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Abdominal Obesity is a Risk Factor for Ischemic Stroke

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Abstract:

We carried out case control study aimed to evaluate abdominal obesity as a risk factor for ischemic stroke. Though it became established as a risk factor for cardiovascular disease, still its association with stroke is less clear. We have taken ninety cases with ischemic stroke and compare waist to hip ratio & waist circumference with same numbers of age and sex matched stroke free people as controls. There are standard markers of abdominal obesity & their cut-off values and ways of measurement were taken from International Diabetic Federation. Both increase waist to hip ratio (63.3% in cases & 26.7% in controls) and increase waist circumference (66.7% in cases & 25.6% in controls) were significant (P<.05) and showed marked strength of association (odds ratio >1) in ischemic stroke patients. After adjusting the significant risk factors in all age and sex matched cases and controls by conditional logistic regression analysis, WHR and WC still showed significant strength of association with ischemic stroke in all groups. The increase abdominal obesity markers were found to have greater association in both female and male cases in relation to their control counterparts. So, in the light of current study we may suggest that abdominal obesity defined as increase waist circumference and waist to hip ratio attribute considerably to the estimate of ischemic stroke events.

Key words: *Abdominal obesity, ischaemic stroke.*

Abbreviation: *WHR (West to hip ratio), WC (West circumference)*

Introduction:

Stroke remains the third most common causes of death worldwide, after heart disease & cancer. Two thirds of these stroke cases live in low and middle income countries such as India and this subcontinent[1]. So, we need to look stroke risk factors in Bangladeshi population. Of all stroke cases 85% are ischemic stroke The impact of obesity on public health is a growing concern because obesity is well recognized to be related to many diseases such as type 2 diabetes mellitus, hypertension, dyslipidemia, gall bladder disease, respiratory disease, sleep apnea, and cancer[2,3]. The unfavorable effect of abdominal obesity on coronary heart disease and all-cause mortality is well recognized[4.5,6,7] but its association with ischemic stroke is less clear. Zhang X et al, demonstrated that increasing levels of general or abdominal adiposity consistently predict risk of stroke in predominantly non-obese Chinese women[8], whereas Hu et al found increase association only in men[9], but Suk et al found potent risk factor for ischemic stroke in all race-ethnic groups[6]. In other large scale studies showed that BMI is not a good indicator of stroke. So we've chosen abdominal obesity and to find out its relation with ischemic stroke[6,7,10,11].

Abdominal or visceral obesity emerging as a risk factor for stroke according to various large scale studies worldwide but not the BMI[6,7]. In Bangladesh so far we know, no previous study has yet conducted to observe the association of abdominal obesity with ischemic stroke. So, we aimed to explore the importance of abdominal obesity as a risk factor of ischemic stroke.

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Objectives:
The study was performed among Bangladeshi stroke patients and healthy peoples without stroke to evaluate the association of abdominal obesity as a risk factor for ischemic stroke.

Materials and Methods:
A case control study carried out in Neurology department & other medicine units of Chittagong medical college and hospital from February 2009 to January 2010. The 90 cases were taken from the admitted cases in those departments and diagnosed as Ischemic stroke by CT scan of head. The same number of controls were taken from age and sex matched healthy attendants of the patients admitted in those departments during the study period.

We took the samples by case record form and by purposive sampling technique. We selected the cases and controls of age group >40 years as we excluded young stroke cases from our study. We excluded those people who has other causes of increase abdominal girth like ascites due to any cause, female with pregnancy or any intra abdominal mass. The following risk factors were noted- hypertension, diabetes mellitus, physical inactivity, cigarette smoking & dyslipidemia. The subjects underwent a diagnostic workup that included fasting lipid profile, blood glucose level, CT scan of head. Informed written consent was taken from each patient and control or their relatives with the approved consent form.

Sample size of this unmatched case control study determined by the software named Open Epi version 3.03.17. In both groups we compared waist circumference and waist to hip ratio as abdominal obesity markers along with other examinations and investigations. The cut-off value of waist circumference (³90 cm in men and ³80 cm in women), waist to hip ratio (³.9 in men and ³.8 in women) & waist circumference was measured in standard method, midway between costal margin and the iliac crest. All the measurements were according to International Diabetic Federation (IDF). All the information obtained were noted in a predesigned questionnaire. Collected data were compiled, processed and analyzed with the help of computer based software SPSS (Statistical Package for Social Science) version 15.

Results and observation:
A total number of 90 cases and 90 controls were enrolled in the study.

Table I showed that waist circumference (88.87±13.17 vs 80.19±7.15) & waist to hip ratio (.96±.11 vs.87±.07) are significantly higher in stroke patients than healthy controls (p=<.05). People with increase waist to hip ratio (63.3% vs 26.7%) have significant risk (p=<.05) of having ischemic stroke than those with normal ratio (odds ratio 4.75) [Table II]. Increase waist circumference (66.7% vs 25.6%) also showed significant association (p=<.05) with ischemic stroke patients than controls (odds ratio 5.83) [Table III].

Table-I

Distribution of mean & standard deviation of Waist circumference, Hip circumference and WHR by groups in all cases and controls.

	Group		p value*
	Case (n = 90)	Control (n = 90)	
Waist circumference (in cm)	88.87 ± 13.17	80.19 ± 7.15	$0.001^{\#\#}$
Hip circumference(in cm)	92.76 ± 6.68	92.43 ± 6.57	0.745^{ns}
WHR	0.96 ± 0.11	0.87 ± 0.07	$0.001^{\#\#}$

*t test was done to measure the level of significance. Data was shown as Mean ± SD.
ns = Not significant. ## = Significant.

Table-II

Distribution of WHR by groups in all cases and controls.

