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Association of smoking and smokeless tobacco with migraine

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ABSTRACT

Background: *Migraine is one of the most common headaches affecting the personal, social, and work life of those afflicted and tobacco is the single most preventable cause of death in the world today. The purpose of this study was to examine the relationship of both smoking and smokeless tobacco with migraine using a hospital-based case–control study design in Dhaka, Bangladesh.*

Methods*: A hospital based case-control study was conducted at the neurology outpatient department in Dhaka, Bangladesh. We enrolled 70 migraine cases during January-December 2014 in neurology outpatient department and 70 age group and sex matched controls from internal medicine and general surgery outpatient department of the study hospitals. Use of smokeless tobacco and smoking (cigarette/bidi/hukka) was determined by an interviewer administered questionnaire.*

Results: *There was no relation between alcohol consumption, BMI, sleep hours per day with migraine. There was an association between smoking, smokeless tobacco use with migraine. The crude OR of smoking was 2.17 (95% CI= 1.02 – 4.58) and after controlling of other variable the effect of smoking on migraine did not persist. The crude OR of 6-10 cigarettes and >10 cigarettes per day was respectively 4.25 (95% CI=1.45- 12.43) and 2.19 (95% CI 0.60- 7.95). The crude OR of smokeless tobacco was 2.63 (95% CI= 1.16 – 5.93) and after adjusting of other variable the effect of smokeless tobacco on migraine did not persist. The crude OR 1.7 (95% CI=0.63- 4.54) for ≤4 times and crude OR 4.51 (95% CI=1.19- 17.08) for ≥ 5 times smokeless tobacco use per day.*

Conclusion: *This study showed that both smoking and smokeless tobacco were associated with migraine but after adjusting of other variables the influence of smoking and smokeless tobacco on migraine did not persist. This study further showed that there was a dose response relationship between smoking and smokeless tobacco with migraine.*

Key Words: *Bangladesh, Headache, Non-communicable, Betel, Quid and Cancer*

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I. Introduction

Globally, it has been estimated that prevalence among adults of current headache disorder (symptomatic at least once within the last year) is 47% (Stovner et al., 2007). Half to three quarters of the adults aged 18–65 years in the world have had headache in the last year and among those individuals, more than 10% have reported migraine. Headache on 15 or more days every month affects 1.7–4% of the world's adult population (World Health Organization, 2011).

In the Global Burden of Disease Study, updated in 2004, migraine on its own was found to account for 1.3% of years lost due to disability (YLD) (World Health Organization, 2008). Headache disorders impose a recognizable burden on sufferers including sometimes substantial personal suffering, impaired quality of life and financial cost. Repeated headache attacks, and often the constant fear of the next one, damage family life, social life and employment. The long-term effort of coping with a chronic headache disorder may also predispose the individual to other illnesses. For example, depression is three times more common in people with migraine or severe headaches than in healthy individuals (World Health Organization, 2012).

There are four types of headache disorder 1) Migraine 2) Tension-type headache (TTH) 3) Cluster Headache (CH) 4) Medication-overuse headache (MOH). Migraine was defined as recurring headache disorder that manifest in the form of attack, last 4–72 hours, unilateral, have a pulsating quality, moderate to severe in intensity, aggravated by routine physical activity and are associated with nausea or vomiting, photophobia and phonophobia (Leonardi and Mathers, 2010). Migraine is a very common primary headache disorder with no underlying identifiable pathological cause (Lipton et al., 2002).

During any given year, 50% of the general populations have headaches and more than 90% report a lifetime history of headache (Lipton et al., 2007). A family history of migraine is one of the most potent and consistent risk factors for migraine. Migraine is strongly associated with anxiety and mood disorders, allergies, chronic pain disorders, and epilepsy. The severity of migraine is variable: 25% of migraineurs experience ≥4 severe attacks per month, 48% have 1–4severe attacks, and 38% have ≤1 severe attack per month. , Smoking, pattern of sleep, weather change, missing a meal, bright light, certain food and alcohol consumption also have been reported as major triggers of migraine (Sarker et al., 2013).

Nearly six million people die each year as a result of tobacco use , accounting for 12% of global adult mortality . If current tobacco use patterns continue, it will cause some 10 million deaths each year by 2020. Tobacco exposure is the single greatest preventable cause of morbidity, disability and mortality. Tobacco can be consumed both in smoke and smokeless form (Hossain et al., 2014).

