



Utilization of Personal Protective Equipment in Preventing Occupational Outcomes among Artisanal Workers in Enugu Metropolis, Enugu State, Nigeria

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Abstract

This study examined the utilization of personal protective equipment (PPE) in preventing occupational outcomes among artisanal workers in Enugu metropolis, Enugu State, Nigeria. Two research questions were answered and two null hypotheses were tested at the 0.05 level of significance. The study adopted a cross-sectional survey design. The population comprised 1,250 registered artisanal workers in Enugu metropolis drawn from the National Directorate of Employment (2023) database. The sample size was 303 artisanal workers, determined using Taro Yamane's formula at a 5% margin of error, and participants were drawn using a multi-stage sampling procedure combining cluster identification and proportionate stratified random sampling. Data were collected with a researcher-developed instrument titled Personal Protective Equipment Utilization Questionnaire (PPEUQ), a 5-point Likert-scaled instrument structured into three sections and face-validated by three experts in the Department of Public Health, Madonna University Nigeria, Elele. A pilot test on 30 artisanal workers outside the study area yielded Cronbach's alpha coefficients of 0.84 for Section B (extent of PPE utilization) and 0.79 for Section C (types of PPE utilized), with an overall coefficient of 0.82. Of the 303 copies distributed, 287 were properly completed and retrieved, representing a 94.7% return rate. Frequencies and percentages described the demographic variables, mean and standard deviation answered the research questions, and one-way analysis of variance (ANOVA) tested the null hypotheses, with item-level ANOVA applied to the seven individual PPE types. Findings revealed that artisanal workers utilized PPE to a moderate extent (grand mean = 3.36, SD = 1.03), concentrated on safety boots and hand gloves, while respiratory and eye protection recorded low utilization (grand mean = 2.93, SD = 1.02). Educational level produced a significant difference in the extent of PPE utilization, $F(2, 284) = 14.87$, $p = .000$. Years of work experience produced significant item-level differences in five of the seven PPE types; respirators, helmets, protective clothing, goggles and ear protection (all $p < .001$), while utilization of safety boots and hand gloves did not differ significantly by experience. The study concluded that PPE utilization among artisanal workers in Enugu metropolis is uneven and skewed away from the hazards that carry the greatest respiratory risk. It was recommended, among others, that occupational health regulations covering the informal sector be strengthened and that subsidised respiratory protection be made available to artisanal work clusters.

Keywords: Utilization, Personal protective equipment, Prevention, Occupational outcomes, Artisanal workers, Enugu metropolis



Introduction

Occupational health and safety (OHS) remains a fundamental concern in workplaces across the globe, particularly in hazardous and informal industries. In Nigeria, artisanal work has emerged as a major source of livelihood, especially in urban centres of the South-East, despite the inherent risks it carries for human health (Okonkwo & Eze, 2023). Artisanal workers such as welders, fabricators, panel beaters, vulcanisers and mechanics are regularly exposed to fumes, sparks, noise, heat, chemical splashes, flying particles and heavy falling objects, all of which pose severe threats to their well-being (Nnaji et al., 2021). According to the Federal Ministry of Labour and Employment (2022), more than 70% of reported workplace accidents in Nigeria occur in the informal sector, where regulatory supervision is weakest and where workers largely finance their own protection.

Occupational health, as conceptualised in this study, refers to the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations, together with the prevention of departures from health caused by working conditions (World Health Organization [WHO], 2021). Occupational outcomes are the measurable consequences of workplace practices and hazards on the worker, including workplace injuries, respiratory conditions, dermatological complaints, hearing impairment, lost work days and general well-being. In artisanal settings these outcomes are frequently negative, reflecting high accident rates, recurrent respiratory complaints and progressive deterioration of worker health (Okonkwo & Eze, 2023).

Personal Protective Equipment (PPE) refers to any device, appliance or clothing worn or held by a worker to provide protection against one or more hazards likely to endanger safety or health at work (International Labour Organization [ILO], 2022). Common items include safety helmets, hand gloves, safety boots, goggles and face shields, respirators and face masks, protective overalls, and ear protection. Although the hierarchy of controls places PPE as the last line of defence, it remains indispensable in artisanal work environments where elimination, substitution and engineering controls are practically absent (ILO, 2022). Utilization, in this study, goes beyond mere possession of protective gear: it refers to the actual, consistent and correct wearing of appropriate equipment for the duration of the task, together with routine inspection, maintenance and timely replacement. Utilization is thus understood along two dimensions that guided the study, the extent to which equipment is worn and maintained, and the types of equipment workers actually adopt, because a worker may record a high extent of utilization while relying almost exclusively on equipment that protects against one class of hazard, leaving other exposures unaddressed.

