Blood Pressure in Tobacco Users

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In Bangladesh 43.3% of adults (41.3 million) use tobacco in smoking and or smokeless form. Immediate availability and the low price gives rise to high consumption of chewing tobacco. This may affect blood pressure. Consumption of tobacco products are the world's leading preventable cause of death. To observe blood pressure levels in tobacco users this cross sectional study was conducted from January 2014 to January 2015 in the Department of Physiology, Rangpur Medical College, Rangpur. A total of 150 subjects were selected, among them 50 were apparently healthy subjects of non-tobacco chewer non-smoker, 50 were apparently healthy tobacco chewer non-smoker subjects and 50 were apparently healthy tobacco chewer smoker subjects. The subjects were collected from different areas of Rangpur district. Blood pressure levels were determined and data were analyzed by one – way ANOVA (post Hoc test) and Pearson's Correlation Coefficient 'r' test. In this study mean blood pressure levels were significantly higher ($P<0.001$) in tobacco chewer non-smoker and tobacco chewer smoker subjects than those of control subjects. This study reveals that blood pressures tend to rise with tobacco use.

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Key words: Tobacco, tobacco chewer non-smoker, blood pressure

Introduction

There are two kinds of commonly used tobacco products in Bangladesh i.e. smoking and smokeless tobacco products. Smoking tobacco products in Bangladesh include manufactured cigarettes, bidis, hand-rolled cigarettes, pipes, cigars, water-pipes or hukkah. Smokeless tobacco products include a wide range: betel quid with zarda, zarda only or zarda with supari; betel quid with sada pata; pan masala with tobacco; sada pata chewing; gul, khoinee. However women usually used smokeless tobacco but rarely smoke or both.[1] When a person pull on a cigarette or chew a quid, the person is exposing himself or herself to 4,000 and more hazardous and cancer causing chemicals.[2] In Bangladesh 43.3% of adults (41.3 million) use tobacco in smoking and / or smokeless form. [1] Currently more than five million people die globally each year due to tobacco related illness, the figure expected to increase to 8.3 million by 2030. Tobacco-attributable

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deaths are projected to decline by 9% between 2002 and 2030 in high income but to double from 3.4 million to 6.8 million in low and middle income countries.[1] Nicotine is one of the main constituent of tobacco. Nicotine is absorbed in substantial quantities from smokeless tobacco and could contribute to the adverse consequences of smokeless tobacco use.[3] Nicotine together with cholesterol and other fat deposits contribute to the hardening of the arteries, damaged linings of the blood vessels which develop through the years.[4] Chronic systemic exposure to nicotine could contribute to accelerated coronary artery disease, acute cardiac ischemic events and hypertension. Systemic absorption of sodium and mutagenic chemicals from smokeless tobacco could aggravate hypertension or cardiac failure or contribute to cancer respectively.[3] Some researchers found a significant increase in resting heart rate, systolic blood pressure and diastolic blood pressure in tobacco users as compared to normal.[5,6] The result of this study will increase awareness about the ill effects of tobacco use.

Methods

This cross sectional study was conducted from January 2014 to January 2015 in the Department of Physiology, Rangpur Medical College, Rangpur. Study subjects were selected by the following purposive sampling procedure. The study was approved by the ethical review committee of Rangpur Medical College. A total number of 150 subjects were enrolled in the study of age group between 20 – 45 years. Among them 50 were apparently healthy subjects of non-tobacco chewer non-smoker, 50 were apparently healthy tobacco chewer non-smoker subjects and 50 were apparently healthy tobacco chewer smoker subjects. Age and sex matched 50 apparently healthy subjects (group – A) was served as control group. The experimental subjects were recruited from Rangpur city and outskirts. Any subject suffering from diabetes mellitus and other chronic diseases (liver, kidney and heart) or having obvious congenital anomalies were excluded from the study. The objectives and the procedures of the study were explained in detail to the subjects. They were informed about the risk and benefit before enrollment of the study. Then the informed written consents of the subjects were obtained from the willing subjects.

Blood pressures were measured by auscultatory method. Statistical analysis were performed by using SPSS 17.0 version for windows. Comparisons of variables were analyzed by one – way ANOVA (post Hoc test) and Pearson's Correlation Coefficient 'r' test. In the interpretation of results, < 0.05 level of probability (p) as considered the level of significance.

Results

Mean systolic blood pressure values revealed significant difference (p <0.001) between group A and group B, group A and group C. But there was no significant difference (p >.05) between group B and group C (Table I and Fig-1).

