The consequence of Khat chewing habit on the periodontal conditions among adults in Sana'a city, Yemen

نتيجة عادة مضغ القات على صحة وحالة اللثة والأسنان للأصحاء البالغين في مدينة صنعاء، اليمن

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ABSTRACT :

***Background and objectives**: Khat chewing is popular among Yemenis. This study was performed to investigate the effects of Khat chewing on periodontal tissue (gum), teeth status and other oral health status. **Methods:** A total of 3000 adult subjects (2400 chewers and 600 non-chewers with a mean age of 29.5 ± 2.9 and 28.6 ± 1.7 years, respectively) were involved in this study in 2014. The Basic Periodontal Examination (BPE) technique that recommended by the British Society of Periodontology was used as screening tool to obtain the picture of the periodontal condition. The rate of the clinical conditions and associated OR were analysis, by comparing their occurrence between Khat chewers and non Khat chewers, then significance was tested by chi-squared test. **Results**: The oral health status of non-chewers was significantly better than that of chewers. The worst sextant score of chewers was a highly significant in which the rate and associated OR of type 4 and type 3 were 8.5% with RR= 18.5 times and 21.7% with 1.9 times respectively, while that of non-chewers were 0.5% and 12.7%, the difference being statistically significant (Pv<0.0001). The incidence of tooth bad conditions as tooth loose, attrition, and staining were significantly higher in Khat-chewers. About 11% of chewers complained of mouth pain, as compared with only about 2% of non-chewers. Furthermore, on oral mucosa ulcer erosion, white patch, red patch, vesicles and creaked were present in 19.5%, 76.7%, 23%, 11% and 25.3% respectively of chewers, as com-pared to 0.3%, 2%, 8%, 0.16% and 1% of non-chewers. Similarly, gingival wrinkled, whitening, redness and recession ulcers on the oral mucosa were present in 56.5%, 52%, 43.7%, and 96.7% respectively of chewers, as com-pared to 3%, 7%, 49%, and 53% of non-chewers. Also significant OR was associated with bad oral mucosa status, bad gingival status, and bad teeth conditions in Khat-chewers. **Conclusion:** There does appear to be a relationship between the terrible effect of chewing Khat on periodontal tissue and oral health status.*

Keywords: Adults, Chewers, Gingival, Sextants, Khat, Oral conditions, Yemen.

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الملخص بالعربي :

