ORIGINAL RESEARCH

# The menace of betel nut and gutka: An oral health survey of school children to assess prevalence of oral lesions in chewers versus non-chewers

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## Abstract

Betel nut (BN) also referred to as Chalia/ Supari has been used for thousands of years. BN chewing is an important and popular cultural activity in India, Bangladesh and Pakistan (the subcontinent). The use of BN is common in the rural and urban areas of Pakistan. In several studies, an association between BN chewing and oral health problems including oral sub mucous fibrosis, leukoplakia, erythroplakia, mouth blisters and traumatic ulcers has been identified. These lesions are reported in children and adolescents. This is of great concern not only because of the high cost involved in their management but the morbidity and mortality associated with it. Low cost, easy availability, advertising, role modeling, social acceptance and perception of BN as harmless, contribute to its use. The aim of this cross-sectional study in Central District of Karachi (CDK) was to assess the prevalence of oral soft tissue lesions and to investigate associations which may exist between oral conditions and BN chewing among the young school going children. Three hundred and sixty students from 17 different schools participated in the study. The mean age was 13.86 ±1.2 years with the age range of 12 to 16 years. Out of these 360 students, 175 were females and 185 were males. The results showed a high prevalence of the pre-cancerous lesion, oral submucous fibrosis among BN chewers (BNC) compared to non-chewers (NBNC) (19% and 3% respectively). The high prevalence of BN chewing (59% of the low socio-economic young population studied) should be addressed at local and government level through support for effective preventive programs and health promotion campaigns. Promotion of oral health and eradication of BN chewing are important goals for the prevention of oral cancer among this population.

## Introduction

The chewing of betel nut (BN) is an old practice in south-east Asia, especially in the Indian subcontinent[1]. This tradition is inherited by generation after generation and has become a popular cultural activity among people of Pakistan, India, Srilanka, and Bangladesh[2]. BN is a fruit of areca tree that widely grows in tropical Pacific, Asia and east Africa[3]. It is a small feathery palm that grows to the height of 1.5 m. The most common method of using BN is to chop it into very small pieces with the help of an especial instrument known in local language - Urdu as "sarota". Slurry of slaked lime and catechu boiled in water is applied on a betel leaf and the chopped pieces of BN are rolled in it to be kept in mouth. This leaf package is generally referred to as betel quid (Paan)[4]. Some chewers like to add tobacco in it and others use it without tobacco.

Gutka is a new product introduced in early 1990's by tobacco industry in India. It is a preparation of crushed BN, tobacco, catechu, paraffin, slaked lime with sweet

and aromatic flavors[5] available in small sachet of 20-50 gm. Gutka is placed in the mouth or chewed and it remains in contact with oral mucosa for variable period of time depending upon the intensity of the habit of the chewer. These products are commonly chewed for their psychoactive effects of well being[6].

It has also been found in a study that the consumption of BN / Gutka / paan is higher in the areas of low socio economic status due to cheap production of unpackaged local manufacturing at home[7]. Owing to poverty, joblessness and political instability, people from Pakistan, India and Bangladesh migrate to other parts of the world; especially to western countries in search of better living conditions. This happens in other third world countries too but the migration from subcontinental countries has the highest rate. These immigrants also carry the habit of BN/ Paan/Gutka chewing to the western countries where they settle. Most immigrants move to English speaking countries like UK, USA, Canada and Australia. In several studies it has been found that chewing habit has become social problem within Asian communities in these countries[8,9]. Thus, habit of chewing BN/Paan/Gutka is becoming an emerging health threat not only in subcontinent but also in developed western countries[10].

BN contains the alkaloid arecoline in addition to nitrosamines, which is carcinogenic. Various studies have been conducted to determine the relation of BN and other alternative chewing material to oral and other associated cancers[11, 12]. It has been proved that BN, Gutka and Paan cause oral cancers[13, 14] and alone in India, out of 700,000 cancers diagnosed each year 300,000 cases relate to tobacco smoking and BN chewing[15,16] . A study done in Pakistan reveals that the use of tobacco with lime has been recognized as a risk major factor for oral and throat cancers[17].

The use of these substances induces fibroblast proliferation and collagen production and thus it is strongly associated with oral sub mucous fibrosis, a crippling and precancerous condition[18].

