



LITHUANIAN UNIVERSITY OF HEALTH SCIENCES
MEDICAL ACADEMY
FACULTY OF ODONTOLOGY
DEPARTMENT OF PERIODONTOLOGY

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**THE POSSIBLE USE OF HERBAL AGENTS AS
PREVENTION IN ADJUNCT TO PROFESSIONAL
MANAGEMENT OF PERIODONTAL DISEASE: A
SCIENTIFIC LITERATURE REVIEW**

The Master's thesis of the Master's degree study programme "Odontology"

Supervisor of the Master's Thesis:

Associate professor, Dr Inga Vaitkevičienė

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Kaunas, 2023

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The Master's thesis of the Master's degree study programme "Odontology"

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Kaunas, 2023

**EVALUATION OF THE SCIENTIFIC LITERATURE REVIEW MASTER'S THESIS
REVIEWER'S FORM**

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No.	MT parts	Evaluation criteria for the Master's thesis structural and methodological requirements	Evaluation* (1-10 points)
1	Summary	Is summary informative and in compliance with the thesis content and requirements? Do the keywords match the essence of the thesis?	
2	Introduction	Are the novelty, relevance and significance of the work justified in the introduction of the thesis?	
3	Aim and objectives	Are the aim and objectives formulated properly and clearly? Are the aim and objectives interrelated?	
4	Criteria for articles selection	Were the eligibility criteria of articles determined? Are all the information sources (databases with dates of coverage, contact with the authors of article) described and is the last search day indicated? Is the electronic search strategy described in such a way that it could be repeated?	
5	Search methods and strategy	Is the selection process of articles (screening, eligibility for systematic review or, if applicable, for meta-analysis) described? Is the process of data selection from articles described (types of research, participants,	

		<p>interventions, factors analyzed, and indicators)?</p> <p>Were all the variables, for which data were searched and described, listed and described? What assumptions or simplifications were made?</p> <p>Were the key measurement indicators (relative risk, mean differences) identified?</p>	
6	Systemization and analysis of data	<p>Is the number of checked articles given: included (after their eligibility evaluation), and rejected (with reasons at each stage of rejection indicated)?</p> <p>Are the characteristics of the described studies (from the included articles according to which the data were taken) provided (e.g., study sample, observation period, type of subjects)?</p> <p>Are systemized publication data presented in tables according to individual objectives?</p>	
7	Discussion	<p>Are the main findings summarized and is their significance indicated?</p>	

		<p>Are the limitations of the performed systematic review discussed?</p> <p>Does author present the interpretation of the results?</p>	
8	Conclusions	<p>Do the conclusions reflect the topic, aim and objectives of the Master's thesis and are they based only on the analyzed material?</p> <p>Are the conclusions clear and concise?</p> <p>Suggestions and practical recommendations (optional).</p>	
9	List of references	<p>Is the references list compiled according to the requirements and are the references to the text correct?</p> <p>Do the cited sources not older than 10 years compose at least 70% of the references, and the sources not older than 5 years make up at least 40%?</p>	
	General	<p>Do the presented annexes help to understand the analyzed topic? Are the volume, structure,</p>	

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ABBREVIATIONS

PI – Plaque Index

GI – Gingival Index

BOP – Bleeding on Probing

SBI – Sulcular Bleeding Index

GBI – Gingival Bleeding Index

MW – Mouth wash

CHX – Chlorhexidine Gluconate

AV – Aloe Vera

GT – Green Tea

ZnA – Zinc Acetate

ZM – Zataria Multiflora

FR – Frankincense

SEM – Standard Error of Mean

SD – Standard Deviation

SUMMARY

Aim:

To evaluate the efficacy of using herbal agents in the prevention of periodontal diseases in adjunct to professional periodontal management.

Material & methods:

A total of 3 electronic databases were used: Wiley Online Library, Cochrane Library and PubMed and literature published between March 2018 and March 2023 were searched. Sequential screenings of the title, abstract, and full-text levels were performed. 5 human studies with reported changes in PI and GI after use of herbal agents and 0.2% CHX in control of periodontal diseases were included according to PRISMA guidelines.

Results:

Initial electronic and hand search generated 204 results, from which 5 full text articles were included in this systematic review. Data from the study trials demonstrated a significant difference in the clinical parameters pre-trial and post- trial period. The PI and GI values were significantly reduced following the regular use of herbal mouth washes, which indicated the effectiveness of herbal extracts as a strong antiplaque and anti-bacterial agent in the control of gingivitis in patients who received initial periodontal prophylactic treatment. Comparison of clinical parameters of herbal mouth washes to CHX mouthwashes showed that the efficacy of both types of mouth rinses are beneficial in oral health management and with regular use, can help maintain low PI and GI values, which is essential to prevent periodontal diseases.

Conclusions:

There is evidence to support that herbal agents present in herbal mouthwashes show significant clinical improvement in oral status and can be used as a safer alternative to CHX as an effective antiplaque and antibacterial agent.

Keywords: herbal; gingivitis; prevention

SANTRAUKA

Tikslas:

Įvertinti augalinių preparatų naudojimo efektyvumą periodonto ligų profilaktikai kartu su profesionaliu periodonto gydymu.

