



## Knowledge and Use of Personal Protective Equipment among Auto Technicians in Uyo, Nigeria

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### Authors' contributions

This work was carried out in collaboration between both authors. Author OEJ designed the study, supervised the data collection, wrote the protocol and the first draft of the manuscript, while author OOM analyzed the data. Both authors read and approved the final manuscript.

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### ABSTRACT

**Background:** Personal protective equipment (PPE) plays a very important role in minimizing exposure to workplace hazards among automobile technicians. This study was carried out to determine the knowledge and use of PPE among auto technicians in Uyo, Nigeria.

**Materials and Methods:** A cross sectional descriptive study was carried out among auto technicians in Uyo from 15<sup>th</sup> to 21<sup>st</sup> November, 2015. Data collection was done using an interviewer administered semi structured questionnaire which examined the socio demographic characteristics, knowledge and use of PPE among respondents selected using simple random sampling method. Data was analyzed with the Statistical Package for the Social Sciences (SPSS) version 20. Level of significance was set at 0.5.

**Results:** A total of 151 auto technicians participated in the study. The mean age of respondents was 30.95±4.8 years. Majority, 148 (98.0%) were males. Sixty seven (44.4%) had only primary education, while 72, (47.7%) also completed secondary education. Auto mechanics constituted 61.6% of respondents. The most commonly known PPE among respondents were overalls 146 (96.7%), while the least was cream 54 (35.8%). Mechanics were significantly more knowledgeable

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about overalls and boots than other groups of auto technicians ( $p < 0.05$ ). A total of 122 (80.8%) respondents had good knowledge of PPE. This was significantly higher among mechanics ( $p < 0.03$ ). However, only 42 (27.8%) respondents' level of utilization of PPE could be classified as good. The most utilized PPE were overalls, 119 (78.8%). No respondent reported receiving any form of training on workplace safety.

**Conclusion:** There was low utilization of PPE despite a relatively high knowledge level. Routine training of automobile technicians on the link between PPE utilization and workplace health and safety is strongly advocated. Legislation and enforcement of PPE use by auto technicians may also be of benefit.

*Keywords: Personal protective equipment; knowledge; utilization; auto technicians; training.*

## 1. INTRODUCTION

Automobile service industry has a large group of workers many of which are in the unorganized sector [1,2]. The numerous activities they are involved in expose them to many physical and chemical agents that can be hazardous to their health. These workers are also prone to workplace accidents and injuries, many of which are preventable [3]. The International Labor Organization estimates that yearly, approximately 270 million work-related accidents occur worldwide [4]. Personal protective equipment (PPE) plays a very important role in the health and safety of workers and when utilized at workplace minimizes exposure to a variety of hazards. According to the Occupational Health and Safety Council (OSHC), the use of PPE generally implies working in a potentially hazardous working environment [5]. Active cooperation and compliance of the workers are necessary for maximum benefits to be derived from PPE utilization [6]. Personal protective equipment includes items such as gloves, overalls, helmets, boots, ear muffs and goggles.

Employees in small and medium enterprises have been shown to be more prone to work related hazards and risks [7]. These groups of workers however have been reported not to know much about such hazards and to have little or no training on workplace safety. A study among automobile repair workers in India reported that half of them were unaware of the health problems associated with their occupational exposures and thereby the use of personal protection was very low. Moreover, none of them had received any formal training on workplace safety [1].

The use of PPE has also been reported to be very low by several other studies. Workers in informal small scale industries including those involved in welding, spray painting and metal

work in Dar es Salaam, Tanzania showed low reported use of personal protective equipment [8]. Similarly, a study carried out in Saudi Arabia also reported low use of PPE [9]. Moreover, a similar study carried out to assess the occupational chemical hazards perceptions, safety practices and their enforcement in Kumasi, Ghana reported that only 0.7% of the respondents reported always using the appropriate PPE during the spray painting process [10]. In Nigeria, studies in south western [11-13], northern [14] and eastern [15] Nigeria also reported low use of PPE among auto technicians. Jinadu in his study opined that automobile mechanics, welders and painters were generally believed to lack knowledge of occupational health hazards and were unlikely to take protective measures against them [13].

