Original research

Betel quid chewing and its risk factors in Bangladeshi adults

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Background: Despite its ill effects, betel quid chewing is a common practice in the South-East Asia Region. However, so far no large-scale study had been conducted, hence, this study was aimed at estimating the extent of betel quid chewing and its association with socio-demographic factors in Bangladeshi adults.

Methods: The data of a cross-sectional sample survey, involving 15 155 and 15 719 adults from rural and urban areas of Bangladesh respectively, were analyzed. Data were collected on betel quid chewing and socio-demographic characteristics by interview method using a pre-tested structured questionnaire. Anthropometric measurements were done following standard protocols.

Results: Overall 31% of the study samples chewed betel quid regularly. Prevalence was two times higher in rural (43.2%) compared to the urban areas (19.1%). Betel quid use was more common among Hindus (41.4%), farmers (55.3%), and people in the 40-year or more (63.9%) age group; and the habit was less common in unmarried (1.6%) and educated persons (19.6%). Ex-smokers (73.8%) and current smokers (37.3%) were more likely to use betel quid than never smokers (25.6%). The frequency of betel quid chewing was 5.15 times a day which varied significantly with age, locality, religion and occupation. Three-fourths of the betel quid users chewed tobacco with it which was not influenced by socio-economic variables. On average, 2.29 Takas (USD 0.03) was spent a day on betel quid chewing.

Conclusions: Betel quid chewing was found to be a common habit in Bangladesh. Mature adults (40+years) of low socio-economic status, i.e., rural residents, farmers and the illiterate are more likely to chew betel quid.

Keywords: Betel quid, areca nut, adults, risk factors, smoking, Bangladesh.

Introduction

Betel quid, the leaf of *Piper betle* vine, is usually taken with aqueous calcium hydroxide paste (slaked lime), pieces of areca nut (*supari)* and some other ingredients, which vary with individual taste and region. After introduction, tobacco soon became the most commonly used ingredient with the betel quid.[1] Betel quid chewing is a popular

traditional activity that is integrated into social and cultural practices and ceremonies.[2] It is a cheaper pleasure, affordable by the least advantaged members of the community. The habit has been prevailing for at least 2000 years throughout South Asia, South-East Asia and the South Pacific.[3] It is the fourth most commonly used psychoactive substance in the world after caffeine, alcohol and nicotine.[4]

Areca nut is often chewed in a betel quid. It is regarded by many people in South Asia as good for health. It is used as an astringent, mouth freshener, a taste enhancer, purgative, intoxicant, for impotence and gynaecological problems, parasitic intestinal infection and for indigestion and prevention of pregnancy-related morning sickness. It is also used as a mildly euphoric stimulant because it contains relatively high levels of psychoactive alkaloids. Chewing increases the capacity to work, causes a hot sensation in the body and heightens alertness. It is used among the poor to avoid boredom and to suppress hunger. A study in the UK reported that 42% of South Asian immigrants (from Bangladesh) chewed areca nut because it gave them a refreshing feeling and 35% used it because of its good taste, 29% used it as a snack and others used it because it helped to relieve stress and was believed to strengthen the teeth and gums.[5]

It is estimated that 600 million people use betel nut globally.[1] The habit of betel quid chewing has been reported in many countries including Pakistan, Sri Lanka, Bangladesh, Thailand, Cambodia, Malaysia, Indonesia, China, Taiwan, Papua New Guinea, several Pacific Islands, and migrant populations in places like South Africa, Eastern Africa, North America, UK, and Australia.[4] In Thailand, a decline has been recorded, while in Taiwan an increase in consumption was noticed, especially among children and youths.[4] The per capita consumption of betel quid in Taiwan has increased from 1.4 kg in 1981 to 7.5 kg

in 1996. In 2001, 14.4% of adult males and 1.5% of adult females were current betel nut chewers.[6] Betel quid chewing is socially acceptable in all sections of society, in all age groups, and among women; although in most countries it is more often confined to the older age groups.[2,4] Blue collar workers and the rural poor had a higher chewing rate. Education and income were inversely correlated with betel quid use.[6] In Pakistan, at least one chewable product of betel, areca and tobacco are used daily by 40% of the adolescents and adults.[7]