Table I: Mean±SD of systolic blood pressure values in different groups

Groups	Systolic blood pressure Mean ± SD mmHg Range (L- H) mmHg	'p' value
A / B (n=50)/(n=50)	109.10±10.865/143.50±14.04 (100 - 120)/(125 - 180)	0.001***
A / C (n=50)/(n=50)	109.10±10.865/143.20±11.101 (100 - 120) / (125 - 160)	0.001***
B / C (n=50)/(n=50)	143.50±14.04/143.20 ±11.101 (125 - 180) / (125 - 160)	0.999^{NS}

A = Apparently healthy subjects of non-tobacco chewer non-smoker (Control).
B = Apparently healthy subjects of tobacco chewer non-smoker (Experimental).

C = Apparently healthy subjects of tobacco chewer smoker (Experimental).
N = Number of subjects.
SD= Standard deviation.
*** = $p < 0.001$ indicates highly significant
NS = $p>0.05$ indicates not significant
L= Lowest value.
H = Highest value
#= Normal range of systolic blood pressure value is 110-140 mmHg.[13]

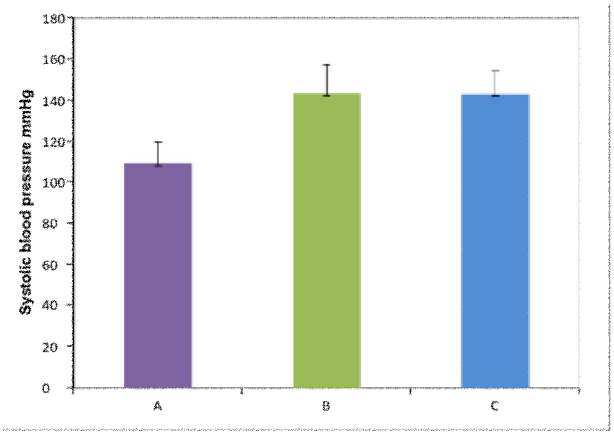

Figure 1. Bar diagram showing mean (± SD) systolic blood pressure values in group A (control), group B and group C (experimental). Vertical lines indicate standard deviation.

Mean diastolic blood pressure values revealed significant difference ($p<0.001$) between group A and group B, group A and group C. But there was no significant difference ($p >.05$) between group B and group C (Table II and Fig-2).

Table II: Mean±SD of diastolic blood pressure values in different groups

Groups	Diastolic blood pressure Mean ± SD mmHg Range (L- H) mmHg	'p' value
A / B (n=50)/n=50)	73.60±5.89/85.80±5.38 (60 - 80) / (80 - 100)	0.001***
A / C (n=50)/(n=50)	73.60±5.89/85.50±4.19 (60 - 80) / (80 - 95)	0.001***
B / C (n=50)/n=50)	85.80±5.379/85.50±4.195 (80 - 100) / (80 - 95)	0.988[NS]

A = Apparently healthy subjects of non-tobacco chewer non-smoker (Control).
B = Apparently healthy subjects of tobacco chewer non-smoker (Experimental).
C = Apparently healthy subjects of tobacco chewer smoker (Experimental).
N = Number of subjects.
SD= Standard deviation.
***= $p < 0.001$ indicates highly significant
NS = $p > 0.05$ indicates not significant
L = Lowest value.
H = Highest value
#= Normal range of diastolic blood pressure value is 60-90 mmHg.[13]

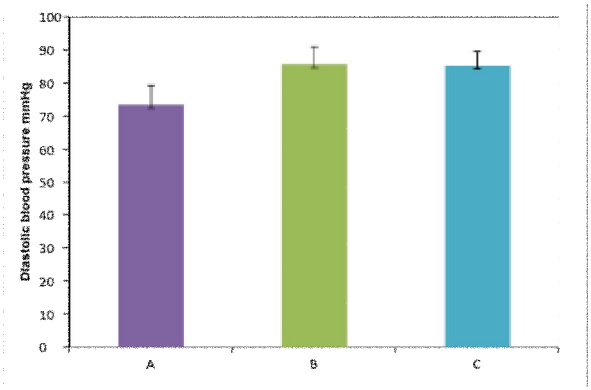

Figure 2. Bar diagram showing mean (± SD) diastolic blood pressure values in group A (control), group B and group C (experimental).Vertical lines indicate standard deviation.

Pulse Pressure

Mean pulse pressure values revealed significant difference (p <0.001) between group A and group B, group A and group C. But there was no significant difference (p >0.05) between group B and group C (Table III and Fig-3).

