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Cross-sectional Study on Prevalence of Betel Nut Chewing among the Youth of Meghalaya, North East Region of India: Development of Multifaceted Prevention Strategy

Shrabani Snigdha[1], Tavleen Bajwa[1], Shaubhik Anand[1], Lalit Mohan[1], Keshav Goyal[1], Muskan Mittal[1], Kusum Rani Gupta[1], James Wahlang[2], Rakesh Kumar Gupta[1], Prerna Diwan[1]*

Abstract

Introduction: Betel (Areca) nut intake, one of the most common oral chewing habits in the world, has been linked to the development of oral cancer, with India having an alarming situation with the highest number of registered oral cancer cases in the world. **Method:** A cross-sectional analysis was done among the young population of Meghalaya in the North Eastern Region of India, where this habit is prevalent. A questionnaire for on-ground data collection was administered to a total of n = 315 participants of both sexes from institutions in and near Shillong, Meghalaya. The relationship of this habit with social structure, knowledge, attitude, and risk perception was done. **Result:** A high prevalence rate of 78.09% was found among the school and undergraduate students from Shillong urban and adjoining rural areas for betel nut (BN) chewing with a higher female to male BN chewing ratio. This habit usually starts at the school level and persists for life. Peer pressure, lack of awareness, habituated families, and strong cultural linkage encourage children and adolescents to start chewing BN at an age as early as of 10 years. Lack of adequate awareness programs highlighting the ill-effects of BN and associated masticatory substances adds to the problem. **Conclusion:** Strategic, structured region-specific multifaceted awareness programs highlighting the potential health risks from uncontrolled, habitual usage of Areca nut has been proposed to prevent initiation of this habit.

Keywords: *Areca* nut, Betel nut, Betel quid, North-East India, Oral cancer

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Introduction

Areca nut (AN) or Betel nut (BN), the seed of *Areca catechu* Linn is one of the most unhealthy substance used after nicotine, alcohol, and caffeine in the world.[1] More than half of its global consumption has been recorded in the Pacific Island and South Asian countries.[2] BN is primarily composed of proteins, fats, carbohydrates, crude fibers, polyphenols, mineral matter, and alkaloids.[3] The alkaloids including arecoline[4] have adverse effects on the nervous and cardiovascular systems, generating a sense of euphoria and relaxation to the user. BN is chewed slowly, paving way for the persistent exposure and sustained absorption of its alkaloids in the oral cavity. It increases salivation and is used to tolerate long gaps between the meals, relieving toothaches and to boost digestive system.[5] The addictive practice of BN has an etiological correlation with the susceptibility to oral cavity cancers, one of the major causes of mortality in India and worldwide.[6] According to the International Agency for Research on Cancer,[7] BN is Group 1 Carcinogen, increases risk of oral, liver, biliary tracts, uterus, esophagus, and pharynx cancers. BN chewing causes malignant lesions such as oral mucosal fibrosis leading to oral cancers.[8] Often, BN chewers combine BN chewing with smoking cigarette which harms the cardiovascular and respiratory system increasing the risk of developing oral leukoplakia and submucosal fibrosis.

In the simplest form, BN is chewed wrapped in betel leaf with slaked lime, this preparation is called betel quid (BQ). BN is also consumed alone in its dried or nut form and in packaged chewing products such as "gutka" and "paan masala". In India, BN consumption is mostly confined to the North Eastern Region (NER), coastal areas, and some parts of northern plains. It is called tembul or kwai in NER and paan in north India. In NER, India including Khasi region of Meghalaya, BN and its derivatives are socially endorsed widely used masticatory products. A large number of people chew BN due to their tradition, easy availability, and regional backdrop. Poor people in these areas eat BN with betel leaf to stave off their hunger pangs.

