Innovations

Sesame a Boon to Dentistry– A systematic review

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Abstract:

Although millions and millions of plants exists in the universe, not all the plants can be used for medical purposes. The use of natural remedies for the management of illnesses always seek importance and in the past few decades the attention towards the use of natural products has increased. One such gift from nature is Sesame, due to its various medical properties like anti-inflammatory, antioxidant, anti- microbial; Sesame is crowned as the "Queen of oilseed crops". Literature search was done in various databases like Pubmed, Cochrane, Google scholar and hand search. Out of 129 records retrieved, a total of 13 articles were included finally. Quality assessment of the selected articles was done using Risk Of Bias(ROB) tool 2. Sesame has been used worldwide for management of various dental problems like dentinal hypersensitivity, gingivitis, periodontal problems, aphthous ulcer, oral mucositis, oral Submucous fibrosis etc. in most of the studies included sesame has been used in the form of oil pulling. Sesame has been proved to be as equally as effective as available gold standards. Hence sesame can be used for the management of oral diseases and moreover can be used safely due to its nil side effects.

Keywords: Sesame, SesamumIndicum, oil pulling, dental problems, oral diseases

Introduction

Management of Oral diseases and infections pose a greater challenge for the clinicians and also they affect the patient's wellbeing. Various drugs and medications have been studied for the management of different oral illnesses. But those medications are commonly of chemical and synthetic derivatives and their use carry a lot of adverse effects. Various in-vitro and in-vivo studies on the beneficial effects of natural products have been conducted worldwide and many published literature prove their efficacy in curing various oral diseases and conditions. The primary advantage of using the natural products when compared to the chemical and synthetic products are their minimal or no side effects at all. The beneficial effects of various natural substances like tea, green tea, honey, berries ,sesamum, licorice, propolis, coconut oil etc have been utilized for the management of various oral illness and been proved to be effective in various laboratory and clinical studies.[1, 2] The secondary metabolites of these natural products are found to have various beneficiary properties like antioxidant, anti-inflammatory and antimicrobial[3]

Sesamumindicum or Sesamum or Sesame is an ancient oilseed crop and is known as the queen of oil seed crops.[4, 5] It is cultivated worldwide and the various parts of this plant like root, leaves, seed, stem and flowers are proved to have antioxidant, anti-inflammatory and antimicrobial properties. The secondary metabolites like sesaminol, sesamol, sesamin, sesamolin, naphthoquinone, hydroxysesamone and anthrasesamones A-F are responsible for the antioxidant and antimicrobial properties of the plant.[6, 7, 8, 9, 10] Taking in to account the various beneficial effects of Sesame, the present systematic review was carried to find out its clinical application in various dental problems.

Materials and method

The systematic review was performed following PRISMA (Preferred Reporting Items for Systematic Review) guidelines. This study was carried out to answer whether Sesame can be a promising medication in the management of various oral diseases compared to available gold standards or standard medications being used. The in vivo studies where Sesame was used as one of the intervention in comparison to other medications in the management of various oral diseases were used. An electronic search was undertaken for English language articles published till September 2021 in various databases like Pubmed, Cochrane, Google scholar. Hand search was also carried out to find out the relevant articles. A literature search was carried with the following keywords "Sesame, SesamumIndicum, oil pulling, dental problems, dental caries, aphthous ulcer, oral potentially malignant disorders, oral mucositis, gingivitis". Filters like time limit, author's name etc were not used to restrict the search of the article.

Eligibility criteria

Inclusion criteria

1. Randomized clinical trials and pilot studies published up to date
2. Full-text articles available in the search engine mentioned
3. Studies in which sesame extracts is used as one of the interventions

Exclusion criteria

1. Reviews, dissertations, unpublished articles
2. Studies in which sesame extracts were used for conditions other than oral problems

Results:

The search yielded a total of 129 records, which were evaluated through various stages to arrive at a final count to be included for the review; like exclusion of repeated articles obtained from various sources, exclusion after going through the title and abstract and we were unable to get the full text of 2 articles (request mail for full article was sent to the author but received no reply hence those two articles were excluded). Figure 1 clearly shows the retrieval process involved in selection of the articles.

