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Short Communication

A scientometric study of tobacco and alcohol use as risk factors for oral cavity health

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KEYWORDS

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Oral leukoplakia;
Oral squamous cell carcinoma;
Tobacco smoking

Abstract *Background/purpose:* Tobacco and alcohol are the well-known carcinogenic agents of oral cavity health. The purpose of this study was to investigate the scientometric characteristics of alcohol and tobacco use and oral health.

Materials and methods: The papers on alcohol and tobacco use and oral cavity were published since 1885 and 1895, respectively. All the eligible papers were retrieved on March 20, 2023 from the Scopus database.

Results: There are 2529 and 1545 papers on tobacco smoking and alcohol drinking and oral cavity in the Scopus database, respectively. Based on the frequency of keywords in all included papers, both smoking and drinking are involved in mouth neoplasms, oral cancer, leukoplakia, and periodontal diseases. In the papers on tobacco and alcohol use and oral cavity, the same research keywords confirm tobacco and alcohol use associate with oral cancer risk possibly through influencing genetics and gene and protein expression. For the distinctive keywords, nicotine, smoking cessation, and electronic cigarette are unique keywords of tobacco use. Acetaldehyde, alcohol dehydrogenase, and alcohol metabolism are unique ones of alcohol use. *Conclusion:* This study for the first time reports the scientometric characteristics of tobacco and alcohol use and oral health, which might aid healthcare authorities to promote tobacco and alcohol control measures focused on the necessities of their population.

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Introduction

Tobacco and alcohol use are the leading risk factors in the global disease burden and the well-known carcinogenic agents of public health including oral health.¹ Among which, it is generally recognized that tobacco and alcohol use are the significant risk factors attributed to oral cancer.² Tobacco smoke is of over 70 carcinogens which have been evaluated by the International Agency for Research on Cancer (IARC) as having sufficient evidence for carcinogenicity in either humans or laboratory animals, acting both as a tumour promoter and even initiator. Tobacco-specific nitrosamines, volatile aldehydes, and polycyclic aromatic hydrocarbons present in several forms of tobacco derivatives have been attributed to mutations in oncogenes, loss of cell cycle control and decrease of apoptosis contributing to carcinogenesis.^{3,4} Also, tobacco products usually contain nicotine, which is related to addiction. On the other side, according to the evaluation by the IARC Working Group and the World Cancer Research Fund International, sufficient evidence reports that alcohol consumption is a carcinogenic agent associated with the risk of head and neck cancers, especially oral cancer.⁴

More importantly, a multivariable Mendelian randomization analysis demonstrated an independent causal effect for smoking and alcohol drinking on oral and oropharyngeal cancer risk⁵; A systematic review and meta-analysis demonstrated the synergistic effect of alcohol and tobacco use on significantly increased risk of oral cancer.⁶ Tobacco and alcohol are also the 2 most commonly consumed addictive substance worldwide, more common than areca nut and betel quid. We newly reported a scientometric study of betel quid chewing and oral cancer and precancerous lesions.⁷ Scientometrics is a useful tool that utilizes bibliometric and citation data to evaluate the academic influence of the literature within the designated area to guide research forward.^{8–11} To investigate the scientometric characteristics of main risk factors for oral cavity health, we provide the bibliometric and research characteristics of alcohol and tobacco use and oral health in the current study.

Materials and methods

As per the methodology described previously,^{7–9} all the English papers on tobacco and alcohol use and oral cavity were retrieved on March 20, 2023 from the Scopus database. According to the search strategy described in [supplementary Table S1](#), we used medical subject term “tobacco” and “oral” and the respective synonyms in the title to retrieve the papers on tobacco and oral health, and used medical subject term “alcohol” and “oral” and the respective synonyms in the title to retrieve the papers on alcohol and oral cavity health. There was no restriction in the search regarding publication year, type, and design of the papers. The papers on tobacco

and oral cavity and ones on alcohol and oral cavity were published since 1885 and 1895, respectively. Titles and abstracts or full texts of the articles were screened and re-evaluated to confirm the eligible papers.

Data search and extraction were performed independently by two investigators (H.L. and W.L.), and discrepancy of results was resolved in a consensus symposium. The scientometric characteristics of all the eligible articles were reviewed and recorded the following information: authorship, publication year, title, citation count, paper type, keywords, affiliation, and country/region of origin. A list of most-cited top-100 articles is created by sorting among all the retrieved articles according to the number of citations in descending order. Descriptive statistics and associations were calculated for scientometric characteristics. The Bibliometrix Biblioshiny R-package software (<https://www.bibliometrix.org/home/>; K-Synth Srl Inc., Naples, Italy) was used to analyze the relevant bibliometric data.

