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KNOWLEDGE, ATTITUDE, AND UTILISATION OF PERSONAL PROTECTIVE EQUIPMENT AMONG TIE-AND-DYE FABRIC DYERS IN ABEOKUTA, OGUN STATE, NIGERIA

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ABSTRACT

This study examined dyers' knowledge, attitudes, and utilisation of personal protective equipment (PPE) during the production of tie-and-dye (adire) fabrics, alongside the factors influencing PPE use in Abeokuta, Nigeria. The study population comprised fabric dyers from the Itoku and Asero markets, with 320 respondents selected through a convenience sampling technique. Data were collected using structured questionnaires and analysed using frequency counts, percentages, mean, standard deviation, and Pearson Product-Moment Correlation (PPMC). Findings indicated a high level of knowledge regarding the importance of PPE ($\bar{x}$ = 1.78), a favourable attitude towards its use ($\bar{x}$ = 3.05), and a moderate level of actual utilisation ($\bar{x}$ = 2.62). Foot protectors and hand gloves were reported as the most frequently used PPE. Key factors influencing usage included price ($\bar{x}$ = 3.51), accessibility ($\bar{x}$ = 3.47), and comfort ($\bar{x}$ = 2.67). Furthermore, significant relationships ($p < 0.05$) were observed between educational status and PPE use ($r = –0.169$), as well as between years of dyeing experience and PPE use ($r = –0.678$). Overall, the findings suggest that while dyers demonstrate substantial knowledge and positive attitudes towards PPE, their level of utilisation remains moderate, underscoring the need for targeted interventions to promote consistent and comprehensive PPE adoption in the informal textile sector.

Keywords: *Dyers, Fabric dyeing, Personal Protective Equipment, Textile production, Workplace Hazards.*

INTRODUCTION

The use of appropriate and quality personal protective equipment (PPE) in workplaces cannot be overemphasised. Several years ago, this need was highlighted by several physicians; Sir Thomas Morrison Legge identified the roles of the employer of labour and those of the employee in reducing workplace hazards and consequently achieving a healthy workplace environment (Amoo and Ezoke, 2020). Indeed, protection of workers from workplace hazards is crucial to reduce mortality and morbidity in the workplace; many of these morbidities and mortalities usually occur long after the workman has left the workplace (Aguwa, 2013). Hence, besides other control measures it becomes important to assess compliance of the employer/employee with personal protective equipment (PPE). PPE or Personal Protective Devices (PPDs) are designed to protect employees from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. They include face shields, safety glasses/goggles, hats/safety helmets, safety shoes, overalls, gloves, ear protection (ear plugs and muffs), vests, respirators, etc. (Occupational Safety, 2009). Often, more than one of these PPE items is worn at the same time in the workplace, depending on the work exposure, e.g. fabric dyers may need gloves, facemask, apron, etc., depending on the activity being carried out (Montana state hospital, 2009).

The need for this PPE has increased over the years with increasing awareness of workplace hazards and the difficulties associated with overdependence on other control measures, which, for some agents, cannot be eliminated or even monitored. Although it is generally recognised that, while in some fabric dying work environments, the noncompliance with PPE policy may not result in significant health problems but for some other occupations, failure to comply with PPE could determine the difference between life and disability or even death (Aguwa, 2016). However, this is not to say that the use of PPE is not important in fabric dyeing, where workers are often exposed to different hazardous agents like caustic soda, hydrosulphide, dye stuffs, etc.

All PPE should be safely designed and constructed, and should be maintained in a clean and reliable fashion. It should fit comfortably, encouraging worker use. If the PPE does not fit properly, it can make the difference between being safely covered and dangerously exposed. In any given work environment, there is always exposure to various risks and injuries ranging from machine failure to exposure to dangerous chemicals and gases through inhalation and skin contact, ergonomic injuries, burns, frost bites, and radiation, to mention a few. Measures are always put in place to ensure that workers in these work environments are protected from these injuries that pose a risk to their health. PPE thus comes as the final barrier between the workers and the injurious exposures. According to Bangor University (2018), it is a requirement by most authorities to provide workers with PPE. An employer should provide adequate training, conduct routine inspections, and have enough PPE supplies on hand to protect all employees; this will contribute to a safer work environment.

