Betel quid dependency and associated intrapersonal, interpersonal and environmental factors amongst adolescents: A school-based cross-sectional survey

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ABSTRACT

Background

Betel quid (BQ) is one of the fourth most commonly used substance globally. Though BQ is a psycho-active substance, yet little has been explored regarding dependency on it particularly among adolescents.

Objectives

Therefore, in this study, we aimed to determine adolescents’ dependency on BQ, along with their intrapersonal, interpersonal and environmental determinants of dependency.

Methods

This cross-sectional study focused on 2200 school-going adolescents of Karachi, Pakistan in 2016. Primary outcome was dependency on BQ among adolescents. Both univariate and multivariate regressions were used to estimate crude and adjusted odds ratios (after adjustments for all intrapersonal, interpersonal, and environmental factors) with 95% confidence level.

Results

Out of 2200 students, 874 (39.7%) were found to be BQ users amongst whom 69 (7.9%) were dependent on BQ. Comparing the groups with only areca nut users as reference category, betel quid with tobacco additives chewers were considerably dependent (OR = 14.08, 95% CI 3.64-54.16). The individuals who chewed >5 chews per day (OR = 1.87, 95% CI 1.08-3.29) and chronic users (>1year) (OR = 2.02, 95% CI 1.09-3.74) were more likely to be dependent. Older students (>12 years) (OR = 2.12, 95% CI 1.06-4.23), and who studied in government schools were significantly dependent (OR = 3.32, 95% CI 1.80-6.10) than those who studied in private schools.
Conclusions

In conclusion, intrapersonal characteristics like more than 5 chews per day, chronic chewers of more than a year, BQ with tobacco chewers, older adolescents and children studying in government schools were significantly associated with BQ dependency.

Keywords:

Betel Quid, Dependency, betel quid dependence scale, adolescents, dependency determinants.
Background

Oral cancers are the third most common cancers in South Asian countries. The common causes of oral cancer in this region include tobacco (both smoked and smokeless) (N. Gupta et al., 2017), alcohol (Nagpal, Nagpal, Mehendiratta, Marya, & Rekhi, 2014) and betel nut (commonly eaten either raw, or refined in the form of paan-betel quid or paan masala) (Humans, Organization, & Cancer, 2004; Lin et al., 2006).

Betel quid is one of the fourth most commonly used substance globally, while others include nicotine, caffeine and alcohol (Boucher & Mannan, 2002; P. Gupta & Ray, 2004; Nelson & Heischober, 1999; Warnakulasuriya & Peters, 2002; Winstock, Trivedy, Warnakulasuriya, & Peters, 2000). Despite of the fact that betel quid is consumed by 600 million people globally, yet its consumption is considerably high in South-East Asia, South Asia and Pacific Islands (P. Gupta & Warnakulasuriya, 2002; Nelson & Heischober, 1999). Typically, betel quid is made up of betel nut, piper betel leaf, slaked lime (calcium hydroxide), and/or tobacco; this combination varies with personal choices, cultural background, country and region at large (Humans et al., 2004). In Pakistan, commonly available formulations include, supari, chaaliya, paan masala and gutka which along-with areca nut also have artificial flavors, natural and synthetic scents, smokeless tobacco, cardamom, catechu and/or lime (Hosein, Mohiuddin, & Fatima, 2015).

Oral cancers are preventable if they are due to betel quid chewing; by curbing the habit. Though it is a well-established cause of oral cancer yet little has been explored to understand how dependent individuals are on it psychologically as it is fundamental in quitting. This backdrop is pivotal in designing an effective and customized behavioral intervention for ceasing the BQ chewing habit so that global load of the disease may lessen (Herzog et al., 2014).
Studies conducted so far have focused on adults that too in a small group (Herzog et al., 2014; Kuo & Lew-Ting, 2008; C.-Y. Lee, Chang, Shieh, & Chang, 2012). Herzog et al. and Lee et al. have worked on validating scale on establishing dependency on BQ by using Betel Quid Dependency Scale (BQDS). Even though the initiating age for the BQ use is 13 years on average (Sorensen et al., 2005); no or very limited work has been conducted on adolescents which is of paramount importance as this is the age of development brimming with inquisitiveness and trialing. Habits started at this age almost inevitably endure to adulthood. Thus; it is of substantial significance to identify the behavioral and psychological aspects alongside dependency of adolescents on BQ.

