QUALITY IMPROVEMENT IN DENTAL AND MEDICAL KNOWLEDGE, RESEARCH, SKILLS AND ETHICS FACING GLOBAL CHALLENGES

Edited by
Armelia Sari Widyarman, Muhammad Ihsan Rizal,
Moehammad Orliando Roeslan & Carolina Damayanti Marpaung

CRC Press
Taylor & Francis Group

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The proceedings of FORIL XIII 2022 Scientific Forum Usakti conjunction with International Conference on Technology of Dental and Medical Sciences (ICTDMS) include selected full papers that have been peer-reviewed and satisfy the conference's criteria. All studies on health, ethics, and social issues in the field of dentistry and medicine have been presented at the conference alongside clinical and technical presentations. The twelve primary themes that make up its framework include the following: behavioral epidemiologic, and health services, conservative dentistry, dental materials, dento-maxillofacial radiology, medical sciences and technology, oral and maxillofacial surgery, oral biology, oral medicine and pathology, orthodontics, pediatrics dentistry, periodontology, and prosthodontics. This proceeding will be beneficial in keeping dental and medical professionals apprised of the most recent scientific developments.

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PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON TECHNOLOGY OF DENTAL AND MEDICAL SCIENCES (ICTDMS 2022), JAKARTA, INDONESIA, 8–10 DECEMBER 2022

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Universitas Trisakti, Indonesia

CRC Press
Taylor & Francis Group
Boca Raton London New York Leiden

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business
A BALKEMA BOOK

First published 2023
by CRC Press/Balkema
4 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

and by CRC Press/Balkema
2385 NW Executive Center Drive, Suite 320, Boca Raton FL 33431

CRC Press/Balkema is an imprint of the Taylor & Francis Group, an informa business

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record has been requested for this book

ISBN: 978-1-032-51441-3 (hbk)
ISBN: 978-1-032-51466-6 (pbk)
ISBN: 978-1-003-40237-4 (ebk)

DOI: 10.1201/9781003402374

Typeset in Times New Roman
by MPS Limited, Chennai, India

Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges – Widyarman et al. (Eds)
© 2024 The Editor(s), ISBN 978-1-032-51441-3

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Preface

Faculty of Dentistry Universitas Trisakti (Usakti) presents FORIL XIII 2022 Scientific Forum Usakti conjunction with International Conference on Technology of Dental and Medical Sciences (ICTDMS) on December 8th–10th 2022. The theme of the conference is "Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges".

The triennial conference has served as a meeting place for technical and clinical studies on health, ethical, and social issues in field medical and dentistry. It is organized around 12 major themes, including behavioral, epidemiologic, and health services, conservative dentistry, dental materials, dento-maxillofacial radiology, medical sciences and technology, oral and maxillofacial surgery, oral biology, oral medicine and pathology, orthodontics, pediatrics dentistry, periodontology, and prosthodontics.

The most recent findings in fundamental and clinical sciences related to medical and dental research will be presented in the conference that will be published as part of the conference proceeding. This proceeding will be useful for keeping dental and medical professionals up to date on the latest scientific developments.

Dr. Aryadi Subrata
Chairman FORIL XIII conjunction with ICTDMS

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Acknowledgements

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Prof. Dr. Rosnah Binti Mohd Zain (*Department of Oro-Maxillofacial Surgical & Medical Sciences, Malaya University*)
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© 2024 The Editor(s), ISBN 978-1-032-51441-3

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Effectiveness of gargling with 100% coconut oil to prevent plaque accumulation and gingival bleeding

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ABSTRACT: Background: Based on Indonesian Baseline Health Research (Riskesdas) con-ducted in 2018, 67.8% of Indonesians suffer from periodontal diseases. Gingivitis is marked by inflammation, bleeding, and swelling of the gums due to plaque buildup. While chemical agents can be effective in managing plaque, natural materials like coconut oil are worth considering. Coconut oil contains lauric acid, which has been shown to have anti-inflammatory and anti-microbial properties. Objectives: To investigate the efficacy of coconut oil as mouthwash in reducing gingivitis. Methods: A clinical study was conducted using a pre-post test control group design. Thirty participants with plaque-induced gingivitis were selected and distributed randomly into the experimental group (n=20) and control group (n=10). The experimental group was asked to rinse with coconut oil 100% and the control group was asked to rinse with 0.1% chlorhexidine mouthwash for 15 mL in 30s. The OHI-S and PBI scores were used to assess plaque accumulation and gingival bleeding at baseline on the 10th day. Data were analyzed using paired t-tests and independent t-tests. Results: After 10 days of treatment, both the experimental and control groups demonstrated a significant decrease in the mean OHI-S and PBI scores. However, there was no significant difference in the reduction of OHI-S and PBI scores between the two mouthwashes. Conclusion: The result of the study demonstrates using coconut oil as mouthwash can effectively decrease plaque accumulation and gingival bleeding. As a natural product, coconut oil can be used as an additional oral hygiene practice for individuals with gingivitis.

1 INTRODUCTION

Dental and oral health deserve serious attention in Indonesia, especially from dentists, as dental and oral diseases affect 90% of the population. In this country, diseases of tooth-supporting tissues and dental caries contribute to the majority of dental and oral diseases (Nurhidayat 2012; Soulissa et al. 2020). The burden of these diseases is reflected in the results of the 2004 Indonesian Household Health Survey (IHHS) that shows 96.58% of the Indonesian population suffers from periodontal diseases.

Gingivitis is a disease caused by microorganisms that form a colony and dental plaque, which then attach to the gingival margin (Page 1986). The formation of plaque, a sticky biofilm that adheres to the surface of the tooth, is a major cause of periodontal disease (Larsen & Fiehn 2017).

DOI: 10.1201/9781003402374-64

Thus, to reduce the prevalence and severity of periodontal diseases, simple prevention measures that can mechanically and chemically control plaque formation are essential (Haytac et al. 2013).

Mouthwash can eliminate microorganisms by destroying bacterial cell walls and inhibiting bac-terial enzymatic activities in addition to controlling plaque (Sharma et al. 2004). In general, mouthwash eliminates or kills bacteria. It also works as an astringent, eliminates bad breath, and has a therapeutic effect of reducing inflammation and preventing caries formation. This therapeutic effect is obtained by adding certain ingredients to the composition, such as fluoride and antibacterial active ingredients in the form of chlorhexidine and essential oils (Marchetti et al. 2011).

Chlorhexidine-containing mouthwash is recommended by the American Dental Association (ADA) as it can inhibit plaque formation and is effective against various microorganisms. However, chlorhexidine has several side effects, such as mucosal irritation, temporary burning sensation, and staining of teeth (Kidd & Fejerskov 2004). Thus, safe, cheap, and easily accessible alternatives are needed. Coconut oil is one type of oil consumed in many tropical countries.

Coconut oil consists of90% saturated fatty acids, with 50% lauric acid content, which has demonstrated anti-inflammatory and antimicrobial properties (DebMandal & Mandal 2011; Ogbolu et al. 2007; Verallo-Rowell et al. 2008). Research has shown that coconut oil can reduce the amount of Streptococcus mutans and Candida albicans in an in vitro oral biofilm model (Kaushik et al. 2016; Thaweboon et al. 2011). In addition, this oil also contains monolaurin, which is effective to kill Escherichia vulneris, Enterobacter spp, Helicobacter pylori, Staphylococcus aureus, and Candida spp., including Candida albicans, Candida glabrata, Candida tropicalis, Candida parapsilosis, Candida stellatoidea, and Candida krusei (Ogbolu et al. 2007; Verallo-Rowell et al. 2008).

Coconut is abundant in Indonesia. However, its potential uses have not been fully explored and people only use it as cooking oil. Recently, coconut oil has attracted lots of attention from the medical research field. A study conducted on the usage of 12.5% virgin coconut oil as mouthwash resulted in the possibility of plaque index decrease in patients wearing fixed prosthetic dentures (Saputra et al. 2018). Hence, this study seeks to contribute to research that explores the potential use of coconut oil in medical and dental fields by examining the effectiveness of gargling using 100% coconut oil to prevent plaque accumulation and gingival bleeding.

2 METHODS

This clinical trial study with a pre-post test control group design was conducted at the Faculty of Dentistry, Universitas Trisakti Dental Hospital, from November to December 2018. This research has received ethical approval from the Health Research Ethics Commission Faculty of Dentistry, Universitas Trisakti with reference number 199/S2/KEPK/FKG/10/2018. All patients have given their informed consent before their participation in this study. The population of this study was patients of the hospital with a sample size of 30. Samples were divided into the treatment (n=20) and positive control (n=10) groups using the simple random sampling technique. Measurements were taken before and after treatment. The Oral Hygiene Index-Simplified (OHI-S) and Papillary Bleeding Index (PBI) scores were recorded before treatment (day 0). The treatment group then received 100% coconut oil while the control group received 0.1% chlorhexidine mouthwash. Each participant also received a toothbrush, toothpaste, and a measuring cup. Participants were given instructions to gargle using 15 mL of 100% coconut oil or 15 mL of 0.1% chlorhexidine mouthwash for 30 seconds after brushing their teeth twice a day, in the morning and at night before going to bed. On the 10th day, the OHI-S and PBI scores were again measured and further data analysis was performed.