BN chewing habit among school children is becoming common in developing countries like India. The initiation of this habit at a very early age is a matter of serious concern requiring an urgent need to intervene and prevents them from becoming addicted. *Areca* products in the packed form commonly available attracts usage by young community.[9] Studies assessing the prevalence BN habit among school children have been reported from different regions.[10-12] A prevalence rate of 27.06% for AN chewing in Indore (Madhya Pradesh, India) school students has

[1]Department of Microbiology, Ram Lal Anand College, University of Delhi, Dhaula Kuan, New Delhi, India

[2]Department of Biochemistry, St. Edmund's College, Shillong, Meghalaya, India

Corresponding Author: Dr. Prerna Diwan, Department of Microbiology, Ram Lal Anand College, University of Delhi, Dhaula Kuan, New Delhi, India. E-mail: prernadiwan.mic@rla.du.ac.in

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been reported.[13] Rural school children including boys and girls of Gandhinagar, Gujarat had similar prevalence rates.[14]

Prolonged use of BN results in a dependence syndrome that progressively damages the health of the individual. Users trying to quit this habit often develop mood swings, insomnia, anxiety, and dissatisfaction.[8] Despite the widespread use of BN and its role in human susceptibility to cancer, there seems to be no systematic strategy to control this habit. Therefore, concerted efforts involving targeted measures in hot spot areas for the affected groups of the society involving doctors, researchers, media, legal experts, and the community at large are required. Lack of scientific information or ignorance in the local community about BN's deleterious effects on health is evident through the widespread prevalence of chewing habit. In this regard, the present sample study as detailed here focuses on a cross section of society studying in higher classes in schools and undergraduates, the adolescents and young adults in Meghalaya, NER of India where this habit is prevalent. This being the most vulnerable section of the society who take up chewing BQ, get addicted, and become long term user of BN. We have assessed prevalence and recorded the usage pattern of BN along with its determinants for usage. Based on the observations, recommendation for the development of a regional level prevention program has been proposed.

Materials and Methods

Site Selection

Shillong, the capital city of Meghalaya, NER, India and the villages along the East Khasi Hills in the outskirts of the city were chosen for data collection. Survey participants from rural areas belonged to families engaged mainly in farming, carpentry, etc., whereas the participants from urban areas belonged to families of Government employees and businessmen. Adolescents and young section of society were the major focus of this research study.

Sampling and Study Participants

A sample n = 315 (males: 127; Female:179) students in the age group of 13–23 years was randomly chosen from senior secondary and secondary classes of schools and undergraduate students of college. Questionnaire was approved by the Institutional Research Committee and necessary permissions were obtained from the school and college authorities and consent from participants was taken to conduct the study. The participation was discretionary.

Conduct of Survey

Participants were registered for the survey explaining the purpose of study in their native Khasi language. The participants were assured that the confidentiality related to the information will be maintained. Informative power-point presentations were shown to the students to describe the objectives of the research project and to apprise them of ill effects of BN consumption. The questionnaire was then administered to the participants to assess the behavior pattern and awareness. The preferred language for the questionnaire was English to match the medium of teaching in the chosen schools and college. The questions were translated in the native Khasi language on request if required through one of the authors. The questionnaire was self-completed by participants. Questionnaire mainly dealt with three sections: (i) Knowledge section included questions on demographic characteristics of the sample population, frequency of consumption of BN, age of initiation, use of potential effect modifiers like tobacco/pan masala/gu*tka*, health-related ill effects due to BN chewing, (ii) attitude section included questions concerning the reasons to start consuming BN, social influence factors, reasons for liking or disliking the habit and the willingness to quit chewing BN, and (iii) awareness section included questions on the perception of risk factors associated with BN chewing and concerning oral cancer.

Data Analysis

Following definitions were adopted for data representation. (i) Chewers: Participants who confirmed using BN (ii) non-chewers: Participants who confirmed that they do not use BN. Categorization based on age, sex, school students, and college students was done for analysis. Statistical Package for the Social Sciences software was used to determine frequency distribution and association with different risk factors. The quantitative analysis and evaluation of the correlation between multiple variables included in the questionnaire were done using statistical tools such as percentages, mean, and cross-tabulation methods in table format using software.

Results

In the present study performed to understand the prevalence of BN chewing habit and its determinants among young adolescent population in Meghalaya, 315 questionnaires were filled by school and college students and staff. 246 participants admitted to using BN were categorized as Chewers (78.09%) and 69 who denied its use, categorized into Non-Chewers (21.9%). The gender distribution was 57% female and 43% males [Figure 1a]. The gender distribution in chewers was found to be skewed towards females (59%) as compared to males (41%) and reverse trend was seen in non-chewers. Among females, 82% were chewers and 18% were non-chewers and this distribution was 74% chewers and 26% non-chewers in males [Figure 1b and c]. Hence, females were found to be more engaged in BN chewing. Among the BN chewers, 83% were habituated to BN whereas 15.04% of chewers also admitted to using potential effect modifiers like Tobacco.