It is known that adults are indulged in BN/Paan/Gutka chewing and there is an increasing concern that children are now using these products[19]. This chewing habit is posing health problems in children and adolescents[20]. As in adults, this may lead to serious oral health conditions such as oral submucous fibrosis (OSF), mouth ulcers (MU), staining of the teeth and gums, leukoplakia (LPK) and other precancerous lesions which lead to oral cancers[21,22]. Several studies have reported that the habit of BN chewing often tends to start at a very young age but none have provided any specific age group[23, 24]. Cause of concern is the intensity of consumption of these products by children. According to findings of a study, 94 % of school goers consume BN and 73 % chew Gutka[19].

Pakistan is located in South-central Asia. Karachi is the largest city in Pakistan and is the capital of Sindh province. Located on the coast of the Arabian Sea (latitude: 24-56-00 N and longitude: 67-01 -00 E), it is the nation's major commercial and industrial center as well as the largest sea port. The population of Karachi is approximately 17.5 million. The city of Karachi is divided into five districts: East, West, North, South and Central. This study was conducted in the Central District Karachi (CDK). This district has a mixture of various ethnicities namely Sindhis, Balochs, Pashtoons, Punjabis and Muhajirs. There is a slight predominance of Muhajirs in this district; this is a community, having migrated from different parts of India. In Pakistan, introduction of Gutka was welcomed by tobacco chewers and it dramatically influenced the sales of paan in this country. Merely in Karachi- a cosmopolitan city populated with immigrants from India, the sale of paan was 60,000 kg per day. Due to switching over to chewing of Gutka, this sale dropped down to 40,000 kg. Although, the use of BN and Gutka is associated with certain oral conditions; the prevalence and effect on oral health of school going children of 12-16 years of age is not clearly known in local context. This study was conducted to identify the prevalence of oral lesions and to investigate association which may exist between the oral conditions and BN/Gutka chewing among the school going children in CD.

## Objectives of the study

To identify oral lesions present in lower secondary school children in CD, Karachi. To compare the prevalence of oral lesions among the school children who chew betel nut or gutka (BNC) versus non-chewers (NBNC).

## Methodology

A cross sectional study was conducted in CD, Karachi. A research questionnaire was prepared, and sent along with the parental consent and student assent forms to the Clinical Research Ethics Committee of the Cork Teaching Hospitals, University College Cork for ethical approval, which approved it. Ethical approval was also granted from Baqai Medical University, Karachi for this study. The questionnaire was scrutinized by the subject specialists and was coded for statistical purposes. The research questionnaire consisted of three parts, which included chewing habits, clinical interview and findings of the clinical examination.

The sample comprised of 360 students from 17 different schools in CD, Karachi. The age range of sample population was 12 - 16 years. The authors was trained and calibrated for the examination of oral health and identification of oral lesions at Cork University School and Dental Hospital. In Karachi, the author hired qualified dental assistants and trained and calibrated them. The subjects had their oral examination done on the specified date by the author and the trained dental staff. Photographs of selected individuals were taken where necessary with the individual's consent.

The schools were picked up randomly from low socioeconomic residential areas in CD. Permission for the research was sought from school principals. Two groups of students were randomly picked (BNC and NBNC) from each school. Parental consent, student assent, and confidential medical history form were also sent to the parents/guardian. They were asked to return all of the completed forms duly signed. The forms had been translated into Urdu (the national language of Pakistan) to allow full understanding and compliance with the whole process. The inclusion criteria were: 1. subjects in the age range of 12-16 years, 2. Subjects were able and willing to cooperate in all the study procedures, 3. Subjects were in good general health. 4. Subjects whose parent/guardian signed the informed consent form, 5. Subjects who signed the consent form, and 6. Subjects known to be non-allergic to any dental products.

Individuals were examined in the natural day light on a chair in a separate room to maintain privacy. A hand torch was also used in some cases, where natural daylight was insufficient. A sterile CPITN probe was used only where necessary to remove debris from a tooth with a standard (size 4, silvered front surface) mirror head. When required the teeth were dried using cotton wool rolls. Universal precautions were followed. Personal protective clothing and equipment was worn by all the examiners and recorders in attendance. Latex free examination gloves were used for the examination of each child and were changed before examining the next child. A facemask was worn and changed at frequent intervals. A disposable paper sheet was used under each set of instruments and disposed after each examination. The CPITN probes and mirrors were placed in a container used solely for the transport of "contaminated" instruments. All re-usable instruments were washed and autoclaved at the end of each session. All contaminated waste, which included gloves, facemasks, cotton wool rolls, tissues and wipes, were disposed into 'hazardous waste' yellow bags in accordance with infection control best practice. Two plastic boxes for instruments were used, of which; one box was for transporting sterile instruments only while the other box was for contaminated instruments. All children were given protective eye covers to wear. These were cleaned with disinfectant wipes between examinations. The torches were wiped with a disinfectant between examinations.

