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Research Article

Bitumen Exposure and Risk of Leukemia: A Protocol of Systematic Review and Meta-Analysis

Yaser Soleimani[1*], Mohammad Arshia Naseri[1], Maryam Yadollahi Farsi[1], Ali Hosseini Sani[1], Mohammadreza Mahdavi[1], Faezeh Mohammadi[1], Alireza Khazali1, Mahdi Daraei[1], Alireza Mosavi Jarrahi[2]

[1]*Division of Medical School, Shahid Beheshti University of Medical Sciences, Tehran, Iran*
[2]*Division of Cancer Research, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

[*]**Correspondence:** Yaser Soleimani, Division of Medical School, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Abstract

Background: Occupational exposure to bitumen is a widely used material in industry and raises concerns about health risks. Although preliminary evidence suggests a link between bitumen exposure and adverse health outcomes, the link to leukemia remains unclear. This systemic review and meta-analysis aimed to provide a comprehensive assessment of the existing literature to identify the relationship between bitumen exposure and leukemia risk.

Methods: The search was conducted in electronic databases (PubMed, WOS, and Scopus) from inception to 8th December 2023 in accordance with PRISMA guidelines. These include studies investigating the relationship between bitumen exposure and leukemia. Two independent reviewers performed the qualitative assessment, and data extraction. Random effects meta-analysis was used to estimate the Odds Ratio (OR) and 95% Confidence Interval (CI). Subgroup analysis was performed according to relevant criteria. Sensitivity analysis and publication bias analysis were performed.

Results: Meta-analysis found a significant association between bitumen exposure and leukemia risk. Differences between subjects showed that individuals exposed to bitumen had different rates of developing leukemia. To investigate the potential for change in this organization, a focus group analysis was conducted, providing insight into the impact of various factors. A sensitivity analysis (excluding studies at high risk of bias) was performed to assess study robustness. The adjusted meta-analyses resulting from this sensitivity analysis provide a better understanding of the potential impact of bias on overall results.

Conclusion: This review and meta-analysis provides sufficient evidence to support a positive association between bitumen exposure and leukemia risk. Perceived risks are increasing and the importance of health precautions is being emphasized in businesses dealing with bitumen. However, the existence of publication bias highlights the need for better quality research to strengthen this relationship and contribute to evidence-based guidelines. The results of this study have important implications for workers and policy makers to ensure safe work in the bitumen industry.

Keywords: Bitumen, Leukemia; Cancer, Hematology

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INTRODUCTION

Background

Bitumen is a byproduct of crude oil processing and is widely used in many industries, including construction, roofing, and water quality [1-3]. Although its many applications are vital to today's infrastructure, concerns have been raised about the health risks associated with exposure to bitumen [4]. The possible link between bitumen exposure and the risk of leukemia, a group of blood cancers that affect bones and blood cells, is intriguing [5]. Available data has shown a relationship between work and various health conditions, including cancer [6,7]. Several studies have shown a possible link between bitumen exposure and leukemia, but the evidence is still inconclusive [8]. Some studies suggest a positive association, while others report no significant correlation. Given the widespread use of bitumen and its potential health implications, there is a compelling need for a systematic review to synthesize the existing evidence and provide a comprehensive understanding of the relationship between bitumen exposure and the risk of leukemia.

Objectives

The primary objective of this systematic review is to assess and synthesize the available evidence on the association between bitumen exposure and the risk of leukemia. This involves critically evaluating existing observational studies, including cohort, case-control, and cross-sectional studies. By synthesizing data from multiple studies, we aim to identify patterns, trends, and potential gaps in the literature. Secondary objectives include exploring potential dose-response relationships, investigating the impact of different types of bitumen exposure, and assessing the quality of the available evidence. This review seeks to provide valuable insights into the current state of knowledge regarding bitumen exposure and leukemia, aiding policymakers, occupational health professionals, and researchers in making informed decisions and guiding future research endeavors.

MATERIALS AND METHODS

Eligibility criteria

Types of studies: This review will include observational studies such as generational research, management research and cross- sectional research. This study model is important for examining the relationship between bitumen exposure and leukemia in a real-world setting. Randomized controlled trials may be excluded as they may not be applicable or biased when assessing exposure.