Adire fabrics are resist-dyed textile materials produced and worn by the Yoruba people of southwestern Nigeria in West Africa. The Yoruba label adire, which means "tie and dyed," was first applied to indigo-dyed cloth decorated with resist patterns around the turn of the twentieth century (Encyclopedia of Clothing and Fashion, 2016). The dyes were initially extracted from grasses and leaves, which were soaked for a number of days in order to extract the dye. However, with innovation, hydrosulphite and caustic soda are used to make sure the dye is perfectly absorbed in the material (Tomori, 2011). Hence, the dyestuffs and chemicals currently used in fabric dyeing and finishing may be harmful to human health, especially with long-term or accidental overexposure, there can be potential health hazards.

Uncontrolled exposure to some hazardous dyestuffs is clearly recognized as potentially harmful to health; but there are a very large number of dyes that have not been associated with any adverse health effects. It is possible that, for a small number of these, adverse effects on health can occur but have not yet been detected; however, it is unlikely we will ever have complete knowledge of all the hazards of dyes. Hence, it is prudent to minimize exposure to dyes of all types, even if no adverse health effects are known (Health and Safety Executive, n.d).

Some common hazards of reactive dyes are respiratory problems due to the inhalation of dye particles. Sometimes they can affect a person's immune system and in extreme cases, this can mean that when the person next inhales the dye, their body can react dramatically. This is called respiratory sensitization; symptoms include itching, watery eyes, sneezing and symptoms of asthma such as coughing and wheezing, Skin irritation or dermatitis as a result of skin contact, asthma as a result of developing an allergy to substances, losing consciousness as a result of being overcome by toxic fumes, cancer, which may appear long after the exposure to the chemical that caused it, and infection from bacteria and other micro-organisms (Samia *et al.,* 2015).

In the same vein, Krishan and Anish (2015), observed that workers in the dying industry are exposed to various respiratory symptoms and illness like asthma, cough, chest pain, chronic bronchitis, chest tightness, etc. this also keep dyers away from work which not only deteriorate the standard of living of people but may also cause long term sickness or even death which may reduce the production of fabrics. Therefore, the problem of this study is the poor usage of PPE among *adire* fabric dyers.

The primary objective of this study was to evaluate the knowledge, attitudes, and utilisation of personal protective equipment (PPE) among fabric dyers in Abeokuta, Nigeria. In line with this objective, the study specifically examined respondents' knowledge of the usefulness of selected PPE, investigated their attitudes towards its application, assessed the extent of PPE utilisation, and identified the key factors influencing its adoption.

Hypotheses

$H_0$1: There is no significant relationship between the level of education of the dyers and the use of PPE.

$H_0$2: There is no significant relationship between years of experience of the dyers and the use of PPE.

METHODOLOGY

Research Design: This study adopted a descriptive survey design where the researcher made use of primary data.

Study Area: The study concentrated on two major locations in Abeokuta (Figure 1), where the production and sale of tie and dye (adire) fabrics are renowned, specifically the Itoku and Asero markets.

Population for the Study: The population for this study comprised all the fabric dyers in Adire/Kampala International Market, Asero and Itoku market.

Sample Size: The sample size was determined using the formula;

$$N = \frac{Z^2PQ}{D^2}$$

where Z is constant, a confidence level of 95%=1.96; P=29% (respondents who have been using at least one kind of PPE according to Akintayo, 2013) = 0.29

Q=1-P = 1-0.29 = 0.71
D= precision value=0.05
N=316.394176 {N= 320}

Therefore, 320 respondents were used for the study. However, 300 questionnaires, which were filled were eventually analysed.

