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ROLE OF ISCHEMIC HEART DISEASE (IHD), CEREBRAL VASCULAR ACCIDENTS (CVA), DIETARY PATTERN AND BODY MASS INDEX (BMI) IN DEVELOPING SECONDARY SYSTEMIC HYPERTENSION

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Abstract:

Objective

1. To determine the role of Family History of Hypertension, Ischemic Heart Disease and Cerebral Vascular Accidents in Developing Secondary Systemic Hypertension.

2. To analyze role of Dietary Pattern and BMI in causing Secondary Systemic Hypertension

Study Design: *Descriptive type of cross sectional*

Place and duration of study: *Lahore General Hospital, Mayo Hospital Lahore and DHQ Layyah, 8 months (2 August, 2017 to 2 April, 2018).*

Results and conclusion: *There was a significantly increased incidence of hypertension in the obese subjects having positive family history of hypertension, ischemic heart disease and cerebral vascular accidents in developing secondary systemic hypertension but study documented negative results with consumption of predominantly western type of food.*

Keywords: *Body mass index (BMI), Blood pressure (SBP and DBP), Obesity, Ischemic Heart Disease (IHD) and Cerebral Vascular Accidents (CVA)*

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INTRODUCTION:

WHO exposed in its report in Geneva, 2013 that elevated blood pressure was found to be a major culprit in causing 7.5 million deaths throughout the world, so rightly considered as a "Silent Killer" [1]

American Heart Association (AHA) and American College of Cardiology (ACC) defined the new lower readings of hypertension. They considered blood pressure in normal range if Systolic blood pressure/Diastolic blood pressure should be lower than 120/80 mm Hg; for increased blood pressure, SBP between 120-129 mmHg and DBP lower than 80 mmHg; for hypertension stage-1, SBP should be less than 130-139 mmHg with DBP between 80-89 mmHg; for hypertension stage-2, systolic BP equal to or above 140 mmHg with diastolic BP as 90 mm Hg[2]

Sedentary lifestyle without much physical activity and dietary factors is a major culprit and dominant cause of health-related problems today because it is considered as a causative factor for various chronic diseases like hypertension. [3,4]

WHO's Fact Sheet No.311 on Obesity and Overweight, Geneva, 2013 reveals that tripled from 1975 to 2016 affecting more than 1.9 billion individuals .39% of patients were aged 18 years, and 13% were falling in the category of obese by 2016. [5]

Few other studies showed that aging and family history are independent and major causative agents and non-modifiable risk factors in developing hypertension [6].The strong hereditarypredis position of hypertension have demonstrated a very strong interrelationship of BP among families. About 30 % to 65 % of the blood pressure variance had been evaluated due to genetic factors in twin studies [7].

Harrison's Principles of Internal Medicine defines CVA as:"The abrupt onset of neurological deficit that is attributable to a focal vascular cause [8]. Stroke can be either Ischemic that are resulted from a local thrombus formation or by embolic phenomenon that leads to occlusion of a cerebral artery or hemorrhagic that include subarachnoid hemorrhage, intracerebral hemorrhage and subdural hematomas which resulted from a blood vessel rupture due to high blood pressure or an arteriovenous malformation (AVMs) or an intracranial aneurysm rupture [9].

Some researchers attributed the hypertension as the most non-modifiable risk factors for stroke which contributed to more than 12.7 million strokes worldwide. 70% of all strokes involve FH of Hypertension and Stroke as the most consistent and powerful predictor [10].

MATERIALS AND METHODS:

The study was conducted from August 2, 2017 to April 7, 2018 in Lahore General Hospital, Lahore, Mayo Hospital Lahore and DHQ Layyah. This was a descriptive type of Cross sectional study. All the ethical standards of APA were followed strictly before and during conduction of study. Permission from all the Head of Departments & Senior Registrars of medicine wards of all the three hospitals were taken for the data collection from subjects. 165 patients included in this study of both gender having age above 18 years were from medical ward.SBP above 140 and above 90 mmHg was taken to be as hypertension. The subjects consuming entirely fast food containing high fat content for five times a week were considered as western type of food consumer. While family history of hypertension, ischemic heart disease and cerebral vascular accidents were collected from patients and if absent, relied upon their verbal evidence.