Tobacco is the single most preventable cause of death in the world today, including South Asian countries like India where there are disparities in chronic diseases like cancer and cardiovascular disease that have surpassed infectious disease as the leading causes of death. South Asians are the third largest Asian group in the United States, comprising 1.89 million people and are among the fastest growing racial groups in New Jersey and the Northeast (Delnevo et al., 2011).

The term smokeless tobacco refers to more than 30 different products, broadly categorized as 'spit tobacco' or 'chewing tobacco'. Tobacco is being chewed in multiple forms in south Asia: betel quid, leaf alone, leaf with lime, tobacco with areca nut preparation, and tobacco water. Generally, sun or air cured smokeless tobacco can be used by itself in unprocessed, processed or manufactured form.

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Several studies demonstrated the relationship between smoking and migraine with inconsistent results .However, it has not been examined if smokeless tobacco, which is highly prevalent in South Asian countries, is associated with migraine or not. The purpose of this study was to examine the relationship of both smoking and smokeless tobacco with migraine using a hospital-based case–control study design in Dhaka, Bangladesh.

II. Materials and Methods

Study design and place of study: A case control study was designed to determine the association. This study was conducted at two government tertiary care hospitals. Bangabandhu Sheikh Mujib Medical University (BSMMU), located at Shahbag, Dhaka and Dhaka Medical College Hospital (DMCH), located at Chankharpul.

Study population: Definition of cases: 70 Patients aged 12 year and above both male and female attended at the outpatient department and who were diagnosed by Doctors of Dhaka Medical College Hospital and Bangabandhu Sheikh Mujib Medical University as migraine during the study period were considered as case.

Definition of controls: 70 Patient without any history of recurrent headache and age group and sex-matched controls were selected from the Dhaka Medical College Hospital and Bangabandhu Sheikh Mujib University where cases were recruited. Controls were recruited from internal medicine and general surgery outpatient department of the study hospitals.

Exclusion criteria: Patients with congenital abnormality, known case of psychiatric illness, hypertension, hypothyroidism and pregnant women were excluded from this study.

Research instrument: A pretested semi-structured questionnaire in Bangla was used for data collection. The questionnaire was pretested on 10 respondents (5 cases and 5 controls) with similar background who were not included in the study sample.

The questionnaire included variables on socio-demographic and economic characteristics, smoking and smokeless status, alcohol and height, weight measurement. Participant's age, participant's educational achievement and occupation, average monthly income, type of family, number of family members were included in socio-demographic section. Age of the participants was taken respectively in completed years. Participant's educational achievement was measured as completed years of schooling. Data regarding smoking status regular or past smoker, number of cigarettes per day, duration of smoking, quitting history of smoking were included in the questionnaire. Respondents were asked about smokeless tobacco use, how many times of smokeless tobacco use, duration of smokeless tobacco use and quitting history of smokeless tobacco use. About alcohol status drink of alcohol in last two weeks, duration of alcohol drink, how many drink takes at one sitting were asked. To calculate body mass index height and weight was measured. Respondents were asked about their sleeping history per day.

Research approach: Research proposal was presented in front of the honorable faculty members of National Institute of Preventive and Social Medicine (NIPSOM). Necessary modifications were done based on their comments and suggestions and then submitted for ethical review committee of the institute. Research proposal with ethical clearance letter, research instrument and consent form was submitted to the study hospitals and necessary permission was taken from the directors of all two study hospitals. Identify of the researcher and purpose of data collection were explained to the respondents and written informed consent was taken before data collection. A written informed consent in Bengali was used for taking consent from the participants. An English version of informed consent form was drafted and then translated into Bengali maintaining its simplicity and clarity. Ethical approval was taken from ethical review committee of the NIPSOM, Bangladesh to conduct the research project.

Data processing and data analysis: After collection, data were thoroughly checked for consistency and completeness and cleaned and edited. Statistical Package for Social Sciences (SPSS) version 16.0

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was used to analyze the data. New variables were constructed as per the requirement of analysis. Participants age and education level was also categorized which were primarily measured in ratio scale. Participant's occupation was re-categorized according to relevance. Average monthly family income also categorized into three groups. For nutritional status assessment, BMI was computed and then categorized according to WHO classification. Number of cigarettes re-categorized according to relevance. Number of using smokeless tobacco per day also categorized into two groups. Descriptive analyses were done for both cases and controls. χ^2 –tests were carried out to find out the association of categorical data. Analysis also included Students t-test, which was used to compare the mean difference between the two groups. To assess the strength of association between smoking and smokeless tobacco with migraine, Odds Ratio (OR) and their corresponding 95% Confidence Intervals (CI) were calculated. Variables found significantly associated with migraine in univariate analyses were considered for inclusion in the multivariate analysis. Binary logistic regression model was constructed to identify the effects of smoking and smokeless tobacco on migraine after adjusting for other variables. Adjusted OR with their 95% CI were also estimated. Statistical significance was defined as $p < 0.05$. Data were presented by figures and tables.