Table 1 shows the characteristics of the included studies. Basic details of each study like author name, year of publication, sample size, details of blinding, mode of use of sesame and characteristics of the included participants were described. The participant details of the 13 studies include, healthy adolescents in 10 studies, children aged 10-12 years in 1 study, patient undergoing chemotherapy in 1 study, pregnant women in 1 study respectively.

Table 2 describes the condition on which the intervention was targeted to treat, parameters checked and the outcome data. The various oral diseases and conditions treated in the included study were plaque induced gingivitis and plaque regrowth inhibition (5 studies), halitosis (3 studies), Oral Submucous Fibrosis (OSMF) (1 study), oral mucositis (1 study), aphthousulcer(2 studies), dentinal hypersensitivity(1 study).

The quality assessment of the included studies was done using Risk Of Bias assessment tool 2 (ROB 2)[11] (Figure 2). Out of the 13 included articles, 2 had high risk and 11 had low risk of bias in the randomization domain. In the bias arising due to deviation from intended intervention 3 had high risk, 6 had low risk and 4 had some concerns pertaining to the domain. Concerning to missing outcome data, 3 articles had high risk, 9 had low risk and 1 article had some concern. 2, 7 and 4 articles had high, low risk and some concerns respectively in measurement of outcome domain. In selection of the reported results 1 article had high risk, 11 had low risk and some concern in one of the articles.

Discussion :

Nothing replaces Nature, similarly although various artificial or synthetic drugs are available for the management of diseases, the good results or outcome which will be obtained on use of natural products always stands high and well appreciated. One such gift from nature is Sesame. It is not simply called as Queen of oil seed crops but it actually deserves. Sesame has got various properties like antioxidant, anti-inflammatory and antimicrobial which are due to its various secondary metabolites like sesaminol, sesamol, sesamin, sesamolin, naphthoquinone, hydroxysesamone and anthrasesamones A-F.

In dentistry sesame is been tried and used in various conditions like gingivitis, aphthous ulcer, OSMF, halitosis, oral mucositis etc and a promising results has been obtained in various studies. In the 13 included studies sesame has been used either in the form of oil pulling or as topical application at specific site.

In a study done by Asokan et al in 2009, sesame was found to be equally effective in reducing the plaque and modified gingival index in comparison with the chlorhexidine group, however the reduction in the colony count were not statistically significant between the two groups.[12] Similarly in 2014 Singla et al noted no statistically significant results between the groups in S. Mutans count, Lactobacillus count, Plaque index, Gingival index.[14]Asokan et al in 2011[13] and Sood et al in 2014 [15] respectively in their studies proved that sesame was equally as effective as chlorhexidine in reducing the halitosis;

however rice bran oil was found to be significant in reducing the grades of halitosis compared to sesame oil and chlorhexidine in a study done by Sheik et al.[18]

Considering the studies conducted in the management of recurrent aphthous ulcer, Dharmavaram et al in 2015 proved ozonated oil as superior compared to sesame oil and placebo;[16] and Sharquie et al in 2020 proved that the mean OCMI score was highly significant statistically after day 8 in sesame oil ($p<0.001$) compared to pumpkin oil group ($p<0.05$) whereas the difference in size of ulcer between two groups on day 4 and 8 was statistically not significant.[23] In 2015 Okada et al conducted a pilot study on chemotherapy induced mucositis and no significant result was obtained between sesame oil and control group regarding the outcome measures pertaining to subjective and objective symptoms graded with CTCAE V3.0 scale .[17]

In 2020 Khaira et al conducted a study to prove the efficacy of sesame oil in the management of OSMF and the outcomes like mouth opening, burning sensation, tongue protrusion, cheek flexibility, gingival index were taken into consideration and a statistically significant result was obtained in the pre and post treatment assessment of all these parameters except for cheek flexibility.[21]Qahtani et al in 2020 proved sesame tobe superior (36.2% reduction in sensitivity) in the management of dentin hypersensitivity in comparison with desensitizing tooth paste (30.5% reduction).[22]

Sesame has been tried worldwide in the management of various oral conditions and proved to be as equal to or superior to the gold standards or the common drugs available in its efficacy. In the present scenario the use of natural remedies for the management of different diseases seek attention particular in the past decade. Hence finding out of a medicine which is naturally and easily available is more important in the present scenario, as people also needs treatment with least side effects. As mentioned early nature cannot be replaced by anything.