WHR	Group		p value*
	Case	Control	
Abnormal	57 (63.3)[#]	24 (26.7)	0.001[##]
Normal	33 (36.7)	66 (73.3)	
Total	90 (100.0)	90 (100.0)	

*Chi square test was done to measure the level of significance.
[#]Figure within parentheses indicates in percentage. Odds ratio (95%CI) = 4.75 (2.52-8.96).
[ns] = Not significant. [##] = Significant.

Table-III

Distribution of WC by groups in all cases and controls.

WC	Group		p value*
	Case	Control	
Abnormal	60 (66.7)[#]	23 (25.6)	0.001[##]
Normal	30 (33.3)	67 (74.4)	
Total	90 (100.0)	90 (100.0)	

*Chi square test was done to measure the level of significance.
[#]Figure within parentheses indicates in percentage. [##]= Significant.

Incidence of increase waist circumference & waist to hip ratio is higher in male cases than controls (p=<.05) [Table IV]. Also higher abdominal obesity markers are found in female cases than controls (p=<.05) [Table V].

Table VI we have made three age & sex matched groups adjusting hypertension in one group, hypertension & diabetes mellitus in another & added physical inactivity with previous factors in last group as they were also found significant other risk factors in our study. By applying conditional logistic regression analysis.

Table-IV

Distribution of mean & standard deviation of Waist circumference, Hip circumference and WHR by groups in male

	Group		p value*
	Case (n = 49)	Control (n = 52)	
Waist circumference (in cm)	90.55 ± 10.72	83.02 ± 7.01	0.001[##]
Hip circumference(in cm)	93.18 ± 6.48	92.67 ± 6.81	0.701[ns]
WHR	0.97 ± 0.09	0.90 ± 0.04	0.001[##]

*t test was done to measure the level of significance. Data was shown as Mean ± SD.
[ns] = Not significant. [##] = Significant.

Table-V

Distribution of mean & standard deviation of Waist circumference, Hip circumference and WHR by groups in female

	Group		p value*
	Case (n = 41)	Control (n = 38)	
WC(waist circumference)	86.85 ± 15.51	76.32 ± 5.36	0.001[##]
Hip circumference(in cm)	92.24 ± 6.96	92.11 ± 6.30	0.926[ns]
WHR	0.94 ± 0.12	0.83 ± 0.08	0.001[##]

*t test was done to measure the level of significance. Data was shown as Mean ± SD. [ns] = Not significant. [##] = Significant.

Table-VI

Association between Anthropometric variables of abdominal obesity and Stroke using all cases and controls by Conditional Logistic Regression Analysis

	{Cases/controls}	Group 1 OR (95%CI)	Group 2 OR (95%CI)	Group 3 OR (95%CI)
WHR (M=≥.9, F≥.8)	57/24	5.51##	5.47##	4.92##
		(2.75-11.00)	(2.78-10.77)	(2.41-10.02)
WC	60/23	7.51##	7.32## (3.45-	7.21##
(M=>90cm, F=>80cm)		(3.63-15.55)	15.54)	(3.56-14.61)

Group 1: Matched for age and sex and adjusted for Hypertension
Group 2: Matched for age and sex and adjusted for Hypertension and Diabetes mellitus
Group 3: Matched for age and sex and adjusted for Hypertension, diabetes mellitus and Physical Inactivity.
ns = Not significant. ## = Significant.

Discussion:

In this case control study ninety ischemic stroke patients were compared with same number of age & sex matched healthy controls to evaluate the impact of abdominal obesity as a risk factor for ischemic stroke.

Majority of case were 56.38 with SD ± 8.0 years and of control were 56.12 with SD ± 7.88 years respectively and maximum of cases (41.1%) and controls (42.2%) were enrolled from 50-60 years age group.

Among the stroke patients of current study, 54.4% were male and 45.6% were female. In the current study stroke patients were significantly more hypertensive (53.3% vs. 27.8%) as well as more diabetic than controls (40.0% vs. 23.3%). In our study, 21.1% of cases were smoker in comparison to controls (13.3%). Here also stroke patients were found to be physically less active. We here tried to measure & compare the strength of association of the markers of abdominal obesity i.e waist circumference and waist to hip ratio between ischemic stroke patients and age & sex matched controls, irrespective of presence or absence of other established risk factors. In our current study, waist circumference (66.7% vs 25.6%) and WHR (63.3% vs 26.7%) of ischemic stroke patients were significantly higher than those of controls. Odds ratio of waist to hip ratio and waist circumference were 4.75 and 5.83 respectively which supports the result. Hip circumference was not significantly different as it is an anatomical parameter and as we took cases and controls from almost same regional area it would expected to be in similar range. In our study both WHR and WC association with ischemic stroke was significant ($p<0.05$) when measured by groups in terms of mean and standard deviation.

In the study of Winter et al[7], with conditional logistic regression analysis method, they found strong association of abdominal obesity markers by adjusting other risk factors. Here we adjust hypertension, diabetes & physical inactivity in three combinations as we found those risk factors significant. By conditional logistic regression analysis method, odds ratio of both increase waist to hip ratio remained significant (odds ratio >1) in all three groups. Despite mild attenuation after adjustment of more risk factors, those markers still showed marked strength of association. In our study we found increase waist circumference and increase waist to hip ratio contributed significantly to the occurrence of ischemic stroke in both male and female groups. Hip circumference remained non significant in both groups.

Conclusion:

Through the study results we've found significant association of abdominal obesity with ischemic stroke patients in Bangladeshi population. Here both men and women cases showed equal association. It will be a subject to vast study that, abdominal obesity is directly or indirectly contribute to the incidence of ischemic stroke by influencing other well recognized risk factors. Here we may suggest

that peoples with abdominal obesity have greater chance of having ischemic stroke.

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