The survey analysis of population by categorization into age groups reflects that 31% participants first got acquainted with BN between the ages of 13–15 years [Figure 1d]. About 22% participants learnt it very early when they were <10 years old. It is evident that by 15 years of age, about 3/4th respondents (76%) knew about BN consumption. This was also the age when 43.9% participants initiated BN consumption. The prevalence rate was highest in 16–18 years [Figure 1e]. It was also higher among school students in comparison to undergraduate college students [Figure 1f], maximum prevalence in secondary school students. Most chewers (47.6%) were new to this habit and had started consuming BN a few months ago while 19.1% were using it for 5 or more years. The Frequency of BN consumption was low among school students, once a day while college students consumed it at least 2–4 times a day. In most participants, the exposure was once every few weeks while 35.4% consumed it daily preferably in the dried form. Each chewing episode for 83.3% respondents took 5–15 min.

Determinants Driving BN Chewing Habit

BN is easily available in the region as reported by 90.61% of the respondents. Besides, another prominent driving factor is its exposure through strong presence in the families. A large number of respondents (93.81%) reported having someone chewing BN in their family and 60.9% reported having 2–4 family members using BN. Most participants (83.1%) denied being forced to consume BN. The BN being age old practice in North Eastern Indian culture, especially in Assam and Meghalaya, also emerged as the main reason among youth stated to start this habit (52.2%).

Another important determinant is the role of peers among young population to start this habit. As much as, 18% of participants reported with certainty that they feel their peers who consume BN have more friends. Additional 48% agreed that may be this is true which is in sync with 10.14% non-chewers, who revealed facing criticism when they did not give in to this popular practice and 16.91% been forced to consume BN at some point in time.

Although, majority of participants reported that BN is prohibited in school/college, significant number (19%) stated it was not prohibited and 9% participants reported BN being secretly consumed in their school/college premises.

The responses regarding liking for this substance were varied with most common reasoning being related to their local culture. Futhermore, many consider it as tension reliever (22.6%) and an almost equal fraction (20.6%) as mouth freshener. About 80% respondents in the given age group did not report any major oral health issues. When comparing responses of chewers, it appeared that college student cohort had more health issues as compared to school students possibly due to increase in the length of BN use in the former. College students (17%) reported having mouth sores and school students (9.26%) reported of pain while swallowing food.

Level of Awareness

About 72.19% respondents were aware of BN ill effects and considered it a bad habit. About 46.34%, even favored the idea of banning it for human consumption [Figure 2a]. A large section (70.15%) was apparently aware of the link between BN consumption and development of oral cancer [Figure 2b]. However, a substantial segment (29.52%) was not aware of this association which is a cause of concern. More than half of the participants (55.5%) in the chewer group confirmed to have read about the ill effects printed on packaged AN products, gutka/pan masala available in the market.

A large proportion (39.37%) also knew someone with this habit who died of oral cancer. The significant number of respondents (27.93%) who was unsure whether BN chewing should be banned or not can be potentially counseled to assist in making an educated choice and decision.

About 80% admitted that their friends and family have talked about quitting BN [Figure 2c] with 74% counseled multiple times and 26% counseled once. An encouraging 57% students had attended awareness campaign on ill effects of BN, out of which 87% shared that such awareness programs were rare. Only 13% had attended such a program in residential locations. An alarming 40% had no exposure of such kind.