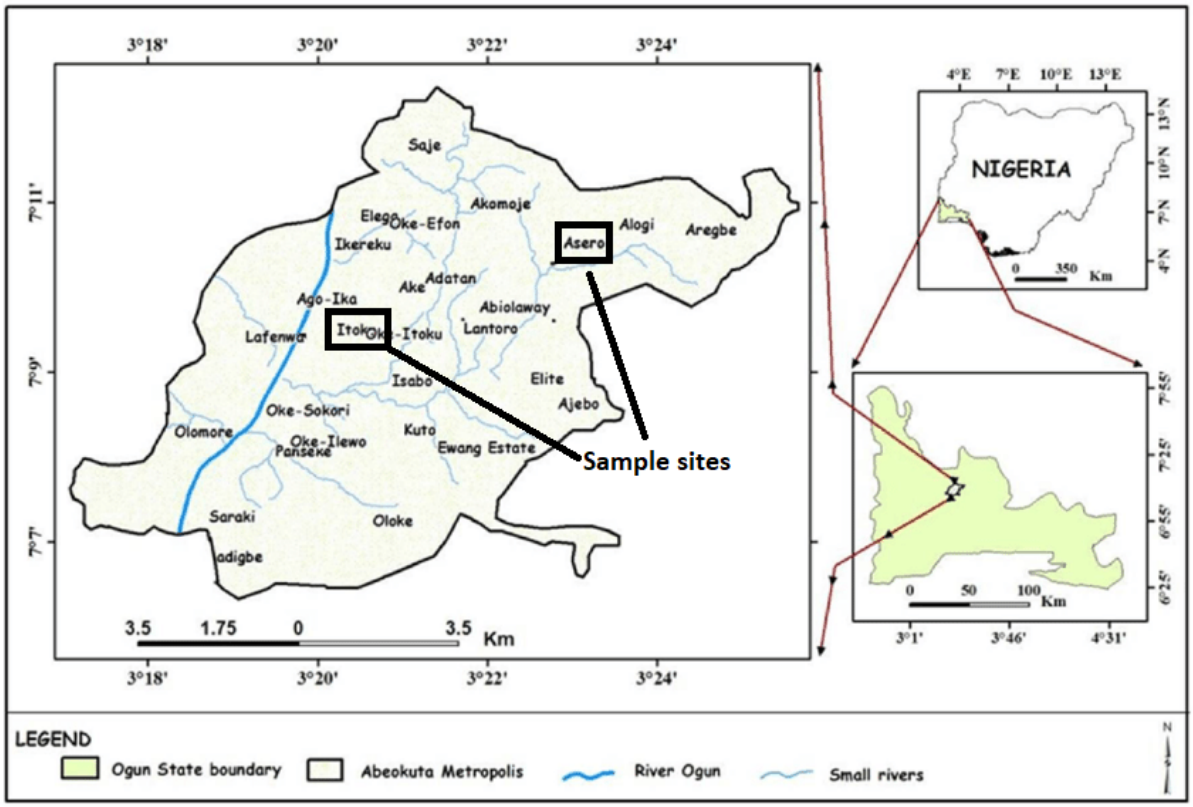

Fig. 1: Map of Abeokuta metropolis showing the sample sites

Sampling Technique: Convenience sampling technique was used to select the respondents in both Itoku and Asero markets based on their availability and willingness to participate in the study.

Research Instrument: A well-structured questionnaire, which had undergone validity and reliability tests, was administered to the respondents. The questionnaire was divided into five sections in line with the specific objectives of the study.

A. The socio-demographic characteristics of respondents, which consisted of the personal information of each respondent: age, sex, level of education, marital status, etc.
B. The knowledge of the respondents was measured using a yes or no scale in response to statements formulated by the researcher.
C. The attitude of the respondent was measured using a four-point scale where 4 = strongly agree (SA), 3= agree (A), 2= disagree (D), 1= strongly disagree (SD). This section was adapted from Yuantari *et al.,* (2015).
D. Respondents' use of personal protective equipment was measured using a four-point scale where 4=always use (AU), 3=don't use (DU), 2=sometimes use (SU), 1=never use (NU). This section was adapted from Yuantari *et al.,* (2015).
E. The identification of the factors that influenced the use of PPE; using a four-point scale as well, where 4 = strongly agree (SA), 3= agree (A), 2= disagree(D), 1= strongly disagree (SD). This section was adapted from Munyua (2017).

