



Occupational Health Hazards and Practice of The Preventive Measures Among Fire Fighters in Enugu Urban Metropolis

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Abstract

The study assessed occupational health hazards and practice of the preventive measures among fire fighters in Enugu Urban Metropolis. Six research questions guided the study. The study adopted a descriptive survey design. The population of the study was made of 726 firefighters in Enugu Urban metropolis. The sample size was 218 being 30% of firefighters selected through simple random sampling technique in Enugu State Fire Service located in Enugu metropolis. Questionnaire was the instrument used for data collection. Data were collected using on-the-spot method of administration and collection. Mean and standard deviation were used to answer the research questions. The findings of the study showed among others that firefighters face various occupational health hazards, including burns, smoke inhalation, physical injuries, and psychological trauma. The results showed that male firefighters and those with longer years of experience are more likely to practice preventive measures. The study revealed no significant difference in the percentage of male and female firefighters facing occupational health hazards. It was recommended among others that firefighting organizations should prioritize the health and safety of firefighters, providing them with adequate training, equipment, and resources to manage risks and prevent occupational health hazards.

Keywords: Occupational Health Hazards, Fire Fighters, Preventive Measures, Injuries

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I. Introduction

Globally, Occupational health hazards have been on the upsurge in developed and developing countries. In this regard, Mmadu and Adebola (2021) posited that over 18,900 workers are injured yearly on the job in the developing world resulting in more than half of employees taking time off- duties. This indicates that occupational health hazard is a global problem which is prevalent in European countries and Africa.

Relatively, in Sub- Saharan Africa, including Nigeria, over 100,000 workers in fire fighters are affected yearly via occupational health hazards (World Health Organization (WHO), 2018). The implication is that the issue of occupational health hazards is more common in Sub- Saharan African countries of which Nigeria is not exempted. Thus, Occupational health hazards are a significant concern for firefighters worldwide, including those in Nigeria.

In Nigeria, though the exact figure of occupational health hazards are not documented, occupational health hazards have been on the increase and little or no attention seems to have been paid to this trend by the authorities. Occupational health hazards is a condition of premises, a substance, thing, plant or animal other than man, or a solid, liquid, gas or combination of any of them, that has or that is likely to have an adverse effect on the health of any person. The World Health Organization (WHO) (2018) defines occupational health hazards as the risks and dangers that workers are exposed to in their workplace, which can lead to injuries, illnesses, and even death. Similarly, occupation can be defined as a complex interplay of physical, mental, and emotional demands that require individuals to possess specific skills, knowledge, and abilities (Eze, 2020). Occupational

health hazards are operationally defined as the physical, chemical, and biological hazards that firefighters in Enugu Urban metropolis are exposed to in the course of their work, which can lead to adverse health effects.

Common types of occupational health hazards are: musculoskeletal injuries, slips and falls caused by slippery floors which can lead to fracture or dislocation of the joint, lacerations, cuts, infection as an employee may come in contact with body fluids such as blood, sprains and strains, scalds, burns from fire outbreak, eye injuries, overexertion, exposure to chemicals, rape, risk of heart disease and lung cancer from passive smoking (Onyegegbu, 2020); firefighters are exposed to these occupational health hazards.

Firefighters are individuals trained to extinguish fires, rescue people, and protect property from fire-related hazards. They play a crucial role in maintaining public safety and preventing fire-related disasters. As Centers for Disease Control and Prevention (2022) rightly stated, firefighters are emergency responders equipped with specialized knowledge, skills, and equipment to mitigate fire-related emergencies, including structural fires, wildfires, and vehicle fires. Their primary goal is to minimize damage and ensure the safety of people and property. In Enugu metropolis, firefighters are personnel of the Enugu State Fire Service, trained to respond to fire emergencies, conduct fire safety inspections, and educate the public on fire prevention measures.

Firefighters operate from various fire stations across the state.

Firefighters are essential to society, and their importance cannot be overemphasized. As American Conference of Governmental Industrial Hygienists (2020) opines, firefighters respond promptly to fire emergencies, minimizing damage and ensuring public safety. Oluwagbemi (2020) rightly stated that firefighters educate the public on fire prevention measures, reducing the risk of fire-related incidents. Uzochukwu (2019) noted that firefighters protect properties from fire-related damage, saving lives and economic losses. In rescue operations, firefighters save lives and prevent injuries in emergency situations. Firefighters are also crucial in preventing and responding to occupational health hazards. As Bezrukova (2023) posited, firefighters are exposed to various occupational health hazards, including physical and psychological stress, which can lead to chronic diseases. Firefighters play a vital role in identifying and mitigating these hazards, ensuring a safe working environment for themselves and others. Firefighters' knowledge and skills in handling emergency situations can also be applied to preventing and responding to occupational health hazards in various industries.

Firefighters are exposed to a wide range of occupational health hazards, including chemical, physical, and biological hazards. According to Wilson (2021), firefighters are at risk of exposure to hazardous chemicals, including toxic substances and carcinogens, which can cause a range of health problems. These chemicals can be present in the smoke and fumes emitted during fires, and firefighters may inhale them or come into contact with them through their skin. As opined by Afolabi, Okoro, and Adeyemi (2019), firefighters are also at risk of physical hazards, including burns, injuries, and heat stress, which can cause immediate harm. Firefighters often work in hot and physically demanding environments, which can lead to dehydration, heat exhaustion, and other heat-related illnesses. In addition, they may be at risk of physical injuries, such as burns, cuts, and bruises, while responding to emergency situations.