2.1 Statistical analysis

The software program SPSS version 24.0 (IBM, USA) was used to analyze data collected in this study, with a confidence level of 95%. Statistical significance was considered to be obtained if the p-value was <0.05. The paired t-test was used to assess the difference in mean OHI-S and PBI scores before and after gargling with 100% coconut oil and 0.1% chlorhexidine mouthwash on Day 0 (before) and Day 10 (after) while the unpaired t-test was applied to identify the difference in

the OHI-S and PBI score mean differences between gargling with 100% coconut oil and 0.1% chlorhexidine mouthwash on day 0 (before) and 10 (after).

3 RESULTS

More men participated in the study (n=16, 53.33%) than women (n= 14, 46.67%). In terms of age, 15 participants were in the category of 20-39 years (50%), 14 participants were aged 40-59 years (46.67%), and 1 was 60 years old (3.33%). Table 1 presents the mean and standard deviation of the OHI-S scores for the treatment and the positive control groups in this study.

Table 1. Distribution of mean OHI scores in treatment group and positive control group.

	Treatment (100% coconut oil)		Positive control (0.1% chlorhexidine)	
Day	n	$x\pm$ SD	n	$x\pm$ SD
0	20	2.44 ±0.47	10	2.70 ±0.50
10	20	1.64 ±0.43	10	1.85 ±0.68

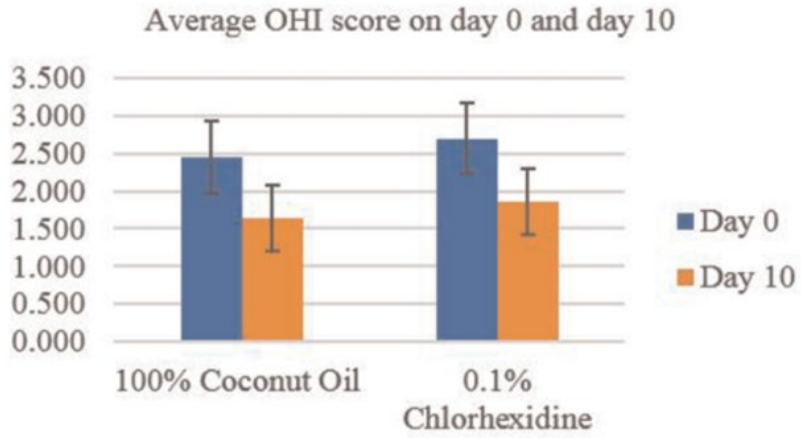

Figure 1. Mean OHI-S scores in treatment and positive control groups.

Based on Figure 1, there was a decrease in the treatment group and the positive control group on day 10. Table 2 lists the mean and standard deviation of the PBI scores for the treatment and positive control groups.

Table 2. Distribution of mean PBI scores in the treatment group and positive control group.

	Treatment (100% coconut oil)		Positive control (0.1% chlorhexidine)	
Day	n	$x\pm$ SD	n	$x\pm$ SD
0	20	1.01 ±0.26	10	1.05 ±0.29
10	20	0.68 ±0.33	10	0.75 ±0.30

The mean and standard deviation of the PBI scores in the treatment group on day 0 and day 10 were 1.010.26 and 0.680.33, respectively, with a decrease of 0.33. The mean and standard deviation of the PBI scores for the positive control group on day 0 and day 10 were 1.050.29 and 0.750.30, respectively, with a decrease of 0.30.

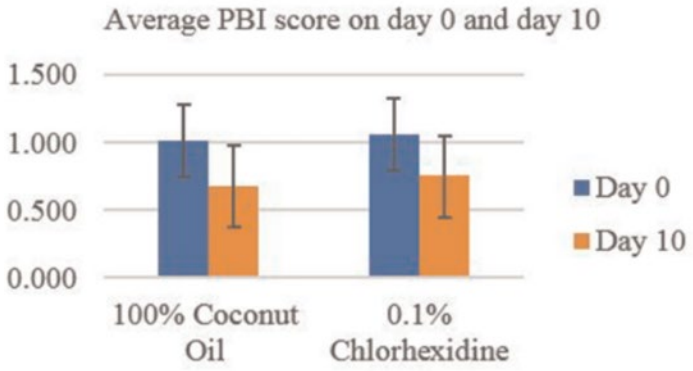

Figure 2. Mean PBI scores in the treatment group and positive control group.

Based on Figure 2, there was a decrease in the treatment group and the positive control group on day 10. The Shapiro-Wilk test was used to analyze the normality of this data. The data were found to be normally distributed ($p > 0.05$).

Table 3. OHI-S score on day 0 and day 10.

Variable	n	OHI-S. Score (Day 0) $x\pm$ SD	OHI-S. Score (10th day) $x\pm$ SD	P-value
100% Coconut Oil	20	2.47 ±0.53	1.63 ±0.41	p = 0.000*
0.1% Chlorhexidine	10	2.63 ±0.54	2.21 ±0.80	p = 0.006*

Note: (*) indicates a significant paired *T*-test with a p-value < 0.05

Table 3 presents the mean and standard deviation of OHI-S scores for the treatment group (100% coconut oil) and positive control group (chlorhexidine 0.1%) on day 0 and day 10. Statistically, the difference between pre- and post-intervention for both the treatment group and the positive control group was significant with a p-value <0.05.

Table 4. Difference in mean OHI-S scores of the treatment group and positive control group.

Variable	OHI-S. score difference $x\pm$ SD	Statistical Analysis Result
100% Coconut Oil	0.79 ±0.67	
0.1% Chlorhexidine	0.85 ±0.74	p = 0.980

The results of the unpaired t-test showed that there was no significant difference in the mean difference in OHI-S scores between the treatment group and the positive control group.

Table 5. PBI scores on day 0 and day 10.

Variable	n	PBI Score (day 0) x± SD	PBI Score (day 10) x± SD	P-value
100% Coconut Oil	20	1.01 ±0.26	0.68 ±0.33	p = 0.001*
0.1% Chlorhexidine	10	1.05 ±0.29	0.75 ±0.30	p = 0.001*

Notes: (*) indicates a significant paired *T*-test with a p-value < 0.05

Statistically, there was a significant difference between pre-and post-intervention for both treatment and positive control groups with a p-value of 0.001.

Table 6. Difference in mean PBI scores of the treatment group and positive control group.

Variable	PBI score difference x± SD	Statistical Analysis Result
100% Coconut Oil	0.33 ±0.35	p = 0.825
0.1% Chlorhexidine	0.30 ±0.19	

The results of the unpaired t-test (unpaired t-test) showed no significant difference was identi-fied in the mean difference in PBI scores between the treatment and the positive control groups.

4 DISCUSSION

Gingivitis is a commonly found disease in tooth-supporting tissues, which is usually caused by poor oral hygiene habits and precedes the onset of periodontitis. A plaque-forming microbial colony that is attached to the gingival margin is the primary cause of gingivitis (Larsen & Fiehn 2017).

This study demonstrated that participants in the treatment group who gargled with 100% coconut oil showed a significant decrease in the average OHI-S score and PBI score on day 10. This supports the findings of Peedikayil et al. (2015) who reported that participants who gargled coconut oil using the oil-pulling method experience a significant reduction in plaque score on Day 7. The decrease in score was caused by the high saponification activity of the coconut oil and its sodium laureate content, which is also the main substance of soap, making it a good and effective cleaning agent to reduce plaque adhesion and accumulation (Peedikayil et al. 2016).

This study adds to prior research's findings that suggested coconut oil is an effective agent to kill Gram-positive and Gram-negative bacteria, including Escherichia vulneris, Enterobacter spp., Helicobacter pylori, Staphylococcus aureus, C. albicans, C. glabrata, C. tropicalis, C. parapsilosis., C. stellatoidea, and C. krusei (Ogbolu et al. 2007). The positive control group that gargled 0.1% chlorhexidine mouthwash in this study also showed a significant decrease in the mean OHI-S score and PBI score on Day 10. This might be due to the mechanism of action of chlorhexidine where its cation molecule attaches to the negative part of the microbial cell wall, causing damage to the cell membrane, and triggering the cell to die.

A study by Kumar (2017) in Chennai, India, demonstrated the ability of chlorhexidine to damage cell membranes in an in vitro study where chlorhexidine effectively kills almost 100% of Gram-positive and Gram-negative bacteria within 30 seconds. Furthermore, in a comparative study of the antibacterial effectiveness ofcoconut oil and chlorhexidine against S. mutans in vivo,a significant decrease in the number of S. mutans is seen both in the coconut oil and chlorhexidine groups. Thus, it can be concluded that against S. mutans, coconut oil is just as effective as chlorhexidine due to its antibacterial ability (Peedikayil et al. 2015).

This study also presented a similar result with no significant difference in the mean difference of OHI-S score and PBI score between the group that gargled 100% coconut oil and the group that gargled 0.1% chlorhexidine. The study by Owittayakul et al. (2018) about gargling coconut oil using the oil-pulling method also gave the same results; there was no difference in the reduction in the percentage of total bacteria, and it was observed that there was a reduced number of S. mutans in both coconut oil group and the 0.12% chlorhexidine group. Thus, to reduce plaque accumulation and the severity of gingivitis, coconut oil can be used as a sub-stitute for mouthwash.