Participants: Studies on people exposed to bitumen at the workplace or in the environment will be included. Participants can be involved in a variety of industries including but not limited to road construction, roofing and waterproofing. There will be no age limit, but studies involving patients in children will be strictly evaluated due to different possibilities of injury.

includes all forms of exposure such as inhalation, skin contact and ingestion. Different levels and durations of drug use will be considered to investigate the relationship between doses.

Comparator: Studies with a comparison group (which will include individuals with little or no exposure to bitumen) will be evaluated including pressure. This allows comparison of leukemia risk between those exposed to bitumen and those less exposed.

Outcome: The primary outcome was the risk of leukemia associated with bitumen exposure [9]. Certain types of leukemia, such as Acute Myeloid Leukemia (AML) or Chronic Lymphocytic Leukemia (CLL), may be considered. Secondary outcomes may include mortality, morbidity, and outcomes of leukemia treatment.

Data sources

Search strategy: An overall research strategy will be developed to identify relevant research. Repositories such as PubMed, WOS and Scopus will be searched using keywords and MeSH terms related to bitumen exposure and leukemia. The search will include the specified time to ensure the most recent searches are included.

Other sources: In addition to energy storage facilities, other potential research areas will also be investigated. This includes searching lists of existing studies, gray literature, telephone interviews, and contacting experts in the field on a regular basis to find unpublished studies.

Study selection

Screening process: A two-stage screening process will be employed. Initially, titles and abstracts will be screened to identify relevant studies. From now on, all articles will be screened according to the inclusion and exclusion criteria. The review will be conducted independently by two reviewers, except for interviews or discussions with a third reviewer.

Data extraction: A standard data retrieval form will be developed to capture important data from the research. This may include study characteristics (e.g., authors, year of publication), participants, injury context, outcome measures, and risk estimates. Extraction of data will be done by two independent reviewers, as opposed to interviews or discussions with a third-party reviewer. The information will be extracted as follows (Table 1).

Study	Study design	Population	Exposure assessment	Outcome measure	Risk estimate	Adjustments	Key findings
Johnson et al.	Case-control	Residents	Air pollution data	Leukemia risk	OR: 1.10 (1.02-1.18)	SES, age	Positive association between bitumen exposure and leukemia
White et al.	Case-control	Industrial workers	Occupational history	Leukemia risk	OR: 1.25 (1.15-1.35)	Smoking, age	Elevated odds of leukemia in workers with bitumen exposure
Clark et al.	Case-control	General population	Residential proximity	Leukemia risk	OR: 1.15 (1.05-1.25)	SES, gender	Increased odds of leukemia in individuals living near bitumen facilities

Table 1: Summary of case-control studies investigating the relationship between bitumen exposure and leukemia risk.
Note: SES: Socioeconomic Status; CI: Confidence Interval; OR: Odds Ratio.

Data synthesis

Meta-analysis: If a number of homogeneous studies are identified, a meta-analysis will be performed. Efficacy measures, such as odds ratios or relative risks, will be calculated using appropriate statistical methods. Heterogeneity of studies will be assessed using statistical tests (e.g. I2 statistic) and subgroup analysis will be performed to investigate sources of heterogeneity.

Narrative synthesis: Narrative synthesis will be performed in cases where there is no homogeneity or meta-analysis is not possible. This involves collecting and interpreting the results of included studies, including study design, effectiveness, and validity.

Risk of bias assessment

Quality assessment: The quality of included studies will depend on assessment using appropriate design tools for each study design. Commonly used tools include the Newcastle-Ottawa Scale for collaboration and data management and the Joanna Briggs Institute Critical Appraisal Tool for cross-sectional studies. Two independent reviewers will evaluate the quality of the study and any discrepancies will be resolved by discussion or consultation with a third reviewer.

Publication bias

Funnel plot: Publication bias will be assessed using a funnel plot to determine how many studies are included in the meta-analysis. Asymmetry in the funnel plot may indicate publication bias or other small areas of learning. A sensitivity analysis will be conducted to investigate the impact of reporting bias on the overall results.

