



Journal of Medical Sciences

ISSN 1682-4474

science
alert

ANSI*net*
an open access publisher
<http://ansinet.com>



CrossMark
← click for updates

Research Paper

J. Med. Sci., 17 (1): 46-52
January-March, 2017
DOI: 10.3923/jms.2017.46.52

JMS (ISSN 1682-4474) is an International, peer-reviewed scientific journal that publishes original article in experimental & clinical medicine and related disciplines such as molecular biology, biochemistry, genetics, biophysics, bio-and medical technology. JMS is issued four times per year on paper and in electronic format.

For further information about this article or if you need reprints, please contact:

Md. Sahab Uddin,
Department of Pharmacy,
Southeast University, Dhaka,
Bangladesh Tel: +880 1710220110

Impact of Tobacco Smoking, Betel Quid Chewing and Alcohol Consumption Habits in Patients with Oral Cavity Cancer in Bangladesh

¹Kala Chand Debnath, ²Md. Sahab Uddin, ³Srijan Goswami,
⁴Oscar Herrera-Calderon, ⁵Md. Tanvir Kabir, ²Md. Fakhrul Hasan,
⁶Kamrun Nahar Lucky, ²Sayema Khanum and ⁷Mohamed M. Abdel-Daim

Background and Objective: Worldwide cancer is an important public health problem. Tobacco smoking, betel quid chewing and alcohol consumption are closely linked with the oral cavity cancer. Therefore, the aim of this study was to explore the status of smoking, chewing and alcohol consumption habits of patients with oral cavity cancer in Dhaka, Bangladesh. **Materials and Methods:** A cross sectional study was conducted among usual oral cancer patients, who attended at the outdoor of the City Dental College and Hospital during the period of January, 2015-February, 2017. Data on socio-demography, risk habit profiles, site of cancer and number of ulcer patients were recorded by previously designed questionnaire. Data entered in the data collection form were entered into the Microsoft Excel. The results obtained were expressed as Mean±SD. **Results:** A total of 200 oral cancer patients were selected for study and highest percentage 24.5% of the patients were in the age group of 60 years and above. It was found that highest percentage, 68.5% of the patients had habit of chewing betel leaf and 60.5% patients had habit of smoking. The most preferred mode of smoking was bidi (52.07%) followed by cigarette (44.63%) and very few were habituated with hookah (1.65%). For 38.3% patients single ulcer was detected in the palate and upper jaw and 52.9% patients had multiple ulcers in the tongue. Single ulcer was found to be high among 69.4% patients having habit of chewing betel leaf and highest multiple ulcers, 47.1% were reported for patients taking gul inside mouth. **Conclusion:** Tobacco smoking and chewing betel quid are strong risk factors in the development of oral cancer. Furthermore, age, gender, education and occupation influence the development of oral cancer.

Key words: Oral cavity cancer, tobacco, smoking, betel quid chewing, alcohol consumption

¹City Dental College and Hospital, Dhaka, Bangladesh

²Department of Pharmacy, Southeast University, Dhaka, Bangladesh

³Department of Molecular Biology and Immunology, Institute of Genetic Engineering, Kolkata, India

⁴Academic Department of Pharmaceutical Sciences, Faculty of Pharmacy and Biochemistry, Universidad Nacional San Luis Gonzaga de Ica, Ica, Peru

⁵Department of Pharmacy, BRAC University, Dhaka, Bangladesh

⁶Department of Pharmacology and Clinical Pharmacy, North South University, Dhaka, Bangladesh

⁷Pharmacology Department, Faculty of Veterinary Medicine, Suez Canal University, Ismailia, Egypt

ANSI*net*

Asian Network for Scientific Information

INTRODUCTION

Oral cavity cancer is currently a major global health issue¹. It is a very disastrous disease that affects many people each year all over the world and it is the 11th most dominant cancer in the world according to the World Health Organization². In developing countries, oral cancer is estimated to be the 3rd most common malignancy after cancer of the cervix and stomach³. Among these modern epidemics, cancer is the 2nd commonest cause of mortality in developed countries. In developing countries, cancer is the 10th most common cause of mortality⁴. Oral cancer represents approximately 13% of all cancers, thereby translating into 30,000 new cases every year⁴.