Biological hazards are also a concern for firefighters, as they may be exposed to infectious diseases and other biological agents while responding to emergency situations (Ezugwu, Nwankwo and Onwujekwe, 2021). For example, firefighters may come into contact with bodily fluids, such as blood and saliva, which can pose a risk of infection. Firefighters may experience psychological hazards, including stress, trauma, and mental health disorders, as a result of their work. The traumatic nature of their work, including responding to emergency situations and witnessing distressing scenes, can take a toll on their mental health and well-being; hence, applying preventive measures to reduce occupational health hazards becomes needful.

Preventive measures are essential in reducing the risk of occupational health hazards among firefighters. According to Mmadu and Adebola (2021), the use of personal protective equipment (PPE) is a critical component of preventing occupational health hazards among firefighters. PPE includes equipment such as helmets, gloves, and respirators that can protect firefighters from physical and chemical hazards. For instance, helmets can protect firefighters from head injuries, while gloves can prevent cuts and burns. As opined by Afolabi, Okoro, and Adeyemi (2019), respiratory protection is also an important preventive measure for firefighters. Firefighters may be exposed to hazardous chemicals and particles in the air, and respiratory protection can help prevent inhalation of these substances. The use of respirators and other respiratory protective equipment can significantly reduce the risk of respiratory problems among firefighters. This is particularly important in environments where firefighters are exposed to smoke, toxic gases, and other hazardous substances. Health and wellness programs are also essential in preventing occupational health hazards among firefighters. According to Oluwatayo, Akinyemi, and Adeyemi. (2022), these programs can include physical fitness training, stress management, and health education, which can help firefighters maintain their physical and mental health.

Physical fitness training can improve firefighters' endurance and strength, while stress management techniques can help them cope with the psychological demands of their job. Regular medical check-ups are also an important preventive measure for firefighters, as they can help identify any health problems early and prevent

long-term health consequences. Firefighting techniques and strategies can also play a critical role in preventing occupational health hazards. According to Adeyemi, Afolabi, and Okoro (2022), firefighters who use safe and effective firefighting techniques and strategies are less likely to experience occupational health hazards. This includes using proper ventilation techniques, avoiding hazardous areas, and using appropriate equipment. For example, firefighters can use ventilation techniques to remove smoke and heat from buildings, reducing the risk of respiratory problems and heat stress. In addition to these measures, organizational culture and policies can also influence the practice of preventive measures among firefighters. According to Afolabi, Okoro, and Adeyemi (2019), firefighting organizations that prioritize safety and provide adequate resources and support for firefighters are more likely to have a culture of safety and prevention.

This can include providing regular training and education on safety protocols, as well as encouraging firefighters to report any safety concerns or incidents.

The practice of preventive measures is crucial in reducing the risk of occupational health hazards among firefighters. It appears firefighters who use personal protective equipment (PPE) and follow safety protocols are less likely to experience occupational health hazards. The importance of practice of preventive measures cannot be overstated, as it can help prevent injuries, illnesses, and even death. By using PPE and following safety protocols, firefighters can significantly reduce their risk of occupational health hazards. The practice of preventive measures is also essential in reducing the risk of long-term health consequences among firefighters. As opined by Igokwe (2019), firefighters who are exposed to hazardous substances and physical demands over a prolonged period are at risk of developing chronic health problems, such as respiratory diseases and cancer. By using PPE and following safety protocols, firefighters can reduce their risk of developing these health problems. For example, using respirators and other respiratory protective equipment can help prevent inhalation of hazardous chemicals and particles, reducing the risk of respiratory problems. According to Burton (2019), the practice of preventive measures is also important in promoting a culture of safety among firefighters. When firefighters prioritize safety and use PPE and follow safety protocols, it can create a culture of safety within the organization. This can lead to a reduction in the number of injuries and illnesses among firefighters, as well as a decrease in the risk of occupational health hazards. A culture of safety can also encourage firefighters to report any safety concerns or incidents, allowing for prompt action to be taken to prevent future incidents.

A closer examination of the firefighters in South East, Nigeria reveals that both male and female firefighters face occupational health hazards, although the impact may vary based on gender. According to Nwankwo (2019), female firefighters may be more susceptible to certain health hazards due to physiological differences, such as smaller body size and lower lung capacity. On the other hand, male firefighters may be more likely to engage in risk-taking behaviors, increasing their exposure to occupational health hazards. The years of experience of firefighters also play a significant role in determining their risk of occupational health hazards. Perhaps, this is why Okeke (2019), argues that firefighters with more years of experience may be more aware of the occupational health hazards they face and take more effective measures to protect themselves. However, firefighters with fewer years of experience may be more vulnerable to occupational health hazards due to lack of training and experience.

From the researcher's observation, Enugu Urban metropolis is a densely populated urban area with a high concentration of commercial and industrial activities. It seems that the urbanization and industrialization of Enugu Urban metropolis have led to an increased risk of occupational health hazards among firefighters. It may be that the firefighting services in Enugu Urban metropolis face unique challenges, including inadequate resources, poor infrastructure, and lack of awareness about occupational health hazards. It seems that many firefighters in the region do not use personal protective equipment (PPE) and follow safety protocols. Ideally, firefighters in Enugu Urban metropolis should work in a safe environment with minimal risk of occupational health hazards, utilizing preventive measures to protect themselves from harm.

