



# Occupational health and safety practices among vehicle repair artisans in an urban area in Ghana

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## ABSTRACT

**Aim:** The aim of the study was to assess the extent of work-related injuries and illnesses, access to first aid, use of Personal Protective Equipment (PPE), fire safety measures and hand hygiene practices among vehicle repair artisans. **Materials and Methods:** Study respondents were 100 vehicle repair artisans comprising of 28 Auto mechanics, 20 electricians, 26 welders, 18 sprayers, and 8 automobile interior designers selected by simple random sampling. Semi-structured questionnaires, extensive field observations and key informant interviews were used to collect primary data in 2013/2014 and analyzed with Minitab version 16 in 2014. **Results:** Close to two-thirds (64%) of the artisans have sustained work-related injuries mostly resulting from cuts and burns. Respondents' marital status ( $P = 0.014$ ) and the type of work ( $P = 0.037$ ) were found to be significantly associated with the incidence of physical injury, in contrast to their level of education ( $P = 0.874$ ) and work experience ( $P = 0.203$ ). Seventy-eight percent of the artisans lack training in fire safety and besides, basic firefighting equipment are non-existent in the workshops visited. Self-medication after injury (55%;  $N = 64$ ) and ignorance in first aid administration (92%) are common among the artisans. Further, due to the physical exertions required by their work, most artisans ( $N = 57$ ) experience musculoskeletal disorders. Use of PPE (27%) and proper hand hygiene practices (28%;  $N = 98$ ) are generally ignored by the artisans posing possible health risks. **Conclusions:** Vehicle repair workers need to be educated on the dangers associated with their work and the best practices to be adopted to curb or forestall these risks.

**KEY WORDS:** First aid, health and safety, injuries, personal protective equipment, vehicle repair artisans

## INTRODUCTION

Globally, protection of workers against work-related injuries and illnesses has over the years been an issue of great concern to employees, workers, governments, and the general public. This is because a safe working environment does not only promote the physical, mental and social well-being of workers, but also saves cost associated with medical bills, compensation, work interruption, loss of experienced personnel, and others resulting from accidents at the workplace [1,2]. The International Labor Organization estimates that every year approximately 270 million work-related accidents are recorded worldwide, resulting in the death of some 2 million people [3]. Apart from the accidents resulting in fatalities, non-fatal accidents at the workplace, in some cases, leave victims with loss of body parts, skin diseases, musculoskeletal and reproductive disorders, cancer, mental and neurological illnesses, respiratory and cardiovascular diseases [1,4,5]. Studies have shown that employees in small and medium enterprises are more prone to work-related hazards and risks [6]. This is partly attributed to

inadequate resources, poor technical capacity and ignorance of occupational safety and health (OSH) standards [3]. The sector also suffers neglect from OSH legislations and services.

In Ghana, OSH legislations that seek to address issues regarding the welfare of employees at the workplace are fragmented. There is the Labor Act 2003 (Act 651), the Factories, Offices and Shops Act 1970 (Act 328) and the Workmen's Compensation Law 1987 (PNDC Law 187) [5,7]. The implementation of these legislations is hugely fraught with several challenges, as has been reported in available literature [8,9]. In spite of this, a draft national OSH policy was additionally developed in 2011 [10]. This clearly depicts the quandary in which authorities find themselves with regards to occupational health and safety issues. This has resulted in several challenges, including deficient standards, poor enforcement of laws, discrepancies, and overlap of functions [11]. Worse still, the Department of Factories Inspectorate, which is mandated to ensure a safe and healthy working environment in Ghana, lacks a comprehensive national surveillance system for occupational injuries and illnesses and

its services are unduly biased toward the formal sector at the expense of the informal sector [9].

However, more than half of Ghana's labor force is in the informal sector and with this, only 2% have OSH services [11]. It is crucial that OSH issues in this sector are brought to the limelight in order to attract the needed attention and recognition in the development of social protection policies. Moreover, there is dearth of information regarding the extent of OSH risks and standard practices associated with workers in the informal sector including vehicle repair artisans and allied artisans. This paper examines the exposure to work-related injury and illnesses, access to first aid, use of personal protective equipment (PPE), fire safety measures and hygiene practices among vehicle repair and allied artisans. These workers, by the nature of their work, are exposed to numerous health risks resulting from key activities such as fixing car engines, vulcanizing, straightening, spraying, welding, cutting, grinding, among others. This study informs the development of health and safety standards and sensitization programs that relate to vehicle repair artisans.