Bangladeshis traditionally, for a long time, have been chewing betel quid as a popular habit. A study, done on a limited sample, reported that 30% of the adults were using betel nut regularly.[8] However, large-scale studies have not been conducted to find out the extent of this habit in Bangladesh. This study was aimed to determine the magnitude of betel quid chewing and its association with locality, sex, education, occupation, smoking and other characteristics since betel quid, even without tobacco, was recently classified as a human carcinogen by the International Agency for Research on Cancer (IARC). Case-control studies from India, Pakistan and Taiwan reported an independent effect of betel quid as a risk factor for oral cancer. It had increased relative risks for pre-cancers; and dose-response trends were also noticed for both frequency and duration of betel quid use.[9] People using betel quid without tobacco were 9.9 times more likely to develop oral cancer than non-users after adjustment for other covariates.[10]

Methods

Cross-sectional sample surveys were conducted in 15 155 rural and 15 719 urban adults to find out the extent of betel quid chewing in Bangladesh. These surveys were conducted in Mirpur, an area in the capital city Dhaka and the rural Kaliganj sub-district which is

approximately 42 km from the capital. These areas are representative of the general urban and rural populations of Bangladesh. The distribution of age and other background characteristics of this sample appear to reflect the profile of the adult Bangladeshi population.[11,12] These areas were chosen to assess whether betel quid chewing differed markedly between rural and urban areas, independent of the variation in socioeconomic characteristics. At 99% confidence level with 5% relative precision, and assumed prevalence of betel quid chewing to be 30.3%,[8] estimated sample size was 6108 individuals for each sex in each area. Considering non-response rate and missing data the targeted sample size was rounded to 15 000 in each area.

To select the sample households, the interviewers' chose a specific place (usually the central point) as a start point for the survey and sampled every second household in the urban or rural areas. The direction for the survey in the locality was chosen entirely by chance (toss of a coin). Only households having at least one male and one female respondent over 18 years of age were included in the survey provided respondents agreed to participate in the study. The exclusion criteria were those who were extremely ill, mentally handicapped or unwilling to participate. However, all households agreed to participate in the study. Although equal representation of both sexes was targeted, about 54% were females in each survey.

Four teams comprising one male and one female interviewer were recruited from the local community. These teams were intensively trained. Male household members were interviewed by male interviewers and female interviewers collected data from the female members. A pre-tested structured questionnaire printed in Bangla was used for data collection. Verbal consent was obtained from every respondent. Interviews were conducted in private. Ethical approval was obtained from the Ethical Committee of the National Institute of Preventive and Social Medicine.

The socio-demographic data included age, sex, marital status, educational attainment, religion, and main occupation. The betel quid chewing data covered prevalence and its cost. Betel quid users were defined as those who took betel leaf with areca nut and lime (with or without tobacco) daily at the time of the data collection. Tobacco is chewed as part of a mixture with betel nut in two different forms, *zarda* and tobacco leaf. *Zarda* is a commercially prepared moist or dry chewed tobacco mixed with a variety of colourings, spices and essences while tobacco is used as dried, whole leaf after chopping it up. Current smokers were defined as those who smoked daily at the time of the data collection; ever smokers as those who had smoked at some time in their life either daily or occasionally; the past smoker category included those who had stopped smoking before the data collection period but used to smoke daily in the past, and occasional smokers were those who smoked occasionally.

The analyses were carried out using the Statistical Package for Social Sciences (SPSS) version 14.0. Prevalence was weighted to account for the age distribution, sex and locality stratification. Distribution of the data was checked and where necessary, log transformation was done to normalize the data before statistical analyses. Statistical tests used to determine the association between exposure and outcome variables included χ^2 test, independent sample t-test and ANOVA. To test the statistical significance, p value level of <0.05 was considered but due to the large sample size a more stringent cut-off of p<0.01 or less was usually used. In addition, as a number of statistical tests were conducted, the Bonferroni correction (α/K, where α is the

p value & K is the number of tests used) was used. Effects of exposure variables were also assessed after adjusting for other variables by multivariate analyses. In addition to Odds Ratio (OR), 95% confidence intervals of different estimates were also estimated.