Medžiagos ir metodai:

Iš viso buvo naudojamos 3 elektroninės duomenų bazės: Wiley Online Library, Cochrane Library ir PubMed bei literatūra, išleista nuo 2018 m. kovo iki 2023 m. kovo mėn. Buvo atliekamos nuoseklios pavadinimo, abstrakčios ir viso teksto lygių peržiūros. Pagal PRISMA gaires buvo įtraukti 5 tyrimai su žmonėmis, kuriuose buvo pranešta apie PI ir GI pokyčius po vaistažolių preparatų ir CHX vartojimo kontroliuojant periodonto ligas.

Rezultatai:

Pradinė elektroninė ir rankinė paieška davė 204 rezultatus, iš kurių 5 pilno teksto straipsniai buvo įtraukti į šią sistemine apžvalgą. Tyrimų duomenys parodė reikšmingą klinikinių parametru skirtumą prieš ir po tyrimo. PI ir GI reikšmės gerokai sumažėjo po reguliaraus vaistažolių burnos skalavimo skysčių naudojimo, o tai rodo, kad vaistažolių ekstraktai yra stiprūs antiapnašų ir antibakteriniai vaistai kovojant su gingivitu pacientams, kuriems buvo atliktas pradinis periodonto profilaktinis gydymas. Palyginus vaistažolių burnos skalavimo skysčių klinikinius parametrus su CHX burnos skalavimo skysčiais, paaiškėjo, kad abiejų tipų burnos skalavimo skysčių veiksmingumas yra naudingas burnos būklei gydyti, o reguliariai naudojant, gali padėti išlaikyti mažas PI ir GI vertes, o tai būtina norint išvengti periodonto ligų.

Išvados:

Yra įrodymų, kad vaistažolių preparatai, esantys vaistažolių burnos skalavimo skysčiuose, rodo reikšmingą klinikinį burnos būklės pagerėjimą ir gali būti naudojami kaip saugesnė CHX alternatyva kaip veiksminga priemonė nuo apnašų ir antibakterinių medžiagų.

Raktiniai žodžiai: vaistažolės; gingivitas; prevencija

1. INTRODUCTION

Traditionally before the development of professional oral hygiene products and procedures used currently in the management and prevention of periodontal diseases, herbal agents have been used as part of individual oral hygiene routines in households[1]. In this systematic review the purpose is to use scientific literature to evaluate the efficacy of such agents and how it may play a significant role in early prevention of the development of periodontal tissue related diseases such as gingivitis.

The most common and earliest stage of periodontal diseases is gingivitis, characterised by red, swollen, bleeding gums [1,2]. According to the 2017 World workshop classification gingivitis can be classified into dental biofilm-induced gingivitis and non-dental biofilm induced gingival diseases. Biofilm-induced gingivitis occurs as a gingival inflammatory response to plaque biofilm accumulation at the gingival margin. Non- dental biofilm induced gingivitis may be caused by systemic and local risk factors, hormonal level, and medication-influenced gingival enlargements [3]. At this stage the disease can be reversed with strict tailored oral hygiene regimes and professional prophylactic periodontal management. Individual regimes typically consist of brushing teeth twice daily, in morning and evening; interdental cleaning either by using dental floss or interdental brushes or by the use of dental mouth washes[4,5]. However if immediate measures are not taken, gingivitis can progress to an irreversible stage known as periodontitis, which can ultimately lead to tooth loss [2].

When it comes to intra-oral mouth rinses in modern dentistry 0.2% Chlorhexidine Gluconate (CHX) has been considered the ‘gold standard’ for its efficacy as a broad spectrum antiseptic since the 1950’s.[6] It has been known for its effectiveness in the removal of plaque, the greyish yellow microbial substance which adheres to hard surfaces in the oral cavity, specifically the teeth and restorations or orthodontics appliances. This substance accumulates over time and ultimately affects the gingival health and is a common cause for development of gingivitis.

As effective as CHX is, there are some negative side effects observed over the years, linked with the use of CHX mouth rinse. Research has shown reports of adverse events (AEs) such as irritation of tongue, sore throat, but most commonly change in taste perception and formation of brownish pigmentation of teeth [7,8]. In the literature, another side effect reported was higher calculus formation, especially in prolonged administration over 14 days [9].

Before the development of CHX in the modern dentistry, populations in India, China, Persia have long used herbal extracts as mouth rinses in their traditional medicinal practices. Common herbs used are Triphala, Tulsi, Neem, Clove oil, Mint, Caraway seeds, White oak bark, Horsetail herb, Aloe vera, Tea tree oil, Green tea [10]. Research papers show evidence to indicate that herbal based mouth wash has similar efficacy in plaque control to that of CHX, but without the negative side effects that the synthetic, alcohol based CHX induces. For example, herbal extract from *Punica Granatam var. Plenifora* can be formed into an organic mouthwash by mixing with vinegar, known locally as Golnaar mouthwash which originates from Persia [11]. This herbal mouth wash is considered a safer and effective alternative to CHX, without the danger of stains on teeth. A review of clinical trials by Safiaghdam et al [12] demonstrated that extracts from medicinal plants could act via several mechanisms such as decreased gingival inflammation and bleeding, inhibition of dental plaque formation, and improvement in different indices of oral hygiene in the treatment of periodontal diseases.