## MATERIALS AND METHODS

This study was undertaken in Mampong-Ashanti Township; the capital of Mampong Municipal Assembly in the Ashanti region of Ghana. The town is located at approximately 60 km North East of the Ashanti regional capital, Kumasi. Geographically, it lies on latitude 7° 05' 42" N and longitude 1° 24' 49" W with a population of approximately 40,000 people [12].

The study employed simple random sampling to select 100 respondents out of about 400 vehicle repair artisans all working at one location in Mampong-Ashanti. The respondents comprised of 28 auto mechanics, 26 welders, 18 sprayers, 20 electricians and 8 automobile interior designers. The respective number of artisans per work specialization selected for the study was based on the estimated distribution of all the 400 workers in the study area. This was obtained from key stakeholder interviews (union leaders in the study area) and field observations. In the context of this study, auto mechanics refers to those artisans engaged in the repair of vehicle engines and other mechanical parts; welders refers to those engaged in fusing metallic vehicle parts together by heating and hammering and others who by the same means create other metallic structures such as steel gates, balustrades, among others; electricians refer to artisans who are specialized in the repair of electrical components of vehicles; sprayers refers to artisans engaged in the application of jets of paints onto vehicle bodies or other metallic surfaces; and automobile interior designers refers to those artisans engaged in the repair or decoration of the interior parts (seats, ceiling, floors, etc.) of vehicles.

Primary data were collected in December, 2013 and January, 2014 through interviews with selected artisans by means of semi-structured questionnaires, key informant interviews and extensive field observations. The questionnaire was organized into five major themes to capture information pertaining to respondents' socio-demographic characteristics; work expertise

(the type of artisanal work), exposure to work-related injuries and illnesses; administration of first aid; fire outbreak and management; use of PPE, and hand hygiene. The data were analyzed with Minitab version 16 in February, 2014 using descriptive statistics such as frequencies and percentages. Comparative analyses to determine associations between study parameters were carried out with the Chi-square ( $\chi^2$ ) test at 5% significance level.

## RESULTS

### Characteristics of Study Subjects

The study respondents were all males engaged in various aspects of vehicle repairs. Overall, about three out of every five respondents were <36 years of age while only 7% was between 46 and 60 years [Table 1]. Per analysis of the respondents' age and work experience, the study found that, majority of these artisans (81%) entered into their various fields of work at a young age of 26 years or younger [Table 1]. Married respondents constituted a significant proportion (63%) of the all respondents while close to one-third (32%) were single. Only 13% of the artisans had no formal education, whereas the remaining proportion had either basic school education (66%) or secondary school education (21%).

### Incidence of Physical Injuries and Access to First Aid

Sixty-four percent (64%) of the artisans had sustained various forms of work-related physical injuries. The pattern of physical injury incidence recorded within the work specializations suggests that physical injuries are highest among auto mechanics (82%), followed by electricians (75%), automobile interior designers (63%), sprayers (50%) and welders (46%) [Table 2]. Incidence of physical injury showed a statistically significant difference ( $P < 0.05$ ) with the various work types. Overall, 59 respondents consented to show evidence of physical work-related injuries. These injuries generally resulted from cuts and burns at the workplace and has left most of them (92%)

**Table 1: Demographic characteristics of study respondents ( $N=100$ )**

Parameter	Variables	Percentage (%)
Age group (years)	<18	2
	18-25	21
	26-35	36
	36-45	34
	45-60	7
Commencement age (years)	<18	18
	18-25	63
	26-30	15
	>30	4
Highest level of education	None	13
	Primary	31
	JHS/MSLC	35
	SHS/o'level	21
Marital status	Single	32
	Married	63
	Divorced	2
	Widowed	3

with scars on various parts of their bodies. Evidence of physical injuries resulting in loss of body parts or impaired vision was shown by only 8% of these respondents.

