Introduction:
Oral diseases are major worldwide public health problems affecting a vast majority of adults. It is estimated that about 3.9 billion people worldwide are affected by oral diseases with untreated dental caries in the permanent teeth as the most common morbidity. (1) Factors (both urban and rural areas) like urbanization, economic development, low education level, prevalent myths and beliefs are related to oral diseases. (2,3) Amongst oral diseases, dental caries is the most widespread non-communicable disease and is a global public health problem affecting children and adults often leading to pain and discomfort. (4)

In a developing country like India where about 68 percent of the population reside in rural set ups, (5) data on oral health remain scarce in rural communities and even scarcer among marginalized groups. While dental problems remain rampant both in urban and rural regions of a nation, the burden of oral diseases is more on the disadvantaged and the socially marginalized groups. (6) Data like determining existing knowledge, behaviors, attitudes on oral health and factors for developing effective community-based oral health education and promotion programs. (7) The WHO STEP wise approach also recommends data collection on modifiable risk factors (oral hygiene practices, alcohol and tobacco consumption, and utilization of dental services) to determine major possible disease burden. (8)

The present study was conducted to gather data on prevalence of dental caries, dental pain and its impact on their daily life, prevailing modifiable risk factors (oral hygiene practices etc)
among a group of population devoid of health and oral health services due to its unique geographical location.

Geographical Location

The Brahmaputra is a braided river, which has resulted in the formation of about 2500 small riverine islands inhabited by approximately 2.5 million people [roughly about 8% of total state population of Assam (India)]. Unfortunately these islands are among the most economically backward areas of Assam with no access to communication and people are badly hit by recurring floods. Most island totally lack basic infrastructure and services, from health to schools from power and roads to drinking water and sanitation.9 Due to recurrent floods, people are forced to shift from one island to another due to massive erosion. The houses are built about 4 – 5 feet above the ground on thick logs which helps them sustain during floods. Transportation is via boat at specific timings only. Healthcare in the form of medical relief is often provided by Primary Health Center (PHC) and/or Community Health Center (CHC) situated on few islands like Majuli (World’s largest riverine island and has to be ferried via boats), which has an area of 421.65 sq.km. (9) Oral health services are very poor with no private practitioners among the islands. Dental officers are deputed at 30-bedded CHC, Kamalabar (Majuli) and at Civil Hospital, Garmur (Majuli). There is only one Regional Dental College at Guwahati in Assam (about 309 km away) to address the unmet dental needs for the population. However, a vast majority of the population living on islands do not have availability of oral health services and/or feasible access to these dentist/oral health services, if any. Even to reach Majuli, one has to ferry across the Brahmaputra for variable duration of time to reach PHC and/or CHC or the mainland.

Methodology

Study Setting

A non-profit trust based in Guwahati, Assam (India) has initiated an innovative program to provide medical services on a boat. The boats provide basic medical services to islanders along the course of Brahmaputra at select locations. Permission was obtained from the non-profit trust to accompany them in an effort to obtain more relevant data on their oral health. The present study was conducted to determine the cumulative status of dental caries among population residing in two conveniently selected economically marginalized islands of Brahmaputra, Assam (India). These islands represented other riverine islands of Brahmaputra from both geographical and developmental domain. The islands did not have any school and or any private/government medical relief center. The study was conducted in 2015. The study duration was over a period of two days for each island. Permission to conduct the study was obtained from the non-profit trust in Guwahati, Assam.

Participants

The participants consisted of general population who visited boat clinic for any general health related problems. All patients who reported to boat clinic and subject to inclusion and exclusion criteria, were included in the present study. The inclusion criteria were:

- Those providing informed consent after the nature of study was explained to them. For those below 18 years, informed consent was obtained from their parent/s accompanying them.
- Knew how to read, write and understand Assamese (Local language of Assam, India). Those unable to read and write were interviewed by a volunteer who was not a part of the study.

Exclusion Criteria: Patients who were not willing to provide informed consent and those requiring immediate medical aid.

A self-administered, closed ended questionnaire was utilized to obtain responses from study participants. The questionnaire consisted of two parts. Part one focused on socio-demographic factors, identification of risk factors like consumption of tobacco, alcohol and oral hygiene practices. In addition any history of dental pain in the preceding 6 months, its impact and steps taken for the same were elicited. If no action was taken by the patient, then reasons for the same were also recorded. For children below the age of 13 years, history of dental pain was elicited from their parent/s. Those unable to read or write were interviewed for the same by a social worker who was not a part of the study. The information for part one was collected followed by clinical examination (part two).

Part two was only clinical evaluation. The participants were screened with type III examination using mouth mirror and probe (WHO Probe). The WHO methods and criteria were used for recording caries prevalence, dmft and DMFT for primary and permanent teeth. The examination was carried out under natural day light. The clinical examination was carried out by a single examiner who was trained and calibrated through a series of clinical training session on a sample of patients who were not included in the present study. The reliability and validity of the questionnaire was not tested.

