

Areca (betel) nut chewing habit among high-school children in the Commonwealth of the Northern Mariana Islands (Micronesia)

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Objective To investigate the prevalence of its use by high-school children in Saipan in Micronesia. Usage of the areca nut is indigenous to south Asia and the western and south Pacific. Some serious health effects of areca nut chewing are recognized and the International Agency for Research on Cancer has recently classified regular use of areca nut as being carcinogenic to humans. Information on usage by young people, however, is scarce.

Methods Data on consumption of areca nut were obtained by a self-administered questionnaire. Following an oral mucosal examination using WHO criteria any detectable oral mucosal diseases were recorded.

Findings Of 309 schoolchildren surveyed (mean age 16.3 ± 1.5 years), 63.4% claimed regular use, the highest level recorded in any school population survey. Significant oral diseases detected were oral leukoplakia in 13% and oral submucous fibrosis in 8.8% of children.

Conclusion These findings from Saipan suggest that areca nut chewing starts at a young age in Micronesia. As many users develop dependency this raises important concerns regarding its consequences for oral health.

Keywords Areca/adverse effects; Substance-related disorders/ethnology/psychology; Mouth mucosa/physiopathology; Leukoplakia, Hairy/epidemiology/etiology; Oral submucous fibrosis/epidemiology/etiology; Oropharyngeal neoplasms/epidemiology/etiology; Child; Adolescent; Cross-sectional studies; Micronesia (Federated States of) (source: MeSH, NLM).

Mots clés Arec/effets indésirables; Troubles liés substance toxique/éthnologie/psychologie; Muqueuse buccale/pathophysiologie; Leucoplasie chevelue/épidémiologie/étiologie; Fibrose buccale sous-muqueuse/épidémiologie/étiologie; Tumeur oropharynx/épidémiologie/étiologie; Enfant; Adoléscent; Etude section efficace; Micronésie (Etats fédérés de) (source: MeSH, INSERM).

Palabras clave Areca/efectos adversos; Trastornos relacionados con sustancias/etnología/psicología; Mucosa bucal/fisiopatología; Leucoplaquia vellosa/epidemiología/etiología; Leucoplaquia vellosa/epidemiología/etiología; Fibrosis bucal submucosa/epidemiología/etiología; Neoplasmas orofaríngeos/epidemiología/etiología; Niño; Adolescente; Estudios transversales; Micronesia (Estados Federados de) (fuente: DeCS, BIREME).

الكلمات المفتاحية: الأريكا، التأثيرات الضائرة للأريكا؛ الاضطرابات المرتبطة بتعاطي مواد الإدمان، إثنولوجيا وسيكولوجية تعاطي مواد الإدمان؛ الغشاء المخاطي للفم، فيزيوباثيا الغشاء المخاطي للفم؛ الطلوان المشعر، وبائيات وسبببات الطلوان المشعر؛ التليف تحت المخاطي للفم، وبائيات وسبببات التليف تحت المخاطي للفم؛ تكون الأورام الفموية البلعومية، وبائيات وسبببات تكون الأورام الفموية البلعومية؛ الطفل؛ المراهق؛ الدراسات المستعرضة؛ ولايات ميكرونيزيا الموحدة (المصدر: رؤوس الموضوعات الطبية، المكتب الإقليمي لشرق المتوسط)

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Introduction

The adverse health effects associated with areca (betel) nut use include oral and oropharyngeal cancer, oral premalignant lesions and conditions (oral leukoplakia and submucous fibrosis), gum disease and addiction (1, 2). Chewing areca nut is widespread in south Asia and in the Pacific region (3). A study in Papua New Guinea has reported that areca nut use is highly prevalent among adults in Melanesia (4). In Taiwan, China, where the habit is practised widely, particularly in the aboriginal areas (5), many reports suggest that this chewing habit starts at a young age (6–9).

Guam, the Commonwealth of the Northern Mariana Islands (CNMI), Republic of Palau, the Federated States of Micronesia and the Republic of the Marshall Islands belong to the geographical area of Micronesia which covers a large portion of the central and western Pacific Ocean. Apart from their geographical separation from Melanesia and Polynesia, the Micronesians are distinct in their physical appearance. In addition, each island group represents a unique culture with specific customs.