Results

Bibliometric characteristics

With the search strategy algorithm, a total of 2529 and 1545 papers on tobacco smoking and alcohol drinking and oral cavity are published until the time of the search, respectively. [Fig. 1A](#) illustrates the number and distribution of the paper types. To concretize the trends of academic influence, we evaluate the annual number of the papers and accumulated citations of the most-cited top-100 papers during 2007–2022. The annual number of the smoking papers stably raises from 63 to 170 during 2007–2022, and the number of the drinking papers modestly raises from 35 to 78 during the period ([Fig. 1B](#)). Unexpectedly, the accumulated citations of the top-100 smoking papers first increase from 801 to 1024 and then decrease up to 764 during 2007–2022; and the accumulated citations of the top-100 drinking papers first increase from 695 to 891 and then decrease up to 693 during the period ([Fig. 1C](#)).

The detailed information on title, publication year, journal, citation count, authors, affiliation, keywords, and document types of the top-100 papers on tobacco smoking and alcohol drinking and oral cavity are presented in [Table S2](#) and [Table S3](#), respectively. For the citations of the top-100 papers by publication years, the citations of both smoking and drinking papers published from 1960s to 2000s stably raise from 130 to 7852 and from 221 to 6044, respectively ([Fig. 1D](#)). For journal with most citations, both smoking and drinking papers published in *Cancer Research* (2434, 2658) and *International Journal of Cancer* (1827, 1662) are of the most citations ([Fig. 1E](#)). Besides, there are 257 papers which the 2 concurrent terms (tobacco smoking and alcohol drinking) in the paper title and oral cavity are published until the time of the search ([Table S4](#)). The cloud