Intention to quit BN was shown by 88.2% users which is a positive trend and 65.44% reported having tried to quit. Students also stated that not much difference was seen in the attitude of peers on BN use discontinuation. However, families and friends (17.9%) praised them for abandoning the practice. On the contrary, nearly 10% families encouraged them to restart this habit. College students mainly complained of mood swings on discontinuing the use of BN while school students complained of a variety of symptoms including mood swings, anxiety, feeling cold, and distraction from the task at hand. A strikingly, 25.2% school students reported feeling more cold on discontinuing BN whereas

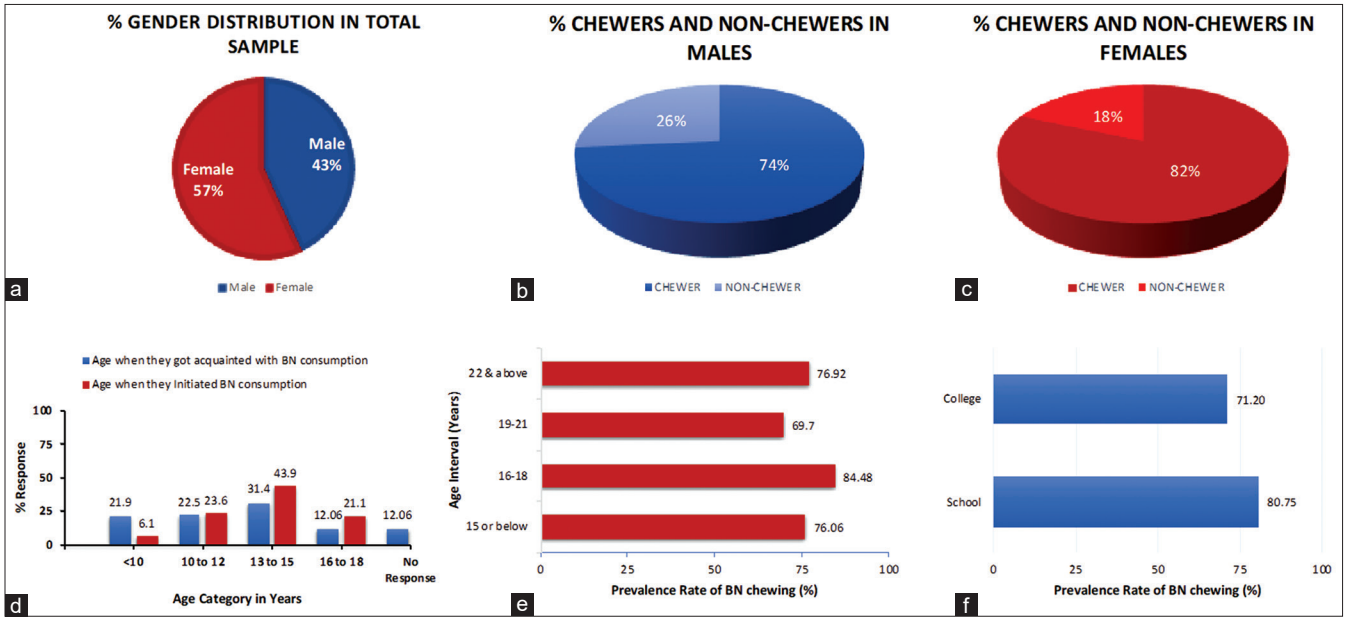

Figure 1: (a) Gender distribution in total sample; (b) Distribution of betel nut (BN) chewers and non-chewers in male participants; (c) distribution of BN Chewers and Non-Chewers in female participants; (d) acquaintance and initiation of BN chewing in Sample Population; (e) prevalence rate of BN Chewing among different age groups; (f) prevalence rate among School and college students

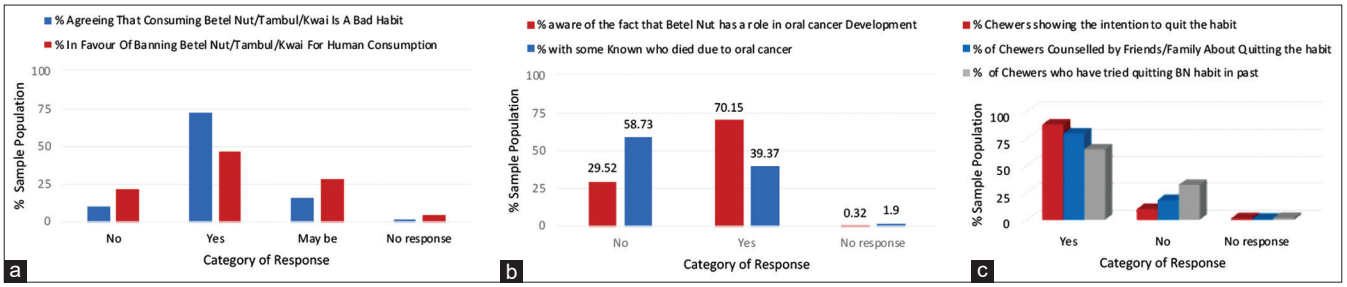

Figure 2: (a) Awareness among sample population on adverse effects of betel nut; (b) Understanding link between betel nut consumption and oral cancer; (c) trend on quitting the habit of Betel quid chewing in sample population

only 3.8% college students reported this issue. A large section of participants (60%) showed interest to be a part of awareness campaign dealing with ill effects of BN chewing. Hence, this section of population would be receptive to further counseling.

