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Knowledge, Attitude and Practice on the Use of Personal Protective Equipment to Small Mining Industry at Kaboha Ward in Geita Region-Tanzania

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Abstract

Background: Knowledge, attitude and practice on the use of personal protective equipment's (PPEs) to small scale mines helps to reduce the risk of getting diseases like tuberculosis, lung cancers and difficulty in breathing. All these may be associated with improper wearing of personal protective equipment like overalls, gumboots, gloves, helmets and goggles at the working places.

Method: The structured questionnaires were used during data collection by providing questionnaires to the workers, then, they filled them according to the questions which needed them to respond. The sample size employed was 120 participants from Kaboha and Busolwa wards working at Kiboha ward mining industry. Many workers' ages ranged 26-35 years. Data analysis has been performed by using the Statistical Package for Social Sciences (SPSS) version 26.

Results: The findings show that 88.4 % of the mining workers had knowledge on wearing PPE and 11.6 % of the workers had no knowledge on wearing the PPE. In practice, it has been revealed that 83.6% of miners wore PPE improperly and only 16.4% wore properly. The low practice is attributed to the workers' attitude as 80.8% perceived as normal and 19.2% perceived as not normal, despite the fact that 76.6% received training.

Conclusion: In regard to the findings, it shows that the workers at Kiboha ward mining are not wearing properly the PPE; hence, they suffer from diseases and infections like tuberculosis, lung cancers, and difficulty in breathing. Some of them become injured to different parts of their bodies like legs, heads, and hands.

Keywords: Knowledge, attitude, practice, personal protective equipment, small mining Industry, Tanzania



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Introduction

Personal Protective Equipment (PPE) is a type of protective gear that is designed to safeguard the wearers' body from injuries or infections/illnesses. PPE is used in a variety of settings, including healthcare, construction, mining, and manufacturing. Surface mine means an excavation in the earth conducted above ground (open-pit mine) for the purpose of opening-up, proving or producing any mineral from a natural deposit. It includes all facilities belonging to or used in connection with the mine.¹ Globally, the mining sector employs over one hundred million people and largely supports global growth.²

Issues of knowledge, attitude and practice on the use of PPE are still a challenge in different areas of the world in which the developing countries face more challenges. For example, when the knowledge and practices of occupational safety and health (OSH) in large and small-scale gold mining sector of Ghana were assessed among 120 miners, it was revealed that 5.8 % do use PPE, 70 % have never used it, while the rest claimed they do it "sometimes".³ Therefore, the compliance with OSH standards has been reported to be low in small scale mining industries.⁴ The proper use of PPE can prevent 37.6% of occupational injuries and diseases. 12%–14% of occupational injuries causing in total disability are due to employees not wearing appropriate PPE.⁵

On Dust Exposure during Small-scale Mining in Tanzania, the median crystalline silica content and the combustible content of the respirable dust samples were 14.2 and 5.5%, respectively.⁶ On the Occupational injuries and fatality in a Tanzanite mine: need to improve workers safety in Tanzania, for the selected period, 248 injury patients were seen. All were males, and 54% were between 18 - 30 years age-group. Almost all (98.7%) didn't use protective gears at work and worked for more than 12 hours daily. Falling rocks were the leading cause of injury (18.2%), and majority sustained multiple injuries (33%). Of the patients seen, 41.3% died.⁶

At Shibalanga Village at Kaboha Ward, the problem of improper use of PPE is common, and it is estimated that, the number of injuries is 342, and 456 people are suffering from respiratory infections. Nowadays people become injured, disabled, suffering, and getting chronic diseases like lung cancers because of working in mining industry without using personal protective equipment's during extraction and purification of minerals. There is a small-scale mining at Kaboha ward in Nyang'hwale district Geita with a total number of 1652 workers of which 964 are males and 688 females. Total number of injuries occurred in the year of 2021, 2022 and 2023 are

147, 256 and 342 respectively. Also, cases are 159 (2021), 187 (2022), 243 (2023) individuals who are suffering from respiratory infections.⁷ This study complies with SDG of 2030 section number 6, which is focusing on improving the health status of the people, especially in rural areas, so this study will help on improving people's health. The aim of the study was to assess the factors contributing to the knowledge, attitude, and practices on the use of personal protective equipment to small mining industry at Kaboha Ward in Geita Region.

