**Research Article**

# Tobacco Use and Betel Quid Dependence among Bangladeshi Rural Adults

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## Abstract

**Background:** Betel quid consumed with and without tobacco additives is a widely acceptable practice in the South-East Asian Region. The areca nut in betel quid is the fourth most psychoactive substance in the world and recently it is classified as a Group 1 carcinogen. The assessment of betel quid dependence has become a global public health issue because of its adverse health consequences. The aim of this study was to assess betel quid dependence among the users (With and without Tobacco Additives) using the Betel Quid Dependence Scale (BQDS) and find out the factors associated with dependence.

**Methods:** A cross-sectional study was conducted among 400 adult betel quid users, who were selected consecutively following the purposive sampling method on the basis of defined selection criteria from January to June, 2017. Data were collected on socio-economic conditions, pattern of betel quid use and betel quid dependence using a pre-tested interview administered questionnaire.

**Results:** Overall 88.25% of the study respondents were dependent. Of them, 90.2% of the respondents used tobacco and 72.1% did not use tobacco. The average amount of betel quids consumed daily was 7.8±7.22 quids/day. About 89.25% of the total respondents used smoke and/or smokeless tobacco and 10.75% of them did not use any forms of tobacco. Of the tobacco users, 70.25% used smokeless tobacco, 12.25% used both forms of tobacco and 6.75% were only smokers. Several of the socio-economic characteristics like age, sex, educational status and occupation of the respondents were statistically significantly associated with betel quid dependence (at p value <0.05).

Other factors like tobacco using status, ingredients used with betel quid, frequency of use, duration of betel quid use, amount of quids taken daily were highly statistically significant (p=0.0001) with betel quid dependence. Female respondents had greater likelihood of dependence [Adjusted odds ratio (AOR) 4.32; 95% confidence interval (CI) 1.65 to 11.33]. The respondents who passed S.S.C or had higher level of education (AOR 0.13; 95% Cl 0.04 to 0.45) were less likely to develop dependence while those who used betel quid for a longer duration (AOR 1.12; 95% Cl 1.05 to 1.18) and increased quantity (AOR 3.07; 95% Cl 1.89 to 5.00) had more chance of developing dependence.

**Conclusion:** In this study, betel quid users with and without tobacco additives was highly statistically significantly associated with dependence (p=0.0001). Betel quid dependence was statistically significantly associated with gender of the respondents, level of education, amount of betel quid consumed daily and duration of use (p<0.05). As betel quid chewing is a personal lifestyle behavior, cessation of its use is not easy to achieve, so designing behavior change motivation programs can help betel quid users to quit.

## Introduction

Areca nut is ranked as the fourth most commonly consumed psychoactive substance after tobacco, alcohol and caffeine [1]. Almost 10% to 20% of the people worldwide chew areca nut with betel quid [2]. Betel quid has been commonly used in the South, Southeast Asia and Asia Pacific regions. It is also practiced among the migrated communities of Africa, North America and Europe [3]. In Bangladesh, betel quid is traditionally used in social customs and cultural rituals. Betel quid colloquially known as pan is a mixture of thin slices of areca nut (supari) and slaked lime (calcium hydroxide) rolled in a betel leaf [2]. The prevalence of chewing betel quid in Bangladesh is almost twice as more in the rural than in the urban areas and three-fourths of the users like to use tobacco in the form of zarda, gul, etc. [4].

Areca nut contains different alkaloids of which arecoline is the principal alkaloid responsible for the dependence. Dependence for a substance may be defined as a cluster of cognitive, behavioral and physiological symptoms indicating that the person loses much control over that substance and continues to use despite adverse [5]. Some of

The essential components for the diagnosis of dependence are tolerance, withdrawal, loss of control and craving [6]. The arecoline acts as an agonist and a stimulant for the central and the autonomic nervous system, increasing the level of noradrenalin and acetylcholine [7]. The symptoms of tolerance and withdrawal found among regular betel quid chewers can be comparable to nicotine dependence among smokers [8]. The immediate effects are rapid increase of facial skin temperature, palpitation and sweating. Some other effects include improved concentration for work, heightened alertness and stave off hunger [1].