Results

Overall 31% (95% CI: 30.99 to 31.01) of the study sample was found to be using betel quid but there was significant heterogeneity in relation to the socio-demographic variables (Table 1). Rural residents (43.2%) were twice as likely to chew betel quid as their urban counterparts (19.1%), (p <0.001). The chewing rate was two percent higher among females (31.8%) than males (29.8%).

Betel quid chewing increased significantly from younger to older age groups peaking in the 50-69 year age groups. More Hindus chewed betel quid compared to other religious groups. Unmarried respondents used betel quid least of all (OR 0.44; 95% CI: 0.34 to 0.56). Betel quid use decreased with increase in educational attainment. Farmers were more likely to chew betel quid (OR 1.23; 95% CI: 1.05 to 1.43). A sequential binary logistic regression model was significant (p<0.001). The model was very good both in classifying regular betel quid chewers (70.8%) and non-chewers (85.8%). Forward logistic regression indicated that age group was the best predictor of betel quid chewing.

Betel quid use was more common among the past smokers (73.8%) and current smokers (37.3%) than the never (25.6%) and occasional smokers (9.7%). After controlling for the socio-demographic variables, past smokers were three times (OR 3.09; 95% CI: 2.71 to 3.53) and current smokers were 1.3 times (OR 1.30; 95% CI: 1.17 to 1.44) more likely to use betel quid. Significant associations of betel quid use were found neither with

general obesity nor central obesity after controlling for the socio-demographic variables (Table 2).

Regular chewers took betel quid on average 5.15 times a day but there was variation by locality, occupation, religion and age (Table 3). Urban respondents and Muslims chewed betel quid more frequently. Businessmen took it significantly more frequently than the non-paid, farmers and servicemen or professionals. The frequency of betel quid chewing increased with age peaking in the 50-59 year age group. Multiple regression models did not show any effect of sex, marital status and education on the frequency of betel quid use after controlling for other variables. Although the model was significant (p<0.001) it could only explain 1.4% of the variation in betel quid chewing.

More than three-quarters of the betel quid users chewed tobacco with it. There was no significant difference in relation to socio-demographic status except for religion; Christians were more likely to take tobacco with betel quid (Table 4).

On an average, betel quid users spent 2.29 Takas (range <1-101 Takas) on betel quid and chewing tobacco. Table 5 shows that the mean expenditure varied markedly by the socio-demographic variables. Significant differences were found in expenditures by marital status, educational levels, religion and occupations. Multiple regression analyses controlling for other socio-demographic variables did not find any association with education and marital status. Only 18.2% of the variation could be explained in multiple regressions. Males, urban users, businessmen, and Muslims spent more money on betel quid chewing. Those in the 30-39 and 40-49 year age groups spent more than younger persons (<20 year age group).

Table 1: Betel quid chewing in relation to the socio-demographic characteristics in Bangladesh

