Always	
1-5 years	5(4.8%)	8(7.8%)	16(115.5%)	2(1.9%)	31(30.1%)
6-10 years	1(1.0%)	9(8.7%)	22(21.4%)	2(1.9%)	34(33.0%)
11-15 years	0(0.0%)	4(3.9%)	13(12.6%)	1(1.0%)	18(17.5%)
16-20 years	0(0.0%)	3(2.9%)	0(0.0%)	1(1.0%)	4(3.9%)
Above 20 years	0(0.0%)	5(4.9%)	11(10.7%)	0(1.0%)	16(15.5%)
Total	6(5.8%)	29(28.2%)	62(60.2%)	6(5.8%)	103(100%)

Table 3b: Chi-Square Test of Association between Years of Work Experience and Level of Compliance to Protective Eyewear

	Value	Df	Asymptotic Significance (2sided)
Pearson Chi-Square	18.850 ^a	12	.092
Likelihood Ratio	20.526	12	.058
N of Valid Cases	103		

(Statistical significance considered at $p < 0.05$)

Relationship between Type of Welding and Level of Compliance to Use of Protective Eyewear

Table 4a: Compliance Levels amongst the Different Types of Welders

Type of welding	Level of compliance to the use of protective eyewear				Total
	Never	Sparingly	Occasionally	Always	
Gas welding	4 (3.9%)	21(20.4%)	25 (24.3%)	3(2.9%)	53(51.5%)
Electric welding	2 (1.9%)	8 (7.8%)	37 (35.9%)	3(2.9%)	50(48.5%)
Total	6(5.8%)	29(28.2%)	62 (60.2%)	6(5.8%)	103(100%)

Table 4b: Chi-Square Test for Association between Type of Welding and Level of Compliance to Protective Eyewear

	Value	Df	Asymptotic Significance (2sided)
Pearson Chi-Square	8.737 ^a	3	.033
Likelihood Ratio	8.970	3	.030
N of Valid Cases	103		

Statistical significance considered at $p < 0.05$

Table 4a above shows the proportionate levels of compliance to the use of protective eyewear amongst gas and electric welders while Table 4b which shows the Chi Square test of association between the type of welding practice and compliance to protective eyewear revealed that there is a statistically significant association between the type of welding practice and compliance to protective eyewear at the 0.05 level of significance ($p < 0.05$).

Relationship between Level of Formal Education and Frequency of Compliance to the Use of Protective Eyewear

Table 5a below shows the level of frequency of compliance to the use of protective eyewear in relation to the level of format education attained by the welders while Table 5b shows the Chi Square test of association between both variables which revealed that there is a statically significant association between the level of formal education attained and the level of compliance to the use of protective eyewear at the 0.05 level of significance ($p < 0.05$)

Table 5a: Level of Formal Education and Compliance to the Use of Protective Eyewear

Level of formal education	Level of compliance to the use of protective eyewear				Total
	Never	Sparingly	Occasionally	Always	
No formal education	0(0.0%)	7 (6.8%)	4 (3.9%)	1 (1.0%)	12(17.5%)
Primary school	1(1.0%)	8 (7.8%)	20 (19.4%)	1 (1.0%)	25(24.3%)
Secondary	5(4.9%)	18(17.5%)	33 (32.0%)	2 (1.9%)	58(56.3%)
Postsecondary	0(0.0%)	1 (1.9%)	5 (4.9%)	2 (1.9%)	8 (7.8%)
Total	6(5.8%)	29(28.2%)	62 (60.2%)	6 (5.8%)	103(100%)

Table 5b: Chi-Square Test for Association between Level of Education and Compliance to Protective Eyewear

	Value	Df	Asymptotic Significance (2sided)
Pearson Chi-Square	18.216 ^a	9	.033
Likelihood Ratio	17.131	9	.047
N of Valid Cases	103		

Statistical significance is considered at 95% confidence interval ($p < 0.05$)

Major Work-related Eye Symptoms Experienced by Welders

Statistics of the most frequent eye symptom relative to welding work revealed that While 23(22.3%) had no remarkable eye symptom, the most predominant eye symptom experienced by welders in order of decreasing proportion were sandy sensation with 31 (30.1%), cloudy vision, 23 (22.3%), painful red eyes, 19 (18.5%), watery eyes, 4 (3.9%) and itchy eyes 3(2.9%) as shown in Table 6a. Chi Square test of association between age and most frequent eye symptoms experienced and revealed that there is a statistically significant relationship between the age of welders and eye symptoms experienced ($p < 0.05$) as shown in Table 6b.

Table 6a: Distribution of Major Eye Symptom/ Complaint among Welders

Most frequent eye symptom	Age group of participants (years)					Total
	16-25	26-35	36-45	46-55	56-65	
None	12(11.7%)	8(7.8%)	2(1.9%)	1(1.0%)	0(0%)	23(22.3%)
Cloudy vision	7(6.8%)	10(9.7%)	4(3.9%)	2(1.9%)	0(0%)	23(22.3)
Painful red eyes	5(4.9%)	10(9.7%)	2(1.9%)	2(1.9%)	0(0.9%)	19(18.5%)
Sandy sensation	11(10.7)	15(14.6%)	5(4.9%)	0(0.0%)	0(0.9%)	31(30.1%)
Itchy eyes	1(1.0%)	2(1.9%)	0(0.0%)	0(0.0%)	0(0%)	3(2.9%)
Watery eyes	2(1.9%)	0(0.0%)	1(1.0%)	0(0.0%)	1(1%)	4(3.9%)
Total	38(27.2%)	45(43.7%)	14(13.6%)	5(4.9%)	1(1%)	103(100%)

Table 6b: Chi-Square Test for Association between Major Eye Complaint and Age of Welders

	Value	Df	Asymptotic Significance (2sided)
Pearson Chi-Square	35.821 ^a	20	.016
Likelihood Ratio	20.931	20	.401
N of Valid Cases	103		

Statistical significance considered at $p < 0.05$

Predominant Work-related Ocular Surface Abnormalities among Welders

The pattern of prominent ocular surface abnormalities associated with welding revealed that while 29.1% (n= 30) welders have no obvious ocular surface abnormality (NAD), the distribution of ocular surface abnormalities in order of decreasing frequency were Pinguecula, 32 (31.1%), Pterygium, 22 (21.4%), Conjunctiva discoloration, 15 (14.6%) and Corneal opacity, 4 (3.9%) as shown in Table 7a. Inferentially, Chi Square test of association between both variables revealed that there is a statistically significant association between the age of welders and ocular surface abnormality. ($p < 0.05$)

Table 7a: Predominant Ocular Surface Abnormality among Welders

Major ocular activity	Age group of participants (years)					Total
	16-25	26-35	36-45	46-55	56-65	
NAD	19(18.5%)	10(9.7%)	1(1.0%)	0(0%)	0(0%)	30(29.1%)
Conjunctiva discoloration	7(6.8%)	5(4.9%)	3(2.9%)	0(0%)	0(0%)	15(14.6%)
Pinguecula	9(8.7%)	20(19.4%)	1(1.0%)	2(1.9%)	0(0%)	32(31.1%)
Pterygium	2(1.9%)	8(7.8%)	8(7.8%)	3(2.9%)	1(1%)	22(21.4%)
Corneal opacity	1(1.0%)	2(1.9%)	1(1.0%)	0(0%)	0(0%)	4(3.9%)
Total	38(36.9%)	45(43.7%)	14(13.6%)	5(4.9%)	1(1%)	103(100%)

Table 7b: Chi-Square Test of Association between Most Obvious Ocular Surface Abnormality and Age

	Value	Df	Asymptotic Significance (2sided)
Pearson Chi-Square	39.321 ^a	16	.001
Likelihood Ratio	40.193	16	.001
N of Valid Cases	103		

Statistical significance is considered at 95% confidence interval ($p < 0.05$)

Relationship between Type of Welding and Predominant Eye Complaint and Prominent Ocular Surface Abnormality

Table 8a and 9a below shows a fair distribution of predominant eye symptom and obvious ocular surface abnormalities among gas and electric welders. Inferential statistics (Chi Square) revealed that there is no statistically significant relationship between the type of welding and predominant eye symptom experienced or prominent ocular surface abnormality observed at the 95% confidence interval ($p < 0.05\%$) as shown in table 8b and 9b above

Table 8a: Type of Welding and Predominant Ocular Surface Complaint

Most frequent eye complaint	Type of welding		Total
	Gas welding	Electric welding	
None	13(12.6%)	10(9.7%)	23(22.3%)
Cloudy vision	14(13.6%)	9(8.7%)	23(22.3%)
Painful red eyes	9(8.7%)	10(9.7%)	19(18.8)
Sandy sensation	12(11.7%)	19(9.7%)	31(30.1%)
Itchy eyes	1(1.0%)	2(1.9%)	3(2.9%)
Watery eyes	4(3.9%)	0(0.0%)	4(3.9%)
Total	53(51.5%)	50(48.5%)	103(100.0%)

Table 8b: Chi Square Test of Association between Type of Welding Versus Predominant Eye Complaint and Prominent Ocular Surface Abnormality

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.364 ^a	5	.195
Likelihood Ratio	8.933	5	.112
N of Valid Cases	103		

Statistical significance is considered at $p < 0.05$

Table 9a: Type of Welding and Prominent Ocular Surface Abnormality

Prominent ocular surface abnormality	Type of welding		Total
	Gas	Electric	
NAD	18(17.5%)	12(11.7%)	30(29.1%)
Conjunctiva discoloration	4(3.9%)	11(10.7%)	15(14.6%)
Pinguecula	14(13.6%)	18(17.5%)	32(31.1%)
Pterygium	14(13.6%)	8(7.8%)	22(21.4%)
Cornea opacity	3(2.9%)	1(1.0%)	4(3.9%)
Total	53(51.5%)	50(48.5%)	103(100.0%)

Table 9b: Chi Square Test of Association between Type of Welding and Prominent Ocular Surface Abnormality

	Value	Df	Asymptotic Significance (2sided)
Pearson Chi-Square	7.522 ^a	4	.111
Likelihood Ratio	7.723	4	.102
N of Valid Cases	103		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 1.94.

Discussion

The largest age group involved in the study was the 26-35 years age group which constituted 38.8%, followed by the 16 – 25 years group. This differ slightly from a similar study on the impact of welding on the vision of welders in France by Boissin *et al* (2002) in which the 36-45 years age group was the largest, constituting 40.2% of the participants as shown in Table 1. The female

welders involved in this study constituted only 1.9% (n= 2) of the respondents as against the males with 98.1% (n= 101) as shown in figure 1. This slightly differ from findings from an earlier study by Davies *et al* (2007) conducted in Calabar, Nigeria where all the participants (welders) were males. However, both findings affirm the view that welding is a male dominated profession in where the major players are the youthful population who possesses the strength for the energy demanding physical activities involved. A key observation from this study was that the female welders were within the youngest age group (16-25years) as shown in Table 1. This suggests that young ladies are gradually venturing into this unarguably male dominated profession (welding).

88.3% of the welders involved in the study were aware that welding could cause harm to their eyes which could be prevented by the use of protective eyewear, 7.8% disagrees, while 3.9% had no idea as shown in figure 2. The level of awareness from this study is slightly lower when compared to that from a similar study carried out by Ajayi *et al* (2011) on the awareness and utilization of protective eye devices among welders in a South Western Nigerian community where 90.6% of the participants were aware of the benefits of the use of protective eye wear but higher than findings from a similar study by Sithole, Oduntan and Oriowo (2009) among welders in the Limpopo province of South Africa where 72% of respondent knew that welding can cause damage to their eyes if precautionary measures are not taken. However, regardless of the seemingly high level of awareness of the hazardous nature of welding, there is need for awareness campaign and safety education among welders

Assessment on the level of compliance to protective eyewear revealed that only 5.8% complied regularly, 60.2% complied occasionally, 28.2% complied sparingly (once in a while) while 5.8% have never used a protective eyewear before as shown in Table 2a. All (100%) of the welders who have never complied fall within the youngest age group (16 – 25 years) with fewer years of work experience. It was observed that majority (60.2%) of the welders complied occasionally which is contrary to findings from a study on the awareness and use of safety devices and pattern of eye injury among Quarry workers in Sabon-Gari local government area of Kano state Northern Nigeria by Sufiyan and Ogunleye (2012) where 71.6% of the participants used protective eye wear regularly.

Also, a similar study by Sithole, Oduntan and Oriowo (2009) on eye protection practices among welders in the Limpopo province of South Africa reported

that 89% of welders put on protective eyewear during welding. This difference in compliance level could be attributed to differences in study techniques, geographical location, and training, attitude of welders and enforcement of safety practices by relevant authorities. The zero-compliant group observed in this study were presumably welders who have not suffered any previous eye injury or exposed to long period of welding due to their short exposure time to the hazardous agents associated with welding.

