**Title:** Diagnosis of carbon monoxide exposure in clinical practice and research: a scoping review

**Keywords :** Carbon monoxide toxicity, Diagnostic test

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**Your abstract**

BACKGROUND Carbon monoxide (CO) is a colourless, odourless gas produced from incomplete combustion of carbon-containing fuels. The effects of exposure to CO range from mild symptoms, such as headache, to neurotoxicity and death. When inhaled, CO binds to haemoglobin forming carboxyhemoglobin (COHb). Several methods exist to measure COHb but detection of exposure is made difficult by its short half-life. In this scoping review we aimed to establish the existing methods used in clinical practice and research to determine CO exposure and map the diagnostic cut-off values used.

METHOD A scoping review was conducted according to the Arksey and O'Malley framework. EMBASE, Medline and CINAHL databases were searched for published articles in English from 2002 onwards using keywords “carbon monoxide”, “poisoning” and “diagnosis”. Reviews and papers relating to outdoor air pollution were excluded. Two reviewers independently screened published abstracts for inclusion, with a third arbiter where there was lack of agreement between reviewers. Full text papers were then reviewed, and data extracted on methods used to measure CO level, diagnostic cut-off values, and whether CO exposure was from a known or unknown source. Papers were grouped according to the diagnostic method.

RESULTS The search identified 518 individual publications for which 63 met the inclusion criteria after removing duplicates. The predominant methodology of papers were single patient case studies and short case series. No interventional studies were identified. The most common methods identified for diagnosing CO exposure were blood measurement of COHb and spectrophotometrically by measuring COHb levels with a CO-oximeter. Exhaled CO levels using breath analysers and ambient CO measurement were also documented. Most papers did not describe the diagnostic cut-off values used to determine CO exposure but where present, a large variation was noted from 2% to 10%. Blood COHb measurements were predominantly taken in the Emergency Department as a screening tool when suspected CO cases were identified. Expired CO measurements and CO-oximetry were also used within the ED.

DISCUSSION AND CONCLUSION Accurate diagnosis of CO exposure is an important factor in guiding treatment and in recognising patients at risk of long-term consequences of exposure. Current methods for diagnosis include carboxyhemoglobin, CO-oximetry and exhaled CO. The results of this scoping review suggest there is wide-spread variation in clinical practice in the cut-off values used to determine exposure. The differences in reported thresholds in research papers make comparison of populations across studies difficult. This scoping review highlights gaps in our current evidence base. Further research is required to identify the optimum measurement method and cut-off values for diagnosis of CO.

**Trial Registration / Funding Information (only)**

N/A