Data was recorded onto the questionnaire form designed and validated for the survey. The subjects' name, age, academic level and the level of maternal education was entered in the personal detail column. Each child was given a discrete five digit number, which was entered at the top of each page of the record in the space provided. The first two digits corresponded to the number given for each participating school. The 3rd, 4th and 5th digit denoted the child being examined. The first child being examined in each school was identified as 001. The Data Recorder wrote in black or blue biro. When an error occurred a line was put through the error and the correct code was written next to the original figure. The charts and the consent forms were attached to the questionnaire by stapling the first page of the habits and practices questionnaire. The order of presentation was then chart, consent form, medical questionnaire, inclusion/exclusion criteria, soft tissue examination, demographic data record and finally the questionnaire.

Each child was asked to sit on the chair. Face masks and tinted protective eyewear were used for all the children. First, a visual examination was done to check for dental caries. Teeth were examined wet, and a CPITN probe was used to remove food debris as well as to confirm dental cavitations. Soft tissues and oral cavity were then examined for any abnormalities.

## Statistical Analyses

SPSS Version 18® was used for statistical analysis.

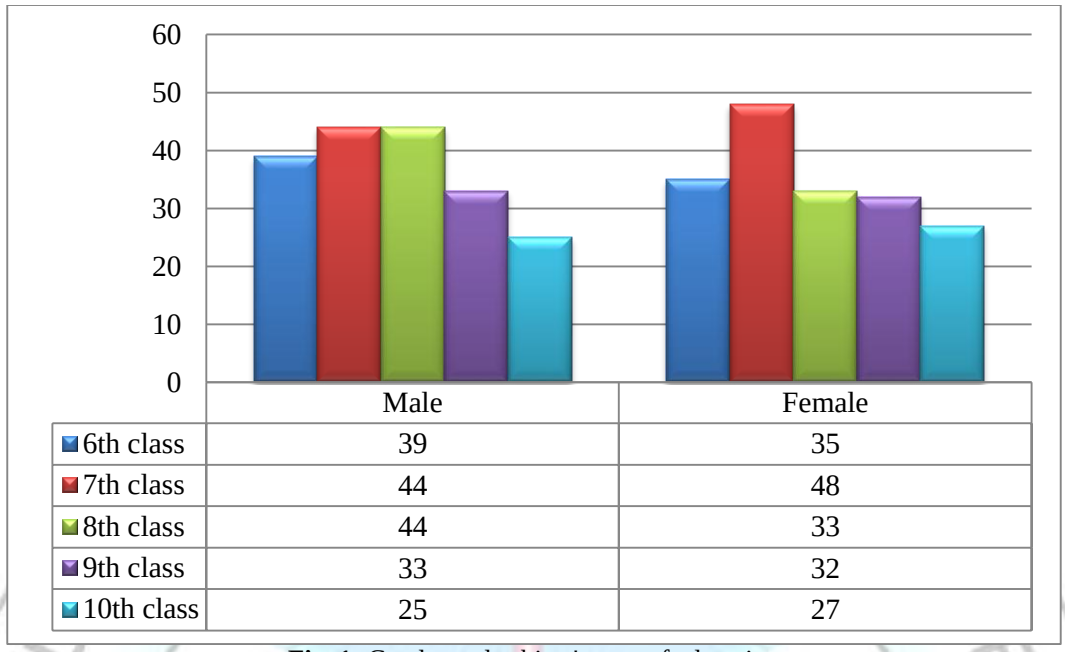
The following information was obtained and analysed:

- The number of children examined by gender and age.
- The mean age in years of children that participated in the study.
- Habit of BN chewing and its association with gender.
- Age of onset, duration, reason for starting, frequency of consumption and number of packets consumed per day.