Statistics

The self-administered questionnaires were then evaluated. Incomplete questionnaires and/or those with additional responses for any items were excluded from the analysis. For statistical analysis dental caries was categorized as either present or absent [DMFT=0 / DMFT ≥ 1]. The data was entered in Microsoft Excel sheet (Microsoft Office 2010, Microsoft Corp) and was then analyzed using Statistical Package for Social Sciences [SPSS 15.0, SPSS Corp, IL, Chicago] Chi square test and students ‘t’ test was used to compare proportion and mean difference among participants for dental caries. Mean differences for DMFT in the age group of 13 – 19 years was not determined owing to less participants.

Results

A total of 102 patients participated in the study. The response rate was 100 percent. The mean age was 27 years (27.02 ± 18.5; range: 5 – 80 years) with more females than males. Muslims accounted for 56.8 (58/102) percent and 58.8 percent (60/102) consumed tobacco. Smokeless tobacco (SLT) was preferred over smoking form (56/60) and majority of study participants consumed less than 5 small sachets of SLT (Figure 1). None of them reported the consumption of alcohol.

![Figure 1: Frequency of consumption of smokeless tobacco among riverine islanders of Assam [SLT – Smokeless Tobacco]](image-url)
The overall prevalence of dental caries was 59.8 percent and the mean dmft affecting the islanders was 2.3 for primary teeth. DMFT scores for participants between 13 to 19 years and those above 19 years was 2.7 and 3.3 respectively. The prevalence of dental caries among the three age group was 54.8 percent, 72 percent and 60 percent respectively. (Table 1 and 2a). Males had significantly higher dmft scores (P=0.02) in primary dentition and DMFT scores of females was almost similar to that of male scores (P=0.86) (Table 2b). In addition, females also had significantly higher proportion of caries free (dmft=0) [$X^2 = 7.05; P=0.008$] oral cavity than males in primary teeth. (Table 2c)

About 6.8 percent did not clean their teeth and 22.5 percent used their finger to clean the teeth, however majority of the study participants cleaned their teeth using toothbrush and toothpaste with none brushing their teeth twice a day. About 46 percent reportedly changed their toothbrush once in six months (Table 3).

Sixty nine percent (71/102) reported dental pain in the preceding 6 months and only 21.1 percent made an attempt to approach a health care provider. About 70 percent (50/71) did not do anything for dental pain. (Table 4). The most common reason quoted was non availability of dentist. The remaining 7.5 percent resorted to local practices for relief from dental pain. Among those who experienced dental pain the most common impact was the inability to have food (both males and females) and difficulty in chewing food among those above 19 years of age. (Table 5)

Discussion
The present study provides estimated prevalence of dental caries and oral hygiene practices of a group of population living and/or migrating among the riverine islands of Brahmaputra. To our knowledge no other study so far has made an attempt to reach out to these islanders in Northeastern India that is devoid of health and oral health services owing to its geographical location.
It was very encouraging to learn that there was no study participant in the present study who gave a history of consuming alcohol. This was rather a shift from the usual findings where consumption of alcohol is usually found among rural population. This can be partly attributed to the fact that majority of participants were Muslims where consumption of alcohol is forbidden on religious grounds. A similar study conducted in the rural settings of Bihar (state in India) also revealed a lower proportion of alcohol intake. (10) Consumption of tobacco is a rising public health problem which was also prevalent amongst riverine islanders. In the present study, the overall prevalence of tobacco consumption was 58.8 percent (60/102) with majority consuming Smokeless tobacco (SLT) (56/60). The overall prevalence of 58.8 percent was higher than the prevalence observed by studies conducted in different geographical location of India with similar study settings (10 – 12) and much higher than the Indian Global Adult Tobacco Survey 2 [GATS 2, 2016 – 17] which reported a prevalence rate of 28.6 percent across India and 48.2 percent for the Indian state of Assam respectively. (13) Consumption of tobacco and particularly SLT was higher among females (53/56). An analysis of secondary data from National Family Health Survey in 2005 – 06 reported about 10.7 percent of women consuming chewable tobacco in India. (14) In addition, GATS 2 reported about 12.8 percent of females above 15 years of age consuming SLT in rural India. (13) It is estimated that female tobacco users from Bangladesh, Myanmar, India and Thailand are more likely to use SLT than smoking form. (15) The findings from the present study confirms the same. The higher prevalence of SLT among women in the present study could be due to higher participation by females than males since, the survey was conducted during the day when most of the males were not available. In addition, prevailing consumption of tobacco among females is also reported in literature.(16 – 19) However, reasons for rising trends of tobacco use among women remains an open empirical hypothesis for further investigation.