III. Results

Background characteristics of cases and controls

Age of respondent

Age of the cases ranged from 15 to 60 years and age of controls ranged from 16 to 60 years. Distribution showed that aged between 20 to 34 years were more common in cases (55.7%) than in the controls (51.4%) whereas aged 35 years and above were more common in controls (42.9%) than in the cases (31.4%).The cases (29.86 ± 10.29) were, on average, two year younger than the participants of controls (32.97 ± 10.68). However, the observed age difference between cases and control was not statistically significant ($p> 0.05$).

Sex of respondent

Distributions showed that female were more common in controls (55.7%) than in cases (44.3%). There was no association between sex and migraine ($p> 0.05$).

Educational status of respondent

The range of educational level of participants was from illiterate to graduate and these were categorized into four groups. Table 01 show that 6 to 10 years education was more common in cases (41.4%) than in controls (30%). Completed 11 years education or higher were more common in controls (44.3%) compared to cases (24.3%). Participants having ≤ 5 years of education were more common in cases (14.3%) than controls (7.1%). Illiterate participants were almost equal in cases and controls. There was no significant association between educational status with cases and controls ($p > 0.05$).

Occupation status of respondent

Majority of the cases (37.1%) and controls (41.4%) were housewives with a higher proportion in controls. The proportion of participants whose occupation was students and business were slightly higher in cases (18.6% and 14.3%, respectively) compared to those in controls (15.7% and 10%, respectively) but the proportion of others occupation group were more common in cases (20%) than controls (11.4%).Service were more common in controls (21.4%) than cases (10%). No association was observed between occupation with cases and controls ($p > 0.05$).

Religion

Proportion of Muslim was high both in cases (98.6%) and controls (85.7%) but it was much higher in cases and significantly different ($p< 0.05$).

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Table 01. Characteristics of respondent

Characteristics	Controls (n=70)	Case (n=70)	χ^2	P	OR (95% CI of OR)
	Number (%)	Number (%)			
Age group of respondent					
≤19 year	4 (5.7)	9 (12.9)	3.27	0.19	
20-34 year	36 (51.4)	39 (55.7)			
≥35 year	30 (42.9)	22 (31.4)			
Sex of the respondent					
Male	31 (44.3)	31 (44.3)	.001	1.0	
Female	39 (55.7)	39 (55.7)			
Religion					
Muslim	60 (85.7)	69 (98.6)	7.99	.005	11.5(1.43-92.47)
Hindu	10 (14.3)	1 (1.4)			
Education level in completed years					
Illiterate	13 (18.6)	14 (20)	7.07	0.07	
≤5	5 (7.1)	10 (14.3)			
6-10	21 (30)	29 (41.4)			
≥11	31 (44.3)	17 (24.3)			
Occupation					
Housewife	29 (41.4)	26 (37.1)	5.41	0.25	
Business	7 (10)	10 (14.3)			
Service	15 (21.4)	7 (10)			
Student	11 (15.7)	13 (18.6)			
Others	8 (11.4)	14 (20)			

Family characteristics of the cases and controls

Data of cases and controls families including average monthly family income, family type, family member and house ownership etc. were collected and presented below.

Family type

The distribution showed that greater proportion of cases (74.3%) lived in nuclear families compared to the controls (55.7%). Chi-square test was done to assess the relationship between family type and migraine of the respondents, which showed that there was significant association between them ($p < 0.05$).

Family income

Income varied between 5000 to 100000 taka in families of cases and between 4000 to 50000 taka in families of controls. Monthly family income of the cases and controls was not normally distributed. For cases and controls, geometric mean of monthly family income was calculated. Geometric mean of cases was 17076.13 taka and controls 15354.27 taka. Average monthly family income was further categorized into three categories- ≤ 10000 taka, 11000-25000 taka, ≥26000 taka. The proportion of cases (51.4%) and controls (47.1%) of families who earn 11000-25000 taka whereas the families who earn ≤ 10000 taka was higher in controls (32.9%) than in cases (25.7%).The proportion who earn ≥26000 taka were almost equal both in cases and controls. But these differences were not significant ($p > 0.05$).

