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Khat chewing habit produces a significant adverse effect on the periodontal oral health : a systematic review and meta-analysis

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All authors has nothing to disclosure

Running head :

Khat chewing and periodontal diseases

Abstract

Background

We aimed to investigate the influence of khat chewing habits on the periodontal oral health, by means of comparing khat chewers to non-chewers in respect of gingival recession, periodontal pocketing depth and loss of attachment.

Material and Methods

We conducted a systematic review and meta-analysis based on the PRISMA guidelines. We searched PubMed, the Cochrane Library, Web of Science, Scopus and grey literature. The inclusion criteria were all studies with aims of comparing khat chewers and/or sides to non-chewers and/or sides in respect of gingival recession, periodontal pocketing depth and loss of attachment. For continuous data, we computed a weighted mean differences (WMD) or standard mean difference (SMD) analyses. An odds ratio (OR) using a random effect model, if heterogeneity was detected; otherwise, a fixed effects model with a 95% confidence interval was used for continuous data. Two subgroups were analyzed : khat chewers versus non-chewers and khat chewers sides versus non-chewers sides of the chewers individuals.

Results

A total of 6192 participants were enrolled in 12 studies (khat chewers = 3513, non-chewers = 2679). There were statistically significant differences between khat and no-chewers in both subgroups analyses regarding gingival recession, periodontal pocketing depth and loss of attachment ($P < 0.05$).

The OR for khat chewers compared to non-chewers , in respect of depth of periodontal pocket and gingival recession were 2.071 and 6.99 respectively .

Conclusion

The results of this meta-analysis have shown that khat chewing habit produce a destructive and adverse effect on the periodontal oral health.

Introduction

Catha Edulis Forsk (khat) is a plant-reported to have a stimulant effect similar to that of amphetamines-grown and used by eastern African communities worldwide (i.e. Yemen, Ethiopia , Somalia and Kenya) (Nencini & Ahmed 1989).

More than 20 million people in Yemen and eastern African countries chew and store fresh leaves of khat for several hours on a daily basis (Al-Motarreb et al. 2002a , b).

Systemically , khat habit chewing caused substantial adverse effect namely : increased blood pressure, tachycardia, insomnia, anorexia, constipation, a sense of general malaise, irritability, reactive depression, migraine, and impaired sexual potency in men (WHO 2003, Hassan et al. 2000).

Locally, several oral manifestations including increase in the incidence of periodontal disease, stomatitis, plasma cell gingivitis. reduced periodontal pocket depth (Hill & Gibson 1987, Rosenzweig & Smith 1966, Luqman & Danowski 1976, Marker & Krogh 2002). Additionally, oral white lesions and keratosis had reported by some studies (Gorsky et al. 2004, Ali et al. 2004).

Although , there is common concept that the periodontal disease is more severe among khat chewers compared to non-chewer. However, there is a conflicting data have been documented in the available literature. Some studies reported that khat chewing habit associated with a deleterious impact on the periodontal status (Mengel et al. 1996, Ali 2007). Others studies reported that khat chewing habit could be improving the status of oral

hygiene , because of antiplaque and antigingivitis features of the khat leaves (Al-Hebshi & Al-Ak'hali 2010, Jorgensen & Kaimenyi 1990).

As there is no a systematic review and meta-analysis focused on the association between khat chewing and gingival recession, periodontal pocketing depth and loss of attachment. Additionally, no clear picture, whether, khat chewing habit has a benefited or a deleterious impact on the periodontal status. Thus, authors of this study hypothesized that there is no difference between khat chewing patients/ chewing side and non-chewing patients / non-chewing side.

The specific aims was to compare between khat chewing patients a/ chewing side and non-chewing patients / non-chewing side in respect of the gingival recession, periodontal pocketing depth and loss of attachment.

Material and methods

Our systematic review followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement for reporting systematic reviews (Liberati et al. 2009).

Focused clinical research question

Our research question was: do khat chewing habit produce adverse effect on periodontal pocketing depth, gingival recession and loss of attachment?