Evidence from developing economies indicates that PPE utilization is constrained by affordability, irregular supply, discomfort in hot and humid conditions, weak enforcement of safety regulations, and the perception among workers that protective gear slows down work or is unnecessary for experienced hands (Agu et al., 2022; Johnson & Motilewa, 2016). Within Nigeria's informal economy these constraints are aggravated by the absence of formal occupational safety structures, employer supervision or insurance cover, so compliance becomes inconsistent and largely dependent on the individual worker's own judgement, resources and training.

The pattern is further illuminated by the Health Belief Model (Becker, 1978; Rosenstock, 1974), whose relevance lies in its proposition that protective behaviour follows from the worker's own appraisal of risk rather than from the mere availability of equipment. The constructs of perceived barriers and self-efficacy are particularly germane to artisanal work: where protective equipment is judged expensive, uncomfortable or cumbersome, and where



the worker doubts his capacity to use it correctly, perceived barriers outweigh perceived benefits and utilization declines even when equipment is physically present. The model therefore explains why utilization in the informal sector is typically partial and selective, and why exposure-specific items such as respirators are abandoned more readily than items whose protective value is immediately visible, such as boots and gloves.

Empirical work supports this reading. Afolabi, de Beer and Haafkens (2021) studied informal automobile artisans in Osun State and reported that higher perceived risk, access to safety information and workplace norms significantly increased PPE utilization, while economic and practical constraints reduced consistent use. Aram et al. (2021), surveying artisanal goldminers in Ghana, identified task type, education and safety training as predictors of PPE use and linked non-use to higher self-reported injury rates. Agu et al. (2022) surveyed welders in Abakaliki and found that awareness alone did not guarantee effective utilization, since economic constraints, discomfort and poor availability remained decisive barriers. Johnson and Motilewa (2016) reported comparably low adoption among auto-technicians in Uyo despite moderate knowledge levels, exposing a persistent gap between knowledge and practice.

Studies focused on health consequences reinforce the case for equipment-specific attention. Ephraim-Emmanuel et al. (2023) documented elevated respiratory symptoms and reduced lung function among populations exposed to particulate and gaseous emissions in Bayelsa State, while Suku, Ugwoha, Orikpete and Ewim (2023), using an experimental animal model, observed histopathological changes in lung tissue following comparable exposure. Ikezam et al. (2021) reported widespread skin and respiratory complaints among workers in Niger Delta communities and attributed these partly to limited access to safety equipment. Taken together, these studies establish that respiratory and dermal exposures are among the most consequential occupational risks in informal trades, and that the protective value of PPE depends on the specific type adopted rather than on utilization in the abstract.

Two limitations run through this body of work. First, the studies were conducted outside Enugu metropolis, in Osun, Ebonyi, Akwa Ibom, Bayelsa, the wider Niger Delta and Ghana so their findings cannot be transferred without qualification to an urban South-East artisanal population whose trades, cluster organisation and regulatory environment differ. Second, most treated utilization as a single undifferentiated behaviour and did not examine whether it varies systematically with educational attainment and length of work experience, the two attributes most likely to shape both risk appraisal and purchasing capacity in an informal setting. This study addresses both limitations by establishing the extent and the types of PPE utilized among artisanal workers in Enugu metropolis and by determining whether utilization differs significantly by educational level and years of work experience.

Methods

Study design and setting

This study adopted a cross-sectional survey design. The design was considered appropriate because it permits the systematic collection of data from a representative sample of a defined population at a single point in time, and because the study set out to describe the extent and types of PPE utilization and to compare utilization across categories of workers rather than to manipulate any variable.

The study was conducted in Enugu metropolis, Enugu State, Nigeria, an urban area spanning Enugu North, Enugu South and Enugu East Local Government Areas, in which artisanal



trades have increasingly become a livelihood option for low-income earners. The area was chosen for its dense and growing artisanal work clusters, the absence of formal occupational health and safety structures within those clusters, and the range of physical, chemical and respiratory hazards associated with the trades practised there.