House ownership

Distribution showed that the participants who lived in rent house were higher in controls (60%) than cases (44.3%). But the participants who lived in own house was higher in cases (55.7%) than controls (40%). There was an association between house ownership and cases and controls ($p> 0.05$).

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Number of family members

Higher proportion of controls (44.3%) had 5 to 6 family members compared to that of cases (40%). About two third of cases (62.9%) had five or more members living in their family whereas half of controls (58.6%) had same number of members living in their family. On average cases (5.43 ± 2.45) had larger family size compared to the controls (4.85 ± 1.83). No association was observed between family size and migraine of the participants ($p > 0.05$).

Self-income of respondent

Distribution showed that the proportion was higher in controls (65.7%) than in cases (61.4%) who had no self-income whereas the proportion was higher in cases (38.6%) than controls (34.3%) who had their own income. No observed difference found between self-income of the family members and cases and controls ($p > 0.05$).

Table 02. Characteristics of family of cases and controls

Characteristics	Control (n=70)	Case (n=70)	χ^2	p	OR (95% CI of OR)
	Number (%)	Number (%)			
Family type					
Nuclear family	39(55.7)	52(74.3)	5.31	.02	0.44 (0.21-0.89)
Combined family	31(44.3)	18(25.7)			
Monthly income of the family					
≤10000	23 (32.9)	18 (25.7)	0.87	0.65	
11000-25000	33 (47.1)	36 (51.4)			
≥26000	14 (20)	16 (22.9)			
Mean ± SD	15354.27 ± 9928.62	17076.13 ± 15519.74			
House ownership					
Rent house	42 (60)	31 (44.3)	3.46	0.06	
Own house	28 (40)	39 (55.7)			
Number of family member					
≤4	29 (41.4)	26 (37.1)	1.70	0.43	
5-6	31 (44.3)	28 (40)			
≥7	10 (14.3)	16 (22.9)			
Self-income					
No	46 (65.7)	43 (61.4)	0.28	0.59	
Yes	24 (34.3)	27 (38.6)			

BMI of cases and controls

We took height and weight of the respondent and compute the BMI of the respondent. For cases and controls, geometric mean of BMI was calculated. Geometric mean of cases was 22.05 kg/m^2 and controls 21.95 kg/m^2. BMI was further categorized into three categories according to WHO-underweight, normal weight and overweight. Normal weight was almost equal both in cases and controls. Over weight was more in controls (15.7%) than cases (12.9%) whereas underweight was more in cases (11.4%) than controls (5.7%). Chi square test was done and no association was observed between them ($p>0.05$).

Alcohol status of respondent

The proportion of not alcohol user was higher in controls (98.6%) than cases (94.3%) whereas regular alcohol user was higher in cases (5.7%) than controls (1.4%). No observed association was found between alcohol status with cases and controls ($p>0.05$).

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Table 03. BMI of cases and controls

Characteristics	Control (n=70)	Case (n=70)	χ^2	p
	Number (%)	Number (%)		
Under weight	5 (7.1%)	8 (11.4%)	0.90	0.64
Normal weight	54 (77.1%)	53 (75.7%)		
Over weight	11 (15.7)	9 (12.9)		

Personal habit of cases and controls

Sleep hours per day of respondent

Participants were asked about their sleeping hours per day. Participants who slept 7 hours and less per day was higher in cases (77.1%) than controls (64.3%) whereas the proportion who slept 8 hours and more was higher in controls (35.7%) than cases (22.9%). There was no association between sleep hours per day with cases and controls (p>0.05).

Table 04. Alcohol status and insufficient sleep of cases and controls

Characteristics	Controls (n=70)	Case (n=70)	χ^2	P
	Number (%)	Number (%)		
Alcohol status				
Not user	69 (98.6)	66 (94.3)	1.86	0.17
Regular user	1 (1.4)	4 (5.7)		
Sleeping hours per day				
≤7 hours	45 (64.3)	54 (77.1)	2.79	0.09
≥8 hours	25 (35.7)	16 (22.9)		

Smoking habit of cases and controls

Smoking status of respondent

Proportion of regular smoker was higher in cases (37.1%) than in controls (21.4%) whereas the proportion of non-smoker was higher in controls (78.6%) than in cases (62.9%).A significant association was found between smoking with migraine ($p < 0.05$). Cases were two times (OR-2.17, 95% CI=1.02-4.58) more likely to have history of smoking than controls.