Literature search strategy

The search strategy included both published and unpublished studies (grey literature) in English, covering the period 1990 to July 2016 . The databases searched involved: PubMed, Ovid MEDLINE, Cochrane CENTRAL and

other grey literature as thesis in the libraries at the faculty of dentistry, Sana'a University ,Yemen and Faculty of Oral and Dental Medicine ,Cairo University, Egypt.

The search strategy was based specific keywords using one or combination of the following keywords: qat OR gat OR *Catha edulis* OR miraa khat AND periodontal, periodontal health, khat AND pocket, khat AND periodontal pocket, khat AND recession, khat AND gingival, khat AND gingival recession, khat AND attachment level, khat AND attachment, khat AND attachment loss. To avoid missing any articles, the references of each selected publication that yielded from an electronic search were performed by Google Scholar and by hand.

Study eligibility

Inclusion criteria

The inclusion criteria were adopted utilizing the following PICOS components. Population (P): Individuals who provided a history of chewing khat and those persons who had never used the khat .Intervention (I) : Individuals who provided a history of chewing khat for 2 times a week for 3 years Comparator (C): Individual who had never used khat. Outcome (O): Periodontal pocketing depth ,gingival recession and loss of attachment . Study Design (S): A prospective randomized controlled clinical trials, controlled clinical studies either prospective or retrospective, and case-control studies that investigated the impact of the khat chewing habit in respect of periodontal pocket depth, gingival recession and loss of attachment .

Exclusion criteria

Articles were excluded when: 1) studies that did not state a required data (means, SD) to perform a meta-analysis; 2) review papers; 3) experimental studies.

Data extraction process

The evaluating process of articles and eligibility of retrieved articles were reviewed by two independent reviewers. Any disagreement between them was resolved by discussion. The following data were extracted (when available) from the included studies: authors, year of publication, study design, number of patients, gender, mean age in years. The data were extracted and presented in Table 1.

Critical appraisal of individual studies

Assessment of bias for each included study was conducted independently by the two authors according to the domain-based assessment described in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins & Green 2011). The following specific domains were used: sequence generation, allocation concealment, blinding, and incomplete outcome data. The domains were considered as 'Yes' (low risk of bias), 'Unclear' (uncertain risk of bias), or 'No' (high risk of bias)

Summary measures

The predictor variables were study (khat chewing user or khat chewing sides) and control groups (non-chewing users or non-khat chewing sides). The outcome variables were gingival recession , periodontal pocketing depth and loss of attachment .

Synthesis of results

Meta-analysis was conducted only if there were studies of similar comparisons reporting the same outcome measures. For dichotomous outcomes, authors calculated a standard estimation of the odds ratio (OR) by the random-effects model if heterogeneity was detected; otherwise, a fixed-effects model with a 95% confidence interval (CI) was performed. Weighted mean differences (WMDs) or standard mean differences (SMD) (if the included studies have used different instrument to measure the same outcome) were used to construct forest plots of continuous data. Analysis of Outcomes variables was performed by subgroup analysis based on whether control group consisted of either volunteer, non-chewing individual or non-chewing side for the same chewer individuals. Thus, included studies dividing into two categories, chewing individual versus non chewing individual and chewing sides versus non chewing sides in respect of each outcome. The data were analyzed using Comprehensive meta-analysis version 2.17 (Borenstein et al. 2009).

Results

Literature search

Results Search outcome

Figure 1 clarifies the process of evaluating articles for inclusion in the review and meta-analysis. The search strategy yielded a total of 325 articles from all databases and 2 additional articles identified from grey literature. Of 328 articles, 92 were duplicates and removed, 135 articles were excluded after reading the titles and abstracts, and full-text articles of the remaining 101 studies were reviewed independently by two authors for eligibility (E.A

and M.S) of which 89 studies were excluded because they did not meet the inclusion criteria. Finally, a total of 12 studies met the inclusion criteria and were processed for critical review Table (1).

Description of studies included

The details of included studies are presented in Table 1.