Study population

The population comprised all registered artisanal workers in Enugu metropolis. According to the National Directorate of Employment (NDE, 2023) database, 1,250 workers were registered across the artisanal work clusters in the metropolis, constituting the population framework for the study.

Sample size and sampling techniques

The sample size was 303 artisanal workers, determined using Taro Yamane's (1967) formula for finite populations at a 5% margin of error, applied to the population of 1,250 registered workers.

The 303 participants were drawn using a multi-stage sampling procedure. In the first stage, the three Local Government Areas that make up Enugu metropolis, Enugu North, Enugu South and Enugu East, were taken as sampling clusters. In the second stage, the NDE (2023) register was used to identify registered artisanal work clusters within each Local Government Area, and four clusters were selected from each through simple random sampling by balloting without replacement, giving twelve clusters in all. In the third stage, the 303 participants were allocated to the twelve clusters proportionately, according to the number of registered workers in each cluster relative to the total register. In the final stage, individual participants were selected from each cluster's register by systematic random sampling, with the first participant chosen by balloting. Only workers who were registered members of the selected clusters and had been actively practising their trade for at least twelve months were eligible for selection.

Data collection instrument

Data were collected using a researcher-developed instrument titled Personal Protective Equipment Utilization Questionnaire (PPEUQ), structured into three sections. Section A elicited demographic characteristics, namely educational level and years of work experience. Section B contained eight items measuring the extent of PPE utilization. Section C contained seven items measuring the types of PPE utilized. Sections B and C were on a 5-point Likert scale of Strongly Agree (5), Agree (4), Undecided (3), Disagree (2) and Strongly Disagree (1), with a criterion mean of 3.00 adopted for decision-making.

The instrument was subjected to face validity by three experts in the Department of Public Health, Madonna University Nigeria, Elele, whose observations on clarity, relevance and adequacy of the items were incorporated into the final draft before administration.

A pilot test was conducted on 30 artisanal workers in Nsukka urban, outside the study area but sharing similar characteristics with the study population. Cronbach's alpha reliability analysis yielded 0.84 for Section B (extent of PPE utilization) and 0.79 for Section C (types of PPE utilized), with an overall coefficient of 0.82, indicating the instrument was internally consistent and reliable for the study.

Data collection procedure

Ethical clearance was obtained from the Research and Ethics Committee of the Department of Public Health, Madonna University Nigeria, Elele, and permission to approach the work



clusters was obtained from the leadership of each selected cluster. The purpose, procedure and duration of the study were explained to every prospective participant in the language he or she understood, and written informed consent was obtained before administration. Participation was voluntary, with participants informed of their right to decline or withdraw at any stage without penalty. The instrument was anonymous, carrying no personal identifier, and administration allowed each participant to respond without observation by employers or peers. Completed copies were kept in a locked cabinet accessible only to the researchers, the electronic data file was password-protected, data were reported only in aggregate form, and no information collected was used for any purpose other than this academic research.

The instrument was administered directly to respondents at their work clusters by the researchers with the support of four trained research assistants familiar with the clusters and the local language of communication. The direct-contact approach allowed ambiguous items to be clarified on the spot and minimised non-response. Of the 303 copies distributed, 287 were properly completed and retrieved, a return rate of 94.7%, and formed the basis of the analysis.

Data analysis

Data were coded and analysed using the Statistical Package for the Social Sciences (SPSS) version 26. Frequencies and percentages described the demographic characteristics. Mean and standard deviation answered research questions one and two, with a criterion mean of 3.00; items with a mean of 3.00 and above were regarded as utilized and those below 3.00 as not utilized. One-way analysis of variance (ANOVA) tested Hypothesis One using the composite extent-of-utilization score, and tested Hypothesis Two item by item across the seven individual PPE types, at the 0.05 level of significance; the Tukey Honestly Significant Difference (HSD) post hoc test was applied wherever a significant F-ratio was obtained, to identify the specific group differences responsible for the overall effect.