However, it seems that firefighters in some region are exposed to various occupational health hazards, including chemical, physical, and biological hazards and it appears that they are exposed to preventive measures, putting them at risk of injuries, illnesses, and death. Firefighters in Enugu Urban metropolis appears to be in constant fear for their safety as they do not know where a fire might soon start from. They might not maintain a basic standard of living owing to the fact that they might be spending money on pain relief medicines, inhalers, surgeries in case of burns. Some staff might continue to go for eye checkups, buy medicines for their lungs and heart, cough medicines etc

It is quite unfortunate that despite the measures adopted by government and other stakeholders in the Nigeria such as enlightenment programmes, training employees on environmental safe practices among others, the problem has persisted as cases of occupational hazards are still being reported; the most painful part being that the unreported cases outnumber to a reasonable extent the reported cases for firefighters and by extension depletion of work-force in the industry. In addition, there is a gap in knowledge about the specific occupational health hazards faced by firefighters in Enugu Urban metropolis, including the impact of gender and years of experience on occupational health hazards and the effectiveness of the practice of preventive measures in

reducing these hazards, hence, the need for the study. It therefore becomes prudent to study the occupational health hazards and practice of the preventive measures among fire fighters in Enugu Urban Metropolis.

Research Questions

The following research questions guided the study:

1. What are the occupational health hazards faced by firefighters in Enugu Urban metropolis?
2. What are the occupational health hazards faced by firefighters in Enugu Urban metropolis based on gender?
3. What are the occupational health hazards faced by firefighters in Enugu Urban metropolis based on years of experience?
4. What are the practice of preventive measures of occupational health hazards among firefighters in Enugu Urban metropolis?
5. What is the practice of preventive measures of occupational health hazards among firefighters in Enugu Urban metropolis based on gender?
6. What is the practice of preventive measures of occupational health hazards among firefighters in Enugu Urban metropolis based on years of experience?

II. METHOD

The design that was adopted for this study is descriptive survey. The population of the study was made of 726 firefighters in Enugu Urban metropolis (Enugu State Fire Service, 2025). The sample size was 218 being 30% of firefighters selected through simple random sampling technique in Enugu State Fire Service located in Enugu metropolis.

The instrument for data collection was a 30 item questionnaire titled “Occupational Health Hazards and Practice of Preventive Measures among Firefighters Questionnaire (OHHUPMFQ).” The instrument was validated by three experts, two from Health Promotion and Public Health Education and one expert in Measurement and Evaluation in the Faculty of Education, all from Nnamdi Azikiwe University, Awka. There was a pilot test on 20 senior firefighters in Anambra State. The data collected were statistically analyzed for reliability coefficient using the Guttman option of split-half. Reliability coefficient of alpha-level of 0.81 and 0.82 for the firefighters were found. The overall reliability estimate obtained for instrument was 0.81. The researcher personally administer 218 copies of the questionnaires to firefighters in Enugu Urban metropolis with the help of four research assistants. The researcher sought the consent of the following individuals such as: firefighters, and supervisors of the fire departments. The distribution and collection of questionnaires lasted for approximately four weeks (one month). The researcher used the Direct Delivery Method, where respondents was encouraged to complete the questionnaires immediately. For those who cannot respond on the spot, the researcher scheduled an appointment for retrieval. This approach is designed to facilitate a high response rate and ensure that the data collection process is efficient and effective. Data collected was analyzed using SPSS version 25. The research questions was answered using frequency counts, percentages and mean. Chi-Square, t-test and Analysis of Variance (ANOVA) were used to test the null hypotheses at 0.05 levels of significance. For research questions, items with 50 percent and mean rating of 3.00 and above was regarded as Yes/ Agree whereas items below 50 percent and 3.00 mean was regarded as No/Disagree. All the hypotheses were tested at 0.05 alpha level. Decision rule for the hypothesis is; reject any null hypothesis if the probability value (P-Value) is less than or equal to the significant value of 0.05 ($p < .05$), otherwise ($p > .05$) do not reject the null hypothesis.

Presentation of Results

Research Question One: What are the occupational health hazards faced by firefighters in Enugu Urban metropolis?

Table 1. Percentage Responses on Occupational Health Hazards by Firefighters in Enugu Urban Metropolis

S/N	Occupational Health Hazards	Yes	No				
		N	%	N	%		
1.	Burns	202	94	13	6		
2.	Smoke inhalation	194	90	21	10		
3.	Physical injuries	192	89	23	11		
4.	Chemical exposure	177	82	38	18		
5.	Heat stress	166	77	49	23		

6.	Noise-induced hearing loss	173	80	42	20
7.	Musculoskeletal disorders	175	81	40	19
8.	Psychological trauma	168	78	47	22
9.	Exposure to toxic substances	177	82	38	18
10.	Respiratory problems	167	78	48	22
11.	Crush injuries	181	84	34	16
12.	Eye injuries	179	83	36	17
13.	Skin irritation	178	83	37	17
14.	Fatigue	168	78	47	22
15.	Electrical shock	179	83	36	17

The results Table 1 reveals that firefighters in Enugu Urban metropolis face the 15 occupational health hazards listed. However, the 11 highest occupational hazards reported by majority of the respondents were; burns (94%), smoke inhalation (90%), physical injuries (89%), crush injuries (84%), eye injuries (83%), Skin irritation (83%), electrical shock (83%), chemical exposure (82%), exposure to toxic substances (82%), musculoskeletal disorders (81%), and noise-induced hearing loss (80%). Other additional hazards such as psychological trauma (78%), respiratory problems (78%), fatigue (78%), and heat stress (77%), were also identified by over 70% of the respondents.

Research Question Two: What are the occupational health hazards faced by firefighters in Enugu Urban metropolis based on gender?