Conclusion:

Sesame can confidently be called as Queen of oil seeds, as it has got such a wonderful properties and more over it is easily available worldwide. Although various parts of the plant like leaves, stem, root etc has been proved to have properties like antioxidant, anti-inflammatory and anti-microbial most of the published articles concentrated on oil obtained from its seed. Further studies to prove the efficacy of other plant parts are encouraged in future.

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Table 1: Characteristics of the included studies

AUTHOR NAME	YEAR	SAMPLE SIZE	GROUPS	BLINDING	METHOD OF USE OF SESAME	PATIENT CHARACTERISTICS
Asokan S et al [12]	2009	20	Group 1- 10 subjects (Sesame oil pulling) Group 2- 10 subjects (chlorhexidin emouthrinse)	Triple blinded	Oil pulling	16-18 years old boys having plaque induced gingivitis
Asokan S et al [13]	2011	20	Group 1- 10 subjects (Sesame oil pulling) Group 2- 10 subjects (chlorhexidin emouthrinse)	Single blinding	Oil pulling	Adolescents aged between 17-19 years who have atleast 24 permanent teeth with gingival probing depth <3mm and having a gingival and plaque index score=1mm in more than 10% of the sites
Singla N et al [14]	2014	40	1.Control group- 10 individuals	Triple blinded	Topical massage with gel	House keeping personnel aged between 18-55

			(Chlorhexidine gel) 2. Test group 1- 10 individuals (pure form of sesame oil) 3. Test group 2- 10 individuals (pure form of coconut oil) 4. Test group 3 - 10 individuals (pure form of olive oil)		and oils	years, having one or two carious teeth and moderate to severe gingival inflammation
SoodP et al[15]	2014	60	1.Group 1- 20 individuals (Chlorhexidine) 2. Group 2- 20 individuals (sesame oil) 3. Control Group - 20 individuals (placebo)	Double blinded	Oil pulling	Students aged 18 years and above and those who had atleast 24 permanent teeth gingival probing depth of <3mm, gingival and plaque score of >=1 in 10% of the sites and intrinsic malodour of oral origin 2 or 3 hours after eating, drinking or brushing of teeth or any other oral activity
Dharmava ramAT et al [16]	2015	30	Group 1- 10 subjects (Ozonated oil) Group 2- 10 subjects (sesame oil) Group 3- 10 subjects (Placebo-distilled water)	Single blinded	Topical application over the ulcer	Patients of both sexes aged above 16 years having 1-5 ulcers of less than 48 hours duration. The most painful ulcer identified by the patient was selected as the index ulcer
Okada S et al[17]	2015	11	Group 1- 7 subjects (sesame oil)	Single blinded	Topical application of	Hematopoitic cancer Patients admitted for

			Group 2- 4 subjects (without sesame oil)		sesame oil over the gingiva, palate, tongue	chemotherapy
Sheik FS et al [18]	2016	30	Group 1- 10 subjects (Rice bran oil) Group 2- 10 subjects (sesame oil) Group 3- 10 subjects (chlorhexidin e)	Double blinded	Oil pulling	Healthy pregnant women who were willing to participate
Saravanan SK et al [19]	2018	45	Group 1- 15 subjects (Probiotic mouthwash) Group 2- 15 subjects (chlorhexidin e mouthwash) Group 3- 15 subjects (sesame oil)	None	Oil pulling	School children aged between 10-12 years with no recent (within 4 weeks) antibiotic therapy
VadhanaV C et al [20]	2019	75	Group 1- 25 subjects (sesame oil) Group 2- 25 subjects (ozonated sesame oil) Group 3- 25 subjects (chlorhexidin e mouthwash)	Triple blinded	Oil pulling	Adolescents aged 12-14 years with decay-missing-filled index<3 and who had not underwent any dental treatment in the past I month, not used any mouthwash for the past 3 months and without any systemic diseases
Khaira S et al [21]	2020	20	No comparison with any intervention. Only sesame oil was used	None	Oil pulling	20 clinically and histopathologicall y proven subjects of oral submucous fibrosis(OSMF) with mouth