Typically for a clinical assessment of a patient's oral health, several dental indices are used to evaluate a disease process or its severity. Plaque Index (PI) and Gingival Index (GI) are two commonly used indices in the evaluation of oral hygiene and gingival health [13].

The articles that were chosen for this systematic literature review compared PI and GI before and after the study period to assess the effectiveness of herbal agents in dental mouthwashes in the control of periodontal diseases, particularly gingivitis. Commonly used gold standard CHX mouth rinses have been proven effective but also have negative side effects, and mouth washes containing herbal extracts are considered a natural, non-synthetic alternative to CHX. The data for this systematic review looks at CHX as a control to comparison of herbal mouthwashes in treatment of gingivitis in adjunct to prophylactic periodontal treatment such as manual and ultrasonic scaling and polishing.

Objectives:

1. To analyse the effectiveness of herbal agents in the treatment of patients with periodontal diseases in adjunct to professional periodontal management.
2. To compare effectiveness of herbal agents to 0.2% CHX in adjunct to professional periodontal management.
3. To indicate how the results are important in the prevention of periodontal diseases.

2. CRITERIA FOR ARTICLE SELECTION

2.1. Protocol

The articles for this systematic review of scientific literature were searched and selected in relevance to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) requirements [14].

2.2. Information sources

Publications viewed in the process of data collection for this literature review was acquired through advanced searches conducted in 3 different electronic database systems, namely: Wiley Online Library [15], Cochrane Library [16] and PubMed [17], as well as manual searches conducted on google search engine. The final literature search was completed on 20th March 2023.

Focus question

The PICO [18] framework was used to help construct the focus question needed to search for relevant literature records for this systematic review.

Table 1. PICO table

Component	Description
Population (P)	Patients with gingivitis who received professional periodontal prophylactic treatment
Intervention (I)	Herbal mouthwashes
Comparison (C)	Chlorhexidine mouthwash
Outcome (O)	Differences in clinical parameters measured: PI and GI

Focus question: ‘In patients who received professional prophylactic treatment, is there evidence to suggest that herbal mouthwashes compared with CHX mouthwashes cause a difference in the clinical parameters (PI and GI) measured?’

2.3. Criteria for article suitability

A set criterion was followed when conducting the literature search. All potential publications relative to the literature topic were searched to view results from only previous 5 years. On Wiley Online Library, the publication date was set to custom range ‘March 2018 to March 2023’ and

subject 'Dentistry' was selected. On Cochrane Library custom range '2018 to 2023' was applied, and language 'English selected', and on the PubMed database a '5-year' filter was applied. The option to filter English language publications was not available on Wiley Online Library and PubMed therefore, it had to be performed manually.

2.4. Literature search

To find scientific literature for this thesis, search was conducted on databases with combinations of certain keywords used to display articles with common titles and content that correlate with the topic of the thesis. The keywords used to filter the search results were 'herbal', 'gingivitis' and 'prevention'. The aim of the search was to find articles which contain research of the efficacy of using naturally available, non-synthetic herbal agents in the management of early-stage oral diseases such as gingivitis and how the results can be compared to more commonly used agents such as CHX and conventional periodontal prophylactic treatment methods which involved scaling.

2.5. Data collection

The results to the mentioned keyword combinations and filters yielded a total of 204 records: 91 from Wiley Online Library, 64 from Cochrane Library and 49 from PubMed. Collected records were screened and tested for duplicates using the Zotero software [19] to eliminate copies of the same records. The remaining articles were reviewed to choose the relevant publications required for the literature review. Another article was reviewed and chosen through manual search conducted on google search engine [20].

2.6 Selection of articles

After removal of duplicates, the remaining literature were screened to remove records in unsuitable publication formats such as abstracts, review articles, meta – analysis reports, chapters, or records from journals. Records which were not in English language, did not mention the keywords in the title, or did not contain reports of clinical human studies were also removed on the basis of irrelevance to topic. Full text articles were the last stage of literature selection process before the final articles for this systematic review was chosen. Selection of articles are more clearly outlined in the inclusion and exclusion criteria.

2.7. Inclusion and exclusion criteria

This criterion outlines the key characteristics which was used to select the final articles for the systematic literature review, as defined below:

Inclusion criteria:

- Published within last 5 years.
- Articles in English Language
- Sample participants are human subjects.
- Articles that evaluate efficacy of herbal agents and CHX in treatment of periodontal disease, with reported changes in PI and GI
- Randomized Clinical Trials (RCT)