Analyses of the association between occurrence of physical injuries and some demographic characteristics of the artisans revealed statistically significant association ( $P < 0.05$ ) between the type of work and incidence of physical injury. Physical injuries were most predominant among auto mechanics (82%) and least prevalent among welders (46%) [Table 2]. In addition, physical injury was very common among married artisans (63%) as compared to single artisans (consisting of single, divorced and widowed) and this showed a statistically significant association ( $P < 0.05$ ) with incidence of injuries. Conversely, there was no statistically significant association between injury incidence and respondents' educational level ( $P > 0.05$ ) as well as between work experience and injury incidence ( $P > 0.05$ ).

More than half (approximately 55%) of respondents who are injured during their work ( $n = 64$ ) do not seek proper medical attention, but rather resort to self-medication [Table 3]. Despite the high-incidence (64%) of work-related injuries among the artisans, first aid facilities are non-existent in the vehicle repair shops and majority (92%) of the artisans are unfamiliar with administering first aid to injured persons. Only a few respondents (8%) claimed to have been trained by their masters in first aid administration at the workshop. Almost all respondents (95%) expressed their willingness to participate in training on reducing injury incidence and first aid administration.

## Work-related Illnesses

Figure 1 shows the overall distribution of common illnesses reported by all the study respondents. For the most part, 57 artisans reported musculoskeletal disorders (MSDs), 39 reported dizziness and 37 reported headaches as the most common work-related illnesses experienced. In general, these were the three topmost illnesses reported among all the

work categories except sprayers. For sprayers, headaches (8), dizziness (8) and coughing (7) were the three key illnesses reported. Further, extensive field observations revealed that, the sheds under which the artisans carry out their activities do not provide adequate protection from the sun. Consequently, most of these artisans work under trees or under poorly constructed wooden sheds or directly under the sweltering sun without any shade.

## Fire Safety and use of PPE

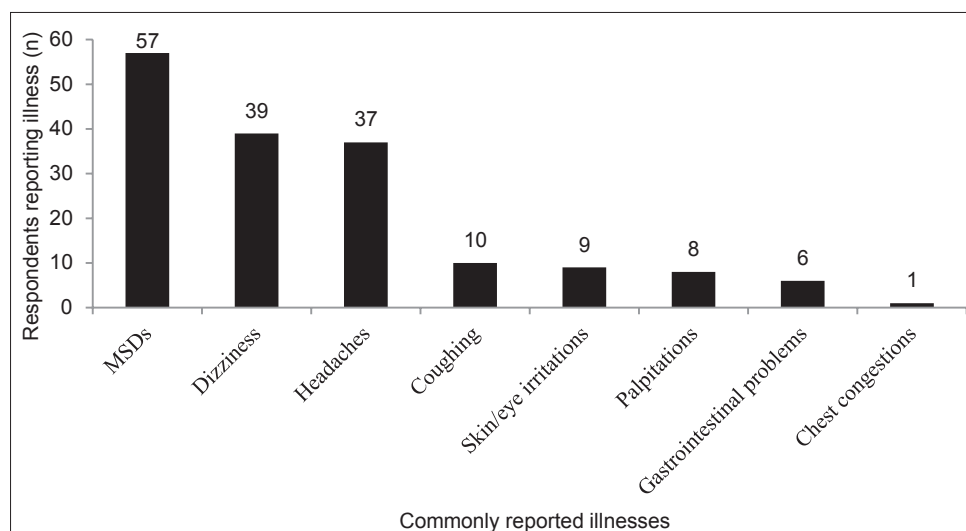
Less than a quarter (22%) of the artisans, reportedly, have been trained in fire safety and management by the Ghana National Fire Service (GNFS) as shown in Table 4. This was confirmed by key informant interviews, which pointed out that, though infrequently, personnel of the GNFS organize training programs for the artisans.