BQDS was initially developed by Lee et al. in 2012 and it was the nascent instrument for assessing betel quid dependence. BQDS encompasses three factors “physical and psychological urgent need,” “increasing dose,” and “maladaptive use.” This scale first was conducted on male prisoners in Taiwan who were not current chewers and there were no women. And it was in Chinese language (C.-Y. Lee et al., 2012). Second study included both gender with a smaller sample size, was in English language and it was on adults (Herzog et al., 2014). To our knowledge, no study so far has been conducted that has used this BQDS in adolescents despite of the fact that chewing habit commences at an age as early as approximately 13 years (Sinha, Abdulkader, & Gupta, 2016).

This study addresses mainly two questions pertinent to the BQ use in adolescents; firstly, what is the level of their dependence on BQ by using a scale, Betel Quid Dependence Scale (BQDS). Secondly, what are the intrapersonal, interpersonal and environmental characteristics associated with BQ chew in adolescents that increase the likelihood of their dependency on it and how they defer in dependent and non-dependent chewing groups.
Methodology

Data Source

Karachi is populated with approximately 24 million inhabitants thus rendering it as the largest city of Pakistan (Valliani et al., 2012). In 2013, the city government divided it into 06 districts and subsequently into 18 towns (Ali, Mogren, & Krantz, 2013). This study was conducted in the government and private schools of Karachi.

Sampling and study participants

Using cluster sampling, 26 secondary schools (clusters) were recruited ensuring proportionate selection of both government and private sector schools. In openEpi, with two-sided significance level at 95% and 0.9 power, sample size was calculated as 1606 which was increased to 2200 by adding attrition rate. Cluster numbers and sizes were calculated using equations manually since software was unavailable (Bennett, Woods, Liyanage, & Smith, 1991).

For the enrollment in the study, the principals of selected schools (both government and private) were provided with the details pertinent to the rationale of the survey and were invited to participate. If any school refused to participate then the invitation was sent to the other school of similar profile. Schools’ heads were also requested to hand out consent forms (provided to schools) to the parents with all the details of the study. Parents were urged to sign an acceptance or refusal and return it to the school within the stipulated time period. After seeking permission from schools’ principals and parents; 50-100 students of grades VI-X were selected from each school. This resulted in a sample size of 2200 which was considerably representative of Karachi’s school-going teenagers.
Data Collection tool and study variables

We used a structured and pre-tested survey questionnaire (some of the questions were adapted from Global Youth Tobacco survey (GYTS) (fact sheets Pakistan—Karachi, 2010) that aimed towards gathering information regarding:

Intrapersonal features like age and gender of the participants alongside their parental education and work history. This section also included queries like the type of school (government or private) participants go to and the amount of their weekly pocket money that they can use in any way they wish. The BQ consumption of an individual was also assessed by three items; number of chews per day, since how many years they have been using it and what type of BQ they use (areca nut alone or in form of paan masala, betel quid without tobacco and betel quid with tobacco).

Family history of betel quid use (Interpersonal) that included the use by peers, friends, teachers and parents. They were also asked a question if they will use BQ in case any if their closest friend offers them.

Accessibility and availability of BQ (environmental) was assessed by asking them if BQ was available in school canteen and/or at shops/hawkers outside school premises. It was also important to know if they knew BQ chewing is hazardous to health thus they were asked if they attended any sessions in school which imparted awareness regarding ill health effects of BQ and areca nut (AN).

Outcome variable - Dependency on betel quid measured based on BQDS (C.-Y. Lee et al., 2012)

This 16-items scale was developed by Lee et.al. (C.-Y. Lee et al., 2012) in 2012 which was subsequently validated by Herzog et.al. (Herzog et al., 2014) in adults. Binary responses were
noted for items in the scale (No=0 and Yes=1). Scores were coded between one and zero thus 0.5 suggested half of the scale being validated as dependency (Herzog et al., 2014). A cut off of 4 was suggested in adults (Zhu et al., 2017) to determine dependency. Three factors like; “physical and psychological urgent need”, “increasing dose”, and “maladaptive use” were used. We employed a conservative BQDS criterion score of 0.5 (or 8 out of 16 BQDS items endorsed) to operationally define betel quid dependence in adolescents as they are likely to overstate it (Colby, Tiffany, Shiffman, & Niaura, 2000) (Table 1).