Reliability of the Research Instrument: A pilot study was carried out among dyers in the Oke-lantoro area of Abeokuta using 10% of the sample size to test the reliability of the instrument; a Cronbach's Alpha reliability coefficient of 0.716 was derived.

Method of Data Analysis: The data was analysed using frequency counts, percentages, mean, standard deviation and Pearson Product-Moment Correlation (PPMC) was used to analyse the hypotheses. Statistical package for social scientists (SPSS version 21) was used to analyse the data.

Decision rule: Mean value of 1.00-1.50 = poor knowledge and 1.51-2.00= good knowledge;

Mean value of 1.00-2.50 = unfavourable attitude and 2.51-4.00= unfavourable attitude;

Mean value of 1.00-2.00 = low level of use, 2.01-3.00= moderate level of use and 3.01-4.00= low level of use.

RESULTS

Socio-demographics: More than two-thirds (74.3%) of the respondents of this study fell between 26 and 35 years of age. The majority (71%) were female, most (69.3%) were married and only (29.3%) were single. The highest level of education for most (62.7%) of the respondents was secondary school education and one-third (34.7%) of the respondents had tertiary education. On average, the respondents of this study had been fabric dyers for about 11-20 years (58.5%). For the respondent's weekly income, 26.3% earned ₦6000-₦10000, and 47.7% earned ₦11000-₦15000. Also, the majority (88.3%) of the respondents were Yorubas.

Respondents' Knowledge of Available Personal Protective Equipment

Table 1 shows that the majority (82%) of the respondents agreed that PPEs are important while working with dyes and chemicals, and almost all (92%) of the respondents agreed that the use of PPE reduces the risks of dyes and chemical injuries. The majority (90%) of the respondents know that a nose cover is a type of PPE that can be worn to prevent inhaling of chemicals and dyes.

Almost all the respondents (97.6%) also accepted that hand gloves are worn to keep the hands away from the chemicals and dye contact and majority agreed (85.0%) that Foot protector should be worn to protect the feet from chemicals and dye contact.

It can therefore be deduced that the respondents of this study have good knowledge of PPE that should be worn to do their work in a safe manner ($\bar{x}$ = 1.78).

Table 1: Respondents Knowledge on the usefulness of selected Personal Protective Equipment (PPE).

STATEMENTS	YES (%)	NO (%)	Mean
PPE are important while working with dyes and chemicals	246(82)	54(18)	1.82
PPE reduces the risk of dye and chemical injuries	276(92)	24(8)	1.92
Nose cover is worn to prevent the inhaling of chemical and dye particles.	270(90)	30(10)	1.90
Eye goggles can be worn to protect the eyes during use of dyes and chemicals.	158(52.7)	142(47.3)	1.53
Whole body protector (overall coat) should be worn to protect the body from dye and chemicals	136(45.3)	164(54.7)	1.45
Hand gloves are worn to keep the hands away from the chemical and dye contact	293(97.6)	7(2.3)	1.98
Foot protector (safety boot) are worn to protect the feet from chemical and dye contact	255(85.0)	45(15.0)	1.85

Overall Mean $= \frac{\sum x_i}{n} = \frac{\sum x}{No.\ of\ statement} = 1.78$

Respondents' Attitude towards the Use of PPE during Adire Production

Table 2 shows that the majority of the respondents agreed that the use of personal protective equipment when mixing dyes and chemicals will protect them from injuries and health hazards ($\bar{x}$ = 3.29), the respondents agreed that they should always wear safety boots as it is an important PPE ($\bar{x}$ = 3.76), they agreed the same for hand gloves ($\bar{x}$ = 3.77) and they moderately agreed that they should always use nose covers during production ($\bar{x}$ = 2.67). Overall, the results showed a favourable attitude of the respondents towards the use of PPE ($\bar{x}$ = 3.05)