Discussion

Even though BN is an addictive substance linked to oral cavity, pharynx, and esophageal cancers, it use is still a popular practice among different populations around the globe, especially in South East Asia. High prevalence of BN consumption has been reported in Papua New Guinea, Guam[15,16] and South Asian countries, Nepal[9] Pakistan, Taiwan, and India.[13,17] However, BN use has not received requisite attention from public health perspective and global health policy initiatives.[18] India has alarming situation requiring intensive measures with the highest number of registered cases of oral cancers in the world, hot spots being NER[19] states of Assam and Meghalaya.[1]

The current study provides a detailed perspective on BN chewing among youth focusing on Khasi region of NER, India. The data clearly indicate high prevalence rate (78.09%) of BN chewing among the secondary, senior secondary school students and undergraduate students from Shillong and adjoining rural areas. In Karachi, Pakistan similar prevalence of 70% among school children in early years was reported.[10] The prevalence rate of 72% among adolescents has been reported in industrial town of Assam.[20] Cross-sectional study of Taiwan revealed about half of the primary school student population in aboriginal areas to be chewing BQ.[21] The high frequency of BN use in this region being directly related to its low cost and ease of availability. An alarming finding from this current study is that children get familiarized with BN at a very young age of 10–12 years and engage in the practice of chewing BQ. An earlier study[12] on South Asian school children in Tower Hamlets, London authors also pointed that BN chewing often starts at a very young age with highest period of risk for starting BN between 5 and 12 age group. Wazir *et al*.[9] reported that the maximum risk of getting into this habit for both the boys and the girls to be at age of 14 and 15 years (adolescence). This early beginning of BN consumption plays a major role in determining their continued adherence and becoming addicted. Factors facilitating this prevalence include, individual's family members addiction to BN[5,22] to which the participant is constantly exposed to at home. The growing child typically imbibes this habit from parents or family members and perceives it as a permission or endorsement from them. A similar trend with regard to this habit development was seen in a cross-sectional study from Taiwan involving students whose fathers were chewers.[23] Significantly high number (42%) of the chewers reported having first tried it with a family member and 26% with friends.[10] Therefore, it is suggested that parents/family should definitely be involved in health education program on prevention of BN usage.[15]

We observed a higher female to male BN chewing ratio which is in contrast to earlier studies in Adolescent population of Sri Lanka,[24,25] which reported higher male to female ratio translating into increased number of oral cancers in males as compared to females. Other studies[19,13] also reported 2:1 ratio of boys chewing AN over girls. BQ is also considered as teratogenic, can cause harm to the developing fetus.[26] Adverse effects associated with BN consumption resulting in miscarriage, premature delivery, infant mortality, reduced fetal length, and weight have also been reported.[27] Dissemination of this information is vital through educative programs on BN prevention.

Almost 75% of the participants informed, BN chewing making them more popular amongst their peers. Hence, peer pressure is another driving force for this rampant practice. Majority of individuals who have tried BN at least once reported not been able to discontinue it, even with their intention to withdraw. Students reported not been given adequate information on ill effects of BN in schools and although not allowed within the school/college boundaries, students consume BN without teachers knowledge. Therefore, adolescent children out of curiosity of trying new things start BN use and fall into the habit of consuming associated tobacco-related masticatory products which can potentiate cancer incidence.

Nearly half of the population in the higher age group (UG College) reported using BN for more than 5 years and had more issues in oral health as compared to early age school students with BN usage of few months. BN consumption frequency varied from once a day amongst school students to a few times a day among college students owing to their age group, relative ease of access and exposure. On the positive side, the prevalence rate was lower in college students, probably being more educated and aware about the adverse effects of the BN consumption. College students reflected a mature attitude, displaying no change in their behavior toward peers even upon their discontinuation of BN consumption and rather praised them for the positive change.