						opening ranging from 11-38mm and those who are willing to quit the habit
QahtaniW et al[22]	2020	100	Group 1- 50 subjects (sesame oil) Group 2- 50 subjects (desensitizing tooth paste)	Single blinded	Topical application on the affected tooth	100 randomly selected patients who visited the dental department with consent to participate in the study were selected
SharquieK E et al[23]	2020	45	Group 1- 20 subjects (sesame oil) Group 2- 25 subjects (pumpkin seed oil)	Single blinded	Topical application on the surface of ulcer	Patients with early onset ulceration (<3 days) and had little or no benefit from other conventional therapy in previous attacks
SezginY et al[24]	2021	24	Sesame oil followed by coconut oil given to all subjects at a wash out period of 14 days	Single blinded	Oil pulling	Healthy adults aged between 18-64 years with presence of more than 22 natural teeth and absence of any systemic diseases

Table 2: Outcome data of the included studies

AUTHOR	YEAR	DENTAL PROBLEM CONSIDERED	EFFECT MEASURED	RESULTS
AsokanS et al [12]	2009	Plaque induced gingivitis	Plaque index, modified gingival index	In both the groups there was a statistically significant reduction ($p<0.05$) in both the Plaque index score and modified gingival index score. But no statistically significant reduction in the colony count between two groups; however oil pulling group there was a colony count reduction

Asokan S et al [13]	2011	Halitosis	Plaque index, Gingival index, ORG 1, ORG 2, BANA test	There was a statistically significant reduction ($p<0.05$) of plaque and gingival score in both the groups. There was a reduction in ORG 1, ORG 2, BANA test scores also; concluding that oil pulling is as effective as chlorhexidine mouthwash
SinglaN et al [14]	2014	Gingival inflammation	S. mutans count, Lactobacillus count, Plaque index, Gingival index	There was a significant reduction in the mean S. mutans count, Lactobacillus count, plaque score and gingival score in all the four groups. However there was no significant change in the percentage reduction was noted between the groups
SoodP et al [15]	2014	Halitosis	Plaque index, Gingival index, ORG1 and ORG2, Anaerobic bacterial colony count	Significant reduction in plaque and gingival index scores within all 3 groups, however there was no statistically significant differernce in the scores post intervention between chlorhexidine and oil group. There was statistically significant reduction ($p<0.000$) in the mean subjective and objective organoleptic scores within oil pulling and chlorhexidine group.
Dharmavara mAT et al [16]	2015	Aphthous ulcer	Duration of pain reduction (VAS score), healing of ulcer, onset of size reduction on day 2, 4 and 6	Significant reduction in pain in group 1 and 2 compared to group 3. Significant reduction of ulcer in group 1 on day 2 when compared to day 4 and 6. The study proved ozonated oil is better than sesame oil and placebo in treating aphthous ulcer.
Okada S et al [17]	2015	Oral mucositis	Subjective and objective symptoms given by CTCAE v3.0 and cytological examination of the swab mucosal swab for inflammatory cells and bacterial cells	No statistical significance between CTCAE v3.0 grades of sesame oil and control group
Sheik FS et al	2016	Halitosis	Halitosis was	In the rice bran oil group there