5 CONCLUSION

Gargling using 100% coconut oil is effective against plaque accumulation and gingival bleeding. There is a significant difference in the mean OHI-S and PBI scores before and after gargling for 10 days with 100% coconut oil. There is also no significant difference observed between the mean difference in OHI-S and PBI scores before and after gargling with 100% coconut oil and 0.1% chlorhexidine.

CONFLICT OF INTEREST

The authors declare no conflict of interest regarding the publication of this paper.

REFERENCES

DebMandal, M., & Mandal, S. 2011. Coconut (Cocos nucifera L.: Arecaceae): in health promotion and disease prevention. Asian Pacific Journal ofTropical Medicine 4(3): 241–247.
Haytac, M.C., Ozcelik, O., & Mariotti, A. 2013. Periodontal disease in men. Periodontology 2000 61(1): 252–265.

Kaushik, M., Reddy, P., Sharma, R., Udameshi, P., Mehra, N.&, & Marwaha, A. 2016. The Effect ofcoconut oil pulling on streptococcus mutans count in saliva in comparison with chlorhexidine mouthwash. The Journal ofContemporary Dental Practice 17(1): 38–41.

Kidd, E.A.M., & Fejerskov, O. 2004. What constitutes dental caries? Histopathology of carious enamel and dentin related to the action of cariogenic biofilms. Journal ofDental Research 83(1_suppl): 35–38.

Kumar, S.B. 2017. Chlorhexidine mouthwash-a review. Journal ofPharmaceutical Sciences and Research 9(9): 1450.

Larsen, T., & Fiehn, N. 2017. Dental biofilm infections–an update. Apmis 125(4): 376–384. Marchetti, E., Mummolo, S., Di Mattia, J., Casalena, F., Di Martino, S., Mattei, A., & Marzo, G. 2011. Efficacy of essential oil mouthwash with and without alcohol: a 3-day plaque accumulation model. Trials 12: 1–7.

Nurhidayat, O. 2012. Perbandingan media power point dengan flip chart dalam meningkatkan pengeta-huankesehatan gigi dan mulut. Unnes Journal ofPublic Health 1(1).

Ogbolu, D.O., Oni, A.A., Daini, O.A., & Oloko, A.P. 2007. In vitro antimicrobial properties of coconut oil on Candida species in Ibadan, Nigeria. Journal ofMedicinal Food 10(2): 384–387.

Owittayakul, D., Palee, K., Khongkhunthian, S.&, & Wanachantararak, P. 2018. Effect of coconut oil on salivary total bacterial and streptococcus mutans counts. Chiang Mai Dental Journal 39(1): 75–83.

Page, R.C. 1986. Gingivitis. Journal ofClinical Periodontology 13(5): 345–355.

Peedikayil, F.C., Remy, V., John, S., Chandru, T.P., Sreenivasan, P., &, & Bijapur, G.A. 2016. Comparison of antibacterial efficacy of coconut oil and chlorhexidine on streptococcus mutans: An in vivo study. Journal ofInternational Society ofPreventive & Community Dentistry 6(5): 447–452.

Peedikayil, F.C., Sreenivasan, P., &, & Narayanan, A. 2015. Effect of coconut oil in plaque related gingivitis - A preliminary report. Nigerian Medical Journal: Journal of the Nigeria Medical Association 56(2): 143–147.

Saputra, L., Gita, F., & & Dewi, R.. 2018. Effect of 12.5% virgin coconut oil (Cocos nucifera) mouthwash on plaque index of fixed prosthetic denture users. International Journal ofApplied Pharmaceutics 9: 41–44.

Sharma, N., Charles, C.H., Lynch, M.C., Qaqish, J., McGuire, J.A., Galustians, J.G., & Kumar, L.D. 2004. Adjunctive benefit of an essential oil–containing mouthrinse in reducing plaque and gingivitis in patients who brush and floss regularly: a six-month study. The Journal ofthe American Dental Association 135(4): 496–504.

Soulissa, A.G., Afifah, J., & Widyarman, A.S. 2020. The effect of tea tree oil in inhibiting the adhesion of pathogenic periodontal biofilms in vitro. Scientific Dental Journal 4(3): 88.

Thaweboon, S., Nakaparksin, J.&, & Thaweboon, B. 2011. Effect of oil-pulling on oral microorganisms in biofilm models. Asia Journal ofPublic Health 2(2): 62–66.

Verallo-Rowell, V.M., Dillague, K.M., & Syah-Tjundawan, B.S. 2008. Novel antibacterial and emollient effects of coconut and virgin olive oils in adult atopic dermatitis. DERM 19(6): 308–315.

Effectiveness of gargling with 100% coconut oil to prevent plaque accumulation and gingival bleeding

by Wita Anggraini FKG

Submission date: 13-Aug-2024 02:38PM (UTC+0700)
Submission ID: 2380818727
File name: ut_oil_to_prevent_plaque_accumulation_and_gingival_bleeding.docx (703.91K)
Word count: 2644
Character count: 14666

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ABSTRACT: Background: Based on Indonesian Baseline Health Research (Riskesdas) con-ducted in 2018, 67.8% of Indonesians suffer from periodontal diseases. Gingivitis is marked by inflammation, bleeding, and swelling of the gums due to plaque buildup. While chemical agents can be effective in managing plaque, natural materials like coconut oil are worth considering. Coconut oil contains lauric acid, which has been shown to have anti-inflammatory and anti-microbial properties. Objectives: To investigate the efficacy of coconut oil as mouthwash in reducing gingivitis. Methods: A clinical study was conducted using a pre-post test control group design. Thirty participants with plaque-induced gingivitis were selected and distributed randomly into the experimental group (n=20) and control group (n=10). The experimental group was asked to rinse with coconut oil 100% and the control group was asked to rinse with 0.1% chlorhexidine mouthwash for 15 mL in 30s. The OHI-S and PBI scores were used to assess plaque accumulation and gingival bleeding at baseline on the 10th day. Data were analyzed using paired t-tests and independent t-tests. Results: After 10 days of treatment, both the experimental and control groups demonstrated a significant decrease in the mean OHI-S and PBI scores. However, there was no significant difference in the reduction of OHI-S and PBI scores between the two mouthwashes. Conclusion: The result of the study demonstrates using coconut oil as mouthwash can effectively decrease plaque accumulation and gingival bleeding. As a natural product, coconut oil can be used as an additional oral hygiene practice for individuals with gingivitis.

1 INTRODUCTION

Dental and oral health deserve serious attention in Indonesia, especially from dentists, as dental and oral diseases affect 90% of the population. In this country, diseases of tooth-supporting tissues and dental caries contribute to the majority of dental and oral diseases (Nurhidayat 2012; Soulissa et al. 2020). The burden of these diseases is reflected in the results of the 2004 Indonesian Household Health Survey (IHHS) that shows 96.58% of the Indonesian population suffers from periodontal diseases.

Gingivitis is a disease caused by microorganisms that form a colony and dental plaque, which then attach to the gingival margin (Page 1986). The formation of plaque, a sticky biofilm that adheres to the surface of the tooth, is a major cause of periodontal disease (Larsen & Fiehn 2017).

DOI: 10.1201/9781003402374-64

Thus, to reduce the prevalence and severity of periodontal diseases, simple prevention measures that can control plaque formation are essential (Haytac et al. 2013).

Mouthwash can eliminate microorganisms by destroying bacterial cell walls and inhibiting bac-terial enzymatic activities in addition to controlling plaque (Sharma et al. 2004). In general, mouthwash eliminates or kills bacteria. It also works as an astringent, eliminates bad breath, and has a therapeutic effect of reducing inflammation and preventing caries formation. This therapeutic effect is obtained by adding certain ingredients to the composition, such as fluoride and antibacterial active ingredients in the form of chlorhexidine and essential oils (Marchetti et al. 2011).

Chlorhexidine-containing mouthwash is recommended by the American Dental Association (ADA) as it can inhibit plaque formation and is effective against various microorganisms. However, chlorhexidine has several side effects, such as mucosal irritation, temporary burning sensation, and staining of teeth (Kidd & Fejerskov 2004). Thus, safe, cheap, and easily accessible alternatives are needed. Coconut oil is one type of oil consumed in many tropical countries.

Coconut oil consists of90% saturated fatty acids, with 50% lauric acid content, which has demonstrated anti-inflammatory and antimicrobial properties (DebMandal & Mandal 2011; Ogbolu et al. 2007; Verallo-Rowell et al. 2008). Research has shown that coconut oil can reduce the amount of Streptococcus mutans and Candida albicans in an in vitro oral biofilm model (Kaushik et al. 2016; Thaweboon et al. 2011). In addition, this oil also contains monolaurin, which is effective to kill Escherichia vulneris, Enterobacter spp, Helicobacter pylori, Staphylococcus aureus, and Candida spp., including Candida albicans, Candida glabrata, Candida tropicalis, Candida parapsilosis, Candida stellatoidea, and Candida krusei (Ogbolu et al. 2007; Verallo-Rowell et al. 2008).