Epidemiological studies have shown that incidence of oral cancer varies significantly in different continents. The highest incidence rates were reported in Asia region (i.e. India, Sri Lanka, Pakistan, Bangladesh and Taiwan) and parts of Europe (i.e. France, Hungary, Slovakia and Slovenia)⁵. In addition, for parts of Latin America, the Caribbean (i.e. Brazil, Uruguay and Puerto Rico) and the Pacific region (i.e. Melanesia and Papua New Guinea) largely attributed to exposure to specific risk factors for oral cancer⁵. In Bangladesh more than 7000 people are newly diagnosed each year and among them 6.6% people are died due to their lifestyle and other factors^{5,6}. Oral cancer mostly affects in the area of the lips, tongue, mouth, salivary glands and oropharynx^{7,8}.

Smoking is one of the most important risk factors for developing oral cancers^{9,10}. Other risk factors have been reported to be closely associated with oral cancers, including betel quid chewing, alcohol consumption¹¹, poor oral health¹² and human papilloma virus infection¹³. The most widespread form of tobacco is chewing of betel quid with tobacco and this has been demonstrated as a major risk factor for oral cavity cancer^{14,15}. In addition, betel quid with or without tobacco is one of the independent major risk factors for oral cancer^{16,17}. In countries where such habits were prevalent and had cultural importance in traditional and religious ceremonies, oral cancer was one of the most common cancers^{18,19}. Apart from tobacco use ill-fitting dentures, syphilis, inadequate diet, malnutrition and chronic irritation from rough or broken teeth were reported more frequently in oral cancer patients²⁰.

No significant advancement in the treatment of oral cancer has been found in recent years. Although better combinations of multidiscipline approach have improved the quality of life in oral cancer patients, the overall 5 year survival rate has not improved much over the past decades²¹. The primary prevention, such as cessation of tobacco smoking and alcohols drinking along with early detection is necessary control procedures to improve the prognosis of oral cancer^{22,23}.

Bangladesh is one of the under developing and over populated country in South Asia²⁴. There are 13,00000 cancer patients in Bangladesh, with about 200,000 patients newly diagnosed with cancer each year^{2,25}. Among these all cancer

patients, 7120 were affected in lip, oral cavity and pharynx. Considering other Asian countries the number of patients was not higher²⁶⁻²⁸. Among the risk factors as stated earlier smoking, chewing and alcohol consumption are considered as the important risk factors for developing oral cancers¹⁰. The incidence of oral cancer among patients who had the habit of tobacco smoking was 8.4 fold higher than that among patients who did not¹¹. Therefore, the objective of this study was to analyze the smoking, chewing and alcoholic consumption pattern of oral cancer patients attending City Dental College and Hospital, Dhaka, Bangladesh. This study will be effective to get the condition of the oral cancer patients with smoking, chewing and alcohol consumption habits in Bangladesh as well as to detect the most important causative factors.

MATERIALS AND METHODS

Study design and study site: A cross-sectional study was carried out to assess the prevalence and various risk factors among patients with oral cavity cancer attending in the City Dental College and Hospital of Dhaka City, Bangladesh.

Study population: A total of 200 patients suffering from oral cavity cancers were selected from the outpatient department of the City Dental College and Hospital during the period of January, 2015-February, 2017. All the selected patients were brought to the Department of Oral Pathology and Microbiology, examined and interviewed. A preformat questionnaire was used to record all the relevant information.

Data collection: The data were collected from the patients with clinically diagnosed and histopathologically confirmed oral cavity cancer. Necessary ethical approval was obtained from the respective authorities. Socio-demographic profile of the patients and study relevant information were collected in a preformed at questionnaire. The data collected in this study are presented in Table 1.

Ethical considerations: The study protocol was approved by the ethics committee of the City Dental College and Hospital, Dhaka, Bangladesh. The study was conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

Statistical analysis: The data entered in data collection from the Microsoft Excel 2010 (Roselle, IL, USA) and analyzed. Proportions and percentages were calculated. The results obtained were expressed as Mean±SD.

RESULTS

In Table 2, details of socio-demographic information of the patients for example sex, religion, occupation, marital status, education level and family income are presented.

Table 1: List of collected information

Socio-demographic profile	
• Sex	
• Religion	
• Occupation	
• Marital status	
• Level of education	
• Monthly family income	
Risk habit profile	
• Smoking	
• Chewing betel leaf	
• Taking betel nut with betel leaf	
• Taking betel nut	
• Taking sadapata with betel leaf	
• Taking zarda with betel leaf	
• Taking lime with betel leaf	
• Taking gul inside mouth	
• Alcohol consumption	
Site of cancer	
• Tongue	
• Palate and upper jaw	
• Buccal mucosa	
• Pharynx	
• Lip	
Number of ulcers	
• Single	
• Multiple	

The distribution of the patients based on their ages is offered in Table 3 in which most of the patients were in the age group 60 years and above.