الخلفية والأهداف: يعد مَضْغ القات عادة شعبيُة بين اليمنيين. هذه الدراسة أدّيتْ لتَحرّي تأثيراتِ مَضْغ القات على أنسجة اللثة ومنزلة الأسنانِ وكذلك الحالة الصحيَّةِ للفم. **الطرق والأساليب:** تمت الدراسة على مجموعة ٣٠٠٠ إنسان بالغ (٢٤٠٠ يمضغون القات و٦٠٠ لا يمضغون ألقات كان متوسط أعمارهم ٢٩.٥ ± ٢.٩ و٢٨.٦ ± ١.٧ سنوات على التوالي) خلال العام ٢٠١٤. لقد استخدمت التقنية الأساسية لفحص اللثة والأسنان (BPE) والتي توصي بها الجمعية البريطانية للثة والأسنان كأداة فحص للحصول على صورة لحالة اللثة والأسنان. لقد تم تحليل نتائج صور حالة اللثة والأسنان والعوامل المؤثرة والمرتبطة بها ، من خلال مقارنة حدوثها بين من يمضغون القات ومن لا يمضغون القات، ثم تم الاختبارات الإحصائية ومدى أهمية دلالتها بواسطة اختبار كاي التربيعي الإحصائي. **النتائج:** كانت حالة صحة الفم عند الأشخاص الذين لا يمضغون القات، أفضل بكثير من عند الذين يمضغون القات. وكانت أسوأ نتيجة و ذات دلالة إحصائية بالغة لفحص التقنية الأساسية لفحص اللثة والأسنان عند من يمضغون القات حيث أن معدل الارتباط بين الحالة الأساسية لفحص اللثة والأسنان من نوع ٤ و٣ كانت ٨.٥٪ و٢١.٧٪ على التوالي، في حين كان ذلك عند من لا يمضغون القات، ٠.٥٪ و١٢.٧٪، والفرق بينهما ذات دلالة إحصائية ($Pv < 0.0001$). كان معدل حدوث الإصابات المرضية للأسنان واللثة مثل الأسنان الرخوة، ونزيف اللثة والبقع اللونية غير الطبيعية على الأسنان أعلى بكثير في من يمضغون القات، حيث أن حوالي ١١٪ من يمضغون القات يشكون من آلام الفم، مقارنة مع ٢٪ فقط بين من لا يمضغون القات. علاوة على ذلك، فان معدل حدوث تآكل الغشاء المخاطي للفم وحدوث قرح الرقعة البيضاء، وحدوث قرح الرقعة الحمراء، الحويصلات الصديدية وحدوث صرير الأسنان كانت موجودة في ١٩.٥٪، ٧٦.٧٪، ٢٣٪، ١١٪ و٢٥.٣٪ على التوالي عند من يمضغون القات مقارنة عند من يمضغون القات بالنسب ٠.٣٪، ٢٪، ٨ ٪، ٠.١٦٪ و١٪ على التوالي. وبالمثال، فان حدوث تجاعيد اللثة ١، وتبييض اللثة، واحمرار وتأكل اللثة والتقرحات في الغشاء المخاطي للفم موجودة في ٥٦.٥٪، ٥٢٪، ٤٣.٧٪، و96.7٪ على التوالي عند من يمضغون القات مقارنة بـ ٣٪، ٧٪، ٤٩٪، و٥٣٪ عند من لا يمضغون القات. كذلك فان الارتباط لعامل الخطورة لحدوث أمراض اللثة والأسنان وسوء أوضاعهن الصحية كان مرتفع جدا بين من يمضغون القات مقارنة مع من لا يمضغون القات. ألخلاصة يظهر هذا البحث عن أن مضغ القات له آثار كارثية على الأنسجة اللثوية والأسنان وبشكل عام على الحالة الصحية للفم.

مفتاح الكلمات: البالغين، ماضغون القات، اللثة، القات ،حالة الفم، الأسنان، اليمن.

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Introduction :

Khat (*Catha edulis*) is a natural stimulant from the *Catha edulis* plant, originated in the flowering evergreen tree or large flowering shrub of Celastraceous family, which grows mainly in Yemen, Ethiopia, Somalia, Kenya, Saudi Arabia, and at high altitude areas in South Africa and Madagascar (1). The plant is identified by different names in different countries: Qat in Yemen, Khat in Ethiopia, Mirra in Kenya and Qaad or Jaad in Somalia, but in the majority of the literature it is accepted as Khat. In Khat growing countries, the chewing of Khat leaves for social and psychological reasons has been experienced for many centuries and its use has been steadily extended to many countries worldwide (2, 3). Present consumers report that chewing Khat gives enhanced energy levels, alertness and confidence, a sense of happiness, improved thinking capacity and creativity, facilitation of communication ability, superior imaginative ability and the capability to associate ideas. For some, chewing Khat is a method of escalating energy and exciting mood in order to improve their work performance (4). The active ingredient of Khat responsible for its psycho- stimulant result is an alkaloid chemical known as cathinone, which is structurally and chemically analogous to amphetamine, and cathine, a milder form of cathinone. Cathinone is a highly effective stimulant, which creates sympathomimetic and central nervous system stimulation analogous to the effect of amphetamine. Fresh leaves have both ingredients; those left unrefrigerated beyond 48 hours would contain only cathine, which give explanation users′ preference for fresh leaves. Khat loses its effectiveness after 48 hours. The results of various *in vivo* and *in vitro* experiments indicate that the substance could be considered as a "natural amphetamine (5). In Yemen, Khat is commonly used for social recreation. Occupational grouping such as motor vehicle drivers and truck drivers chew Khat for the duration of long distance driving to keep them awake; those in cutting of rock stone and building establishment, also use it under a multiplicity of other conditions. A