Together Guam and the CNMI form the Northern Mariana Island chain which extends in a north–south direction

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between the equator and Japan. The CNMI is an unincorporated territory of the USA and consists of 14 principal islands, three of which are inhabited. Saipan, 12.5 miles long and 5.5 miles wide, is the CNMI's largest island and is home to 90% of its population (about 58 000 people in 1995). The indigenous ethnic group are the Chamorro people, who comprise approximately 60% of the population. In the late nineteenth century a migration of islanders from the Caroline Islands (now the Federated States of Micronesia) occurred. The descendants of these immigrants are called Carolinians. Due to the proximity of the CNMI to Asia, there is also a large representation of other racial groups such as Chinese, Filipinos, Japanese and people from the Republic of Korea.

Areca nut use among the inhabitants of Guam has been reported to be widely prevalent (10). In Guam, areca nut (pugua) chewing is an old tradition, particularly among Chamorro people (the indigenous people of Guam and Saipan) (<http://ns.gov.gu/pugua.html>). Most of the chewers in the islands surrounding Micronesia use the soft immature nut, split open and filled with lime (calcium hydroxide) and wrapped with piper betel leaf. Chamorros traditionally chewed the hard mature nut with lime with or without the leaf. The chewing habits among adolescents in Micronesia have not been reported. We conducted a cross-sectional study on high-school students in Saipan with the objective of describing the prevalence, correlates of use, reasons for chewing and reasons for disliking the habit, and to characterize the associated clinically detectable oral mucosal lesions.

Materials and methods

Sample

On Saipan there are three public high schools with a total of 2415 students of whom 1186 are female and 1229 are male. Several small private high schools, all religion-based, were excluded from the study. Permission to undertake the study in the three schools was obtained from the school authorities. Information about the study and consent forms were sent to the parents and legal guardians by schoolteachers and collected prior to the study. Participation was voluntary. All consenting students (with the signed consent of their parent(s) or guardian(s)) who attended the school on the days of the examinations and were physically present in the science classroom in each school at the time of the visits by the research team participated in the study. The mean age of the high-school students was 16 years (range 14–18 years).

During 2004, the three schools were visited by a dentist who acted as a screener and a registered dental hygienist who administered the questionnaire to the participants. The 15-item questionnaire was self-completed by students during class time under the supervision of the dental hygienist. The dentist was blinded as to the responses to the questionnaire. Altogether four visits were made to the schools to collect data.

Questionnaire

Questions on demographic characteristics, areca nut use, daily frequency of use, other ingredients mixed with nut (e.g. leaf and lime), tobacco use (smoking and/or chewing), age of initiation of nut chewing, reasons for use, social influence factors, risk perceptions and reasons for disliking the habit were included in the study questionnaire. The questionnaire (available on request from the authors) was developed on the basis of a previous study undertaken on Asian schoolchildren by one of the

authors (11). The questionnaire was administered in English as the school classes are taught in English, and this is the spoken language, although many students also speak one of the other two languages, i.e. Chamorro and Carolinian.

The age of initiation of areca nut use was taken as first age of regular nut use. Patterns of nut use were established according to the other ingredients added to the quid. The questionnaire also presented a list of reasons for chewing areca nut which had to be answered with either yes or no. The source of nut was established as: own purchase, from parents, friends, plucked off the trees, or other, to collect information on sharing of the habit with parents or friends. Finally we asked an open question about knowledge and beliefs regarding the adverse health effects associated with nut use and any reasons for not chewing. Information on tobacco smoking or chewing, and alcohol use was also collected.

Clinical examination

All oral examinations were done by one specialist examiner who was familiar with oral mucosal lesions in the local population. The students were seated on a school chair and lighting was provided by a handheld halogen diving light. A sterile mouth mirror was used for retraction of tissue, and where necessary sterile packs of gauze were used. WHO criteria for the detection of oral mucosal lesions were used (12), and mouth opening (inter-incisal distance) was measured in millimetres using a sterile metal ruler to establish any limitation of opening to confirm oral submucous fibrosis. The location and description of oral lesions noted were charted, and if a lesion was found, the parent or guardian was informed.

A brief education programme followed immediately after the screening to encourage schoolchildren to quit their habits.

Data analysis

Data were entered on an Excel worksheet, and frequency distributions of areca nut, tobacco and alcohol use by this group of schoolchildren, together with other variables, were estimated. The present focus is on the description of risk factors and the prevalence of oral mucosal diseases in the population under study.

Results

Data were collected on the 309 high-school students who participated in the study. Of these, 153 were male and 156 female and their mean age was 16.3 ± 1.5 years (Table 1). Most children were from the Chamorro tribe ($n = 128$; 41%) and other ethnic groups included Carolinian (16%), Filipino (14%) and Palauan (9%).