[18]			checked by TANITA breath checker	was a highly significant difference in the grades of halitosis compared to other two groups
SaravananSK et al [19]	2018	Gingival inflammation	Plaque index, gingival index, plaque control method acceptance by modified facial image scale	The scores were measured on baseline, day 15 and 30. Intergroup comparison at all time periods between the 3 groups was not statistically significant. However sesame oil had greater acceptance of 85% compared to other two groups
VadhanaVC et al [20]	2019	Plaque, calculus and Streptococcus mutans	Debris index (DI-S), Calculus index (CI-S), Oral hygiene index – Simplified (OHI-S), Plaque Index(PI) and S. mutans count	The scores were analysed on baseline(T1), 15 days(T2), day 30(T3). Maximium zone of inhibition of S. mutans was obtained for group 3. There was no significant difference in the DI-S, CI-S, OHI-S and S. mutans count. But there was statistically significant difference in the PI between group 2 and 3 with PI score reduction at T2 in group 2and 3 and at T3 maximum reduction in group 3
KhairaS et al [21]	2020	OSMF	Mouth opening, VAS to assess burning sensation, tongue protrusion, cheek flexibility, gingival index	Parameters were checked on day 0, once every 15 days for 6 months. The mean difference in the pre and post treatment of mouth opening, VAS, tongue protrusion and gingival index was statistically significant except for cheek flexibility
QahtaniW et al [22]	2020	Dentinal hypersensitivity	VAS to record sensitivity at the beginning and at the 8^{th} week of treatment	Desensitizing tooth paste showed 30.5% reduction in sensitivity whereas 36.2.% reduction was noted in sesame oil group
SharquieKE et al [23]	2020	Recurrent Aphthous stomatitis	Oral Clinical manifestation Index (OCMI) was measured at baseline, day 4 and 8 and the prophylactic effect was measured after 1,2 and 3 months from starting therapy.	The mean OCMI score was highly significant statistically after day 8 in sesame oil ($p<0.001$) compared to pumpkin oil group ($p<0.05$). The difference in size of ulcer between two groups on day 4 and 8 was statistically not significant. There was statistically significant effect on the OCMI of ulcers after 1,2,and

				3 months from start of therapy, proving both intervention can be effective as therapeutic and prophylactic agents.
SezginY et al [24]	2021	Plaque regrowth inhibition	Plaque index, gingival index, stain index and bleeding on probing	There was no significant differences in Plaque index, gingival index, stain index and bleeding on probing between coconut oil and sesame oil when whole mouth scores were evaluated. 70.8% of patients reported that they would prefer to use coconut oil if they have to choose considering taste perception and nausea experience

ORG1- Organoleptic breath assessment by examiner, ORG2- Self- assessment of breath by participant, VAS- Visual Analogue Scale

Figure 1: PRISMA Flow diagram showing the steps involved in article selection for the systematic review