A standardized questionnaire on sociodemographic status including name, gender, marital status, age, education, blood pressure readings were filled by research participants. Height, weight and Systolic &Diastolic blood pressures was measured by the research participants by using plastic height measuring foot, weight measuring machine provided by ward staff and mercury sphygmomanometer.

Information was collected and data was entered in SPSS version 22. Mean and standard deviations calculated for quantitative variables such as age, BMI, systolic and diastolic pressure. Frequencies and percentages are for qualitative variables gender, marital status, education, family history of hypertension, ischemic heart disease and cerebral vascular accidents. Then independent variable T-Test was applied to compare two test variables to obtain 2/2 tables to check whether the relationship between the two variables under investigation is significant or not by looking at Pearson coefficient value (p).

INCLUSION CRITERIA AND EXCLUSION CRITERIA:

Questionnaires were filled from all those subjects who were admitted in wards. All the critically ill patients were not taken. Also, all those patients whom refused to participate in the study for no reason were also excluded.

RESULTS:

Frequencies:

Out of 124 subjects,67(54%) were male and 57(46%) were female. 108(87.1%) were married and 16(12.9%) were unmarried.28(22.6%) were below 40 years old and 96(77.4%) were equal and above 40 years old.83(66.9%) were uneducated and 41(33.1%) were formally educated.31(25%) used to eat a predominantly eastern diet while 93(75%) were eating predominantly western type of diet.92(74.2%) had a strong family history of hypertension while 32(25.8%) did not (have any family history of hypertension).74(59.7%) did had a family history of IHD while 50(40.3%) did not have any family history of IHD .64(51.6%) had a previous family history of CVA while 60(48.4%) didn't .The subjects having normal systolic and diastolic blood pressures were 43 (34.7%), those having prehypertension were 16 (12.9%), with 55 at (hypertension) stage 1 (were 55) (44.4%) and having (hypertension) stage 2 were 10 (8.1%). The subjects having BMI in (the) underweight range were found to be 23 (18.5%), in the normal BMI range were 52 (41.9%) and in(the) overweight & obese range were 49 (39.5%) (Table 1).

Means & Standard Deviations:

Height ranged from 1.52 meters to 2.13 meters with the mean height 1.7809 and standard deviation of +-0.17959. BMI ranged from 12.08 to 42.63 kg/m2 with a mean value of 24.0694 and standard deviation of 6.71151. Systolic Blood Pressure ranged from 90 to 178 mmHg with a mean value of 134.2016 and standard deviation of 19.94382. Diastolic Blood Pressure ranged from 67 to 109 mmHg with a mean value of 85.0081 and standard deviation of 9.5081. (Table 2).

Blood Pressure and Diet Pattern:

Mean difference of SBP in the subjects consuming predominantly western type of diet (Mean= 135.8710, S.D= 17.30558) was 4.57857 mmHg which was positively higher than the subjects consuming predominantly eastern type of diet (Mean=129.1935, S.D= 4.67605) but that relationship was not statistically significant if the confidence interval should be taken as 95% (t=1.197, p=0.234).

Mean difference of DBP in the subjects consuming predominantly western type of diet (Mean= 86.1290, S.D=8.7467) was 1.34048 mmHg which was positively higher than the subjects consuming predominantly eastern type of diet (Mean=81.6452, S.D=10.9774) but that relationship was not statistically significant if the confidence interval should be taken as 95% (t=0.732, p=0.465). So, the null hypothesis was correct (Table 2).

Blood Pressure and Family History of Hypertension:

Mean difference of SBP in the subjects having the strong family history of hypertension (Mean= 139.9130, S.D= 19.08377) was 22.13179 mmHg which was positively higher than the subjects (which/who) don't had any family history of hypertension (Mean=117.7813, S.D= 11.57510) and that The relationship was statistically significant if the confidence interval should be taken as 95% (t=7.755, p<0.001).