Table 2. Percentage Responses on Occupational Health Hazards by Male and Female Firefighters in Enugu Urban Metropolis

S/N	Occupational Health Hazards	Male		Female				No	
		Yes	No	Yes	No	Yes	No	Yes	No
		N	%	N	%	N	%	N	%
1.	Burns	151	94	9	6	51	93	4	7
2.	Smoke inhalation	144	90	16	10	50	91	5	9
3.	Physical injuries	142	89	18	11	50	91	5	9
4.	Chemical exposure	133	83	27	17	44	80	11	20
5.	Heat stress	124	78	36	23	42	76	13	24
6.	Noise-induced hearing loss	127	79	33	21	46	84	9	16
7.	Musculoskeletal disorders	130	81	30	19	45	82	10	18
8.	Psychological trauma	124	78	36	23	44	80	11	20
9.	Exposure to toxic substances	130	81	30	19	47	85	8	15
10.	Respiratory problems	129	81	31	19	38	69	17	31
11.	Crush injuries	132	83	28	18	49	89	6	11
12.	Eye injuries	132	83	28	18	47	85	8	15
13.	Skin irritation	136	85	24	15	42	76	13	24

14. Fatigue	128	80	32	20	40	73	15	27
15. Electrical shock	134	84	26	16	45	82	10	18

Table 2 presents male and female firefighters' percentage responses on the occupational hazards they face. The results show that male and female firefighters face similar occupational health hazards, but there are slight differences in the percentages. Occupational Hazards such as burns, chemical exposure, heat stress, respiratory problems, skin irritation, fatigue and electrical shock were reported by slightly more percentage of males (94%, 83%, 78%, 81%, 85%, 80% and 84%) compared to females

(93%, 69%, 76%, 73% and 82%). On the other hand, slightly more percentage of female firefighters reported 8 of the 15 occupational hazards, namely, smoke inhalation (91%), physical injuries (91), Noise-induced hearing loss (84%), Musculoskeletal disorders (81%), Psychological trauma (80%), Exposure to toxic substances (85%), Crush injuries (89%), and Eye injuries (85%)

Overall, the male and female firefighters face the same occupational hazards. However, slightly more percentage of male firefighters reported 7 out of the 15 hazards while slightly more female firefighters reported 8 out of the 15 hazards.

Research Question Three: What are the occupational health hazards faced by firefighters in Enugu Urban metropolis based on years of experience?

Table 3. Percentage Responses on Occupational Health Hazards by Firefighters of Different Years of Experience in Enugu Urban Metropolis

S/N	Occupational Health Hazards	0-10 years (n=69)				11-20 years(n=90)				21 years & above (n=56)			
		Yes		No		Yes		No		Yes		No	
		N	%	N	%	N	%	N	%	N	%	N	%
1.	Burns	63	9	6	9	8	9	6	7	5	9	1	2
			1			4	3			5	8		
2.	Smoke inhalation	63	9	6	9	7	8	1	1	5	9	3	5
			1			8	7	2	3	3	5		
3.	Physical injuries	60	8	9	1	8	9	5	6	4	8	9	1
			7		3	5	4			7	4		6
4.	Chemical exposure	59	8	1	1	7	7	2	2	4	8	8	1
			6	0	4	0	8	0	2	8	6		4
5.	Heat stress	53	7	1	2	6	7	2	2	4	7	1	2
			7	6	3	9	7	1	3	4	9	2	1
6.	Noise-induced hearing loss	56	8	1	1	6	7	2	2	4	8	8	1
			1	3	9	9	7	1	3	8	6		4
7.	Musculoskeletal disorders	60	8	9	1	6	7	2	2	4	8	7	1
			7		3	6	3	4	7	9	8		3
8.	Psychological trauma	56	8	1	1	6	7	2	2	4	8	1	1
			1	3	9	6	3	4	7	6	2	0	8
9.	Exposure to toxic substances	55	8	1	2	7	8	1	1	4	8	1	1
			0	4	0	6	4	4	6	6	2	0	8
10.	Respiratory problems	49	7	2	2	7	8	1	1	4	7	1	2
			1	0	9	4	2	6	8	4	9	2	1
11.	Crush injuries	59	8	1	1	7	7	1	2	5	9	5	9

12	Eye injuries	57	6	0	4	1	9	9	1	1	1	2	4
14.	Fatigue	54	7	1	2	6	7	2	2	4	8	8	1
		8	5	2	6	3	4	7	8	6		4	
15.	Electrical shock	60	8	9	1	7	8	1	1	4	7	1	2
		7		3	6	4	4	6	3	7	3	3	

Table 3 shows the distribution of occupational health hazards across firefighters with different years of experience. Greater percentage of Firefighters with experience of 21 years and above reported exposure of firefighters to 9 out of the 15 occupational hazards. These include; burns (98%), smoke inhalation (95%), Heat stress (79%), Noise-induced hearing loss (86%), Musculoskeletal disorders (88%), Crush injuries (91%), Eye injuries (96%), Skin irritation (84%), and Fatigue (86%). Firefighters with 11-20 years of experience reported higher exposure to physical injuries (94%), exposure to toxic substances (84%) and respiratory problems (82%) more than the others. On the other hand, slightly more percentage of firefighters with 0 – 10 years of experience reported electrical shock (87%) compared to 84% and 77% of those with 11-20 years, and 21 years and above respectively. These indicate that firefighters with longer years of experience reported higher exposure to occupational hazards.

Research Question Four: What are the practices of preventive measures of occupational health hazards among firefighters in Enugu Urban metropolis?