The lack of adequate legislation and enforcement may also contribute to the low use of PPE reported in several developing countries. A study carried out in Norway reported that most workers always used gloves, overalls and respiratory protective equipment during car painting with consequent low exposure to organic solvents because of strict legislative enforcement [16].

Despite the relevance of PPE use in minimizing exposure to a variety of hazards in the workplace, there are no documented studies on this subject among auto technicians in Uyo, south-south Nigeria. This study was therefore carried out to determine the knowledge and use of PPE among auto technicians in Uyo in order to document findings and suggest possible ways of improving the health and safety of this group of workers.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

This study was conducted at an auto technician village in Uyo, a city in southern Nigeria with a

projected population of 413,381 in 2015 [17]. The vehicle repair site houses the majority of the auto technicians in the city.

## 2.2 Study Design / Population

This was a cross sectional descriptive study carried among auto technicians in Uyo,

## 2.3 Sample Size

The formula for estimating single proportion for cross sectional studies was used in calculating the sample size [18], with prevalence, (0.08) being the use of overalls by automobile mechanics in a previous Nigerian study [12],  $z$  of 1.96, sampling error set at 5%, and 10% over estimation to accommodate for non response. A sample size of 150 was obtained.

## 2.4 Data Collection

Data collection was carried out from 15<sup>th</sup> to 21<sup>st</sup> November, 2015, using an interviewer administered questionnaire with 3 sections which examined the socio demographic characteristics, knowledge and utilization of PPEs among the respondents. The tool was pre-tested on 10 automobile technicians at a roadside workshop in the city to ensure adequate comprehension. The chairman of the automobile technicians association provided a list of all automobile technicians and their shop numbers in the garage. There were 412 registered technicians. One hundred and fifty one were subsequently selected by simple random sampling method using a table of random numbers. Data collection was not possible at a central location as the respondents were not willing to leave their work locations. They were therefore visited in their respective shops over a period of 6 days and the questionnaires were administered by 5 previously trained research assistants. In addition focus group discussion was carried out among 12 of the respondents who belonged to the group of those not using PPE in order to explore possible reasons for non use.

## 2.5 Data Management

The data obtained was analyzed using the Statistical Package for the Social Sciences (SPSS) version 20. The level of knowledge and utilization was categorized into two based on scoring. Those that knew of or had used 4 or more PPE were categorized as 'good' and less

than 4 categorized as 'poor'. Data analysis was done using descriptive statistics (frequency and proportion to summarize variables) and inferential statistics (Chi -square to test the significance of association between two categorical variables). Fisher's exact test was used whenever the expected values were less than 5. Level of significance was set at 5%.

## 2.6 Ethical Considerations

Ethical clearance was obtained from Akwa Ibom State Health Research Committee (Approval number: MP/PRS/99/VOL.VII/497). Permission was also obtained from the chairman of the automobile technicians' association. The purpose, content and significance of the study were adequately explained to the respondents after which written/verbal consent was obtained from each of them. Participation was entirely voluntary. No names or shop numbers were used to ensure confidentiality.

## 3. RESULTS AND DISCUSSION

### 3.1 Results

A total of 151 auto technicians participated in the study. Majority, 148 (98.0%) were males. The mean age of respondents was  $30.95 \pm 4.8$  years. Sixty seven (44.4%) had primary education, while 72, (47.7%) had also completed secondary education. Auto mechanics outnumbered the other occupations constituting 61.6% of the auto technicians. The commonest daily income earned by about half of them was 1,000 – 3,000 naira (\$5-15) (Table 1).

The most commonly known PPE among respondents were overalls 146 (96.7%), while the least was cream 54 (35.8%). The mechanics were significantly more knowledgeable about overalls and boots than other groups of auto technicians ( $p < 0.05$ ) (Table 2).

The most utilized PPE were Overalls, 119 (78.8%), Boots were most frequently used by mechanics, 57 (61.3%), while gloves were most utilized by panel beaters 17 (60.7%) and mechanics 55 (59.1%) ( $p < 0.05$ ) (Table 3).

A total of 122 (80.8%) respondents had good knowledge of PPE. This was significantly higher among mechanics ( $p < 0.03$ ). Other characteristics like age and educational level did not show any significant associations (Table 4).