Method

Study Area

The study was conducted in Geita Region, Nyang'hwale District, Kaboha and Busolwa Ward at Shibalanga, Ifugandi and kaboha Small Mining industries. the total population of Geita region is 2,977,608 males are 1,463,764, females are 1,513,844 of which Nyang'hwale district it has the total number of 225,803, males are 113,495 and females are 112,308 while kaboha ward it has population of 9,402, males 4,632, females 4770 and Busolwa ward has the total population of 18,658, males 9,367 and females are 9,291 but also the economic activities which is conducted over there are, mining, agricultural, livestock keeping and business activities are the major activities conducting at Kaboha and Busolwa ward.⁸

Study Design and Population

The cross-sectional study was employed to investigate knowledge, attitude, and practice on uses of Personal Protective Equipment, in which large number of data was collected at a short time. The study population included all labours working at mines aged from 18 years and above from different places, in Tanzania.

Study Size

The sample size was 120, i.e. 20 workers at management level, and 100 labours who work at Shibalanga mining, Kaboha and Ifugandi, aged 18 years and above.

From the formula⁹; $n = (NZ^2 P(1 - P)) / (e^2 (N - 1) + Z^2 P(1 - P))$

Where; N=Study population =1652, Z=1.75(given confidence level of 92%, P=Proportional Population =0.5, E=Accessible error =0.088, and n =sample size

$n = (1652 * [1.75]^2 0.5(1 - 0.5)) / ([0.088]^2 (1652 - 1) + [1.75]^2 0.5(1 - 0.5)) = 120$ participants

Sampling Procedure

Participants were selected using simple random sampling method because it's fair/ unbiased, every member of the population has equal chance to be

included in the sample thus individuals who meet the criteria consent for their participation in the study after being explained to them the aim of the study, voluntary nature of their participation and data collection procedures.

Data collection method

Structured and unstructured questionnaires were used to investigate reasons for improper use of PPE which have been used as a tool for data collection which comprise of different parts because it collects information from a large number of people within a period of time, hence it ensures accuracy of data collection so that the results are interpreted and generalized. Pre-test of the data collection instruments were done to 12 participants at Kiboha ward, and improvements were carried out.

Data analysis and presentation

Data entry and statistical analysis has been performed by using the Statistical Package for Social sciences (SPSS) since it ensures effective data sorting management and analysis to draw the conclusion. Data were presented by using charts and tabular format.

Ethical approval

Mining manager, foremen, and Environmental Health officer were informed about the purpose of the study and that information which have been provided by labours was kept confidential and data collection tools required provision of sensitive identical participants' information i.e. names, phone numbers etc.

Results

A total of 120 respondents (miners, smelters, supervisors, machine operators) having the age of 18 years and above participated in the study. The table 1 below shows the age, gender, level of education, marital status and occupation of workers who responded during data collection. The males were 90 (74.4%) and females were 30 (25.6%). In terms of ages; 18-25 years were 32 workers (26.4%), 54 workers (44.6%) aged 26-35 years, 27 (22.3%) aged 36-45, 6 (5%) aged 46-55 and 1 (0.8%) aged 56 and above. Also, the level of education, marital status and the occupations of workers at Kaboha ward as follows , for those with primary or secondary education were 89 (73.6%), certificate 21 (17.4), diploma 10 (10%), about marital status of workers were as follows for those who were married are 72 (59.5%) and those who were not married are 48 (40.5%), occupations of people who are working in those mines industries are as follows small miners 95 (78.5%), farmers 7 (5.8%), smelter 7 (5.8%) and the supervisor of those mines were 11 (9.1%).