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significant number of students chew Khat to be alarms especially during examination periods. There is also specific usage of Khat by the special sections of the community: craftsmen and farmers use Khat to reduce physical fatigue and traditional healers to heal ailments (6). Khat leaves, which are normally located in the mouth in the lower distal mucobuccal fold, are usually chewed during sociocultural meetings where the chewing practice may take up to 6 hours (7). In view of the fact that the process of Khat chewing has a drying effect on the oral mucosa, its users have a propensity to consume a great quantity of fluids (8). Some of the Khat users also supplement their chewing practice with smoking habits (9). Side effects that are supposed to be related to the chewing of Khat include systemic effects like elevation of blood pressure, tachycardia, hyperthermia, increased sweating, muscular weakness, loss of appetite, spermatorrhea some gastrointestinal disturbances (10) and local (oral) effects similar to gingival bleeding (2) halitosis, problem in opening the mouth, periodentitis (11), teeth discoloration, xerostomia, and ulcers in the oral cavity (12). This study was performed to investigate the effects of Khat chewing on periodontal tissue (gum), teeth status and other oral health status among adults in Sana'a city, Yemen.

Subject and Methods :

This cross-sectional epidemiological study was conducted among individuals attending the outpatient dental clinics of the Government Dental College, Sana′a University, whom representative dental clinics in Sana'a city in Yemen. The subjects were divided into two groups, Khat chewers (n = 2400) and non-chewers (n = 600) for comparison purposes, with a mean age of 29.5 ± 2.9 and 28.6 ± 1.7 years, respectively and their ages were ranged from 18 to 35 years.. The Basic Periodontal Examination (BPE) technique that recommended by the British Society of Periodontology (13) was used as screening tool to obtain the picture of the periodontal conditions. Data related to the picture of the periodontal conditions were collected by questionnaire.

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Only individuals who provided a history of chewing Khat for more than 3 years, not less than 4 days per week and not less than 4 hours per day were considered. In addition, only individuals who used to chew Khat on one side of their mouth were selected. So, it was considered that the non-chewing side which was diagnosed as the healthy side or the controlled side is the only parameter used to make sure that there is no other cause of periodontal disease presented at the time of investigation. Assessment of gingival recession was done to specifically determine its extent, i.e., displacement of the gingival margin at least 1 mm apical to the cemento-enamel junction in all subjects. All participants gave oral consent, completed a questionnaire, and had the Basic Periodontal Examination (BPE) technique to obtain the picture of the periodontal conditions. The study was approved by the Faculty ethic committee.

Data analysis :

To relate possible risk factors for Khat chewing, the data were examined in a case-control study format. For Khat chewers , persons with evidence of defecates in on periodontal tissue (gum), teeth status and other oral health status were matched up with those who were non-Khat chewers, and thus did not have clinical evidence of diseases effect the on periodontal tissue (gum), teeth status and other oral health status. Differences in categorical variables were assessed using Fisher's exact tests where appropriate. Ninety-five percent confidence intervals for odds ratios were calculated according to the method of Cornfield and 95% confidence limits for simple proportions were calculated by an exact binomial method using EPI-INFO.

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RESULTS:

Table 1 illustrated the different age and sex characteristics of the periodontal lesions and the habit of Khat chewing survey participants. The male participants were representing 75% in Khat chewers and non-chewers. The study include adults in all age groups start from > 20years age group in which it counts about 7.4% for Khat chewers and 7.3% for non-chewers, ended with age group 33-35 years in which it counts about 15% for Khat chewers and 15.3% for non-chewers. Table 2 illustrated the basic periodontal examination results by determine the rate of sextants types among Khat chewers and none Khat chewers and associated OR of chewing Khat in contracting type of sextants. The data show that quite a large number of non-Khat chewers (21.3%) show type 0 sextants (0 =No disease (no gingival pockets < 3 mm), while only 6.7% of Khat chewers group show type 0 sextants and this variation was highly significant in which Pv was < 0.0001. There was high rate of type 3 sextants (shallow periodontal pockets 4-5 mm i.e. first band on probe partially visible) among Khat chewers (21.7%) with associated OR equal to 1.9 times, and this association with Khat chewers ranged from 1.5 to 2.5 ($Pv \leq 0.0001$), while the rate of type 3 sextants was 12.7% in non-chewer group. The rate of type 4 sextants (4 = Deep periodontal pockets > 6 mm) in Khat chewers was 8.4% with associated OR equal to 18.5 times, and this association with Khat chewers ranged from 5.7 to 71.7 ($Pv \leq 0.0001$), as compared to only about 0.5% of non-Khat chewers. There was no significant difference between Khat-chewers and non-chewers with respect to occurrence of type 1 and type 2 sextants. About 35.4% of chewers had type 1 sextants, as compared to about 41% of non-Khat chewers. Also about 27.8% of chewers had type 2 sextants, as compared to about 24.3% of non-Khat chewers. Table 3 showed the different complaints of teeth health conditions. The incidence of teeth loose was significantly higher in Khat-chewers (6.25%) than in non-chewers (2%), with highly significant associated OR of contracting teeth loose with Khat chewing