Exclusion criteria

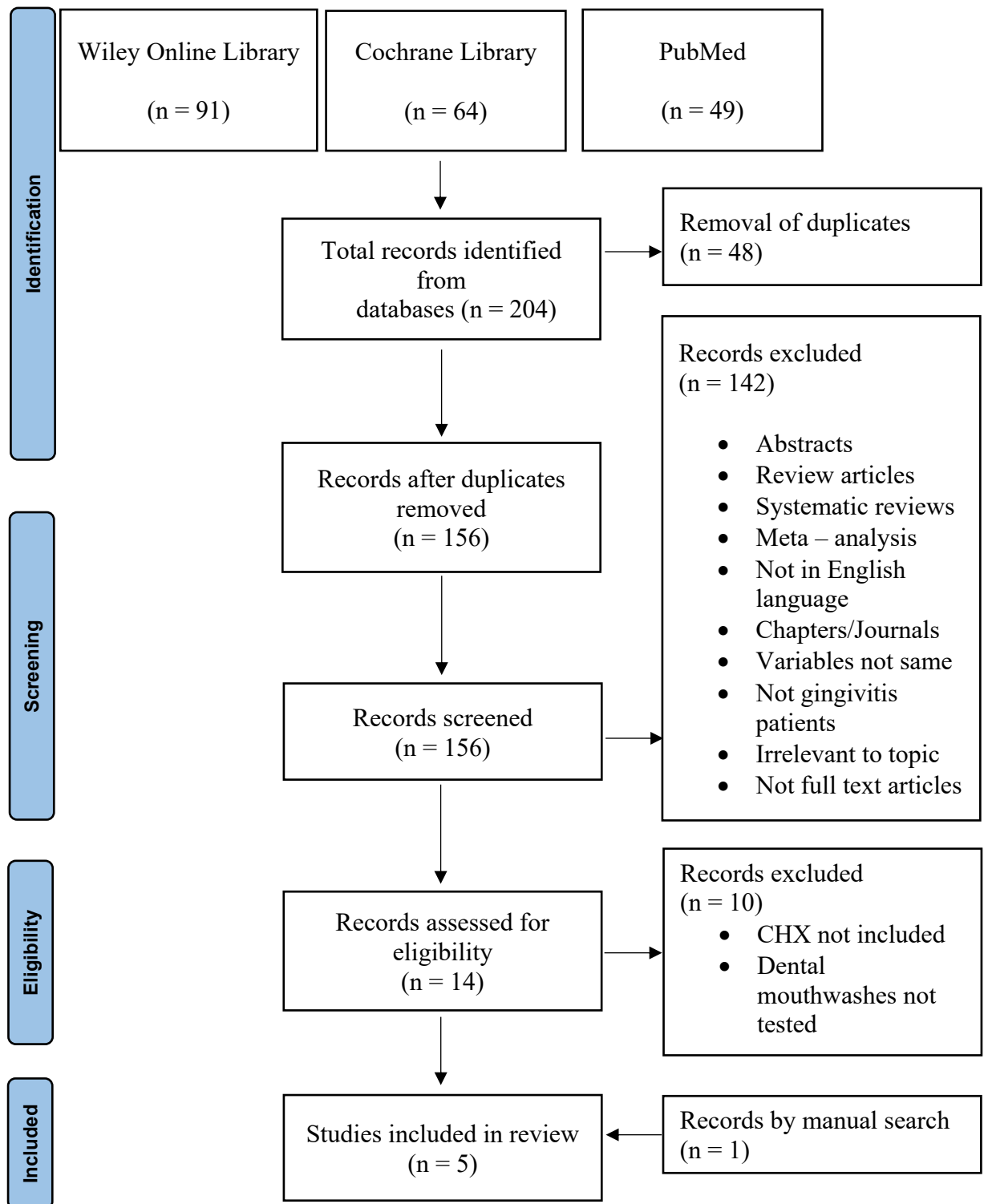
- Systematic review
- Meta analysis
- Abstracts
- Reviews
- Journal chapters
- Duplicate publications
- Publications older than 5 years
- Publications not in English language
- In vitro studies
- Animal studies

3. SYSTEMISATION AND ANALYSIS OF DATA

3.1. Search Results

The results to the keywords 'herbal', 'gingivitis', 'prevention' and filters yielded a total of 204 records: 91 from Wiley Online Library, 64 from Cochrane Library and 49 from PubMed. Collected articles were screened and tested for duplicates using the Zotero software to eliminate copies of the same publication. 48 records were excluded through this process. The remaining 156 records were screened to choose the relevant publications required for the literature review. The following criteria for exclusion based on publication type was applied: abstracts, systematic reviews, review articles, meta-analysis, and publications from journals or chapters. Records not in English language; did not mention the keywords in the title or did not include reports of clinical human studies were also removed. By the end of the screening process a total of 142 records were excluded from the literature selection process. Only full text articles with gingivitis patients who received periodontal treatment and mentioned CHX and herbal extracts in the study trial were reviewed for the next stage of selection. 14 reports were assessed for eligibility and 10 were removed as the record content involved studies of herbal agents in different types of product formats such as gel, toothpaste, pills, powders. 4 full text articles were selected as it had the most similar clinical parameters for clinical significance of efficacy of the agents used and the herbal agents tested were presented in the form of mouthwash. Another article was reviewed and chosen through manual search conducted on google search engine. The selection process for the final 5 articles of this systematic literature review is presented according to the PRISMA flow chart as shown below in Fig 1.

Figure 1. PRISMA flow chart [21]



3.2. Characteristics of studies

Relevant information from the 5 articles chosen for this literature review are collected and presented in Table 2.