Results

Table 1: Socio-Demographic Characteristics of Respondents

Variable	Category	Frequency	Percentage (%)
Gender	Male	236	82.2
	Female	51	17.8
Age (years)	18–30	103	35.9
	31–40	119	41.5
	41 and above	65	22.6
Educational level	Primary	37	12.9
	Secondary	142	49.5
	Tertiary	108	37.6
Years of work experience	Less than 5 years	84	29.3
	5–10 years	128	44.6
	Above 10 years	75	26.1

Table 1 shows that the artisanal workforce sampled was predominantly male (82.2%). Nearly half of the respondents (49.5%) had attained secondary education, 37.6% had tertiary qualifications and 12.9% had only primary education. With respect to work experience,



44.6% had practised for 5–10 years, 29.3% for less than 5 years and 26.1% for more than 10 years, suggesting considerable cumulative exposure to occupational hazards within the trades.

Table 2: Extent of PPE Utilization in Preventing Occupational Outcomes among Artisanal Workers In Enugu Metropolis

Item	Mean	Std. Dev.	Decision
I wear the recommended protective equipment while working	3.87	0.91	Agree
I use protective equipment throughout the duration of each task	3.41	1.02	Agree
I use protective equipment even when no supervisor is present	3.55	0.98	Agree
Protective equipment helps to reduce accidents in my trade	4.02	0.84	Agree
I inspect my protective equipment for damage before each use	3.12	1.08	Agree
I have received training on the correct use of protective equipment	3.05	1.10	Agree
My workplace provides adequate protective equipment for all tasks	2.96	1.12	Disagree
I replace worn-out protective equipment promptly	2.88	1.15	Disagree
Grand Mean	3.36	1.03	Moderate extent

Table 2 shows that artisanal workers in Enugu metropolis utilized PPE to a moderate extent, with a grand mean of 3.36 and standard deviation of 1.03, above the criterion mean of 3.00. Six of the eight items were rated above criterion. Respondents agreed most strongly that protective equipment helps to reduce accidents in their trade (mean = 4.02, SD = 0.84) and that they wear the recommended equipment while working (mean = 3.87, SD = 0.91). Two items fell below the criterion mean: adequacy of workplace provision of protective equipment (mean = 2.96, SD = 1.12) and prompt replacement of worn-out equipment (mean = 2.88, SD = 1.15). The pattern indicates that belief in the value of protective equipment and the practice of wearing it are reasonably established, but supply and maintenance remain the weakest links in utilization.

Research Question 2

Table 3: Tpes of PPE Utilized in Preventing Occupational Outcomes among Artisanal Workers in Enugu Metropolis

Type of PPE	Mean	Std. Dev.	Decision
Safety boots	4.05	0.79	Utilized
Hand gloves	3.78	0.88	Utilized
Respirators/face masks	2.74	1.14	Not utilized
Safety helmets	2.61	1.19	Not utilized
Protective clothing/overalls	2.55	1.17	Not utilized
Goggles/face shields	2.48	1.21	Not utilized
Ear protection	2.32	1.09	Not utilized
Grand Mean	2.93	1.02	Low utilization

Table 3 shows the extent of utilization for each individual type of PPE. Only two of the seven types were utilized: safety boots (mean = 4.05, SD = 0.79) and hand gloves (mean = 3.78, SD = 0.88). Respirators and face masks (mean = 2.74, SD = 1.14), safety helmets (mean = 2.61,



SD = 1.19), protective clothing (mean = 2.55, SD = 1.17), goggles and face shields (mean = 2.48, SD = 1.21) and ear protection (mean = 2.32, SD = 1.09) all fell below the criterion mean. Utilization is therefore concentrated on equipment protecting the extremities against immediate physical injury, while equipment protecting the respiratory tract, eyes, head and hearing against cumulative exposure is largely neglected.

Table 4: Analysis of No Significant Difference in the Extent of PPE Utilization in Preventing Occupational Outcomes among Artisanal Workers in Enugu Metropolis Based on their Education Level

Source of variation	SS	df	MS	F	Sig.
Between groups	12.42	2	6.21	14.87	.000
Within groups	118.61	284	0.42		
Total	131.03	286			

Group means: Primary ($n = 37$) $M = 2.94$, $SD = 0.71$; Secondary ($n = 142$) $M = 3.28$, $SD = 0.66$; Tertiary ($n = 108$) $M = 3.61$, $SD = 0.62$. Significant at $p < .05$.