Over 250 million people are smokeless tobacco users in the South-East Asia region [9]. In Bangladesh, men use both smoke and smokeless form of tobacco like cigarette, bidi, zarda, sadapata, gul and khoinee but women usually do not smoke but use smokeless tobacco with betel quid [10]. More than six million people are dying each year globally due to tobacco related diseases [11].

Betel quid chewed without tobacco or lime has adverse effects on both the hard and soft tissues of the oral cavity, like attrition, damage to periodontal ligaments and tooth mobility [12]. Many lesions (betel chewer's mucosa, areca nut related lesion, quid induced lesion and betel quid lichenoid lesion) and conditions (oral leukoplakia, oral sub mucous fibrosis) are associated with regular betel quid chewing with or without tobacco which precede the development of oral cancer [13].

The International Agency for Research on Cancer, classified areca nut alone as a Group 1 carcinogen (Carcinogenic to Humans)

[14]. Combining tobacco (another carcinogen) with betel quid increases its risk further for premature death and illness, so chewing betel quid and tobacco has become an important public health problem [15]. The areca nut alkaloids are converted into areca nut specific N-nitroso compounds which are responsible for oral cancer, its precursors leukoplakia, lichen planus and oral sub mucous fibrosis, other cancers of pharynx and esophagus [16]. Oral cancer is the second most form of cancer and cause of death among men living in South-East Asia.

Globally one third of cancer cases are of oral cancer and one half from the South-East Asian region. One of the important factors contributing to this is the use of betel quid and tobacco [17]. There have many researches on the epidemiological aspect, extend of betel quid use in the South-Asian countries but very few studies focused on the behavioral and psychological issues. One of the ways of controlling the amount of usage and designing cessation programs of such psycho stimulant substances is to understand the behavioral pattern. Further researches in this field are required to reduce the burden of oral health related diseases arising due to betel quid use.

## Methods

A cross sectional study was conducted in a selected rural community of the Gaffargaon sub-district for a period of six months; from January to June, 2017. To complete the study in time, a work schedule was prepared including all the tasks in a sequence. At 95% confidence interval with 5% precision and taking the prevalence of betel quid dependence to be 40.5%, [8] so the estimated sample size was 370 Considering non-response rate and missing data the targeted sample size was 400 respondents. Prior to commencement of the study, the research protocol was approved by the ethical committee of the National Institute of Preventive and Social Medicine, Dhaka, Bangladesh.

The respondents were selected by purposive sampling method. After giving complete description of the study to the respondents, written consent in Bengali were taken from the interested respondents. For those who could not sign the consent form was read out and their thumb print were taken. They were informed of their full right to participate and to refuse from the study.

The researcher assured the respondents that no invasive procedures will be employed on them. The questionnaire was pre-tested through face to face interview on 10% of the total sample to establish if the questions were relevant, unambiguous and appropriate. After pre-testing was done, irrelevant and problematic items were identified and consequently deleted or reformulated. Data were collected by visiting households. On the visited day only households having male and female respondents aged from 18 years to 60 years and those who used at least one betel quid daily in the last one year were included provided they gave their consent

to participate in the study. Respondents, who were mentally and physically disabled, suffered from chronic diseases, used illicit substances and who were unwilling to participate were excluded from the study.

The socio-economic characteristics included age, sex, marital status, religion, educational level, main occupation and average monthly income. The pattern of betel quid related data included, duration of betel quid use, age at initiation, amount of quids taken daily and frequency of use, different ingredients used with the betel quid. Betel quid users were defined as respondents using a mixture of areca nut, lime rolled in a betel leaf (with or without Tobacco). Betel quid dependence was assessed using the 16-item Betel Quid Dependence Scale. The question of each item had a dichotomous answer that is "yes" or "no". For the answer "yes" the score was 1 and for the answer "no" the score was 0. The total score ranged from 0 to 16. The respondents whose total score was above 3 were defined as dependent [18].