Table 2. Descriptive characteristics of chosen studies

Study	Year of Publication	Type of Study	Sample Size (n)	Sample Age	Baseline stage (Day 0)	Study sample format	Mouthwashes used	Clinical Parameters measured	Frequency of Mouth wash	Observation period
Andhare et al.[22]	2022	RCT	60 patients	18-40	Phase I periodontal treatment: scaling and polishing Oral hygiene instructions	4 groups: (n=15 each) Group 1: Green Tea MW Group 2: Chlorhexidine MW Group 3: Aloe Vera MW Group 4: Control group - No mouthwash	0.2% Chlorhexidine 0.5% Green Tea Aloe Vera	PI GI SBI	10ml of mouth wash twice daily after tooth brushing	21 days
Kamath et al.[23]	2022	RCT	30 patients	18-40	Ultrasonic scaling Oral hygiene instructions	2 groups (n = 15 each) Group 1: Aloe Vera MW Group 2: Chlorhexidine MW	0.2% Chlorhexidine Aloe Vera	PI GI BOP	10 ml mouth rinse twice daily for 1 minute after tooth brushing	35 days
Altindal et al.[24]	2023	Retrospective study	60 patients	18-50	Scaling and polishing Oral hygiene instructions	4 groups (n=15 each) Group 1: Control group - no mouth wash	0.2% Chlorhexidine 0.3% Zinc acetate +	PI GI	CHX and ZnA group recommended to use mouthwash according to	1 week

						Group 2: Chlorhexidine MW Group 3: Zinc Acetate MW Group 4: Thyme MW	0.025% diacetate Thyme tea		manufacturer's instructions. Thyme tea twice a day	
Khoshbakht et al.[25]	2019	RCT	140 patients	17-49	Professional prophylaxis Oral hygiene Instructions	4 groups: Group 1: Control group, Chlorhexidine MW (n=31) Group 2: Zataria Multiflora (ZM) MW (n= 33) Group 3: Frankincense (FR) MW (n = 32) Group 4: combination of ZM + FR MW (n = 32)	0.2% Chlorhexidine Zataria Multiflora Frankincense	PI GI GBI	10ml of mouthwash twice daily after toothbrushing	21 days
Deshpande et al.[26]	2021	RCT	60 patients	10-14	Oral hygiene instructions Oral prophylaxis	3 groups (n=20 each) Group 1: Green tea MW Group 2: Green tea + Ginger MW Group 3: Chlorhexidine MW	0.2% Chlorhexidine 5% Green Tea Green Tea + Ginger	PI GI	Mouth rinse twice a day	30 days

Abbreviations:

RCT – Randomized clinical trials; **MW** – Mouth wash;

PI – Plaque Index; **GI** – Gingival Index; **SBI** – Sulcular Bleeding Index; **BOP** – Bleeding on Probing

3.3. Risk of Bias

The Cochrane RoB2 tool [27] was used to assess the risk of bias in 4 of the articles which had RCT as the study design, as presented in Table 3.

The article by Altindal et al.[24] was a retrospective study therefore a different risk of bias assessment tool had to be used as the methodology of the study is different to that of RCT. The Cochrane ROBINS – I tool [28] was used, and results of bias assessment are presented in Table 4.

Table 3. Risk of Bias assessment for Randomised Clinical Trials (RoB 2 tool)[27]

Study	Risk of bias arising from the randomisation process	Risk of bias due to deviations from the intended interventions	Risk of Bias due to missing outcome data	Risk of bias in the measurement of the outcome	Risk of bias in the selection of the reported result	Overall bias
Andhare et al.[22]	Low risk of bias	Low risk of bias	Low risk of bias	Low risk of bias	Low risk of bias	Low risk of bias
Kamath et al.[23]	Low risk of bias	Low risk of bias	Low risk of bias	Low risk of bias	Low risk of bias	Low risk of bias
Khoshbakht et al.[25]	Some concerns	High risk of bias	Low risk of bias	Low risk of bias	Low risk of bias	High risk of bias
Deshpande et al.[26]	Some concerns	Low risk of bias	Low risk of bias	Low risk of bias	Low risk of bias	Some concerns

Table 4. Risk of Bias assessment for Non – Randomised studies of Intervention (ROBINS – I) [28]

	Study
	Altindal et al.[24]
Bias due to confounding	Low risk
Bias in selection of participants into the study	Low risk
Bias in classification of interventions	Low risk
Bias due to deviations from intended interventions	Low risk
Bias due to missing data	Low risk
Bias in measurement of outcomes	Moderate risk
Bias in selection of reported result	Low risk
Overall bias	Low risk

3.4. Results

The statistical methods used to calculate the distribution of trial results were the same in 4 articles, as displayed in Table 5.

However, 1 article by Khoshbakht et al.[25] used a different statistical method to summarize the results, as shown in Table 6.

Table 5. Comparison of clinical parameters at initial visit and end of study trial period