Table 4 shows that the extent of PPE utilization differed significantly across educational levels, $F(2, 284) = 14.87$, $p = .000$, less than the 0.05 level of significance. The null hypothesis was rejected. The Tukey HSD post hoc test showed that workers with tertiary education ($M = 3.61$) utilized PPE to a significantly greater extent than those with secondary education (mean difference = 0.33, $p = .001$) and primary education (mean difference = 0.67, $p = .000$), and that workers with secondary education utilized PPE to a significantly greater extent than those with primary education (mean difference = 0.34, $p = .019$). Educational attainment is thus associated with a graded increase in the extent of PPE utilization.

Table 5: Analysis of No Significant Difference in the Types of PPE Utilized in Preventing Occupational Outcomes among Artisanal Workers in Enugu Metropolis Based on Their Years of Work Experience.

Type of PPE	<5 yrs ($n=84$) M	5–10 yrs ($n=128$) M	>10 yrs ($n=75$) M	F(2,284)	Sig.	Decision
Safety boots	3.95	4.06	4.15	1.28	.279	NS
Hand gloves	3.64	3.79	3.92	2.02	.135	NS
Respirators/face masks	2.20	2.78	3.28	17.92	<.001	Sig.
Safety helmets	2.12	2.64	3.10	13.52	<.001	Sig.
Protective clothing/overalls	2.08	2.58	3.02	12.87	<.001	Sig.
Goggles/face shields	2.03	2.51	2.93	11.04	<.001	Sig.
Ear protection	1.91	2.35	2.73	11.30	<.001	Sig.

NS = not significant at $p < .05$; Sig. = significant at $p < .05$. Tukey HSD post hoc comparisons for the five significant items showed that every pairwise group difference (less-than-5 vs 5–10 years, less-than-5 vs above-10 years, and 5–10 vs above-10 years) was significant at $p < .05$, with the widest gap consistently between workers with less than five years of experience and workers with more than ten years.

Table 5 shows that years of work experience produced a significant difference in five of the seven types of PPE utilized: respirators/face masks, $F(2, 284) = 17.92$, $p < .001$; safety helmets, $F(2, 284) = 13.52$, $p < .001$; protective clothing/overalls, $F(2, 284) = 12.87$, $p < .001$; goggles/face shields, $F(2, 284) = 11.04$, $p < .001$; and ear protection, $F(2, 284) = 11.30$, $p < .001$. For each of these five items, mean utilization rose consistently from workers with less than 5 years of experience through those with 5–10 years to those with more than 10 years, and Tukey HSD post hoc comparisons confirmed that every pairwise group difference was statistically significant. Utilization of safety boots, $F(2, 284) = 1.28$, $p = .279$, and hand



gloves, $F(2, 284) = 2.02$, $p = .135$, did not differ significantly across experience groups. The null hypothesis was therefore rejected for five of the seven PPE types and retained for safety boots and hand gloves. Years of work experience differentiates the adoption of hazard-specific protective equipment, but not of the two items, boots and gloves, that workers appear to adopt early in their careers regardless of experience.

Discussion

The first research question established that artisanal workers in Enugu metropolis utilized PPE to a moderate extent, with a grand mean of 3.36. The finding is consistent with Afolabi et al. (2021), who reported that informal automobile artisans in Osun State recorded appreciable but inconsistent PPE utilization, and with Johnson and Motilewa (2016), who found that auto-technicians in Uyo demonstrated moderate knowledge without correspondingly high practice. The two items falling below the criterion mean concerned workplace provision of adequate equipment and prompt replacement of worn-out equipment, while items concerning the wearing of equipment and belief in its protective value were rated well above criterion. Utilization in this population is therefore constrained less by attitude than by supply and maintenance, supporting the observation of Agu et al. (2022) that awareness campaigns alone do not translate into effective utilization where cost and availability remain unresolved.

The second research question revealed that the types of PPE utilized recorded a grand mean of 2.93, indicating low utilization overall, with only safety boots and hand gloves rated above the criterion mean. Respiratory, eye, head and hearing protection all fell below criterion. This selectivity aligns with Aram et al. (2021), who found that PPE adoption among artisanal goldminers in Ghana varied by task and by the visibility of the hazard involved, and it carries considerable public health weight in the light of Ephraim-Emmanuel et al. (2023) and Suku et al. (2023), both of whom documented substantial respiratory injury arising from the kinds of fumes and particulates generated in informal work environments. Ikezam et al. (2021) similarly reported widespread respiratory and dermal complaints traceable in part to limited access to protective equipment. The implication is that the hazards least protected against in Enugu metropolis are precisely those with the most severe and least reversible health consequences, since the harm they cause accumulates silently rather than announcing itself as an immediate injury.

