

## Review Article

### Effect from exposure to Dental x-rays

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#### ABSTRACT:

Purpose for this review is to outline the results of different studies on exposure to dental x-rays and related health risk. To perform the exploratory review, we searched the EMBASE, PUBMED, MEDLINE and NCBI databases for papers published before September 2021. A total of 3158 studies, eliminating copied studies, were found. The final 26 studies were selected. For health outcome 12 studies about intracranial tumor, 6 about thyroid tumor, 4 about neck and head areas and 4 related to systematic health.

In intracranial tumor studies, the link between dental x-ray exposure and meningeal tumor was significant in 8 of the 12 studies. In 5 of the 6 thyroid tumor related studies, there was a significant association with dental diagnostic x-rays. Neck and head area studies include salivary gland, laryngeal and parotid gland tumors. There was significant association between full mouth x-ray and salivary gland cancer, and not parotid gland cancer. Health outcomes like cataract, low birth weight and leukemia was also reported. In some studies examining health effects related to dental diagnostic x-ray exposure, increased risk of meningeal tumor and thyroid cancer was suggested. More studies on large population should be designed.

**Key words:** Dental radiography, radiation exposure.

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#### INTRODUCTION

X-rays are electromagnetic waves discovered on November 8 by Sir Wilhelm Conard Roentgen. X-rays possess great penetrating powers with wavelength ranges from 0.1—0.5 Å. They can cause ionization of gases indirectly. They travel with the speed of light i.e.  $3 \times 10^8$  m/s. Diagnostic x-rays are very important part of dental practices. With developing techniques radiation doses has been reduced but dental diagnostic x-ray imaging is still one of the most common type of radiological procedure that are frequently performed in dental clinics (1,2). There are different type of dental x-rays like full mouth series, bitewing and panoramic views (3). Dental x-ray exposes patients with less radiation dose. The survivors of Hiroshima atomic bombing give us the evidence of increasing cancer risk from low doses of radiation (4). Repeated exposure also increases cancer risk (5). Dental x-rays exposure is associated with risk of cancer, which was also revealed in previous studies (6, 7). In neck and head region

cancer risk causes have been discussed. Many studies reported on the association between exposure to dental x-ray and meningeal tumor risk, but still this is controversial, as some studies show lack of correlation (8, 10). A systematic review study introduced that there is no clear evidence for exposure to dental diagnostic x-rays and developing meningeal tumors (11). Some studies shows association between dental x-ray exposure and increased risk of intracranial (12, 13), parotid gland tumor, breast tumor and thyroid tumor (14, 15, 16, 17). Most common cancer is thyroid cancer worldwide, the dental x-ray exposure likely to contribute as due to the location of the thyroid gland. Repeated dental x-ray may result in different health problems including neck and head cancer and different systematic problems. Therefore we conduct systematic review of papers which reported a relationship between dental x-ray exposure and overall health risks as there are no previous reports which can summarize these relationships.

## MATERIALS AND METHODS

The patient, intervention, comparator, outcomes (PICO) method was followed as a usable tools for evaluation review process (18). PICO method was as follows: - 'P' is all patients, 'I' referred as dental x-ray exposure, 'C' is referred as non-exposure dental x-rays and 'O' to intracranial tumor, meningial tumor, thyroid cancer and other cancers.

## DATA SOURCES

We searched EMBASE, PUBMED, MEDLINE and NCBI databases and performed manual search for papers. Database research was published before September 2021. Paper published in different languages was selected. Some manual research was also carried out using the reference lists of papers included systematic review on review papers about overall health.

## STUDY INCLUSION AND EXCLUSION

We independently assessed each study through database predetermined selection criteria. Disagreements were settled by discussion. Inclusion criteria: - human health issues related to dental radiation exposure, human body study, and full text of the studies are as follows whereas exclusion criteria was radiation dose assessment, radiation protection management, review articles and recommendations and letters.

## RESULT

Total 3158 studies, except duplicate studies were collected. Title and abstract of these papers were assessed and full text of the final 26 studies that are selected through exclusion criteria. All these studies were conducted in different countries and published between 1997 and 2021.

## QUALITY ASSESSMENT

The median of eligible studies was 5.0, 6.0 and 4.5 for meningioma and tumors in neck and head areas, thyroid cancer and systematic health outcomes.

## HEALTH RELATED OUTCOMES

**Intracranial tumor:** -12 research papers are on dental diagnostic x-ray intracranial tumor. 6 specified the type of dental diagnostic x-rays whereas other five did not. 3 of these studies included bitewing and panorama types of examination. There are eight papers on meningioma, four on gliomas, one on acoustic neuroma, one on schwannoma, while two papers shows unspecific brain cancer.

**Thyroid tumor:** -there are 6 thyroid research findings related to thyroid cancer. Out of these 6 studies. Four were case-control studies, two were cohort studies. These six studies don't specify dental x-ray types where as in five of them studies, there was significant association between dental diagnostic x-rays and thyroid tumor.

**Tumors in neck and head areas:** - these tumors include laryngeal, parotid and salivary gland tumor. As dental diagnostic x-ray increased laryngeal cancer risk also increased. There was significant association between open mouth x-ray and salivary gland tumor but not parotid gland tumor.

**Health outcomes:** - low birth rate and leukemia was reported as systematic health outcomes related to dental x-ray exposure. One study classifies dental diagnostic x-ray type and has a correlation with low birth weight. Risk of leukemia increased according to dental x-ray exposure. A case shows that thumb cancer occurred in a radiographer who had performed dental diagnostic x-ray for 20 years.

## DISCUSSION

Level of exposure is lower than that of other x-ray radiation but there is an internal risk from radiation exposure. There are some studies on low dose dental diagnostic x-rays and health effects excluding some body parts. Among 26 papers it was reported that there was a correlation between dental diagnostic x-rays and overall health. Eighteen papers shows association with neck and head areas. The selected papers included 12 on intracranial cancer, 6 on thyroid tumor, 4 on neck and head areas other than brain and thyroid. As oral cavity is located near neck and brain region therefore dental x-rays affect brain and neck region.

Some papers shows correlation between dental diagnostic x-ray exposure and overall health. The present study identified 3 papers on occupational groups (17). According to study risk of thyroid cancer was 13.2 times higher among female dentists and dental hygienists. Women are more likely to have thyroid cancer due to hormones (37). A paper shows that cumulative dose for dentists who was working from long time was higher (38). So, dental practicing staff/students should be aware of exposure from dental x-rays and risk of accumulative exposure to low dose radiation from dental x-rays can't be ruled out. Panorama examinations are more commonly used as panoramic diagnostic information coverage exceeds dental diagnostic x-rays (39).

There is a limitation of this study as this study did not show exposure measurements like exposure dose and frequency.

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