In Table 4, details of smoking, chewing and alcohol consumption habits of oral cancer patients are presented.

Out of 60.5% smoker patients, in Fig. 1 the pattern of smoking habit of the patients is mentioned.

The distribution of cancer by number of ulcers (i.e. single/multiple) and different anatomical sites of oral cavity (i.e. tongue, palate and upper jaw, buccal mucosa, pharynx, lip) among oral cancer patients are shown in Table 5.

Table 6, represents the distribution of the oral cancer patients by number of ulcers (i.e. single/multiple) and pattern of tobacco smoking, betel quid chewing and alcohol consumption habits.

DISCUSSION

Oral cancer remains one of the most life-threatening oral disease in the world. Globally oral cavity cancer is the most common cancer and is a major problem in regions where tobacco use is prevalent in the form of chewing and smoking as well as alcohol consumption^{7,29}. Its distribution and occurrence varies by age, ethnic group, lifestyle and habits of individuals. It also varied from country to country²⁹⁻³¹.

In this study among the male patients, highest percentage of oral cancer were reported in the age group 55-59 years, whereas among the female highest percentage were in the age group 50-54 years. Data also revealed that the oral cancer was lowest in the age group less than 45 years. The study suggested that the incidence of oral cancer increases

Table 2: Socio-demographic characteristics of the patients (n = 200)

Variables	No.	%
Sex		
Male	107	53.5
Female	93	46.5
Religion		
Islam	157	78.5
Hinduism	35	17.5
Christianity	4	2.0
Buddhism	4	2.0
Occupation		
Farmer	97	48.5
Housewife	49	24.5
Businessman	34	17.0
Laborer	14	7.0
Others	4	2.0
Unemployed	2	1.0
Marital status		
Married	197	98.5
Unmarried	3	1.5
Level of education		
Illiterate	130	65.0
Class I-V	37	18.5
Class VI-X	28	14.0
SSC	3	1.5
HSC	2	1.0
Monthly family income (Tk)		
Up to 3000	92	46.0
3001-6000	38	19.0
6001-9000	19	9.5
>9001	51	25.5

SSC: Secondary school certificate, HSC: Higher secondary certificate

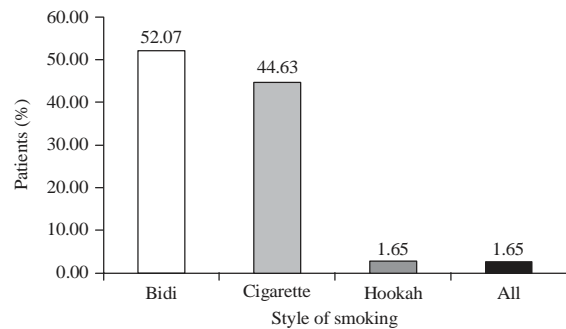


Fig. 1: Percent distribution of patients by type of smoking (N = 121)

with age, predominantly in people aged 50 years and above³². In line with the annual report by the Taiwan Cancer Registry System, the median age of diagnosis for oral cancer is 51 years³³.

In the South Asian region over one third of tobacco consumed is smokeless. Traditional forms like betel quid, tobacco with lime and tobacco tooth powder are commonly used³⁴. More than 90% of oral cancer cases report using tobacco products in Asian countries³⁵. It is used in smoking as well as smokeless forms. Betel quid chewing is the most common form of chewing in Bangladesh and also reported in Asia-Pacific regions²⁴. Betel quid consists of areca nut, betel leaf, catechu, zarda and slaked lime³⁶. About 10% of the world's population chews betel quid regularly³⁷. From this

Table 3: Distribution of the patients by age and sex (n = 200)

Age (year)	Sex				Total (n = 200)	
	Male (n = 107)		Female (n = 93)			
	No.	%	No.	%	No.	%
<45	14	13.1	10	10.8	24	12.0
45-49	12	11.2	21	22.6	33	16.5
50-54	14	13.1	34	36.6	48	24.0
55-59	43	40.2	3	3.20	46	23.0
≥60	24	22.4	25	26.9	49	24.5