Table 2: Respondents' Attitudes towards the Use of PPE

Statement	SD (%)	D(%)	A(%)	SA(%)	Mean
The use of personal protective equipment when mixing dyes and chemicals will protect me from injuries and health hazards.	35(11.7)	0(0)	107(35.7)	158(52.7)	3.29
I must wear personal protective equipment when mixing dye, chemicals and dying clothes	0(0)	142(47.30)	58(19.3)	100(33.3)	2.86
I should always wear a foot protector (safety boot) as it is an essential piece of PPE.	0(0)	0(0)	70(23.3)	230(76.7)	3.76
I should always wear hand gloves as it is an important PPE	0(0)	0(0)	67(22.3)	233(77.7)	3.77
I should always use eye goggles as it is an important PPE	35(11.7)	139(46.3)	69(23)	57(19)	2.49
I should always use a nose cover as it is an important PPE	7(2.3)	154(51.3)	69(23)	70(23.3)	2.67
I should always wear a whole-body protector (overall coat) as it is an important PPE	35(11.7)	139(46.3)	56(18.7)	70(23.3)	2.54

Overall Mean= $\frac{\sum x_i}{n} = \frac{\sum x}{No\ of\ statement}$ **=3.05**

Respondents' Level of Use of PPE during Adire Production.

Table 3 shows the frequency of use of PPE among the respondents. The scale used to measure frequency of use was: Never use, sometimes use, Often use and Always use.

Results showed that the respondents' level of use of safety boots and hand gloves was high ($\bar{x}$ = 3.77 and 3.55 respectively), the respondents' use of Nose cover is moderate ($\bar{x}$ = 2.06) while their usage of the Whole-body protector and eye goggle is low ($\bar{x}$ = 1.92 and 1.81, respectively. Overall, the respondents of this study had a moderate level of use of PPE ($\bar{x}$ = 2.62).

Table 3: **Identification of Respondent's level of Use of Personal Protective Equipment.**

PPE Types	NU(%)	SU(%)	OU(%)	AU(%)	Mean
Hand gloves	0(0)	0(0)	136(45.3)	164(54.7)	3.55
Whole-body protector (overall coat)	129(43)	101(33.7)	35(11.7)	35(11.7)	1.92
Foot protector (safety boot)	0(0)	35(11.7)	0(0)	265(88.3)	3.77
Nose cover	89(29.7)	105(35)	106(35.3)	0(0)	2.06
Eye goggle	161(53.7)	34(11.3)	105(35)	0(0)	1.81

Overall mean = $\frac{\sum x_i}{n} = \frac{\sum x}{No\ of\ statement}$ **= 2.62**

Factors Influencing Respondents' Use of PPE

Table 4 indicated that majority agreed that price of PPE will determine if they will buy or not ($\bar{x}$ = 3.51) and that PPE are easily found in the markets near them ($\bar{x}$ = 3.47). The respondents moderately agreed that they are usually not comfortable wearing all the PPE that is necessary for their craft ($\bar{x}$ = 2.67), and moderately agreed to receiving social and peer support ($\bar{x}$ = 2.16) on the use of PPE. However, the respondents disagreed that without the use of PPE, they are at risk of getting injured by dye and chemicals

TABLE 4: Factors Influencing the Use of PPE among Respondents

Factors	Statement	SD(%)	D(%)	A(%)	SA(%)	Mean
Price	The price of PPE will determine if I will buy or not	0(0)	22(7.3)	103(34.3)	175(58.3)	3.51
Risk perception	Without the use of PPE, I am at risk of getting injured by dye and chemicals	160(53.3)	104(34.7)	36(12)	0(0)	1.59
Comfortability	I am not always comfortable when I wear all the necessary PPE	36(12)	35(11.7)	92(30.7)	105(35)	2.67
Availability of personal equipment	Personal protective equipment are easily found in the markets near me	0(0)	0(0)	158(52.7)	142(47.3)	3.47
Social support and peer	My colleagues support the use of personal protective equipment	125(41.7)	71(23.7)	69(23)	35(11.7)	2.05
	My coworkers always use personal protective equipment	22(7.3)	174(58)	104(34.7)	0(0)	2.27

Research Hypotheses

$H_0$1: There is no significant relationship between the level of education of the dyers and their use of PPE.