**Table 2: Incidence of physical injuries among vehicle repair artisans**

Study parameter	Work specialization				
	Auto mechanic $n$ (%)	Electrician $n$ (%)	Welder $n$ (%)	Sprayer $n$ (%)	Automobile interior designer $n$ (%)
Physical injury sustained					
Yes ( $n=64$ )	23 (82)	15 (75)	12 (46)	9 (50)	5 (63)
No ( $n=36$ )	5 (18)	5 (25)	14 (54)	9 (50)	3 (38)
Total	28	20	26	18	8

**Table 3: Access to first aid after injury**

Study parameters	Variables	Frequency ( $n$ )	Percentage (%)
Source of medical treatment ( $n=64$ )	Self-medication	35	54.7
	Attended to by a Physician	29	45.3
Access to a first aid box ( $n=100$ )	Yes	8	8.0
	No	92	92.0
Training in first aid administration ( $n=100$ )	Trained	8	8.0
	Not trained	92	92.0



**Figure 1: Illnesses commonly experienced by respondents**

Despite the host of hazards present at the vehicle repair workshops, less than a third (27%) of the artisans interviewed were observed to be using PPE during their work. Even among this proportion observed, none of them used the full complement of the required PPE such as safety boots, face shields, goggles, nose masks, overalls, gloves, and respirators. Approximately 8% out of the 26 welders observed, used protective goggles during welding. Further, out of 18 sprayers, 56% used only nose masks during the spraying process. This, however, does not constitute adequate protection from the hazardous chemicals they are exposed to since other parts of their bodies viz. face, hands and eyes are equally exposed to spray paints. The other sprayers only tied a piece of cloth around their nose during spraying.

Among the artisans who do not use any PPE ( $N = 73$ ), 63% argued that they cannot afford to purchase them. Others (34%) also asserted that they feel uncomfortable to use them while 3% claimed PPE are irrelevant for their work.

### Hand Hygiene among Vehicle Repair Artisans

Regarding hygiene practices, the findings from this study indicate that the artisans are either unenlightened or unconcerned about the risks associated poor hand hygiene in particular. Although majority of the artisans (98%) maintained that they frequently wash their hands at the workplace, it was observed that this is not done adequately to effectively remove grease, grime and other deposits mostly on their hands [Table 5]. Adequate hand washing entails washing both hands with soap under running water. However, while less than half (42%) reported that they practice hand washing with soap at all times, 54% reportedly did so occasionally [Table 5]. Deposits of dirt were evidently observed beneath the fingernails of close to two-thirds (65%) of the artisans. The proportion of artisans practicing adequate hand hygiene was relatively higher among auto mechanics (46%) and welders (35%) in contrast to electricians (25%), sprayers (11%), and automobile interior designers (0%). Particularly, some auto mechanics observed during the study had a characteristic black-tainted

palms possibly resulting from hand contact with greasy vehicle components and used engine oil.

### DISCUSSION

This study was not without constraints. A general sense of disinterest by the artisans toward the study hampered data collection due to several studies carried out in the area by numerous researchers as the study gathered. Therefore, some artisans were reluctant to provide the relevant information resulting in a lower-than-expected response rate. Of 200 respondents initially anticipated for the study based on a 95% confidence level and a total population of approximately 400, a response rate of 50% was obtained for the study.

The absence of females among the study respondents and generally at the study area typically confirms the fact that, females are rarely engaged in vehicle repairs in Ghana and only constitute a very low proportion where present. They are mostly limited to only those work specializations that do not involve much physical exertions such as autobody spraying as Adei *et al.* [5] observed. The laborious nature of the work of these artisans also possibly justifies why it is dominated by young and energetic males. The distribution of education levels among the artisans also affirms that this type of work is not reserved entirely for the uneducated, but those with basic and senior high school education as well. The pattern of work experience of the artisans could signify that the sector has been a source of employment for the youth in the past decade.

Contrary to the notion that, a greater work experience on the job and higher level of education may perhaps reduce an artisan's susceptibility to physical injuries at the work place, this study found no significant association ( $P > 0.05$ ) between these variables. Rather, incidence of physical injuries was associated with the type of work and marital status ( $P < 0.05$ ). Possibly, this implies that educational level and working experience do not necessarily preclude artisans from getting injured.