Mean difference of DBP in the subjects having the strong family history of hypertension (Mean=86.6739, S.D= 10.09527) was 6.45516 mmHg which was positively higher than the subjects which don't had any family history of hypertension (Mean=802188, S.D= 5.25930) and that relationship was statistically significant if the confidence interval should be taken as 95% (t=4.597, p<0.001) (Table 2).

Blood Pressure and Family History of Ischemic Heart Disease (IHD):

Mean difference of SBP in the subjects having (the) strong family history of IHD (Mean= 139.4865, S.D=18.19698) was 4.57857 mmHg which was positively higher than the subjects which don't had any family history of IHD (Mean=86.2973, S.D=9.50087) and that relationship was not statistically significant if the confidence interval should be taken as 95% (t=1.197, p=.234).

Mean difference of DBP in the subjects having (the) strong family history of IHD (Mean=86.2973, S.D=9.50087) was 1.34048 mmHg which was positively higher than the subjects which don't had any family history of IHD (Mean=83.1000, S.D=9.28736) and that relationship was not statistically significant if the confidence interval should be taken as 95% (t=.732, p=0.465) (Table 2).

BP & Family History of Vascular Accidents (CVA):

Mean difference of SBP in the subjects having the strong family history of CVA (Mean=141.7031, S.D=17.65604) was 15.50313 mmHg which was positively higher than the subjects which don't had any family history of CVA (Mean=126.2000
, S.D=19.24049) and that relationship was statistically significant if the confidence interval should be taken as 95% (t=4.679, p<0.001).

Mean difference of DBP in the subjects having the strong family history of CVA (Mean=87.1406, S.D=9.40595) was which was positively higher than

the subjects which don't had any family history of CVA (Mean=82.7333, S.D=9.15565) and that relationship was statistically significant if the confidence interval should be taken as 95% (t=2.644, p=.009). (Table 6).

Mean difference of SBP in the smoker subjects (Mean=139.9130, S. D=19.08377) was 22.13179 mmHg which was positively higher than the non-smoker subjects (Mean=117.7813, S. D=11.57510) and that relationship was statistically significant if the confidence interval should be taken as 95% (t=7.755, p<0.001).

Mean difference of DBP in the smoker subjects (Mean=86.6739, S. D=10.09527) was 22.13179 mmHg which was positively higher than the non-smoker subjects (Mean=80.2188, S. D=5.25930) and that relationship was statistically significant if the confidence interval should be taken as 95% (t=4.597, p<0.001) (Table 2)..

Blood Pressure and Body Mass Index: The relationship between BP and BMI was statistically significant for SBP(p=0.005, S.D=12.65255) as well as for DBP (p=0.001, S.D=6.01513) if the confidence interval should be taken as 95%. (Table 2)

Table 1: Frequencies of different qualitative variables:

				Count	Row N %
Gender	**Male**	Education	No Formal Education	44	65.7%
			1-8 Years	6	9.0%
			9+ Years	17	25.4%
		Marital Status	Married	58	86.6%
			Unmarried	9	13.4%
		Life Style	Healthy	33	49.3%
			Sedentary	34	50.7%
		Diet Pattern	Predominantly Eastern Diet	23	34.3%
			Predominantly Western Diet	44	65.7%
		Hypertension	Yes	53	79.1%
			No	14	20.9%
		Diabetes Mellitus	Yes	48	71.6%
			No	19	28.4%
		Ischemic Heart Disease	Yes	41	61.2%
			No	26	38.8%
		Cerebral Vascular Accidents	Yes	34	50.7%
			No	33	49.3%
		Smoking	Yes	53	79.1%
			No	14	20.9%
	Female	Education	No Formal Education	37	64.9%
			1-8 Years	9	15.8%
			9+ Years	11	19.3%
		Marital Status	Married	50	87.7%
			Unmarried	7	12.3%
		Life Style	Healthy	14	24.6%
			Sedentary	43	75.4%
		Diet Pattern	Predominantly Eastern Diet	8	14.0%
			Predominantly Western Diet	49	86.0%
		Hypertension	Yes	39	68.4%
			No	18	31.6%
		Diabetes Mellitus	Yes	36	63.2%
			No	21	36.8%
		Ischemic Heart Disease	Yes	33	57.9%
			No	24	42.1%
		Cerebral Vascular Accidents	Yes	30	52.6%
			No	27	47.4%
		Smoking	Yes	39	68.4%
			No	18	31.6%

