A study protocol to determine the influence of socio-demographic characteristics on Knowledge, Attitude, and Behaviour of Artisanal Miners on Occupational Health and Safety, and Mining regulation in Kolwezi, Democratic Republic of Congo

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Abstract

Introduction: Artisanal mining has been classified as a high-risk occupation worldwide. This has been largely attributed to the nature of the work, the lack of knowledge on occupational health and safety, and non-compliance with safety regulations. This study is designed to assess the knowledge, attitudes, and behaviour of artisanal miners on occupational health and safety and the Democratic Republic of Congo mining regulation in Kolwezi city. **Method**: This paper proposal describes the influence of socio-demographic characteristics on the level of knowledge, attitude and, behaviour of artisanal miners and compliance with safety regulations. A cross-sectional study will be conducted among workers using simple random sampling from five different artisanal mines in Kolwezi, in the Democratic Republic of Congo. Data analysis will be performed using both Statistical Package for Social Sciences (SPSS) version 25 and the Center for Disease Control and Prevention (CDC) program EP INFO 7.2. The results were reported as odds ratios and adjusted odds ratios with 95% confidence intervals. **Results:** The study will provide the causes of the lack of knowledge of Kolwezi's artisanal miners on Occupational Health and Safety and, non-compliance with safety measures and mining regulation. This study will assist the Ministry of Labour to reinforce the policies and framework in Occupational Health and Safety in artisanal mining by empowering and equipping occupational inspectors. **Conclusion:** Through the Ministries of Education and Public Health, artisanal miners can be trained on safety measures and the use of PPE.
Keywords: Occupational Health Safety, mining regulations, Artisanal Mining Card, Knowledge, Attitude, and Behaviour

Introduction

In the Democratic Republic of Congo, when public mining enterprises such as MIBA and GECAMINES bankrupted, a large part of the mining activities has been taken over by actors in the informal sector, who exploit concessions abandoned or formerly belonging to the public enterprises (1). As of 2002, much artisanal mining has been happening due to increased demand for minerals and high rates of unemployment. This vertiginous progression of artisanal mining activities is not without unfortunate consequences. Several young people engaged in artisanal mining are exposed to all kinds of occupational hazards and daily, human lives are lost because of failure to comply with safety regulations. In 2006, at the artisanal exploitation site of Ruashi Mining, 13 accidents causing 35 deaths and 16 injuries has been reported, indicating an annual victim rate of 0.4 to 0.5% (2). In June 2019, 40 artisanal miners died in Kamoto Copper Company (KCC) in Kolwezi, and in October 2019, 21 artisanal miners died when a gold mine in Maniema Province collapsed (3-4). Although occupational health and safety in the mining industries have much improved over the past years, there are still more measures that need to be implemented to guarantee a safe working environment (5). Therefore, this paper aims to provide statistical information about the knowledge, attitudes, and behaviour toward OHS and mining regulation among artisanal miners in Kolwezi.

The working environment in artisanal mining is dangerous because of non-respect of safety standards, no wearing of personal protection equipment to protect miners from exposure to radiation, injuries, and other accidents that may occur (6). The International Labour Organization (ILO), convention No.176, Article 14 states that under national laws and regulations, workers should perform their specific duties following their training guidelines which include compliance with the prescribed safety and health measures in consideration of how possible carelessness can put not only their lives but also that of others in danger (7). Therefore, occupational health and safety are of great importance in terms of protecting employees from professional risks which have negative effects both economically and socially.

The DRC has developed regulations adapted to the local situation to ensure occupational safety based on Title 7 of the Labour Code, Article 207 of the Mining Code, and Article 492 of Mining Regulations (8, 9, 10). Congolese Labour Code requires the promotion and establishment of an occupational health and safety system. It is in this perspective that the Ministry of Labour undertook various actions to set up a promotional framework in matters of health and safety, in particular by the establishment of a better regulatory framework that aims to improve health and safety at work (8). In addition to these fundamental tools governing the country's mining sector, there are several official texts: orders, instructions, circulars, and deeds of engagement from the operators involved in formalizing and improving artisanal mining in the DRC.

In the DRC, although the safety concerns associated with artisanal mining activities are known, and the Congolese Labor code and Mining code are applied, hardly a week passes without an article in the press reporting new accidents. It appears there is no understanding of occupational health among artisanal miners. Therefore, this study will assess the knowledge, attitude, and behavior of artisanal miners on Occupational Health safety in Kolwezi City. The study aims to determine if artisanal miners in Kolwezi are well informed about Occupational Health and Safety and the DRC mining regulation and if non-compliance on safety measures is correlated to age, gender, educational level, work experience, and marital status.

