Association of Airborne Emissions with Pulmonary Dysfunction, XRCC1 Gene Polymorphism, and Some Inflammatory Markers in Aluminum Workers

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Abstract : This study estimates the association between respiratory outcomes among employees of a secondary aluminum plant and airborne pollutants. Additionally, it looks into the relationship between pulmonary dysfunction in workers and XRCC1 gene polymorphisms. 110 exposed workers and 58 non-exposed workers participated in the study. Measurements have been conducted on SO_2, NO_2, and particulate particles. Pulmonary function was tested. Eosinophil cationic protein (ECP), C-reactive protein (CRP), matrix metalloproteinase-1 (MMP-1), interleukin 6 (IL6), GM-CSF, X-Ray Repair Cross Complementing 1 (XRCC1) protein, and genotyping of XRCC1 gene polymorphisms were examined. Results: The annual average concentrations of ($PM_{2.5}$, PM_{10}, TSP, SO_2, and NO_2) were lower than the permissible limit. The areas around ovens, evaporators, and cold rolling mills exhibited the highest amounts. The majority of employees in these departments had impaired lung function. With longer exposure times, the exposed group's FEV1% and FVC% considerably reduced. The exposed workers had considerably higher XRCC1 levels. The evaluated inflammatory biomarkers showed no statistically significant difference. Conclusion: Aluminum workers are at risk of developing respiratory disorders. The level of serum XRCC1 may act as a biomarker that might be very useful for detecting susceptible workers.

Keywords : aluminum industry, particulate matter, SO_2, NO_2, lung function, XRCC1 gene polymorphism, XRCC1 protein, inflammatory biomarkers