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A Systematic Review of the Association between Particulate Matter Air Pollution and Asthma Exacerbations in Schoolchildren: An African Contextual Analysis for Eswatini, 2002

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Abstract

Asthma is a major public health concern for children. Environmental factors, particularly air pollution, are significant contributors. In Africa, rapid industrialisation and urbanisation have increased exposure to pollutants like particulate matter (PM). Synthesising evidence on this association within specific African contexts, such as Eswatini, is necessary to inform local policy and clinical practice. This systematic review aimed to determine the correlation between particulate matter air pollution and asthma exacerbation rates in schoolchildren residing in the industrial zone of Casablanca in Eswatini. Its objective was to critically appraise and synthesise existing literature to clarify the nature and strength of this association. A systematic search was conducted across multiple electronic databases for relevant peer-reviewed studies. Pre-defined inclusion and exclusion criteria were applied. Two independent reviewers screened titles, abstracts, and full texts, extracted data, and assessed the methodological quality of included studies. A narrative synthesis was performed due to heterogeneity in study designs and outcome measures. The review identified no primary empirical studies that directly investigated the correlation between PM and asthma exacerbations in schoolchildren in the specified region of Eswatini. Synthesis of broader contextual evidence from similar settings indicated a consistent positive association between elevated PM levels and increased incidence of asthma symptoms. A recurring theme was the heightened vulnerability of children living near industrial activities. The absence of direct, localised research represents a critical evidence gap for public health decision-making in Eswatini. While broader literature strongly suggests a detrimental link, the specific magnitude and characteristics of this association in the Casablanca industrial zone remain unquantified. Urgent investment in localised air quality monitoring and epidemiological research is recommended to generate context-specific evidence. Public health authorities should consider precautionary measures to reduce children's exposure to industrial emissions. Future research must prioritise this population and setting. asthma, particulate matter, air pollution, schoolchildren, industrial zone, systematic review, Eswatini, Africa. This review highlights a

critical gap in local evidence and underscores the necessity for context-specific research to guide public health action in Eswatini and similar industrialising African settings.

Keywords: *air pollution, particulate matter, asthma exacerbation, schoolchildren, sub-Saharan Africa, environmental epidemiology, systematic review*

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