Data were cleaned and edited. Analysis was done using Statistical Package for Social Sciences (SPPSS) version 20.0. Respondents were divided into two groups: betel quid users with tobacco and betel quid users without tobacco. Statistical tests ($\chi^2$) were performed to determine the association between the socio-economic characteristics and the pattern of use with the two groups of users. Association was also seen between these factors with betel quid dependence. To control the confounder and to identify the important predictors, all variable that were found significant in univariate analysis (at p<0.05) were included in binary logistic regression model and association was reported with Adjusted Odds Ratio (AOR) with 95% CI, with p value.

## Results

More than half of the total respondents were females i.e. 224 (56%) and the male respondents were 177 (44%). The average

age of the female respondents was 41.21 ±10.76 years and the male was 43.47±11.74 years. Out of the 400 respondents, 357 (89.25%) used tobacco in different forms with their betel quid and 43 (10.75%) did not use tobacco. Of these tobacco users, 281 (70.25%) of the respondents used only smokeless form of tobacco with their betel quid and 27(6.75%) only smoked but did not use smokeless tobacco and 49 (12.25%) of the respondents used both forms of tobacco (Figure 1).
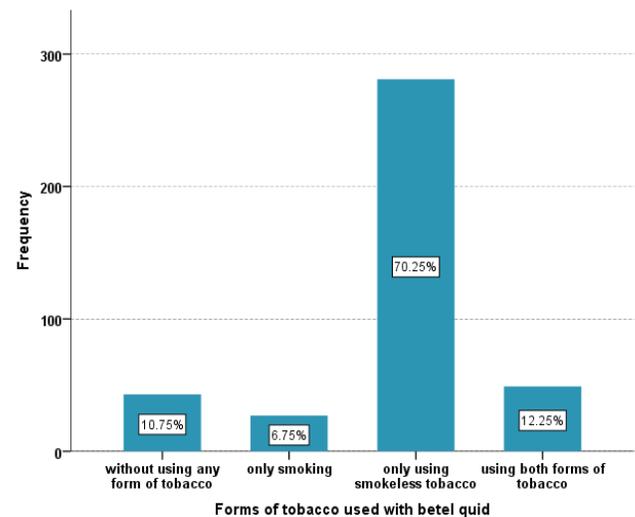


**Figure 1:** Distribution of the forms of tobacco used with betel quid by the respondents.

Betel quid chewing is increased significantly in the age group 50 years and above. Majority of the respondents used betel quid for a duration of 10 to 19 years. The average amount of betel quids consumed daily was 7.8±7.22 quids/day. (Table 1).

| Characteristics | Tobacco use status of the respondents | | $\chi^2$ | p value |
|---|---|---|---|---|
| | Betel quid without tobacco | Betel quid with tobacco | | |
| | n (%) | n(%) | | |
| **Sex** | | | | |
| Male | 21 (11.9%) | 155(88.1%) | 0.46 | 0.5 |
| Female | 22 (9.8%) | 202 (90.2%) | | |
| **Age (in years)** | | | | |
| Less than 35 | 10 (9.1%) | 100 (90.9%) | 2.85 | 0.24 |
| 35-49 | 12 (8.5%) | 130 (91.5%) | | |
| 50 and above | 21 (14.2%) | 127 (85.8%) | | |
| **Education** | | | | |
| illiterate | 22 (10%) | 197 (90%) | 1.76 | 0.42 |
| Below Secondary | 11(9.4%) | 106 (90.6%) | | |
| Secondary and above | 10 (15.6%) | 64 (84.4%) | | |
| **Occupation** | | | | |
| Unemployed | 23 (10.8%) | 190 (89.2%) | 0.8 | 0.67 |
| Day labourer | 11 (9.2%) | 109 (90.8%) | | |

| | | | | |
|---|---|---|---|---|
| Service holder | 43 (13.4%) | 357 (86.6%) | | |
| **Income (in Taka)** | | | | |
| Below 5000 | 8 (13.8%) | 50 (86.2%) | 0.88 | 0.84 |
| 5000-9000 | 17 (10.0%) | 153 (90.0%) | | |
| 10000-14000 | 9 (9.5%) | 86 (90.5%) | | |
| Above 15000 | 9 (11.7%) | 68 (88.3%) | | |