**Table 1. Socio-demographic characteristics of respondents**

Variable	Frequency N =151	Proportion (%)
<b>Age</b>		
12-21	34	22.5
22-31	46	30.5
32-41	40	26.5
>41	31	20.5
Mean age = 30.95±4.81		
<b>Sex</b>		
Male	148	98.0
Female	3	2.0
<b>Level of education</b>		
None	7	4.6
Primary	67	44.4
Secondary completed	72	47.7
Tertiary	5	3.3
<b>Occupation</b>		
Mechanic	93	61.6
Panel beater	28	18.5
Auto electrician	21	13.9
Spray painter	9	6.0
<b>Daily income (\$)</b>		
<5	56	37.1
5-15	74	49.0
>15-25	14	9.3
>25	7	4.7

**Table 2. Knowledge of PPE by occupation of auto technicians**

Knowledge of PPE	Mechanic N=93 n (%)	Panel beater N=28 n (%)	Auto electrician N=21 n (%)	Spray painter N=9 n (%)	Total N=151 n (%)	P-value
<b>Overalls</b>						
Yes	93 (100)	26 (92.9)	19 (90.5)	8 (88.9)	146 (96.7)	Fishers exact=0.01*
No	0 (0.0)	2 (7.1)	2 (9.5)	1 (11.1)	15 (3.4)	
<b>Boots</b>						
Yes	92 (98.9)	27 (96.4)	17 (81.0)	8 (88.9)	144 (95.4)	Fishers exact=0.00*
No	1 (1.1)	1 (3.6)	4 (19.0)	1 (11.1)	7 (4.6)	
<b>Gloves</b>						
Yes	88 (94.6)	27 (96.4)	18 (85.7)	7 (77.8)	140 (92.7)	Fishers exact=0.09
No	5 (5.4)	1 (3.6)	3 (14.3)	2 (22.2)	11 (7.3)	
<b>Helmets</b>						
Yes	74 (70.6)	20 (71.4)	12 (57.1)	5 (55.6)	111 (73.5)	$\chi^2 = 6.19$
No	19 (29.4)	8 (28.6)	9 (42.9)	4 (44.4)	40 (26.5)	p =0.10
<b>Earmuffs</b>						
Yes	39 (41.9)	11 (39.3)	8 (38.1)	3 (33.3)	61 (40.6)	$\chi^2 = 0.34$
No	54 (58.1)	17 (60.7)	13 (61.9)	6 (66.7)	90 (59.4)	p =0.95
<b>Cream</b>						
Yes	34 (36.6)	11 (39.3)	7 (33.3)	2 (22.2)	54 (35.8)	$\chi^2 = 0.95$
No	59 (63.4)	17 (60.7)	14 (66.7)	7 (77.8)	97 (64.2)	p =0.81

Only 42 (27.8%) respondents' level of utilization of PPEs could be classified as good. Usage of PPE seemed to be highest among those with tertiary education, 4 (80%), mechanics,

31 (33.3%) and those with daily income of \$25 or above, 4 (57.1%). These associations were however not significant (Table 5).

**Table 3. Utilization of different PPE by occupation of auto technicians**

Utilization of PPE	Mechanic N=93 n (%)	Panel beater N=28 n (%)	Auto electrician N=21 n (%)	Spray painter N=9 n (%)	Total N=151 n (%)	P-value
<b>Overalls</b>						
Yes	75 (80.7)	23 (82.1)	15 (71.4)	6 (66.7)	119 (78.8)	Fishers exact=0.56
No	18 (19.3)	5 (17.9)	6 (26.6)	3 (33.3)	32 (21.2)	
<b>Boots</b>						
Yes	57 (61.3)	16 (57.1)	6 (28.6)	4 (44.4)	83 (55.0)	Fishers exact=0.048*
No	36 (38.7)	12 (42.9)	15 (71.4)	5 (55.6)	68 (45.0)	
<b>Gloves</b>						
Yes	55 (59.1)	17 (60.7)	5 (23.8)	4 (44.4)	81 (53.6)	$\chi^2 = 15.01^*$ p=0.00
No	38 (40.9)	4 (39.3)	16 (76.2)	5 (55.6)	70 (46.4)	
<b>Helmets</b>						
Yes	33 (35.5)	6 (21.4)	3 (14.3)	3 (33.3)	45 (29.8)	$\chi^2 = 4.88$ p=0.18
No	60 (64.5)	22 (78.6)	18 (85.7)	6 (66.7)	106 (70.2)	
<b>Cream</b>						
Yes	17 (18.3)	7 (25.0)	3 (14.3)	1 (11.1)	28 (18.5)	Fishers exact=0.77
No	76 (81.7)	21 (75.0)	18 (85.7)	8 (88.9)	123 (81.5)	
<b>Earmuffs</b>						
Yes	11 (11.8)	1 (3.4)	1 (4.8)	0 (0.0)	13 (8.6)	Fishers exact=0.53
No	82 (88.2)	27 (96.6)	20 (95.2)	9 (100.0)	138 (91.4)	