Table III: Mean±SD of pulse pressure values in different groups

Groups	Pulse pressure Mean ± SD mmHg Range (L- H) mmHg	p
A / B (n=50)/(n=50)	34.50±9.16/57.60 ± 9.49 (15 - 60) / (40 - 80)	0.001***
A / C (n=50)/(n=50)	34.50±9.16/57.60 ± 8.159 (15 - 60)/(45 - 75)	0.001***
B / C (n=50)/(n=50)	57.60±9.49/57.60 ± 8.16 (40 - 80) / (45 - 75)	1.000^{NS}

A= Apparently healthy subjects of non-tobacco chewer non-smoker (Control).
B= Apparently healthy subjects of tobacco chewer non-smoker (Experimental).
C= Apparently healthy subjects of tobacco chewer smoker (Experimental).
n= Number of subjects.
SD= Standard deviation.
***= p < 0.001 indicates highly significant
NS= p > 0.05 indicates not significant
L= Lowest value.
H= Highest value
#= Normal range of pulse pressure values is 30-40 mmHg.[13]

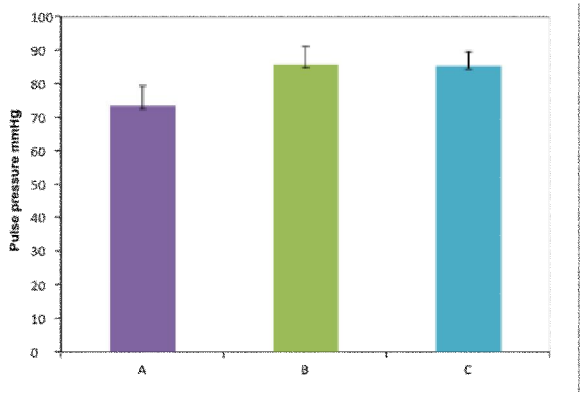

Figure 3. Mean pulse pressure values

Figure 3. Bar diagram showing mean (± SD) pulse pressure values in group A (control), group B and group C (experimental).Vertical lines indicate standard deviation.

Mean Pressure

Mean pulse pressure values revealed significant difference (p <0.001) between group A and group B, group A and group C. But there was no significant difference (p >.05) between group B and group C (Table IV and Fig-4).

Table IV: Mean pressure values

Groups	Mean pressure Mean ± SD mmHg Range (L- H) mmHg	p
A / B (n=50)/(n=50)	85.14±6.59/104.28±7.98 (70 - 99) / (93 - 123)	0.001***
A / C (n=50)/(n=50)	85.14±6.59/104.10±5.99 (70 - 99) / (95 - 113)	0.001***
B / C (n=50)/(n=50)	104.28±7.98/104.10±5.99 (93 - 123) / (95 - 113)	0.999 ^{NS}

A= Apparently healthy subjects of non-tobacco chewer non-smoker (Control).
B= Apparently healthy subjects of tobacco chewer non-smoker (Experimental).
C= Apparently healthy subjects of tobacco chewer smoker (Experimental).
n= Number of subjects.
SD= Standard deviation.
***= p < 0.001 indicates highly significant
NS= p > 0.05 indicates not significant
L= Lowest value.
H= Highest value
#= Normal range of mean pressure level is 78-98 mmHg.[13]

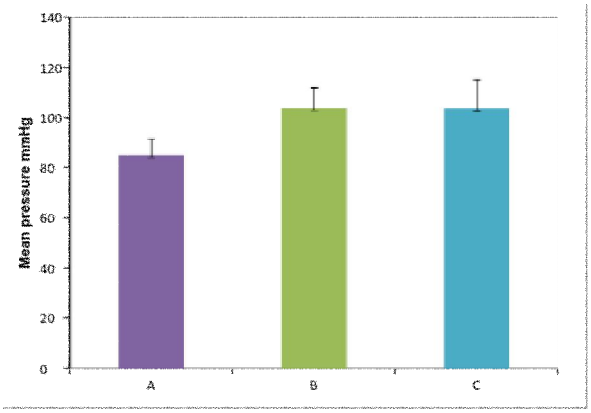

Figure 4. Bar diagram showing mean (± SD) mean pressure levels in group

A (control), group B and group C (experimental). Vertical lines indicate standard deviation.