However, Chi Square test for association between age of welders and level of compliance shows no statistically significant association ($p < 0.05$) as shown in Table 2b. Similarly, the level of compliance with reference to the years of work experience showed no defined pattern except the zero compliant group which fall within the least experience group with 1 – 5 years' work experience as shown in Table 3a. Inferential statistics (Chi square) also revealed that there is no statistically significant relationship between level of compliance and years of work experience ($p < 0.05$) as shown in Table 3b

The study also observed that only 2.9% of both gas and electric welders complied regularly to eye PPE, 24.3% of gas and 35.9% of electric welders complied occasionally, 20.4% of gas and 7.8% of electric welders complied sparingly while 3.9% of gas and 1.9% of electric welders have never used protective eyewear during work as shown in Table 4a. This suggests that electric welders had a slightly better compliance to the use of protective eyewear compared to gas welders. Inferential statistics (Chi Square) also revealed that there is a statistically significant association between type of welding and compliance to protective eyewear ($p < 0.05$) as shown in Table 4b.

Compliance level in relation to level of formal educational attainment showed no defined pattern, though 80% of welders who reported that they have never used protective eyewear during welding had secondary school education, with the remaining 20% attaining primary school education as shown in Table 5a. Inferential statistics revealed that there is a statistically significant association between the level of formal educational attainment and compliance to protective eyewear ($p < 0.05$).

The study also revealed that while 22.3% of welders have no remarkable eye symptoms, the most frequent symptomatic eye complaint among welders in order of decreasing proportion were sandy sensation (30.1%), cloudy vision (22.3%), painful red eyes (18.5%), watery eyes (3.9%) and itchy eyes (2.9%) as shown in Table 6a. These symptoms were distributed among the different cadres of welders as confirmed by Chi Square test of association between age

and most frequent eye symptoms experienced which revealed that there is a statistically significant association between age of welders and eye symptoms experienced ($p < 0.05$) as shown in Table 6b. The symptomatic eye complaints reported by welders could be attributed to work related exposures, prolong work duration and poor/ noncompliance to safety/ preventive measures.

The study also observed that while 29.1% of welders had no remarkable ocular surface abnormality, the distribution of ocular surface abnormalities in order of decreasing proportion include Pinguecula (31.1%), Pterygium (21.4%), Conjunctiva discoloration (14.6%) and Corneal opacity (3.9%) as shown in Table 7a. The occurrence of ocular changes associated with welding showed no defined pattern among welders of different ages, years of work experience and welding type.

However, inferential statistics (Chi Square) revealed that there is a statistically significant association between age of welders and ocular surface abnormalities as shown in Table 7b. These ocular complaints and surface abnormalities among welders are indications of poor work conditions, hazardous environment, carefree attitude and practice which once again re-emphasize the need for enlightenment among this sub group on the need for safety work ethics. It was also observed that gas welders tend to have slightly higher frequency of reported ocular abnormalities with the exception of painful red eyes which has a higher frequency among electric arc welders as shown in Table 8a.

However, inferential statistics (Chi square) revealed that there is no statistically significant association between the type of welding practiced and the occurrence of ocular surface abnormalities and eye symptoms ($p < 0.05$) as shown in figure 8b and 9b.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Despite the relatively high level of awareness among welders of the hazardous nature of welding and the benefits of protective eyewear, the level of compliance to protective eye devices is relatively poor (about 6%) as over 60% of welders employ the use of protective eyewear occasionally. Compliance to protective eyewear among welders is not significantly associated with age, years of work experience and level of formal education attained. However, there is a statistically significant association between level of compliance and the type of welding with the electric (arc) welders having a slightly better

compliance level compared to gas welders. The most remarkable work-related ocular symptom among welders is gritty (sandy) sensation, followed by blurry vision while the most predominant ocular sign is Pinguella, closely followed by Pterygium. Also, while there is a statistically significant association between the age of welders and the ocular signs and symptoms experienced, there is no statistically significant association between type of welding and ocular signs and symptoms associated with welding.

Recommendations

There should be periodic education of welders and other artisans on the benefits of regular compliance to the use of the appropriate protective devices and the negative effects of poor compliance. This should be followed by strict enforcement and monitoring of compliance to protective device and meting out of sanctions for poor compliance as well as rewards for regular compliance. Government and other stakeholders should as a priority formulate and implement worker friendly health insurance schemes for persons engaged in relatively hazardous jobs. There is also need for stakeholders, government, Non-governmental and faith based organizations to subsidize the price of protective devices as much as possible in order to make them affordable to artisans. Similarly, government agencies (such as the Nigerian Bank of industry) should formulate policies to promote local production of quality protective devices in order to make them readily available to welders and other artisans exposed daily to occupational hazards.

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Conflict of Interest

The researchers hereby declare that there was no conflict of interest in the study and its reported findings.

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Management of Seminal Vesicular Tumors in Port Harcourt, Southern Nigeria

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Abstract

Tumours of the seminal vesicle are rare. Because of the location of the organ, the clinical manifestation is indistinct and diagnosis is difficult. The purpose of the study is to discuss the management of adenocarcinoma of the seminal vesicle using two consecutive patients with seminal vesicle tumours who presented late with features suggestive of typical prostate neoplasm and were misdiagnosed even after contrast enhanced Computerized Tomography scan as case studies. To highlight the challenges encountered in diagnosis of seminal vesicle tumour and to review the literature on the management of the disease.

Keywords: *Adenocarcinoma, Seminal vesicle, rare tumour*

Case 1:

A 32-year-old man presented with history of painless haematuria of 8 months and storage lower urinary tract symptoms of about 2 months. He also had severe deep pelvic pain, and difficulty in walking. There was supra pubic tenderness but no masses were palpated per abdomen. Digital rectal examination revealed a huge mass protruding into the rectum from the anterior rectal wall that was firm. A clinical diagnosis of bleeding BPH was made. Serum PSA was 0.8 ng/ml. Cystoscopy revealed no evidence of bladder cancer. Barium enema showed no synchronous rectal lesions. Intravenous Urography showed evidence of bilateral obstructive uropathy with urinary bladder displaced to the right but no features suggestive of upper tract malignancies (figures 1-2).

Abdomino-pelvic USS was done which showed an echo complex mass measuring 82 mm by 90 mm visualized below the urinary bladder. The shadow of the urethral catheter was not seen traversing the mass but was rather displaced to the left. The mass equally displaced the bladder anteriorly. This raised a doubt whether it was a prostate mass. Abdomino-Pelvic CT scan showed a heterogeneously enhancing mass of weight 789 g (figure 3). Differential diagnoses of benign prostatic enlargement, Rhabdomyosarcoma, and Pelvic abscess were made. He had pelvic exploration through a midline subumbilical incision. A huge capsulated unresectable mass was seen. Mass was debulked. Patient had uneventful postoperative recovery. He passed clear urine after removal of catheter. Histology showed adenocarcinoma of the seminal vesicle. He was booked for adjuvant radiotherapy but was lost to follow up 6 months after discharge.



Figure 1: This Shows the Post Micturition Phase of Intravenous Urogram (IVU)

The contrast opacified urethral catheter (thick white arrow) is deviated to the right.



Figure 2: Bilateral Hydroureteronephrosis Resulting from Huge Pelvic Mass

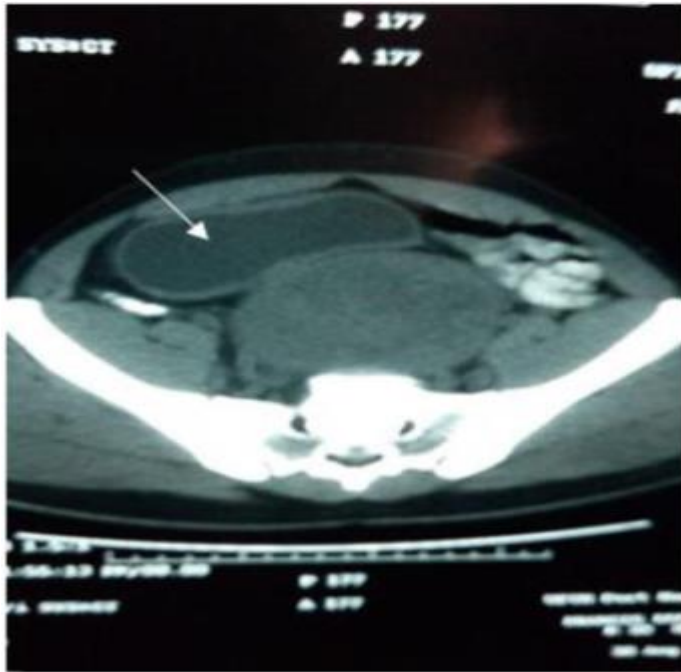


Figure 3: Contrast Enhanced CT of the Pelvis Showing a Pelvic Mass that Typically Resembles a Prostate Mass. Urine Filled Bladder (Thin White Arrow) is Displaced Superiorly, Anteriorly and to the Left

Case Report 2:

A 47-year-old businessman with a 6-month history of painless progressively increasing lower abdominal mass. He had significant storage lower urinary tract symptoms. He also had persistent nonproductive cough of 2 months duration and left lower limb swelling of a month's duration. He smoked a pack of cigarette a day for about 23 years. Examination revealed a huge non-tender 18cm by 10cm firm mass above the pubic symphysis. Digital rectal examination revealed an enlarged mass, firm, cannot get above it. A diagnosis of benign prostatic enlargement was made. His PSA was 0.9ng/ml. An ultrasound scan done revealed a prostate of 972g with mild flow on doppler. A CT scan revealed a complex cystic soft tissue mass in the lower abdomen not

distinguishable from the prostate, with a diagnosis of multilocular cystadenoma of the prostate with mild hydronephrosis.

A differential of bladder leiomyosarcoma, small cell neuroendocrine tumour of the prostate, retroviral disease and genitourinary Tuberculosis were made. Mantoux test was negative, retroviral screen was negative, alphafetoprotein and carcinoembryonic tumour antigen were within normal limits. He had a transrectal tru cut biopsy of the prostate which revealed a benign prostatic hyperplasia. He was also being managed by the haematologist, pulmonologist and general surgeons. He had an exploration via a midline incision. A huge pelvic mass which displaced the bladder anteriorly and rectum posteriorly was found. Attempts at removing the mass were unsuccessful and the mass was debulked and haemostasis was secured. Sample was sent for histology and the result revealed a malignant mesenchymal tumour of the seminal vesicle was made. Immunohistochemistry was not done. The patient made unremarkable recovery. He was booked for chemotherapy but was lost to follow up.

Discussion

Malignant tumours of the seminal vesicle are rare¹. Primary adenocarcinomas have been reported just more than 50 times and primary leiomyosarcomas about 8 times^{1,2}. Secondary tumours of the seminal vesicle on the other hand are commoner and arise from primaries in a contiguous organ such as prostate, bladder or rectum³. Part of diagnostic work up therefore should include exclusion of tumours in any of these surrounding structures.

Malignancies of the seminal vesicle could occur in males between the ages of 19 and 90 years⁴. As in the cases reported, most cases present with nonspecific symptoms like haematuria, haemospermia, pelvic pain or storage lower urinary tract symptoms like frequency and urgency.^{2,3} The pressure of the enlarging seminal vesicle reduces the functional capacity of the bladder and limits the ability of the bladder to expand, hence the storage symptoms. It is therefore important to at least consider differential diagnosis of seminal vesicle tumour in patients that present with lower urinary tract symptoms. Both patients presented with pressure symptoms: while the first case presented with difficulty walking and deep pelvic pain the second presented with left lower limb swelling.

Digital Rectal Examination (DRE) is a very important examination tool in assessing patients with prostatic diseases. Digital rectal examination will frequently show a mass protruding from the anterior rectal wall which needs to be differentiated from a prostate mass, rectal mass, or secondaries from other

neoplasms. Digital rectal examination finding is therefore only suggestive but not diagnostic.

PSA is a glycoprotein that liquefies the ejaculate.⁵ Serum PSA assay is an important diagnostic tool in evaluation of suspected SVC patient. Low PSA value in these patients was an important diagnostic clue, since it ruled out a prostatic disease. This is because seminal vesicle tumours do not express PSA and prostate specific acid phosphatase, (PAP)⁶. Furthermore, the lack of immune staining for PSA will rule out the possibility of a prostate secondary. This will not however exclude anaplastic prostate carcinoma which are usually PSA negative⁷.

Other biochemical assays have improved the detection of SVC. For instance, identification of specific immunophenotype for SVC has improved the utility of immunohistochemistry in the diagnosis of the tumour⁶. SVC stain positive for cancer antigen (CA) 125. Neoplasms that commonly invade the seminal vesicle such as adenocarcinoma of prostate, all bladder adenocarcinomas, bladder transitional cell carcinoma, rectal carcinoma, and the very rare mullerian duct cyst adenocarcinoma are all known to be CA 125 negative⁶. Thus, negative staining for PSA/PAP and positive staining for CA125 could differentiate primary SVC from all other differential diagnoses enumerated above.