Table 4: Distribution of the patients by smoking, chewing and alcohol consumption habits (n = 200)

Habit	No.	%
Smoking		
Yes	121	60.5
No	79	39.5
Mean no./session taking per day	10.8±4.0	Range = 4-20
Chewing betel leaf		
Yes	137	68.5
No	63	31.5
Mean no. of pieces taking per day	5.8±3.1	Range = 1-12
Taking betel nut with betel leaf		
Yes	122	61.0
No	78	39.0
Taking betel nut		
Yes	104	52.0
No	96	48.0
Mean no. of pieces taken per day	3.2±0.5	Range = 1-10
Taking sadapata with betel leaf		
Yes	99	49.5
No	101	50.5
Mean frequency of taking per day	7.3±3.1	Range = 3-15
Taking zarda with betel leaf		
Yes	56	28.0
No	144	72.0
Mean frequency of taking per day	6.5±3.0	Range = 2-15
Taking lime with betel leaf		
Yes	124	62.0
No	76	38.0
Mean frequency of taking per day	6.6±3.2	Range = 2-15
Taking gul inside mouth		
Yes	44	22
No	156	78
Mean frequency of taking per day	6.1±2.0	Range = 3-10
Alcohol consumption		
Yes	17	8.5
No	183	91.5
Mean frequency of taking per day	3.7±1.2	Range = 2-5

Values were expressed as Mean±SD

Table 5: Distribution of the patients by site of cancer and number of ulcers (n = 200)

Site of cancer	Number of ulcers				Total (n = 200)	
	Single (n = 183)		Multiple (n = 17)			
	No.	%	No.	%	No.	%
Tongue	45	26.60	9	52.5	54	27.0
Palate and upper jaw	70	38.30	0	0.0	70	35.0
Buccal mucosa	57	31.10	0	0.0	57	28.5
Pharynx	0	0.00	6	35.3	6	3.0
Lip	11	6.00	2	11.8	13	6.5

study it was found that highest percentage of the respondents had habit of chewing betel leaf, followed by lime with betel leaf, followed by betel nut with betel leaf, followed by smoking, followed by betel nut, followed by sadapata with betel leaf, followed by zarda with betel leaf, then gul inside mouth and alcoholism. A previous case-control study

presented that the incidence of oral cancer was 123-fold higher in those who smoked, drank alcohol and chewed betel quid than in avoiders¹¹.

Drinking alcohol is an important risk factor for oral cancer. In China, India, Pakistan, Sri Lanka, Bangladesh, Nepal and Thailand spirits are consumed more commonly⁸.

Table 6: Distribution of the patients by number of ulcers and pattern of smoking, chewing and alcohol consumption habits (n = 200)

Habit	Number of ulcer					
	Single (N =183)		Multiple (N = 17)		Total (N = 200)	
	No.	%	No.	%	No.	%
Smoking	112	61.2	9	52.9	121	60.5
Chewing betel leaf	127	69.4	10	58.8	137	68.5
Taking betel nut with betel leaf	113	61.7	9	52.9	122	61.0
Taking betel nut	93	50.8	11	64.7	104	52.0
Taking sadapata with betel leaf	91	49.7	8	47.1	99	49.5
Taking zarda with betel leaf	53	29.0	3	17.6	56	28.0
Taking lime with betel leaf	116	63.4	8	47.1	124	62.0
Taking gul inside mouth	36	19.7	8	47.1	44	22.0
Alcohol consumption	15	8.2	2	11.8	17	8.5

This study reported lowed alcohol consumption habit of the patients. Another study proposed that the alcohol might enable the passage of carcinogens through cellular membranes³⁸. Furthermore, alcoholic consumption, enhanced liver metabolizing function and might, therefore, activate carcinogenic substances. Furthermore, alcohol might alter intracellular metabolism of the epithelial cells at the target site³⁸. Thus, the oral mucosa was more susceptible to carcinogens brought by smoking and betel quid chewing.

Smoking includes the use of cigarettes, bidi and hookah. Though cigarette smoking is seen in all Asian countries, bidi smoking is common in countries like Bangladesh, India, Pakistan and Sri Lanka^{8,39}. Bidi is prepared by rolling dried tobacco flakes into a dried Temburni leaf and secured with thread⁴⁰. Smoking bidi is an important risk factor contributing to a considerable number of oral cavity cancer cases in Bangladesh, Nepal, India, Pakistan and Sri Lanka⁴¹. Bidi smokers are 4 times at risk of developing oral cancer compared to non-smokers^{8,42}. In this study among the smoker patients the most preferred mode of smoking was bidi and very few were habituated with hookah. A previous study found the at equal intake or duration levels, black-tobacco smoking was associated with a 2-4 fold increase in cancer risk compared to blond tobacco smoking⁴³.