Binary logistic regression model was constructed with smoking status to see the effect of smoking on migraine after removing the effects of other variables. The full model was statistically significant ($\chi^2 = 18.30, p < 0.001$). The overall model could explain 16.3% variation in migraine by smoking. The model could correctly predict 42.9% of controls and 80% of cases and the overall correct prediction was 61.4%. After adjusting of other variables the influence of smoking on migraine did not persist (p=0.09).

Number of cigarette per day of respondents

The proportion of 6-10 cigarettes and >10 cigarettes per day is respectively higher in cases (24.3%, 10%) than controls (7.1%, 5.7%) whereas the proportion of 1-5 cigarettes per day are higher in controls (8.6%) than cases (2.9%). An association was observed between number of cigarettes per day with cases and controls (p <0.05).

Similarly another logistic regression model was constructed with number of cigarette per day on migraine after controlling the effects of religion and family type. The model was statistically significant

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($\chi^2 = 16.50, p < 0.001$). The overall model could explain 14.8% variation in migraine by number of cigarette per day. The model could correctly predict 52.9% of controls and 72.9% of cases and overall correct prediction was 62.9%. After adjusting of other variables the influence of number of cigarette per day on migraine did not persist (p= 0.32).

Table 05. Smoking characteristics of cases and controls

Characteristics	Control (n=70)	Case (n=70)	χ^2	p	Crude OR (95% CI of OR)	Adjusted OR
	Number (%)	Number (%)				
Smoking habit						
Not smoker	55 (78.6%)	44 (62.9%)	4.17	0.04	2.17 (1.02-4.58)	1.94
Smoker	15 (21.4%)	26 (37.1%)				
Number of cigarette per day						
Non user	55 (78.6%)	44 (62.9%)	10.59	0.01		0.83
1-5	6 (8.6%)	2 (2.9%)			0.42	
6-10	5 (7.1%)	17 (24.3%)			4.25	
>10	4 (5.7%)	7 (10.0%)			2.19	

Remark: Adjusting variables are religion and family type.

Duration of cigarette smoking

The proportion of 6-10 years and ≤5 years cigarette smoking was respectively higher in cases (14.3%, 12.9%) than controls (4.3%, 10%). No observed difference was found between them (p>0.05).

Table 06. Duration of cigarette smoking of cases and controls

Duration of cigarette smoking	Control (n=70)	Case (n=70)	χ^2	P
	Number (%)	Number (%)		
≤5 year	7 (10.0%)	9 (12.9%)	5.58	0.13
6-10 year	3 (4.3%)	10 (14.3%)		
≥11 year	5 (7.1%)	7 (10.0%)		
Not user	55 (78.6%)	44 (62.9%)		

Smokeless tobacco habit of cases and controls

Smokeless tobacco status of respondent

Distribution showed that the proportion of smokeless tobacco user was higher in cases (32.9%) in comparison to controls (15.7%). On the other hand the proportion of non-user of smokeless tobacco was higher in controls (84.3%) than cases (67.1%). Observed association was found between smokeless tobacco uses with migraine (p < 0.05). Cases were 2 times (OR-2.63, 95% CI=1.16-5.93) more likely to have history of smokeless tobacco use than controls.

Binary logistic regression model was constructed with smokeless tobacco use to see the effect of smokeless tobacco use on migraine after removing the effects of other variables. The full model was statistically significant ($\chi^2 = 22.04, p < 0.001$). The overall model could explain 19.4% variation in migraine by smokeless tobacco. The model could correctly predict 54.3% of controls and 75.7% of cases and the overall correct prediction was 65%. After adjusting of other variables the influence of smokeless tobacco use on migraine did not persist (p=0.06).

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Number of smokeless tobacco use per day of respondent

Distribution showed that four and less times and five and more times smokeless tobacco use per day was equal in cases (15.7%) but five and more times smokeless tobacco use per day was more in controls (11.4%). A significant difference was found between number of smokeless tobacco use with cases and controls ($p< 0.05$).