Tissue histology is important for diagnosis of SVC. Although a trucut biopsy will show the histologic pattern of an adenocarcinoma, it may not indicate the organ of origin. Specific immunostains as shown above will be required to demonstrate the organ of origin whenever trucut biopsy is used in the diagnosis of SVC⁷. However, using surgical specimens' diagnosis is easier. Dalgard *et al*⁸ provided 3 criteria that should be used whenever surgical specimen are evaluated for SVC. These include: (1) a macro or microscopically verified carcinoma localized exclusively to the seminal vesicle, (2) exclusion of primary carcinoma in any other part of the body, and (3) the tumor should preferably be a papillary adenocarcinoma that resembles the architecture of the non-neoplastic seminal vesicle. In case 1, trucut biopsy was deferred because of the degree of haematuria, but histology for the surgical specimen, and other ancillary investigations satisfied the first two criteria. Because of the stage of the disease in this patient however, evaluation for the third criteria was difficult. In this regard, immune staining would have been necessary for confirmation of the diagnosis.

As part of diagnostic workup for haematuria, Intravenous Urography was done for the first patient and this revealed contralaterally displaced urinary bladder, urethral catheter that was shifted from the midline (fig 2) and bilateral hydroureteronephrosis (fig 3). A prostate mass elevates the base of the bladder in IVU, and a urethral catheter, if present should traverse the mass. Displacement of the bladder and the urethral catheter to the right suggests that a contralaterally placed pelvic mass may be responsible. Intravenous urography here played an indirect role in diagnosis of SVC. The second case did not carry out an IVU. He however did a contrast enhanced CTU scan.

Computed Tomography scan, Magnetic Resonance Imaging, and Ultrasonography are useful in diagnosis of seminal vesicle tumour both in the early stage where they help to exclude carcinomas of adjacent organs like prostate, rectum and bladder and at the advanced stage where they delineate the tumour focus⁸. In the two patients, CT scan identified the masses as prostate mass because of the markedly increased size (789g) and 972g in the first and second case respectively. However, USS (like the IVU) by showing the shadow of urinary bladder displaced laterally and the image of the urethral catheter not traversing the mass, clearly excluded a prostate mass.

In management of seminal vesicle tumours a multidisciplinary approach is important to get a good outcome.¹⁰ The second case was managed by a pulmonologist, haematologist and general surgeons. Early cases of seminal vesicle tumour are best treated with radical prostatectomy or cystoprostatectomy and pelvic lymph node dissection and these offer a curative treatment pathway^{3,4}. In both cases presented above open surgery was also carried out. Mendrek *et al*¹¹ also carried out open surgery for his case. However, cases of minimally invasive surgery for tumours on the seminal vesicle have been carried done.^{12,13,14,15} Adjuvant radiotherapy or androgen deprivation has resulted in long term palliation in patients with advanced diseases^{3,4}. Adjuvant chemotherapy has shown additional benefit in the management of advanced SVC.^{16,17}

In conclusion, Primary adenocarcinoma of the seminal vesicle is rare. Diagnosis is difficult and patients usually present late. Diagnosis requires a high index of suspicion, radiological examination, cystoscopy and histology to make a diagnosis. Inclusion of SVC as a differential diagnosis in patients with LUTS may increase clinical suspicion.

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Eviscerations in a District Hospital in Ghana: A Five-Year Experience

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Abstract

Destructive eye surgeries have been described as necessary evils. Even though they are important and sometimes life-saving, their psychological impacts on the patients are many. This study sought to determine the prevalence and main indications of evisceration in Our Lady of Grace Hospital in the Asikuma–Odoben- Brakwa District of the Central Region of Ghana. The mixed method study design was used. A five-year review of all cases of eviscerations from 2012-2016, was conducted. Also, in-depth interviews of 9 patients purposively selected, who had undergone eviscerations during the period under review were conducted. Data analysis was largely descriptive. Out of a total of 2996 ocular surgeries conducted within the 5-year period, 101 were eviscerations. This gives a 5-year prevalence of 3.4 per 100 surgeries. Out of the 101 cases of eviscerations, 81 were included in the analysis due to the availability of complete data. The majority of patients who underwent eviscerations were 60 years and more. Right (51%) and left (49%) eyes were eviscerated in nearly equal proportion. The occupations of the majority of patients were farmers/fisher folks (55.6%) and trading (19.8%). Most (76.5%) eviscerations were due to non-trauma-related causes mainly infections (55.6%). The trauma-related indications for evisceration (23.4%) were stick/vegetative materials, stone/particles, and assault. Eye infections and injuries which are largely preventable were the main causes of eviscerations in this study. Public education to encourage early reporting is needed. The aged should be discouraged from engaging in unprotected manual farm-related activities.

Keywords: *Evisceration, Destructive Eye Surgery, Central Region, Ghana*

INTRODUCTION

Surgical removal of the eyeball is always a difficult decision to be taken by both doctors and patients. This is because the psychological impacts on the affected patients and their families are many. Such effects include high levels of anxiety and depression¹ distress driven by concerns about appearance and sight loss.² Even though a common reason for eye amputation is the presence of a painful blind eye, about a third of patients who have undergone destructive eye surgeries (DES) continue to have pain after the procedures.³ There are many and varied indications for performing surgical removal of the eyes. These indications and prevalence of the surgeries differ among countries and even within a country.⁴ Ocular infections such as endophthalmitis and panophthalmitis are the most implicated indications for DES in developing countries^{5,6}, whilst malignant tumours are the main reasons why eyes are removed surgically in developed countries.^{7,8} Other common indications in both developed and developing countries are painful blind eyes, disfigured eyes, and trauma.^{9,10}

There are three main techniques used for surgical eye removal. These are evisceration, enucleation, and exenteration. Evisceration is the removal of the eye's contents, leaving the scleral shell and extraocular muscles intact.¹¹ The procedure is usually performed to reduce pain or improve cosmesis in a blind eye, as in the case of endophthalmitis unresponsive to antibiotics. An ocular prosthesis can be fitted over the eviscerated eye in order to improve cosmesis. Either general or local anesthetics may be used during eviscerations, with antibiotics and anti-inflammatory agents given. Enucleation on the other hand is the removal of the entire globe from orbit while preserving all other orbital structures.¹¹ The optic nerve is detached from the eyeball. This technique is usually for intraocular tumors or malignancies. Exenteration is the removal of all of the orbital tissues including the eyeball.¹⁰ It is a destructive procedure performed in an attempt to save a life. It is mostly undertaken to treat malignant eye diseases.

Many studies have been conducted globally to ascertain the prevalence, indications and risk factors associated with destructive eye surgeries. These studies have shown substantial variations in the prevalence and causes among nations and even within a nation. A Nigerian study,¹⁰ found that the commonest indication for surgical eye removals was trauma, followed by tumour and ocular infections whilst a study conducted in Cameroon,¹² found

infective causes (perforated corneal ulcer, and endophthalmitis), trauma, painful blind eyes, and malignancy as the leading causes.

In Ghana, even though the burden of eye disease is high and about 1% of the population is estimated to be blind¹³ and many of these are likely to undergo destructive eye surgeries to manage their condition, only a few studies have been conducted to determine the prevalence and leading causes of destructive eye surgeries. A study conducted in North-Eastern Ghana found that the most common causes of evisceration were ocular infections.⁶ This study therefore sought to determine the prevalence and indications of destructive eye surgeries performed at Our Lady of Grace Hospital in the Asikuma-Odoben-Brakwa (AOB) District in the Central Region of Ghana and to explore the impact of the surgeries on the lives of the patients.

METHODOLOGY

Study Design

The study made use of the mixed-method study design which encompasses both quantitative and qualitative methods. A review of cases of eye removal at a district hospital in the Central Region of Ghana from January 2012 to December 2016. A retrospective records review was undertaken. The review was followed up with in-depth interviews of 9 patients who had an eye removed through evisceration at the hospital during the period. Thus, both quantitative and qualitative methods were used in this study (mixed design method). The quantitative arm of the study was a retrospective descriptive study involving a records review of all cases of DES at the Our Lady of Grace Hospital (OLGH) from January 2012 to December 2016. The qualitative arm involved indepth interviews of purposively selected patients who had undergone destructive eye surgeries during the period of review.

Study Setting

The study was conducted at the Our Lady of Grace Hospital located at Breman Asikuma. It is a 130-bed hospital that serves as the district hospital in the AOB District. It serves as the main referral hospital for eye conditions for all health facilities in the North-Central portion of the Central region and other parts of the country. The hospital records an annual average outpatient attendance of over 100,000 with about 20% of these patients reporting with eye-related conditions.

Data Collection

The main source of data for the quantitative study were the theatre case register and patient folders. A data extraction form was used to gather information on the demographic characteristics of all cases, their presenting complaints, examination findings, diagnosis and type of destructive eye surgery performed. In the qualitative study, 9 patients were purposively selected from the list of cases. They were contacted through telephone calls. After consenting to participate, arrangements were made to conduct the interviews at locations and times convenient to each of them. An interview guide developed from existing literature was used. All interviews were audio-recorded and transcribed verbatim.

Data Analysis

Quantitative data: descriptive statistics were used to summarize all findings. Categorical variables were reported as frequencies and percentages. Continuous variables were reported as means and standard deviations (SD). Number of DES performed each year was reported as frequencies and as proportions of the total number of eye surgeries performed. Data analysis was done using SPSS version 21.

The primary indication for the surgeries was categorized into two main groups. Trauma and nontrauma-related causes. Non-trauma related category was further sub-divided into diagnostic groupings such as infections and degenerations.

Qualitative data: data analysis followed the procedure described by Sandelowski (2000).¹⁴The audio-recorded interviews were transcribed verbatim using Microsoft Word. SPSS version 21 was used for thematic analysis. Phrases and sentences were grouped. From these themes, subcategories emerged which formed the basis for summaries and conclusions.

Ethical Consideration

Ethical clearance was sought from the Ethical Board of Ensign College of Public Health, and permission from the Management team of Our Lady of Grace Hospital. Patients' confidentiality was ensured. Participants involved in the in-depth interviews were made to provide written informed consent before participation.

FINDINGS

The only type of destructive eye surgery performed in the hospital in the period under review was evisceration. There were no enucleations nor exenterations performed. Out of a total of 2996 eye surgeries performed within the 5-year period, 101 were eviscerations. This gives an average crude incidence of 3.4 per 100 surgeries per year with a range of 3.0 – 3.9 per 100. Only 81 of the 101 cases had complete data to allow for analysis. Table 1 gives the distribution of cases over the 5-year period.

Table 1: Distribution of Annual Surgeries and Evisceration Rates at OLGH from 2012 to 2016

	2012	2013	2014	2015	2016	Total
Eye Surgeries	740	562	505	578	611	2996
Eviscerated Eyes	23	22	15	18	23	101
% of Evisceration	3.1%	3.9%	3.0%	3.1%	3.8%	100%
No. with available information	13	16	12	18	22	81

More right eyes 42 (52%) were surgically removed compared to left eyes 39 (48%).

Demographic Characteristics

Of the 81 patients whose records were analyzed, 41 (50.6%) were females. The median age was 43 years. The mean age of patients was 50 years (SD 1.53). Patients above 50 years constituted the majority of 53 (65.4%). There were only two cases below 20 years of age. Most 31(38.3%) of the patients have had only primary education with as many as 22 (27.2%) with no formal education. Majority were farmers and fisher folks 45 (55.6%). Table 2 shows the demographic profile of the cases.

Table 2: Demographic Profile of Patients

Variable	Categories	Frequency	(%)
Age (In years)	<20	2	2.5
	20-34	13	16.0
	35-49	13	16.0
	50-59	15	18.5
	60-69	13	16.0
	70 and above	2	2.5
Gender	Female	41	50.6
	Male	40	49.4
Marital Status	Single	16	19.8
	Married	47	58
	Divorced	5	6.2
	Widowed	13	16.0
Religious affiliation	Christians	71	87.6
	Muslims	6	7.4
	No religion	3	3.7
	Others	1	1.3
Occupation	Farmers/Fisherman	45	55.6
	Trading	16	19.8
	Artisan	8	9.9
	Unemployed	5	6.2
	Student	4	4.9
	Retirees	2	2.5
	Civil/ service	1	1.2
	None	22	27.2
Educational Level	Primary	31	38.3
	Secondary	27	33.3
	Tertiary	1	1.2

The cases were from 4 regions of Ghana. Most of them (75.4%) were residents of the Central region, 12.3% were from the Eastern region, 8.6% from the Western region whilst 3.7% visited the hospital from the Ashanti region.

