https://doi.org/10.48047/AFJBS.6.14.2024. 213-223

African Journal of Biological Sciences

Impact of Herbal medication on dental caries – A Systematic Review

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Article History

Volume 6, Issue 13, 2024

Received: 18June 2024

Accepted: 02July 2024

doi:*10.48047/AFJBS.6.14.2024*. 213-223

Abstract:

Background: According to data gathered over the previous twenty years, dental caries is one of the most prevalent and serious oral health issues in the world today. Dentists also face challenges in treating this disease. Knutson's technique, which involves applying 2% neutral sodium fluoride topically to treat dental caries, is one treatment that has been used recently. However, it is time-consuming, and its efficacy is still being questioned. Other treatments include filling treatments and RCT, but these also have drawbacks. so, in this study intervention of Ayurveda and its effectiveness in this disease is summarized. **Methods:** We conducted a systematic search of electronic databases for randomized control trials, in vitro-in vivo experiments, unpublished data from pre-print servers, and available literature to ascertain the relative efficacy of ayurvedic drugs for dental caries. Based on PRISMA GUIDELINE for systemic review selection process based on inclusive and exclusive criteria were conducted. Risk of bias assessment done by using Cochrane Collaboration's Risk of Bias Assessment Tool. **Result:** All the reviewed studies are randomized controlled trials, animal studies, and clinical trials. Among all the studies herbal medicines show a significant reduction in the symptoms than other conventional medicines. As all the other ayurvedic drugs come across during studies were also effective. **Discussion:** The results of this study will guide future investigations and offer valuable information to clinicians in developing the most effective Ayurvedic treatment plan for patients with dental caries.

Keywords: *Ayurveda*, Dental caries, herbal medicines, prisma guideline.

Introduction:

Dentistry has been around since 5000 BC, back when dental caries was believed to be caused by a "tooth worm." “Dental caries” first appeared in literature, at about 1634. The term “dental caries” is derived from the Latin word “caries” which means decay.[1] In the initial phase dental caries are described as teeth holes. As per the report, it is one of the most common and oldest diseases found in human beings. According to WHO, the global prevalence rate of dental caries is 514 million children suffer from primary tooth caries and approximately 2 billion people suffer from caries of permanent teeth.[2] Although they can be prevented in most cases, oral diseases are a major source of health care burden in many nations and can cause pain, discomfort, disfigurement, and even death in certain cases.[3] There are various treatments available for dental caries but these are costly and time-consuming.

The term "natural" refers to the absence of artificial sweeteners, colors, preservatives, additives, flavors, and fragrances in toothpaste mixes. The producers of those herbal dentifrices assert that by using a wide range of plant ingredients, their products can replicate the advantages of conventional dentifrices, including their capacity to combat plaque, improve breath, and stave off gum disease. Consumer demand for products that don't harm the environment, don't use animal products, are vegan-friendly, and don't have any side effects has increased because of the trend to "go herbal." Herbal products are sold in greater quantities than medicine with a fluoride base in some regions of the world.

As everyone follows a healthy lifestyle and natural remedies there is a need for ayurvedic intervention in the dental field also. Ayurveda is well known for its preventive action. In *Ayurveda* dental caries are referred to as *krimi danta*. As per data collected from the previous 20 years, there is much ayurvedic research was performed. In our study, we prepared to summarize the efficacy of *Ayurveda* interventions for patients suffering from dental caries in the systematic review and network meta-analysis, to provide scientific reference for the design of future clinical trials and provide helpful evidence for clinicians to formulate the best *Ayurveda* treatment strategy for management of dental caries.[18]

Review Question:

Are Ayurveda interventions effective in the management of patients with dental caries?

Objectives:

The primary objective of this review is to assess the effectiveness of *Ayurvedic* drug intervention in the management of dental caries. Additionally, this systemic review will recognize the most effective component in the management of dental caries.

Methods:

According to PRISMA GUIDELINE [6]methods include:

Eligibility criteria:

Inclusion**:**

- In this only data collected from 2003 to 2023 through PubMed, Scopus articles are reviewed. That data content only herbal drugs used for management of dental caries. Through Google Scholar, AYUSH portal, Shodhganga, Web of Science, PubMed, Scopus, and the Cochrane Central Register of Controlled Trials (CENTRAL).
- Randomized controlled trials, animal studies, clinical trials, case studies which shows effectiveness of herbal drugs in reduction of dental caries.