Coconut is abundant in Indonesia. However, its potential uses have not been fully explored and people only use it as cooking oil. Recently, coconut oil has attracted lots of attention from the medical research field. A study conducted on the usage of 12.5% virgin coconut oil as mouthwash resulted in the possibility of plaque index decrease in patients wearing fixed prosthetic dentures (Saputra et al. 2018). Hence, this study seeks to contribute to research that explores the potential use of coconut oil in medical and dental fields by examining the effectiveness of gargling using 100% coconut oil to prevent plaque accumulation and gingival bleeding.

2 METHODS

This clinical trial study with a pre-post test control group design was conducted at the Faculty of Dentistry, Universitas Trisakti Dental Hospital, from November to December 2018. This research has received ethical approval from the Health Research Ethics Commission Faculty of Dentistry, Universitas Trisakti with reference number 199/S2/KEPK/FKG/10/2018. All patients have given their informed consent before their participation in this study. The population of this study was patients of the hospital with a sample size of 30. Samples were divided into the treatment (n=20) and positive control (n=10) groups using the simple random sampling technique. Measurements were taken before and after treatment. The Oral Hygiene Index-Simplified (OHI-S) and Papillary Bleeding Index (PBI) scores were recorded before treatment (day 0). The treatment group then received 100% coconut oil while the control group received 0.1% chlorhexidine mouthwash. Each participant also received a toothbrush, toothpaste, and a measuring cup. Participants were given instructions to gargle using 15 mL of 100% coconut oil or 15 mL of 0.1% chlorhexidine mouthwash for 30 seconds after brushing their teeth twice a day, in the morning and at night before going to bed. On the 10th day, the OHI-S and PBI scores were again measured and further data analysis was performed.

2.1 Statistical analysis

The software program SPSS version 24.0 (IBM, USA) was used to analyze data collected in this study, with a confidence level of 95%. Statistical significance was considered to be obtained if the p-value was <0.05. The paired t-test was used to assess the difference in mean OHI-S and PBI scores before and after gargling with 100% coconut oil and 0.1% chlorhexidine mouthwash on Day 0 (before) and Day 10 (after) while the unpaired t-test was applied to identify the difference in

the OHI-S and PBI score mean differences between gargling with 100% coconut oil and 0.1% chlorhexidine mouthwash on day 0 (before) and 10 (after).

3 RESULTS

More men participated in the study (n=16, 53.33%) than women (n= 14, 46.67%). In terms of age, 15 participants were in the category of 20-39 years (50%), 14 participants were aged 40-59 years (46.67%), and 1 was 60 years old (3.33%). Table 1 presents the mean and standard deviation of the OHI-S scores for the treatment and the positive control groups in this study.

Table 1. Distribution of mean OHI scores in treatment group and positive control group.

	Treatment (100% coconut oil)		Positive control (0.1% chlorhexidine)	
Day	n	$x\pm$ SD	n	$x\pm$ SD
0	20	2.44 ±0.47	10	2.70 ±0.50
10	20	1.64 ±0.43	10	1.85 ±0.68

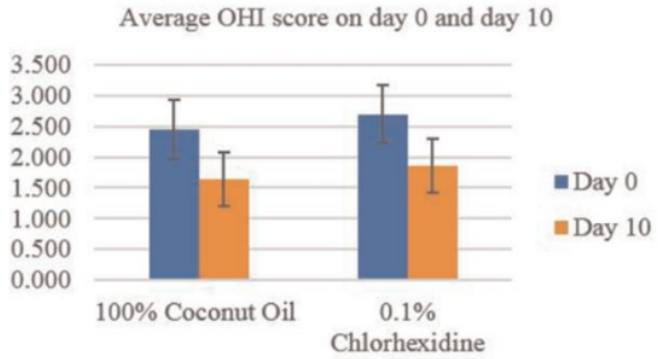

Figure 1. Mean OHI-S scores in treatment and positive control groups.

Based on Figure 1, there was a decrease in the treatment group and the positive control group on day 10. Table 2 lists the mean and standard deviation of the PBI scores for the treatment and positive control groups.

Table 2. Distribution of mean PBI scores in the treatment group and positive control group.

	Treatment (100% coconut oil)		Positive control (0.1% chlorhexidine)	
Day	n	$x\pm$ SD	n	$x\pm$ SD
0	20	1.01 ±0.26	10	1.05 ±0.29
10	20	0.68 ±0.33	10	0.75 ±0.30

The mean and standard deviation of the PBI scores in the treatment group on day 0 and day 10 were 1.010.26 and 0.680.33, respectively, with a decrease of 0.33. The mean and standard deviation of the PBI scores for the positive control group on day 0 and day 10 were 1.050.29 and 0.750.30, respectively, with a decrease of 0.30.

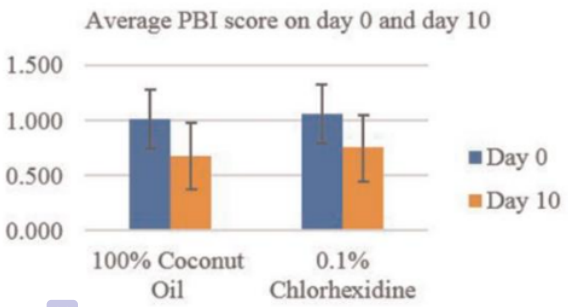

Figure 2. Mean PBI scores in the treatment group and positive control group.

Based on Figure 2, there was a decrease in the treatment group and the positive control group on day 10. The Shapiro-Wilk test was used to analyze the normality of this data. The data were found to be normally distributed ($p > 0.05$).

Table 3. OHI-S score on day 0 and day 10.

Variable	n	OHI-S. Score (Day 0) $x\pm$ SD	OHI-S. Score (10th day) $x\pm$ SD	P-value
100% Coconut Oil	20	2.47 ±0.53	1.63 ±0.41	p = 0.000*
0.1% Chlorhexidine	10	2.63 ±0.54	2.21 ±0.80	p = 0.006*

Note: (*) indicates a significant paired *T*-test with a p-value < 0.05

Table 3 presents the mean and standard deviation of OHI-S scores for the treatment group (100% coconut oil) and positive control group (chlorhexidine 0.1%) on day 0 and day 10. Statistically, the difference between pre- and post-intervention for both the treatment group and the positive control group was significant with a p-value <0.05.

Table 4. Difference in mean OHI-S scores of the treatment group and positive control group.

Variable	OHI-S. score difference $x\pm$ SD	Statistical Analysis Result
100% Coconut Oil	0.79 ±0.67	
0.1% Chlorhexidine	0.85 ±0.74	p = 0.980

The results of the unpaired t-test showed that there was no significant difference in the mean difference in OHI-S scores between the treatment group and the positive control group.

Table 5. PBI scores on day 0 and day 10.

Variable	n	PBI Score (day 0) x± SD	PBI Score (day 10) x± SD	P-value
100% Coconut Oil	20	1.01 ±0.26	0.68 ±0.33	p = 0.001*
0.1% Chlorhexidine	10	1.05 ±0.29	0.75 ±0.30	p = 0.001*

Notes: (*) indicates a significant paired *T*-test with a p-value < 0.05

Statistically, there was a significant difference between pre-and post-intervention for both treatment and positive control groups with a p-value of 0.001.

Table 6. Difference in mean PBI scores of the treatment group and positive control group.

Variable	PBI score difference x± SD	Statistical Analysis Result
100% Coconut Oil	0.33 ±0.35	p = 0.825
0.1% Chlorhexidine	0.30 ±0.19	

The results of the unpaired t-test (unpaired t-test) showed no significant difference was identi-fied in the mean difference in PBI scores between the treatment and the positive control groups.

4 DISCUSSION

Gingivitis is a commonly found disease in tooth-supporting tissues, which is usually caused by poor oral hygiene habits and precedes the onset of periodontitis. A plaque-forming microbial colony that is attached to the gingival margin is the primary cause of gingivitis (Larsen & Fiehn 2017).

This study demonstrated that participants in the treatment group who gargled with 100% coconut oil showed a significant decrease in the average OHI-S score and PBI score on day 10. This supports the findings of Peedikayil et al. (2015) who reported that participants who gargled coconut oil using the oil-pulling method experience a significant reduction in plaque score on Day 7. The decrease in score was caused by the high saponification activity of the coconut oil and its sodium laureate content, which is also the main substance of soap, making it a good and effective cleaning agent to reduce plaque adhesion and accumulation (Peedikayil et al. 2016).

This study adds to prior research's findings that suggested coconut oil is an effective agent to kill Gram-positive and Gram-negative bacteria, including Escherichia vulneris, Enterobacter spp., Helicobacter pylori, Staphylococcus aureus, C. albicans, C. glabrata, C. tropicalis, C. parapsilosis., C. stellatoidea, and C. krusei (Ogbolu et al. 2007). The positive control group that gargled 0.1% chlorhexidine mouthwash in this study also showed a significant decrease in the mean OHI-S score and PBI score on Day 10. This might be due to the mechanism of action of chlorhexidine where its cation molecule attaches to the negative part of the microbial cell wall, causing damage to the cell membrane, and triggering the cell to die.

A study by Kumar (2017) in Chennai, India, demonstrated the ability of chlorhexidine to damage cell membranes in an in vitro study where chlorhexidine effectively kills almost 100% of Gram-positive and Gram-negative bacteria within 30 seconds. Furthermore, in a comparative study of the antibacterial effectiveness ofcoconut oil and chlorhexidine against S. mutans in vivo,a significant decrease in the number of S. mutans is seen both in the coconut oil and chlorhexidine groups. Thus, it can be concluded that against S. mutans, coconut oil is just as effective as chlorhexidine due to its antibacterial ability (Peedikayil et al. 2015).