Causes of Eviscerations

Non-trauma related causes accounted for most cases of eviscerations (76.6%). These included infections (55.6%) and degenerative lesions (21.0%). Traumatic causes such as stick injuries, stones and assault accounted for 23.4%

of all eviscerations performed. Table 3 shows the etiology of cases. Figure 1 shows the sex distribution of the main causes of evisceration among patients.

Table 3: Causes of Eviscerations at OLGH (2012-2016)

Classification	Frequency	%
Non-Trauma	62	76.6
Infections	45	55.6
Endophthalmitis	28	34.6
Ulcerative keratitis	17	21.0
Degeneration	17	21.0
Staphyloma	16	19.8
Phthisical eye	1	1.2
Trauma	19	23.4
Stick / vegetative material	12	14.8
Stone / particles	3	3.7
Assault	4	4.9

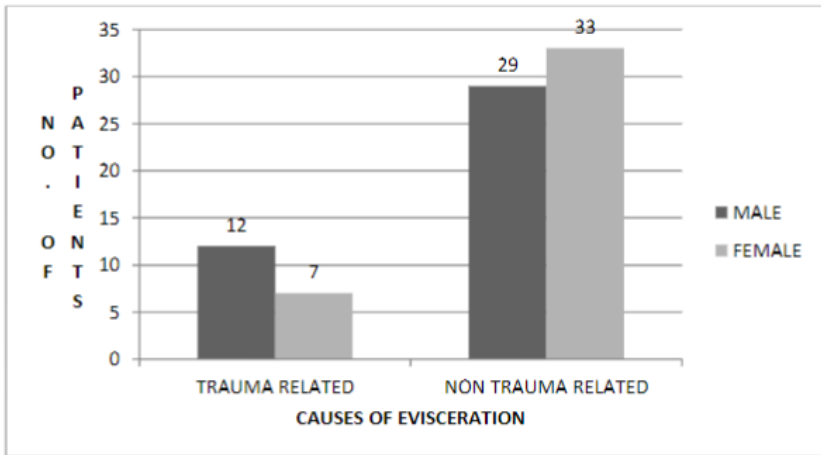


Figure 1: Causes of Evisceration by Sex Distribution of Patients Who Underwent Eye Removal at OLGH from 2012 to 2016 Presenting Complaints and Past Medical Histories as Extracted from Patients' Records

Table 4 shows a summary of the main presenting complaints and past medical histories of studied patients. Majority of patients who eventually had their eyes surgically removed presented with pain and eye redness (80.2% and 69.1%

respectively). About 16.0% admitted that they had engaged in self-medication prior to reporting.

Table 4: Presenting Complaints and Past Medical Histories as Extracted From Patients’ Records

Past Medical History	Frequency (%)
Pain	65 (80.2)
Eye redness	56 (69.1)
Eye discharges	40 (49.4)
Foreign body sensation	24 (29.6)
Headache	19 (23.5)
Self-medication	13 (16.0)
Eye itching	12 (14.8)

Clinical Findings as Extracted from Patients Records

The clinical findings revealed that conjunctival injection was the highest disorder found during the clinical examination with a proportional recording of 66.7%. Only 4.9% of them were found to have corneal lacerations. Other patients were found after clinical examination to have eye swelling, eye tears, and purulent discharge in the eye, chemosis, prolapse of the uveal, and melted cornea. Spontaneous evisceration (23.5%) implies that the respondent presented an already damaged eye to the clinic (Table 5).

Table 5: Clinical Findings as Extracted from Patients’ Records

Clinical Findings	Frequency (%)
Conjunctival injection	54 (66.7)
Uveal prolapse	33 (40.7)
Tearing	33 (40.7)
Corneal ulceration	28 (34.6)
Purulent discharge	24 (29.6)
Eye swelling	23 (28.4)
Spontaneous evisceration	19 (23.5)
Chemosis	18 (22.2)
Melted corneal	8 (9.9)
Corneal laceration	4 (4.9)

Presentation of Qualitative Results

Qualitative

There were 9 (5 females and 4 males) participants involved in in-depth interviews. One of the major themes that emerged was the description of events that led to the surgical removal of their eyes.

The events surrounding the evisceration of their eyes were found to be predominantly non-trauma related. The study revealed that most (6) of the patients who had their eyes removed through the evisceration technique were self-medicating either with the use of herbal medicine or orthodox drugs from unregistered or unprofessional eye care practitioners.

For instance, a female patient 76 years of age said:

“A cocoa chemical spray entered my eye which I have used herbal medicine to treat until I started feeling severe discharge (pus) and pain in the affected eye and I reported to the hospital”.

A male patient of 46 years said:

“Something fell on my eye and I did not attend to it because I thought it was not much affected but went to the counter chemical seller to buy chloramphenicol eye drop to treat the eye redness and other symptom seen for about five (5) weeks”.

The study found that patients stayed at home to self-medicate for an average of 1 month, either with orthodox or herbal medicines, before seeing health professionals.

Other effects on the affected eyes were pains and itching at the surgical sites. The presence of phantom syndrome in the presence of light and shadow on the eviscerated eye was not found in any of the studied patients. Some of them (5) complained that even after the surgeries they cannot see clearly (blur) and a few (4) of them too could not see at all with the only eye left.

Respondents were asked if they had experienced any forms of stigmatizing behaviour towards them after the surgeries. None of them reported ever being stigmatized. The people around them related positively with the eviscerated patients, irrespective of the place they found themselves, including at work and at religious meeting places. According to a female respondent 45 years of age: *“though there is a change in my walking and focus since I now walk and focus with only one eye but I have not experienced any form of stigmatization from*

anybody being personal or societal". She also added: *"people rather supported and encouraged me after the operation which left me with only one eye"*.

Discussion

This study sought to determine the main indications and prevalence of destructive eye surgeries in the study population. The only type of destructive eye surgeries observed in this study was evisceration. Similar studies worldwide have found eviscerations to be the commonest destructive eye surgeries.^{15,16} This is probably because eviscerations are technically easier to perform, could be performed under local anesthesia, are known to cause less destruction of the anatomy of the orbit, and are associated with fewer complications.^{17,18}

The overall incidence of eviscerations in this study was 3.4 per 100 surgeries over a 5-year period. This is similar to the 3.4% incidence found in a Nigerian study⁵ but higher than the incidence of 2.7% found in an earlier study conducted in Ghana⁶ and 1.4% found in another study conducted in Nepal.¹⁹

The leading causes of evisceration in this study were infections (55.6%) and trauma (23.4%). These findings are not unique to this study as similar trends have been reported by earlier studies in Ghana⁶, and Nigeria.²⁰ In the Ghanaian study, infective lesions accounted for 47.9% of all excisions whilst 23.2% of the surgeries were as a result of ocular injuries. An Indian study²¹ reported that as many as 78.6% of all eviscerations were due to panophthalmitis while 21.3% were a result of irreparable eye injuries. The findings of this study however contradict what was found in some other studies conducted in Nigeria^{9,10}, and in Ethiopia²² that found trauma and malignancy as the leading indications of DES.

The high incidence of eye infections in this study could probably be ascribed to the high level of illiteracy found among the study population. The majority of the patients resided in the Central region of Ghana. This region is considered one of the poorest in Ghana with an illiteracy rate of 21.7% according to the 2021 population and housing census in Ghana.²³ Many (55.6%) of the patients in this study were farmers and fisher folks with as many as 27.2% reporting no formal education. This high level of illiteracy coupled with their main occupation as farmers will make them vulnerable to occupational eye injuries as well as the use of harmful traditional medications to treat eye ailments. This study found evidence of self-medication among participants. Many earlier studies have linked the use of traditional eye medications to the incidence of

infection-related DES.^{5,24} The practice of self-medication may include the use of steroids which could have accounted for the high incidence of ulcerative keratitis found in this study. Such abuse of steroids could also lead to other complications like glaucoma and cataracts.

In this study, none of the patients interviewed complained of phantom eye syndrome. This is in contrast with the findings of an earlier study by Rasmussen (2010),³ who found that phantom syndrome was frequent among eye amputated patients. Even though in this study all participants interviewed reported that the surgical removal of their eyes has reduced the quality of their lives, none reported any stigmatizing behaviour towards them. This finding is contrary to what was found in an earlier study among individuals who wore ocular prostheses resulting from traumatic eye injuries.² In that study some participants reported being stigmatized many years after their surgeries.

CONCLUSION

Eye infections and injuries were the main causes of eviscerations found in this study. These are largely preventable. Public education should focus on early presentation, the dangers of self-medicating with harmful traditional drugs, and how to avoid occupational eye injuries.

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Level of Awareness on Disaster Risk Preparedness in Informal Settlements of Nyeri Town, Nyeri County, Kenya

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Abstract

The main objective of this study was to assess level of awareness on disaster risk preparedness in informal settlements of Nyeri town, Nyeri County, Kenya. To achieve this, the study was guided by two specific objectives: to establish the level of awareness on the types of disasters that can affect the informal settlement residents in Nyeri town and to determine the level of awareness on the existence of disaster risk reduction policies to curb disasters among the people living in informal settlements of Nyeri town. The study adopted a descriptive research design using primary data collected through a structured questionnaire. The population for this study was 384 respondents of the four settlements of Nyeri town, that is, Majengo Witemere Ngangarithi, Mathari and Ruring'u Muslim village. The study found out that, majority of the respondents 93.0% was aware of the disasters that can affect them in their area of residents. The study further established that, majority of the residents 196 (51.0%) was aware of the existence of disaster risk reduction policies as compared to 49.0% who were not aware of any disaster risk reduction policy. It was concluded that Risk assessment as a step for successful disaster reduction measures will ensure that the community members are aware of the possible hazards. National and County government should incorporate the national and international policies and guidelines in their policy. The Government should be keen on learning on previous disasters that have affected other informal settlements

Keywords: *Awareness, Disasters Risks, Policies, Preparedness*

INTRODUCTION

Informal settlements are groups of people living on land they have no legal claim to and construct houses without approved plan resulting in squatter settlements, slum or shanty town (Doveym, 2013). They are found across the globe mainly in developing countries in urban areas. The settlements are growing and an estimated 1 Billion people in the world live in slums. Problems in urban areas are caused by the change in cities over time. This change such as different economic base (service industries instead of manufacturing) or different activities or population movement leads to different needs within the urban areas (Wekesa, Steyn and Otieno, 2011).

Disasters are worldwide phenomena that range from being highly localized to global in scope (Ronan et al., 2015). Regardless of their origin and classification, all disasters have a public health importance due to their potential to cause loss of lives and livelihoods. What differs, however, is the community's preparedness, which determines its ability to cope and prevent loss of lives and livelihoods during the event and immediately after (Levac, Toal-Sullivan and OSullivan, 2012). Disaster preparedness is a continuous and integrated process resulting from a wide range of risk reduction activities and resources rather than from a distinct sectoral activity by itself (Munasinghe and Matsui, 2019). Predicting a disaster before it happens allows mechanisms such as evacuations that drastically reduce loss of lives and properties. Cities and urban areas provide important opportunities for the development of communities and nations (Baker and Grant Ludwig, 2018).

Risks caused by rapid and often improper urbanization compounded by natural hazards create some of the major challenges in the 21st Century. Lam et al. (2017) estimate that by 2050, 66 per cent of the world's population will be urban, while rapid and unplanned urbanization will also continue to see a dramatic rise in informal settlements. Aside from the negative impacts of improper urbanization on socioeconomic development, the risks and humanitarian consequences of rapid urbanization are alarmingly increasing (Etinay, Egbu and Murray, 2018).

Rapid urbanization and the increasing complexity in urban contexts require better understanding of risk factors and sources of vulnerability and exploring innovative ways for effective disaster risk reduction and response and cooperation with other stakeholders (Baker and Grant Ludwig, 2018). Public education and awareness are necessary in order for members of local communities to collect and document information of disasters that they have

encountered and lessons learnt as prerequisites of preparedness for future disasters (Paton, 2019). It is important, to incorporate homegrown coping mechanisms for each community. These activities are supposed to be devoted to the local authorities and provincial administration units in every community. The repetitive nature of both the natural and man-made disasters in the 25 years suggests that despite the legal, institutional and policy framework, local communities are not adequately prepared for disaster prevention, control and mitigation (Levac et al., 2012). It is likely that these programs have not been devolved and adequately implemented at community levels.

Problem Statement

A number of factors have driven the emergence of informal settlements. They include rural-urban migration lack of affordable housing, weak governance, economic vulnerability, low paid work marginalization and displacement caused by conflicts, natural disasters and climate change (UNHabitat, 2015b). According to Doveym, (2013), these settlements continue to be geographically, economically, socially and politically disengaged from wider urban system and excluded from urban opportunities and decision making. Buildings in the informal settlements in Nyeri town are erected without access roads between them posing the dangers of fires where the fire fighters cannot gain access leaving many families at risk of disasters (GOK, 2015).