Data analysis of this study revealed that multiple ulcers were found to be high in tongue, pharynx and lip whereas single ulcer was found to be high in palate and upper jaw and buccal mucosa. The affected sites of oral cancer patients are lip, base of the tongue, lingual tonsil, gum, floor of the mouth, hard palate, soft palate, uvula, palate, buccal mucosa, vestibule of mouth, oral cavity parotid gland, submandibular gland, tonsil fossa, tonsil, vallecular, anterior surface of epiglottis, bronchial cleft, oropharynx, etc^{44,45}. Among all sites, tongue, oral cavity and parotid gland are highest affected sites^{44,46}. This study revealed highest percentage of chewing betel leaf among patients with single ulcer (i.e., palate and upper jaw) and multiple ulcers (i.e., tongue) in patients taking betel nut. Previous studies found evidence of the synergistic effects of smoking, drinking and betel quid chewing on the risk of developing oral cavity cancer^{8,43}.

CONCLUSION AND FUTURE RECOMMENDATION

This study reported the habits of chewing betel leaf, tobacco smoking and taking betel nut with betel leaf amid patients with oral cavity cancer. Among smoker patient's bidi was mostly used mode of smoking. For most of the patients with habit of chewing betel leaf had single ulcer and multiple ulcers were reported for patients with habit of taking gul inside mouth. Among the patients older age group were more prone to develop oral cancer. The lower social-economic condition of the people is the main challenge for the development of oral cancer in Bangladesh. Moreover, lack of infrastructure and health workers, lack of awareness and illiteracy etc. potentiate the condition. The placement of community hospital in rural area as well as awareness and knowledge can be increased among people in Bangladesh for the maintenance of good oral health.

SIGNIFICANCE STATEMENT

This study discovers the relationship of tobacco smoking, betel quid chewing, alcohol consumption and oral cavity cancer that can be beneficial for readers/researchers to get the role of the aforementioned factors in Bangladeshi patients. This study will help the researcher to uncover the critical areas of factors affecting oral cavity cancer that many researchers were not able to explore. Thus, this study will be created a linkage between oral cavity cancer and potential prognostic factor, for patients with oral cavity cancer.

ACKNOWLEDGMENTS

The authors wish to thank the City Dental College and Hospital, Dhaka, Bangladesh for providing permission to conduct this study.