This study also presented a similar result with no significant difference in the mean difference of OHI-S score and PBI score between the group that gargled 100% coconut oil and the group that gargled 0.1% chlorhexidine. The study by Owittayakul et al. (2018) about gargling coconut oil using the oil-pulling method also gave the same results; there was no difference in the reduction in the percentage of total bacteria, and it was observed that there was a reduced number of S. mutans in both coconut oil group and the 0.12% chlorhexidine group. Thus, to reduce plaque accumulation and the severity of gingivitis, coconut oil can be used as a sub-stitute for mouthwash.

5 CONCLUSION

Gargling using 100% coconut oil is effective against plaque accumulation and gingival bleeding. There is a significant difference in the mean OHI-S and PBI scores before and after gargling for 10 days with 100% coconut oil. There is also no significant difference observed between the mean difference in OHI-S and PBI scores before and after gargling with 100% coconut oil and 0.1% chlorhexidine.

CONFLICT OF INTEREST

The authors declare no conflict of interest regarding the publication of this paper.

REFERENCES

DebMandal, M., & Mandal, S. 2011. Coconut (Cocos nucifera L.: Arecaceae): in health promotion and disease prevention. Asian Pacific Journal ofTropical Medicine 4(3): 241–247.

Haytac, M.C., Ozcelik, O., & Mariotti, A. 2013. Periodontal disease in men. Periodontology 2000 61(1): 252–265.

Kaushik, M., Reddy, P., Sharma, R., Udameshi, P., Mehra, N.&, & Marwaha, A. 2016. The Effect ofcoconut oil pulling on streptococcus mutans count in saliva in comparison with chlorhexidine mouthwash. The Journal ofContemporary Dental Practice 17(1): 38–41.

Kidd, E.A.M., & Fejerskov, O. 2004. What constitutes dental caries? Histopathology of carious enamel and dentin related to the action of cariogenic biofilms. Journal ofDental Research 83(1_suppl): 35–38.

Kumar, S.B. 2017. Chlorhexidine mouthwash-a review. Journal ofPharmaceutical Sciences and Research 9(9): 1450.

Larsen, T., & Fiehn, N. 2017. Dental biofilm infections–an update. Apmis 125(4): 376–384. Marchetti, E., Mummolo, S., Di Mattia, J., Casalena, F., Di Martino, S., Mattei, A., & Marzo, G. 2011. Efficacy of essential oil mouthwash with and without alcohol: a 3-day plaque accumulation model. Trials 12: 1–7.

Nurhidayat, O. 2012. Perbandingan media power point dengan flip chart dalam meningkatkan pengeta-huankesehatan gigi dan mulut. Unnes Journal ofPublic Health 1(1).

Ogbolu, D.O., Oni, A.A., Daini, O.A., & Oloko, A.P. 2007. In vitro antimicrobial properties of coconut oil on Candida species in Ibadan, Nigeria. Journal ofMedicinal Food 10(2): 384–387.

Owittayakul, D., Palee, K., Khongkhunthian, S.&, & Wanachantararak, P. 2018. Effect of coconut oil on salivary total bacterial and streptococcus mutans counts. Chiang Mai Dental Journal 39(1): 75–83.

Page, R.C. 1986. Gingivitis. Journal ofClinical Periodontology 13(5): 345–355.

Peedikayil, F.C., Remy, V., John, S., Chandru, T.P., Sreenivasan, P., &, & Bijapur, G.A. 2016. Comparison of antibacterial efficacy of coconut oil and chlorhexidine on streptococcus mutans: An in vivo study. Journal ofInternational Society ofPreventive & Community Dentistry 6(5): 447–452.

Peedikayil, F.C., Sreenivasan, P., &, & Narayanan, A. 2015. Effect of coconut oil in plaque related gingivitis - A preliminary report. Nigerian Medical Journal: Journal of the Nigeria Medical Association 56(2): 143–147.

Saputra, L., Gita, F., & & Dewi, R.. 2018. Effect of 12.5% virgin coconut oil (Cocos nucifera) mouthwash on plaque index of fixed prosthetic denture users. International Journal ofApplied Pharmaceutics 9: 41–44.

Sharma, N., Charles, C.H., Lynch, M.C., Qaqish, J., McGuire, J.A., Galustians, J.G., & Kumar, L.D. 2004. Adjunctive benefit of an essential oil–containing mouthrinse in reducing plaque and gingivitis in patients who brush and floss regularly: a six-month study. The Journal ofthe American Dental Association 135(4): 496–504.

Soulissa, A.G., Afifah, J., & Widyarman, A.S. 2020. The effect of tea tree oil in inhibiting the adhesion of pathogenic periodontal biofilms in vitro. Scientific Dental Journal 4(3): 88.

Thaweboon, S., Nakaparksin, J.&, & Thaweboon, B. 2011. Effect of oil-pulling on oral microorganisms in biofilm models. Asia Journal ofPublic Health 2(2): 62–66.

Verallo-Rowell, V.M., Dillague, K.M., & Syah-Tjundawan, B.S. 2008. Novel antibacterial and emollient effects of coconut and virgin olive oils in adult atopic dermatitis. DERM 19(6): 308–315.

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Word count: 6771
Character count: 37046

QUALITY IMPROVEMENT IN DENTAL AND MEDICAL KNOWLEDGE, RESEARCH, SKILLS AND ETHICS FACING GLOBAL CHALLENGES

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Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges

Edited by

Armelia Sari Widyarman, Muhammad Ihsan Rizal, Moehammad Orliando Roeslan and Carolina Damayanti Marpaung
Universitas Trisakti, Indonesia

CRC Press
Taylor & Francis Group
Boca Raton London New York Leiden

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business
A BALKEMA BOOK

First published 2023
by CRC Press/Balkema
4 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

and by CRC Press/Balkema
2385 NW Executive Center Drive, Suite 320, Boca Raton FL 33431

CRC Press/Balkema is an imprint of the Taylor & Francis Group, an informa business

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record has been requested for this book

ISBN: 978-1-032-51441-3 (hbk)
ISBN: 978-1-032-51466-6 (pbk)
ISBN: 978-1-003-40237-4 (ebk)

DOI: 10.1201/9781003402374

Typeset in Times New Roman
by MPS Limited, Chennai, India

Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges – Widyarman et al. (Eds)
© 2024 The Editor(s), ISBN 978-1-032-51441-3

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Preface

Faculty of Dentistry Universitas Trisakti (Usakti) presents FORIL XIII 2022 Scientific Forum Usakti conjunction with International Conference on Technology of Dental and Medical Sciences (ICTDMS) on December 8th–10th 2022. The theme of the conference is "Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges".

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Acknowledgements

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Prof. Adrian Yap (*Department of Dentistry, Ng Teng Fong General Hospital, Singapore*)
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Effectiveness of gargling with 100% coconut oil to prevent plaque accumulation and gingival bleeding

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ABSTRACT: Background: Based on Indonesian Baseline Health Research (Riskesdas) con-ducted in 2018, 67.8% of Indonesians suffer from periodontal diseases. Gingivitis is marked by inflammation, bleeding, and swelling of the gums due to plaque buildup. While chemical agents can be effective in managing plaque, natural materials like coconut oil are worth considering. Coconut oil contains lauric acid, which has been shown to have anti-inflammatory and anti-microbial properties. Objectives: To investigate the efficacy of coconut oil as mouthwash in reducing gingivitis. Methods: A clinical study was conducted using a pre-post test control group design. Thirty participants with plaque-induced gingivitis were selected and distributed randomly into the experimental group (n=20) and control group (n=10). The experimental group was asked to rinse with coconut oil 100% and the control group was asked to rinse with 0.1% chlorhexidine mouthwash for 15 mL in 30s. The OHI-S and PBI scores were used to assess plaque accumulation and gingival bleeding at baseline on the 10th day. Data were analyzed using paired t-tests and independent t-tests. Results: After 10 days of treatment, both the experimental and control groups demonstrated a significant decrease in the mean OHI-S and PBI scores. However, there was no significant difference in the reduction of OHI-S and PBI scores between the two mouthwashes. Conclusion: The result of the study demonstrates using coconut oil as mouthwash can effectively decrease plaque accumulation and gingival bleeding. As a natural product, coconut oil can be used as an additional oral hygiene practice for individuals with gingivitis.

1 INTRODUCTION

Dental and oral health deserve serious attention in Indonesia, especially from dentists, as dental and oral diseases affect 90% of the population. In this country, diseases of tooth-supporting tissues and dental caries contribute to the majority of dental and oral diseases (Nurhidayat 2012; Soulissa et al. 2020). The burden of these diseases is reflected in the results of the 2004 Indonesian Household Health Survey (IHHS) that shows 96.58% of the Indonesian population suffers from periodontal diseases.

Gingivitis is a disease caused by microorganisms that form a colony and dental plaque, which then attach to the gingival margin (Page 1986). The formation of plaque, a sticky biofilm that adheres to the surface of the tooth, is a major cause of periodontal disease (Larsen & Fiehn 2017).