In the year 2015/2016 there were 99 fire incidences in the whole of Nyeri County and 45 (50%) occurred in informal settlements (Nyeri Fire brigade report 2015). This shows that there are more disaster risks in informal settlements than in other areas. During disasters, many families incur losses, and children, including disabled are most affected hence aggravating poverty in informal settlements. There is no community initiative to curb disasters and no studies have been done to scientifically analyze the problems. This study therefore seeks to assess the level of awareness on disaster risk preparedness in informal settlements of Nyeri town, Nyeri County, Kenya.

Objective of the Study

The general objective of this study was to assess the level of awareness on disaster risk preparedness in informal settlements of Nyeri town, Nyeri County, Kenya. The specific objectives were:-

- To establish the level of awareness on the types of disasters that can affect the informal settlement residents in Nyeri town
- To determine the level of awareness on the existence of policies to curb disasters among the people living in informal settlements of Nyeri town

Research Questions/Hypothesis

What is the Level of Awareness on the Types of Disasters Affecting Informal Settlements?

- i. What is the level of awareness on the policies related to disaster risk reduction?

LITERATURE REVIEW

Theoretical Review

Theory of Planned Behaviour

The study used the theory of planned behavior to discuss the two objectives which sought to assess the level of awareness on the types of disasters and policies in place to curb disasters among the people living in informal settlements of Nyeri town. The theory of Planned Behaviour is one of the models most frequently used in the literature to explore pro-environmental behaviour including recycling, travel mode choice, energy consumption, water conservation, food choice, and ethical investment (Stern, 2000; Staats, 2003).

Armitage and Conner (2001) identified its application in 154 different contexts. The model of the theory of Planned Behaviour assumes that consumers make decisions by calculating the costs and benefits of different courses of action and choosing the option that maximises their expected net benefits. The theory of Planned Behaviour belongs to the so-called group of 'rational choice models'. It builds on the following key assumptions: Individual self-interest is the appropriate framework for understanding human behaviour; rational behaviour is the result of processes of cognitive deliberation; internal factors, especially the attitude, play the most important role. The policy interventions that flow from this model are relatively straightforward. Policy should seek to ensure that consumers have access to sufficient information to make informed choices.

Empirical Review

Level of Awareness of the Disasters that Can Affect the Residents in the Informal Settlements of Nyeri Town

According to Qureshi *et al.* (2006), any disaster management is successful only when the general public has some awareness about the disaster. The key to reducing loss of life, personal injuries, and damage from natural disasters is widespread public awareness and education. People must be made aware of what natural hazards they are likely to face in their communities. They should know in advance what specific preparations to make before an event, what to do during a hurricane, earthquake, flood, fire, or another likely event, and what actions to take in its aftermath.

According to Ismaila Rimi Abubakar (2019) In Saudi Arabia, many cities have been recently experiencing incidences of disasters, such as floods, disease epidemics, and sandstorms. However, studies on public perception of disaster risk in the country are few and nascent. Disasters are prevalent worldwide, and there is a need to engage high-risk populations in collaborative disaster management activities to improve resilience that is inclusive of the whole community (Enarson, and Walsh, 2007). It is clear from extant literature that awareness has a supportive influence on collaboration; however, there is a need for a better understanding of how this interaction activates action toward collaborative disaster management activities (Mendoza *et al.*, 2014; Na, Okada, and Fang, 2009), especially for high-risk populations (Enarson, and Walsh, 2007).

A study conducted to examine fire safety mechanisms and their effect on prevalence of fire disasters in Kenya slums found that majority of the respondents did not know of any fire safety mechanism while some had poor knowledge about fire safety mechanisms. Majority of the participants pointed to the need to increase awareness on how to mitigate and deal with fire disaster while others appealed to the government to provide safety facilities, Edobot (2015). A study by Murage (2012) assessed factors influencing fire disaster preparedness in the central business district of Nyeri Town, Nyeri County. The study found that the level of fire safety awareness is very low and the Municipal council does not inspect compliance with fire disaster preparedness by laws.

Level of Awareness on the Existence of Policies to Related to Disaster Risk Reduction to Curb Disasters among the People Living in Informal Settlements of Nyeri Town

National disaster management policies seek to set the overall policy goal and objectives for disaster risk management, provide a broad policy framework for the harmonization of sectoral and cross sectoral policy objectives, principles and strategies and establish an integrated and multi sectoral approach to disaster management (Tall, Patt and Fritz, 2013). The policies also seek to promote positive behavioural and attitudinal change towards disaster management, provide a basis for the formulation of a comprehensive disaster management legal framework and establish an institutional framework for disaster preparedness , management and to establish an effective monitoring and evaluation system and provide for an effective information management system to facilitate collection, storage, analysis and dissemination of disaster management information, (Murange, 2012).

Over the years, disasters in Kenya have been handled without a coordinated disaster management policy, legal and institutional frameworks (Menya and K’Akumu, 2016). In addition, disaster response activities have been poorly coordinated, due to lack of standard operational procedures and disaster emergency operation plans. This situation remains a challenge that has led to duplication of efforts and wasteful use of resources.

METHODOLOGY

Research Design

This study used descriptive cross-sectional study design in which the awareness or condition and potentially related factors were measured at a specific point in time for a defined population according to Flick (2015). This design is preferred because it allows for investigation of more than one variable (Mugenda and Mugenda, 2010).

Research Population and Sample

The study targeted residents of the four informal settlements of Nyeri town with a population of 97,469 people. The four settlements were Majengo, Ruringu, Ngangarithi and Mathari in Nyeri town. The population of study was the male and female residents of informal settlements of Nyeri town. It was also decided to include population of different ages, religions, occupation and education. Sample size was calculated using Fisher et al. (1998) formula. The study used a sample size of 384 respondents that was divided proportionally

between the four settlements. The study used simple random sampling to identify the respondents. Simple random sampling reduced bias and gave each individual in the informal settlements a chance to participate.

Ethical Considerations

Scientific approval for the study was sought from Graduate Studies Committee. Ethical approval was sought from the Meru University Institutional Research Ethics Review Committee. Permission to collect data was obtained from the Nyeri County Commissioner's office and the Nyeri County Government. Consent to participate in the study was sought from the potential respondents. The participants were guaranteed that the privacy of the data was protected by strict standard of anonymity.

Research Variables

Awareness of disaster and existence of policies were the independent variables while the dependent variable was disaster risk preparedness.

Data Collection

This research used the primary and secondary data. The instrument used for the collection of the primary data was questionnaire containing questions to measure the level of awareness of the respondents on the type of disasters in their area and existence of policies related to disaster risk reduction. The secondary data constituted relevant literature such as journals, reports internet and related books which contributed to the development of study.

Statistical Analysis

The following statistical were used,

1. Frequencies
2. Chi-square tests

Demographic Data Analysis

The study was interested in the demographic information of the respondents to help understand better the data on the topic under study. This entailed information on respondents' age, gender, occupation, marital status, level of education and religion.

Table 1: Demographic Results

Demographic Variables	Frequency	Percentage
Gender		
Male	184	47.9
Female	200	52.1
Total	384	100.0
Age of respondents		
20-30	141	36.7
31-40	88	22.9
41-50	75	19.5
51-60	48	12.5
>60	32	8.4
Total	384	100.0
Type of occupation		
No employment	146	38.1
Salaried employment	47	12.2
Self-employment	191	49.7
Total	384	100.0
Marital Status		
Divorced	22	5.7
Married	184	47.9
Not ready to answer	28	7.3
Single	126	32.8
Windowed	24	6.3
Total	384	100.0
Level of Education		
College University	91	23.7
No Education	23	6.0
Primary	97	25.3
Secondary	173	45.0
Total	384	100.0
Religion		
Christian	263	68.5
Muslim	114	29.7
None	7	1.8
Total	384	100.0

Table 1 shows that, the total number of female respondents was 200(52.1%) and that of men was 184(47.9%). This indicates that, gender inclusion was considered by the researcher. The study indicates that majority of the respondents 229(59.6%) are in their lower middle age and middle age of between 20-40 years. Age determines the level of vulnerability of an individual to respond to disasters. It also influences person's contribution to social networking and communal activities. The findings indicate that, there is significant number of non-employed residents 146 (38.1%) in the informal settlement of Nyeri town. Unemployment may drive individuals to indulge in some informal activities that may accelerate the effects of a disaster when it occurs.

The findings show that majority of the respondents 187(47.9%) were married. Marital status may influence the capacity of a household to mitigate a disaster. This result indicate that, majority of the respondents 293(76.3%) were literate (at least reached up to primary level). The level of education is very important to establish extend of awareness of the residents on disaster risk preparedness. The results further shows that majority of the residents in the informal settlements of Nyeri town are Christian as indicated by 263(68.5%). Religions may affect the level of acceptance of some of policies related to disaster risk reduction.

Level of Awareness of the Respondents on the Types of Disasters in Their Area

Respondents were asked whether they are aware of disasters that can affect them and to give the most common one. The result was recorded in Table 2.

Table 2: Level of Awareness of the Respondents on the Types of Disasters in Their Area

Are you aware of the disasters that can affect you?	Results	Frequency	Percentage	
	Yes	357	93.0	
	No	27	7.0	
	Total	384	100.0	
If yes, which is the commonest disaster in this area among these	Disaster	Frequency	Percentage	
	Fires	196	54.9	
	Flood	32	9.0	
	Landslides	51	14.3	
	None	78	21.8	
	Total	357	100.0	

Table 2 shows that, majority of the respondents 357 (93.0%) are aware of the disasters that can affect them in their area of residents. Minority of the respondents 27(7.0%) are not aware of disasters that can affect them in their area of residents. This indicate that majority of them are well informed and conscious of the disasters in their areas.

It was further established that, the most common disaster in the areas (Majengo, Ruring’u, Mathari and Ngangarithi) was fire where 196 (54.9%) of the respondents admitted that they were aware of the disasters that could affect them in their area of residents. This was followed by landslides with 51(14.3%) respondents and the last was floods with 32(9.0%) of the respondents. It was further established that, 78(21.8%) of the respondents stated that, none of the three (fire, landslides and floods) is common in their area of residents.

Level of Awareness on the Existence of Disaster Risk Reduction Policies

Respondents were asked whether they are aware of any policy rule concerned with disaster risk reduction and to state the one that they know. The result was recorded in Table 3

Table 3: Level of Awareness on the Existence of Disaster Risk Reduction Policies

Are you aware of any policy rule concerned with disaster reduction?	Results		Frequency	%
	Yes		196	51.0
	No		188	49.0
	Total		384	100.0
	If yes which one?	Policy	Frequency	%
	Environmental	77	39.3	
	Housing	73	37.2	
	Land	31	15.8	
	Water groups	15	7.7	
	Total	196	100.0	
Do you comply with the policy rule that you know concerning disaster risk reduction?	Results		Frequency	%
	Yes		193	50.3
	No		191	49.7
	Total		384	100.0
	If no, give reasons	Reason	Frequency	%
	Hard to follow	123	64.4	
	Is not for poor like me	9	4.7	
	It is costly	14	7.3	
	other reason	42	22.0	
	There is no risk	3	1.6	
	Total	191	100.0	
Do you think these regulations/laws promote positive behavioural and attitudinal change towards disaster management?	Results		Frequency	%
	No		92	24.0
	Yes		292	76.0
	Total		384	100.0

Table 3: Level of Awareness on the Existence of Disaster Risk Reduction Policies

Are you familiar with bodies that enhance the laws in this area?	Yes		311	81.0
	No		73	19.0
	Total		384	100.0
	If yes which ones?	Body	Frequency	%
		Community members	87	28.0
		County government	186	59.8
		Individuals	13	4.2
		National government	25	8.0
		Total	311	100.0
What do you think are consequences of not complying with the regulations? Choose one	Consequences		Frequency	%
	Arresting people		94	24.5
	Demolition of houses		63	16.4
	Eviction		29	7.6
	Relocation		129	33.6
	Stopping people from settling in those areas		69	18.0
	Total		384	100.0
How do you think these policies can be improved? Choose one	Ways		Frequency	%
	Through approach	Bottom-up	188	49.0
	Through approach	Combined	144	37.5
	Through approach	Top-down	52	13.5
	Total		384	100.0

Table 3 shows that, majority of the respondents 196 (51.0%) are aware of existence of a disaster reduction policy rule. Minority of the respondents 188(49.0%) are not aware of existence of a disaster reduction policy rule. This figure 188(49.0%), is quite significant and it implies that many people living in the informal settlements are not aware of any policy rule concerning with disaster reduction. For those who are aware of existence of any policy rule, they were asked to state the one they know. It was established that, environmental policy was commonly known by the residents with 77(39.3%)

respondents followed by housing policy 73(37.2%) respondents, land policy 31(15.8%) and the least was water policy 15(7.7%).

