

## Adherence to safety protocols among factory workers of an industrial municipality in southern Ghana.

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### Abstract

**Background:** A critical component of safety in the work environment is adherence to safety protocols for the protection of workers. The violation of safety procedures in the workplace has resulted in over a million workplace accidents globally, majority of which are reported in industrial hubs of low income countries.

**Methods:** Cross-sectional design was used to quantitatively study 241 factory workers to establish demographic factors influencing adherence to safety protocols.

**Results:** The results indicated that age ( $p<0.001$ ), sex ( $p<0.001$ ), education ( $p=0.035$ ) and job position/rank ( $p=0.013$ ) influenced adherence to safety protocols significantly. Females were more likely to adhere to safety protocols than males [odds ratio (OR)=2.61 (95% C.I 1.44–4.73),  $p=0.002$ ]. Workers with University degrees had higher likelihood of adhering to safety protocols compared with Certificate holders [odds ratio (OR)=2.81 (95% C.I 1.14–6.95),  $p=0.025$ ]. The odds of adherence to safety protocol among supervisors was 40% less than that of operators of factory equipment [odds ratio (OR)=0.42 (95% C.I 0.21–0.87),  $p=0.019$ ].

**Conclusion:** Our findings show that supervisors' report of poor adherence to safety protocols is a major problem which stems from the responsibility of the employer, which if not attended to, could worsen safety and health hazards among factory workers in low income countries.

**Keywords:** Hazard, Industry, Workplace, Ghana.

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### Introduction

Accidents in factories continue to threaten the safety of workers globally, resulting in injuries, disabilities or deaths. It is estimated that over two million people worldwide die of occupational injuries and work-related diseases annually [1,2]. About 80% of these adverse health impacts occur in developing countries [2]. In Ghana, factory workers are exposed to work related accidents daily. In the year 2012, Amponsah-Tawiah and Dartey-Baah [3] estimated that the annual number of factory related accidents and illness was more than two million. Some of these accidents were reported to arise due to exposure to workplace hazards including cutting equipment, operation of machinery, collision with objects, falls, burns and contact with corrosive chemicals. According to Gyekye [4], factors such as non-existence of safety protocols, limited knowledge of existing protocols and failure to comply with established workplace protocols contribute to high rate of reported accidents in the workplace.

In the interest of ensuring protection of workers from work-related injuries and illnesses as well as preventing accidents in the workplace, government and local institutions must not only provide policies and protocols to workers, but also ensure effective adherence to same. Occupational health and safety

literature suggests that effective participation of workers in health and safety issues depend on availability of policies [5]. Notwithstanding the critical roles in ensuring worker protection, Ghana is yet to publish a single comprehensive national policy on occupational health and safety, as it currently gleans from different fragmented legal provisions to inform workers about their health and safety [6]. Existing national and institutional health and safety policies should describe procedures that must ensure safety and health of workers in an industry with regards to identification and control of hazard as well as ongoing education and training of workers on safety and health [7].

Studies have shown that safety in the workplace is a joint responsibility of both employers and employees [8,9]. Thus, every worker is entitled to safety services irrespective of the type of occupation or specific task performed [3]. Violations to safety procedures are significant causes of many accidents in the workplace [10-12]. In Ghana, for instance, a total number of 18,454 workers made financial claims due to workplace injuries between 2008 and 2010 [13]. Since there is poor information regarding the present status on adherence to safety protocols among factory workers in resource poor settings, it is crucial to conduct research to improve knowledge about the situation in such locations.

Thus, this study aimed to assess the factors influencing adherence to safety protocols among workers in five factories located within an industrial setting in Southern Ghana with emphasis on demographic features of the workforce. This would inform workers about the status and risk factors associated with adherence to safety protocols in industrial settings of low income countries.

## **Method**

Factory workers were defined as those who worked for food and beverages production companies within the Tema municipality of Ghana and earned monthly salaries. The types of activities undertaken by these workers include manufacturing, processing and packaging of foods and beverages.