## Results

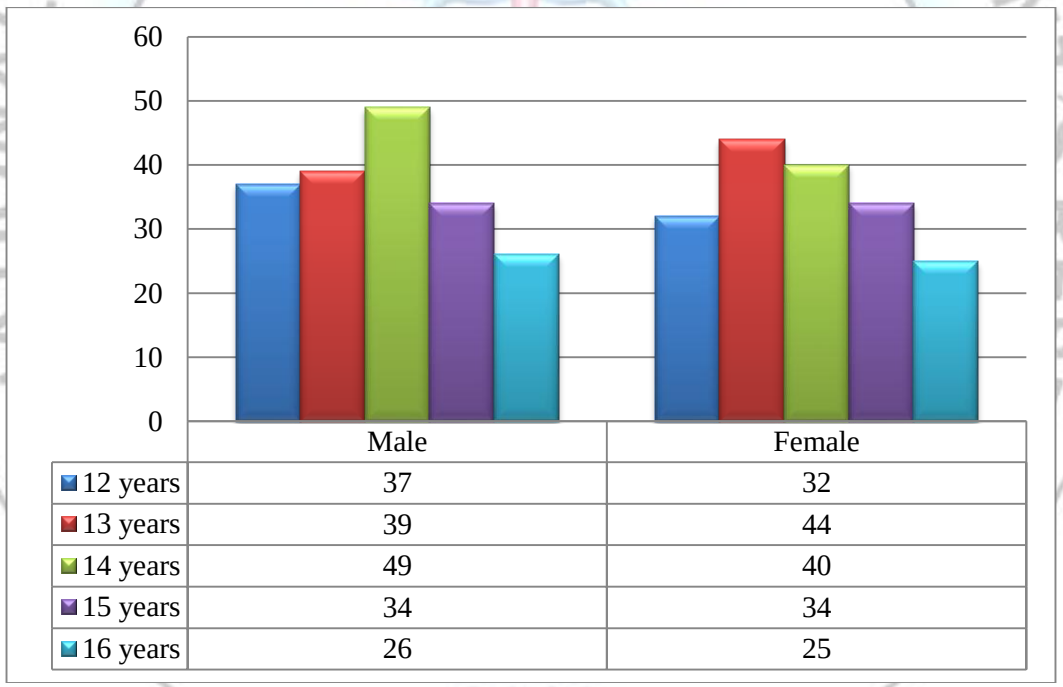
The sample comprised of 360 students who were selected from seventeen secondary schools in the CD. This sample size represents the power of the study after comparing with the previous available studies showing the prevalence of BN chewing between 70% and 75%. These schools were randomly selected in a recognized low socio-economic area based on high unemployment and a low educational standard.

Out of the 360 students, 51.38% were males (n=185) and 48.61% were females (n=175). The mean age was 13.86 ± 1.2 years with the age range of 12-16 years. The sample is summarized by gender and year of education in Figure 1, and by gender and age in Figure 2.




| | Male | Female |
|---|---|---|
| 6th class | 39 | 35 |
| 7th class | 44 | 48 |
| 8th class | 44 | 33 |
| 9th class | 33 | 32 |
| 10th class | 25 | 27 |

**Fig. 1:** Gender and subject's year of education




| | Male | Female |
|---|---|---|
| 12 years | 37 | 32 |
| 13 years | 39 | 44 |
| 14 years | 49 | 40 |
| 15 years | 34 | 34 |
| 16 years | 26 | 25 |

**Figure 2.** Gender and age of the subject

Number and percentage of BNC and NBNC is given in Table 1 which shows that 58.61% of the examined subjects were in the habit of BN chewing.

In table 2, BN chewing habit among gender is shown separately which illustrates that 61.61% of males and 38.39% of females chewed BN

**Table 1: Percentage (%) of study participants involved in BN chewing**

| BNC | n | % |
|---|---|---|
| Yes | 211 | 58.61 |
| No | 149 | 41.39 |

**Table 2: BN chewing and gender distribution**

| Betel nut chewing | Males % (n) | Females % (n) |
|---|---|---|
| Yes | 61.61 (130) | 38.39 (81) |
| No | 36.91 (55) | 63.08 (94) |

A chi-square test was performed to examine the difference in the habit of BN chewing among males and females. The difference between these variables was significant, $X^2 = 21.32$, df =1, $p < 0.001$. Almost twice the numbers of males (61.61%) chewed betel nut as compared to females (38.39%).

**The association between oral submucous fibrosis and betel nut chewing**

Two types of oral lesion were reported, Oral Submucous Fibrosis (OSF) and Traumatic Ulcers (TU). When OSF was analyzed among BNC and NBNC, it was noted that 19.43% of BNC and 2.69 of NBNC had OSF (Table 3).