DOI: 10.1201/9781003402374-64

Thus, to reduce the prevalence and severity of periodontal diseases, simple prevention measures that can mechanically and chemically control plaque formation are essential (Haytac et al. 2013).

Mouthwash can eliminate microorganisms by destroying bacterial cell walls and inhibiting bac-terial enzymatic activities in addition to controlling plaque (Sharma et al. 2004). In general, mouthwash eliminates or kills bacteria. It also works as an astringent, eliminates bad breath, and has a therapeutic effect of reducing inflammation and preventing caries formation. This therapeutic effect is obtained by adding certain ingredients to the composition, such as fluoride and antibacterial active ingredients in the form of chlorhexidine and essential oils (Marchetti et al. 2011).

Chlorhexidine-containing mouthwash is recommended by the American Dental Association (ADA) as it can inhibit plaque formation and is effective against various microorganisms. However, chlorhexidine has several side effects, such as mucosal irritation, temporary burning sensation, and staining of teeth (Kidd & Fejerskov 2004). Thus, safe, cheap, and easily accessible alternatives are needed. Coconut oil is one type of oil consumed in many tropical countries.

Coconut oil consists of90% saturated fatty acids, with 50% lauric acid content, which has demonstrated anti-inflammatory and antimicrobial properties (DebMandal & Mandal 2011; Ogbolu et al. 2007; Verallo-Rowell et al. 2008). Research has shown that coconut oil can reduce the amount of Streptococcus mutans and Candida albicans in an in vitro oral biofilm model (Kaushik et al. 2016; Thaweboon et al. 2011). In addition, this oil also contains monolaurin, which is effective to kill Escherichia vulneris, Enterobacter spp, Helicobacter pylori, Staphylococcus aureus, and Candida spp., including Candida albicans, Candida glabrata, Candida tropicalis, Candida parapsilosis, Candida stellatoidea, and Candida krusei (Ogbolu et al. 2007; Verallo-Rowell et al. 2008).

Coconut is abundant in Indonesia. However, its potential uses have not been fully explored and people only use it as cooking oil. Recently, coconut oil has attracted lots of attention from the medical research field. A study conducted on the usage of 12.5% virgin coconut oil as mouthwash resulted in the possibility of plaque index decrease in patients wearing fixed prosthetic dentures (Saputra et al. 2018). Hence, this study seeks to contribute to research that explores the potential use of coconut oil in medical and dental fields by examining the effectiveness of gargling using 100% coconut oil to prevent plaque accumulation and gingival bleeding.

2 METHODS

This clinical trial study with a pre-post test control group design was conducted at the Faculty of Dentistry, Universitas Trisakti Dental Hospital, from November to December 2018. This research has received ethical approval from the Health Research Ethics Commission Faculty of Dentistry, Universitas Trisakti with reference number 199/S2/KEPK/FKG/10/2018. All patients have given their informed consent before their participation in this study. The population of this study was patients of the hospital with a sample size of 30. Samples were divided into the treatment (n=20) and positive control (n=10) groups using the simple random sampling technique. Measurements were taken before and after treatment. The Oral Hygiene Index-Simplified (OHI-S) and Papillary Bleeding Index (PBI) scores were recorded before treatment (day 0). The treatment group then received 100% coconut oil while the control group received 0.1% chlorhexidine mouthwash. Each participant also received a toothbrush, toothpaste, and a measuring cup. Participants were given instructions to gargle using 15 mL of 100% coconut oil or 15 mL of 0.1% chlorhexidine mouthwash for 30 seconds after brushing their teeth twice a day, in the morning and at night before going to bed. On the 10th day, the OHI-S and PBI scores were again measured and further data analysis was performed.

2.1 Statistical analysis

The software program SPSS version 24.0 (IBM, USA) was used to analyze data collected in this study, with a confidence level of 95%. Statistical significance was considered to be obtained if the p-value was <0.05. The paired t-test was used to assess the difference in mean OHI-S and PBI scores before and after gargling with 100% coconut oil and 0.1% chlorhexidine mouthwash on Day 0 (before) and Day 10 (after) while the unpaired t-test was applied to identify the difference in

the OHI-S and PBI score mean differences between gargling with 100% coconut oil and 0.1% chlorhexidine mouthwash on day 0 (before) and 10 (after).

3 RESULTS

More men participated in the study (n=16, 53.33%) than women (n= 14, 46.67%). In terms of age, 15 participants were in the category of 20-39 years (50%), 14 participants were aged 40-59 years (46.67%), and 1 was 60 years old (3.33%). Table 1 presents the mean and standard deviation of the OHI-S scores for the treatment and the positive control groups in this study.

Table 1. Distribution of mean OHI scores in treatment group and positive control group.

	Treatment (100% coconut oil)		Positive control (0.1% chlorhexidine)	
Day	n	$x\pm$ SD	n	$x\pm$ SD
0	20	2.44 ±0.47	10	2.70 ±0.50
10	20	1.64 ±0.43	10	1.85 ±0.68

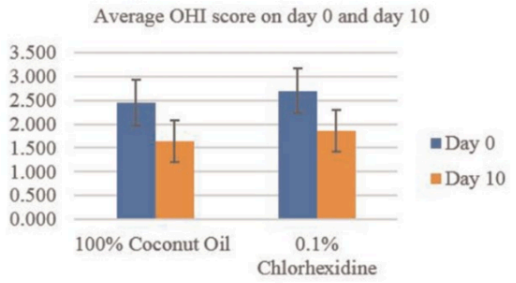

Figure 1. Mean OHI-S scores in treatment and positive control groups.

Based on Figure 1, there was a decrease in the treatment group and the positive control group on day 10. Table 2 lists the mean and standard deviation of the PBI scores for the treatment and positive control groups.

Table 2. Distribution of mean PBI scores in the treatment group and positive control group.

	Treatment (100% coconut oil)		Positive control (0.1% chlorhexidine)	
Day	n	$x\pm$ SD	n	$x\pm$ SD
0	20	1.01 ±0.26	10	1.05 ±0.29
10	20	0.68 ±0.33	10	0.75 ±0.30

The mean and standard deviation of the PBI scores in the treatment group on day 0 and day 10 were 1.010.26 and 0.680.33, respectively, with a decrease of 0.33. The mean and standard deviation of the PBI scores for the positive control group on day 0 and day 10 were 1.050.29 and 0.750.30, respectively, with a decrease of 0.30.

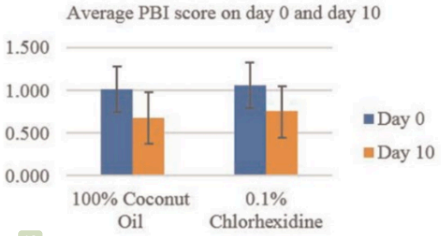

Figure 2. Mean PBI scores in the treatment group and positive control group.

Based on Figure 2, there was a decrease in the treatment group and the positive control group on day 10. The Shapiro-Wilk test was used to analyze the normality of this data. The data were found to be normally distributed ($p > 0.05$).

Table 3. OHI-S score on day 0 and day 10.

Variable	n	OHI-S. Score (Day 0) $x\pm$ SD	OHI-S. Score (10th day) $x\pm$ SD	P-value
100% Coconut Oil	20	2.47 ±0.53	1.63 ±0.41	p = 0.000*
0.1% Chlorhexidine	10	2.63 ±0.54	2.21 ±0.80	p = 0.006*

Note: (*) indicates a significant paired *T*-test with a p-value < 0.05

Table 3 presents the mean and standard deviation of OHI-S scores for the treatment group (100% coconut oil) and positive control group (chlorhexidine 0.1%) on day 0 and day 10. Statistically, the difference between pre- and post-intervention for both the treatment group and the positive control group was significant with a p-value <0.05.

Table 4. Difference in mean OHI-S scores of the treatment group and positive control group.

Variable	OHI-S. score difference $x\pm$ SD	Statistical Analysis Result
100% Coconut Oil	0.79 ±0.67	
0.1% Chlorhexidine	0.85 ±0.74	p = 0.980

The results of the unpaired t-test showed that there was no significant difference in the mean difference in OHI-S scores between the treatment group and the positive control group.

Table 5. PBI scores on day 0 and day 10.

Variable	n	PBI Score (day 0) x± SD	PBI Score (day 10) x± SD	P-value
100% Coconut Oil	20	1.01 ±0.26	0.68 ±0.33	p = 0.001*
0.1% Chlorhexidine	10	1.05 ±0.29	0.75 ±0.30	p = 0.001*

Notes: (*) indicates a significant paired *T*-test with a p-value < 0.05

Statistically, there was a significant difference between pre-and post-intervention for both treatment and positive control groups with a p-value of 0.001.

Table 6. Difference in mean PBI scores of the treatment group and positive control group.

Variable	PBI score difference x± SD	Statistical Analysis Result
100% Coconut Oil	0.33 ±0.35	p = 0.825
0.1% Chlorhexidine	0.30 ±0.19	

The results of the unpaired t-test (unpaired t-test) showed no significant difference was identi-fied in the mean difference in PBI scores between the treatment and the positive control groups.

4 DISCUSSION

Gingivitis is a commonly found disease in tooth-supporting tissues, which is usually caused by poor oral hygiene habits and precedes the onset of periodontitis. A plaque-forming microbial colony that is attached to the gingival margin is the primary cause of gingivitis (Larsen & Fiehn 2017).