### ***Study site and design***

This cross-sectional study was conducted to generate quantitative research information from 241 factory workers in Tema, an industrial hub in Ghana, about the factors influencing adherence to safety protocols. Four (4) registered food and beverages production companies were randomly selected out of 21. These companies were selected based on certain similar features with Unilever Ghana Limited, a standard company used for this study. The selection criteria were; factory workers with three shifts system, availability of 'parent' multinational company, and evidence of low records of reported accidents by the Factories Inspectorate Division of Ghana. The four (4) companies were designated A, B, C and D.

### ***Sampling***

A sample size of 277 was calculated to obtain accurate and valid results based on the Cochran's correction formula (1997) [14];  $n1+n/N$  where  $n=Z^2pd/d^2$ ,  $p=0.05$  and  $N=1002$ . However, after collection of questionnaire, editing, cleaning and coding, data from 241 respondents was obtained and used for analysis. The sample of factory workers recruited for the study was in proportion of the total population of the respective factories. Thus, a total of 90, 54, 17, 25 and 55 respondents were obtained from Unilever Ghana Limited, Companies A, B, C and D respectively. Simple random sampling was used to select the workers through balloting.

### ***Questionnaire administration***

A previously tested self-administered questionnaire (consisting of 20 items) was used to collect data from the factory workers about demographic characteristics, adherence to safety protocols, and knowledge of safety protocols. Each Likert scale question consisted of five (5) point scale items ranging from 1 (strongly disagree) to 5 (strongly agree) [15]. The questionnaire was given to each factory worker in a sealed envelope and completed by them individually. The identity of both workers and companies were not disclosed (except for Unilever Ghana Limited, upon request) and information provided by the workers were kept confidential.

### ***Ethics statement***

The current study received ethical clearance from the Ghana Health Service Ethical Review Committee (GHS-ERC) with

protocol number GHS-ERC: 68/03/13. Individual consent was sought from each factory worker and those who voluntarily agreed to participate, by signing the consent forms, were given the questionnaire.

### ***Data management and analysis***

After fieldwork, each questionnaire was given a reference number and checked for completeness before entering data into SPSS version 20.0 for Windows 10 (SPSS, Inc., Chicago, IL, USA) to minimize errors and to validate the data. Double entry of data from questionnaire responses was done to ensure accuracy. The independent variables were age, sex, education, rank or position at work. The outcome variable was adherence to safety protocols among factory workers. In order to examine and quantify the associations that might exist between the independent and outcome variable, Chi-squares and logistic regression analysis were performed. The strength of association between the independent and outcome variable was determined, considering  $p$  values less than 0.05 as statistically significant in this preliminary study.

## **Results**

### ***Demographic characteristics of factory workers***

Overall, the majority (167/241; 69.3%) of factory workers were males compared with (30.7%; 74/241) females, whilst mean age was 33.5 years  $\pm$  9.42SD. The median age was 32 years (Ranging from 19 to 57 years). The highest educational qualification for most (145/241; 60.2%) factory workers was tertiary (i.e., University Degree and Higher National Diploma) whilst the least (about 16%) obtained Secondary/Vocational school Certificates. Most (187/241; 77.5%) of the factory workers were equipment operators on the factory floor whilst 18.7% (45/241) were supervisors and about 4% managers, as shown in Table 1.

### ***Association between demographic characteristics and adherence to safety protocols***

There were strong significant associations between age ( $p<0.001$ ); sex ( $p<0.001$ ) and adherence to safety protocols among factory workers (Table 2). The level of education and position or rank of workers also showed somewhat significant associations with adherence to safety protocols ( $p=0.035$ ,  $p=0.013$  respectively), among the study participants as shown in Table 2.

### ***Effect of demographic characteristics on adherence to safety protocols***

As shown in Table 3, females were 2.60 times more likely ( $p=0.002$ ) to adhere to safety protocols at the workplace compared with males. The odds of supervisors adhering to safety protocols was 40% less compared with that of workers operating equipment on the factory floors. Workers with Higher National Diploma (HND) were about 3.6 times more likely of adhere to safety protocols compared with certificate holders ( $p=0.004$ ), whilst those with University degrees were about 3 times more likely to adhere compared with certificate holders ( $p=0.025$ ).