Both the questionnaire and BQDS were translated into Urdu language (local language) and then back to English to ensure they mean the same after translation.

Ethical Considerations: The Institutional Review Board of Dow University of Health Sciences imparted approval to this study after careful scientific evaluation and critical analysis. (Reference Number: IRB-725/DUHS/Approval/2016/219).

Statistical Analysis: Data of the current study were analyzed by using SPSS v17. Descriptive statistics including mean, frequency and percentages were reported. Chi-square analysis was performed to determine significance of association between independent variables {intrapersonal (age, gender, school type, parents ‘education and work status, betel quid consumption and weekly pocket money), interpersonal (BQ use by peers, parents, teachers and use susceptibility if close friend offers it) and environmental determinants (awareness sessions regarding ill effects of BQ use, and its availability at school canteen and/or outside school hawkers)} and outcome variable “Dependency on betel quid” which was measured based on BQDS. Further, multivariate logistic regression was employed to ascertain the presence of dependency on BQ by controlling all other study variables. Results were reported as adjusted odds ratio (aOR) after adjusting for all above
mentioned study variables with 95% confidence level. P-value was deliberated significant at < 0.05.
Results

Out of 2200 students, 2140 participants provided complete information on which analysis was performed. School response rate was 80%. The betel quid and smokeless tobacco consumers were 912 amongst whom 874 (39.7%) were found to be BQ users (any type) (Table 2). Out of 874 individuals, 837 (95.7%) were areca nut and paan masala users, 25 (2.86%) were betel quid chewers without tobacco and 12 (1.37%) were betel quid with tobacco users. Based on BQDS, 69 (7.9%) individuals were found to be dependent on BQ while 805 (92.1%) consumers formed non-dependent betel quid chewing group.

Endorsement of betel quid dependence scale items

Table 1 demonstrates the items for the BQDS under 3 factors. Most adolescents highly endorsed the “increasing dose” (mean % = 18.36) and “physical and psychological urgent need” (mean % = 18.18) factors. Whereas, the “maladaptive use” (mean % = 9.15) was least marked by the participants.

Intrapersonal, interpersonal and environmental determinants of dependency on BQ

Intrapersonal determinants of dependency on BQ

Intrapersonal determinants suggested that the adolescents (n=247) who consumed 5 or more chews per day were positively linked with dependency ($\chi^2 = 18.64$, df= 1, p-value <0.001) on BQ as compared with those who consumed less than 5 chews. Likewise, individuals (n=472) who chewed for more than a year were more likely to be dependent ($\chi^2 = 15.68$, df= 1, p-value <0.001) on BQ than those who chewed for less than a year. Out of 69 dependent individuals, 62 (89.9 %) were only areca nut or paan masala users, while remaining 6 (8.69%) and 1 (1.45%) were betel quid with tobacco and betel quid without tobacco users respectively. Significant differences in the
distribution of dependency on BQ were observed in older age group (>12 years) ($\chi^2 = 7.03$, df= 1, p-value 0.008), in individuals who were mostly studying in government schools ($\chi^2 = 26.66$, df= 1, p-value <0.001) and adolescents whose mothers were educated ($\chi^2 = 7.97$, df= 1, p-value 0.005) (Table 2).

The results of both univariate (Chi-square analysis) and multivariate analyses corroborated with each other. The effect size of likely dependency on BQ with tobacco additives group further substantially increased ($aOR = 14.08$, 95% CI 3.64-54.16) when compared with only areca nut chewers after adjusting for other intrapersonal, interpersonal and environmental factors. Older students (>12 years) were more dependent on BQ ($aOR = 2.12$, 95% CI 1.06-4.23) as compared with younger group. Government school students were more significantly dependent on BQ ($aOR = 3.32$, 95% CI 1.80-6.10) as compared with private school candidates (Table 3).

**Interpersonal factors of dependency on BQ**

There were no significant differences noted in interpersonal factors except for the use susceptibility of adolescents when their close friend will offer them BQ in any form ($\chi^2 = 8.75$, df= 1, p-value 0.003) (Table 2), which after multivariate analysis became non-significant (Table 3).

