Association of Individual Risk Factors to Body Discomfort of Filipino Small Scale Gold Miners

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ABSTRACT

Work-related musculoskeletal symptoms (WMSS) are one of the most common health problems around the world. These symptoms include discomfort such as pain, numbness, tingling, aching and stiffness felt on the different parts of the body. Body discomfort has been commonly associated with physically demanding working conditions, one of which is the small scale gold mining. However, there is little information about the association of body discomfort in the small scale gold mining and extraction in the Philippines to individual risk factors such as age, estimated height, years of work experience, alcohol consumption, and tobacco consumption of the workers. Thus, to provide a baseline data of the prevalence of body discomfort and its association to individual risk factors, a survey of 124 small scale gold mining and extraction workers in seven different mining sites from the north and south of the Philippines was conducted. The body discomfort questionnaire used is a 5-point scale rating on the frequency and severity of symptoms perceived in different parts of the body such as neck, shoulders, upper back, lower back, arms, elbows, hands or wrist, hips, thighs, knees, legs, and feet or ankle. Ninety five percent (95%) of the interviewees perceived body discomfort in at least one part of their bodies. Discomfort of body part found in the upper body, middle body, and extremities were found to be correlated; lower back (65.32%), shoulders (59.68%), and neck (54.03%) have the highest percentage. Spearman correlation was used to check for correlations between the frequency and severity of body discomfort and the individual factors. Results showed that severity of lower back discomfort and estimated alcohol consumption per week has low positive correlation (0.347). Frequency (0.315) and severity (0.305) of knee discomfort also have a low positive correlation to years of experience in mining. Binary logistic regression was used to obtain the significant risk factors that affect the presence of body discomfort. No individual factors were found to be significantly associated with presence of neck, upper back, shoulder, arms, hands/wrists, hips, thigh, legs, and feet/ankle discomfort. Estimated alcohol consumption per week was found to be significantly associated with presence of discomfort on the lower back, years of experience in mining to presence of discomfort on the elbows, years of experience in mining and estimated height to presence of discomfort on the knees. In order to reduce, at most prevent, body discomfort, result of the study suggests that emphasis is needed on alcohol consumption, height of the tunnels and facilities, and work design of the mining and extraction processes. Further analysis of other possible risk factors is needed for the body discomfort with no association to the individual risk factors.

Keywords: Body discomfort, Individual risk factors, Filipino Small Scale Gold Miners

1. Introduction

Work-related musculoskeletal symptoms (WMSS) are one of the most common health problems around the world. These symptoms include discomfort such as pain, numbness, tingling, aching and stiffness felt on the different parts of the body. Reducing risks or exposure to risks of Work-related musculoskeletal disorders (WMSD) is vital. Studies suggest that individual factors such as age, height, career length, smoking, and alcohol consumption are significantly related to WMSD risk. Age and length of employment was reported to be significantly related to neck pain in a study of 420 medical secretaries (Kamwendo et al., 1991). Risks were elevated as length of employment increased in a study on rockblasters, bricklayers and foreman in large construction firms (Stenlund et al., 1992). It was reported in some studies that people with back pain, are, on the average, taller than those without it (Rowe, 1965, Tauber, 1970, Merriam et. al., 1980, Biering-Sorensen, 1983). A study in a Finnish population study, found that height was a significant predictor of herniated lumbar disc (Heliövaara et. al., 1987). Age and current smoking
were significant predictors in change from no neck trouble to severe neck trouble of machine operators, carpenters, and office workers (Vilkari-Juntura et al., 1994). Alcohol consumption, tobacco smoking, and having children were shown to be significant risk factors in a detailed analysis of musculoskeletal disorder risk factors among Japanese nurses (Smith et al., 2006).

In the Philippines, however, there is little information on the prevalence of body discomfort and its association to individual risk factors of the workers in the small scale gold mining and extraction in the Philippines, one of most physically demanding jobs that rely on manual labor (Custodio, et al., 2016). Thus, this study aims to provide a baseline data of the prevalence of body discomfort and its association to individual risk factors in the small scale gold mining and extraction in the Philippines.