Discussion

The present study was carried out to assess blood pressure in tobacco chewer non-smoker and tobacco chewer smoker subjects. This parameter was also studied in age matched apparently healthy control subjects for comparison. In this study, all types of blood pressure are increased in tobacco chewer non-smoker and tobacco chewer smoker subjects than those of healthy control subjects. Blood pressure was significantly higher ($p < 0.001$) in tobacco chewer non-smoker and tobacco chewer smoker subjects than those of healthy control subjects. This finding is in consistent with that of some other researchers. The researchers suggested that high blood pressure in tobacco chewer non-smoker subjects might be due to nicotine through sympathetic stimulation, release of catecholamine and the consequent vasocons-triction.[6,7,10] Systolic blood pressure, diastolic blood pressure and mean arterial pressure were significantly higher in these subjects due to active ingredient Licorice in chewed tobacco that inhibits metabolism of mineralocorticoids and causes Na^+ retention.[7] As a result increased extracellular fluid volume, blood volume and cardiac output which in turn increase systolic blood pressure. The researchers suggested that high blood pressure in tobacco chewer smoker subjects might be due to a more prolonged absorption of tobacco accompanied with more prolonged vasoconstriction.[5,8] Besides, NO is an endothelium-derived relaxing factor synthesized in arterial endothelium which is reduced in tobacco chewer smoker subjects. It is due to reduction in basal NO release that may cause a predisposition to hypertension.[9] The sympathico-adrenal activating properties of nicotine and high sodium content of oral tobacco preparations could contribute for high blood pressure.[11] A strong positive relationship was found between cotinine (major nicotine metabolite) and high blood pressure in smokeless tobacco users.[12] However, in our country no published data are available regarding these type of findings for comparison. All types of blood pressure are increased may be due to consumption of tobacco for a prolong period of time which induced sustained rise of blood nicotine level. Sympathetic stimulation by nicotine causes release of epinephrine and norepinephrine resulting rise in systolic blood pressure. As nicotine together with cholesterol and other fat deposits contribute to the narrowing of the lumen of the blood vessels. Thereby the peripheral resistance is also increased which gives rise to high diastolic blood pressure. Mean pressure is also increased due to increased diastolic pressure.

Conclusion

This study may conclude that blood pressures are increased with tobacco use and related to duration of tobacco chewing and smoking in tobacco users.

References

1. World Health Organization, Country Office for Bangladesh. Global adult tobacco survey: Bangladesh report 2009.
2. Welcome To Tobacco Intervention llInitiative. Available from http://tii.org.in/Public/AboutTobacco.aspx .
3. Benowitz NL. Systemic Absorption and Effects of Nicotine From Smokeless Tobacco. SAGE journals1997; 11(3): 336-341.
4. Hopkinson A. Smoking – The Hard Facts About Nicotine and How it causes Hypertension. Availablellfromllhttp://EzineArticles.com/?expert= Alvin_Hopkinson.
5. Gupta BK, Kaushik A, Panwar RB, Chaddha VS, Nayak KC, Singh VB et al. Cardiovascular Risk Factors in Tobacco-chewers: A Controlled Study. J Assoc Physicians India 2007; 55: 27-31.
6. Nanda PK and Sharma MM. Immediate effect of tobacco-chewing in the form of "Paan" on certain cardio-respiratory parameters. Indian J Physiol Pharmacol 1988; 32(2): 105-13.
7. Siddiqui S, Rana A, Singal S, Pandey D and Khan S. Assessment of Cardiovascular Risks of Tobacco Chewers by Comparing it with Normal human Beings. National journal of Physiology, Pharmacy & Pharmacology 2014; 4(1): 76-79.
8. Shrivastava RK, Jha RK and Kumar R. Comparative Study of Tobacco Chewer & Smokers as a Risk Factor For Cardiovascular Disease. Indian Journal of Applied Research 2014; 4(1): 26-27.
9. Guven A and Tolun F. Effects of Smokeless Tobacco “Maras Powder” Use on Nitric Oxide and Cardiovascular Risk Parameters.Int J Med Sci. 2012; 9(9): 786-792.
10. Sucakli MH, Ozkan F, Fatih MI, Celik M, Keten HS and Bozoglan O. Effects of smokeless tobacco (Maras powder) use on carotid intima media thickness. Med Sci Monit 2013; 19: 859-864.
11. Pandey A, Patni N, Sarangi S, Singh M, Sharma K, Vellimana AK et al. Association of exclusive smokeless tobacco consumption with hypertension in an adult male rural population of India. Tobacco Induced Diseases 2009; 5: 15.
12. Bolinder G and Faire DU. Ambulatory 24-h blood pressure monitoring in healthy, middle-aged smokeless tobacco users, smokers and nontobacco users. American Journal of Hypertension 1998; 11: 1153-1163.
13. Swash M and Glynn M. Cardiovascular system. In: Timmis. Hutchisons Clinical Methods. 22nd ed. Saunders Elsevier, Book aid and Sabre foundation, Philadelphia, 2007; 77.