The overall caries prevalence was 59.8 percent with a mean dmft of 2.3 for participants below the age of 13 years and mean DMFT of 3.0 for permanent teeth respectively (13 – 19 years: 2.7; above 19 years: 3.3) [table 2]). The mean dmft of 2.3 in the present study was lower than the mean dmft reported in previous studies in similar age groups. (20, 21) The minimum age in the present study was 5 years, a time when first permanent molars begin to erupt in the oral cavity. Therefore, dmft of 2.1 indicates, status of primary teeth in mixed dentition. The DMFT of permanent teeth in mixed dentition was found to be 0.16. DMFT of 2.7 was found for study participants in the age groups of 13 – 19 years. A systematic review conducted in 2017 revealed a wide range of dental caries for adolescents (1.4 – 7.1). The DMFT values in the age group of 15 – 19 years across different study settings were almost similar to DMFT obtained in the present study. (22) In addition, another systematic review reported weighted mean DMF value of 1.9 among 11-15 years old adolescents. (23) The mean DMFT value among those above 19 years in the present study was slightly lower than a study conducted in central India12 and much lower than a study conducted in western India. (24) Surprisingly the present study did not witness any filled component among its study participants, indicating that preventive and/or curative oral health services were not utilized by islanders. Almost all the teeth were either decayed (for D = decayed component) and/or grossly decayed (M = missing component) that were indicated for extraction, but considered under missing component. Only one study participant reportedly approached a dentist at the CHC. As reported in previous studies with males having higher caries experience and dmft scores than females (20, 25, 26), the present study also demonstrated significantly higher dmft scores in males than females (P<0.05) as against DMFT scores in permanent dentition (above 19 years) where both males and females had similar DMFT scores (P=0.89). There was an
increase in DMFT score with increase in age. We also observed that proportion of females with no caries experience (dmft = 0) was higher in primary dentition. However, we also observed an increase in the proportion of females with dental caries in permanent dentition (above 19 years). Since females were large in number than males in the present study, there is a possibility that caries experience of males is missing from the present study. However, further research is warranted taking into account other factors like diet and sugar consumption which was not considered in the present study.

Tooth brushing is a healthy preventive oral health behavior that was practiced by a majority of islanders. However, there was a section of islanders who preferred cleaning their teeth using finger (22.5) and the rest using twigs of tree (4.9) and/or not cleaning their teeth (6.8). The figures were marginally better than a study conducted among rural adults in Central India, where about 37 percent and 40 percent did not use toothbrush as against 34.2 percent in the present study. (10, 24) This calls for an appropriate strategy devised by regional/state policy makers highlighting the importance of oral health with focus on rural population especially marginalized groups. Majority of those using toothbrush change their toothbrush once in six months, perhaps the constraint of accessibility is the main factor in the current study setting.

Overall about 69 percent (71/102) of study participants reportedly gave a history of dental pain in the preceding 6 months with females experiencing more dental pain than males. It was surprising to know that about 75 percent (50/71) made no efforts for relief from dental pain. The main reason for ‘not doing anything’ for pain were, ‘non-availability of dentist’ and ‘transportation problems’. About 21 percent (15/71) approached the boat (for medical services) for their opinion and were prescribed pain killers. Only one study participant could approach a dentist, perhaps recommended by the doctors on boat clinic. It is worth appreciating the observation that very few participants weren’t aware that dentist has to be approached for dental pain. Majority of the participants cited reasons like ‘transportation problems’, ‘non-availability of dentist’ and ‘no one to take /accompany them’ to a dentist. This is perhaps a good indication since it implies that study participants might have utilized dental services, had there been any dentist nearby. In addition, even if there was a dentist nearby, the geographical location might have proved to be a major constraint. This is contrary to a study conducted in central India where about 75 percent did not know that a dentist has to be approached for teeth related problems. (10) Dental pain has its impact on daily life often limiting individual’s day to day activities. Both male and female study participants in the present study reported their inability to have their food due to dental pain. For study participants over 20 years of age, the most common impact was difficulty in chewing food followed by difficulty to work. The results were almost similar to a study conducted among Brazilian adults where difficulty in chewing certain food was the most common impact. (27) Difficulty in chewing food/eating was also reported as an impact by adolescents in the present study which was also reported among adolescents in similar settings. (28)

Conclusion

It can therefore be concluded that almost all participants had unmet dental treatment needs and the main reason was the lack of available and accessible oral health services owing to its geographic location. A substantial proportion of study participants did not brush their teeth and experienced dental pain causing difficulty in chewing food thereby affecting their quality of life. There is a need to rectify the challenge observed in the present study by planning customized oral health program with a mission to provide optimum oral health services thereby reducing the gap of unmet dental need.