REFERENCES

1. Coelho, K.R., 2012. Challenges of the oral cancer burden in India. *J. Cancer Epidemiol.*, Vol. 2012.

2. Sultana, N. and M. Malik, 2014. The overview of oral cancer and risk factors in Bangladesh. *Int. J. Dental Sci. Res.*, 2: 8-10.
3. Torre, L.A., F. Bray, R.L. Siegel, J. Ferlay, J. Lortet-Tieulent and A. Jemal, 2015. Global cancer statistics, 2012. *CA: Cancer J. Clin.*, 65: 87-108.
4. Khandekar, S.P., P.S. Bagdey and R.R. Tiwari, 2006. Oral cancer and some epidemiological factors: A hospital based study. *Indian J. Community Med.*, 31: 157-159.
5. Ferlay, J., H.R. Shin, F. Bray, D. Forman, C. Mathers and D.M. Parkin, 2010. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. *Int. J. Cancer*, 127: 2893-2917.
6. Saha, S., 2016. An assessment of knowledge and awareness of oral and oropharyngeal cancer. B. Pharm Thesis, Department of Pharmacy, East West University, Dhaka, Bangladesh.
7. Warnakulasuriya, S., 2009. Global epidemiology of oral and oropharyngeal cancer. *Oral Oncol.*, 45: 309-316.
8. Rao, S.V.K., G. Meija, K. Roberts-Thomson and R. Logan, 2013. Epidemiology of oral cancer in Asia in the past decade-an update (2000-2012). *Asian Pac. J. Cancer Prev.*, 14: 5567-5577.
9. Znaor, A., P. Brennan, V. Gajalakshmi, A. Mathew and V. Shanta *et al.*, 2003. Independent and combined effects of tobacco smoking, chewing and alcohol drinking on the risk of oral, pharyngeal and esophageal cancers in Indian men. *Int. J. Cancer*, 105: 681-686.
10. Guneri, P., H. Cankaya, A. Yavuzer, E.A. Guneri and L. Erisen *et al.*, 2005. Primary oral cancer in a Turkish population sample: Association with sociodemographic features, smoking, alcohol, diet and dentition. *Oral Oncol.*, 41: 1005-1012.
11. Ram, H., J. Sarkar, H. Kumar, R. Konwar, M.L.B. Bhatt and S. Mohammad, 2011. Oral cancer: Risk factors and molecular pathogenesis. *J. Maxillofac. Oral Surg.*, Vol. 10. 10.1007/s12663-011-0195-z
12. Guha, N., P. Boffetta, V.W. Filho, J.E. Neto and O. Shangina *et al.*, 2007. Oral health and risk of squamous cell carcinoma of the head and neck and esophagus: Results of two multicentric case-control studies. *Am. J. Epidemiol.*, 166: 1159-1173.
13. Gillison, M.L., 2007. Current topics in the epidemiology of oral cavity and oropharyngeal cancers. *Head Neck*, 29: 779-792.
14. Gupta, P.C., 1999. Mouth cancer in India: A new epidemic? *J. Indian Med. Assoc.*, 97: 370-373.
15. Balaram, P., H. Sridhar, T. Rajkumar, S. Vaccarella and R. Herrero *et al.*, 2002. Oral cancer in Southern India: The influence of smoking, drinking, paan-chewing and oral hygiene. *Int. J. Cancer*, 98: 440-445.
16. Warnakulasuriya, S., C. Trivedy and T.J. Peters, 2002. Areca nut use: An independent risk factor for oral cancer. The health problem is under-recognised. *Br. Med. J.*, 324: 799-800.
17. Jacob, B.J., K. Straif, G. Thomas, K. Ramadas and B. Mathew *et al.*, 2004. Betel quid without tobacco as a risk factor for oral precancers. *Oral Oncol.*, 40: 697-704.
18. Ariyawardana, A., M.A.M. Sitheequ, A.W. Ranasinghe, I. Perera and W.M. Tilakaratne *et al.*, 2007. Prevalence of oral cancer and pre-cancer and associated risk factors among tea estate workers in the central Sri Lanka. *J. Oral Pathol. Med.*, 36: 581-587.
19. Subapriya, R., A. Thangavelu, B. Mathavan, C.R. Ramachandran and S. Nagini, 2006. Assessment of risk factors for oral squamous cell carcinoma in Chidambaram, Southern India: A case-control study. *Eur. J. Cancer Prev.*, 16: 251-256.
20. Vogler, W.R., J.W. Lloyd and B.K. Milmore, 1962. A retrospective study of etiological factors in cancer of the mouth, pharynx and larynx. *Cancer*, 15: 246-258.
21. Carvalho, A.L., I.N. Nishimoto, J.A. Califano and L.P. Kowalski, 2005. Trends in incidence and prognosis for head and neck cancer in the United States: A site-specific analysis of the SEER database. *Int. J. Cancer*, 114: 806-816.
22. Ramadas, K., R. Sankaranarayanan, B.J. Jacob, G. Thomas and T. Somanathan *et al.*, 2003. Interim results from a cluster randomized controlled oral cancer screening trial in Kerala, India. *Oral Oncol.*, 39: 580-588.
23. Gelband, H., P. Jha, R. Sankaranarayanan and S. Horton, 2015. *Cancer: Disease Control Priorities. 3rd Edn., Vol. 3, The International Bank for Reconstruction and Development, Washington DC., USA.*
24. Uddin, M.S., A. Al-Mamun, M.A. Iqbal, M. Nasrullah, M. Asaduzzaman, M.S. Sarwar and M.S. Amran, 2016. Internet addiction disorder and its pathogenicity to psychological distress and depression among university students: A cross-sectional pilot study in Bangladesh. *Psychology*, 7: 1126-1137.
25. Hussain, S.M.A., 2013. Comprehensive update on cancer scenario of Bangladesh. *S. Asian J. Cancer*, 2: 279-284.
26. Spallholz, J.E., L.M. Boylan and M.M. Rhaman, 2004. Environmental hypothesis: Is poor dietary selenium intake an underlying factor for arsenicosis and cancer in Bangladesh and West Bengal, India? *Sci. Total Environ.*, 323: 21-23.
27. Radoi, L., S. Paget-Bailly, D. Cyr, A. Papadopoulos and F. Guida *et al.*, 2013. Tobacco smoking, alcohol drinking and risk of oral cavity cancer by subsite: Results of a French population-based case-control study, the ICARE study. *Eur. J. Cancer Prev.*, 23: 268-276.
28. Grady, D., 2017. Researchers find distinctive patterns of cancer in Asian-Americans. <http://www.nytimes.com/2007/07/11/health/11iht-cancer.4.6617221.html>.