Characteristics	N	Betel quid chewing n (%)	p-value**	Adjusted for Socio-demographic variablesˇ	
				OR	95% CI
Area					
Rural*	15 155	6546 (43.2)			
Urban	15 716	3009 (19.1)	<0.001	0.58	0.54 to 0.62
Sex					
Male*	13 588	4055 (29.8)			
Female	17 283	5500 (31.8)	<0.001	1.20	1.04 to 1.37
Age (years)					
<20*	3654	30 (0.8)			
20-29	10 033	674 (6.7)		5.04	3.46 to 7.36
30-39	6502	2025 (31.1)		22.72	15.56 to 33.17
40-49	4887	2842 (58.2)		66.49	45.49 to 97.19
50-59	2914	2003 (68.7)		96.90	65.90 to 142.48
60-69	1822	1254 (68.8)		81.86	55.22 to 121.35
70 +	1059	727 (24.90	<0.001	63.54	43.02 to 96.82
Religion					
Islam*	28 834	8768 (30.4)			
Hindu	1639	678 (41.4)		0.87	0.76 to 0.99
Christian	393	108 (27.5)	<0.001	0.57	0.43 to 0.75
Marital status					
Married*	23 685	8586 (36.3)			
Unmarried	5819	91 (1.6)		0.44	0.34 to 0.56
Widow/ divorced	1366	878 (64.3)	<0.001	1.05	0.91 to 1.21
Educational status					
No schooling*	8669	5195 (59.9)			
1-5 yrs of schooling	6547	2274 (34.7)		0.64	0.59 to 0.69
6-10 yrs of schooling	10 498	1707 (16.3)		0.34	0.32 to 0.38
Higher secondary +	5134	374 (7.3)	<0.001	0.17	0.15 to 0.20
Occupation					
Non-paid*	15 380	5504 (35.8)			
Students	2138	6 (0.3)		0.27	0.12 to 0.64
Manual labourer	640	270 (42.2)		1.29	1.03 to 1.62
Farmer	3290	1818 (55.3)		1.23	1.05 to 1.43
Skilled labourer	993	215 (21.7)		1.09	0.83 to 1.28
Business	3152	1003 (31.8)		1.15	0.99 to 1.34
Service	4485	617 (13.8)	<0.001	0.73	0.63 to 0.85

* Reference Group, OR- Odds Ratio, CI-Confidence Interval, **p-value by χ^2-test.
ˇAdjusted for socio-demographic variables shown in the table.

Table 2: Association of betel quid chewing with smoking, body mass index, and central obesity in Bangladesh

Characteristics	Betel quid chewing		p-value**	Unadjusted		Adjusted for Socio-demographic variablesˇ	
	N	%		OR	95% CI	OR	95% CI
Smoking							
Never*	5441	25.6					
Occasional	144	9.7		0.31	0.26 to 0 .37	1.03	0.83 to 1.28
Past	1866	73.8		8.18	7.44 to 8.98	3.09	2.71 to 3.53
Current	2096	37.3	<0.001	1.73	1.62 to 1.84	1.30	1.17 to 1.44
Body mass index							
CED III*	423	7.2					
CED II	464	7.9		0.79	0.66 to 0.93	1.28	1.01 to 1.61
CED I	1038	17.7		0.61	0.52 to 0.71	1.23	1.00 to 1.50
Normal	3260	55.6		0.43	0.38 to 0.50	1.12	0.93 to 1.34
Overweight	774	11.5	<0.001	0.50	0.42 to 0.58	1.17	0.95 to 1.44
Waist circumference							
Normal*	4775	81.5					
High	646	11.0		1.13	1.02 to 1.24	1.02	0.90 to 1.16
Very High	441	7.5	<0.001	1.26	1.12 to 1.42	1.02	0.87 to 1.20

* Reference group, CED- Chronic energy deficiency, OR- Odds Ratio, CI-Confidence Interval,
**p-value by χ2-test, ˇadjusted for locality, age, sex, education, occupation, religion and marital status.

Table 3: Frequency of betel quid chewing per day in relation to the socio-demographic characteristics in Bangladesh