Study	Trial groups	Clinical Parameters for PI and GI (Mean± SD)					
		Baseline PI	Final PI	Difference in PI	Baseline GI	Final GI	Difference in GI
Andhare et al.[22]	GT	1.70 ± 0.23	0.63 ± 0.13	1.06 ± 0.12	1.70 ± 0.20	0.68 ± 0.08	1.01 ± 0.12
	CHX	1.69 ± 0.23	0.57 ± 0.10	1.12 ± 0.24	1.69 ± 0.16	0.59 ± 0.08	1.10 ± 0.09
	AV	1.76 ± 0.24	0.74 ± 0.13	1.02 ± 0.12	1.66 ± 0.32	0.77 ± 0.16	0.89 ± 0.19
	C	1.72 ± 0.22	0.90 ± 0.17	0.81 ± 0.09	1.69 ± 0.23	0.92 ± 0.16	0.77 ± 0.13
Kamath et al.[23]	AV	2.58 ± 0.81	2.12 ± 0.69	0.46 ± 0.24	2.18 ± 0.41	1.69 ± 0.39	0.48 ± 0.44
	CHX	2.97 ± 0.39	2.18 ± 0.18	0.78 ± 0.24	2.62 ± 0.27	2.24 ± 0.21	0.37 ± 0.27
Altindal et al.[24]	C	1.85 ± 0.08	0.75 ± 0.08	-1.09 ± 0.11*	1.85 ± 0.07	0.69 ± 0.07	-1.15 ± 0.08*
	CHX	1.86 ± 0.07	0.76 ± 0.07	-1.09 ± 0.09*	1.85 ± 0.05	0.41 ± 0.07	-1.44 ± 0.04*
	ZnA	1.86 ± 0.09	0.81 ± 0.08	-1.05 ± 0.10*	1.84 ± 0.05	0.53 ± 0.04	-1.31 ± 0.02*
	T	1.86 ± 0.07	0.76 ± 0.08	-1.09 ± 0.11*	1.85 ± 0.06	0.47 ± 0.06	-1.39 ± 0.03*
Deshpande et al.[26]	GT	1.90±0.51	1.19±0.49	NA	1.94±0.32	1.43±0.35	NA
	GT + Ginger	1.76±0.55	0.89±0.38		1.99±0.29	1.22±0.29	
	CHX	1.80±0.56	1.29±0.53		1.87±0.35	1.36±0.32	

Abbreviations:

PI – Plaque Index

GI – Gingival Index

SD – Standard Deviation

GT – Green Tea

CHX – Chlorhexidine

AV – Aloe Vera

C – Control group (No mouthwash)

ZnA – Zinc Acetate

T – Thyme

NA – Not applicable

* - For this article the difference in PI and GI is calculated as: final measurement - baseline measurement = difference, hence why the results are shown as negative. These results do not suggest that the variable agents used in the study groups are ineffective.

For all the other articles the difference in PI and GI is calculated as: baseline measurement - final measurement = difference

Table 6. Comparison for Clinical Parameters in study by Khoshbakht et al.[25]

Trial groups	Clinical Parameters for PI (Mean± SEM)			Clinical Parameters for GI n (%) (Scale Number of GI) *		
	Baseline PI	Final PI	Difference in PI	Baseline GI	Final GI	Difference in GI
CHX	82.54±3.134	35.37±2.771	NA	25(80.65) ¹ 5(16.12) ² 1(3.22) ³	24(77.41) ⁰ 7(22.59) ¹	NA
ZM	87.71±2.172	33.65±2.399	NA	28(84.84) ¹ 5(15.15) ²	30(90.90) ⁰ 3(9.1) ¹	NA
FR	82.79±3.378	37.43±3.204	NA	24(75) ¹ 8(25) ²	28(87.5) ⁰ 4(12.5) ¹	NA
ZM + FR	92.13±2.601	92.13±3.274	NA	24(75) ¹ 7(21.87) ² 1(3.13) ³	26(81.25) ⁰ 6(18.75) ¹	NA

Abbreviations:

PI – Plaque Index

GI – Gingival Index

SEM – Standard Error of Mean

CHX – Chlorhexidine

ZM – Zataria Multiflora

FR – Frankincense

NA – Not applicable

n - represents the number (%) of patients

***** - Scale number of GI: represents the number of patients at each scale of the GI

(0 = healthy gum, 1= mild inflammation, 2 = moderate inflammation, 3 = severe inflammation)

As displayed in the previous sections, the results of the comparison of the 2 commonly observed clinical parameters: PI and GI measured in gingivitis patients across all 5 studies are organized into Table 5 and Table 6.

In the study of Andhare et al.[22] 4 the initial plaque level for all trial groups at baseline was between 1 - 2 according to PI [13], which indicated thin to moderate amount of plaque accumulation on the surfaces of teeth. Final PI measurements decreased to between 0 - 1 for all groups, which is indicative of none to minimal plaque. The maximum overall difference in PI was observed in CHX group with a mean difference of 1.12 ± 0.24 , followed by GT with mean difference of 1.06 ± 0.12 and then the AV group with difference value of 1.02 ± 0.12 . Similar to PI values, the GI values measured at baseline for all groups were 1-2, suggestive of mild to moderate gingival inflammation with bleeding on probing. Final GI measurements reduced to between 0 – 1, which indicated none to minimal inflammation of the gingiva with no bleeding on probing. The maximum mean change in GI was found in the CHX group at 1.10 ± 0.09 , followed by GT group, followed by AV group. Least difference in both clinical parameters was reported by the C group, which used no mouthwashes and also reported highest PI and GI measurements at end of trial. In this study, GT herbal mouthwash displayed a significant reduction in PI and GI. GT has equivalent anti-plaque efficacy as CHX and can be considered a potent alternative to prevent and treat gingival diseases.

For the study of Kamath et al.[23] only two variables were compared : AV and CHX. Average PI and GI measurements made at baseline for both groups scored between 2 – 3, which suggested moderate to abundant plaque levels, moderate inflammation with bleeding on probing and severe inflammation with tendency to spontaneous bleeding. Final average measurements for both PI and GI were scored between 2 – 3, except for final GI for AV group which was 1.69 ± 0.39 . CHX group showed highest mean difference in PI in comparison to AV group from baseline to end of trial with a mean difference value of 0.78 ± 0.24 . However, in terms of results for GI difference, the results for CHX were lower compared to AV. Overall, the result of this article indicates that AV is the more effective agent in the management of gingivitis and can be used as an adjunct to professional oral hygiene in the prevention of periodontal results.