This study demonstrated that participants in the treatment group who gargled with 100% coconut oil showed a significant decrease in the average OHI-S score and PBI score on day 10. This supports the findings of Peedikayil et al. (2015) who reported that participants who gargled coconut oil using the oil-pulling method experience a significant reduction in plaque score on Day 7. The decrease in score was caused by the high saponification activity of the coconut oil and its sodium laureate content, which is also the main substance of soap, making it a good and effective cleaning agent to reduce plaque adhesion and accumulation (Peedikayil et al. 2016).

This study adds to prior research's findings that suggested coconut oil is an effective agent to kill Gram-positive and Gram-negative bacteria, including Escherichia vulneris, Enterobacter spp., Helicobacter pylori, Staphylococcus aureus, C. albicans, C. glabrata, C. tropicalis, C. parapsilosis., C. stellatoidea, and C. krusei (Ogbolu et al. 2007). The positive control group that gargled 0.1% chlorhexidine mouthwash in this study also showed a significant decrease in the mean OHI-S score and PBI score on Day 10. This might be due to the mechanism of action of chlorhexidine where its cation molecule attaches to the negative part of the microbial cell wall, causing damage to the cell membrane, and triggering the cell to die.

A study by Kumar (2017) in Chennai, India, demonstrated the ability of chlorhexidine to damage cell membranes in an in vitro study where chlorhexidine effectively kills almost 100% of Gram-positive and Gram-negative bacteria within 30 seconds. Furthermore, in a comparative study of the antibacterial effectiveness ofcoconut oil and chlorhexidine against S. mutans in vivo,a significant decrease in the number of S. mutans is seen both in the coconut oil and chlorhexidine groups. Thus, it can be concluded that against S. mutans, coconut oil is just as effective as chlorhexidine due to its antibacterial ability (Peedikayil et al. 2015).

This study also presented a similar result with no significant difference in the mean difference of OHI-S score and PBI score between the group that gargled 100% coconut oil and the group that gargled 0.1% chlorhexidine. The study by Owittayakul et al. (2018) about gargling coconut oil using the oil-pulling method also gave the same results; there was no difference in the reduction in the percentage of total bacteria, and it was observed that there was a reduced number of S. mutans in both coconut oil group and the 0.12% chlorhexidine group. Thus, to reduce plaque accumulation and the severity of gingivitis, coconut oil can be used as a sub-stitute for mouthwash.

5 CONCLUSION

Gargling using 100% coconut oil is effective against plaque accumulation and gingival bleeding. There is a significant difference in the mean OHI-S and PBI scores before and after gargling for 10 days with 100% coconut oil. There is also no significant difference observed between the mean difference in OHI-S and PBI scores before and after gargling with 100% coconut oil and 0.1% chlorhexidine.

CONFLICT OF INTEREST

The authors declare no conflict of interest regarding the publication of this paper.

REFERENCES

DebMandal, M., & Mandal, S. 2011. Coconut (Cocos nucifera L.: Arecaceae): in health promotion and disease prevention. Asian Pacific Journal ofTropical Medicine 4(3): 241–247.
Haytac, M.C., Ozcelik, O., & Mariotti, A. 2013. Periodontal disease in men. Periodontology 2000 61(1): 252–265.

Kaushik, M., Reddy, P., Sharma, R., Udameshi, P., Mehra, N.&, & Marwaha, A. 2016. The Effect ofcoconut oil pulling on streptococcus mutans count in saliva in comparison with chlorhexidine mouthwash. The Journal ofContemporary Dental Practice 17(1): 38–41.

Kidd, E.A.M., & Fejerskov, O. 2004. What constitutes dental caries? Histopathology of carious enamel and dentin related to the action of cariogenic biofilms. Journal ofDental Research 83(1_suppl): 35–38.

Kumar, S.B. 2017. Chlorhexidine mouthwash-a review. Journal ofPharmaceutical Sciences and Research 9(9): 1450.

Larsen, T., & Fiehn, N. 2017. Dental biofilm infections–an update. Apmis 125(4): 376–384. Marchetti, E., Mummolo, S., Di Mattia, J., Casalena, F., Di Martino, S., Mattei, A., & Marzo, G. 2011. Efficacy of essential oil mouthwash with and without alcohol: a 3-day plaque accumulation model. Trials 12: 1–7.

Nurhidayat, O. 2012. Perbandingan media power point dengan flip chart dalam meningkatkan pengeta-huankesehatan gigi dan mulut. Unnes Journal ofPublic Health 1(1).

Ogbolu, D.O., Oni, A.A., Daini, O.A., & Oloko, A.P. 2007. In vitro antimicrobial properties of coconut oil on Candida species in Ibadan, Nigeria. Journal ofMedicinal Food 10(2): 384–387.

Owittayakul, D., Palee, K., Khongkhunthian, S.&, & Wanachantararak, P. 2018. Effect of coconut oil on salivary total bacterial and streptococcus mutans counts. Chiang Mai Dental Journal 39(1): 75–83.

Page, R.C. 1986. Gingivitis. Journal ofClinical Periodontology 13(5): 345–355.

Peedikayil, F.C., Remy, V., John, S., Chandru, T.P., Sreenivasan, P., &, & Bijapur, G.A. 2016. Comparison of antibacterial efficacy of coconut oil and chlorhexidine on streptococcus mutans: An in vivo study. Journal ofInternational Society ofPreventive & Community Dentistry 6(5): 447–452.

Peedikayil, F.C., Sreenivasan, P., &, & Narayanan, A. 2015. Effect of coconut oil in plaque related gingivitis - A preliminary report. Nigerian Medical Journal: Journal of the Nigeria Medical Association 56(2): 143–147.

Saputra, L., Gita, F., & & Dewi, R.. 2018. Effect of 12.5% virgin coconut oil (Cocos nucifera) mouthwash on plaque index of fixed prosthetic denture users. International Journal ofApplied Pharmaceutics 9: 41–44.

Sharma, N., Charles, C.H., Lynch, M.C., Qaqish, J., McGuire, J.A., Galustians, J.G., & Kumar, L.D. 2004. Adjunctive benefit of an essential oil–containing mouthrinse in reducing plaque and gingivitis in patients who brush and floss regularly: a six-month study. The Journal ofthe American Dental Association 135(4): 496–504.

Soulissa, A.G., Afifah, J., & Widyarman, A.S. 2020. The effect of tea tree oil in inhibiting the adhesion of pathogenic periodontal biofilms in vitro. Scientific Dental Journal 4(3): 88.

Thaweboon, S., Nakaparksin, J.&, & Thaweboon, B. 2011. Effect of oil-pulling on oral microorganisms in biofilm models. Asia Journal ofPublic Health 2(2): 62–66.

Verallo-Rowell, V.M., Dillague, K.M., & Syah-Tjundawan, B.S. 2008. Novel antibacterial and emollient effects of coconut and virgin olive oils in adult atopic dermatitis. DERM 19(6): 308–315.

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by Wita Anggraini FKG

Submission date: 13-Aug-2024 02:38PM (UTC+0700)
Submission ID: 2380818727
File name: ut_oil_to_prevent_plaque_accumulation_and_gingival_bleeding.docx (703.91K)
Word count: 2644
Character count: 14666

Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges – Widyarman et al. (Eds)

Effectiveness of gargling with 100% coconut oil to prevent plaque accumulation and gingival bleeding

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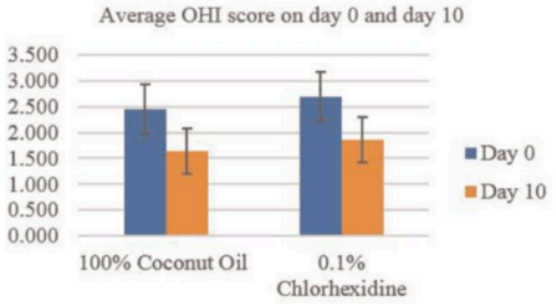

Figure 1. Mean OHI-S scores in treatment and positive control groups.

Based on Figure 1, there was a decrease in the treatment group and the positive control group on day 10. Table 2 lists the mean and standard deviation of the PBI scores for the treatment and positive control groups.

Table 2. Distribution of mean PBI scores in the treatment group and positive control group.

	Treatment (100% coconut oil)		Positive control (0.1% chlorhexidine)	
Day	n	$x\pm$ SD	n	$x\pm$ SD
0	20	1.01 ±0.26	10	1.05 ±0.29
10	20	0.68 ±0.33	10	0.75 ±0.30

The mean and standard deviation of the PBI scores in the treatment group on day 0 and day 10 were 1.010.26 and 0.680.33, respectively, with a decrease of 0.33. The mean and standard deviation of the PBI scores for the positive control group on day 0 and day 10 were 1.050.29 and 0.750.30, respectively, with a decrease of 0.30.

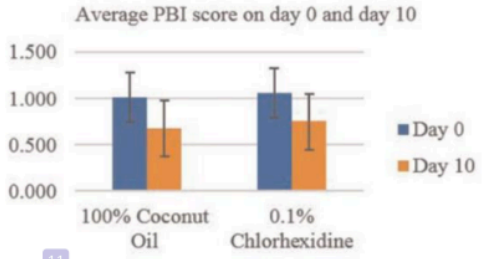

Figure 2. Mean PBI scores in the treatment group and positive control group.