Table 1: Age, Gender, Level of Education, Marital status and Occupation

| Category | Description | Freq | Percent |
|--------------------|-----------------------|------|---------|
| Age | 18-25 | 32 | 26.4 |
| | 26-35 | 54 | 44.6 |
| | 36-45 | 27 | 22.3 |
| | 46-55 | 6 | 5 |
| | 56> | 1 | 0.8 |
| Gender | Male | 90 | 74.4 |
| | Female | 30 | 25.6 |
| Level of Education | Primary and secondary | 89 | 73.6 |
| | Certificate | 21 | 17.4 |
| | Diploma | 10 | 8.3 |
| Marital status | Married | 72 | 59.5 |
| | Not married | 48 | 40.5 |
| Occupation | Small miners | 95 | 78.5 |
| | Farmers | 7 | 5.8 |
| | Smelter | 7 | 5.8 |
| | Supervisor | 11 | 9.1 |

The table 1 shows the trend of demographic information's which comprises of the ages, gender, level of education, marital status and occupation of the workers at the area where investigation was conducted at Kaboha ward Geita. The percentage of males (74.4%) is greater than that of females who are working in the mining activities due to nature of the activities performed which need more masculine. The age of majority who are working in the mining site ranges 26-35(44.6%). Majority of workers (73.6%) were those completed primary and secondary level compared to other levels of education. In terms of marital status those who married (59.5%) were more than the unmarried ones due to the fact that they were occupied with earning money for basic needs of caring their families. Also, more workers were small miners (78.5%).

The table 2 shows that 107 (88.4%) of workers have knowledge on wearing personal protective equipment (PPE) at the working places, and 13 (11.6%) are those who do not have on knowledge wearing PPE. Some of the personal protective equipment used by workers are; 1 worker (0.8%) used masks, 28 (23.1%) used helmets, 32 (26.4%), 1 worker (0.8%) used overall cloth 1 (0.8%). Also, the workers who used all the PPEs as recommended were 58 (47.9%), signifying high knowledge. Furthermore, the respondents responded on the importance of wearing personal protective equipment as follows: on the category of prevention of diseases were 19 (15.7%), prevention of dusts 17 (14%), prevention of injuries 16 (13.2%), others 13 (10.7%) and those who responded that all alternative are important were 55 (45.8%).

Table 2: Knowledge of workers associated with type and significance of using PPE

| Category | Description | No. | Percent |
|-------------------------|---------------------------------|-----|---------|
| PPE (n = 120) | Knowledge on Wearing | 107 | 88.4 |
| | Don't have knowledge on wearing | 13 | 11.6 |
| Type of PPE (n =107) | Masks | 1 | 0.9 |
| | Helmets | 28 | 26.2 |
| | Overalls | 1 | 0.9 |
| | All (masks, helmets, Overalls) | 58 | 54.2 |
| | Diseases prevention | 19 | 15.8 |
| Importance (n =120) | Dusts prevention | 17 | 14.2 |
| | Injuries prevention | 16 | 13.3 |
| | Others (mercury, gloves...) | 13 | 10.8 |
| | All | 55 | 45.8 |

The figure 1 below shows the trend of workers perceptions on effects of not wearing PPE at the working places who said normal are 97 (80.8%) and not normal 23 (19.2%).

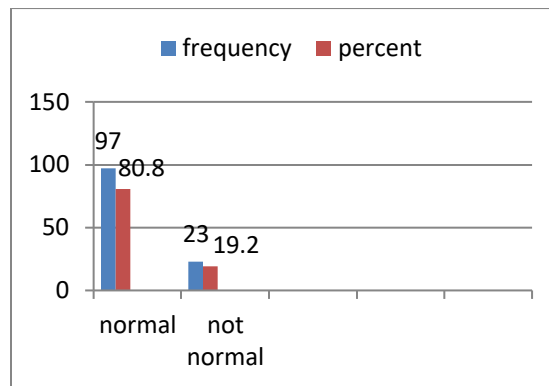


Figure 1: Workers perceptions on effects of not wearing PPE

The figure 2 below shows the trends of health effects associated with improper or not wearing of PPE which have been listed by workers in the mines as follows; diseases 19 (15.7%) respondents said diseases occurrence (15.7%), 35 respondents (28.9%) said accidents, 25 respondents (20.7%) said swelling of legs and limbs, 28 (24%) said, difficult breathing 28 and those who stated other negative effects (miscarriages, infertilities, poverty) apart from those alternatives in questionnaire were 13 (10.7%).