**Table 4: Training in fire management among various work specializations**

Study parameter	Work specialization				
	Auto mechanics $n$ (%)	Electricians $n$ (%)	Welders $n$ (%)	Sprayers $n$ (%)	Automobile interior designers $n$ (%)
Training in fire management					
Trained ( $n=22$ )	7 (25.0)	2 (10.0)	9 (35.0)	4 (22.0)	0 (0.0)
Not trained ( $n=78$ )	21 (75.0)	18 (90.0)	17 (65.0)	14 (78.0)	8 (100.0)
Use of PPE					
PPE used ( $n=27$ )	8 (28.6)	2 (10.0)	5 (19.2)	10 (55.6)	2 (25.0)
No PPE used ( $n=73$ )	20 (71.4)	18 (90.0)	21 (80.8)	8 (44.4)	6 (75.0)
Total	28	20	26	18	8

**Table 5: Hand hygiene practices among the vehicle repair workers**

Study parameter	Variables	Frequency, $n$	Percentage (%)
Regular hand washing at work ( $N=100$ )	Yes	98	98.0
	No	2	2.0
Mode of hand washing ( $N=98$ )	Water only	4	4.1
	Water and soap (occasionally)	53	54.1
	Water and soap (always)	41	41.8
Adequate hand hygiene practice	Auto mechanics ( $n=26$ )	12	46.0
	Electricians ( $n=20$ )	5	25.0
	Welders ( $n=26$ )	9	35.0
	Sprayers ( $n=18$ )	2	11.0
	Automobile interior designers ( $n=8$ )	0	0
Condition of finger nails ( $N=100$ )	Deposits of dirt beneath finger nails	65	65.0
	Without deposits of dirt	35	35.0

There is the need to rather incorporate basic occupational health and safety practices into the informal job training sessions of these artisans during their apprenticeship in order to instill in them the need to protect themselves at the workplace. This would require a strong collaboration between the artisans and relevant stakeholders such as the GNFS, the Ghana Health Service and the Department of Factories Inspectorate to organize training-of-trainers workshops for masters who would subsequently train their apprentices. Per, the GNFS Act 1997 [13], the GNFS is mandated to train and organize fire volunteer squads at community level and organize public fire education programs in order to create and sustain awareness of the hazards of fire. The Department of Factories Inspectorate, in line with the Factories, Offices and Shops Act 1970 [14], provides leadership in occupational health and safety nationwide while the Ghana Health Service embarks on health promotion exercises as part of its mandates. This presents a good opportunity for such synergy to be developed since a high proportion of artisans expressed the willingness to participate in training programs in this regard.

Apart from physical injuries, there is the possibility of other non-physical work-related injuries in the study area, as per the field observations, resulting from excessive noise levels and prolonged inhalation of contaminated air (isocyanates in spray paints and dust) in the area. This, according to available studies, could correspondingly culminate into reduced hearing acuity [15-17] and work-related asthma [18-20].

The absence of adequate basic first aid items and personnel with rudimentary first aid skills at the workshops is an affront to the general welfare of these artisans. This, coupled with the lack of a medical center within their immediate environment, as observed, is likely to contribute to loss of lives if a major accident should occur. The importance of first aid facilities (equipment and supplies) and availability of personnel with basic skills in first aid administration at the workplace has been underscored by several authors [21-24].

The high incidence of self-medication among the artisans poses grave health effects, as indicated by authors of various studies [25,26]. Apart from abusing the medicines, this practice is also known to contribute to the development of antibiotic resistance. Concerted efforts are required to create awareness among the artisans on the perils of this practice on their health since ignorance is known to partly account for this phenomenon [27].

Due to the physical exertions involved in their work the high prevalence of MSDs among the artisans are to be expected. Consistent with these findings, other authors [4,28-31] have also reported high-incidence of MSDs among workers whose work involve physical exertions. The prevalence of headaches and coughing among Sprayers corroborates findings by Adei *et al.* [5]. According to available literature [32-36], persistent coughing is among the early symptoms of exposure to isocyanates in spray paints, which after long-term exposure could result in lung infections and eventually in death.

Aggravating the plight of these artisans is the scorching conditions under which they work as a result of inadequate

shelter. This could have other health implications. Price [37] argues that exposure to extremes of heat results in heat stroke and heat exhaustion and also increases the possibility of acute cardiovascular disease. Exposure to heat during work has also been reported to cause reproductive problems particularly in men, by reducing sperm counts [38] and causes non-melanoma skin cancer with high prevalence in men [39]. There is the need for comprehensive biological monitoring and medical screening of these artisans to gain a holistic insight into the health risks associated with these conditions under which they work.