**Table 1.** Demographic characteristics of factory workers (n (%) represent frequency and row percentages).

Characteristic	Unilever Ghana n (%) N=90	Company A N (%) N=54	Company B n(%) N=17	Company C n(%) N=25	Company D n(%) N=55	Total n(%) N=241
<b>Age</b>						
18-30	23(25.6)	28(51.9)	9(52.9)	8(32.0)	43(78.2)	111(45.9)
31-40	25(27.8)	19(35.2)	7(41.2)	1(5.9)	14(56.0)	76(31.4)
41-50	24(26.7)	7(13.0)	****		3(12.0)	1(1.8)
51-60	18(20.0)	****			****	18(7.4)
<b>Sex</b>						
Male	73(81.1)	32(59.3)	14(82.4)	21(84.0)	27(49.1)	167(69.3)
Female	17(18.9)	22(40.7)	3(17.6)	4(16.0)	28(50.9)	74 (30.7)
<b>Education</b>						
Certificate	****	4(7.4)	7(41.2)	2(8.0)	8(32.0)	26(47.3)
Diploma	10(11.1)	18(33.3)	****	9(36.0)	21(38.3)	57(23.7)
HND	45(50.0)	18(33.3)	7(41.2)	6(24.0)	6(10.9)	2(3.6)
Degree	35(38.9)	14(26.0)	2(17.6)			60(28.5)
<b>Position/Rank</b>						
Operators	87(96.7)	26(48.1)	15(88.2)	20(80.0)	39(70.9)	187(77.5)
Supervisors	2(2.2)	25(46.3)	1(5.88)	4(16.0)	1(4.0)	13(23.6)
Managers	1(1.1)	3(5.6)	1(5.88)		3(5.4)	9(3.7)

N represents sample size in a row.

\*\*\*\*indicate the fact that parameter estimates were not possible since the number workers that had the outcome of interest was zero).

**Table 2.** Relationship between demographic factors and adherence to safety protocols.

Characteristic	N=241 N (%)	Adherence to safety protocols N (%) N=102	$\chi^2$ , P-value
<b>Age</b>			
18-30	111(45.9)	32(31.4)	21.912, p<0.001
31-40	76(31.4)	34(33.3)	
41-50	36(14.9)	25(24.5)	
51-60	18(7.4)	11(10.9)	
<b>Sex</b>			
Male	167(69.3)	82(80.4)	10.26, p<0.001
Female	74 (30.7)	20(19.6)	
<b>Education</b>			
Certificate	37(16.2)	9(8.8)	10.366, p=0.035
Diploma	57(23.7)	22(21.6)	
HND	85(35.3)	44(43.1)	
Degree	60(28.5)	27(26.5)	
<b>Position/Rank</b>			
Operators	187(78.4)	89(87.3)	8.7, p=0.013
Supervisors	44(18.3)	12(11.8)	
Managers	8(3.3)	1	

## Discussion

This study increases our understanding about adherence to safety protocols within the context of demographic features of factory workers in an industrial setting of a low income country. Adherence to safety protocols at the workplace is considered a core component of safety behaviour among workers [16]. Common demographic factors used by previous researchers to assess adherence to safety protocols comprise age of workers, level of education, type of employment and gender [17-20].

Pertaining to sex, our study reports higher male participation in factory work compared with females. The social distinction between the roles of men and women in domestic and public spheres might have contributed to this finding. Men are perceived

**Table 3.** Influence of demographic characteristics on adherence to safety protocols (Ref represent the reference variable of the covariate used in logistic regression analysis).