Characteristics	N	Mean†	SD	p-value	Adjusted for Socio-demographic variables		
					β	F-value	p-value
Area							
Rural*	6545	5.02	4.27				
Urban	3006	5.44	4.27	<0.001^	.029	23.3	<0.001
Sex							
Male*	4051	5.21	4.63				
Female	5500	5.11	4.00	NS^	-.007	0.3	NS
Age in Years							
<20*	30	4.14	3.63				
20-29	674	4.50	4.59		.044		
30-39	2025	5.04	4.67		.093		
40-49	2841	5.29	4.32		.115		
50-59	2002	5.31	3.96		.119		
60-69	1253	5.26	4.21		.118		
70 +	726	4.99	3.52	<0.001ˇ	.101	10.2	<0.001
Religion							
Islam*	8764	5.21	4.34				
Hindu	678	4.55	3.52		-.057		
Christian	108	4.52	2.94	<0.001ˇ	-.057	18.9	<0.001
Marital status							
Married*	8582	5.15	4.29				
Unmarried	91	4.55	7.52		.011		
Widow/ divorced	878	5.17	3.89	NSˇ	-.009	0.5	NS
Educational status							
No schooling*	5194	5.10	4.02				
1-5 yrs of schooling	2273	5.25	4.30		.010		
6-10 yrs of schooling	1706	5.22	5.03		.000		
Higher secondary +	373	4.89	3.87	NSˇ	-.040	4.0	NS
Occupation							
Non-paid*	5503	5.10	3.99				
Students	6	3.80	1.94		-.109		
Manual labourer	270	5.22	3.90		.003		
Farmer	1817	5.07	4.22		-.003		
Skilled labourer	215	5.07	5.22		-.006		
Business	1003	5.67	5.40		.044		
Service/ professionals	615	5.00	4.14	<0.001ˇ	-.012	5.1	<0.001

*Reference Group, †Geometric mean, SD- Standard deviation, p-value by ^t-test, ˇone-way ANOVA, NS- Not significant

Table 4: Chewing tobacco use among the betel quid users in relation to the socio-demographic characteristics in Bangladesh

Characteristics	Chewing tobacco use				p-value*
	No		Yes		
	N	%	N	%	
Area					
Rural	1501	22.9	5040	77.1	
Urban	736	24.5	2269	75.5	NS
Sex					
Male	904	22.3	3143	77.7	
Female	1333	24.2	4166	75.8	NS
Age (years)					
<20	10	33.3	20	66.7	
20-29	149	22.1	524	77.9	
30-39	478	23.6	1546	76.4	
40-49	645	22.7	2194	77.3	
50-59	486	24.3	1516	75.7	
60-69	305	24.3	948	75.7	
70 +	164	22.6	561	77.4	NS
Religion					
Islam	2008	22.9	6752	77.1	
Hindu	209	30.9	468	69.1	
Christian	20	18.5	88	81.5	<0.001
Marital status					
Married	2024	23.6	6553	76.4	
Unmarried	13	14.3	78	85.7	
Widow/ divorced	200	22.8	678	77.2	NS
Educational status					
No schooling	1247	24.0	3943	76.0	
1-5 yrs of schooling	517	22.8	1755	77.2	
6-10 yrs of schooling	388	22.7	1318	77.3	
Higher secondary +	82	22.0	291	78.0	NS
Occupation					
Non-paid	1360	24.7	4142	75.3	
Students	1	16.7	5	83.3	
Manual labourer	66	24.6	202	75.4	
Farmer	371	20.4	1466	79.6	
Skilled labourer	54	25.1	161	74.9	
Business	221	22.1	781	77.9	
Service/ professionals	147	23.9	468	76.1	NS

*p-value by χ2-test, NS- Not significant.

Table 5: Daily expenditure (in Taka) on betel quid in relation to the socio-demographic characteristics in Bangladesh