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equal to 3.3 times and this association ranged from 1.7 to 6.2 (Pv ≤ 0.0001). The incidence of attrition was significantly higher in Khat-chewers (98.5%) than in non-chewers (25%), with highly significant associated OR of contracting attrition with Khat chewing equal to 197 times and this association ranged from 133 to 292 (Pv ≤ 0.0001). The incidence of teeth staining was significantly higher in Khat-chewers (97.7%) than in non-chewers (65%), with highly significant associated OR of contracting staining with Khat chewing equal to 22.9 times and this association ranged from 16.1 to 31.9 (Pv ≤ 0.0001). There was no significant difference between Khat-chewers and non-chewers with respect to missing teeth due to caries, missing teeth due to periodontal diseases and missing teeth due to other reasons (Table 3). An effect of Khat-chewing on the buccal mucosa i.e., the occurrence of pain, ulcer erosion, white patch, red patch, vesicles and creaked was observed clinically. Mucosa pain, ulcer erosion, white patch, red patch, vesicles and creaked had a higher incidence in Khat-chewers than in non-chewers (Table 4) Logistic regression analysis also showed significant large odds ratios for these conditions for chewers as compared with non-chewers. This analysis showed that Khat-chewers are at higher risk for the various conditions studied, irrespective of sex, indicating a causative role of Khat in periodontal diseases for example risk for ulcer erosion in chewers as compared with non-chewers was 72.4 times and this risk ranged from 17.8-420 times (Pv < 0.0001) (Table 4). Also a high significant risk of pain, white patch, red patch, vesicles and creaked for chewers as compared with non-chewer (Table 4). An effect of Khat-chewing on the gingival status i.e., the occurrence of wrinkled, whitening, redness and recession was observed clinically. Gingival wrinkled, whitening, and recession had a higher significant incidence in Khat-chewers than in non-chewers (Table 5). Logistic regression analysis also showed significant large odds ratios for these conditions for chewers as compared with non-chewers. This analysis showed that Khat-chewers are at higher risk for the various conditions studied, irrespective of sex,

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indicating a causative role of Khat in gingival diseases for example risk for gingival recession in chewers as compared with non-chewers was 26 times and this risk ranged from 19.6-34.6 times (Pv < 0.0001) (Table 5). Also high significant risk of gingival wrinkled and whitening in Khat-chewers is compared with non-chewers (Table5)

Discussion :

The present study revealed a number of interesting and relevant findings. There is significant difference between Khat-chewers and non-chewers with respect to oral health conditions by measures used. The present study also indicated deterioration of periodontal condition among Khat-chewers. Periodontal pockets as indicated by type 3 and type 4 sextants (shallow periodontal pockets 4 - 5 mm, or deep periodontal pockets > 6 mm) were significantly more common among chewers than among non-chewers. These data indicate a potential role of Khat-chewing in oral health status. Previously, Hill and Gibson (14) reported that Khat-chewing was associated with a higher prevalence of type 3 and 4 sextants. The rigidity of the Khat and friction mechanism with mucosal and periodontal tissues might be responsible for the poor periodontal status of chewers (15). Khat, which contains alkaloids, in addition to the presence of pesticides in Khat leaves might have a significant causative role in periodontal diseases. This result support to the earlier findings of Periodontal pockets, gingival lesions and gingival recession were more prevalent among chewers than among non-chewers (16), which is directly related to mechanical and chemical components in the Khat leaves (16). The present study also indicated deterioration of teeth condition among Khat-chewers., even though both groups adopted approximately the same oral hygiene measures. The incidence of teeth loose, attrition, and staining were significantly higher in Khat-chewers than in non-chewers (Table 3). Furthermore, teeth loose, attrition, and staining has also been reported in Khat-chewers (17).This lends support to the earlier findings of pigmentation on the Khat chewing site which is directly related to