Similarly another logistic regression model was constructed with number of smokeless tobacco use per day on migraine after controlling the effects of other variables. The model was statistically significant ($\chi^2 = 22.52, p < 0.001$). The overall model could explain 19.8% variation in migraine by number of number of smokeless tobacco use per day. The model could correctly predict 51.4% of controls and 78.6% of cases and overall correct prediction was 65%. After adjusting of other variables the influence of number of smokeless tobacco use per day on migraine did not persist ($p= 0.05$).

Duration of smokeless tobacco use

Distribution showed that the proportion of five years and less smokeless tobacco users were more in cases (17.1%) than controls (5.7%). The proportion of six years and more smokeless tobacco user were higher in cases (15.7%) in comparison to controls (10%). Chi-square test was done to assess the relationship between duration of smokeless tobacco use and migraine of the respondents, which showed that there was significant association between them ($p < 0.05$).

Another logistic regression model was constructed with duration of smokeless tobacco use on migraine after controlling the effects of other variables. The model was statistically significant ($\chi^2 = 23.07, p < 0.001$). The overall model could explain 20.3% variation in migraine by number of number of smokeless tobacco use per day. The model could correctly predict 50% of controls and 80% of cases and overall correct prediction was 65%. After adjusting of other variables the influence of duration of smokeless tobacco use on migraine was persisted ($p= 0.04$). Migraine were almost two times (adjusted OR 0.55; 95% CI 0.31 – 0.96) less likely in those who used six years and more smokeless tobacco compared to those who did not use.

Table 07. Smokeless tobacco habit of the respondent

Characteristics	Control (n=70)	Case (n=70)	χ^2	p	Crude OR (95% CI of OR)	Adjusted OR
	Number (%)	Number (%)				
Smokeless tobacco user						
Non user	59 (84.3%)	47 (67.1%)	5.59	0.02	2.63 (1.16-5.93)	2.29
Regular user	11 (15.7%)	23 (32.9%)				
Number of smokeless tobacco use per day						
Non user	59 (84.3%)	48 (68.6%)	6.18	0.04	1	0.55
≤ 4 times	3 (4.3%)	11 (15.7%)			1.70	
≥ 5 times	8 (11.4%)	11 (15.7%)			4.51	
Duration of smokeless tobacco use						
Not user	59 (84.3%)	47(67.1%)	6.25	0.04	1	0.55
≤5 year	4 (5.7%)	12(17.1%)			3.76	
≥6 year	7 (10.0%)	11(15.7%)			1.98	

Remark: Adjusting variables are religion, family type and smoking status.

IV. Discussion

This case control study was conducted with a view to determine the influence of smoking and smokeless tobacco in migraine patients. Dhaka Medical College Hospital and Bangabandhu Sheikh Mujib Medical University were selected for enrolment of cases and controls. Patients aged twelve years and above with migraine (70) were selected as cases and age group and sex matched controls were taken for each case from the hospital.

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Review of the literature showed that the associations between smoking and migraine headaches are not consistent. Most of the previous studies conducted involving migraine and relation of smoking, alcohol, lifestyle and other risk factors (Aamodt et al., 2006; López-Mesonero et al., 2009; Nazari et al., 2010; Rasmussen, 1993). There is not much data regarding smokeless tobacco and relation of migraine. To fill up data gap, initiate was taken to conduct this case-control study.
An association was observed between religion and migraine. Proportion of Muslim was high in cases (98.6%) and controls (85.7%) but it was much higher in cases. According to Bangladesh Demographic profile 2014 the main religion in Bangladesh is Islam (89.5%) and a significant percentage of the population adheres to Hinduism (9.6%). In previous study (Lucchetti et al., 2015) only high non-organizational religiousness associated with presence of headache (OR: 1.22, 95% CI 1.01-1.49).

Proportion was higher in controls (45.7%) than in cases (40%) that had 5-6 family members in family. About two third of cases (62.9%) had five or more members living in their family whereas half of controls (58.6%) had same number of members living in their family but the association between number of family member and migraine was not significant. But in previous study, number of family member was associated with migraine (Sarker et al., 2013). This might be due to less sample size in this study.

There was an association between smoking and migraine is in agreement with some studies (Chen et al., 1987; Sarker et al., 2013), although several studies found no association between them (Chen et al., 1987; Fernandez-de-Las-Penas et al., 2010; Nazari et al., 2010) based on 508 migraine cases and 3192 controls observed that there were more smokers in migraine group compared to non-migraine group. Nazari et al. (2010) study conducted among women only where smoking is rarely practiced in female gender. Takeshima et al. (2004) study was based on secondary data which was not primarily designed to examine the association between smoking and migraine headache. This variation between the findings could be due to the difference in study design, sample size and study population.