The third article reviewed was Altindal et al.[24] which evaluated 3 variable mouthwashes in the study trial groups : CHX; ZnA and T and C group was used as control. Clinical parameter values were similar for all groups at beginning of trial, with an average score between 1 – 2, which

represents thin to moderate plaque levels, and mild to moderate gingival inflammation with bleeding on probing. Final mean values of both parameters were scored below 0, indicative of no plaque and no gingival inflammation. The mean differences for PI and GI in this study is negative as the difference is calculated as: mean value of clinical parameter measurements at post treatment minus measurement at baseline, instead of vice versa, however this is not negative indication of the effectiveness of the mouthwashes used. The difference in PI values for all trials groups are similar and not statistically significant, however for the GI results, CHX had highest mean difference with a value of -1.44 ± 0.04 , followed by T group, then ZnA. The C group with no mouth wash demonstrated the least level of difference in values which indicated that there is a clinical significance of using mouthwashes to reverse symptoms of gingivitis and improve oral health. T group, which used Thyme tea as mouth wash showed statistically significant results and is comparable to the effects of Chlorhexidine mouth, as well as being an organic, cost-effective alternative.

The next article by Deshpande et al.[26] compared efficacy of GT, Ginger + GT combination and CHX. Unfortunately, in the study, there was no calculated difference in clinical parameters from baseline to end of treatment, therefore results were visually read, and differences compared. Average clinical parameters at baseline were scored to be between 1- 2 indicative of thin to moderate plaque levels, and mild to moderate gingival inflammation with bleeding on probing. The scores remained between 1- 2 post trial, except for GT + Ginger which reported 0.89 ± 0.38 , which was indicative of no plaque. Manual comparisons of initial and final clinical parameters revealed that GT + Ginger showed the highest mean difference in clinical parameters.

The last article by Khoshbakht et al.[25] also does not contain calculated differences in clinical parameters. This article presented the average measurements for PI using Mean (Standard of Error of Mean (SEM)), which is used to demonstrate how different the sample mean is likely to be from the population. Data for CHX showed that GI values at baseline out of sample size 80.65% had score of 1, 16.12% with score of 2, and 3.22% with score of 3. At end of trial, 77.41% had score of 0 and 22.59% with score of 1. For group ZM, 84.84% had score of 1 and 15.15% with a score of 1 at beginning of trial. At end of trial 90.90% had score of 0 and 9.1% with score of 1. For FR group, initial GI: 75% had score of 1, 25% with score of 2. At end of trial, 87.5% with score of 0 and 12.5% with score of 1. For FR + ZM group at baseline, 75% had score of 1, 21.87% had score of 2 and 3.13% had score of 3. At end of trial, 81.25% has score of 0 and 18.75% had score of 1.

4. DISCUSSION

4.1. Interpretation of results

Data from the selected 5 articles supports that herbal agents in dental mouthwashes are successful in the treatment of gingivitis patients and can be considered an efficient alternative to CHX in adjunct to professional prophylactic periodontal management.

In total, across all 5 studies 5 different indices were used to measure the status of intra-oral health at the beginning and end of the trial period. In the study of Andhare et al. [22] PI, GI and SBI were measured. In the study of Kamath et al.[23] PI, GI and BOP was measured. For Altindal et al.[24], only PI and GI was observed. In Khoshbakht et al.[25] PI, GI and GB was used. And in the last article by Deshpande et al.[26] only PI and GI was measured. To keep the comparison of clinical parameters as similar as possible, only the results for PI and GI from all articles are used in this literature review as they are the only parameters which are used in all 5 articles.

In order to compare the efficacy of the herbal mouthwashes in comparison to CHX mouthwash in gingivitis patients, the PI and GI were observed in the initial visit after professional prophylactic periodontal treatment such as scaling and polishing. The same clinical parameters were again observed at intervals and at end of trial period, both of which varies across the 5 articles. Therefore, in the comparison table, only the baseline measurements taken on the initial visit pre-trial, and the end measurements taken on the last day of trial are displayed and compared. Calculated values for difference between baseline and final PI and GI are only mentioned in 3 articles, excluding Khoshbakht et al.[25] and Deshpande et al.[26], hence in the results tables it is mentioned not applicable . (Refer to table 5, 6)

In 4 of the 5 articles, results of both clinical parameters at each stage of trial for each control group was averaged and a range from the minimum to maximum measurement concluded. This is known as the Mean \pm Standard deviation[29] and helps to demonstrate the average of total results for a sample and how variable the results are (refer to Table 5). However in Khoshbakht et al.[25] Mean \pm Standard of Error [30] was the format used to display results for PI measurements and n (%) (Scale Number of GI) was used to display results for GI measurements for each trial study group. As these formats of results was dissimilar to the other 4 articles, separate Table 6 was used to display these specific results.