Although, a significant number of participants knew about BN's relation to cancer and knew someone who died due to oral cancer, yet, would still give reasons as "BN is a part of culture," "acts as a mouth freshener," "can be eaten as candy," "kept them warm," and "give a light stain to their teeth" to justify their chewing habits.

The cultural linkage of BN is deep rooted in India. In North-east India, people offer BN/betel leaf to their guest after the meal.

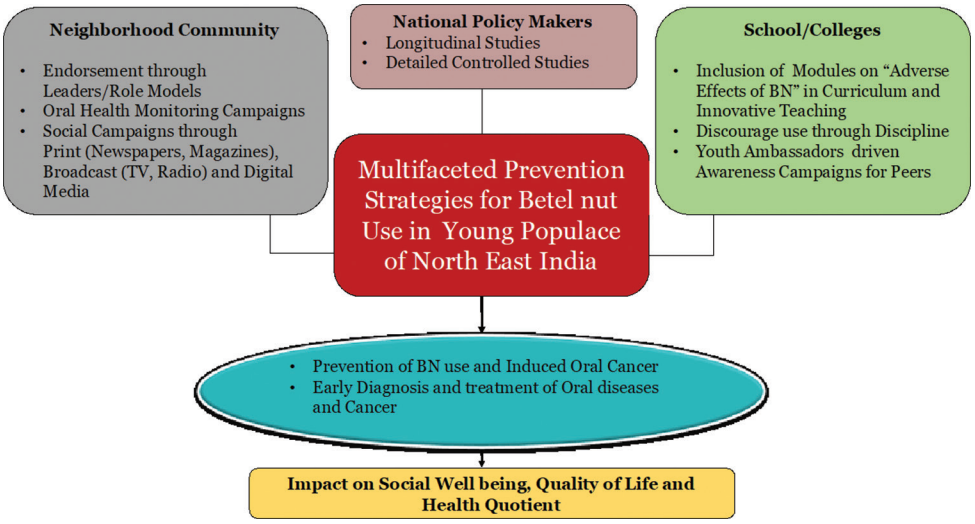

Figure 3: Proposed prevention strategy

In ancient times, as a custom of the royalty and dignity by Kings BN (as male principle) was chewed with betel leaf (as female principle) for its breath-freshening and relaxant properties. This legacy has been passed on over centuries and its even now is majorly chewed in all religious and wedding ceremonies.

Students reported a variety of symptoms if discontinuing the use of BN such as mood swings, anxiety, feeling cold, and distraction from work in confirmation to the earlier reports.[28] Among mild habituated users, the alkaloids of BN exert swift influence on the neurological pathways in the body leading to such symptoms.[4] The sense of negligence about the adverse effects of BN chewing can be attributed to the paucity of awareness programs in NER. In the current study, many participating students expressed their willingness to participate in such awareness programs if organized.

Conclusion

Structured intervention and aggressive awareness programs to encourage behavior modification toward BN are required. The vulnerable age group, that is, early teenage should be reached at the colleges and schools educating them about the serious terminal ill effects of BN. Research studies tailored to the culture of given region can be employed as a pre-orientation tool with real life local data to effectively highlight the risks of BN chewing and its association with oral diseases including cancers.

Besides educational institutions, parents, community, mass media including Social Media, can be involved in a multifaceted intervention program as proposed in Figure 3 for curbing this habit. Outreach, social media intervention through display of the warning signs for its adverse effects is needed to be done on large scale as being done for the use of Gutka and Paan Masala.[29]

Furthermore, for schools authors suggest content building and inclusion as exhaustive modules integrated in school curriculum for repeatedly endorsing ill effects of BN. The content depiction can be made innovative for students through audio-videos, designed, and led by experts as a strategy to bring about a decline in consumption trends of BN. The findings of this study can be utilized for National policy recommendations on health promotion through development of appropriate cessation strategies for BN usage. Amid COVID-19 outbreak, government of India's advisories to avoid chewing and spitting to prevent spread the virus may positively be utilized as a head start to implement proposed strategy to control the habit of chewing BN.

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