Table 3 indicate that, majority of the residents from informal settlements of Nyeri town comply with the policy rule concerning disaster risk reduction as shown by 193(50.3%) of respondents. 191(49.7%) respondents confirmed that they do not comply with the policy rule concerning disaster risk reduction. This number is quite significant. When they were asked to give reasons for not complying with the policy rules, majority of them said that the rules were hard to follow as indicated by 123(64.4%) of the respondents who failed to comply with the regulations.

Table 3 shows that, majority of the residents in the informal settlements of Nyeri town think that the disaster risk reduction regulations/laws promote positive behavioural and attitudinal change towards disaster management as indicated by 292(76.0%) of the respondents while 92(24.0%) of the respondent thought that the regulations/laws do not promote any positive behavioural and attitudinal change towards disaster management.

Table 3 indicate that, majority of the residents in the informal settlements of Nyeri town were familiar with the bodies that enhance disaster risk reduction laws as confirmed by 311(81.0%) respondents. Only 73(19.0%) of the respondents were not familiar with the bodies. It was noted that, 186(59.8%) of the respondents who were aware of the bodies confirmed that they were more familiar with the County Government, 87(28.0%) of the respondents were familiar with the Community members, 25(8.0%) were familiar with the National Government and the least was Individual bodies that was confirmed by 13(4.2%) of the responded.

Table 3 show that, the main action taken to an individual who would not comply with the disaster risk reduction regulations was relocation of the individual as confirmed by 129(33.6%) of the total respondents. The other action that could be taken to a non-compliance was arresting of the individuals as confirmed by 94(24.5%) of the respondents. 69(18.0%) of the respondents indicated that, if people failed to comply with the regulations they would be stopped from settling in those areas, 63(16.4%) of the respondents said that the action that were normally taken to noncompliance was demolition of houses. The least action taken was eviction of the individuals who failed to comply with the disaster risk reduction regulations as supported by 29(7.6%) of the respondents.

Table 3 shows that, majority of the residents in the informal settlements of Nyeri town preferred improvement of the disaster risk reduction policies through bottom-up approach as indicated by 188(49.0%) of the respondents followed by through combined approach as indicated by 144(37.5%) of the respondents and the least preferred approach of improving the policies was the top-down approach as indicated by 52(13.5%) of the respondents.

Association between the Informal Settlement Demographic Characteristics and the Level of Awareness of the Disasters That Can Affect the Respondents in Their Area of Residents

Association of informal settlement demographic characteristics with awareness of the disasters that could affect the respondents in their area of residence was calculated using chi-square and results recoded in Table 4 The results showed that the level of awareness was higher in those reside in Mathari 90(95.7%) informal settlement compared to the others. However, the results indicated that there was no significant association between the area of residence and level of awareness of the disasters that could affect them [$X^2(3) = 2.99$, p-value =0.393>0.05].

It was also established that the level of awareness was higher for those in age bracket 41-50 years 72(96.0%), those who were self-employed 181(94.8%), those who completed college and university education 87(95.6%) and those who had no religion 100(100%) but it was noted that, there was no significant association between the level of awareness of the disaster that could affect the respondents with the age of the respondents and their occupation as given by the p-values of 0.485 and 0.390 respectively.

The results showed that there was a significant association between the level of education of the respondents and the level of awareness of the disaster that could affect them [$X^2(3) = 14.848$, pvalue =0.002<0.05].

The results also showed that there was a significant association between the religions of the respondents and the level of awareness of the disaster that could affect them [$X^2(2) = 7.090$, pvalue =0.029<0.05].

Table 4: Association between the Informal Settlement Demographic Characteristics and the Level of Awareness of the Disasters That Can Affect the Respondents in Their Area of Residents

Demographic variables	Yes	No	N	Chisquare (X ²)	Degree of freedom	P-Value
Area of residence						
Majengo	91(91.9%)	8(8.1%)	99	2.990	3	0.393
Mathari	90(95.7%)	4(4.3%)	94			
Ngangarithi	98(94.2%)	6(5.8%)	104			
Ruringu	78(89.7%)	9(10.3%)	87			
Total	357(93.0%)	27(7.0%)	384			
Age bracket						
20-30	132(93.6%)	9(6.4%)	141	3.457	4	0.485
31-40	82(93.2%)	6(6.8%)	88			
41-50	72(96.0%)	3(4.0%)	75			
51-60	43(89.6%)	5(10.4%)	48			
>60	28(87.5%)	4(12.5%)	32			
Total	357(93.0%)	27(7.0%)	384			
Occupation						
No employment	133(91.1%)	13(8.9%)	146	1.883	2	0.390
Salaried employment	43(91.5%)	4(8.5%)	47			
Self-employment	181(94.8%)	10(5.2%)	191			
Total	357(93.0%)	27(7.0%)	384			
Level of Education						
College/ University	87(95.6%)	4(4.4%)	91	14.848	3	0.002
No Education	17(73.9%)	6(26.1%)	23			
Primary	89(91.8%)	8(8.2%)	97			
Secondary	164(94.8%)	9(5.2%)	173			
Total	357(93.0%)	27(7.0%)	384			
Religion						
Christian	250(95.1%)	13(4.9%)	263	7.090	2	0.029
Muslim	100(87.7%)	14(12.3%)	114			
None	7(100%)	0(0.0%)	7			
Total	357(93.0%)	27(7.0%)	384			

Association between the Informal Settlement Demographic Characteristics and the Level of Awareness of Any Policy Rule Concerned With Disaster Risk Reduction

Association of informal settlement demographic characteristics and with awareness of any policy rule concerning with disaster risk reduction was calculated using chi-square and results recoded in Table 5. The results showed that the level of awareness was higher for those reside in Ngangarithi informal settlement 63(60.6%) compared to the others.

However, the results indicated that there was no significant association between the area of residence and level of awareness of any policy rule concerning with disaster risk reduction [$X^2(3) = 7.026$, $p\text{-value} = 0.071 > 0.05$]. It was also established that the level of awareness was higher for those in age bracket 20-30 years 75(53.2%), those who were salaried employed 26(55.3%), those who completed college and university education 54(59.3%) and those who had no religion 6(85.7%) but noted that, there was no significant association between the level of awareness of any policy rule concerning with disaster risk reduction with the age of the respondents and the occupation of the respondents as given by the p-values of 0.819 and 0.380 respectively.

The results showed that there was a significant association between the education level of the respondents and the level of awareness of any policy rule concerning with disaster risk reduction [$X^2(3) = 8.056$, $p\text{-value} = 0.045 < 0.05$].

The results also showed that there was a significant association between the religions of the respondents and the level of awareness of any policy rule concerning with disaster risk reduction [$X^2(2) = 10.031$, $p\text{-value} = 0.007 < 0.05$].

Table 5: Association between the Informal Settlement Demographic Characteristics and the Level of Awareness of Any Policy Rule Concerned With Disaster Risk Reduction

Demographic Variables	Yes	No	N	X²	Degree of freedom	Pvalue
Area of residence						
Majengo	44(44.4%)	55(55.6%)	99	7.026	3	0.071
Mathari	50(53.2%)	44(46.8%)	94			
Ngangarithi	63(60.6%)	41(39.4%)	104			
Ruringu	39(44.8%)	48(55.2%)	87			
Total	196(51.0%)	188(49.0%)	384			
Age bracket						
20-30	75(53.2%)	66(46.8%)	141	1.544	4	0.819
31-40	46(52.3%)	42(47.7%)	88			
41-50	39(52.0%)	36(48.0%)	75			
51-60	22(45.8%)	26(54.2%)	48			
>60	14(43.8%)	18(56.3%)	32			
Total	196(51.0%)	188(39.0%)	384			
Occupation						
No employment	68(46.6%)	78(53.4%)	146	1.936	2	0.380
Salaried employment	26(55.3%)	21(44.7%)	47			
Self-employment	102(53.4%)	89(46.6%)	191			
Total	196(51.0%)	188(49.0%)	384			
Level of education						
College University	54(59.3%)	37(40.7%)	91	8.056	3	0.045
No Education	9(39.1%)	14(60.9%)	23			
Primary	40(41.2%)	57(58.8%)	97			
Secondary	93(53.8%)	80(46.2%)	173			
Total	196(51.0%)	188(49.0%)	384			
Religion						
Christian	144(54.8%)	119(45.2%)	263	10.031	2	0.007
Muslim	46(40.4%)	68(59.6%)	114			
None	6(85.7%)	1(14.3%)	7			
Total	196(51.0%)	188(49.0%)	384			

DISCUSSION, CONCLUSION AND RECOMMENDATION

Discussion of the Findings

The study found out that, majority of the respondents 93.0% was aware of the disasters that can affect them in their area of residents. Minority of the respondents 7.0% were not aware of disasters that can affect them in their area of residents. This indicate that majority of them are well informed and conscious of the disasters in their areas, which means that, an introduction of any disaster management initiative in these areas can be successful as stated by Qureshi *et al.* (2006), any disaster management is successful only when the general public has some awareness about the disaster.

The study further established that, the level of awareness of the disasters in their area of residents was higher for those reside in Mathari, those in age bracket between 41-50 years, those who were self-employed, and those who completed college and university education and those who had no religion. The results showed that there was a statistical significant association between the level of education of the respondents and the level of awareness of the disaster that could affect them. The study also established that there was a statistical significant association between the religions of the respondents and the level of awareness of the disaster that could affect them but no statistical significant association between the levels of awareness of the disaster that could affect the community and area of resident, age and Occupation.

With reference to the responses obtained from the interviewee, the study established that the most common disaster in the informal settlement of Nyeri town was fires 54.9% followed by land slide 14.3% and the least was floods 9.0% while 21.8% stated that none of the three is common in their areas.

The study found out that, majority of the residents 51.0% was aware of the existence of disaster risk reduction policies as compared to 49.0% who were not aware of any disaster risk reduction policy. This is an indication of low awareness of the existence of disaster risk reduction policy and therefore, posed danger to the lives of the residence as well as hinders the response when a disaster occurs.

This is in line with Koitamet (2013) who noted that the response to fires in informal settlements in Nairobi was hindered by the lack of public awareness of fire policy and standard operating procedures during fire outbreaks. The study established that the level of awareness of the existence of disaster risk reduction policies was higher for those reside in Ngangarithi informal

settlement, those in age bracket between 20-30 years, those who were salaried employed, those who completed college and university education and those who had no religion.

The results showed that there was a significant association between education level of the respondents and the level of awareness of policy rule concerning with disaster risk reduction. The results also showed that there was a significant association between the religions of the respondents and the level of awareness of policy rule concerning with disaster risk reduction but no significant association with area of residents, age and occupation.

The study further established that the commonly known policies by the residents of the informal settlement of Nyeri town were Environmental policy 39.3% followed by the housing policy 37.2%, land policy 15.8% and water group policy 7.7% in that order.

The study found out that 50.3% of the residents from informal settlements of Nyeri town comply with the policy rule concerning disaster risk reduction as compared to 49.7% of residents who do not comply with the policy rules concerning disaster risk reduction. The study established that the reasons for not complying with the policy rules were that, the rules were hard to follow, others said that they are costly to follow, were not for the poor people and a few said that there was no risk that they may experience by not following the policy rules.

A chi-square test was done and established that the level of compliancy was higher for those reside in Ngangarithi informal settlement 65(62.5%) compared to the other informal settlements with a significant association between the area of residence and the level of compliancy of policy rules concerned with disaster risk reduction. The results indicated that, those who were self-employed 106(55.5%) had a higher level of compliancy compared to the others with a statistically significant association between occupation and the level of compliancy of policy rules concerned with disaster risk reduction.

The study found out that most of the residents (76.0%) in the informal settlements of Nyeri town thought that the disaster risk reduction regulations/laws promote positive behavioural and attitudinal change towards disaster management as compared to 24.0% of the residents who thought that the regulations/laws do not promote any positive behavioural and attitudinal change towards disaster management. This is in line with a research conducted by Murange (2012) stated that the policies seek to promote positive behavioural and attitudinal change towards disaster management, provide a

basis for the formulation of a comprehensive disaster management legal framework and establish an institutional framework for disaster preparedness, management and to establish an effective monitoring and evaluation system and provide for an effective information management system to facilitate collection, storage, analysis and dissemination of disaster management information.

The study further established that majority of the residents (81.0%) in the informal settlements of Nyeri town were familiar with the bodies that enhance disaster risk reduction laws as compared to 19.0% of the respondents who were not familiar with the bodies. The study found out that the bodies that the residents were familiar with were the County Government (59.8%), Community members (28.0%), National Government 25(8.0%) and the Individual bodies 13(4.2%).