**Table 1:** Association of the socio-economic characteristics with the tobacco use status of the respondents (n=400).

Shows the association of the socio-economic characteristics with the two groups of betel quid users There was no statistically significant difference with gender, age, education, occupation and income between the two groups (p<0.05). However, there was a significant difference with frequency and quantity of betel quid used daily between the two groups (p<0.05) (Table 2).

| Characteristics | Tobacco use status of the respondents | | $\chi^2$ | p value |
|---|---|---|---|---|
| | Betel quid without tobacco | Betel quid with tobacco | | |
| | n( %) | n(%) | | |
| **Duration of use (in years)** | | | | |
| Less than 10 | 17 (10.8%) | 140 (89.2%) | 0.6 | 0.74 |
| 29-Oct | 15 (9.6%) | 142 (90.4%) | | |
| 30 and above | 11 (12.8%) | 75 (87.2%) | | |
| **Age at initiation (in years)** | | | | |
| Less than 20 | 9 (8.3%) | 99 (91.7%) | 1.42 | 0.5 |
| 20-29 | 15 (10.3%) | 130 (89.7%) | | |
| 30 and above | 19 (12.9%) | 128 (87.1%) | | |
| **Frequency of use** | | | | |
| ≤ 3 times | 29 (20.3%) | 114 (79.7%) | 22.26 | 0.000* |
| >3 times | 6 (9.2%) | 59 (90.8%) | | |
| All day | 8 (4.2%) | 184 (95.8%) | | |
| **Quantity of quid (quid/day)** | | | | |
| Less than 3 | 17 (26.2%) | 48 (73.8%) | 19.19 | 0.000* |
| 3and above | 26 (7.8%) | 309 (92.2%) | | |
| * = statistically significant at p value <0.05 | | | | |

**Table 2:** Association of the pattern of betel quid use with the tobacco use status of the respondents (n=400)

The total score of the betel quid dependence scale was dichotomized according to the cut off score which was set at 3 on the basis of the Receiver Operating Curve. Score above 3 points were diagnosed as dependent [19]. About 353 (88.25%) of the total respondents was found to be dependent (Figure 2).
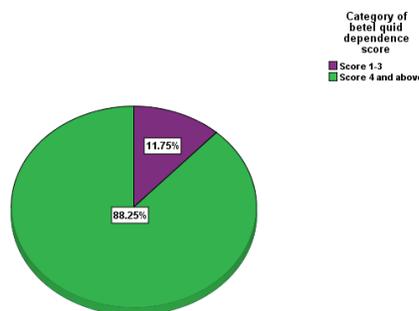


**Figure 2:** Distribution of the scores of the Betel Quid Dependence Scale.

On univariate analysis, the socio-economic characteristics: gender, age, educational level and occupation of the respondents were statistically significantly associated with betel dependence (p <0.05) (Table 3).