**Table 4. Selected characteristics of auto technicians and levels of knowledge of PPE**

Characteristics	Level of knowledge			Statistical indices
	Good N=122 n (%)	Poor N=29 n (%)	Total N=151	
<b>Age</b>				
12-21	30 (88.2)	4 (11.8)	34	$\chi^2 = 1.7$ p =0.6
22-31	36 (78.3)	10 (21.7)	46	
32- 41	31 (77.5)	9 (22.5)	40	
>41	25 (80.6)	6 (19.4)	31	
<b>Educational level</b>				
None	6 (85.7)	1 (14.3)	7	Fishers exact=0.84
Primary	52 (77.6)	15 (22.4)	67	
Secondary completed	60 (84.5)	12 (15.5)	72	
Tertiary	4 (80.0)	1 (20.0)	5	
<b>Occupation</b>				
Mechanic	81 (87.1)	12 (12.9)	93	Fishers exact=0.03
Panel beater	22 (78.6)	6 (21.4)	28	
Auto electrician	13 (76.2)	8 (23.8)	21	
Spray painter	6 (66.7)	3 (33.3)	9	

No respondent reported receiving any form of training on workplace safety. The reasons given for non use of PPE by 12 respondents who participated in a focus group discussion were lack of training on PPE, 9 (75.0%), discomfort, 2 (16.7%) and unaffordability, 1 (8.3%).

### 3.2 Discussion

The use of PPE by auto technicians during vehicular repair contributes greatly to their

workplace safety and health. This study was conducted to assess the knowledge and use of PPE by auto technicians while carrying out their duties. The mean age of respondents was  $30.95 \pm 4.81$ . This agrees with findings of a similar study in Ghana where majority of the respondents were 26-35 years old [19]. Majority of the respondents in the present study were males as only 3 female auto technicians were involved in the study. Similar findings have been recorded in other studies [15,19]. Females are

**Table 5. Selected characteristics of auto technicians and levels of utilization of PPE**

Characteristics	Level of utilization			Statistical indices
	Good N=42 n (%)	Poor N=109 n (%)	Total N=151	
<b>Age</b>				
12-21	8 (23.5)	26 (76.5)	34	$\chi^2 = 1.94$ $p = 0.6$
22-31	14 (26.1)	32 (73.9)	46	
32- 41	9 (22.5)	31 (77.5)	40	
>41	11 (35.5)	20 (64.5)	31	
<b>Educational level</b>				
None	2 (28.6)	5 (71.4)	7	Fishers exact=0.09
Primary	17 (25.4)	50 (74.6)	67	
Secondary completed	19 (26.4)	53 (73.6)	72	
Tertiary	4 (80.0)	1 (20.0)	5	
<b>Occupation</b>				
Mechanic	31 (33.3)	62 (66.7)	93	$\chi^2 = 4.68$ $p = 0.20$
Panel beater	7 (25.0)	21 (75.0)	28	
Auto electrician	3 (12.3)	18 (87.7)	21	
Spray painter	1 (11.1)	8 (88.9)	9	
<b>Daily income (\$)</b>				
<5	16 (28.6)	40 (71.4)	56	Fishers exact=0.21
5-15	17 (23.0)	57 (77.0)	74	
>15-25	5 (35.7)	9 (64.3)	14	
>25	4 (57.1)	3 (42.9)	7	

rarely involved in vehicle repair due to the physical exertion involved. Moreover such jobs are traditionally regarded as suitable for males, so the females are not encouraged to learn the vocation. Almost half of the respondents had completed secondary education compared to 20% reported in a study in Ibadan, Nigeria [12]. This shows that vehicle repair is also engaged in by those with some basic education and not solely illiterates. Those with tertiary education were however very few. Similar finding was reported in eastern Nigeria where only 1.2% had post secondary education [15].