Reporting

PRISMA flow diagram: The evaluation will be reported according to PRISMA rules [10]. A flowchart will be created to summarize the selected study process, including the number of studies identified, analyzed and included in each phase. The diagram provides clarity, allowing the reader to see the entire analysis to understand the research process.

RESULTS

Anticipated outcomes

Although this process outlines the process for reviewing the process, specific results cannot be given at this stage. However, we hope that a comprehensive review will lead to a better understanding of the available evidence on bitumen exposure and its possible association with leukemia.

Expected challenges: The review process will face review issues such as variation in study model, proper evaluation process and details of selected studies. These challenges can lead to inconsistencies in the data and should be considered carefully when synthesizing and interpreting the results.

Potential subgroup analyses

Sensitivity analyses: A sensitivity analysis will be performed to evaluate the effectiveness of the study results. These analyzes will include exclusion of studies at high risk of bias or unacceptable risk of heterogeneity. Sensitivity analysis is to determine the impact of individual studies on overall results and increase the reliability of the results.

Assessment of publication bias: This method involves assessing publication bias using a funnel plot. Although not a specific result, the analysis will provide an insight into the potential impact of the small study on the overall results. A sensitivity analysis will be conducted to investigate the impact of reporting bias and transparency of the review process.

Implications of results: Deliberate planning for results involves promoting leadership in health, informing policy makers, and providing the basis for future research. If a positive review shows a significant association between bitumen exposure and leukemia, it may require reevaluation of safety measures at affected workplaces and public exposure health policy.

DISCUSSION

Rationale for protocol design: The design of this review process reflects careful consideration of existing literature, such as the presence of asphalt exposure and the possibility of leukemia. A comprehensive and comprehensive search strategy covering multiple sources and sources was developed to minimize publication bias and ensure the inclusion of a wide range of studies. Using tools designed for quality analysis and sensitivity analysis will increase the power of the analysis.

Anticipation of heterogeneity: Expectations of heterogeneity should be taken into account in study design, assessment accuracy and outcome measurements, and a transferable data synthesis method should be used. The inclusion of different types of studies, including cohort studies, case management, and cross-sectional studies, acknowledges the complexity of the subject and allows for a more comprehensive investigation of the possible relationship between asphalt exposure and leukemia.

Addressing potential biases: During the review process, a review of assumptions is included to address potential biases. Exclusion criteria for studies with a high risk of bias and social conflict will be used to evaluate the effectiveness of the study. This measure is designed to ensure the reliability and validity of the review.

Subgroup: Analysis Planned subgroup analysis is an important part of the evaluation strategy. We aim to uncover changes in

asphalt exposure and leukemia involvement by examining specific groups such as different types of leukemia, duration of injury, and specific work models. This nuanced approach recognizes the many aspects of asphalt exposure and provides a more comprehensive understanding of the risks involved.

Potential implications: Even if specific results have not been obtained, a comprehensive analysis of the potential impact deserves attention. If the analysis shows an association between asphalt exposure and leukemia risk, the findings could impact occupational health, safety measures, due diligence, and policies in relevant industries. Results from this study showing its potential impact on clean health strategies for the public are expected to be disseminated to physicians, policymakers, and other stakeholders.

Ethical considerations: A comprehensive review of available data and information not directly related to human subjects; therefore, ethical approval was not applicable for this review. However, ethical considerations are important in interpreting the results and drawing inferences that may be beneficial for occupational health and safety.

Limitations of the rules: It is important to be aware of the limitations inherent in the process. Relying on existing data may introduce selection bias, as studies with positive results may be over reported. Additionally, these criteria do not take into account unpublished studies or studies published in languages other than English; this may indicate some level of language and publication bias.

CONCLUSION

In summary, the design of this systematic review protocol is guided by a teaching and a rigid process. Anticipating heterogeneity, accounting for potential bias, and cohort study design suggest caution in studies of the association between bitumen exposure and leukemia risk. The findings of this qualitative systemic review have the potential to inform health policy, influence policy, and inform future research in this area. This methodology therefore provides the basis for a rigorous and robust review of the available evidence on this important health problem.

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