Table 5 shows that there is a significant relationship between respondents' education and level of use; the null hypothesis was therefore rejected.

$H_0$2: There is no significant relationship between the years of experience of the dyers and the use of PPE.

Table 6 shows that there is a significant relationship between years of experience and respondents' use of PPE. Therefore, the null hypothesis was rejected.

Table 5: Table showing the relationship between Respondents Education and Practice

	N	Mean	Std. Deviation	r	P	Remark
Level of education	300	2	0.15608	0.169	0.003	significant
Respondents' level of use	300	2.62	1.00514			

*Significant at 0.05 level

Table 6: Table showing the relationship between Years of Experience and Practice

	N	Mean	Std. Deviation	r	P	Remark
How long have you been a fabric dyer?	300	3	1.092	0.678	0.00	Significant
Respondents' practices	300	2.62	1.00514			

*Significant at 0.05 level

Discussion of Results

The result of this study showed that more than two-thirds (74.3%) of the respondents of this study fell between 26 and 35 years of age and the majority of the respondents were female (71%). Several studies in different parts of the world suggest that there are more female textile dyers than male; a study by the International Labor Organization (ILO) in 2017 found that in the textile and clothing industry in India, women constitute a significant portion of the workforce in textile and clothing production; also, number of women workers in the sector has been consistently increasing, often overtaking the rate of increase of male employment. Another study by Akinmoye and Ogunduyile (2020) suggests that women are more likely to work in textile dyeing than men.

A larger percentage (69%) of the respondents in this study were married, while most (62.7%) of the respondents had secondary school leaving certificates as their highest level of education which implies that tertiary education may not be necessary for the textile dyeing occupation, this is in line with the study of Ogunduyile *et al.,* (2017) which revealed that most of the respondents agreed that formal schooling is of no use to dyers. Averagely (47.7%), the respondents in this study earn between ₦11,000 and ₦15,000 naira weekly and almost all (97.3%) of the respondents are Yorubas; this is expected as the study was carried out in a Yoruba land.

The study identified respondents' knowledge of the usefulness of common PPE around them. The result revealed that the respondents agreed that PPE are important while working with dyes and chemicals ($\bar{x}$ = 1.82) and PPE reduces the risk of dye and chemical injuries ($\bar{x}$ = 1.92). Overall, they showed good knowledge ($\bar{x}$ = 1.78) about the use of the different personal protective equipment that is common around them. Similarly, Kulitsara (2016) reported that the respondents of his study (even though, steel workers) had good knowledge regarding the use of PPE.

Findings of this study also showed that the majority of the respondents had a favourable attitude ($\bar{x}$ = 3.05) toward the use of personal protective equipment during adire production, in which they agreed that the use of personal protective equipment when mixing dyes and chemicals will protect them from injuries and health hazards ($\bar{x}$ = 3.05) and believed that they should always wear hand gloves ($\bar{x}$ = 3.77) as well as safety boots ($\bar{x}$ = 3.77) when mixing dye, chemicals and dying clothes. This corroborates the findings of Akintayo (2013), where it was revealed that the majority (73.2%) of the respondents had a favourable attitude towards the use of PPE.

Results revealed respondents' high usage of the foot protector ($\bar{x}$ = 3.77), hand gloves ($\bar{x}$ = 3.55), moderate usage of nose covers ($\bar{x}$ = 2.06) and low

usage of overall coats ($\bar{x}$ = 1.92), and eye goggles ($\bar{x}$ = 1.81). Although some of the dyers complained of the discomfort most of the PPE gave them while working. Several studies have reported low usage of complete PPE among factory workers; Kulitsara (2016) reported that the majority (78.9%) of the respondents of his study do not practice the use of PPE. Also, the result of Munyua (2017) indicated that none of the workers utilised the full complement of PPE that was required to protect them from chemicals and other mechanical hazards that they may be exposed to while performing various motor vehicle repairs. Akintayo (2013).