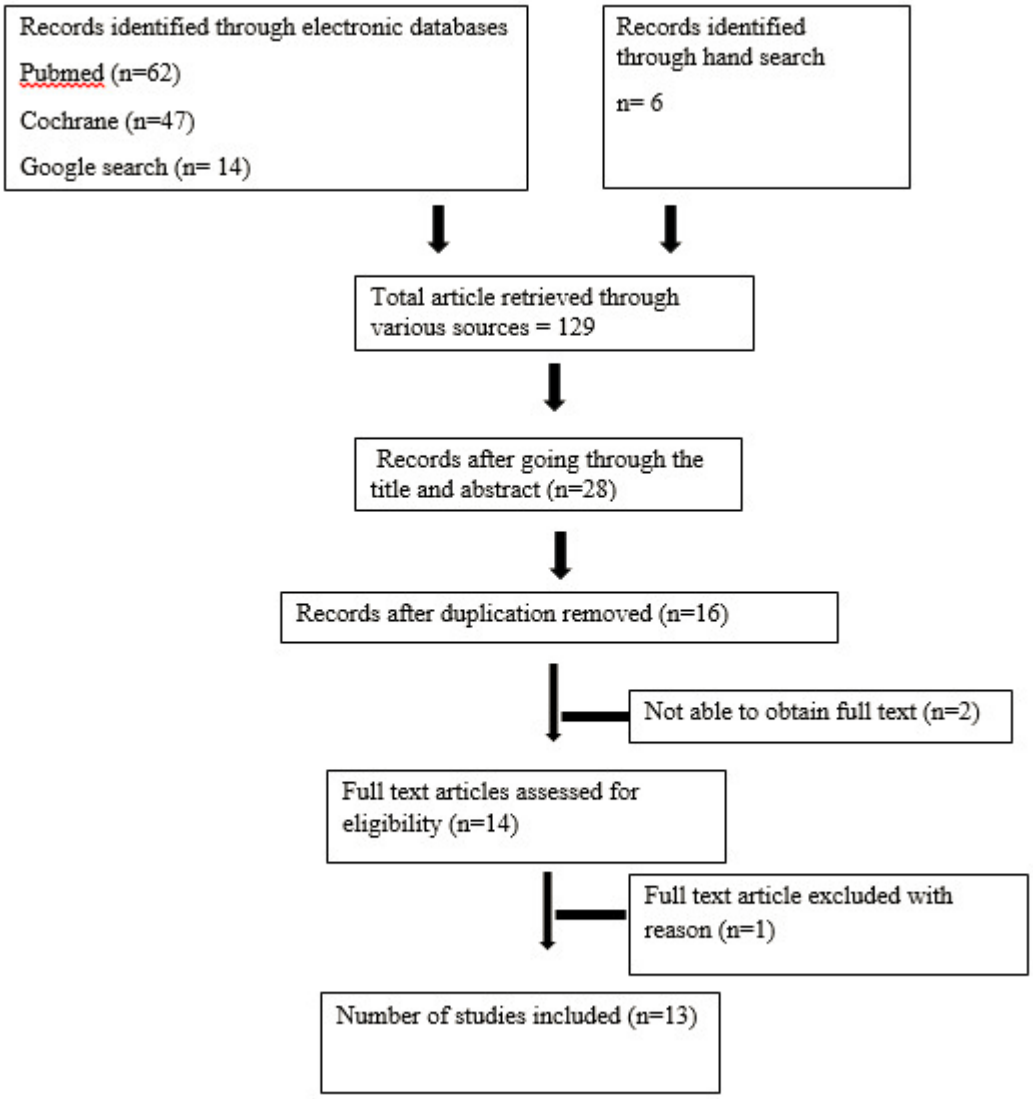
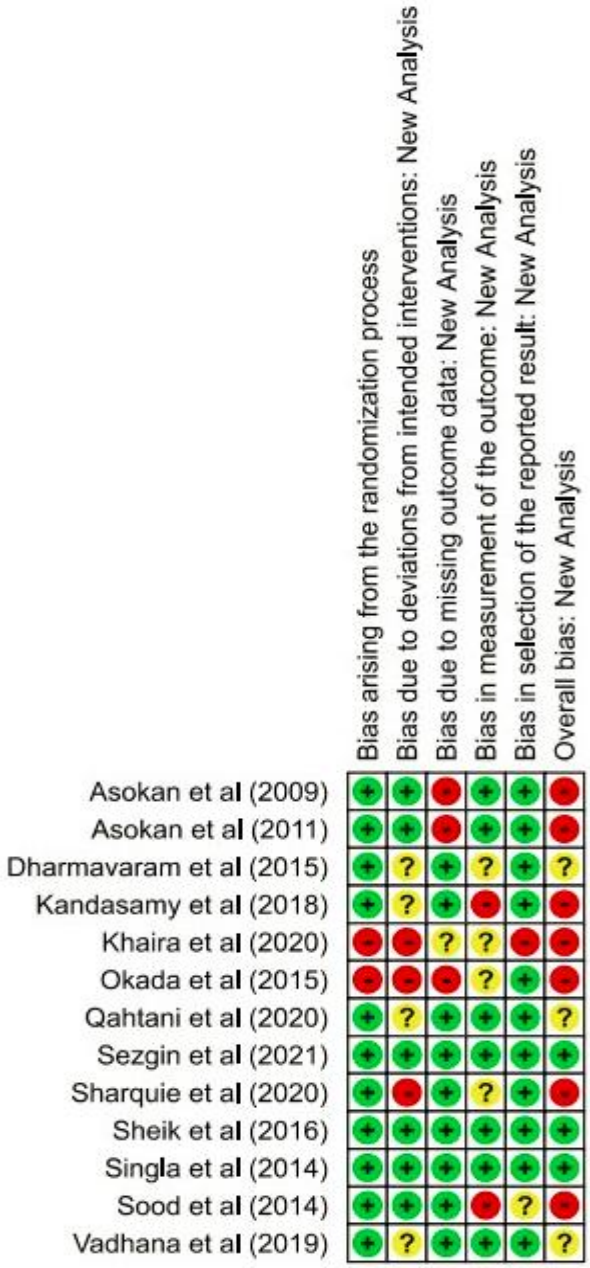


Figure 2: Bias Assessment of the included studies



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Author's contribution:

Author 1 contributed for literature search, data collection and analysis and manuscript preparation
Author 2 contributed for data analysis and manuscript editing and review
Author 3 contributed for data collection, analysis and manuscript editing