



# Effect of Exposure to Pollutants in the Workplace on Body Inflammatory Biomarkers among the Employees of Gol-Gohar Mine in Sirjan

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## ABSTRACT

**Introduction:** The employees of Gol-Gohar Sirjan mine are exposed to various harmful factors in their work environment, including pollutants from machine emissions, which can pose a threat to their health. Carbon monoxide (CO), hydrocarbon emissions, nitrogen oxide (NO<sub>2</sub>), sulfur oxide (SO<sub>2</sub>), and lead (Pb) are the compounds found in machine exhaust. Exposure to particles with a diameter of less than 1.5 micrometers, which is the result of fossil fuels, increases the number of neutrophils and lymphocytes in the lung and changes the concentration of inflammatory mediators. This study aimed to investigate the effect of exposure to workplace pollutants on the serum levels of inflammatory cytokine TNF- $\alpha$  and anti-inflammatory interleukin 2 (IL-2) and 10 (IL-10) in Gol-Gohar mine workers of Sirjan.

**Methods and Materials:** In this case-control study, 100 workers were selected as the case group, and 100 people outside the mine were considered as the control group. Blood samples (5 mL) were taken from the subjects. The serum levels of TNF- $\alpha$  and IL-2 and IL-10 were measured using an ELISA kit according to the kit's instructions. The parameters of air pollution from the measuring station in the working environment of the mine, including PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>, and CO, were measured during the periods of the project activity using the filtration method. All statistical operations were performed using SPSS 20 software.

**Results:** The results showed the following percentage of pollution caused by the activity of machines: 66.59% (CO), 69.48% (NO<sub>2</sub>), 71.68% (SO<sub>2</sub>), 44.35% (PM<sub>2.5</sub>), 56.08% (PM<sub>10</sub>). In addition, the serum level of TNF- $\alpha$  in mine workers who were directly exposed to pollutants was significantly higher than that of the control group ( $p = 0.05$ ). Meanwhile, the serum levels of IL-2 and IL-10 in mine workers significantly decreased compared to those of the control group ( $p = 0.05$ ). The logistic regression analysis results showed that exposure to PM<sub>10</sub> and PM<sub>2.5</sub> particulates may cause a seven-fold decrease in IL-10 serum concentration ( $p = 0.05$ ).

**Conclusion and Discussion:** This findings show that people exposed to environmental pollutants are associated with changes in the concentration of inflammatory and anti-inflammatory cytokines. Based on the results of our study, individuals who were more exposed to PM<sub>10</sub> and PM<sub>2.5</sub> particles exhibited a significant decrease in the anti-inflammatory cytokine IL-10 and a notable increase in the serum level of the inflammatory cytokine TNF- $\alpha$ . This outcome indicates that workers Gol-Gohar mine may be at high risk of developing chronic inflammation due to direct exposure to environmental pollutants.

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