Results

Data from the questionnaire will be entered and captured for storage, cleaned and coded then processed by IBM SPSS Statistics Version 25 to generate descriptive statistics such as Mean, Median, SD, Percentages, and Frequency tables. Frequency distribution will be used to compare the relationship between the different variables. The strength of association will be calculated using odds ratios (OR) with the CDC program Epi Info 7 and the probability of statistical significance set at a p-value of <0.05 with a confidence interval (CI) of 95%.

Regression analysis will be performed to determine if socio-demographic characteristics influence knowledge, attitudes and, behaviour of artisanal miners towards occupational health and safety guidelines and the DRC mining regulations.

Discussion

Several studies have been carried out locally and internationally in the past to solve occupational and safety problems. Kumwimba (12) found that working conditions in artisanal mining are very bad and often very dangerous. Diggers, even children, work barefoot, without personal protective equipment, and unventilated wells; Elenge (13) listed the causes of the most frequent accidents, such as lack of safety equipment and non-compliance with international standard safety measures in mining operations were mentioned and; Ayoo (14) enumerated the causes of non-compliance with safety measures in Kenya, such as the cost of equipment, knowledge, awareness on safety requirements and administrative issue.

In D.R. Congo, researchers agreed on Poor compliance with safety and security mining policies and regulation, lack of training, and unawareness of security measures as the cause of artisanal mining accidents. However, the causes of this poor compliance have not been mentioned in the research already published in the artisanal mining sector in D.R. Congo, especially in Kolwezi.

This study is the first (according to our knowledge) study carried out in five artisanal mines in Kolwezi aiming to look at the influence of socio-demographic characteristics on knowledge, attitudes, and behaviour of artisanal miners towards OHS and the D.R.C mining regulations. The results of this study will hopefully be able to identify the gaps in the knowledge of OHS and mining regulation observed in Kolwezi due to lack of awareness of the regulation. Gaining the level of knowledge of the artisanal miners on safety issues and the factors that affect compliance with occupational health safety regulations among the artisanal miners in Kolwezi, should be useful in improving the management of artisanal miners in terms of awareness on security measures that should be applied in the mines.

The study results will also inform the different stakeholders in the artisanal mining sector on the importance of complying with occupational health and safety measures. Lastly, the findings from this study may be used as a reference for further research on artisanal mining in the DRC particularly on the influence of socio-demographic characteristics on compliance with regulations.

The study focused only on the artisanal workers in one city, therefore, it cannot be generalized to all artisanal mining in the DRC. Being a quantitative study means that subjects will be unable to explain their responses further as the close-ended questions do not allow for descriptive answers which might sometimes be very useful.

Methodology

Study design and population: This study will adopt a descriptive quantitative approach, using a cross-sectional research design to determine the association between the knowledge, attitudes, and behaviour of artisanal miners and socio-demographic characteristics.

Population and sampling: The study population will consist of five artisanal mining organizations in Kolwezi by using simple random sampling. The updated population size of artisanal miners is unknown. However, the last estimation of artisanal miners made by Kolwezi

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civil society in 2019, is 140,000 (11). To calculate sample size, the researcher used Epi Info version 7.2.3.0, considering a confidence interval of 95% (type value 1.96) and a margin of error of 5% (type value of 0.05) with 80% power, the sample size will be 383.

Data collection and analyse: The data will be collected from five main artisanal mining sites in Kolwezi namely; Kasulo, Mutoshi, Kamilombe, Uck Drain, and Tilwezembe et Intermediaires, within a period of five weeks. A closed-ended questionnaire validated by public health experts will be administrated to respondents at different artisanal mining sites. The questionnaire covers the following aspects; (1) socio-demographic characteristics, (2) knowledge of occupational health safety, (3) knowledge of the DRC safety regulation, (4) attitudes towards DRC mining regulations, and (5) behaviour by artisanal miners towards DRC mining regulations will be designed in English then translated into French and vernacular language. The questionnaires will be distributed to the artisanal miners who met the inclusion criteria during working hours. Participants who will be unable to read and write effectively will be assisted by the researcher and assistants trained for the task.

Conclusion

The study will determine the factors that affect compliance with Occupational health safety among the artisanal miners in Kolwezi. Methods of dissemination of results will include publishing research project results in journals, presenting at conferences and seminars and through workshops, and in-service training for artisanal miners.

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Conflict of interest
Authors declare no conflict of interest.

Ethics Clearance
This study was approved by the University of Johannesburg, the Ethics Committee (REC-616-2020), and Higher Degrees Committee (MPH HDC-01-46-2020), and the DRC authorization (CAB.MIN/MINES/LBA/227/CNK/2020).
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