

Abstract

Occupational and environmental exposures to volatile organic compounds in a hand-dug petroleum extraction site

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Objective/Background:

Myanmar is rich in natural resources such as petroleum. Due to the traditional way in which the crude oil is extracted, workers could be exposed to volatile organic compounds (VOCs) found in petroleum which have been linked to health risks at certain levels. The objective of this study was to assess occupational and environmental exposures to volatile organic compounds from a traditional petroleum extraction process.

Methods:

VOC levels (e.g. benzene, hexane, hydrogen sulfide, and toluene) in a hand-dug petroleum extraction site in central Myanmar were measured using a handheld VOC detector and compared to recommended exposure limits (RELs). Demographics of workers and working conditions were recorded through face-to-face interviews (n=21 adults) in Burmese language.

Results:

The benzene levels ranged from 0.0–26.0 mg/m³ ($\bar{X}$ =3.3 mg/m³), hexane 0.0–697.4 mg/m³ ($\bar{X}$ =30.4 mg/m³), hydrogen sulfide 0.0–167.4 mg/m³ ($\bar{X}$ =20.6 mg/m³), and toluene 0.0–71.7 mg/m³ ($\bar{X}$ =5.2 mg/m³) in sites where the majority of workers spend over 10 hours without proper personal protective equipment (PPE). Detected VOC levels exceeded the RELs based on time weighted averages (TWAs) and/or short term exposure limit (STELs) of benzene (TWA 0.32 mg/m³, STEL 3.2 mg/m³), hexane (TWA 190 mg/m³, STEL 8.0 mg/m³), and hydrogen sulfide (TWA 15 mg/m³, STEL 28 mg/m³) except for toluene (TWA 376 mg/m³)

Conclusion:

The study detected VOC levels that exceeded the RELs based on time weighted averages (TWAs) and/or short term exposure limit (STELs) of benzene, hexane, and hydrogen sulfide. The survey found 70% of the workers live onsite with their families, so this pilot study suggests that similar traditional petroleum extraction operations pose potential threats to not only workers but also family members including vulnerable population groups, such as pregnant women and children. Further studies including continuous monitoring of VOCs and epidemiological surveys along with outreach need to be conducted to improve decision-making by local stakeholders.

Environmental health sciences Occupational health and safety