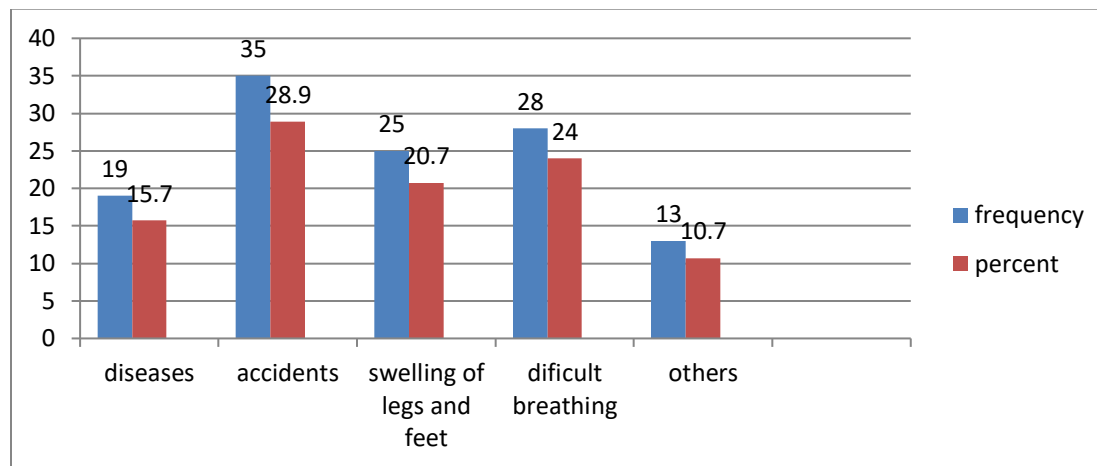


Figure 2: Effects of not or improper wearing of PPE

The chart below (figure 3) shows the trends of workers who whether trained on how to wear properly or not trained on how to wear PPEs, and the responses were as follows; who responded yes that they received training are 92 (76.6%) and no are 28 (23.4%).

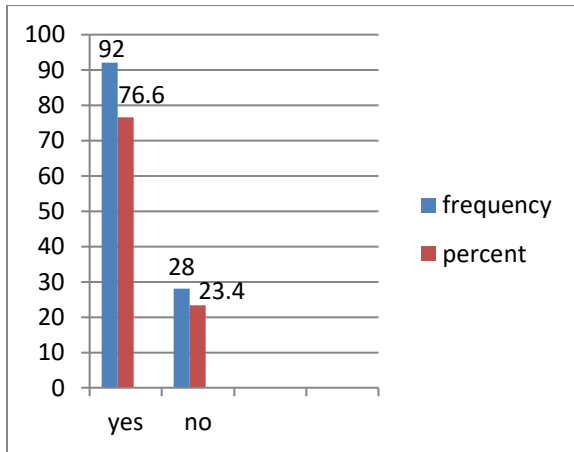


Figure 3: Training on How to Wear Proper PPEs

The chart (figure 4) shows the trend of workers who are wearing PPE properly who answered yes 14 (11.7%) and no 106 (88.3%).

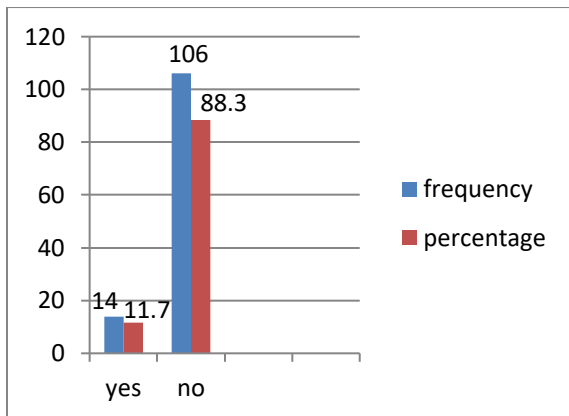


Figure 4: Workers Wearing Properly the PPE

Discussion

The study found that 88.4 % of the mining workers had knowledge on wearing PPE and 11.6 % of the workers had no knowledge. In practice, it has been revealed that 83.6% of miners wore PPE improperly and only 16.4% wore properly. The low practice is attributed to the workers’ attitude as 80.8% perceived as normal and 19.2% perceived as not normal, despite the fact that 76.6% received training.