29. Yang, Y.H., H.Y. Lee, S. Tung and T.Y. Shieh, 2001. Epidemiological survey of oral submucous fibrosis and leukoplakia in aborigines of Taiwan. *J. Oral Pathol. Med.*, 30: 213-219.
30. Zini, A., R. Czerninski and H.D. Sgan Cohen, 2010. Oral cancer over four decades: Epidemiology, trends, histology and survival by anatomical sites. *J. Oral Pathol. Med.*, 39: 299-305.
31. Subramanian, S., R. Sankaranarayanan, B. Bapat, T. Somanathan and G. Thomas *et al.*, 2009. Cost-effectiveness of oral cancer screening: Results from a cluster randomized controlled trial in India. *Bull. WHO.*, 87: 200-206.
32. Howell, R.E., B.A. Wright and R. Dewar, 2003. Trends in the incidence of oral cancer in Nova Scotia from 1983 to 1997. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endodontol.*, 95: 205-212.
33. Liu, S.A., W.C. Tsai, Y.K. Wong, J.C. Lin and C.K. Poon *et al.*, 2006. Nutritional factors and survival of patients with oral cancer. *Head Neck*, 28: 998-1007.
34. Gupta, P.C. and C.S. Ray, 2003. Smokeless tobacco and health in India and South Asia. *Respirology*, 8: 419-431.
35. Abdul Hamid, G. and N. Baom, 2017. Tobacco and betel quid in development of oral cancer. *J. Cancer Prev. Curr. Res.*, Vol. 7. 10.15406/jcpr.2017.07.00223
36. IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2014. Betel-quid and areca-nut chewing and some areca-nut derived nitrosamines. *IARC Monogr. Eval. Carcinog. Risks Hum.*, 85: 1-334.
37. Yamada, T., K. Hara and T. Kadowaki, 2013. Chewing betel quid and the risk of metabolic disease, cardiovascular disease and all-cause mortality: A meta-analysis. *PLoS ONE*, Vol. 8. 10.1371/journal.pone.0070679
38. Boffetta, P. and M. Hashibe, 2006. Alcohol and cancer. *Lancet Oncol.*, 7: 149-156.
39. Rahman, M., J. Sakamoto and T. Fukui, 2005. Calculation of population attributable risk for bidi smoking and oral cancer in South Asia. *Prev. Med.*, 40: 510-514.
40. Chadda, R.K. and S.N. Sengupta, 2002. Tobacco use by Indian adolescents. *Tobacco Induced Dis.*, Vol. 1. 10.1186/1617-9625-1-2-111
41. Ma'aita, J.K., 2000. Oral cancer in Jordan: A retrospective study of 118 patients. *Croatian Med. J.*, 41: 64-69.
42. Johnson, N., 2001. Tobacco use and oral cancer: A global perspective. *J. Dent. Educ.*, 65: 328-339.
43. Castellsague, X., M.J. Quintana, M.C. Martinez, A. Nieto and M.J. Sanchez *et al.*, 2004. The role of type of tobacco and type of alcoholic beverage in oral carcinogenesis. *Int. J. Cancer*, 108: 741-749.
44. Kamal Uddin, A.F.M., Z.J. Khan, J. Islam and A.M. Mahmud, 2013. Cancer care scenario in Bangladesh. *South Asian J. Cancer*, 2: 102-104.
45. Geum, D.H., Y.C. Roh, S.Y. Yoon, H.G. Kim and J.H. Lee *et al.*, 2013. The impact factors on 5-year survival rate in patients operated with oral cancer. *J. Korean Assoc. Oral. Maxillofac. Surg.*, 39: 207-216.
46. Prieto, I., A. Prieto, M. Bravo and A. Bascones, 2005. Prognostic factors for cancer of the oral cavity. *Quintessence Int.*, 36: 711-719.