Ecotoxicology and Environmental Safety 166 (2018) 453–461

Contents lists available at ScienceDirect

Ecotoxicology and Environmental Safety

journal homepage: www.elsevier.com/locate/ecoenv

Review

Climate change risk perception in global: Correlation with petroleum and liver disease: A meta-analysis

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ARTICLE INFO

Keywords:
Petroleum
Cirrhosis
Fatty liver
Liver enzyme

ABSTRACT

Background: Liver diseases have been bound to environmental factors, inclusive of air pollution. The exposure of workers to petrochemicals counts as a possible cause of Liver diseases, whereas results are inconsistent with the previous studies. In this study, a meta-analysis is conducted to assess the pooled risk.
Methods and finding: A systematic search was performed by related researchers. Correlations are analyzed among petroleum and liver cirrhosis mortality, fatty liver, alanine amino transferase (abbreviated as ALT), aspartate amino transferase (abbreviated as AST). Pooled risk ratios (RR) with 95% confidence interval (CI) and effect size (ES) with 95% confidence interval are calculated. Sensitivity analysis and publication bias are also tested. Data are analyzed from 5 studies involving 296 participants. Results are incorporated through adopting a random effects meta-analysis. Working in a petrochemical plant shall not increase the death risk posed by cirrhosis (RR = 0.44, 95% CI [0.36; 0.54]). Yet the incidence of fatty liver increases (RR = 1.22, 95% CI [1.21; 1.23]). Abnormal incidence of ALT and AST also increases.
Conclusions: Occupational exposure plays an important role in causing ALT abnormalities and fatty liver among oil workers, but not a risk factor of cirrhosis, AST abnormalities and liver cancer.

1. Introduction

In the next few decades as society passes the point of peak production of petroleum, human health and well-being shall possibly be subject to huge risks. Regardless of the declines in global production rates, global demand for petroleum shall possibly grow (Nisbet et al., 2011). Petrochemical manufacturing industry, involves processes that produce and potentially emit hazardous chemicals into the surrounding water, soil, and air, which in turn has raised substantial pressure to the environment (Samanta et al., 2002; Chen and Kan, 2008). It not only causes climate change, e.g. greenhouse effect, but also increases the prevalence of some non-communicable diseases. This disease includes blood disorders, lesions, tumors, and morphological abnormalities (Feuston et al., 1997; Yamato et al., 1996; Kennish and Ruppel, 1996; Vyskocil and Cizkova, 1996). Many studies have shown that non-communicable diseases inclusive of liver disease are also a risk among oil workers.

Liver cirrhosis and fatty liver disease count as the most prevalent chronic liver disease worldwide (Salem and Lewandowski, 2013) and becoming third leading cause of cancer-related mortality. Yet the precise mechanisms remain inadequately understood, and the interventions are limited. How liver disease and oil are related to each other has been broadly studied. Some studies bespeak that oil factory work may consequently increase the incidence of fatty liver disease (Tompa et al., 2016), whereas the results are inconsistent in other studies. The incidence of cirrhosis in numerous studies has not increased, though the degradation of petroleum may lead to a slew of non-infectious diseases (Feuston et al., 1997; Yamato et al., 1996; Kennish and Ruppel, 1996; Vyskocil and Cizkova, 1996).

Although some researches bespoke that oil exposure is bound by cirrhosis and increased hematological toxicity or liver cancer risk, this outcome may take years to develop. Immediate health effects of oil

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https://doi.org/10.1016/j.ecoenv.2018.09.080
Received 3 June 2018; Received in revised form 15 September 2018; Accepted 18 September 2018

exposure may be seen in hepatic parameters, indicating its toxic effects and potential for future health risk (D'Andrea and Reddy, 2013). ALT and AST count as an important marker of liver abnormality and always used as an indicator in liver related studies (D'Andrea and Reddy, 2013; Attarchi et al., 2007a, 2007b).

As demand for oil and oil plants increase (Nisbet et al., 2011), so does the rise in climate change and non-communicable diseases caused by oil. Non-communicable diseases inclusive of cirrhosis, liver fatty liver and liver cancer may be considered to be closely related to environmental. though widely research, but for the moment about whether exposure to oil and liver disease is the lack of a systematic review. Thus, we performed this meta-analysis to investigate the relationship between oil exposure and cirrhosis, liver fatty liver, liver cancer and hepatic enzyme.

2. Methods

A systematic search is conducted with Cochrane Library, Pubmed, Medline, Embase, Science direct, Web of Science, Wanfang database, google scholar, Chinese biological and medical database, China National Knowledge and the Internet. Numerous useful optimal search strategies are grasped from the Cochrane Handbook for Systematic Reviews of Interventions (Tsai et al., 1996a, 1996b). The database is searched with the words below: words in terms of liver, "Hepar", "Liver", "Hepatic", "Cirrhosis", "Hepatotomy", "Hepatic enzyme", "Fatty liver", "Liver enzyme", "Hepatitis" or "Hepatine", and word prefix "Hepat" are adopted; words denoting petroleum, "Petroleum" "Gas", "Fossil", "Petrochemical", "Refinery", or "Oil" are adopted; words denoting work, "Work", "Job", "Employ", or "task" are adopted. No language restriction is imposed on the search. The title and abstract of all potentially relevant studies are identified. Full papers are scrutinized for relevance for the ambiguous title or abstract. Additionally, the references of prominent papers, and literature reviews are manually searched. This study sought to comprise as much adequately existing data as judiciously possible.