With the recent incessant fire outbreaks in Ghana, fire equipment has become indispensable assets both at homes and at workplaces. Particularly, considering the presence of naked flames for welding, the maze of electrical wires traversing the area, flammable chemicals used by sprayers and the host of vehicles laden with fuel in the vehicle repair shops, as observed in the study, the importance of fire safety equipment cannot be overemphasized. The absence of basic firefighting and safety equipment such as extinguishers and fire alarms in the shops coupled with lack of training on fire management among the artisans therefore pose a huge threat to human life and properties in the area. The use of water, leaves and sand to put out fires in cases of fire outbreaks do not provide an adequate fire protection mechanism in the shops. Evidently, the mandate of the GNFS to inspect and offer technical advice on fire extinguishers [13], has not been entirely enforced in this crucial workplace. According to available statistics, the Ashanti Region of Ghana, where the study area is located, has the highest incidence of fire outbreaks [40]. This calls for urgent interventions in this regard, which must include training of the artisans in fire management, awareness creation on the need to acquire basic firefighting equipment and enforcement of fire safety legislations at the workplace.

As has been extensively reported in literature [21,41,42], PPE provide a physical barrier to chemical, physical and biological hazards at the workplace when these hazards cannot be completely precluded. Notwithstanding, the host of hazards at the shops, the use of PPE among the artisans was low and the justification given only reinforce the fact that these artisans are either ignorant or just careless about the health implications of their work. Specifically, welders and sprayers are at a higher risk compared to the other artisans considering the type of work they do. This is in view of the fact that, welders are exposed to the glare of welding flame and flying particles, which could easily cause irreversible damage to their eyes [43,44]. Meanwhile, they rarely use protective glasses. Similar to the findings of this study, Omolase and Mahmoud [45] observed <20% of welders ( $N = 84$ ) from Owo town in Nigeria to be using protective goggles. In addition, findings by Dartey *et al.* [46], after assessing airborne lead levels at selected welding shops in Kumasi pointed out that, welders are exposed to high airborne lead levels consistently above the  $50 \mu\text{g}/\text{m}^3$  level recommended by the World Health Organization (WHO). This makes them prone to numerous health complications associated with lead poisoning [47-49]. On the other hand, sprayers are prone to respiratory, neurological and dermal illnesses from contacts with potentially poisonous chemicals in spray paints and particulates



of metals in sanding dust [5,18,19,50,51]. Therefore, without the full complement of PPE, the sprayers could be exposed to numerous, chronic and usually non-physical work-related injuries.

Given the numerous chemical agents and grime that these artisans come into contact with on daily basis, proper skin care practices are highly recommended. The Health and Safety Executive of UK [16] posited that, prolonged skin contact with fuels, solvents, abrasive materials and used engine oil could result in dermatitis and skin cancer among vehicle repair artisans. Hand washing with soap is known to effectively remove dirt from the hands, which reduces the risk of infections and other health risks [52,53]. However, from observations, this is mostly not done under running water with both hands, as recommended by Centers for Disease Control and Prevention [54]. Hand washing with soap under running water was predominant among auto mechanics (46%;  $N = 26$ ) and welders (35%;  $N = 26$ ). However, some auto mechanics had characteristically black-tainted palms possibly resulting from working with greasy vehicle components and tools. Therefore, degreasing solvents would be required in addition to washing with soap in order to effectively remove the grease from their hands. If not, ingestion of these chemical agents could occur unintentionally posing carcinogenic effects [55].

## CONCLUSIONS

This study lays bare the work-related hazards among vehicle repair artisans and concludes that there is the need for collaboration between the artisans and relevant stakeholders, namely the GNFS, the Ghana Health Service and the Department of Factories Inspectorate to train the former on occupational health and safety. This should include intensive education on skin care and the usefulness of rudimentary protective equipment in forestalling work-related injuries and illnesses. Basic training in OSH needs to be integrated into the informal training of apprentices by their masters. Bio-monitoring and medical screening of the artisans is proposed by the study to gain further insight into the adverse health effects resulting from the work of the artisans. A comprehensive study in other workshops across the country is warranted to obtain a holistic picture nationwide for the necessary policy considerations.

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