The lifestyle habits as shown by the percentage distributions are described below. A total of 169 students (63.4%) claimed to use areca nut regularly (Table 1). The habit was more prevalent among male students (73% of males versus 54% of females). There were some variations in the prevalence of chewing habits in the three schools visited; the means ranged from 52.8–85.9%. Two students were chain-chewers and 21 (7%) reported chewing more than 20 areca quids per day. The preferred nut was the soft variety and most schoolchildren added powdered lime to the quid mixture. Piper betel leaf was also often consumed with the nut. The mean age of initiation of areca nut chewing was 12.0 years, and 60 students had started the habit at 10 years of age or younger.

Table 1. Age, sex and characteristics with reference to tobacco, alcohol and areca nut use

| School | n | Mean age | Smokers (%) | Alcohol users (%) | Areca nut chewers (%) | Tobacco/snuff users (%) |
|--------|-----|------------|-------------|-------------------|-----------------------|-------------------------|
| 1 | 40 | 15.4 ± 1.1 | 25.0 | 27.5 | 52.5 | 22.5 |
| 2 | 78 | 17.4 ± 1.3 | 32.1 | 41.0 | 85.9 | 20.5 |
| 3 | 191 | 16.1 ± 1.4 | 22.0 | 20.0 | 56.5 | 15.1 |
| All | 309 | 16.3 ± 1.5 | 24.9 | 26.2 | 63.4 | 17.5 |

Tobacco use was also widely prevalent among these schoolchildren; almost a quarter of students of both sexes reported smoking tobacco. Tobacco chewing and/or snuff dipping was practised by 17.5%. Alcohol drinking was reported by 26% of high-school students, and the habit was more prevalent among male students (37% of males versus 15% of females).

The percentage distribution of answers on the source of betel nut for individual consumption was examined. The majority (44%) bought areca nut out of their own pocket money. Just over 10% reported being supplied by their parents and there was some sharing of the nut with friends (25%). Some students (9%) had access to the nut from home-grown trees from which they plucked the nuts themselves.

The results from the attitude section of the survey are shown in Table 2, which lists the reasons that users gave for chewing betel nut. Overall, the five most common reasons given were: craving for the nut, boredom, as an aid to concentration, at times of unhappiness and to postpone hunger. Very few used it to refresh their breath or to look mature and none used it to look good.

Among non-users the reasons given for dislike of the habit were stained teeth, offensive breath following chewing and poor appearance due to staining of teeth. Eight out of 160 (5%) who answered the section on beliefs were aware that areca nut could cause oral cancer and one mentioned that the parents did not approve of chewing. Eight mentioned that the quid burned their mouths, probably related to the addition of lime to the nut.

A considerable number of students with associated oral pathological lesions and conditions were noted during the screening examination (Table 3) and a disturbing number of children (12.9%) had oral leukoplakia. These lesions could either be related to tobacco (smoking or chewing) or areca nut chewing, as all students in whom leukoplakia was detected reported indulging in both habits. A condition more specific to areca nut chewing was oral submucous fibrosis with submucosal banding which was found in 27 (8.8%) of schoolchildren; nine had established features (mouth opening < 40mm) and 18 had early features of fibrosis.

Discussion

Areca nut is the fourth most commonly used substance of abuse in the world after tobacco, alcohol and caffeine (13). Culturally associated health-risk behaviours, which contribute to morbidity and mortality in later life, often are established during youth, extend to adulthood, are interrelated and are preventable. In this point-prevalence study, 63% of Saipan children in high schools were regular chewers of areca nut. In the neighbouring Republic of Palau, the Youth Tobacco Survey of 2001 (<http://www.cdc.gov/tobacco/global/gyts/reports/pdf/palau.pdf>) recorded a similar prevalence of chewing among Palau's children.

Compared with Taiwan, China (6, 7, 9) and Asian migrant schoolchildren (11) the prevalence of areca nut chewing recorded in the present study in Micronesia was considerably higher. A high proportion of chewers in Sapien also smoked tobacco and consumed alcohol regularly.

Habituation and addiction to areca nut have been reported in Papua New Guineans (4, 14) among aborigines of Taiwan, China (15), and among immigrants living in the United Kingdom (16). It is likely that children who are regular chewers at school-leaving age will be dependent on the nut and continue the chewing habit into their adult life, unless an appropriate intervention is made.