| Characteristics | Total betel quid dependence score | | | | |
|---|---|---|---|---|---|
| | Score ≤ 3points | Score 4 and above | $\chi^2$ | p value | COR with 95% CI |
| | n (%) | n (%) | | | |
| **Sex** | | | | | |
| †Male | 28 (15.9%) | 148 (84.1%) | 5.24 | 0.02* | 2.04 |
| Female | 19 (8.5%) | 205 (91.5%) | | | (1.1-3.79) |
| **Age (in years)** | | | | | |
| †Less than 35 | 17 (15.5%) | 93 (84.5%) | 4.33 | | 1.18 |
| 35-49 | 19 (13.4%) | 123 (86.6%) | 0.22 | 0.64 | (0.58-2.40) |
| 50 and above | 11(7.4%) | 137 (92.6%) | 4.03 | 0.04* | 2.28 (1.02-5.08) |
| **Education** | | | | | |
| † Illiterate | 18 (8.2%) | 201 (91.8%) | 17.64 | | |
| Below Secondary | 11 (9.4%) | 106 (90.6%) | 0.14 | 0.71 | 0.86 (0.39-1.9) |
| Secondary and above | 18 (28.1%) | 46 (71.9%) | 15.78 | 0.000* | 0.23 (0.11-0.47) |
| **Occupation** | | | | | |
| † Unemployed | 17 (8.0%) | 196 (92.0%) | 7.05 | | |
| Day labourer | 17 (14.2%) | 103 (85.5%) | 3.13 | 0.08 | 0.53 (0.39-1.9) |
| Service | 13 (19.4%) | 54 (80.6%) | 6.54 | 0.01* | 0.36 (0.11-0.47) |
| †= reference category; *=Significant at p value <0.05; COR= Crude Odds Ratio; CI= Confidence interval | | | | | |

**Table 3:** Association of socio-economic characteristics with betel quid dependence score (n=400).

Moreover, pattern of use related variables: Type of ingredients used, duration of use, frequency and quantity of betel quid use were statistically significantly associated with betel quid dependence. The betel quid dependence was significantly different between the two groups of tobacco users. Comparison between the two groups showed that betel quid users with tobacco were more likely to be dependent than those who did not use tobacco additives. Among the betel quid users, 322 (90.2%) were dependent taking tobacco in either smoke or smokeless forms or both. Whereas, the betel quid users 31 (72.1%), did not take tobacco were found to be dependent. (Table 4).

| Characteristics | Total betel quid dependence score | | | | |
|---|---|---|---|---|---|
| | Score ≤ 3points | Score 4 and above | $\chi^2$ | p value | COR with 95% CI |
| | n( %) | n (%) | | | |
| **Tobacco use status** | | | | | |
| †Without tobacco | 12 (27.9%) | 31 (72.1%) | 12.13 | 0.000* | 3.56 (1.68-7.56) |
| With tobacco | 35 (9.8%) | 322 (90.2%) | | | |
| **Type of ingredients** Zarda used: | | | | | |
| †No | 23 (23.7%) | 74 (76.3%) | 17.67 | 0.000* | 3.61 (1.93-6.76) |
| Yes | 24 (7.9%) | 279 (92.1%) | | | |
| **Frequency of use** | | | | | |
| † 3times or less | 40 (28.0%) | 103 (72.0%) | 24.42 | | |
| More than 3 times | 6 (9.2%) | 59 (90.8%) | 8.22 | 0.004* | 3.82 (1.53-9.54) |
| All day | 1 (0.5%) | 191 (99.5%) | 17.83 | 0.000* | 74.16 (10.05-547.4) |
| **Duration of use (in years)** | | | | | |
| †Less than 10 | 37 (23.6%) | 120 (76.4%) | 27.78 | | |
| 29-Oct | 7 (4.5%) | 150 (95.5%) | 19.28 | 0.000* | 6.61 (2.85-15.35) |
| 30 and above | 3 (3.5%) | 83 (96.5%) | 12.07 | 0.001* | 8.53 (2.55-28.59) |
| **Age at initiation of use (in years)** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| †Less than 20 | 0 (0.0%) | 108 (100%) | 0.18 | | |
| 20-29 | 22 (15.2%) | 123 (84.8%) | 0 | 0.99 | 0 |
| 30 and above | 25 (17%) | 122 (83%) | 0 | 0.99 | 0 |
| **Quantity of quid (quid/day)** | | | | | |
| †Less than 3 | 30 (46.2%) | 35 (53.8%) | 88.59 | 0.000* | 16.03 |
| 3 and above | 17 (5.1%) | 318 (94.9%) | | | (8.04-31.96) |
| †= reference category; *=Significant at p value <0.05; COR= Crude Odds Ratio; CI= Confidence interval | | | | | |