Exclusion:

- Data content other than any herbal drugs or any surgical procedures are excluded.
- Literature in other languages was excluded due to lack of translation of it.

Information sources:

Search strategy:

The following electronic databases were searched: Google Scholar, AYUSH portal, Shodhganga, Web of Science, PubMed, Scopus, and the Cochrane Central Register of Controlled Trials (CENTRAL). Keywords and controlled vocabulary terms (such as EMTREE terms and medical sub-heading (MeSH) terms) were used. Terms related to patients (dental caries) as well as terms related to treatments (*Ayurvedic* medicine, herbal drugs) were included in the keyword list. A manual search was also carried out using pertinent review articles and qualifying primary studies as a guide. We searched about grey literature. Also, investigated the possibility of uncirculated research, experts in the field were

contacted. If any important details were missing from published research, the study authors were notifie

Selection process:

The selection process was carried out by two review authors after the deduplication procedure in endnote. A total of 116 articles were selected. Based on inclusion and exclusion criteria, the titles of the studies identified from the search were assessed independently by two authors [R.S. and A.S.]. First, titles and abstracts were screened to identify eligible studies. Disagreements amongst reviewers were resolved by discussion. A third external reviewer resolves disagreements if the reviewers are unable to reach a consensus. The resulting studies were screened for eligibility once the first round of screening was complete. These articles were then independently screened by two reviewers. The PRISMA flow diagram [figure .1.] track, and report detailed explanations for exclusion. Under the PRISMA [6] guidelines, a flow diagram illustrating the study selection process was provided. We reviewed numerous reports of related studies collectively.

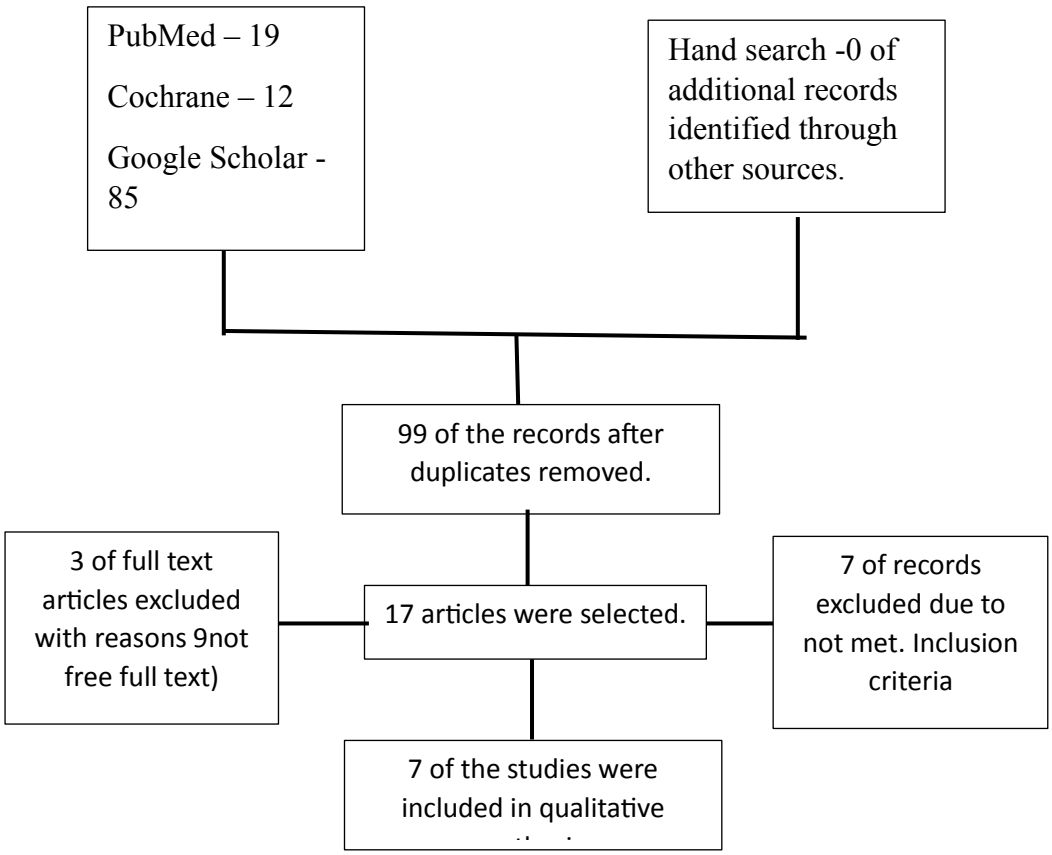

Figure .1. PRISMA flow diagram

Data extraction and management:

Two reviewers were independently extract data from the included studies after identifying the target RCTs. The data extracted is as follows:

1. The overview of the research (first author, year of publication, nation of study, single- or multicentre).

2. The specifics of the treatment, including the diagnostic standards, inclusion and exclusion criteria, overall sample size, intervention parameters, recruitment timeline, and duration of follow-up.

3. The participants' details, including their age, gender, and co-morbidities.

4. Intervention specifics (medication, amount, mode, and length).

PICO ANALYSIS:

Participants:

Participants in these studies had no limitations of age, gender, or study type. All the studies were involved in this review.

Interventions:

Herbal drugs

Comparators/Control:

Comparator for this study 2% neutral sodium fluoride.

Language:

Study includes articles published only in English language.

Time frame:

Publication years between 2003 to 2023 were included in the studies.

Outcomes:

- Silness–Löe plaque index (PI) [Table.1.]

Silness – loe plaque index (PI)	**Criteria**
0	Absence of microbial plaque.
1	Thin film of microbial plaque along free Gingival margin
2	Moderate accumulation with plaque in the sulcus
3	Large amount of plaque in sulcus or pocket along the free gingiva margin.

Table .1. [7]

- Löe–Silness gingival index (GI) [Table.2.]

Appearance	**Bleeding**	**Inflammation**	**GI**
Normal	No bleeding	none	0
Slight change in color and ,mild edema with slight change in texture	No bleeding	mild	1
Redness,hypertrophy,edema and glazing	Bleeding on probing/ pressure	moderate	2
Marked redness,hypertrophy, edema, ulceration.	Spontaneous bleeding	severe	3

Table.2. [8]

Risk of Bias:

Risk of bias assessment was done by using the Cochrane collaboration tool.[10] The study design characteristics and internal validity features of each of the included studies were

evaluated by two reviewers, independently and in duplicate. The evaluation was conducted both within and between the studies. Writing an explanation of the findings from each included study was the first step. The risk of bias was then evaluated, and each included study was given a score of low, high, or unclear. Next, each study's overall quality was evaluated by assigning a grade to each of the four bias categories [Figure .2.] For each of the seven categories of biases, a score of 3, 1, and 0 was regarded as low, unclear and high risk of bias respectively.