88.4% of mining workers had knowledge on wearing PPE, and those who had no knowledge on wearing PPE (11.6%) stated that they did not get training. Despite the fact that majority had knowledge on how to wear PPE, the state of everyone according to his/her income to buy the PPE is contrary to human health standards as it is very important for everyone to be given the PPE prior commencement of working. That is to say the employer

had to provide enough and complete set of PPEs to all mining workers. This is suggested by the study which demonstrates that, PPE with high effectiveness are the best ones to be distributed to workers by the overseers before they start working.¹⁰ Also, this study provides different view as in Ghana very few miners use PPE despite the significant hazards and risks to which they are exposed.¹¹ Therefore, training is insisted to be done to the mining workers on the significance of wearing PPE at working places.

The workers perception on the effects of not wearing the personal protective equipment at the working area was low. Majority of workers (80.8%) not wearing of PPE as normal phenomenon at working places since the outcome of effects takes long period of time. The perception, that not wearing PPE is normal is contrary to the study⁶ which shows one of examples of the results of not wearing the PPE like falling rocks were the leading cause of injury and majority sustained multiple injuries (33%) of the patients seen, whereas, 41.3% died. The effects of accidents is leading as 28.9% of workers have been affected, followed by difficulty in breathing (24%), then, swelling of legs and feet (20.7%), diseases (15.7%) and other effects like miscarriages, infertilities... (10.7%). That means not wearing PPE is fatal as can bring disabilities and non-communicable diseases. Therefore, this concurs with one of the studies suggesting that, the proper use of PPE can prevent 37.6% of occupational injuries and diseases. Also, 12%–14% of occupational injuries resulting in total disability are caused by employees not wearing appropriate PPE.⁵

Training was done to 76.6% of workers at mining sites basing on how to wear properly the PPE. For that case, some of the reasons for those who do not wear properly the PPEs are due to their behaviour of neglecting as the way they perceive issues despite the education they have as signified by 73.6% of miners have primary and secondary school levels, and still received training on PPE use. This concurs with the study (in Turkey) which states that, characteristics and needs of each job to maximize the knowledge and skills of workers in implementing occupational health and safety is crucial.^{10,12}

The study indicates the trend of workers who have enough personal protective equipment at the working places, but, 88.3% of workers do not wear properly the PPE. This means many workers are not wearing PPE properly during working hours which is detrimental as can result into injuries resulting into disabilities, communicable and non-communicable diseases. Malema cautions that every worker should take

reasonable actions in ensuring that PPE are worn properly to avoid unnecessary accidents to meet the standards of Occupational Health and Safety.¹³

Implications of the findings of this study

The accredited small-scale mines' industries will improve quality of the health services offered, especially in the areas that were identified as weakest, which include physical facilities, equipment and presentation of personnel. Also, Mines Company has to provide personal protective equipment to workers who are working in the mining places instead of the workers to come with their own equipment during working hours. Furthermore, the mines company has to employ an environmental health practitioner who will be the chief adviser on the issues relating with the prevention of diseases which may be associated with the mining activities for example, respiratory infections, and some of the chronic disease like skin and lung cancers. It is important to establish a system of regularly getting clients' feedback on different aspects of the services provided, in order to improve on them and serve clients better. Then, the government also has to ensure the enforcement of rules and regulations to all miners that violate the laws.

Strengths and Limitations of the Study

On one side, the study is essential as it is going to contribute to the improvement of the mining company in area of supplying sufficient PPE to ensure safety to the workers. The mining officials will work hard to ensure that the occupational health and safety standards are met for healthy community. On the other side, needed tolerance during data collection since the miners were so busy such that meeting with them took a bit long period of time. Financial constraints occurred such that some friends contributed to ensure the purpose as met.

Conclusion

Based on the major findings highlighted in this study, it can be concluded that the entire Personal Protective Equipment (PPE) is a type of protective gear that is designed to safeguard the wearer's body from injury or infection. PPE is used in a variety of settings, including healthcare, construction, mining, and manufacturing. It's essential to use personal protective equipment's in every setting which needs gears which will prevent worker from becoming injured and suffering from respiratory infections like tuberculosis.

Declarations

Ethical Consideration: Mining manager, foremen, and Environmental Health officer were informed about the purpose of the study and that information which have been provided by labours was kept confidential and data collection tools required provision of sensitive identical participants' information i.e. names, phone numbers etc.

Authors' Contribution: Erasto Kinemelo was responsible for data supervision and manuscript preparation. Kengele James Kengele worked on data collection and analysis

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