2. Method

Data gathering was done in the study sites of the Mineral Extraction with Responsibility and Sustainability (MINERS) Program PROJECT G: The Gold and Copper Chase (Life Cycle Analysis of Sustainable Small Scale Production Systems). Samples were taken by convenience sampling. A survey of 124 small scale gold mining and extraction workers in seven different mining sites from the north and south of the Philippines, regions of Abra, Benguet, Compostela Valley, and Agusan del Norte, was conducted. The body discomfort questionnaire used is a 5-point scale rating on the frequency and severity of symptoms perceived during the last 12 months in different parts of the body such as neck, shoulders, upper back, lower back, arms, elbows, hands or wrist, hips, thighs, knees, legs, and feet or ankle. The workers were also asked about their personal information which includes age, estimated height, years of work experience as a miner, estimated alcohol consumption per week, and number of cigarette sticks smoked per week for the estimated tobacco consumption.

Spearman correlation was used to check for correlations between the frequency and severity of body discomfort and the individual factors. Binary logistic regression was used to obtain the significant individual risk factors that affect the presence of body discomfort.

3. Results

All miners and extraction workers who participated in the study were male from 17 to 59 years old with an average age of 32 years old.

The smallest participant is 134 cm. (~4’4”) and the tallest had the height of 183 cm (~6’), the sample had an average estimated height of 164 cm. (~5’4”). The common tunnel size of the observed mines had around 3-5 feet height opening. Thus, it is very common for the workers to stoop down when entering and leaving the tunnel.

The sample of miners and extraction workers has an average of 6 years experience in mining, with a maximum of 38 years and a minimum of 1 month.

Gin and beer were the most common alcoholic beverage taken by the workers. The sample has an average estimated alcohol consumption of 118 mL per week (approximately 1 bottle of gin or 7 bottles of beer in a week), and a maximum of 840 mL per week. 18.54% of the samples do not drink any alcohol.

Forty-four percent (44%) of the participants do not smoke. Those who do smoke an average of 8 sticks per day, with a maximum of 60 cigarette sticks per day.

Ninety five percent (95%) of the interviewees perceived body discomfort in at least one part of their bodies. Discomfort of body part found in the upper body, middle body, and extremities were found to be correlated; lower back (65.32%), shoulders (59.68%), and neck (54.03%) have the highest percentage (see Figure 1.)

![Figure 1. Percentage of Prevalence of Body Discomfort](image)

Spearman correlation was used to check for correlations between the frequency and severity of body discomfort and the individual factors. Results showed that severity of lower back discomfort and estimated alcohol consumption per week has low positive correlation (0.347). As the estimated alcohol
consumption increases, lower back severity also increases. Frequency (0.315) and severity (0.305) of knee discomfort also have a low positive correlation to years of experience in mining. As years of experience in mining/extraction increases, knee frequency and severity also increases. Other risk factors are not correlated to body discomfort of the workers.

To further determine which of the individual risk factors has a significant effect to the presence of body discomfort, binary logistic regression was used. Age was excluded in running the data due to the assumption of no multicollinearity, since age and year of experience were found to be correlated (pearson correlation coefficient: 0.425).

No individual factors were found to be significantly associated with presence of neck, upper back, shoulder, arms, hands/wrists, hips, thigh, legs, feet/ankle discomfort.

Estimated alcohol consumption per week (OR=1.0030, p-value= 0.035) was found to be significantly associated with presence of discomfort on the lower back. One unit increase in alcohol consumption results to 0.3% increase in the odds of having discomfort on the lower back.

Years in mining (OR=1.0735, p-value= 0.04) was found to be significantly associated with presence of discomfort on the elbows. One year increase in experience as a miner results to 7.35% increase in the odds of having discomfort on the elbow.

Years in mining (OR=1.0824, p-value= 0.019) and estimated height (OR=1.1177, p-value= 0.005) were found to be significantly associated with presence of discomfort on the knees. One year increase in experience as a miner results to 8.24% increase in the odds of having discomfort on the knees. Taller workers are more prone to have knee discomfort; one unit increase in height results to 11.77% increase in the odds of having discomfort on the knees.

### 4. Conclusion

Ninety five percent (95%) of the interviewees perceived body discomfort in at least one part of their bodies. Discomfort in the lower back (65.32%), shoulders (59.68%), and neck (54.03%) have the highest percentage. Spearman correlation revealed that alcohol consumption and years of experience in mining are correlated to lower back and knee discomfort, respectively. Binary logistic regression showed that estimated alcohol consumption, years experience in mining, and estimated height, increase the odds of having discomfort on the lower back, elbow, and knees, respectively.

In order to reduce, at most prevent, body discomfort, result of the study suggests that emphasis is needed on alcohol consumption, height of the tunnels and facilities, and work design of the mining and extraction processes.

Further analysis of other possible risk factors is needed for the body discomfort with no association to the individual risk factors.

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