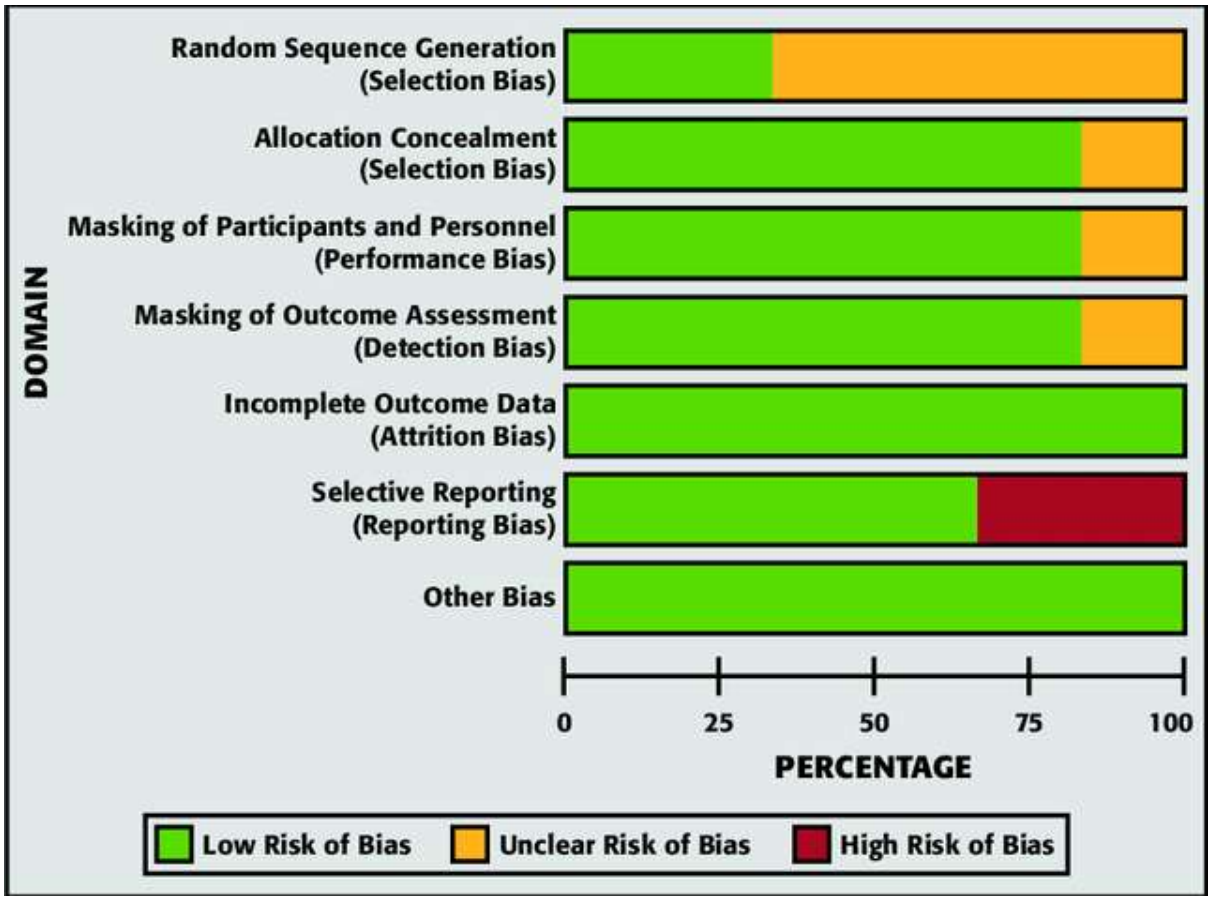

Figure .2. Risk of bias – included studies.[9]

RESULT:

116 publications from various databases were found through a systematic literature search. After reviewing the titles, 54 articles were eliminated, and 62 articles were chosen for additional processing. After reading the abstracts, we eliminated 45 articles that did not meet our inclusion criteria. A total of 17 articles are chosen and can be read in full. Ultimately, 10 articles were chosen for full-text reading . Finally, seven[11],[12], [13],[14],[15], [16],[17] articles were included in this article after three were excluded due to different outcomes and the lack of a free full text. Numerous factors, including the study location, study design, study setting, year of publication, age distribution of the study population, measurement tool, and study duration, were taken into consideration when characterizing the studies. Among seven selected articles one article from Chinese[12], one article from Thailand[11], one from Japan [13] and four articles were from India. No studies were found from Africa and Australian continents. Among the seven studies two were invitro studies in which *triphala* vs calcium hydroxide[14] and other in vitro study included grape seed extract vs sodium fluoride[15] were studied, one was randomized field trial *terminalia chebula* fruit mouthrinse[16] used, one randomized cross over clinical trial *Teucrium Polium*[17], two were systemic review one from China and one from Thailand included. One article from Japan[13] on oral infection included in which *Houttuynia cordata* Extract were used for treatment.

Conclusion:

The studies included in this systematic review are limited to those written in English. Just published data or research are included in this systematic review for analysis. The quantity of studies evaluating the purpose of this review was thus constrained. In the study, heterogeneous outcome variables are included because there aren't enough clinical studies comparing herbal and conventional dentifrices. The study aimed to determine how well dental plaque was removed after using herbal remedies in comparison to conventional medications. For dental caries and dental plaque, various indices were employed. It is impossible to say if the indices examined are sensitive enough based on this systematic review; nonetheless, dental professionals frequently use them all. Turesky's adaptation of the Quigley and Hein PI and the GI by Löe and Silness are the most often utilized indices in this review. While other medications on the market contain chemicals that may cause side effects

after long-term use that are frequently overlooked, herbal medicine, which contains herbal ingredients, acts naturally in our oral cavity.

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