The results showed that price ($\bar{x}$ = 3.51) and availability ($\bar{x}$ = 3.47) of PPE are important factors responsible for the use of PPE. This is supported by the findings of Madziatera *et al.,* (2020), who posited that poor availability of PPE leads to poor selection of PPE, hence making availability an important determinant of usage. Comfortability is another important factor ($\bar{x}$ = 2.67) as most (65.7%) of the respondents said they do not wear PPE because it causes discomfort to them while working and this may slow down their work. This is in line with the study of Munyua (2017) and Krishan *et al.,* (2015), where they both reported that the respondents complained of discomfort from the PPE while working. Respondents' risk perception of their non-usage or insufficient usage of PPE is low ($\bar{x}$ = 1.59), this implies that they are not conscious of the possible hazards that may occur from their continuous exposure to dyes and chemicals, especially synthetic dyes.

Finally, the findings of this research revealed that there was a significant relationship between respondents' level of education and use of PPE. It can be inferred that being educated can impact on a person's willingness to use PPE because education brings knowledge. This corroborates the findings of Yeon and Shin (2020), who reported that reality-based education on the use of PPE helps to reduce contamination and improve performance related to the use of PPE. Also, there was a significant relationship between their years of experience as fabric dyers and their use of PPE. This may imply that because of their length of years of doing the craft, some of the respondents may begin to play down on the need to wear complete PPE at all times.

Conclusion

The findings of this study indicate that fabric dyers in Abeokuta possess substantial knowledge of the importance of personal protective equipment (PPE) and maintain favourable attitudes towards its use. Nevertheless, the actual level of utilisation remains moderate, suggesting a gap between awareness and practice. The frequent use of foot protectors and gloves highlights partial compliance, while other essential PPE items are underutilised. Furthermore, the study revealed that cost, accessibility, and comfort are critical determinants influencing PPE adoption, alongside educational background and years of experience. These insights underscore the need for targeted interventions aimed at improving the availability, affordability, and usability of PPE within the informal textile sector. Strengthening awareness campaigns, providing training on occupational health and safety, and implementing supportive policies could significantly enhance compliance and reduce occupational hazards among dyers.

Recommendations

Drawing on the findings of this study, the following recommendations are advanced for policymakers, regulatory bodies, and stakeholders in occupational health and the informal textile sector:

1. Institutionalised occupational health education: Government agencies, health institutions, and trade associations should establish continuous education and training programmes for fabric dyers to strengthen their knowledge, attitudes, and practices regarding PPE. Such initiatives should emphasise the occupational risks linked to dyeing chemicals and the protective role of PPE.
2. Strengthened public awareness through mass media: Policymakers and stakeholders should collaborate with media organisations to develop targeted campaigns that not only highlight the harmful effects of chemical exposure but also communicate the health, social, and economic benefits of consistent PPE adoption.
3. Regulation and enforcement of PPE use: Occupational health and safety authorities should introduce and enforce context-appropriate guidelines for PPE usage within the informal textile sector. Trade associations and cooperatives can be mobilised to reinforce compliance and provide peer-level monitoring.
4. Accessibility and affordability of PPE: Government agencies, non-governmental organisations, and industry stakeholders should work with local manufacturers and distributors to make high-quality PPE more accessible and affordable. Subsidies or cooperative purchasing schemes could

be introduced to encourage adoption, particularly among low-income dyers.

5. Integration of occupational safety into policy frameworks: State and local governments should embed occupational safety and health considerations into wider informal sector development policies. Such integration will ensure that the welfare of textile dyers and other artisans is prioritised within broader socio-economic growth strategies.
6. Ongoing research and monitoring: Further research are recommended to examine long-term patterns of PPE compliance and their impact on workers' health outcomes. Additionally, establishing monitoring and evaluation mechanisms will provide evidence-based insights for policymakers and enable the design of more effective interventions.

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