It was alarming to note the development of oral mucosal lesions in these schoolchildren, associated with the habit of areca nut chewing and tobacco use. Betel chewers' mucosa, oral leukoplakia and oral submucous fibrosis are well characterized as oral lesions caused by chronic use of this substance (1, 2, 17–19). Oral submucous fibrosis, a potentially malignant condition leading to considerable disability is specifically caused by areca nut chewing (20). The carcinogenicity of the nut has been proven in experimental systems (21) and more recently people who chew the nut have been shown to have a significantly increased risk of oral and oropharyngeal cancer (2). The International Agency for Research on Cancer has therefore re-affirmed that areca nut is carcinogenic to humans (2). Starting the habit at a young age significantly increases the risk of cancer in the population as many of these carcinogens

Table 2. Reasons for chewing areca nut given by high-school students^a

| Reasons for chewing | School | | | All |
|-------------------------|--------|----|----|-----|
| | 1 | 2 | 3 | |
| Craving | 9 | 33 | 50 | 92 |
| Boredom | 7 | 26 | 42 | 75 |
| Aid to concentration | 8 | 22 | 23 | 53 |
| When unhappy | 6 | 17 | 28 | 51 |
| Postpone hunger | 6 | 15 | 25 | 46 |
| Taste | 7 | 19 | 8 | 34 |
| Do something with mouth | 3 | 13 | 13 | 29 |
| Custom | 6 | 11 | 12 | 29 |
| Pleasure | 2 | 12 | 14 | 28 |
| Snack | 1 | 10 | 5 | 16 |
| Refresh breath | 0 | 0 | 5 | 5 |
| Look mature | 0 | 1 | 1 | 2 |
| Look good | 0 | 0 | 0 | 0 |
| No replies | 20 | 4 | 81 | 105 |

^a Multiple responses were recorded.

Table 3. Oral lesions and conditions related to chewing areca nut

| Oral lesions | School 1 (n = 40) | School 2 (n = 78) | School 3 (n = 191) | All (%) (n = 309) |
|-------------------------|----------------------|----------------------|-----------------------|----------------------|
| Chewer's mucosa | 2 | 19 | 11 | 32 (10.3) |
| Lichenoid lesion | 0 | 6 | 9 | 15 (4.8) |
| Leukoplakia | 4 | 17 | 19 | 40 (12.9) |
| Oral submucous fibrosis | 4 | 13 | 10 | 27 (8.8) |

take several decades to exhibit their mutagenic action. It is important to note that cessation of the habits can lead to resolution of some oral lesions or a decrease in the severity of oral symptoms (22).

Following migration from south Asia and the western Pacific to both Europe and North America the habit has remained prevalent among new settlers (11, 23). The health consequences of areca nut chewing should therefore be recognized in these migrant communities that have settled in other parts of the world.

In a study of cancer trends in Guam from 1971 to 1995, a continued high incidence of oral cancer on Guam, particularly

among Chamoru people was reported among habitual users of betel nut (24). The authors concluded that it therefore seems reasonable at least to try to discourage the adoption of this habit by young people.

The big challenge therefore is to discover effective strategies to motivate young children not to initiate the habit, and to enable adolescent children to realise the potential health risks of this substance. Among the opinions concerning factors that discouraged areca nut use in this study group it is striking that substantial numbers believed that staining of teeth, leading to poor aesthetics was a social problem among chewers. Young people differ from adults in the ways they perceive and interact and it is of interest to note that dental aesthetics was a factor that discouraged them to chew, a factor not suggested by studies in older adults (25). School health education programmes in the future should capitalize on such views of schoolchildren in efforts to emphasize important health-related messages. ■

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Résumé

Chique des noix d'arec par les élèves d'établissement d'enseignement secondaire du Commonwealth des Mariannes du Nord (Micronésie)

Objectif Étudier la prévalence de la chique de noix d'arec chez les élèves des établissements d'enseignement secondaire de Saipan en Micronésie. L'utilisation de la noix d'arec est une pratique locale en Asie méridionale et dans le Pacifique Ouest et Sud. On reconnaît à cette pratique certains effets graves sur la santé et l'Agence Internationale pour la recherche sur le cancer a récemment classé l'usage régulier de la noix d'arec comme cancérigène pour l'être humain. Les données concernant cet usage chez les jeunes sont cependant rares.

Méthodes Des données sur la consommation de noix d'arec ont été recueillies à l'aide d'un questionnaire auto-administré. Après examen de la muqueuse buccale selon les critères de l'OMS, toutes les pathologies détectables de cette muqueuse ont été enregistrées.