The study established that the main action taken to individuals who would not comply with the disaster risk reduction regulations was relocation of the individuals. Other actions that could be taken to non-compliance were arresting of the individuals, stopping the individuals from settling in those areas, demolition of houses and the least action taken was eviction of the individuals from those areas.

The study further established that the most important preferred approach for improving the disaster risk reduction policies in the informal settlements of Nyeri town was bottom-up approach as indicated by 49.0% of the respondents followed by combined approach (bottom-up and top-down approaches) as indicated by (37.5%) of the respondents and the least preferred approach of improving the policies was the top-down approach as indicated by 13.5% of the respondents.

Therefore, a bottom-up approach provide better aspects in improving policies related to disaster risk reduction as the community members will be allowed to air their opinions and incorporate in the policy strategies. This is in line with the study conducted by (World Water Council, 2018) who was against the top-down approach suggested that, top-down approach of governance affects initiatives in disaster risk reduction negatively because the communities are not involved and they are expected to give information of effects of disaster on economy, labour markets, infrastructure, public health and transportation.

Conclusion

Objective one sought to assess the level of awareness on the types of disasters and policies in place to curb disasters among the people living in informal settlements of Nyeri town. It was found that, majority of the respondents in the informal settlements of Nyeri town was aware of the disasters that can affect them in their area of residents and the exiting disaster risk reduction policies. The study also found that the level of awareness of the disasters and policies was higher for those completed colleges and university education with a statistical significant association. Therefore it is concluded that education level is key when addressing issues related to disaster risk preparedness in informal settlements.

Recommendations

The study recommends that the County Government of Nyeri to review and implement a disaster management policy, develop a risk management programme, and vital records management programme. The policy should be flexible, implementable and cost effective. It should be reviewed regularly to reflect the current trends in management of disasters.

The study recommends that the County Government of Nyeri should align the disaster risk preparedness plans to the County Integrated Development Plan and allocate adequate funds for disaster management in the annual budget. Allocating funds in the long term ensures the sustainability of mitigation measures and preparedness in disaster risks.

The County Government of Nyeri needs to install firefighting systems such as fire and smoke detectors, fire extinguishers, fire blankets, sand buckets and first aid kits at strategic places in these informal settlements.

Community members should be trained on how to use the firefighting systems and regularly perform fire drills. They should ensure that all electrical appliances are order, and installation should be done by a trained electrician. They should also keep contact of telephone numbers of the firefighting brigade who can be contacted in case of an emergency.

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Influence of Sanitation on Employee Performance at National Social and Security Fund, Kenya

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Abstract

Organizations exist to produce goods and services to meet the customers' demands and to give favorable working environment for workers as outlined in the Occupational Health and safety standards Act (2007). Since organizations depend on the employees as the main working force to help them meet their objectives, the provision of safe and healthy program will depend on the size of the organizations. The purpose of this study was to examine the extent to which sanitation influences employee performance at NSSF. In the research methodology, Descriptive research design was used where 4750 staff at the National Social Security Fund (NSSF), headquarters in Nairobi, were considered as the population. Stratified and purposive samplings were used in this study where a sample of 369 from the population was considered. The study used structured questionnaires and observation methods as instruments of data collection. Research's findings suggested that a number of illnesses and disorders were brought on by poor sanitation. The research validated the 1959 Two-Factor Theory put out by Frederick Herzberg. According to the theory, two factors—motivators, or things that will gratify an employee, and hygiene factors, or items that are related to employees' mental health—have an impact on how well employees perform inside an organization. This study is distinctive since it emphasizes how sanitation would help to boost performance while an unfavorable work environment would make the employees unhappy, which would lower their performance.

Keywords: *Sanitation, Employee Performance, Occupational Health, Safety*

INTRODUCTION

Occupational Health and Safety (OHS) deals with standards, protocols that are adopted in the formal workplace both in Public and Private Organizations. Goethe (2019) confirmed that safety as a discipline is concerned with Injury causing while health is concerned with diseasecausing conditions. Occupational Health and safety in Developing Nations have not been efficient thereby leading to various work-related injuries. In America and Europe, Occupational Safety and Health (OSH) is accomplished through efficient task performance in organizations.

The employee safety and health in the United States of America (USA), led to Occupational health and Safety Act 1970, enacted to help prevent approximately 15,000 work-related deaths which occurred in the USA every year. Mansdorf (2019) noted that effective safety and health management policies should be geared towards improving the performance of organizations in the world. According to statistics from the International Labor Organization (ILO) that were released in 2013, almost 2.2 million workers passed away annually as a result of illnesses related to their jobs.

In Africa, the adoption of OSH is slow in most of the countries as compared to their European Counterparts. In Kenya, Occupational Health and Safety Act of 2007, outlines that any workplace should be clean with an adequate supply of air. Floors walls and doors should be painted regularly to make the environment to be sufficiently clean.

Secondly, the offices should have the right number of people who are every spaced. There should be good waste disposal mechanisms in place. Ablution blocks should be marked and should be cleaned regularly. They should have running water and toiletries such as tissue paper, hand washing soaps, wipers among others. Moreover, the buildings should have staircases for those living with a disability. The chair should be comfortable to prevent the cause of any health-related diseases in the workplace. Offices should be properly lit to take care of those having eyesight problems and the Computers should be fitter with antireflective layers.

Kipkosgei (2018) did study about the effects of social interventions on employee performance at Eldoret Water and Sanitation. This study identified sanitation as Occupational health and safety measure. The study noted that hygiene factors will affect the productivity of the employees therefore should be improved.

Lankoski (2009) asserts that a good organization requires a wider approach by ensuring that health and safety programs are provided. This will help not only in providing a conducive atmosphere for the employees to apply their skills but will also contribute to the efficiency in the organization since the various deadlines will be met by the employee. Madichie and Nyakang'o (2016) observed that Occupational Health and Safety, is an area that corporations should invest in to improve performance.

Statement of the Problem

Healthy working environments are the pillars that would promote employee performance among the various employees. According to National Profile on Occupational Safety and Health (2013), about 20-35% of health-related illnesses and diseases among the workers are transmitted in the workplaces. Poor hygiene, inadequate lighting, uncomfortable furniture, overcrowding in offices that allowed the spread of airborne diseases, were the main causes of these illnesses. Amos *et al.* (2018) indicated that since the year 2006, the government of Kenya had embarked on the implementation of rapid initiative as an approach to measure staff efficiency and performance in all ministries, state departments, and agencies. It is now a policy that all Semi-Autonomous Government Agencies must carry out performance appraisals yearly to know whether their staffs are efficient so that organizations can make more profits. The influence of sanitation on employee performance have been identified by several scholars as a cause of staff inefficiency in most of the organizations in Kenya.

Oluoch (2015) did research on the effects of OSH on employee performance in Kenya Power and Lighting Company, Lukoko (2014)) did a research on the impact of occupational safety and health on the performance of employees at Mumias Sugar Company. All these studies recommended for more research to be done in bigger SAGA with a big number of employees and also offer several services to a bigger customer base. It is from this backdrop that NSSF was considered for this study which the research findings were generalized in ascertaining influence of sanitation Occupational health and safety measures on employee performance. The study examined the influence of sanitation on the performance of employees at NSSF.

Justification and Significance of the Study

National Social Security Fund is responsible for development projects, investments, public services, social obligations, planning, and member contribution collecting. NSSF provided the best organization where the

research findings would be generalized due to the high number of employees they have engaged as compared to SAGs such as the Kenya Institute of Curriculum Development (KICD). Secondly, NSSF also employed heterogeneous staff who were considered as respondents, therefore, a representative sample was drawn.

The study's findings might be used to create theories and plans for the various occupational safety and health programmes, which would be beneficial to academics and researchers. The research findings would be useful to policymakers to create new regulations that tighten the standards controlling workplace health and safety. Utilizing research findings would enable management, staff, and stakeholders at NSSF to enhance physical occupational health measures.

Theoretical Framework

The study was supported by Frederick Herzberg's Two –factor theory proposed in the year 1959. The theory postulates that in an Organization, there are two factors that influence employee performance. The first factor is the motivators which are the things that will satisfy the employee. Satisfiers include complexities of job content; whether it is simple or complex that an employee is able to perform, how employees are motivated after successfully completing a challenging task, and recognition and appreciation of good performing employees. The second factor is hygiene; which deals with the mental status of workers. Hygiene factor which includes the working environment would affect the mental status of the workers. A good working environment free from diseases and hazards would satisfy the employees, thereby improving their performance, while an unfavorable working environment would dissatisfy the employees, thereby reducing their performance.

Empirical Review

Onuorah *et al.* (2020) conducted research on the management of work-related hazards in Organizations in Nigeria. The study identified office space and sitting arrangements as the independent variables. This study concluded that hazards contributed to non-performance among the employees. In addition, poor and unsafe working conditions contributed to the employees being infective since they cannot carry out their tasks within the required schedule. However this study has some contextual and methodological gaps which require more studies to, be done locally to help to ascertain the research findings.

Nkudefe (2013) carried out research about effects of occupational health and safety on labor productivity in firms in Accra Ghana. The study considered; quantity, quality, attendance, and concentration as independent variables, while employee performance as dependent variable. Measurement was done by considering investment, training, and management. The study found that when quality of work is improved, the performance of employees also improved. However, this study has a methodological gap, therefore, the need for more studies to be done to confirm the research findings.

Kipkosgei (2018) did a study about effect of social interventions on employee performance at Eldoret and Water Sanitation. Descriptive research design was used in this study and a sample of 400 respondents was considered. Independent variables were sanitation and socialization while dependent variable is employee performance. The study concluded that social interventions and sanitation should be improved at Eldoret Water and Sanitation Company.

Nanzushi (2015) studied how workplace environment affected performance of employees in Mobile telecommunication firms in Nairobi City County, Kenya. Nanzushi pointed out that a welcoming and comfortable work environment would boost employee productivity, enhancing organizational effectiveness. Employee performance was the dependent variable, and the independent factors were hygienic conditions, lighting, ventilation, staff training and development, leadership, and management. This study used a descriptive research approach, and 164 employees from Kenya's top telecommunications companies were selected at random as a sample. The study came to the conclusion that in order to increase employee performance, the working conditions inside the various telecommunication networks needed to be addressed.

Oluoch (2015) studied the impact of Occupational Health and Safety at Kenya's power headquarters in Nairobi, Kenya. Descriptive research design was adopted. Stratified sampling method was used. Independent variables used in this study were; wellness-assisted programmes, safety policy programmes, occupational safety, and surveillance while, dependent variable was employee performance. The study concluded that good health and safety programmes improve performance of employees at Kenya Power Limited. Oluoch recommended that, Kenya Power Company should improve on Occupational health and safety measures such as spacing workers in the various Offices, proper ventilation in the offices, proper lighting, and provision

of adequate air conditioners. Secondly, organizations should include Occupational health and safety measures in their strategic plans to help in improving employee performance. The study was done in energy sector so there is need for the same study to be done in different sectors such as social welfare to ascertain the research findings. The summary of the literature and gaps to be filled are tabulated and shown below.

Table 1: Summary of Literature and Gaps to Be Filled

Author /year	Variables	Main findings	Study gap	The focus of the current study
Onuorah(2020)	Office space, sitting arrangements	-Spacious offices reduce airborne disease among the employees. -Congestion in offices increases exposure to employees contacting diseases leading to poor performance.	Study not conclusive, there is a need to consider other OSH measures such as security, sanitation, lighting, and aeration of the offices	-physical work environment. -Office space and layout
Nkudefe (2013)	-Quality, -Quantity, -Attendance	-The study found out Occupational health and safety had an impact on efficiency of employees.	-Contextual gap; the study considered manufacturing industries, therefore, need to carry out the same study in other Organization.	workplace

Table 1: Summary of Literature and Gaps to Be Filled

Oluoch (2015)	Wellness assisted programmes, safety policy programmes, Occupational safety, and surveillance	-The study found out that OSH programs positively affected efficiency of employees at Kenya Power and Lighting company in Kenya.	-Methodological gap-The study only used questionnaires as the method of collecting data which might have resulted in errors so there is a need to incorporate the Observation method so that researcher can physically visit the research location to collect data.	-Physical workplace -office space and layout
Kipkosgei (2018)	-sanitation, socialization, and efficiency in the workplace.	-The study concluded that good sanitation, socialization will have a positive effect on the efficiency of employees.	-Contextual gap-The study only considered sanitation as the main factor affecting employee efficiency and left out other factors such as Office space, security, and physical work environment.	-Sanitation in the workplace
Nanzushi (2015)	-sanitation, office lighting, office ventilation, staff training and development, and leadership and management.	-The study found out that proper sanitation, good aeration, and staff training will have a positive impact on employee performance.	-Methodological gap-The research was carried out by considering a small sample from which the research findings have been drawn.	-Sanitation in the workplace

The operationalization frame provided how variables were measured against indicators. Sanitation was measured against indicators as, waste disposal, clean drinking water, Office Cleanliness and toiletries. The dependent variable; Employee performance was measured against indicators as staff turnover, staff layoff, staff lateness and Staff absenteeism. This was summarized below:

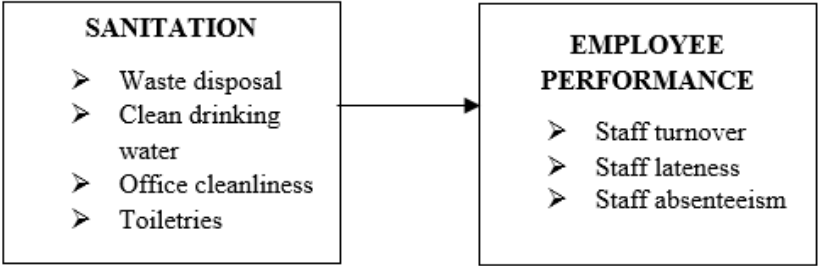


Figure 1: Conceptual Framework

Source: Researcher (2022)

METHODOLOGY

In order to collect high-quality data across the numerous departments and sub departments of NSSF, a descriptive study design was employed (Cooper and Schindler 2003). Sanitation with indicators such as garbage removal, portable water, a clean office, and toiletries were independent variables. Staff turnover, staff tardiness, and staff absenteeism were indicators for the dependent variable, employee performance. A Likert scale was employed to measure the data, which were classed as nominal ratio and ordinal.