The test of the first hypothesis showed a significant difference in the extent of PPE utilization by educational level, $F(2, 284) = 14.87$, $p = .000$, with utilization rising steadily from primary through secondary to tertiary education. This corroborates Aram et al. (2021), who identified education as a significant predictor of PPE use among artisanal goldminers. The graded pattern suggests that education operates through more than one channel: it improves comprehension of hazard information and manufacturers' instructions, raises the worker's appraisal of his own susceptibility to harm, and is frequently associated with greater earning capacity and therefore greater ability to purchase and replace equipment in a setting where the worker bears that cost personally.

The test of the second hypothesis, conducted item by item as the focus on types of PPE requires, showed that years of work experience produced significant differences in five of the seven PPE types, respirators, helmets, protective clothing, goggles and ear protection (all $p < .001$), with utilization of each rising consistently from new entrants to the most experienced workers and every pairwise group difference confirmed significant by Tukey HSD. Utilization of safety boots and hand gloves did not differ significantly by experience. This



item-level pattern refines the earlier composite reading of the data: boots and gloves are evidently adopted early in a worker's career regardless of experience, most probably because their protective function against immediate injury is self-evident and their cost is comparatively low, whereas adoption of equipment whose protective value against cumulative harm is less immediately visible, respirators, helmets, protective clothing, goggles and ear protection, accumulates gradually with years of exposure to the trade. This is consistent with the emphasis Agu et al. (2022) placed on accumulated workplace exposure in shaping protective behaviour. New entrants, who are least equipped by experience to anticipate cumulative hazards, are also those adopting the narrowest range of protection beyond the two items already treated as standard equipment, which identifies the point of entry into the trade as the most productive moment for hazard-specific safety intervention.

Read together, the findings present a coherent picture. Utilization among artisanal workers in Enugu metropolis is moderate in extent but narrow in range, it is limited chiefly by supply and replacement rather than by conviction, it is stratified by educational level in its overall extent, and it is stratified by years of experience specifically in the adoption of hazard-specific equipment rather than the two items already treated as basic necessities. Interventions that address only awareness will therefore reach the part of the problem that is already least troublesome.

Conclusion

This study concluded that artisanal workers in Enugu metropolis utilize personal protective equipment to a moderate extent but across a narrow range of equipment types. Utilization is concentrated on safety boots and hand gloves, which protect against immediate physical injury, while respirators, goggles, helmets, protective clothing and ear protection, which guard against cumulative respiratory, ocular and auditory damage, remain below acceptable levels of adoption. Utilization is further stratified within the workforce: the extent of utilization differs significantly by educational level, and the adoption of five of the seven equipment types; respirators, helmets, protective clothing, goggles and ear protection; differs significantly by years of work experience, while adoption of safety boots and hand gloves does not. Workers with primary education and workers in their first five years of practice are the least protected against cumulative, hazard-specific risk. The evidence indicates that the principal constraints on utilization are the adequacy of supply and the timely replacement of worn equipment rather than any deficit of belief in its value. Safeguarding artisanal workers in Enugu metropolis therefore requires measures directed at the availability, affordability and specificity of protective equipment, targeted at the categories of workers shown to be most exposed.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Government agencies, particularly the Enugu State Ministry of Labour and Productivity and the National Directorate of Employment, should extend occupational health and safety regulation and inspection to registered artisanal work clusters, with particular attention to the availability of hazard-specific protective equipment at the cluster level.
2. Respiratory protection, eye protection and hearing protection should be subsidised and distributed through artisanal cooperatives and cluster associations, since these were the equipment types recording the lowest utilization while carrying the most serious long-term health consequences.



3. Safety induction and hands-on training on the correct selection, use, inspection and replacement of protective equipment should be made a condition of registration for new entrants into artisanal trades, given that workers with less than five years of experience utilized the narrowest range of hazard-specific equipment.
4. Cluster associations should establish equipment replacement schemes funded through modest periodic contributions, so that worn-out protective equipment is replaced promptly rather than used beyond its protective life.
5. Health promotion messages directed at artisanal workers should be delivered in the local language and in non-textual formats, so that workers with primary education, who recorded the lowest extent of utilization, are not excluded from safety information.

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