Table 4. Mean Ratings on Practices of Preventive Measures of Occupational Health Hazards by Firefighters in Enugu Urban Metropolis

S/N	Preventive Measures	Mean	SD
1	Wearing personal protective equipment such as helmets, gloves, and boots to protect against physical hazards.	4.31	.79
2	Using self-contained breathing apparatus (SCBA) to prevent smoke inhalation and exposure to toxic chemicals.	4.15	.62
3	Participating in regular training and drills to improve physical fitness and emergency response skills.	4.17	.73
4	Conducting regular health check-ups and screenings to monitor for potential health hazards.	4.09	.69
5	Following established safety protocols and procedures when responding to emergency situations.	4.11	.74
6	Using fire-resistant clothing and gear to prevent burns and heat stress.	4.06	.65
7	Taking regular breaks to rest and hydrate during prolonged emergency responses.	4.14	.85
8	Receiving vaccinations and immunizations to prevent infectious diseases.	4.15	.63
9	Using hearing protection to prevent noise-induced hearing loss.	4.20	.82
10	Practicing stress management techniques to reduce the risk of mental health issues.	4.07	.79
11	Ensuring proper ventilation and air quality in fire stations and emergency response vehicles.	4.09	.72
12	Using safety harnesses and fall protection equipment when working at heights.	4.00	.80
13	Implementing ergonomic practices to prevent musculoskeletal injuries.	4.17	.73
14	Participating in regular fitness and wellness programs to maintain physical health.	4.07	.74
15	Staying up-to-date with the latest firefighting techniques and technologies through continuous education and training.	4.04	.66
	Mean of Means	4.12	.73

Table 4 shows the mean ratings of preventive measures adopted by firefighters. The firefighters adopt all the 15 listed preventive measures with the three highest rated preventive measures being; wearing personal protective equipment (mean = 4.31), using hearing protection (mean = 4.20), participating in regular training and drills, and implementing ergonomic practices to prevent musculoskeletal injuries (mean = 4.17).

Other practices include; Using self-contained breathing apparatus (SCBA) to prevent smoke inhalation and exposure to toxic chemicals (Mean =15), receiving vaccinations to prevent infectious diseases (mean = 4.15), taking regular breaks during emergencies (mean = 4.14), Following established safety protocols and procedures when responding to emergency situations (mean = 4.11), among others. Overall, firefighters adopt occupational hazards preventive measures as shown by the overall mean rating of 4.2.

Research Question Five: What are the practices of preventive measures of occupational health hazards among firefighters in Enugu Urban metropolis based on gender?

Table 5. Mean Ratings on Practices of Preventive Measures of Occupational Health Hazards by Male and Female Firefighters in Enugu Urban Metropolis

S/N	Preventive Measures	Male (n=160)		Female (n=55)	
		Mean	SD	Mean	SD
1	Wearing personal protective equipment such as helmets, gloves, and boots to protect against physical hazards.	4.32	.77	4.27	.85
2	Using self-contained breathing apparatus (SCBA) to prevent smoke inhalation and exposure to toxic chemicals.	4.20	.58	4.00	.69
3	Participating in regular training and drills to improve physical fitness and emergency response skills.	4.18	.73	4.13	.75
4	Conducting regular health check-ups and screenings to monitor for potential health hazards.	4.18	.69	3.85	.65
5	Following established safety protocols and procedures when responding to emergency situations.	4.11	.71	4.13	.82
7	Taking regular breaks to rest and hydrate during prolonged emergency responses.	4.18	.87	4.04	.82
8	Receiving vaccinations and immunizations to prevent infectious diseases.	4.14	.64	4.20	.62
9	Using hearing protection to prevent noise-induced hearing loss.	4.27	.74	3.96	.98
10	Practicing stress management techniques to reduce the risk of mental health issues.	4.14	.72	3.85	.95
11	Ensuring proper ventilation and air quality in fire stations and emergency response vehicles.	4.09	.72	4.07	.74
12	Using safety harnesses and fall protection equipment when working at heights.	3.96	.83	4.11	.69
13	Implementing ergonomic practices to prevent musculoskeletal injuries.	4.19	.70	4.13	.82
14	Participating in regular fitness and wellness programs to maintain physical health.	4.08	.74	4.04	.77
15	Staying up-to-date with the latest firefighting techniques and technologies through continuous education and training.	4.11	.63	3.84	.71
	Mean of Means	4.15	0.71	4.04	0.77

Table 5 shows the mean ratings of preventive measures by gender. Both male (mean = 4.15) and female firefighters (mean = 4.04) reported high adherence to preventive measures, but males rated slightly higher overall. Specifically, male firefighters reported higher adherence to measures such as wearing personal protective equipment (mean = 4.32), using hearing protection (mean = 4.27), Using self-contained breathing apparatus (SCBA) to prevent smoke inhalation and exposure to toxic chemicals (mean = 4.20), Implementing ergonomic practices to prevent musculoskeletal injuries (Mean = 4.19), Participating in regular training and drills to improve physical fitness and emergency response skills (Mean= 4.18), Conducting regular health check-ups and screenings to monitor for potential health hazards (Mean = 4.18), Taking regular breaks to rest and hydrate during prolonged emergency responses (Mean = 18), Receiving vaccinations and immunizations to prevent infectious diseases (Mean = 4.14), practicing stress management (mean = 4.14), and Staying up-to-date with the latest firefighting techniques and technologies through continuous education and training (Mean = 4.11) compared to females. Female firefighters, however, rated receiving vaccinations (mean = 4.20) and using safety harnesses (mean = 4.11) slightly higher than males.

This suggests that while both genders adhere to all the necessary preventive measures of occupational hazards, there slight mean differences in specific practices which are mostly in favour of male firefighters.

Research Question Six: What are the practices of preventive measures of occupational health hazards among firefighters in Enugu Urban metropolis based on years of experience?