Risk of bias within studies included

All included studies were a moderate risk of bias. The details of critical appraisal are presented in Table 2

Results of the outcomes variables

A. Dichotomous data

1. Depth of periodontal pocket

Three studies with 2733 participants (khat chewers = 2039. non-chewers = 694) investigated depth of the periodontal pocket (Hill & Gibson 1987, Aiman 2007, Al-Kholani 2010). There was significant difference between 2 groups (random; OR = 4.797 ; 95%, 1.71 to 13.410, P = 0.003). There was significant heterogeneity among studies ($I^2 = 78\%$; P = .009), Thus , a random effect model was used. (Fig 2).

2. Gingival recession in millimeter

Three studies with 3880 participants (khat chewers = 2354, non-chewers = 1526) investigated depth of the gingival recession (Aiman 2007, Al-Kholani 2010, Al-Sharabi 2013). There was significant difference between the 2 groups (random; RR = 6.8 ; 95%, 2.65 to 17.67, P = 0.001). OR was 6.99, meaning that habitual khat chewing increase an incidence of gingival

recession by 6.99 times that those non-chewer group. There was significant heterogeneity among studies ($I^2 = 96\%$; $P = .0.000$), Thus , a random effect model was used. (Fig 2).

2. Continuous data

A. Khat-chewers versus non-khat chewers

1. Depth of periodontal pocket

A total of 933 participants enrolled in three studies (khat chewers = 739, non-chewers = 194) that assessed depth of the periodontal pocket (Al-Akhali & Al-Safi 2002, Al-Hebshi & Skaug 2005, Al-Hajri et al. 2013). There was significant difference between the 2 groups (random; SMD = 0.364 ; 95%, 0.202- 0.526, $P = 0.001$). There was significant heterogeneity among studies, thus a random effect model was used ($I^2 = 94\%$; $P = .000$. (Fig 3).

2. Gingival recession

Two studies with 407 participants (khat chewers = 325, Non-chewers = 82) assessed incidence of the gingival recession (Al-Akhali & Al-Safi 2002, Yarom et al. 2010). There was significant differences between the 2 groups (fixed; SMD = 0.225 ; 95%, 0.007- 0.061, $P = 0.011$). There was no heterogeneity among studies ($I^2 = 0.00\%$; $P = 0.27$. (Fig 3).

3. Attachment loss

Four studies with 958 participants (khat chewers = 754, non-chewers= 204) assessed the incidence of attachment loss (Al-Akhali & Al-Safi 2002, Al-Hebshi & Skaug 2005, Al-Hajri et al. 2013, Dhaifullah et a.l. 2015). There was significant difference between the 2 groups (random; SMD = 0.620;

95%, 0.460- 0.780, $P = 0.001$). There was heterogeneity among studies ($I^2 = 83\%$; $P = 0.000$), therefore, a random effect model was performed (Fig 3).

B. Chewing sides versus non chewing sides

1. Depth of periodontal pocket

A total of 661 participants enrolled in four studies (khat chewers sides = 661, non-chewers sides = 661) that assessed depth of the periodontal pocket (Al-Akhali & Al-Safi 2002, Al-Hebshi & Skaug 2005, Yarom et al. 2010, Al-Hajri et al. 2013). There was significant between the 2 groups (random; SMD = 0.268 ; 95%, 0.159- 0.377, $P = 0.001$). There was significant heterogeneity among studies, thus, a random effect model was used ($I^2 = 92\%$; $P = .000$). (Fig 4).

2. Gingival recession

Three studies with 267 participants (khat chewers sides = 267, non-chewers = 267) assessed incidence of gingival recession (Al-Akhali & Al-Safi 2002, Al-Akhali et al. 2008, Dhaifullah et al. 2015). There was significant difference between the groups (random; SMD = 0.752 ; 95%, 0.566- 0.937, $P = 0.001$). There was significant heterogeneity among studies ($I^2 = 98\%$; $P = 0.000$), thus , a random effect model was used (Fig 4).