Résultats Parmi les 309 élèves soumis à l'enquête (âge moyen 16,3 ± 1,5 ans), 63,4 % ont indiqué un usage régulier, ce qui représente la proportion la plus élevée relevée dans une enquête sur une population scolaire. Les affections bucco-dentaires importantes détectées étaient la leucoplasie orale dans 13 % des cas et la fibrose buccale sous-muqueuse chez 8,8 % des enfants.

Conclusions Les résultats obtenus à Saipan laissent à penser que la chique de noix d'arec débute à un âge précoce en Micronésie. Compte tenu de la proportion élevée d'utilisateurs développant une dépendance, ces résultats suscitent de fortes préoccupations à l'égard des conséquences pour la santé bucco-dentaire de cette pratique.

Resumen

Estudio de la costumbre de mascar nuez de areca (betel) entre los escolares de secundaria de la Mancomunidad de las Islas Marianas Septentrionales (Micronesia)

Objetivo Investigar la prevalencia de ese hábito entre los escolares de secundaria de Saipan, en Micronesia. El mascado de nuez de areca es una costumbre autóctona de Asia meridional y el Pacífico occidental y meridional. Se sabe que ese hábito tiene algunos efectos graves en la salud, y el Centro Internacional de Investigaciones sobre el Cáncer ha clasificado recientemente el uso regular de la nuez de areca como hábito carcinogénico en el ser humano. No obstante, la información disponible sobre la frecuencia de esa práctica entre los jóvenes es escasa.

Métodos Los datos sobre el consumo de nuez de areca se obtuvieron mediante un cuestionario autoadministrado. Tras examinar la mucosa oral utilizando criterios de la OMS, se registraba

cualquier signo detectable de enfermedad de la mucosa.

Resultados De los 309 escolares encuestados (edad media: 16,3 ± 1,5 años), un 63,4% declararon consumir regularmente betel, lo que constituye el nivel más alto registrado hasta la fecha en una población escolar. Como enfermedades bucodentales importantes se detectaron leucoplasia oral en un 13% de los niños, y fibrosis submucosa oral en un 8,8%.

Conclusión Estos resultados de Saipan indican que la costumbre de mascar nuez de areca se inicia a edades tempranas en Micronesia. Dado que muchos de los mascadores desarrollan dependencia, las posibles consecuencias para la salud bucodental suscitan gran preocupación.

ملخص

عادة مضغ جوزة الأريكا (التببول) بين طلاب المدارس الثانوية في رابطة جزر ماريانا الشمالية (ميكرونيزيا)

الغرض: تقصي مدى انتشار عادة تعاطي الأريكا بين طلاب المدارس الثانوية في جزيرة سايبان في ميكرونيزيا.

الموجودات: من بين جملة الطلاب الذين تم مسحهم (متوسط العمر 16,3 عاما +/- 1,5) أكد 63,4% منهم تعاطيهم المنتظم للأريكا، وهو أعلى مستوى تم تسجيله في أي مسح لطلاب المدارس. وشملت أمراض الفم الرئيسية التي تم اكتشافها: مرض الطلوان الفموي في 13% من الطلاب، ومرض التليف تحت المخاطي للفم في 8,8% من الطلاب.

الاستنتاج: تتم نتائج المسح الذي أُجري في سايبان عن أن مضغ جوزة الأريكا يبدأ في سن مبكرة في ميكرونيزيا. ويؤدي تزايد اعتماد تعاطي الأريكا عليها إلى قلق شديد بشأن عواقب التعاطي على صحة الفم.

معلومات أساسية: يتوطن تعاطي جوزة الأريكا منطقة جنوب آسيا وغرب وجنوب المحيط الهادئ. وقد عُرفت بعض التأثيرات الصحية الخطيرة لمضغ جوزة الأريكا، كما صنّفت الوكالة الدولية لبحوث السرطان التعاطي المنتظم للأريكا على أنه مسبب للسرطان في البشر. ومع ذلك، تتسم المعلومات المتاحة عن تعاطي الشباب للأريكا بالندرة.

الطريقة: تم الحصول على معطيات حول استهلاك جوزة الأريكا عن طريق استبيان ذاتي الاستكمال. وبعد إجراء فحص للغشاء المخاطي للفم باستخدام معايير منظمة الصحة العالمية، تم تسجيل الأمراض التي أمكن

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