Characteristics	Mean†	SD	p-value	Adjusted for Socio-demographic variables		
				β	F-value	p-value
Area						
Rural*	1.93	3.33				
Urban	3.36	3.30	<0.001^	.225	900.0	<0.001
Sex						
Male*	2.73	4.00				
Female	2.02	2.64	<0.001^	-.145	92.7	<0.001
Age(years)						
<20*	2.62	4.18				
20-29	2.28	4.17		.047		
30-39	2.39	4.26		.061		
40-49	2.36	2.87		.064		
50-59	2.28	2.82		.049		
60-69	2.19	3.32		.037		
70 +	2.01	2.19	<0.001ˇ	.010	3.3	0.003
Religion						
Islam*	2.35	3.39				
Hindu	1.82	2.61		-.056		
Christian	1.42	1.40	<0.001ˇ	-.127	19.3	<0.001
Marital status						
Married*	2.30	3.33				
Unmarried	2.82	7.79		.059		
Widow/ divorced	2.15	2.37	0.001ˇ	.013	2.0	NS
Educational status						
No schooling*	2.09	2.96				
1-5 yrs of schooling	2.35	3.51		.010		
6-10 yrs of schooling	2.74	4.07		.017		
Higher secondary +	3.18	2.63	<0.001ˇ	-.018	2.1	NS
Occupation						
Non-paid*	2.02	2.75				
Students	2.29	1.75		-.098		
Manual labourer	3.21	2.96		.036		
Farmer	2.17	3.12		-.024		
Skilled labourer	3.18	4.22		.042		
Business	3.36	5.06		.068		
Service/ professionals	3.35	3.31	<0.001ˇ	.032	10.0	<0.001

*Reference group, †Geometric mean, SD- Standard deviation, p-value by ^t-test, ˇone-way ANOVA, NS- Not significant

Discussion

Despite betel quid chewing being a risk factor for oral cancer, it is a popular habit in South Asia, South-East Asia and the South Pacific.[2,3] The prevalence of 31% estimated in this study is similar to the earlier report of 30.3% prevalence by Rahman *et al.*[8] Prevalence of betel quid chewing in Bangladesh lies in the middle of the 20%-40% prevalence found in India, Pakistan and Nepal over the last two decades[7] and in the South Asian immigrants to the UK, where 42% of adults used betel quid.[1]

Adding tobacco with betel quid is a common practice in the South-East Asian countries.[4] In the current study, three-quarters of the betel quid chewers added tobacco which is slightly lower than the report (85.2%) by Rahman *et al.*[8] In the current sample betel quid chewing frequency was 5.15 times per day, on average. These rates are much lower than Pakistan where the mean frequency of betel quid chewing varied from 6.5 to 11 in different ethnic groups.[7] In the Solomon Islands, subjects who chewed higher amounts of betel quid per day (>5) showed significantly higher risks of oral and pharyngeal cancer than those who chewed less quids (<5).[13] The cessation rates of betel quid chewing were associated with the decreasing daily consumption of betel quid. Hence, reduction of the daily amount, in a betel quid cessation programme, could be associated with future stopping habit.[14]

Several factors influence betel quid chewing, including ethnicity, demographic and psychosocial factors, its accessibility and public policy. Personal habits are dictated by different social and cultural behaviours in both sexes.[13] Four factors form the foundation for the popularity of betel quid chewing: Social acceptability, religious beliefs, perceived health benefits and addiction.[5]

As there are no social restrictions, betel quid chewing, with added tobacco, has been a traditional practice for a long time among Bangladeshi women. There was no sex-difference in betel quid chewing in the current study although Rahman *et al*[8] found that females used betel quid in higher proportions (34.6%) than males (26%); this might reflect sampling differences between the two surveys. In Karachi, an equal percentage (30%) of men and women chewed betel quid,[1] while in Taiwan more males than females used it (14.4% versus 1.5% respectively)[6] but in Cambodia, females (32.6%) outnumbered males (0.8%) in betel quid chewing and in Mumbai (India) 37.8% of men and 29.7% of women used betel quid.[4] Even if women had a lower chewing behaviour, they were less likely to stop chewing than men. As regard to whether betel quid chewing cessation has an association with sex, ethnicity and type of quid, male chewer's are the major focus in betel quid chewing prevention programmes.[14]

No sex difference was found in frequency of betel quid chewing; the overall mean was 5.21 times/day which is slightly lower than the mean of 5.88 found by Khan *et al.*[16] This study also found that a high proportion of male (77.7%) and female (75.8%) betel quid chewers also took tobacco which is in agreement with the finding of Rahman *et al* [8] where the male and female who were taking tobacco with betel quid were 80.3% and 88.1% respectively. Males spent 7.3 times more than females (6.38 and 0.87 Takas, respectively) which is much greater than the difference found by the Bangladesh Bureau of Statistics study (5.25 and 2.62 Takas by males and females, respectively).[17]