Based on Figure 2, there was a decrease in the treatment group and the positive control group on day 10. The Shapiro-Wilk test was used to analyze the normality of this data. The data were found to be normally distributed ($p > 0.05$).

Table 3. OHI-S score on day 0 and day 10.

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0.1% Chlorhexidine	10	2.63 ±0.54	2.21 ±0.80	p = 0.006*

Note: (*) indicates a significant paired *T*-test with a p-value < 0.05

Table 3 presents the mean and standard deviation of OHI-S scores for the treatment group (100% coconut oil) and positive control group (chlorhexidine 0.1%) on day 0 and day 10. Statistically, the difference between pre- and post-intervention for both the treatment group and the positive control group was significant with a p-value <0.05.

Table 4. Difference in mean OHI-S scores of the treatment group and positive control group.

Variable	OHI-S. score difference $x\pm$ SD	Statistical Analysis Result
100% Coconut Oil	0.79 ±0.67	
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The results of the unpaired t-test showed that there was no significant difference in the mean difference in OHI-S scores between the treatment group and the positive control group.

Table 5. PBI scores on day 0 and day 10.

Variable	n	PBI Score (day 0) x± SD	PBI Score (day 10) x± SD	P-value
100% Coconut Oil	20	1.01 ±0.26	0.68 ±0.33	p = 0.001*
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Notes: (*) indicates a significant paired *T*-test with a p-value < 0.05

Statistically, there was a significant difference between pre-and post-intervention for both treatment and positive control groups with a p-value of 0.001.

Table 6. Difference in mean PBI scores of the treatment group and positive control group.

Variable	PBI score difference x± SD	Statistical Analysis Result
100% Coconut Oil	0.33 ±0.35	p = 0.825
0.1% Chlorhexidine	0.30 ±0.19	

The results of the unpaired t-test (unpaired t-test) showed no significant difference was identi-fied in the mean difference in PBI scores between the treatment and the positive control groups.

4 DISCUSSION

Gingivitis is a commonly found disease in tooth-supporting tissues, which is usually caused by poor oral hygiene habits and precedes the onset of periodontitis. A plaque-forming microbial colony that is attached to the gingival margin is the primary cause of gingivitis (Larsen & Fiehn 2017).

This study demonstrated that participants in the treatment group who gargled with 100% coconut oil showed a significant decrease in the average OHI-S score and PBI score on day 10. This supports the findings of Peedikayil et al. (2015) who reported that participants who gargled coconut oil using the oil-pulling method experience a significant reduction in plaque score on Day 7. The decrease in score was caused by the high saponification activity of the coconut oil and its sodium laureate content, which is also the main substance of soap, making it a good and effective cleaning agent to reduce plaque adhesion and accumulation (Peedikayil et al. 2016).

This study adds to prior research's findings that suggested coconut oil is an effective agent to kill Gram-positive and Gram-negative bacteria, including Escherichia vulneris, Enterobacter spp., Helicobacter pylori, Staphylococcus aureus, C. albicans, C. glabrata, C. tropicalis, C. parapsilosis., C. stellatoidea, and C. krusei (Ogbolu et al. 2007). The positive control group that gargled 0.1% chlorhexidine mouthwash in this study also showed a significant decrease in the mean OHI-S score and PBI score on Day 10. This might be due to the mechanism of action of chlorhexidine where its cation molecule attaches to the negative part of the microbial cell wall, causing damage to the cell membrane, and triggering the cell to die.

A study by Kumar (2017) in Chennai, India, demonstrated the ability of chlorhexidine to damage cell membranes in an in vitro study where chlorhexidine effectively kills almost 100% of Gram-positive and Gram-negative bacteria within 30 seconds. Furthermore, in a comparative study of the antibacterial effectiveness ofcoconut oil and chlorhexidine against S. mutans in vivo,a significant decrease in the number of S. mutans is seen both in the coconut oil and chlorhexidine groups. Thus, it can be concluded that against S. mutans, coconut oil is just as effective as chlorhexidine due to its antibacterial ability (Peedikayil et al. 2015).

This study also presented a similar result with no significant difference in the mean difference of OHI-S score and PBI score between the group that gargled 100% coconut oil and the group that gargled 0.1% chlorhexidine. The study by Owittayakul et al. (2018) about gargling coconut oil using the oil-pulling method also gave the same results; there was no difference in the reduction in the percentage of total bacteria, and it was observed that there was a reduced number of S. mutans in both coconut oil group and the 0.12% chlorhexidine group. Thus, to reduce plaque accumulation and the severity of gingivitis, coconut oil can be used as a sub-stitute for mouthwash.

5 CONCLUSION

Gargling using 100% coconut oil is effective against plaque accumulation and gingival bleeding. There is a significant difference in the mean OHI-S and PBI scores before and after gargling for 10 days with 100% coconut oil. There is also no significant difference observed between the mean difference in OHI-S and PBI scores before and after gargling with 100% coconut oil and 0.1% chlorhexidine.

CONFLICT OF INTEREST

The authors declare no conflict of interest regarding the publication of this paper.

REFERENCES

DebMandal, M., & Mandal, S. 2011. Coconut (Cocos nucifera L.: Arecaceae): in health promotion and disease prevention. Asian Pacific Journal ofTropical Medicine 4(3): 241–247.

Haytac, M.C., Ozcelik, O., & Mariotti, A. 2013. Periodontal disease in men. Periodontology 2000 61(1): 252–265.

Kaushik, M., Reddy, P., Sharma, R., Udameshi, P., Mehra, N.&, & Marwaha, A. 2016. The Effect ofcoconut oil pulling on streptococcus mutans count in saliva in comparison with chlorhexidine mouthwash. The Journal ofContemporary Dental Practice 17(1): 38–41.

Kidd, E.A.M., & Fejerskov, O. 2004. What constitutes dental caries? Histopathology of carious enamel and dentin related to the action of cariogenic biofilms. Journal ofDental Research 83(1_suppl): 35–38.

Kumar, S.B. 2017. Chlorhexidine mouthwash-a review. Journal ofPharmaceutical Sciences and Research 9(9): 1450.

Larsen, T., & Fiehn, N. 2017. Dental biofilm infections–an update. Apmis 125(4): 376–384. Marchetti, E., Mummolo, S., Di Mattia, J., Casalena, F., Di Martino, S., Mattei, A., & Marzo, G. 2011. Efficacy of essential oil mouthwash with and without alcohol: a 3-day plaque accumulation model. Trials 12: 1–7.

Nurhidayat, O. 2012. Perbandingan media power point dengan flip chart dalam meningkatkan pengeta-huankesehatan gigi dan mulut. Unnes Journal ofPublic Health 1(1).

Ogbolu, D.O., Oni, A.A., Daini, O.A., & Oloko, A.P. 2007. In vitro antimicrobial properties of coconut oil on Candida species in Ibadan, Nigeria. Journal ofMedicinal Food 10(2): 384–387.

Owittayakul, D., Palee, K., Khongkhunthian, S.&, & Wanachantararak, P. 2018. Effect of coconut oil on salivary total bacterial and streptococcus mutans counts. Chiang Mai Dental Journal 39(1): 75–83.

Page, R.C. 1986. Gingivitis. Journal ofClinical Periodontology 13(5): 345–355.

Peedikayil, F.C., Remy, V., John, S., Chandru, T.P., Sreenivasan, P., &, & Bijapur, G.A. 2016. Comparison of antibacterial efficacy of coconut oil and chlorhexidine on streptococcus mutans: An in vivo study. Journal ofInternational Society ofPreventive & Community Dentistry 6(5): 447–452.

Peedikayil, F.C., Sreenivasan, P., &, & Narayanan, A. 2015. Effect of coconut oil in plaque related gingivitis - A preliminary report. Nigerian Medical Journal: Journal of the Nigeria Medical Association 56(2): 143–147.

Saputra, L., Gita, F., & & Dewi, R.. 2018. Effect of 12.5% virgin coconut oil (Cocos nucifera) mouthwash on plaque index of fixed prosthetic denture users. International Journal ofApplied Pharmaceutics 9: 41–44.

Sharma, N., Charles, C.H., Lynch, M.C., Qaqish, J., McGuire, J.A., Galustians, J.G., & Kumar, L.D. 2004. Adjunctive benefit of an essential oil–containing mouthrinse in reducing plaque and gingivitis in patients who brush and floss regularly: a six-month study. The Journal ofthe American Dental Association 135(4): 496–504.

Soulissa, A.G., Afifah, J., & Widyarman, A.S. 2020. The effect of tea tree oil in inhibiting the adhesion of pathogenic periodontal biofilms in vitro. Scientific Dental Journal 4(3): 88.

Thaweboon, S., Nakaparksin, J.&, & Thaweboon, B. 2011. Effect of oil-pulling on oral microorganisms in biofilm models. Asia Journal ofPublic Health 2(2): 62–66.

Verallo-Rowell, V.M., Dillague, K.M., & Syah-Tjundawan, B.S. 2008. Novel antibacterial and emollient effects of coconut and virgin olive oils in adult atopic dermatitis. DERM 19(6): 308–315.

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