**Table-4:** Association of the pattern of betel quid use with betel quid dependence score (n=400).

Several of the socio-economic and pattern of betel quid use related variables were associated with betel quid dependence in the univariate analysis. Hence a binary logistic regression model was constructed to find out the important predictors for betel quid dependence adjusting the other factors. The model was good at classifying correctly the betel quid dependent respondents (97.2%) and the not dependent respondents (48.9%). The predictors in the model showed that female respondents were almost four times likely to be dependent than male respondents and those who had higher level of education (secondary and above) were eight times less likely to develop dependence. Increased duration of use had a positive association with dependence (Adjusted OR= 1.12; 95% CI= 1.05 to 1.18). Those who used greater quantity of betel quid, they were three times more likely to be dependent than others (Table 5).

| Predictors | Wald $\chi^2$ | p value | AOR (95% CI) |
|---|---|---|---|
| Sex | 8.85 | 0.003 | 4.32 |
| | | | (1.65-11.33) |
| Education (Secondary and above) | 9.03 | 0.003 | 0.13 |
| | | | (0.04-0.45) |
| Duration of use | 13.11 | 0.0001 | 1.12 |
| | | | (1.05-1.18) |
| Quantity of quid used | 20.36 | 0.0001 | 3.07 |
| | | | (1.89-5.00) |
| **AOR**= Adjusted odds ratio; CI= Confidence interval; Logistic regression: Cox & Snell $R^2$= 0.30, Nagelkerke $R^2$= 0.58, model $\chi^2_{(df8)}$ = 1.80, p < 0.05 | | | |

**Table 5:** Predictors for betel quid dependence from the logistic regression model.

## Discussion

The socio-economic characteristics like the age group which chewed greater amount of betel quid and the level of education is similar to a study conducted in Bangladesh and in a South Indian community [4,19]. The pattern of betel quid use is also found to be consisted with other studies. [19,20]. In this study, 353 (88.2%) of the respondents scored 4 points and above This result is dissimilar with the result of the study conducted in Taiwan [18]. A possible explanation could be that the sample in this study consisted of users reporting on their present experiences of betel quid dependence rather than ex-users reporting retrospectively. The betel quid dependence was assessed between the two groups of users (with and without tobacco additives).

About 9 out of 10 respondents using betel quid with tobacco were dependent while 7 out of 10 respondents were dependent using only betel quid. Both the groups showed a high percentage of dependence but the group who added tobacco was higher. This could be because of the fact that nicotine in tobacco is another substance of dependence. The dependence among the users with tobacco was 322 (90.2%) which is dissimilar compared with other studies conducted earlier [7]. The result is somewhat different due to the fact the population in the present study included both sexes but in the study conducted in Pakistan was among male respondents only [20].

However, the dependence among the users without tobacco was 31 (72.1%) is found to be consistent with the study conducted among healthy males who came to a Civil Hospital in Pakistan [20]. The important predictors for dependence found in this study found in the binary logistic model is consistent with other studies. Female respondents had more chance of developing dependence than male respondents which is similar to the study conducted in the South, South-east and East Asia region [8]. Higher level of education lowered the likelihood of dependence. From this, it can be said that if we provide the message of the harmful effects of chewing betel quid through health education programs, then people will be less inclined to chewing betel quid. Increasing duration and amount of quid used were more likely to result in dependence. The possible explanation that could be drawn from this is that there is an association of betel quid chewing for a longer period of time and the increased quantity of betel quid with dependency. These factors are similar to previous studies [7,8,20].

### Limitations of the Study

The respondents were selected by purposive sampling method and the sample size was also small which may not be a true representative of the entire population. Moreover, this study was a cross-sectional study, so this study was unable to explore any time

trends in use and the development of betel quid dependence.

## Conclusion

Betel quid chewing is deeply rooted in Bangladeshi tradition and culture. This study assessed the betel quid dependence among the users with and without tobacco. The most important finding is the high levels of betel quid dependence in our sample of betel quid users. Understanding of the psychological and behavioral aspects of the Bangladeshi betel quid users is required for developing effective cessation and harm reduction programs.

