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**ABSTRACT**

**Objective**: Text

**Method**: Text

**Result:** Text

**Conclusion**: Text

Keywords: *Include at least 3 keywords or phrases*

(Not exceeding 200 words)

1. Introduction

Unlike established manufacturers of gold jewelry, small gold workshops may not have the expertise in Safety and Health to provide effective engineering control methods to reduce the workers exposure to heavy metal. These heavy metals exposure may occur during the steps of molding, casting, filling, polishing and plating gold jewelries and routes of exposures to metal fumes, vapors and dusts is largely via inhalation.

Based on the present literature, limited number of study has reported heavy metal exposures among goldsmith workers who handle the production of jewelries. In Malaysia, there have been no studies as of yet which relates heavy metal exposure among gold jewelry workers with biological monitoring. There is a need to provide a baseline data of heavy metals exposures among goldsmith workers in order to compare it to existing standards. This is to ensure workers were not subjected to unacceptable level of heavy metal exposures that have been linked to deleterious health effects such as cancers.

2. Materials and Method

This was a cross-sectional study conducted among welders employed in small and medium sized establishments of automobile workshop in Malaysia.

2.1. Subtopic

Before analysis, the hair samples were prepared and digested using hair analysis method (D’Ilio et. al, 2000) at the Bioscience Institute Laboratory, Universiti Putra Malaysia. The steps included the following: 1) the collected hair samples were cut into smaller pieces and then 2) the samples were added with 50 ml deionized water (60°C) and kept for 30 minutes. Next, 3) the hair samples were washed for three times with ultra-pure water and were next 4) dried in a drying oven for 15 minutes at 105°C.

For digestion, approximately 300-400 mg of hair samples in 100 ml beakers were added with 2 ml 69% concentrated nitric acid or HNO3 and were left to predigest for 30 minutes. The hair samples were then placed in the microwave digester at 80°C for 45 minutes.

3. Results

This study was able to recruit 48 number of participants. The results in Table 1 and 2 showed that among exposed participants, there were higher percentages of males when compared to females, lower education level (diploma level) compared to higher education level and there were more lower income level (RM 1000-2999) compared to higher income level. Almost one-third of the respondents were current smokers.

3.1. Work history

The result for the hair samples is presented in Table 2. In terms of Pb exposure, all workers had Pb exposure and the mean±standard deviation of Pb was 68.00±100.41 μg/g. On the other hand, the geometric mean of Pb levels in hair samples was 30.90 μg/g.

3.2. Heavy metal analysis

Further analysis performed between the distribution of logged Pb and logged Cu values found that there was a strong correlation between the two metals in the hair samples as presented in Table 1.

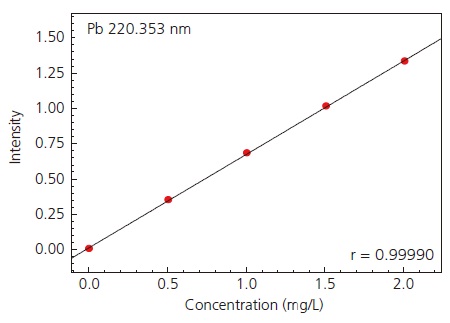
**Table 1.** The correlation between heavy metalsin hair samples of goldsmiths (n=48)

|  |  |  |
| --- | --- | --- |
|  | Pearson correlation | P value |
| Pb \* Cu | 0.357 | 0.013\* |
| Pb \* As | 0.467 | 0.045\* |

*\* p is significant when <0.05*

3.2.1. Work Factor and Safety and Health Practices

Figure 1 presents the reported work factors among the goldsmiths. It was found that approximately half of all workers have less than 9 years of experience (48%) and most of them performed different tasks of work including goldsmith work (15%), designing (8%), clerking (8%) and sales (8%). The working hours in a day was mostly 8 hours (85%) more than half of them reported overtime work in a week (58%) with duration of 2 to 4 hours (56%).



**Figure 1.** The calibration curve for Pb analysis via ICP-OES

4. Discussion

In comparing the Pb and Cu distributions with a previous study performed in Italy among seventy-five welders, this study reported extremely high Pb exposure (0.66 versus 68.00 μg/g) and Cu levels (13.27 versus 34.91 μg/g) (D’Ilio et al., 2000). The difference between the study in Italy and this study was the focus on the production of batteries in which the complete working cycle from melting to casting was carried out by a single craftsman (D’Ilio et al., 2000).

5. Conclusion

In conclusion, the geometric mean (standard deviation) for Pb and Cu in hair samples of welders was 68.0±100.41 μg/g and 34.91±21.88 μg/g. The reported safety and health practice was poor and the usage of PPE was not linked to lower heavy metal exposures. Thus, some of the measures that can be adopted are the use of LEV system at work sections that produce dust and fumes. This study has showed that there is a need for safety and health training to be given to welders to increase their knowledge and practice in safety and health.

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