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mechanical and chemical components in the Khat leaves. It has been believed that such chemicals may also contribute to the development of oral white changes (16). The present study indicated that chewing Khat has a potentially causative role in the development of oral lesions, and periodontal status, as higher odds ratios were observed for various lesions and bad condition of buccal mucosa and gingival status (Table 4, 5) among Khat-chewers. The occurrence of pain, ulcer erosion, white patch, red patch, vesicles, and creaked, in addition to wrinkled, whiting and redness of gingival mucosa were more prevalent among chewers than among non-chewers. Hill and Gibson (14) (reported a higher prevalence of bad of buccal mucosa condition (18), suggesting that smoking etc could be a factor affecting such changes. The age, sex and smoking adjusted odds ratios for Khat-chewers against non-chewers were statistically significant for various complaints and conditions, suggesting a role of the chewing habit in the deterioration of gingival condition and buccal mucosa status as well as various oral conditions in Khat-chewers compared with non-chewers. Furthermore, Khat containing pesticides might be cytotoxic to periodontal fibroblasts and thus, exacerbate preexisting periodontal disease as well as impair periodontal reattachment (19). The hardness of the Khat leaves and friction mechanism with mucosal tissues might act as a predisposing factor in the occurrence of ulcers among chewers. These ulcers usually observed at the Khat chewing sites only. Clinically, this type of ulcers is characterized by burning like lesions. The Clinicopathological effects of Khat habit on the oral mucosa are well documented (20). These effects include different grades of keratotic white lesions, keratinization of non-keratinized oral mucosa and epithelial dysplasia. Recent genetic study showed that Khat consumption, especially when accompanied by tobacco consumption might be a potential cause of oral malignancy (21). This finding was supported by another study, which demonstrated the Khat habit as a probable contributing etiological factor of squamous cell carcinoma (22). The findings of present study support the need for health education and promotion programs to

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increase the awareness of the problem in the population. Positive long term lifestyle changes, including physical exercise should be established early in life since Khat habit tends to start in childhood and progress into adulthood. Health education programs disseminated by the mass media to raise the public awareness should focus on the real impact of the habit on students and the misconception that Khat enhanced productivity and achievement. More studies are needed to explore other social and educational prospective issues so that more comprehensive preventive strategies could be established.

Conclusion:

There does appear to be a relationship between the terrible effect of chewing Khat on periodontal tissue and oral health status.

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Table 1: Age and sex characteristics of the periodontal lesions and the habit of Khat chewing survey participants, Sana'a city, Yemen, 2014

	Khat chewer (n=2400)		None Khat chewer (n=600)	
	NO.	%	No.	%
Sex				
Male	1800	75	450	75
Female	600	25	150	25
Age groups				
> 20 years	177	7.4	44	7.3
20-23 years	504	21	126	21
24-26 years	576	24	144	24
27-29 years	343	14.3	85	14.1
30-32 years	439	18.3	109	18.1
33-35 years	361	15	92	15.3
Total	2400	80	600	20
Max	35 years		35 years	
Min	18 years		18 years	

Table 2: The basic periodontal examination results by determine the rate of sextants types among Khat chewers and none Khat chewers in contracting type of sextants

Type of sextants	Khat chewers		None Khat chewers		OR	CI	χ^2	*Pv*
	No	%	No	%				
Type 0	161	6.7	128	21.3	0.27	0.2-0.34	117	<0.0001
Type 1	850	35.4	247	41.2	0.78	0.05-0.94	6.8	0.008
Type 2	666	27.8	146	24.3	1.5	1.2-1.8	13.3	0.0002
Type 3	521	21.7	76	12.7	1.9	1.5-2.5	24.6	<0.0001
Type 4	202	8.4	3	0.5	18.3	5.7-71.7	47	<0.0001