## References

1. Boucher BJ, Mannan N (2002) Metabolic effects of the consumption of *Areca catechu*. Addiction Biology 7: 103-110.

2. Gupta PC, Warnakulasuriya S (2002) Global epidemiology of areca nut usage. Addiction Biology 7: 77-83.

3. Gupta PC, Ray CS (2004) Epidemiology of betel quid usage. Annals Academy of Medicine Singapore 33 (Supplementary): 31-36.

4. Flora MS, Mascie-Taylor CGN, Rahman M (2012) Betel quid chewing and its risk factors in Bangladeshi adults. WHO South-East Asia Journal of Public Health 1: 169-181.

5. World Health Organization (WHO). Lexicon of alcohol and drug terms. WHO Geneva, Switzerland 1994; 1-65.

6. Lee CH, Ko AMS, Yen CF, Chu KS, Gao YJ, et al. (2012) Betel-quid dependence and oral potentially malignant disorders in six Asian countries. The British Journal of Psychiatry 201: 383-91.

7. Benegal V, Rajkumar RP, Muralidharan K (2008) Does areca nut use lead to dependence? Drug and Alcohol Dependence 97: 114-121.

8. Lee CH, Ko AMS, Yen CF, Chu KS, Gao YJ, et al. (2012) Population Burden of Betel Quid Abuse and Its Relation to Oral Premalignant Disorders in South, Southeast, and East Asia: An Asian Betel-Quid Consortium Study. American Journal of Public Health 102: 17-23.

9. Sinha DN, Gupta PC, Ray C, Singh PK (2012) Prevalence of Smokeless Tobacco Use among Adults in WHO South-East Asia. Indian Journal of Cancer 49: 342-346.

10. WHO (World Health Organization) (2009) Global Adult Tobacco Survey: Bangladesh Report 1-120.

11. Hossain MS, Kypros K, Rahman B, Arslan I, Akter, et al. (2014) Prevalence and Correlates of Smokeless Tobacco Consumption among Married Women in Rural Bangladesh. Plos One 9: 1-6.

12. Trivedy CR, Craig C, Warnakulasuriya S (2002) The oral health consequences of chewing areca nut. Addiction Biology 7: 115-125.

13. Avon SL (2004) Oral Mucosal Lesions Associated with Use of Quid. Journal of the Canadian Dental Association 70: 244-248.

14. International Agency for Research on Cancer (IARC) Working Group on the Evaluation of Carcinogenic Risks to Humans. Betel quid and areca-nut chewing and some areca-nut derived nitrosamines. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans 2004 85: 1-334.

15. Manilla, Philippines (2012) World Health Organization. Review of areca (betel) nut and tobacco use in the Pacific: a technical report. WM 290. Western Pacific Region: 1-66.

16. Pankaj C (2010) Areca Nut or Betel Nut Control is Mandatory if India Wants to Reduce the Burden of Cancer Especially Cancer of the Oral Cavity. International Journal of Head and Neck Surgery 1: 17-20.

17. Petti S, Masood M, Skully C (2013) The Magnitude of Tobacco Smoking-Betel Quid Chewing-Alcohol Drinking Interaction Effect on Oral Cancer in South-East Asia. A Meta-Analysis of Observational Studies. Plos One 8: 1-8.

18. Lee CY, Chang CS, Shieh TY, Chang YY (2012) Development and validation of a self-rating scale for betel quid chewers based on a male-prisoner population in Taiwan: The Betel Quid Dependence Scale. Drug and Alcohol Dependence 121: 18-22.

19. Bhat SJS, Blank MD, Balster RL, Nichter M, Nichter M (2010) Areca Nut Dependence among Chewers in a South Indian Community who do not also Use Tobacco. Addiction 105: 1-14

20. Mirza SS, Shafique K, Vart P, Arian MI (2011) Areca nut chewing and dependency syndrome: Is the dependence comparable to smoking? Substance Abuse Treatment, Prevention, and Policy 6: 1-6