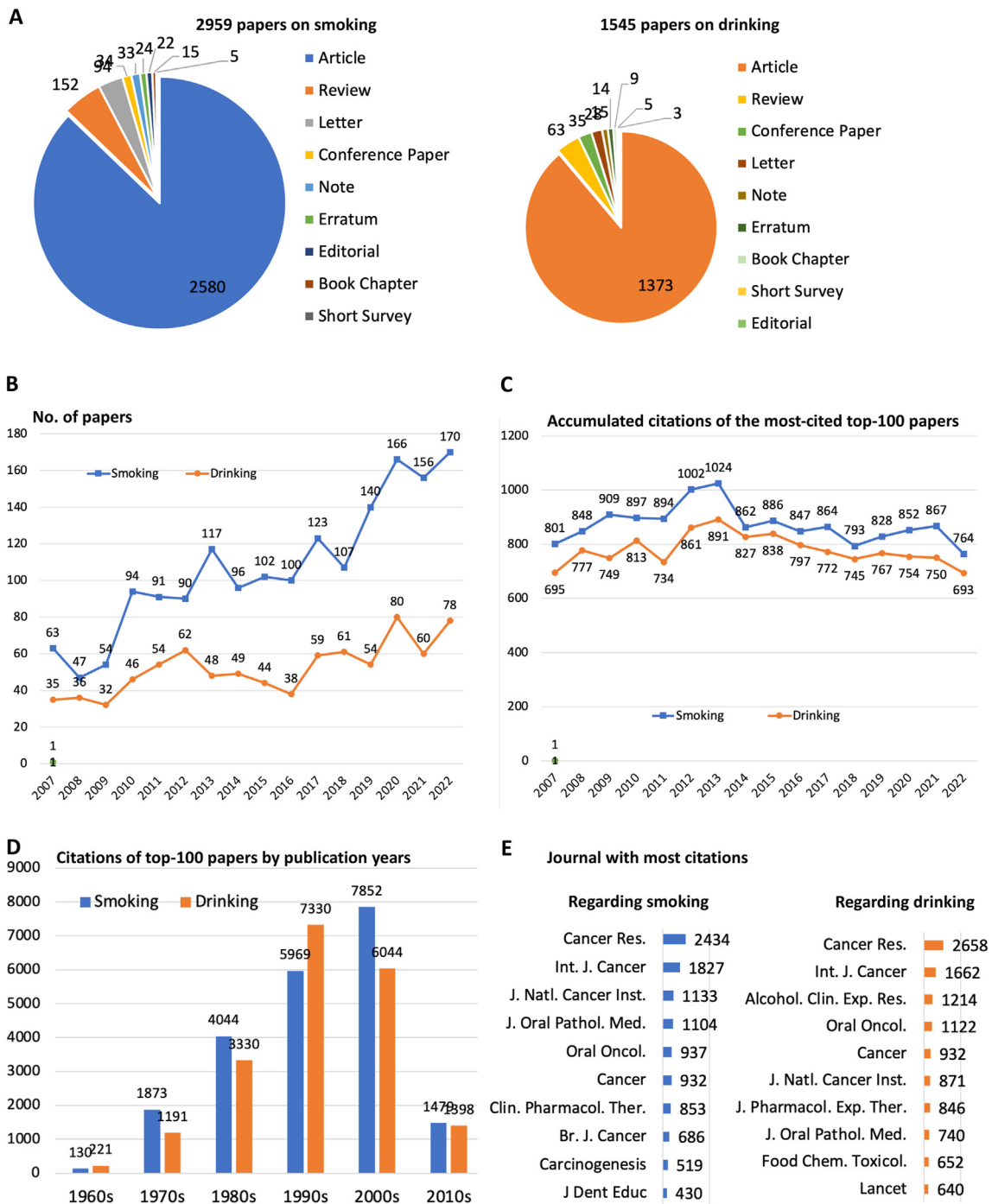


Figure 1 Citation characteristics of the papers on tobacco smoking and alcohol drinking and oral cavity. (A) Document types and distribution of the papers. (B) The annual number of the papers during 2007–2022. (C) The accumulated citations of the most-cited top-100 papers during 2007–2022. (D) Citations of top-100 papers by publication years. (E) Journal with most citations.

graphs of research keywords, journal of publication, contributing authors, institutions, and countries/regions of origin regarding the papers on tobacco and alcohol use and oral cavity are showed in Fig. 2.

Research characteristics

All the keywords are automatically recognized in the order of highest to lowest frequency by the database. Based on

the frequency of keywords in all included papers, the top-10 related disorders, top-20 study designs, and top-20 keywords are identified. For the related disorders, both smoking and drinking are involved in the most of the same disorders such as mouth neoplasms, oral cancer, leukoplakia, and periodontal disease (Fig. 3A). For study design, human cell, questionnaire, and epidemiology study rank in the top-10 in smoking but not drinking papers; rat, mouse study, and randomized controlled trial rank in the top-10 in drinking but not smoking papers (Fig. 3B).

