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Dust exposure and its health implications to miners in Mererani artisanal and small-scale mining industry

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Abstract

This study aimed to identify and quantify the total dust exposure to underground miners in Mererani, Tanzania, and its composition to generate evidence for informed decision- and policy-making. The Analytical Air Monitoring System (AMS) was used for dust collection, and analysis was conducted gravimetrically. The dust composition was analysed using Inductively Coupled Plasma Optical Emission Spectroscopy. The results showed significant variation in dust exposure levels across different mining zones, with miners inhaling up to 1859 mg of dust over an 8-hour period in drilling zones (DZ), 797 mg in loading zones (LZ), and 382 mg in resting zones (RZ). The mean value of dust exposure was significantly different, with a p -value of <0.05 . Miners had higher levels of heavy metal and silica than those from unmined sites, with chromium being the most dominant element across all samples. Cumulative exposure to dust over time is linked to long-term respiratory impairment and serious health conditions such as lung cancer. These findings highlight the need for intervention, including education on dust hazards, provision of personal protective equipment (PPE), and enforcement of safety standards to safeguard miners' health. Addressing these issues is critical to promoting policy reforms and sustainable mining practices in Mererani and similar communities.

Keywords; Tanzanite mining, dust exposure, artisanal mining, underground miners, occupational health and safety