The proportion of smoker was higher in cases (37.1%) than in controls (21.4%) in this study. In logistic regression after controlling the effects of religion and family type the influence of smoking on migraine did not persist. But in nuclear family there was an observed difference between smoking and migraine.

There was a relationship between frequency of smoking and migraine. The proportion of 6-10 cigarettes and >10 cigarettes per day was respectively higher in cases (24.3%, 10%). In the findings of Sarker et al. (2013), dose response relationship between frequency of smoking and migraine was found. The adjusted OR of cigarette/bidi/hukka smoking for different doses was 5.5 (95%CI = 1.2-24.8, $P = 0.027$) for 1–5 times per day, 6.3 (95%CI = 1.8-21.2, $P = 0.003$) for 6–10 times per day, and 6.7 (95%CI = 1.9-23.2, $P = 0.003$) for >10 times per day relative to non-users.

The crude OR of cigarette smoking for different doses was (crude OR 0.42; 95% CI= 0.08 – 2.16) for 1-5 times per day, (crude OR 4.25; 95% CI= 1.45 – 12.43) for 6-10 times per day and (crude OR 2.19; 95% CI = 0.60 – 7.95) for > 10 times per day relative to non-user. In logistic regression after controlling the effect of other variable the influence of number of cigarette per day did not persist.

Smokeless tobacco use is widely prevalent in South Asian countries. In Bangladesh, among females, 94.7% of current tobacco users used only smokeless tobacco (Centers for Disease Control and Prevention, 2010). Younger people hesitate to smoke in front of their parents and seniors. Smokeless tobacco is an exception. Besides, these are considered as a symbol of hospitality in the rural areas. It is a social custom to serve guests by betal quid after meal in a family or social event.

There was a relationship between smokeless tobacco use and migraine. But the proportion of smokeless tobacco user was more in cases (32.9%) than in controls (15.7%). In nuclear family the relationship between smokeless tobacco use and migraine was persisted. But in logistic regression after controlling the effects of religion, family type the influence of smokeless tobacco use on migraine did not persist. Sarker et al. (2013) found relation between smokeless tobacco use and migraine.

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There was an association between numbers of smokeless tobacco use per day with migraine. Smokeless tobacco use ≤ 4 times and ≥ 5 times per day was equal in cases (15.7%). After controlling the effect of other variable the influence of frequency of smokeless tobacco use on migraine did not persist.

The proportion of five years and less smokeless tobacco users were more in cases (17.1%) than in controls (5.7%) in this study and there was a significant association between duration of smokeless tobacco use with migraine. The crude OR 3.76; 95% CI= 1.14 - 12.44 for five years and less smokeless tobacco user and crude OR 1.98, 95% CI= 0.71 – 5.48 for six years and more smokeless tobacco user. After adjusting of other variables the influence of duration of smokeless tobacco use on migraine was persisted.

V. Conclusion

There was no significant relationship between socio economic condition and personal habit such as age, sex, average monthly income, number of family member, alcohol status, sleeping habit and migraine headaches. But there was a relationship between religions, family type with migraine. However this study showed that both smoking and smokeless tobacco were associated with migraine but after adjusting of other variables the influence of smoking and smokeless tobacco on migraine did not persist. This study further showed that there was a dose response relationship between smoking and smokeless tobacco with migraine. Hence the role of the public health professional is quite important informing and educating the people and inspiring them not to smoke or use smokeless tobacco.

In spite of maximum efforts by the researcher, due to time and resource constraints, only seventy cases and seventy controls could be enrolled in this study. Cases and controls were recruited from two hospitals situated in Dhaka city. Therefore, this study might not represent other parts of the country. Cases were enrolled only from hospitals. Their characteristics might differ from those who were not come to hospital for treatment.

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Competing interests

The authors declare that they have no competing interests.

Author's Contribution

Sujit Kumar Paul formed the idea of this study, collected data, performed analysis and prepared the manuscript. Prof. Dr. Md. Anisur Rahman provided support and guidance in all activities and revised the manuscript. Kazi Mahmudul Hasan and Mahmoodur Rahman managed the analyses, revision of the study. All authors read and approved the final manuscript.

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