**Environmental determinants of dependency on BQ**

Environmental factor between the two groups like when this product is available at school canteen was the sole significant finding associated with BQ dependency ($\chi^2 = 4.86$, df= 1, p-value 0.027) (Table 2) which disappeared after multivariate analysis (Table 3).
Discussion

In the current study, we observed dependency syndrome in the users of all three types of betel quid like areca nut only, betel quid without tobacco, and betel quid with tobacco. Amongst intrapersonal, interpersonal and environmental factors, the former was significantly associated with BQ dependency in adolescents. Intrapersonal characteristics like more number of chews per day, older adolescents and students studying in government schools were convincingly associated with BQ dependency.

The dependency on BQ was found to be 7.9% in our study group. This was comparatively less probably because we focused on adolescents (who were using the product for less number of years) while the other studies (reported so far) had adults who were using BQ for more than 10-30 years (Bhat, Blank, Balster, Nichter, & Nichter, 2010; C. H. Lee et al., 2014; Mirza, Shafique, Vart, & Arain, 2011). In this study, approximately 90% of the dependent chewers were consumers of ‘areca nut only’ in the form of paan masala which may probably be corroborated with the more number of chewers in this group, and the dependency can be attributed to the arecoline in betel nut (Lord, Lim, Warnakulasuriya, & Peters, 2002; Papke, Horenstein, & Stokes, 2015). This unique finding can be accredited to adolescents as compared with adults who used betel nut with tobacco and formed larger ‘BQ with tobacco’ dependent group in other studies (C. H. Lee et al., 2014; Mirza et al., 2011).

The consumers who used ‘BQ with tobacco’ were 14 times more likely to develop dependency as compared with ‘areca nut alone’ users in the current study. And this effect size significantly increased (which can be explained by the presence of both nicotine and arecoline in the product (Lord et al., 2002; Papke et al., 2015) after adjusting for BQ intake items, age, gender and other remaining intrapersonal, interpersonal and environmental variables. This finding was consistent
with previous studies where adults who were chronically using ‘BQ with tobacco’ more were found to be convincingly dependent on it (C. H. Lee et al., 2014; Mirza et al., 2011). In our study with increasing age, dependency increased which remained significant after adjustments for other variables in multivariate analysis suggesting the association between duration of use (in years) which increases as individual ages.

We found no positive association between BQ use by family and dependency, whereas, previous study witnessed a profound family influence on BQ dependency and suggested family based interventions to curb the habit (C.-H. Lee et al., 2012).

The findings of our study render adolescents’ dependency on BQ to be more clearly associated with its intake, increasing age and that, a majority of dependent chewers were concentrated in government schools of Karachi. This thus suggests a focused modus operandi for future interventions to cease the habit and as a result, a reduction in the related disease burden.

Our knowledge base suggests this to be the first study of its kind focusing on large school-going adolescent’s population of Karachi, Pakistan providing evidence of their dependency on betel quid alongside comprehensive intrapersonal, interpersonal and environmental contributors of dependency on BQ. The current study also used BQDS for detecting dependency first time in adolescents (Herzog et al., 2014; C.-Y. Lee et al., 2012; Zhu et al., 2017).

This study has certain limitations: as this is a self-reportedly generated data therefore its quality may have been compromised due to under-statement of the BQ use by the participants based on various social and cultural barriers. These children were though assured the maintenance of anonymity of data and it was also consented information. As with all such comparable studies, second limitation is the recall bias in the first section of the questionnaire where basic information
was gathered. Although, that was taken care of in the subsequent sections where counter checks for vital data were incorporated in addition to BQDS like number of chews per day, number of years of BQ chews and type of BQ used. Finally, as it is a cross-sectional study thus causality must be ascertained cautiously as it requires higher levels of evidences.
Conclusion

In this study, the BQ dependency was observed in adolescents (in all three types of BQ chewers) by using BQDS. Individuals who consumed more than 5 chews per day, chronic chewers of more than a year, BQ with tobacco chewers, older adolescents (>12 years) and children studying in government schools were significantly associated with BQ dependency, which also positively differed between BQ dependent and non-dependent groups. These determinants can play a dynamic role in reducing dependency on BQ thus may be considered strongly considered while designing and implementing future interventions for the said cause.

Author’s contributions: KS and AH comprehended the basic theme of the work, AH sorted all approvals and collected the data, AH ran the analysis with statistical support from SZ, both AH and SZ interpreted the results, KS supervised throughout the project and in drafting of manuscript.
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