Table 6. Mean Ratings on Practices of Preventive Measures of Occupational Health Hazards by Firefighters of Different Years of Experience in Enugu Urban Metropolis

S/N	Preventive Measures	0-10 years (n=69)		11-20 years(n=90)		21 years & above (n=56)	
		Mean	SD	Mean	SD	Mean	SD
1	Wearing personal protective equipment such as helmets, gloves, and boots to protect against physical hazards.	4.38	.79	4.07	.80	4.61	.65
2	Using self-contained breathing apparatus (SCBA) to prevent smoke inhalation and exposure to toxic chemicals.	4.23	.62	4.06	.59	4.20	.64
3	Participating in regular training and drills to improve physical fitness and emergency response skills.	4.14	.69	4.11	.81	4.29	.62
4	Conducting regular health check-ups and screenings to monitor for potential health hazards.	4.03	.77	4.06	.62	4.23	.69
5	Following established safety protocols and procedures when responding to emergency situations.	4.26	.66	3.98	.78	4.14	.75
6	Using fire-resistant clothing and gear to prevent burns and heat stress.	3.94	.70	4.07	.63	4.18	.61
7	Taking regular breaks to rest and hydrate during prolonged emergency responses.	4.26	.83	3.94	.84	4.30	.85
8	Receiving vaccinations and immunizations to prevent infectious diseases.	4.16	.72	4.11	.61	4.21	.56
9	Using hearing protection to prevent noise-induced hearing loss.	4.20	.68	4.23	.82	4.13	.97
10	Practicing stress management	3.88	.88	4.11	.73	4.21	.76

	techniques to reduce the risk of mental health issues.						
11	Ensuring proper ventilation and air quality in fire stations and emergency response vehicles.	4.19	.71	4.00	.73	4.11	.71
12	Using safety harnesses and fall protection equipment when working at heights.	3.99	.72	3.93	.85	4.13	.81
13	Implementing ergonomic practices to prevent musculoskeletal injuries.	4.12	.83	4.26	.66	4.11	.71
14	Participating in regular fitness and wellness programs to maintain physical health.	4.04	.70	3.96	.81	4.29	.65
15	Staying up-to-date with the latest firefighting techniques and technologies through continuous education and training.	4.14	.69	3.94	.66	4.07	.63
	Mean of Means	4.13	0.73	4.05	0.73	4.21	0.71

Table 6 highlights the mean ratings of preventive measures based on years of experience of firefighters. Firefighters with 21 years and above reported the highest mean practice of preventive measures (mean = 4.21), followed by those with 0–10 years (mean = 4.13), and lastly 11–20 years (mean = 4.05).

Specifically, preventive measures such as wearing personal protective equipment and taking regular breaks were rated highly across all groups, with the most experienced group rating them the highest (4.61 and 4.30, respectively). Other practices rated most highly by those with the highest years of experience were; Participating in regular training and drills to improve physical fitness and emergency response skills (Mean = 4.29), Six other preventive measures were rated most highly by the firefighters with 21 years and above experience. These include; conducting regular health check-ups and screenings to monitor for potential health hazards (Mean = 4.23), practicing stress management techniques to reduce the risk of mental health issues (Mean = 4.21), receiving vaccinations and immunizations to prevent infectious diseases (Mean = 4.21), using fire-resistant clothing and gear to prevent burns and heat stress (Mean = 4.18), and using safety harnesses and fall protection equipment when working at heights (Mean = 4.13). Firefighters with 0–10 years of experience reported higher adherence to ventilation practices (mean = 4.19) and staying up-to-date with firefighting techniques (mean = 4.14) compared to those with 11–20 years. Overall, those with highest working experienced had highest mean ratings of most of the preventive practices.

4.3 Discussion of Findings

The findings of this research are discussed based on the research questions Occupational Health Hazards Faced by Firefighters in Enugu Urban Metropolis

The results of this study revealed that firefighters in Enugu Urban Metropolis face various occupational health hazards, including burns, smoke inhalation, physical injuries, crush injuries, eye injuries, skin irritation, electrical shock, chemical exposure, exposure to toxic substances, musculoskeletal disorders, and noise-induced hearing loss, psychological trauma, respiratory problems, fatigue, and heat stress. This indicates that firefighters are exposed to a wide range of hazards that can affect their physical and mental health. The likely reason for this outcome lies in the nature of firefighting work, which involves exposure to extreme temperatures, toxic substances, and physical dangers. Firefighters often work in high-risk environments, which can lead to injuries and health problems. This finding is consistent with the work of Alom and Ogbuene (2023), who reported that firefighters are exposed to various occupational health hazards, including physical, chemical, and psychological hazards. Similarly, Opeyemi and Charles (2023) observed that firefighters are at risk of experiencing occupational health hazards, including injuries, respiratory problems, and mental health issues. The result also aligns with the International Labour Organization (ILO) guidelines on occupational safety and health, which emphasize the importance of protecting workers from hazards and risks in the workplace. The ILO guidelines recognize that firefighters are among the workers who face high risks of occupational health hazards and emphasize the need for employers to provide a safe working environment and adequate protective equipment. Furthermore, the findings of this study affirm the importance of occupational health and safety measures in protecting firefighters from hazards and risks. The study highlights the need for firefighting organizations to

prioritize the health and safety of firefighters, providing them with adequate training, equipment, and resources to manage risks and prevent occupational health hazards. Therefore, the occupational health hazards faced by firefighters in Enugu Urban Metropolis may be attributed to the nature of their work and the risks associated with firefighting. This highlights the need for firefighting organizations to prioritize the health and safety of firefighters, providing them with adequate protective equipment, training, and resources to manage risks and prevent occupational health hazards.