3. Attachment loss

Three studies with 443 participants (khat chewing sides = 443, non-chewers sides = 443) assessed incidence of attachment loss (Al-Hebshi & Skaug 2005, Al-Hajri et al. 2013, Dhaifullah et al. 2015). There was significant differences between the 2 groups (random; SMD = 0.389 ; 95%, 0.256-

0.522, $P = 0.001$). There was no heterogeneity among studies ($I^2 = 9\%$; $P = 0.000$) (Fig 4).

Discussion

The objective of the present study was to find the association between khat chewing habit and periodontal status, specifically periodontal depth pocket, gingival recession and loss of attachment. The main key finding of this meta-analysis have shown that khat-chewers have a significance incidence of pocket depth , gingival recession and loss of attachment , when compared to those non-chewers ($P < 0.05$). Additionally, our met-analysis of binary outcomes revealed that khat chewing habit increase an incidence of periodontal pocketing depth by OR of 2.071 and gingival recession by OR of 6.99 , when compared to non-chewers persons. The results of present study are consistent with others studies (Al-Akhali & Al-Safi 2002, Al-Hajri et al. 2013, Al-Akhali et al. 2008, Yarom et al. 2010, Aiman 2007, Al-Kholani 2010, Al-Sharabi 2013, Dhaifullah et al. 2015). and inconsistent with others reports (Hill & Gibson 1987, Mengel et al. 1996, Jorgensen & Kaimenyi 1990, Al-Hebshi & Skaug 2005).

Limitations of this study are, first, because majority of the included studies conducted in Yemen, thus , external validity of this study cant apply to other country due to the chewing habit differ from area to area. Second, there are certain confounder factors can influences an evidence presented by this study namely : amount of khat chewed ,duration of chewing and frequency of khat chewing , smoking and using of toothpick during khat chewing.

Strength of this study are: 1) this systematic review and meta-analysis comprising 12 studies with 3838 participants computed using both

dichotomous and continuous data; 2) assessment of risk within included studies was performed ; 3) all included studies were controlled with either non khat chewers or non khat chewers sides , thus , our results were based on comparison between study group (khat chewers person/sides) and control group (non khat chewers/sides).

In conclusion , the result of this meta-analysis confirm that the adverse effect of khat chewing on three periodontal parameters including : pocket depth, gingival recession and attachment loss. Therefore khat chewing consider detrimental to periodontium.

Figure caption

Figure 1 : Flow diagram of the search strategy (PRISMA).

Figure 2: Forest plot, khat chewers vs non-khat chewers , periodontal pocket and gingival recession, (dichotomous outcomes)

Figure 3: Forest plot, khat chewers vs non-khat chewers , periodontal pocket and gingival recession and attachment loss (continuous outcomes)

Figure 4: Forest plot, khat chewers sides vs non-khat chewers sides , periodontal pocket and gingival recession and attachment loss (continuous outcomes)

Tables 1: Characteristics of the included studies

Table 2 : Critical appraisal of the included studies

References

1. Aiman, A. (2007) Khat Habit in Yemen Society A Causative Factor for Oral Periodontal Diseases. *Int. J. Environ. Res. Public Health* **4**, 243-247.
2. Al-Akhali, MS., Al-Safi, F. (2002) The Periodontal health status of the khat chewers in Yemen Sana'a. *MS Thesis*. Baghdad University College of Dentistry.
3. Al-Akhali, M., Al- Haddad, K., Alsanabani, F. (2008) Tooth lost and gingival recession as a risk factor of khat chewing in Yemen. *Cairo Dental journal* **2**, 171- 176.
4. Al-Hajri, M., El Refaey, M., El-din, Fat.halla G., and Yossef, El-Firt E.(2013) Apoptosis due to Khat chewing analyzed by p53expression in gingival tissue. *Egyptian dental Journal E.D.J* **59**, 1-9.
5. Al-Hebshi, NN., Skaug, N. (2005) Effect of khat chewing on 14 selected periodontal bacteria in sub-and supragingival plaque of a young male population. *Oral Microbiology Immunology* **20**, 141–146.
6. Al-Hebshi, NN., Al-Ak'hali, MS. (2010) Experimental gingivitis in male khat (*Catha edulis*) chewers. *J Int Acad Periodontol* **12**, 56-62.
7. Ali, A., Al-Sharabi, A., Aguirre, JM., Nahas, R. (2004) A study of 342 oral keratotic white lesions induced by qat chewing among 2500 Yemeni. *J Oral Pathol Med* **33**, 368-372.
8. Ali, A. (2007) Qat habit in Yemen society: A causative factor for oral periodontal diseases. *Int J Environ Res Public Health* **4**, 243-247.
9. Al-Kholani, A. (2010) Influence of khat chewing on periodontal tissues and oral hygiene status among Yemenis. *Dent Res J* **7**, 1–6
10. Al-Motarreb, A., Al-Kebsi, M., Al-Adhi, B., Broadley, KJ. (2002a) Khat chewing and acute myocardial infarction. *Heart* **87**, 279-80.