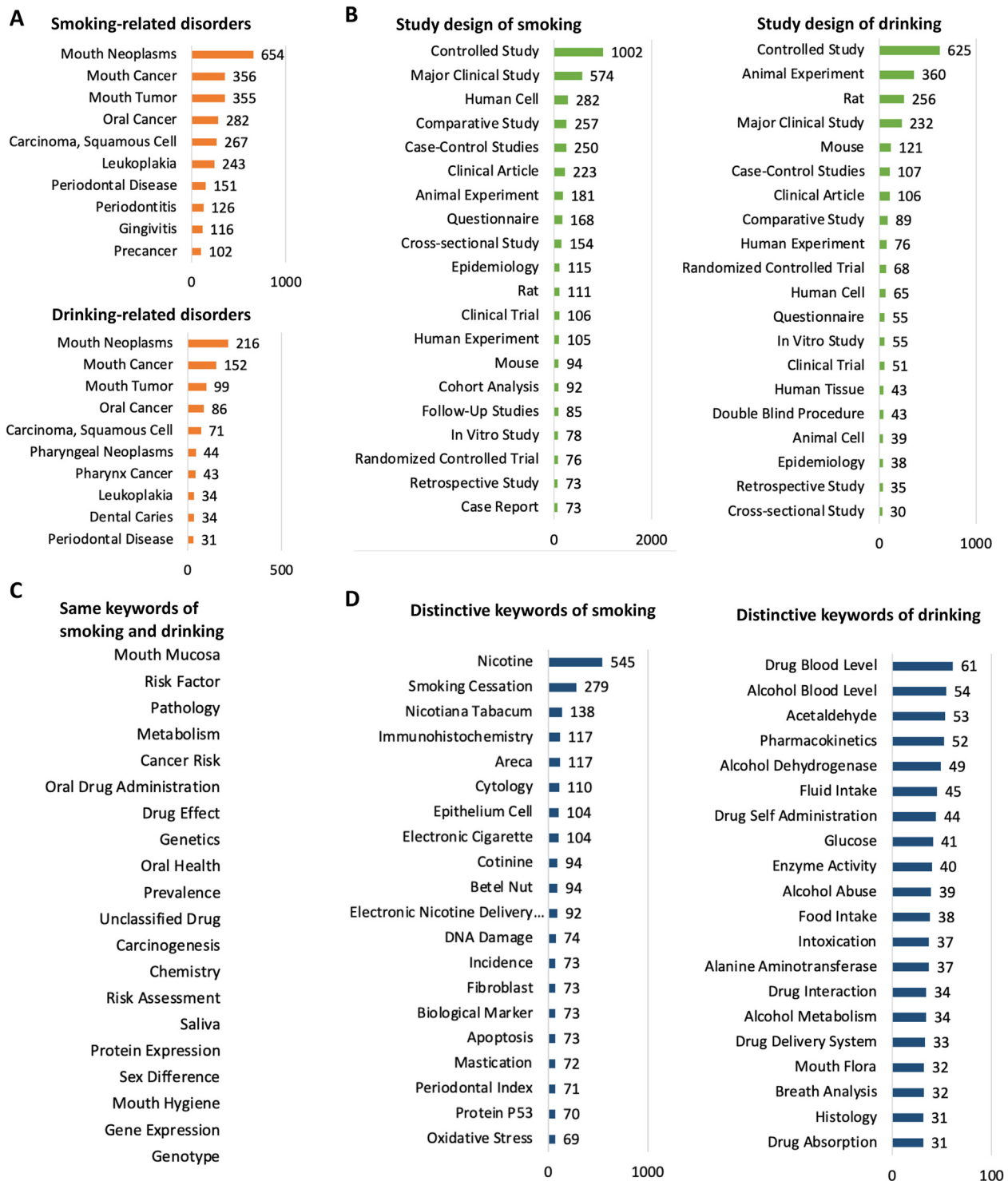


Figure 3 Research characteristics of the papers on tobacco smoking and alcohol drinking and oral cavity. The ranks of (A) related disorders, (B) study design, (C) same keywords, and (D) distinctive keywords.

Discussion

If areca and betel nut chewing is a major public health problem mainly in many South Asian regions and Pacific Islands,⁷ the consumption of tobacco and alcohol as carcinogenic agents are the public health problem all over the world. For oral cavity health, it is generally recognized that

tobacco smoking and alcohol drinking are reported to affect oral cancer and oral precancer leukoplakia. The development of oral cancer often precedes by oral precancer and is attributed to a complex carcinogenic process, which results from the interaction of genetic and environmental factors. Meanwhile, there are some reports on associations of tobacco and alcohol use with periodontal diseases and dental

caries. We also observe that both the number and citations of smoking papers are higher than those of drinking papers, indicates tobacco smoking was still the most frequently reported risk factor attributed to oral cavity health, especially oral cancer.

In this study, we highlight the analysis of research keywords. In the papers on tobacco and alcohol use and oral cavity, the same keywords mouth mucosa, cancer risk, genetics, and carcinogenesis confirm tobacco and alcohol use associate with oral cancer risk possibly through influencing genetics and gene and protein expression. For the distinctive keywords, nicotine, smoking cessation, and electronic cigarette are unique keywords of tobacco use. Acetaldehyde, alcohol dehydrogenase, and alcohol metabolism are unique ones of alcohol use. Alcohol might act through its middle metabolite – acetaldehyde, which is detoxified by aldehyde dehydrogenase. Locally, alcohol acts as a solvent that increases the absorption of carcinogens into mouth mucosa. Ethanol facilitates the uptake of environmental carcinogens, especially from tobacco smoking, through the cell membrane of oral keratinocytes made more permeable by its direct effect.⁵ This possible mechanism could explain that the synergistic and interactive effect of alcohol and tobacco use on significantly increased risk of oral cancer.⁶

In summary, the scientometric characteristics of tobacco and alcohol use and oral cavity health are firstly comprehensively provided in this study. Even though there are certain limitations in a scientometric analysis mentioned previously,^{8,9} we hope that the above observations of this analysis might aid healthcare authorities to promote tobacco and alcohol control measures focused on the necessities of their population.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jds.2023.05.016>.

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