

## ABSTRACT

The cement manufacturing industry involves a variety of hazardous processes, including quarrying, crushing, raw material grinding, blending, kiln burning, cement grinding, and packaging, which exposes workers to a variety of occupational and environmental health risks, including both long-term and short-term health effects. In order to address these health risks, this study used Delphi analysis to identify and prioritize the health risks faced by cement manufacturing workers. This study represents a beginning step toward addressing this issue by compiling an authoritative list of health concerns that require HSE's immediate attention. A meticulous data collection procedure known as a "Ranking-type" Delphi survey was applied to create a rank-order list of worker health concerns. This data collection method is thought to organize and obtain expert opinions from a panel of experts through iterative, controlled feedback. Three Cement Manufacturing Industries of Sindh were selected as sample, named Lucky Cement Industry limited, Popular Cement Industry limited and Power Cement Industry limited. For the data collection for Health risks of workers, a Questionnaire survey was conducted from workers of mentioned Cement Industries, open ended interviews were conducted from experts: Industrialists, environmentalists, and academics and the existing literature was reviewed. Experts from different area of studies were selected to expand our knowledge and view on the types of health risks, rather than depending on the single view of mode of experts, an aspect that has been ignored in past Health risk management research. Expert's professionals were recruited from each category to form three panels. The Delphi analysis involved multiple rounds of interviews, where the experts provided their opinion on the different health risks faced by workers in the industry. The responses were then analyzed and categorized, with the most commonly identified health risks ranked by experts. The Ranked list was assessed through the non-parametric test Kendal Coefficient of Concordance (W) and the identified value for occupational health risks was 0.7 and for environmental health risks was 0.6. These results show a high level of agreement between the Experts on their ranking. The research identifies the top five risks as: (i) Fatal diseases Silicosis due to inhaling concrete dust (2) COPD (chronic obstructive pulmonary disease) because of organic dust (3) lung

cancer due to repeated and long term exposure of Aluminium oxide in cement and clinker dust (4) Eyes discoloration causing permanent Iron staining due to repeated contact of Iron oxide in cement dust (5) hearing loss and tinnitus(ringing, whistling, clicking and roaring in the ear) caused by high level of continual noise at some sections too much high as 90-100 dB(Decibel). On the basis of findings of this study, a strategy is proposed to strengthen the Health Safety and Environment (HSE) policies and procedures. The findings of this study can help occupational health managers and HSE policymakers design effective preventative strategies and interventions to reduce the health hazards that workers confront. The Delphi analysis methodology employed in this study can also be utilized in other industries to identify and rate occupational and environmental health risks, assisting in the establishment of safer and healthier workplaces.

**Keywords:** Cement Manufacturing Industry, Health Risks, Occupational, Delphi Analysis, Environmental