The target audience was the 4,750 employees at the NSSF Headquarters, from whom a sample of 369 respondents was chosen using stratified sampling (Human resource department, NSSF 2022). Since each responder within the population was given equal representation in this study, stratified random sampling was practical for this investigation. Stratification was carried out according to the different departments. In order to obtain trustworthy evidence for this study and provide legitimate information, primary and secondary sources of data were used. This allowed the researcher to ask questions and seek clarifications that primary data sources could not have provided (Mugenda & Mugenda, 2003). Observation and a structured questionnaire were utilized as the study's primary techniques for gathering quantitative data. Before conducting the entire investigation, a pilot test was conducted to

analyze the research study in order to reduce errors and determine the costs involved (Cooper & Schindler, 2003). In order to evaluate the internal consistency and reliability of the Likert scale that was used in this experiment, reliability statistics were performed using Cronbach's alpha coefficient.

Where percentages, the mean, and the standard deviation were computed, descriptive statistics were utilized. To determine the direction and strengths of variables, regression analysis was used (Montgomery, 2011). Employee performance was the dependent variable for this study, denoted by (Y), and sanitation was denoted by (X_1), with $Y=f(X_1)$. There were instances of research plagiarism where the respondent's anonymity and confidentiality were respected, and all sources of the information were acknowledged. Before sending study items to the respondents, we requested their informed and voluntary consent. During the research process, legal considerations were noted, and the research results were communicated with the appropriate authorities.

FINDINGS

The results of the observational study indicated that sanitation has to be improved, including the availability of clean drinking water, effective waste disposal, and personnel congestion. All of these increased the risk of contracting water- and air-borne infections, which decreased workers' productivity. The results corroborated those of another study by Nanzushi (2015), which found a relationship between employee performance and workplace hygiene. Additionally, workplace sanitation needs to be enhanced.

Three hundred and sixty nine questionnaires were distributed to the respondents at National Social and Security Fund This was done physically and online. 200 questionnaires were distributed physically while 169 were distributed online. This was carried out in response to the ongoing measures to control the spread of Covid-19 disease where staff who are 50 years and above are advised to work remotely. 195 filled questionnaires and 160 filled questionnaires for both physical and online distributions respectively were returned. This gave 96% response rate, sufficient for analysis. Good response rate was accredited to the pilot research conducted and the necessary modifications to the questions, which were straightforward, clear, and direct. Additionally, the questionnaires were given at a time when the majority of respondents could access them and could participate in the study. Shuttleworth (2009) noted that in research a response rate of over 85% is excellent and can be used for data analysis.

Findings indicated, 200 of the respondents were males constituting 56%, 155 females constituting 44 %. Results concurred with another study which was done by Oluoch (2015) at Kenya power and lighting limited which demonstrated that there was no gender bias in this investigation. The study's results showed that considering all genders reduced bias that could arise as a result of gender inequality. The study's findings also showed that there is less of a gender gap among NSSF employees, and as a result, NSSF has taken the 2010 Kenyan Constitution's two-thirds gender rule into account. The results differ from those of the Korea Institute of Technology (2018) study, which had biasness because there were more females than males.

Most of respondents at the National Social Security Fund headquarters are over 36 years old, with 42.3% falling in the 36–45% age range, those over 46 years old making up 5.6% of the sample, followed by the 26–35 age range at 23.9% and the 20–25 age range at 28.2%. The study's findings demonstrated that all participants from various age groups were included, and many professionals of all ages had the opportunity to offer their services at NSSF. The findings were consistent with those of another survey carried out by Kipkosgei (2018) at Eldoret Water and Sanitation, which included respondents from the organization's various age groups.

The data collected showed that majority of the employees hold bachelor's degree certificates at 41%, diploma and higher diplomas at 28%, post graduate certificates at 28% and 3% hold secondary certificates. This information shows that the majority of NSSF personnel are literate and have had literary education, which meets the organizations varied job requirements. Findings showed respondents were educated about numerous occupational health and safety topics, resourceful in their responses to the study's questions, and could advise management on various OHS practices that could be strengthened. The results supported those by Hameed and Amjad (2009), which revealed that most of the respondents were knowledgeable about how OHS measures could be improved in an organizations.

A series of questions regarding objectives of the study were given to the respondents. Responses were rated on a continuous range of 1-Strongly disagree, 2-disagree, 3neutral, 4-agree, and 5-Strongly agree using the Likert scale. The study gathered data on sanitation where the indicators were considered.

Respondents moderately agreed poor waste disposal influenced employees' performance with a mean of 3.52; however, some respondents believed that

inadequate access to safe drinking water also had an impact on employees' performance with a mean of 3.59; respondents agreed that offices should be cleaned regularly and that adequate toiletries should be available to improve employees' health conditions so that they can work more effectively. Respondents strongly agreed that office cleanliness and provision of toiletries influenced greatest the performance of employee, since it had highest respondents with a mean of 3.61.

The results of the study demonstrated how NSSF employees' performance was impacted by poor sanitation. Respondents highlighted that improper waste management contributed to the spread of airborne illnesses including the common cold and influenza. According to the study, offices need to be cleaned frequently to avoid airborne infections brought on by waste and dust. This supported a study by Nanzushi (2015) that discussed the importance of having clean offices at work for better health. The study agreed with the findings done by Korea Institute of Technology (2018).

The study found out safe drinking water enhanced employee performance. To avoid water-borne illnesses, water dispensers should be cleaned frequently. Additionally, glasses, cups, or mugs used to serve water should also be cleaned more frequently. This stopped the spread of many illnesses and disorders at work. The study also discovered that providing commodities like tissue, hand washing soaps, and installing taps with running water in the restrooms enhanced employee wellness, which in turn increased performance in the company performance.

Study collected data on the dependent variable, employee performance, by asking a number of questions to the respondents to ascertain the numerous factors that influenced performance of the employees.

According to the data acquired, the majority of respondents (Mean=3.643) agreed that workplace accidents contributed to employee sick days. 47 percent of respondents agreed that work-related sickness caused staff absenteeism, with a mean of 3.845, and 46% agreed that inadequate cleanliness contributed to staff turnover in the firm.

Variance analysis was done to test the difference in means for level of significance. It was achieved through identifying the total variance that resulted into random errors and the components that showed differences between the means. Variance analysis was done by using ANOVA. Testing statistical significance of mean differences (for groups or variables) is the aim of the variance analysis. Variance analysis, involved dividing entire variance

into parts due to actual random error and due to variations in the means. Analysis of changes in sample outcomes relative to predicted population parameters formed the basis of ANOVA (Kucuk et al. 2016). Results of ANOVA demonstrated independent variables were significant at the 0% level (Sig.F >.005) in the F-Statistics obtained (F=132.129), verifying the model's appropriateness.

The Regression model used depicted as: $Y = \beta_0 + \beta_1 X_1 + e_i$. Where: Y - Performance of employees, β_0 : Constant factor, β_1 : Coefficient for Sanitation, X_1 Sanitation, and e_i : Error terms. The table below summarized coefficients and model

Fahrmeir et al. (2021) noted that, modified R squared coefficient of determination measured the amount of the dependent variable's fluctuation explained by a change in the independent variable. Adjusted R² was preferred since R squared couldn't detect biasness. Coefficient of determination equals to 0.77 (R²=77%). This meant, changes in employee performance can be explained by changes in variables sanitation, security and office space and layout totaling to 77%. Multiple linear regression equation becomes: $Y = 0.76 + 0.69X_1$. Employee performance would be 0.76 if sanitation conditions ranked at zero, as indicated by the constant 0.76 in the equation above. The coefficient for sanitation (X_1) is 0.69, which indicated unit change in sanitation would result to 0.69 units increase in employee performance.

Sanitation aggravated water-borne illnesses like cholera, dysentery, and diarrhea, which reduced labor performance. Employee productivity suffered as a result. The report also stated that workplace dangers including illness and injuries should be eliminated.

The findings of the study were consistent with those of Winarmo and Perdana (2015), who identified quality, cost effectiveness, quantity, and punctuality as requirements for establishing an effective workplace. According to the study, employees suffered from illnesses and diseases at work, which affected their performance. The study discovered that underperforming employees would use sick days, be away from work, or eventually resign owing to illnesses and diseases related to their job.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Research findings showed that that gender issues were taken into consideration. Males made up 56% of the population, leaving women with the remaining. This demonstrated that, in some respects, male to female ratio at NSSF is almost balanced, indicating that the issue of gender equality was taken into account by NSSF management. Majority of responders were between the (32-37) age group. This demonstrated that the majority of employees are responsible, experienced adults who can comprehend the status of physical occupational health and safety measures at NSSF.

The research's findings also indicated that more than 90% of NSSF staff were educated and held post-secondary degrees in a variety of professions. This demonstrated that the respondents are competent in evaluating the various physical occupational health and safety measures that have been implemented and those that should be implemented in relation to their impact on employees' performance. The research findings by departments and sections demonstrated that personnel were taken into account from various departments, minimizing bias. According to the study, the Operations division had highest percentage with (79%) respondents. This demonstrated that most of the staff at the NSSF directly interacts with clients when it comes to the registration of new members and the processing of dues. They also demonstrated their knowledge of the various physical, occupational, and health measures currently in place as well as any gaps that need to be filled.

The majority of respondents in a study at NSSF on the connection between sanitation and worker performance believed that offices with poor waste disposal should improve in order to prevent airborne diseases. The availability of clean, drinkable water, according to the respondents, is provided; nonetheless, it is insufficient for the workers and clients who visit the various Offices. The general health of the staff was impacted by the office's cleanliness. The research also revealed that most NSSF staff members deal directly with customers when it comes to new member registration, processing dues, and awareness of the many physical occupational, and health measures currently used or proposed in order to stop the spread of water-borne infections, the survey also revealed that employer should give their staff access to more toiletries. The results of the research indicated that poor sanitation contributed to the emergence of a number of illnesses and disorders, and the management at NSSF should thus enhance cleanliness. The study concluded

that employees' performance was affected by sanitation. More toiletries, clean and safe drinking water, and a clean working environment should all be supplied, according to the study's findings about sanitation. Key things that affected how well employees performed were employee turnover, staff tardiness, and absenteeism. The management at NSSF failed to successfully implement OHS as sanitation as a measure to improve employee performance.

Recommendations

The study recommend that, performance of employees is a key determinant of organizational progress. The goal of occupational health and safety measures is to encourage employee wellness at work. A healthy worker is more effective and productive. Therefore, businesses should develop OHS policies and rules that align with the Occupational Safety and Health Act of 2007. Inadequate workplace architecture and layout, poor security, and poor cleanliness are all blamed for work-related illnesses and diseases. According to the research's conclusions, NSSF management has to take stronger action to ensure sanitation is considered a part of occupational health and safety. Employees should have access to enough drinking water. Stronger waste management is needed since offices are becoming more frequently messy as a result of the business' expanding clientele. To perform cleaning more frequently, additional cleaners should be hired. The restrooms should have enough paper towels and hand soaps, among other essentials.

Suggestions for Future Research

The study suggested that future studies can investigate how workplace health and safety affect employee performance by considering new Objectives. Future studies can employ a larger sample size of more than 369 to generalize the research findings. Future researchers might think about using different state corporations to conduct a comparable study so that the research findings can be compared, and finally, they might use a different research design and data collection techniques in their future studies instead of the questionnaires and observation methods that were employed in this one.

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