11. Al-Motarreb, A., Baker, K., Broadley, KJ. (2002b) Khat: Pharmacological and medical aspects and its social use in Yemen. *Phytother Res* **16**, 403-13.
12. Al-Sharabi, A. K., Shuga-Aldin, H., Ghandour, I., et al. (2013) Khat chewing as an independent risk factor for periodontitis: a cross-sectional study. *Int J Dent* vol. **2013**, pp. 2013.
13. Borenstein, M., Hedges, L., Higgins J, Rothstein H. (2009) Introduction to Meta-Analysis. Wiley, Chichester UK.
14. Dhaifullah, E., Al-Maweri, SA., Al-Motareb, F., Halboub, E., Elkhatat, E., Baroudi, K., Tarakji, B. (2015) Periodontal Health Condition and Associated Factors among University Students Yemen. *J Clin Diagn Res* **9**, 30-33.
15. Gorsky, M., Epstein, JB., Levi, H., Yarom, N. (2004) Oral white lesions associated with chewing khat. *Tob Induced* **2**:145-50.
16. Hassan, NA., Gunaid, AA., Abdo-Rabbo, AA., Abdel-Kader, ZY, al-Mansoob, MA., et al. (2000) The effect of Qat chewing on blood pressure and heart rate in healthy volunteers. *Trop Doct* **30**, 107-8.
17. Higgins, JPT., Green, S (eds). (2011) Cochrane Handbook for Systematic Reviews of Interventions, Version 5.1.0. *The Cochrane Collaboration*. Available at: <http://www.cochranehandbook.org>. Updated March.
18. Hill, CM., Gibson, A. (1987) The oral and dental effects of khat chewing. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* **63**, 433-436.
19. Jorgensen, E., Kaimenyi JT. (1990) The status of periodontal health and oral hygiene of Miraa (*Catha edulis*) chewers. *East Afr Med J* **67**, 585-590.

20. Liberati, A, Altman, DG., Tetzlaff, J., Mulrow, C., Gøtzsche, PC., Loannidis, JP., et al. (2009) The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions explanation and elaboration. *PLoS Med* **6**, 1–6.
21. Luqman, W., Danowski, TS. (1976) The use of khat in Yemen social and medical observations. *Ann Intern Med* **85**, 246-9.
22. Marker, P., Krogdahl, A. (2002) Plasma cell gingivitis apparently related to the use of khat: report of a case. *Br Dent J* **192**, 311-313.
23. Mengel, R., Eigenbrodt, M., Schunemann, T., Flores-de-Jacoby, L. (1996) Periodontal status of a subject sample of Yemen. *J Clin Periodontol* **23**, 437-443.
24. Nencini, P., Ahmed, AM. (1989) Khat consumption. A pharmacological review. *Drug Alcohol Depend.* **23**, 19-29.
25. Rosenzweig, KA., Smith, P. (1966) Periodontal health in various ethnic groups in Israel. *J Periodontal Res* **1**:250-259.
26. WHO Expert Committee on Drug Dependence. (2003) Thirty-third report. *WHO Tech Rep Ser No. 915*. Geneva: WHO.
27. Yarom, N., Epstein, J., Levi, H., et al. (2010) Oral manifestations of habitual khat chewing: a case-control study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* **109**, 60-66.