**Table 3: Presence of oral OSF between BNC and NonBNC**

| OSF | Yes % (n) | No % (n) | Total % (n) |
|---|---|---|---|
| BNC | 19.43 (41) | 80.57 (170) | 100 (211) |
| NonBNC | 2.69 (4) | 97.31 (145) | 100 (149) |

A chi-square test was performed to examine the difference in the presence of OSF between BNC and NBNC. There was a significant difference, $X^2 = 22.39$, df=1, $p < 0.001$.

**Oral submucuous fibrosis among male and female betel nut chewers**

Among males, 23.85% of BNC had OSF, compared with 7.27% of NBNC; this difference according to BN chewing also existed for females with 12.34% of female BNC having OSF compared with 0% of NBNC (Table 4)

**Table 4: OSF and gender distribution**

| BNC | | NonBNC | |
|---|---|---|---|
| Male % (n) | Female % (n) | Male % (n) | Female % (n) |
| 23.85 (31) | 12.34 (10) | 7.27 (4) | 0 (0) |
| 76.15 (99) | 87.65 (71) | 92.73 (51) | 100 (94) |
| 100 (130) | 100 (81) | 100 (55) | 100 (94) |
| 100 (211) | | 100 (149) | |

A chi square test was performed to examine the difference in the presence of OSF between male gender and BN chewing. The difference between these variables was significant, $X^2 = 6.92$, df=1, $p < 0.009$.

## Discussion

Habit of chewing BN and Gutka is popular among young students of CDK who belong to financially poor families. According to the results of this study, significantly more males (61.61%) chewed BN than females (38.39%). These findings are similar to the findings of two previous studies[25,26]. A study conducted in United Kingdom by Farrand et al, in a sample of 704 children aged between 11- 15 years, showed a high prevalence of BN chewing among males belonging to the Asian community[27]. In Karachi, males have freedom to go and spend time outside the home, which makes them more exposed to the habit whereas females are restricted to do so. In a study, the majority of students claimed that they often saw BN vendors near their residential areas, and some reported that BN vendors were situated near their schools[28]. Boys have a higher exposure to BN as compared to girls. This may be the possible reason of its higher prevalence among males.

The highest proportion (44.07%) of children chewed BN twice a day, 36.01% once a day and 19.92% more than twice a day. Among them, 50.78% of males as compared to 33.33% of females were chewing BN twice a day, and 25.38% of males and 11.12% of females were chewing BN more than that. The high proportion of children identified as chewing BN may pose difficulties for their future health as Shah and Sharma found in a case control study that an increasing frequency of BN chewing is associated with oral soft tissue problems[19]. These findings are supported by the results of many studies done in past[12,29,30]. Increased frequency of use is directly proportional to the low cost and eases of availability. These two factors should be addressed and appropriate steps should be taken to control the use of BN.

In this study, 19.43% of BNC and 2.69% of NBNC had OSF. These findings are similar to the studies of Trivedy et al [12,] Shah & Sharma[19], Sinor et al [29] and Maher et al[31] Ma et al[32]. As mentioned earlier, OSF is a precancerous lesion and can lead to a significant burden of disease requiring expensive and invasive treatment. The findings of this study should help to educate children, parents, teachers and primary health workers and allow the development of preventive strategies against BN chewing.

As shown in the results, 0.90% of BNC and 4.02% of NBNC had traumatic ulcers. The studies done by Zain et al[33]J and Ainkittivong et al[34] showed an increase in the prevalence of traumatic ulcers in BNC. This is actually opposite to the findings of this study. The above mentioned studies were conducted in older people (age 60 years and above) whereas this study focused on children between the age of 12-16 years.

This cross sectional study examined the prevalence of oral soft tissue lesions among BNC and NBNC from a sample of 360 school children, and produced findings which are consistent with the results of other studies. However, the targeted population belonged to a low socio economic area in a particular district of Karachi. During the data collection period, civil un-rest made recruitment to the study and data collection difficult and therefore the results may not be representative of the whole population of Karachi.

Many parents refused to permit photographs to be taken, as they feared how the images would be used and

expressed an anxiety that images would be available freely. This was a disappointment to the author as photographs would have assisted in health education and promotion programmes.

## Conclusion and future work

The study has provided a considerable amount of basic data and although analysis in a short time frame has been limited, the author proposes using the data to explore further associations with multiple logistic regressions. As this study demonstrate a significant prevalence of BN chewing in this group, the development of an awareness program should be considered as an important preventive health initiative.

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