Table 2: Descriptive Statistics for Quantitate Variables

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Height(m)	124	1.52	2.13	1.7809	.17959
BMI(kg/m2)	124	12.08	42.63	24.0694	6.71151
Systolic Blood Pressure (mmHg)	124	90.00	178.00	134.2016	19.94382
Diastolic Blood Pressure (mmHg)	124	67.00	109.00	85.0081	9.50866
Valid N (listwise)	124				

Table 3: Table shows the statistics (t-test results) for the Dietary pattern, Family history of hypertension, Family history of IHD, Family history of CVA, Smoking and BMI

Variable	T-test value for SBP	T-test value for DBP	p-value for SBP	p-value for DBP
Dietary pattern	**1.1967**	**0.706**	**0.340**	**0.465**
Family history of hypertension	**7.755**	**4.597**	**0.000**	**0.000**
Family history of IHD	**1.261**	**0.706**	**0.210**	**0.482**
Family history of CVA	**4.666**	**2.644**	**0.000**	**0.009**
Smoking	**7.755**	**4.597**	**0.000**	**0.001**
BMI	**-2.897**	**-3.630**	**0.005**	**0.001**

DISCUSSION:

In this study, we discovered the strong interrelationship between family history of hypertension and incidence of hypertension in a Pakistani population. A statistically significant relationship between family history of hypertension and incidence of hypertension had been evaluated in our study, both for SBP (p< 0.001, S.D==-+19.08377 and DBP (p= 0.001, S.D==-+10.09527). These results matched with a Chinese study which documented that SBP (p< 0.001, S.D==-+18.09) and DBP (p= 0.001, S.D==-+9.09). {11]

Cardiovascular accidents and hypertension are among the rapidly growing threats to health worldwide, especially in developing countries such as Pakistan and In current study, there has been found a statistically strong relationship between development of hypertension and Cardiovascular accidents' family history for SBP (p< 0.001, S.D==-+ 17.656040) but that relationship was not statistically significant for DBP (p=0.009, S.D=+-9.40595) and these results are almost similar with previous studies.(12)

Hypertension is considered as one of the major factor for the development of Ischemic Heart Disease (IHD) and we tried to confirm whether family history of IHD can cause hypertension or not but the results were not statistically significant for both SBP and DBP (p=0.234, S.D=18.19698).

The subjects with positive previous history of smoking had increased chances of developing hypertension than non-smoker and relationship of previous history of smoking and hypertension was proved to be statistically significant for both SBP (P<0.001, SD=19.08377) for DBP (p=0.001, S.D=10.09527) an this is accordance with other similar studies which can be explained by the gender inequality, culture difference and other sociodemographic factors. (13)

Our study documented that there is no significant effect of consumption of predominantly western type of food consumption containing large amount of fatty acid on BP (p=0.234, S. D= 26.03513). These results are commensurate to those of the other biomedical scientists. (36). Although, a few epidemiologic studies documented conflicting results. (14)

The relationship between BP and BMI was statistically significant for SBP as well as for DBP and it matched to other studies as well (15). The mechanisms by which increased BMI induces hypertension due to renal injury are not completely understood but which increased BMI is associated with renal hyper-perfusion and hyperfiltration. An experimental case control study in experimental dogs showed that focal glomerulosclerosis and other histologic abnormalities like diabetic nephropathy are also indicated which resulted from elevated glomerular transforming growth factor (TGF)-β1 expression in these dogs. (16)

Limitations:

But there were two major limitations in our study:

First, the study design was way simple infer a fully reliable correlation that was descriptive type of cross-sectional study.

Second, as we only recruited ward patients aged above 18 years old some selection bias might confound the results.

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CONCLUSION:

There was a significantly increased incidence of hypertension in the obese subjects having positive family history of hypertension and cerebral vascular accidents in developing secondary systemic hypertension but study showed negative results with consumption of predominantly western type of food and ischemic heart disease.

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