2 of the articles in this systematic literature review tested a C group which used no mouthwashes as part of the clinical trials. In the two studies by Andhare et al. [22] and Altindal et al.[24], results for comparison of clinical parameters show that there were a significant difference in the differences of PI and GI values reported in the group with mouthwashes in comparison with groups without mouthwash. Additionally, comparison of the initial and final clinical parameters of the C groups show that oral hygiene can be improved simply by maintaining a regular oral hygiene routine. These articles support that oral care routines yield a better result in terms of gingival health when mouth washes are implemented to individual oral care.

Herbal mouth washes were reported to have the highest mean difference in clinical parameters in comparison to CHX in 3 of the articles. For the study of Kamath et al.[23] AV group reported a significantly lower GI at the end of trial in comparison to CHX. The GI score for AV was reduced from 2 to 1, whereas the score remained 2 for CHX. The article by Deshpande et al.[26] reported lowest final PI and GI scores in the herbal groups. Unfortunately, in the study, there was no calculated difference in clinical parameters from baseline to end of treatment, therefore results were visually read, and differences compared. If manually calculated, the Ginger + GT group showed biggest mean difference in improvement of PI measurements, and CHX showed least significant difference. For GI measurements, Ginger + GT group was most efficient in improving the gingival health, whereas GT group and CHX group showed similar results and efficacy. The significantly better results of Ginger + GT group in both parameters demonstrates that herbal mouth has effective antiplaque qualities and can be successfully used as an alternative to CHX as an adjunct to mechanical plaque control. The article by Khoshbakht et al also does not contain calculated differences in clinical parameters, however if manually calculated it is evident that the differences are quite similar for the 3 of the trial groups, with better results of PI improvement with ZM group, however the combination of ZM + FR suggests least efficacy. All groups showed efficacy in decreasing the PI scores. In reference to GI parameters, the ZM group also appears to be the most effective group, with differences more extreme than that of CHX group. Overall, the results suggest ZM to be a superior alternative to CHX in the improvement of gingival health and can be considered as a safer, natural alternative.

4.2. Limitations

To outline some limitations of this literature review, 1 of the 5 articles selected was a retrospective study whereas the other 4 were RCT. The article by Altindal et al.[24] states in the title to be a randomized trial however in the methods and strategy it is outlined to be a retrospective study, and

no indications regarding randomisation process in the planning, selection or intervention is mentioned. This made it difficult to decide type of study design and risk of bias assessment tool required to assess the bias in the literature review. As a result, 2 types of risk assessment bias tables completed.

Another limitation is that out of the 5 types of clinical parameters measured overall in the 5 articles, only 2 indices: PI and GI were eligible for comparison of results as they were the only constant indices observed in all articles. This may have impacted the total yield of result as additional information available in 3 articles had to be excluded to present the results as similarly and as possible.

In addition, the statistical analysis tests, and presentation of results differs across all articles. This made combining, organizing, and creating a summary of results table quite difficult. Some of the mentioned qualitative and quantitative data analysis tests are paired and unpaired t-test, Shapiro-wilk test, Friedman rank test, Wilcoxon signed rank test and ANOVA.

One more limitation to mention would be differences in oral state of sample population in 2 studies. In the article by Kamath et al.[23] the population had fixed orthodontic appliances which may have interfered with the efficacy of the treatment. Also in the study by Altindal et al.[24] the patient population suffered from halitosis. This is an undesired variable in this literature review however it matched the inclusion criteria for this literature search, and the difficulty of finding relevant articles for the systematic review was the reason this article was included in the final selection regardless of this variable.

5. CONCLUSIONS

1. Comparison of study trial data of the 5 literatures used for this systematic review shows that herbal mouthwashes were found to be clinically effective in reduction of plaque and gingival indices with regular use.
2. When results of clinical parameters were compared to CHX rinses, there was evidence to suggest that herbal agents have equal, and sometimes superior efficiency in the treatment of gingivitis in terms of antiplaque effectiveness and promotion of gingival health and is a successful natural, safer alternative to CHX. The risk of adverse effects caused by herbal mouth washes are far lower as compared to the side effects observed with CHX.
3. The PI and GI measurements are a strong indication of the oral hygiene and gingival tissue status. Reduction in these values indicates decreased plaque accumulation and gingival inflammation levels. Maintenance of low PI and GI scores is important for oral health and prevention of gingivitis, which is usually the first stage of periodontal diseases, therefore prevention of gingivitis can help prevent periodontal diseases.

In conclusion the data from the systematic review indicates that herbal extracts are effective antiplaque and antiseptic agents in the prevention of periodontal diseases in adjunct to professional periodontal management.

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8. ANNEXES



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DĖL PRITARIMO TYRIMUI

LSMU Bioetikos centras, įvertinęs Jessly James pateiktus dokumentus, studento tiriamajam darbui tema „The possible use of herbal oral agents as prevention in adjunct to professional management of periodontal disease: A Scientific Literature Review“ pritaria*.

dr. Aušra Urbonienė

* Pastaba: šis pritarimas neatleidžia tiriamąjį mokslinį darbą vykdančių asmenų nuo prievolės laikytis Bendrojo duomenų apsaugos reglamento nuostatų ir nuo atsakomybės gauti nacionalinio arba regioninio bioetikos komiteto leidimą, jei toks leidimas būtinas pagal LR Biomedicininį tyrimų etikos įstatyme numatytus reikalavimus.