Characteristics	Adherence to safety protocols Odds ratio	(95%CI)	P-Value
<b>Educational level</b>			
Certificate	Ref.		
Diploma	2.095	0.838-5.237	0.114
HND	3.577	1.517-8.435	0.004**
Degree	2.813	1.139-6.945	0.025*
<b>Position/Rank</b>			
Supervisors	Ref.		
Operators	0.421	0.205-0.868	0.019*
Managers	0.161	0.019-1.330	0.09
<b>Age</b>			
18-30	Ref.		
31-40	1.999	1.085-3.681	0.026*
41-50	5.611	2.472-12.733	0.000***
51-60	3.879	1.381-10.897	0.010*
<b>Sex</b>			
Male	Ref.		
Female	2.605	1.436-4.727	0.002**

to possess traits of robustness and physical strength required for factory work [21]. However, a case-control study conducted in Ethiopia by Aderaw et al. [22] reported that men were more likely to ignore safety rules and sustain injuries due to their tendency to engage in risky behavior at work. Another study by Courtenay [23] reports that possession of masculine ideals by men contribute to the disparity between health outcomes of men and women at the workplace. Other anecdotal evidence suggests that health promoting behaviours are associated with femininity whilst health harming behaviours are linked with masculinity. These observations place a responsibility on employers of factory workers to educate and train male employees about the need for adherence to safety behaviour and practices at the workplace. This would reduce reported accident cases among

factory workers working in industrial hubs of low income countries, majority of whom are males.

The finding that older factory workers were more likely to adhere to safety work procedures is consistent with a previous finding in France by Bhattacharjee et al. [24], which may be due to disparities in factors including working experience, level of skills and knowledge about work and safety procedures between older and younger workers. Older workers have the tendency to offer years of experience, skill and wisdom to their juniors, providing critical mentorship to younger workers or to newly assigned employees. It is, however, important that whilst attempts are made by employers to improve adherence to safety measures among younger employees, supporting the health and safety of older workers is not compromised. This would ensure that factory workers meet their full potential at the workplace.

Factory workers who had higher education (i.e., up to the University level) were more likely to adhere to safety protocols compared with those with lower educational qualifications (i.e., with certificates). Other studies conducted in similar industrial settings of low income countries also found associations between educational level and safety behaviour [18,20]. Workers with higher education were more compliant with safety procedures. This would suggest that the more educated a worker is, the less likely they would experience the hazards of work as a result of better understanding and compliance to safety protocols.

Supervisors play key roles in ensuring safety of employees in the workplace [25]. Employees on the other hand are more likely to conform to safety rules and procedures when they perceive that the supervisors themselves are compliant or demonstrate fair levels of adherence to safety protocols [25]. The problem, however, is that supervisors, may become complacent to adhere to safety protocols because of absence of direct supervision by their immediate superiors or employers on the factory floor. This assertion may explain the findings of this study about the higher likelihood of adherence to safety protocols among operations staff compared with the supervisors. Even though it is the responsibility for the employer to educate and train both supervisors and workers, it might be anticipated that supervisory support is critical for improved adherence by workers to safety protocols. As such, there must be mechanisms available to improve this process in the workplace to reduce safety and health hazards among factory workers.

### **Limitations of Study**

Future researchers should apply designs that offer a sounder basis for inferring causality, as the cross-sectional design applied in our study prevents drawing inferences based on causality. Secondly, the respondents' adherence to safety protocols may be over-estimated to portray evidence of positive work behaviour. Future studies with prospective design to also include additional variables, when implemented, would provide valuable information relating adherence to safety protocols and incidence of injuries recorded among factory workers in industrial settings of low income countries.

### **Conclusion and Recommendation**

Our findings show that supervisors' report of poor adherence to safety protocols is a major problem which stems from the responsibility of the employer, which if not attended to, could worsen safety and health hazards among factory workers. Factory supervisors need to be properly educated on safety protocols since supervisory support is critical for improved adherence by factory workers to safety protocols. There is need for policy makers to promote measures to help improve adherence to safety protocols among factory workers, thereby reduce exposures to hazards of work.

### **Author's Contributions**

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Study design (JPK, IDN and MOA). Data collection, cleaning and analysis (JPK and MOA). Quality assessment (JPK and IDN). Preparation and critical review of manuscript (JPK and IDN). All authors read and approved the final manuscript.

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