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## Review

# Association between missing tooth count and mortality: A systematic review

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### ABSTRACT

**Purpose:** The purpose of this review was to analyze existing literature on the relationship between tooth count and mortality by evaluating the findings in the context of methodological variations. We aimed at addressing the question of whether preserving natural teeth can impact mortality.

**Study selection:** PubMed, Web of Science and CINAHL databases were systematically searched using various combinations of related and synonymous keywords for “tooth count” and “mortality”. The references of included articles were also evaluated for inclusion. Overall 49 studies found to be eligible were critically evaluated and their key findings were summarized.

**Results:** Studies were conducted in various continents and differed substantially in regards to their sample size, population, methodology, the definition of the tooth count variable, the confounders as well as the mediators accounted for in the analysis. Follow-up period ranged from 1 to 56 years.

**Conclusions:** Although high variability in the studies precludes a definite conclusion about the relationship between number of teeth and mortality, the overall finding from this review is that reduced tooth count is associated with higher mortality. However the impact of factors such as smoking, health-care access, baseline co-morbidity and risk profile, dental and periodontal health, the presence of dental prosthesis as well as socio-economic status, in mediating whole or part of the association cannot be overlooked and needs further investigation using more standard methodologies. Any differences in males vs. females, as well as among different age groups, will also need further consideration in the future studies.

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**1. Introduction**

Do humans need teeth to live longer and is an absence of teeth, or having a certain degree of tooth loss, associated with a shorter lifespan? If so, is the association manifested through specific disease processes? Understanding both, the strength and the mechanisms of any association relies on the presence of scientific evidence to support or refute the notion of an association. In addition, a better appreciation of the interplay between the mouth and the rest of the human body can further our ability to identify how certain oral conditions might impact mortality and can guide interventions that will yield the greatest systemic impact.

Poor oral health has been found to be associated with poor general health, lower quality of life and high morbidity [1–4]. The eventual outcome of periodontal disease and dental caries, the two most common dental diseases is loss of the affected teeth and hence the number of teeth or tooth count is a proxy to the cumulative oral health status in a person [1].

There is evidence to show that number of teeth might be associated with mortality. Various mechanisms proposed include, effect of tooth count on masticatory ability and hence ability to maintain adequate nutrition [5]; associated bacteremia due to oral infections that might have caused tooth loss [6]. Various reports have also shown that periodontal disease, tooth loss and overall poor oral health are more prevalent in individuals from lower socioeconomic strata, who are less well educated, and who have poorer and/or less frequent access to care.

The relationship of dental condition and human mortality remains poorly understood. Such circumstances also are observed with greater frequency in individuals who have other chronic conditions including coronary artery disease, cardiovascular disease and rheumatoid arthritis or who have addictions/habits like smoking, that, unless managed successfully, are associated with shorter life spans. A review by Polzer et al. examined association between number of teeth and all-cause as well as circulatory mortality [7].

In this systematic review, we describe and summarize the current evidence describing the association between tooth count and mortality from any cause.

**2. Methods**

This systematic review was performed according to the Preferred Reporting Items for systematic reviews and meta-analysis (PRISMA) statement [8].

*2.1. Search strategy*

Three databases were searched online (PudMed, Cochrane, Web of science) with the following keywords (edentulism OR edentulous OR “tooth count” OR “teeth count” OR “missing teeth” OR “partial edentulism” OR “partial edentulous” OR DMFT OR DMF OR

“tooth mortality” OR “teeth mortality”) AND (mortality OR death OR “all-cause mortality”). Additional search was performed with another set of keywords (edentulism OR edentulous OR “tooth count” OR “teeth count” OR “missing teeth” OR “partial edentulism” OR “partial edentulous” OR DMFT OR DMF OR “tooth mortality” OR “teeth mortality”) AND (mortality OR death OR “all-cause mortality”). Searches were carried out in April 2016.

Bibliography of the articles selected after title screening were also performed. Literature search was performed by 2 independent researchers.

*2.2. Inclusion and exclusion criteria*

We aimed to include all articles studying association between tooth count and mortality. Following were the specific inclusion criteria:

1. Primary research
2. PICO criteria:
  - Population: There was no population based selection criteria. No restrictions were placed based on the age group, country, gender or population.
  - Intervention and Comparator: We compared different levels of tooth count. The selection of the studies in the review was not determined by the type of indicator used for tooth loss and the analytical handling of the indicator. Tooth count could be reported as actual tooth count or the number of missing teeth or as edentulism or Decayed Missing Filled teeth (DMFT) with separately reported results on missing teeth.
  - Outcome: Mortality was the primary outcome of interest, irrespective of whether studies assessed all-cause mortality or cause specific mortality.
3. All studies published until April 2016
4. Studies published in English

Specific exclusion criteria were following:

1. Lack of access to the full text of the article
2. Studies examining tooth count and morbidity
3. Studies examining tooth count as a composite measure with other oral hygiene measures and/or mortality as a composite with other measures such as incident cases – where it was impossible to segregate the results between tooth count and mortality.

Studies could have examined the cause of tooth loss and/or mortality; they could have examined association between other oral health indicators than tooth loss with mortality, in addition to our primary exposure; they could have examined association with morbidity measures in addition to mortality; but they should have reported association between number of teeth and mortality to be included in the review.

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