Occupational Health Hazards Faced by Firefighters in Enugu Urban Metropolis based on Gender

The results of this study revealed that there were slight differences in the percentage of male and female firefighters facing the various occupational health hazards of firefighters in Enugu Urban Metropolis. This indicates that both male and female firefighters are exposed to similar occupational health hazards, but with some variations in the frequency and severity of the hazards. The likely reason for this outcome lies in the fact that male and female firefighters often perform similar tasks and are exposed to similar risks, but may have different physical and psychological responses to the hazards. This finding is consistent with the work of Agaja (2023), who reported that male and female firefighters face similar occupational health hazards, but with some differences in the frequency and severity of the hazards. Similarly, Bezrukova (2023) observed that male and female firefighters are exposed to similar occupational health hazards, but female firefighters may be more vulnerable to certain hazards due to physical and biological differences. The result also aligns with the principles of occupational health and safety, which emphasize the importance of protecting all workers from hazards and risks in the workplace, regardless of gender. The findings of this study highlight the need for firefighting organizations to prioritize the health and safety of all firefighters, providing them with adequate training, equipment, and resources to manage risks and prevent occupational health hazards. Furthermore, the findings of this study suggest that firefighting organizations should consider the specific needs and vulnerabilities of male and female firefighters when developing occupational health and safety policies and programs. This may include providing additional support and resources for female firefighters, who may be more vulnerable to certain hazards. Therefore, the slight differences in the percentage of male and female firefighters facing occupational health hazards in Enugu Urban Metropolis may be attributed to the physical and psychological differences between male and female firefighters, as well as the specific tasks and risks associated with their work. This highlights the need for firefighting organizations to prioritize the health and safety of all firefighters, providing them with adequate training, equipment, and resources to manage risks and prevent occupational health hazards.

Occupational Health Hazards Faced by Firefighters in Enugu Urban Metropolis based on Years of Experience

The results of this study revealed that although all categories of firefighters face the same occupational health hazards, the percentage of those with longer years of experience was slightly more than those with fewer years of experience. This indicates that firefighters with more years of experience are more likely to be exposed to occupational health hazards, possibly due to their increased involvement in high-risk situations. The likely reason for this outcome lies in the fact that firefighters with more years of experience are often assigned to more complex and high-risk tasks, which increases their exposure to occupational health hazards. This finding is consistent with the work of Chornomaz (2023), who reported that firefighters with more years of experience are more likely to be exposed to occupational health hazards due to their increased involvement in high-risk situations. Similarly, Ukegbu (2022) observed that firefighters with longer years of experience are more likely to experience occupational health hazards due to their cumulative exposure to risks. The result also aligns with the principles of occupational health and safety, which emphasize the importance of protecting workers from hazards and risks in the workplace, particularly those with more years of experience. The findings of this study highlight the need for firefighting organizations to prioritize the health and safety of firefighters with more years of experience, providing them with adequate training, equipment, and resources to manage risks and prevent occupational health hazards. The findings of this study suggest that firefighting organizations should consider the specific needs and vulnerabilities of firefighters with more years of experience when developing occupational health and safety policies and programs. This may include providing additional support and resources for firefighters with more years of experience, such as regular health check-ups and mental health support. Hence, the slightly higher percentage of firefighters with longer years of experience facing occupational health hazards in Enugu Urban Metropolis may be attributed to their increased involvement in high-risk situations and cumulative exposure to risks. This highlights the need for firefighting organizations to prioritize the health and safety of firefighters with more years of experience, providing them with adequate training, equipment, and resources to manage risks and prevent occupational health hazards.

Practice of Preventive Measures of Occupational Health Hazards among Firefighters in Enugu Urban Metropolis

The results of this study revealed that firefighters in Enugu Urban Metropolis practice some preventive measures of occupational health hazards. This indicates that firefighters are aware of the importance of preventing occupational health hazards and are taking steps to protect themselves. The likely reason for this

outcome lies in the fact that firefighters are trained to prioritize their safety and health, and are equipped with personal protective equipment (PPE) and other resources to prevent occupational health hazards. This finding is consistent with the work of Obasa (2020), who reported that firefighters are aware of the importance of preventing occupational health hazards and take steps to protect themselves. Similarly, El Diasty (2022) observed that firefighters prioritize their safety and health, and take measures to prevent occupational health hazards. The result also aligns with the principles of occupational health and safety, which emphasize the importance of preventing hazards and risks in the workplace. The findings of this study highlight the need for firefighting organizations to continue to prioritize the health and safety of firefighters, providing them with adequate training, equipment, and resources to prevent occupational health hazards. The findings of this study suggest that firefighting organizations should continue to promote a culture of safety and health among firefighters, encouraging them to prioritize their safety and health and take steps to prevent occupational health hazards. This may include providing regular training and refresher courses, as well as recognizing and rewarding firefighters who prioritize their safety and health. Therefore, the practice of preventive measures of occupational health hazards among firefighters in Enugu Urban Metropolis may be attributed to their awareness of the importance of preventing occupational health hazards and their training and equipment to protect themselves. This highlights the need for firefighting organizations to continue to prioritize the health and safety of firefighters, providing them with adequate resources and support to prevent occupational health hazards.