OR: odds ratio > 1 (risk), CI: Confidence intervals 1 to more than 1, χ^2: Chi-square > 3.9 (significant), *Pv*: Probability value < 0.05 (significant)

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The worst finding in a sextant dictates the sextant's BPE score. The BPE is usually recorded in a table of six boxes. The scoring is as follows:

0 =No disease (no gingival pockets < 3 mm).

1 = Bleeding on probing (no gingival pockets < 3 mm).

2 = No periodontal pocketing < 3mm, but calculus present with or without plaque retentive factors such as "overhanging" restorations.

3 =Shallow periodontal pockets 4-5 mm (i.e. first band on probe partially visible).

4 =Deep periodontal pockets > 6 mm (first band on probe disappears).

(BASIC PERIODONTAL EXAMINATION (BPE) British Society of Period ontology, 2011)

Table 3: The distribution of different tooth health conditions among Khat chewers and non-Khat chewers

Tooth health conditions	Khat chewer (n = 2400)		Non-Khat chewer (n = 600)		OR	CI	χ^2	*Pv*
	No	%	No	%				
Normal	6	0.25	150	25	0.01	0.0-0.02	596	<0.0001
Loose	150	6.25	12	2	3.3	175-6.2	16.9	<0.0001
Attrition	2364	98.5	150	25	197	133-292	1910	<0.0001
Staining	2345	97.7	390	65	22.9	16.6-31.9	637	<0.0001
Missing due to caries	628	26.2	120	20	1.42	1.1-1.78	9.7	0.001
Missing due to periodontal diseases	18	0.75	12	2	0.37	0.2-0.82	7.5	0.005
Missing due to other reasons	18	0.75	6	1	4.5	0.64-91	2.6	0.1

OR: odds ratio > 1 (risk), CI: Confidence intervals 1 to more than 1, χ^2: Chi-square > 3.9 (significant), *Pv*: Probability value < 0.05 (significant).

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Table 4: The distribution of different buccal mucosa health conditions among Khat chewers and non-Khat chewers

Buccal mucosa health conditions	Khat chewer (n = 2400)		Non-Khat chewer (n = 600)		OR	CI	χ^2	*Pv*
	No	%	No	%				
Normal	162	6	540	90	0.01	0.1-0.01	1855	<0.0001
Pain	264	11	2	0.3	36.9	9.1-215	67	<0.0001
Ulcer erosion	468	19.5	2	0.3	72.4	17.8-420	133	<0.0001
White patch	1840	76.7	12	2	161	88-301	1132	<0.0001
Red patch	552	23	48	8	3.4	2.5-4.7	67.5	<0.0001
Vesicles	264	11	1	0.16	139	21.2-268	127	<0.0001
Creaked	607	25.3	6	1	33.5	14.4-83	174	<0.0001

OR: odds ratio > 1 (risk), CI: Confidence intervals 1 to more than 1, χ^2: Chi-square > 3.9 (significant), *Pv*: Probability value < 0.05 (significant)

Table 5: The distribution of status of the gingival among Khat chewers and non-Khat chewers

Status of the gingival	Khat chewer (n = 2400)		Non-Khat chewer (n = 600)		OR	CI	χ^2	*Pv*
	No	%	No	%				
Normal	66	2.75	240	40	0.04	0.03-0.06	727	<0.0001
Wrinkled	1356	56.5	18	3	42	25.6-69	553	<0.0001
Whitening	1248	52	42	7	14.4	10.3-20.1	396	<0.0001
Redness	1048	43.7	294	49	0.81	0.7-0.9	5.5	<0.0001
Recession	2321	96.7	318	53	26	19.6-34.6	866	<0.0001

OR: odds ratio > 1 (risk), CI: Confidence intervals 1 to more than 1, χ^2: Chi-square > 3.9 (significant), *Pv*: Probability value < 0.05 (significant).