The findings of the current study were in agreement with Rahman *et al,*[8] in showing that the proportion of betel quid chewers increased with age and more than 50% of the middle-to elderly-aged persons took betel quid, which

was very high in comparison to Taiwan, where only 20% used it.[6] Rahman *et al* did not find any difference in chewing tobacco among betel quid users in different age groups, which is consistent with the current data.[8] The frequency of betel quid chewing increased with age and remained similar in the middle-and elderly-age groups.

Urban residents were less likely to use betel quid than in the rural areas (19.1% versus 43.2%), but their frequency of chewing was higher (5.44 and 5.02 times/day for urban and rural areas respectively). Rahman *et al* and Wen *et al* also found a lower usage in urban than rural areas in Bangladesh[8] and Taiwan[6] respectively. Rahman *et al* also showed that the prevalence of betel quid use decreased with improving socio-economic class of urban residents.[8] The current study, however, showed no significant difference in tobacco chewing between urban and rural betel quid users (75.5% and 77.1% respectively) after adjusting for the other socio-demographic variables. No locality differences in chewing tobacco were found among males in a Bangladeshi study[16] or in an Indian study involving both sexes.[18]

Educational attainment was inversely associated with betel quid use in the current study which is consistent with the findings of a Taiwanese study.[6] Education always plays a vital role in the health status of a country and also in the development of health behaviour of an individual.[19] Our study also showed that manual labourers and farmers were more likely to chew betel quid. However, business persons also used betel quid frequently. Thus, male manual labourers appear to be the occupational group most at risk for the hazards of betel quid chewing as they are more likely to chew tobacco than other occupations.

Another important finding is that betel quid chewing is closely associated with religion.

A study from Leicester, UK, reported that areca nut chewing was most common among first generation Asian immigrants with the highest prevalence among Jains (28%) and Muslims (23%) followed by Hindus (18%). In second generation Asian immigrants, this practice was highest among Muslims (17%) followed by Hindus (13%) and Jains (12%).[20] Our study revealed that Hindus were more likely to chew betel quid with tobacco. Betel quid is regarded by many Indians as a fruit of divine origin. It is considered an auspicious ingredient in Hinduism and is used along with betel leaf in religious ceremonies, important social gatherings and weddings and when honouring individuals.[5] Seventh-Day Adventists in Solomon Islands were less likely to be betel quid chewers. This might be explained by the code of abstinence from betel quid use recommended by the Seventh-Day Adventists.[21]

When betel quid with tobacco is consumed with alcohol and smoking, relative risk increases elevenfold.[22] We found a significant association between smoking and betel quid use. Betel quid use rate was higher among current smokers than among never smokers but the rate was highest among ex-smokers. Probably smoking quitters took betel quid as a means of quitting tobacco smoking. Therefore, betel quid chewing should not be considered as an isolated issue, but should always be coupled with issues related to tobacco smoking. Effective policies in smoking prevention and smoking cessation may substantially reduce betel quid use. Reducing cigarette smoking served as an important first step in reducing betel quid chewing in Taiwan,[6] thus, incorporating betel quid into tobacco control may provide a new paradigm to slow down the drastic increase in betel quid use in Bangladesh also. We did not find any association of betel quid with general or central obesity although a study in Taiwanese men found independent association with general and central obesity.[23]

In conclusion, betel quid chewing was found to be a common habit in Bangladesh. Mature adults (40+years) of low socio-economic status, i.e., rural residents, farmers and illiterate are more likely to chew betel quid. An anti-betel quid chewing programme is urgently warranted for current chewers. Education about betel quid chewing should be emphasized in the public prevention education. Regular screening for betel quid chewing may help prevent excess deaths in the future. As the habit is rooted in Bangladeshi tradition and culture, anthropological studies are indicated for designing appropriate educational campaigns.

Acknowledgements

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