

REVIEW

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Effect of Occupational Exposure to Radar Radiation on Cancer Risk: A Systematic Review and Meta-Analysis

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Abstract

Objective: Microwave radiation is one of the most growing environmental workplace factors that exposes too many workers in the various workplaces. Regard to concerns about cancer incidence in these workers and lack of systematic or meta-analytic studies about this object, so, we conducted a meta-analysis to acquire an understanding of the association between cancer risk and occupational exposure to radar radiation. **Methods:** A systematic search was carried out on case-control, cohort and clinical control trial studies that published in the Cochrane Library, PubMed, ISI Web of Science, Scopus and Google scholar databases that accomplished from March 2017 to March 2018 and updated on 30 September, 2018 in English and Persian articles without time limit in publication date. Keywords were selected based on PICO principle and collected from MeSH database. After removal of duplicated studied, taking into inclusion and exclusion criteria, the process of screening was carried out and data were extracted after preparation of the full text of included articles. Article collection was completed by manually searching for a reference list of eligible studies. For quality assessment of included studies, Newcastle-Ottawa scale was used. **Results:** a total of 533 studies was found in the first step of literature search, only 6 were included with 53,008 sample size according to inclusion and exclusion criteria. Estimated pooled random effects size analysis showed no significant increasing effect of occupational exposure to radar radiation on mortality rate (MR=0.81, 95%CI: 0.78, 0.83) and relative risk (RR=0.87, 95%CI: 0.75, 0.99, P <0.0001) of cancer with a significant heterogeneity between the selected studies. **Conclusions:** In conclusion, the results of this meta-analysis study have shown no significant increase in overall mortality ratio and cancer risk ratio from occupational exposure to the radar frequency of workers. But, these results are not conclusive. As regards to some limitation such as fewer numbers of included studies, lack of data about exposure characterizations and demographic characterizations in this meta-analysis, this result is not certain and conclusive. It is recommended to conduct future studies.

Keywords: Occupational cancer- occupational exposure- Radar- cancer- neoplasm- meta-analysis

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Introduction

Microwave (MW) radiation became one of the most significant and fastest growing environmental factors due to intensive development of communication technologies during the last decades. In microwave spectra, radar frequency with 1-300 GHz range has varied applications such as satellite, communications, military, Network, navigation, air-traffic Control, navigation, marine and weather. Therefore, many workers are exposed to these waves (Yakymenko et al., 2011; Zaroushani et al., 2014; Zaroushani et al., 2016). Pulsed MW, which generally affect only certain groups of military or service staff or population living nearby. Concerns have been raised about

the safety of the microwave emissions of radars. Radars are detection systems which use MW to determine both moving and fixed objects like aircraft, ships, missiles, etc. Depending on the tasks they use different frequencies of MW (Yakymenko et al., 2011). Some common types of radars encountered with daily life include: Air traffic control radars, Weather radars, military, marine and Speed control radars. Therefore, too many workers are exposed to radar radiation (Zaroushani et al., 2014). There are many studies on exposure assessment and biological effects of microwave radiation (Khavanin et al., 2008; Zaroushani et al., 2014; Zaroushani et al., 2016; Zaroushani et al., 2016).

Previously, many case-controls, reviews and epidemiological studies were conducted on a wide range of

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