The respondents that were mechanics outnumbered those from the other occupations, constituting almost two thirds of the auto technicians. This could be because it may be a preferred vocation as mechanics seem to be in higher demand on routine basis than the other groups of auto technicians. Other studies also reported similar findings [19-20].

Several studies have shown that PPE provides a physical barrier to workplace hazards [21,22]. In the present study, eight out of every ten respondents had good knowledge of PPE. This was significantly higher among mechanics. Other characteristics like age and educational level did not show any significant associations with the level of knowledge. Despite the high level of

knowledge of PPE types, utilization was however low among respondents as the level of utilization of only about a quarter could be classified as good. Previous studies have also reported low use of PPE among auto technicians [1,9,11,12,14,23-24]. A study reported that though workers knew that PPE was important in protecting against injury, most of them did not wear the different types. The reason given was discomfort and heat [24]. In another study in Ghana, most of the respondents disagreed with the use of hand gloves as they wanted their hands to be free to carry out activities. Lack of usage of gloves contributes to the incidence of cuts and dermatitis [19]. A similar use of PPE of 27% as reported in the present study was documented among vehicle repair artisans in an urban area in Ghana [20]. Majority (63%) of those not using PPE in that study said they could not afford it, while 34% attributed non use to discomfort [20]. In the present study, though the respondents' knowledge about the existence of different types of PPE was high, up to three quarters of those who participated in a focus group discussion revealed that they lacked training on the importance of PPE in hazard prevention at workplace. Only one person out of twelve complained of unaffordability. This suggests that if they fully understand the role of PPE in health and safety, purchase and use would more likely increase as acquiring it would

become a priority. A daily income of 1,000 – 3,000 naira (\$5-15) which was the commonest earning of about half of the respondents was likely to be used for whatever was considered as priorities by them. An Indian study reported a mean income of INH 5350(\$80.25) monthly among the automobile workers which was lower than what was obtained in the present study and made spending on healthcare and PPE luxuries [1].

Tertiary education and higher income seemed to positively affect usage of PPE in the present study, even though the associations were however not statistically significant. The few auto electricians in the study with tertiary education probably had more comprehensive work stations with increased patronage and higher income. This would increase the likelihood of purchase of PPE. Taha also documented in his study that all the workers who used PPE had secondary education or diploma [9].

The most frequently known and used PPE in the present study were overalls. Similar finding was documented by Asogwa [11]. A study in Saudi Arabia however reported safety glasses (42%) and gloves (40%) were the most frequently mentioned, while only 3% mentioned overalls [9].

No respondent in the present study reported receiving any form of training on workplace safety. A similar finding was reported in another study [1]. Adequate training would lead to increased consciousness of workplace hazards and the role of PPE in minimizing their effects. A study reported a linkage between awareness of hazard and utilization of safety measures [25]. Legislation and enforcement have also been reported in a study to increase PPE utilization [16].

#### 4. LIMITATION

Some of the auto technicians were not willing to spare too much time to be interviewed as they were eager to resume their activities. This may have led to the withholding of certain information in order to save time. Also, the issue of self reporting was considered a limitation as the findings of the study were entirely based on the information given by the respondents.

#### 5. CONCLUSION

There was low utilization of personal protective equipment among the auto technicians in this

study, despite a relatively high knowledge level of the existence of different types. Up to three quarters of those who participated in a focus group discussion revealed that they lacked training on the importance of PPE in hazard prevention at workplace. Routine training of automobile technicians on the link between PPE utilization and workplace health and safety is strongly advocated. This training can be organized through their union and fixed on their monthly meeting days. Legislation and enforcement of PPE use by auto technicians may also be of great benefit.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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