The inclusion criteria are listed below: (1) original papers defining exposure group as working in the oil factory explicitly; (2) The control group is regulated as the general population or the unexposed population; (3) original papers offering original data, incidence, confidence intervals and standard errors; (4) full-texts original papers are available; (5) The patient is diagnosed explicitly with fatty liver, cirrhosis. The patients are subject to ALT and AST tested.

The exclusion criteria are listed below: (1) studies with subjects overlapped with other publications; (2) unpublished researches and studies reported merely in abstract form; (3) studies reported with deficient original data, incidence, confidence intervals and standard errors; (4) the content of original paper concerned with ALT, AST and oil, whereas the evaluation doles concerned with liver disease; (5) The control group is not regulated as the general population, or the unexposed population. All searches are conducted independently by at least two reviewers.

2.1. Data extraction

Data is extracted as (1) the occurrence number of study group; (2) the nonoccurrence number or the total number of the study and control group; (3) the incidence and 95% CI of the study. The extracted information of each study is also encompassed by the name of the first author, the year of publication, case number, control number, follow-up days, and loss of follow-up, pulpitis or periapical periodontitis, single or multiple canals, intro-operative or postoperative, different root canal irritant, ages for all case and control groups.

2.2. Meta-analysis

Data is calculated in line with the Cochrane Handbook (Tsai et al., 1996a, 1996b). A pooled RR and relevant 95% CI are computed whereby the statistical software package STATA (Stata Statistical Software: Release 10.1; StataCorp LP, College Station, TX). We also assessed heterogeneity of the encompassed studies. Q and I2 statistics are employed to quantify the Heterogeneity. If the studies took on homogeneity, whereas $p > 0.1$and $I2 \le 25\%$ (bespeaking no evidence of heterogeneity), the fix effect model (Peto method) is employed to aggregate the data; otherwise, the random-effects model would be adopted. Visual inspection of the Begg's plots is to observe publication bias.

If the original paper provides the occurrence number of study group, the nonoccurrence number or the total number of the study and control group. A pooled RR and relevant 95% CI are employed to drawn the comparison in incidence rate between the control group and the study group. A pooled RR and relevant 95% CI are adopted to observe the overall incidence rate as the original paper offered the incidence and 95% CI.

3. Results

3.1. Study selection and characteristics

1365 records are eventually found. 29 original studies are involved in this meta-analysis. The study selection is illustrated in Fig. 1. Most of the encompassed studies are published in English. The most common reasons why papers are excluded are partially presented below: a) The study group is with liver enzyme at least 10% above reference levels. As controls, without any liver enzyme abnormalities. It is not a paper concerned with how liver disease and oil are related (e.g., Carvalho et al., 2006. Publish in English (Carvalho et al., 2006)); b) Papers are concerned with the dry clean workers. Workers are not working in petrochemical plants, though they are exposed to oil (e.g., Takeuchi Y, et al., 1981. Publish in Japanese (Takeuchi et al., 1981)). The original data, incidence, confidence intervals, standard errors are not involved in the original paper (e.g., Attarchi et al., 2007a, 2007b. Publish in English (Attarchi et al., 2007a, 2007b)) (Fig. 2).

If there are any other different operations, the paper would be excluded either. The totally 29 studies are involved and published from 1983 to 2016. Characteristics of the 26 studies are summarized in

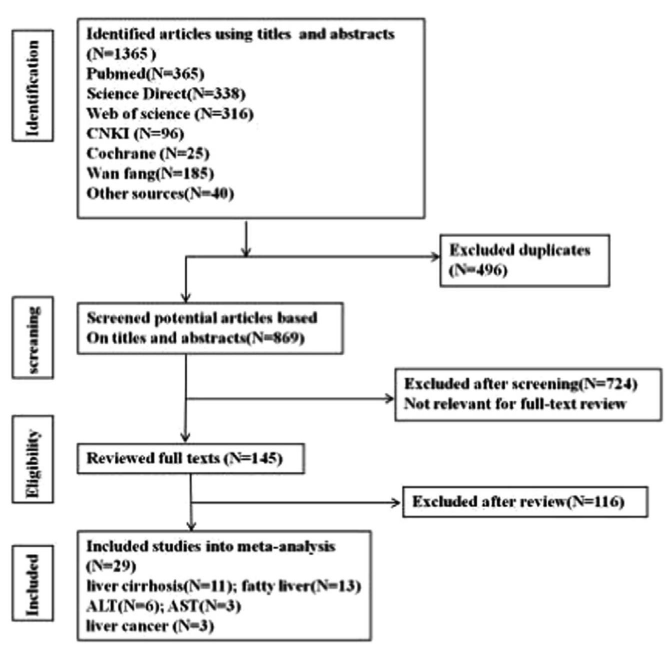

Fig. 1. Flow of systematic literature search on liver disease for workers in the oil factories. N = number of studies.