Practice of Preventive Measures of Occupational Health Hazards among Firefighters in Enugu Urban Metropolis based on Gender

The results of this study revealed that male firefighters had higher mean rating of the practice of preventive measures of occupational health hazards compared to female firefighters. This indicates that male firefighters are more likely to practice preventive measures of occupational health hazards, possibly due to their increased exposure to high-risk situations and greater confidence in their ability to manage risks. The likely reason for this outcome lies in the fact that male firefighters may be more likely to engage in high-risk activities and therefore take more precautions to protect themselves. This finding is consistent with the work of Ugwu (2021), who reported that male firefighters are more likely to practice preventive measures of occupational health hazards due to their increased exposure to risks. Similarly, Sabitu (2009) observed that male firefighters are more confident in their ability to manage risks and therefore take more precautions to protect themselves. The result also aligns with the principles of occupational health and safety, which emphasize the importance of protecting workers from hazards and risks in the workplace. The findings of this study highlight the need for firefighting organizations to prioritize the health and safety of female firefighters, providing them with adequate training, equipment, and resources to manage risks and prevent occupational health hazards. Furthermore, the findings of this study suggest that firefighting organizations should consider the specific needs and vulnerabilities of female firefighters when developing occupational health and safety policies and programs. This may include providing additional support and resources for female firefighters, such as training on risk management and prevention of occupational health hazards. Therefore, the higher mean rating of male firefighters in the practice of preventive measures of occupational health hazards may be attributed to their increased exposure to high-risk situations and greater confidence in their ability to manage risks. This highlights the need for firefighting organizations to prioritize the health and safety of female firefighters, providing them with adequate resources and support to prevent occupational health hazards.

Practice of Preventive Measures of Occupational Health Hazards among Firefighters in Enugu Urban Metropolis based on Years of Experience

The results of this study revealed that firefighters with the longest years of experience had higher mean rating of the practice of preventive measures of occupational health hazards. This indicates that firefighters with more years of experience are more likely to practice preventive measures of occupational health hazards, possibly due to their increased awareness of the risks and hazards associated with their job. The likely reason for this outcome lies in the fact that firefighters with more years of experience have had more opportunities to learn from their experiences and develop strategies to manage risks and prevent occupational health hazards. This finding is consistent with the work of Eze (2019), who reported that firefighters with more years of experience are more likely to practice preventive measures of occupational health hazards due to their increased awareness of the risks. Similarly, Sofoluwe (2020) observed that firefighters with longer years of experience are more likely to take proactive measures to prevent occupational health hazards. The result also aligns with the principles of occupational health and safety, which emphasize the importance of experience and training in preventing hazards and risks in the workplace. The findings of this study highlight the need for firefighting organizations to prioritize the training and development of firefighters, providing them with opportunities to learn from their experiences and develop strategies to manage risks and prevent occupational health hazards.

Furthermore, the findings of this study suggest that firefighting organizations should consider the specific needs and vulnerabilities of firefighters with fewer years of experience, providing them with additional support

and resources to manage risks and prevent occupational health hazards. This may include providing mentorship programs, regular training, and feedback to help them develop their skills and knowledge.

Therefore, the higher mean rating of firefighters with the longest years of experience in the practice of preventive measures of occupational health hazards may be attributed to their increased awareness of the risks and hazards associated with their job, as well as their experience and training in managing risks. This highlights the need for firefighting organizations to prioritize the training and development of firefighters, providing them with opportunities to learn from their experiences and develop strategies to manage risks and prevent occupational health hazards.

III. Conclusion

The findings of this study revealed that firefighters in Enugu Urban Metropolis face various occupational health hazards, and that preventive measures are being practiced. The study also showed that male firefighters and those with longer years of experience are more likely to practice preventive measures. The results suggest that firefighting organizations should prioritize the health and safety of firefighters, providing them with adequate training, equipment, and resources to manage risks and prevent occupational health hazards. These outcomes indicate that a proactive approach to occupational health and safety is essential for protecting firefighters from hazards and risks, and that both male and female firefighters respond positively to preventive measures.

IV. Implications of the Findings

The implications of this study are particularly significant for firefighting organizations, policymakers, and occupational health and safety professionals. If the findings of this study are not addressed, firefighters will be more likely to experience occupational health hazards, leading to increased injuries and illnesses. This will result in decreased safety culture among firefighters, leading to increased risk-taking behavior and decreased adherence to safety protocols. Firefighters who are injured or experience occupational health hazards will be unable to perform their duties, leading to reduced productivity and increased workload on other firefighters. The consequences of occupational health hazards will lead to increased healthcare costs for firefighters, which may be borne by the firefighting organization or the government. Firefighters who are constantly exposed to occupational health hazards will experience decreased morale and job satisfaction, leading to increased turnover rates and decreased retention of experienced firefighters. This will have a negative impact on public safety, as firefighters are essential for responding to emergencies and protecting the public.

Firefighters who are exposed to occupational health hazards will be at increased risk of developing long-term health problems, such as respiratory diseases, cancer, and mental health disorders. The consequences of occupational health hazards will lead to increased absenteeism and decreased productivity among firefighters, resulting in decreased effectiveness in responding to emergencies. Firefighting organizations will struggle to recruit and retain experienced firefighters, leading to decreased capacity to respond to emergencies and protect the public. The health and well-being of firefighters will be compromised, leading to decreased quality of life and increased mortality rates. The public's safety and well-being will be put at risk, as firefighters are essential for responding to emergencies and protecting the public.

5.4 Recommendations

Sequel to the implications of the findings, the following recommendations were made:

1. Firefighting organizations should prioritize the health and safety of firefighters, providing them with adequate training, equipment, and resources to manage risks and prevent occupational health hazards.
2. Firefighting organizations should consider the specific needs and vulnerabilities of male and female firefighters, as well as those with different years of experience, when developing occupational health and safety policies and programs.
3. Government should ensure that regular training and refresher courses are provided for firefighters to update their knowledge and skills on managing risks and preventing occupational health hazards.
4. Firefighting organizations should promote a culture of safety and health among firefighters, encouraging them to prioritize their safety and health and take steps to prevent occupational health hazards.
5. Firefighting organizations should provide adequate personal protective equipment (PPE) to firefighters and ensure they use them properly
6. Fighting organizations should consider conducting regular health check-ups and monitoring for firefighters to identify and address potential health hazards early.

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