

An Epidemiological Study to Measure the Prevalence of Risk Factors of Diabetes and Hypertension and to Find the Association between Them: A Cross-Sectional Study in Gandhinagar

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Abstract:

Introduction: The prevalence of hypertension and diabetes is on the rise in developing countries like India. There are many risk factors which are associated with diabetes and hypertension like tobacco consumption, physical inactivity etc. The present study was conducted to measure the prevalence of risk factors and their association with diabetes and hypertension. **Objective:** To measure the prevalence of risk factors among government employees in Gandhinagar, Gujarat and to find an association of risk factors with diabetes and hypertension among the study group. **Method:** A cross-sectional study was carried out by randomly selected 775 employees working in new Sachivalay, Gandhinagar in Gujarat. The predesigned and pretested questionnaire was used to collect data regarding socio-demographic profile and standard procedures were followed for anthropometric examination, blood sugar estimation and blood pressure monitoring. **Result:** Majority of the participants were male (88%) and from the age group of 41-49 years (63%). Half of the participants were studied up to graduation. Family history, physical activity and education status found to be statistically significantly associated with hypertension while only family history was found to be statistically significantly associated with diabetes. There was no association found between Per capita income and tobacco usage with hypertension and diabetes in the study group. **Conclusion:** The prevalence of risk factors for diabetes and hypertension were found very high in the study group. The association of risk factors with diabetes & hypertension was found significantly associated. Health education should be given to the government employees for diabetes, hypertension and their management. Periodic screening should be conducted for early diagnosis.

Key words: Association, Diabetes, Hypertension, Risk factors

Introduction:

Diabetes is endemic in India.^[1-3] The International Diabetes Federation has estimated that India currently has more than 65 million people with type 2 diabetes and the numbers are poised to double in the next 20 years.^[4] It has been reported that the prevalence of diabetes among urban participants in India is among the highest in the world and comparable to the high prevalence countries of West Asia and the Pacific.^[3,4] Hypertension is also one of the important public health challenges worldwide because of its high frequency and concomitant risks

of cardiovascular and kidney disease.^[5, 6] It has been identified as a leading risk factor for mortality and ranked third as a cause of Disability-adjusted life-years.^[7] The accelerating epidemic of hypertension in India was documented by studies done at various places across the country.^[8] The National Nutrition Monitoring Bureau (NNMB), which monitors the nutritional status of the population in nine States of India has estimated the prevalence of hypertension among the rural adult (aged 18 and above) population of India to be 25 per cent during 2004-2005.^[9] The epidemic of diabetes and hypertension in India is due

to the rapid epidemiological transition attributed to changes in dietary patterns and decreased physical activity apart from the role of genetic factors in the disease causation. Diabetes and hypertension both are major public health diseases and there are known risk factors like tobacco consumption, physical inactivity are prevalent in the community. With this background the present study was conducted to measure the prevalence of risk factors and their association with hypertension and diabetes.

Method:

A cross-sectional study was conducted in Sachivalay, which is cluster of State Government offices in Gandhinagar, the capital of Gujarat. At an expected prevalence of hypertension in adults of 20 percent,^[10] with an absolute precision of 3 percent and design effect of 1 at 95 percent significance level (alpha risk of 5 percent), the required sample size was calculated as 682, by using formula, $N = Z^2 p (1-p) / D^2$ [Where p is prevalence and D is absolute precision ($Z=1.96$)].^[11] Anticipating a refusal rate of 10%, the final sample size obtained was 750. Thus, we have included 775 participants for hypertension. At an expected prevalence of diabetes in adults of urban India of 14%,^[12] with an absolute precision of 3% and a design effect of 1 at 95% significance level, the required sample size was calculated as 535. Anticipating a refusal rate of 10%, the final sample size obtained was 588. Thus, finally we have included 590 subjects. We measured blood pressure of all 775 study participants and out of them 590 were tested for diabetes. Venous blood was collected for fasting and postprandial blood glucose estimation by using Oral Glucose Tolerance Test. Oral glucose tolerance test and diagnosis was done as per guideline of American Diabetes Association.^[13] Blood pressure was measured as per guideline of American Heart Association^[14] and diagnosis was done based on JNC VII guideline.^[15] A pre-tested and pre-designed questionnaire was used to collect data regarding socio-demographic profile and personal history. Weight and height were measured by standard techniques using calibrated adult weighing scale and stadiometer respectively. Respondents were asked whether they are consuming tobacco in any forms

(Smokeless & smoking), based on this they were classified in current tobacco user, ex-user or non-user. Ex-user and non-user were grouped together for analysis as non-user. The Per Capita Income (PCI) was then divided into three categories, namely upper (PCI > Rs. 5000), middle (PCI > Rs. 2500 and \leq Rs. 5000), and lower (PCI \leq 2500). Physical activity was measured as per Leisure Time Physical Activity Questionnaire.^[16] Based on this, they were divided into four groups. In government offices, employees were ranked as per their position, educational status and salary scale. Cadre-I suggests highest ranked employees and Cadre-4 as lowest ranked. An informed written consent was taken from the each participant.

Statistical analysis: The collected data were entered and analysed in Microsoft Office Excel and Epi-Info.7.

Result:

The present study was conducted in new sachivalay, Gandhinagar by randomly selected 775 government employees. Table 1 shows that, out of 775 study participants, 676 (87.22%) were male and 99 (13.78%) were female. Majority participants (63%) were from the age group of 41-49 years and 61.5% found to be working as cadre-3 employees.

Table 2 is showing that 275 (35.48) out of total 775 study participants checked for blood pressure were found to be hypertensive. Out of them, 18.7% were found to be tobacco users. Prevalence of tobacco consumption is 21.45 % in hypertensive and 17.2% in non-hypertensive subjects but the difference was not found statistically significant as per chi-square test. 97 (35.27%) hypertensive subjects have positive family history of hypertension. An association between family history and prevalence of hypertension was found statistically significant in the present study as per chi-square test. Per capita income of study participants were not found associated with hypertension as per chi-square test. Physical activity was measured as per Leisure Time Physical Activity Questionnaire^[16] and based on this, they were divided into four groups. An association between level of physical activity and hypertension prevalence was found statistically significant as per chi-square test.

Table 1: Socio-demographic profile of study participants

Sr. No.	Variable		Male(n=676)	Female(n=99)	Total(N=775)*
1	Age	<40 Years	83	9	92 (11.9)
		41-49 Years	419	69	488 (63)
		>50 Years	174	21	195 (25.2)
2	Cadre	1	67	9	76 (9.8)
		2	101	13	114 (14.7)
		3	406	71	477 (61.5)
		4	102	6	108 (13.9)
3	Education	Primary	49	9	58 (7.4)
		secondary	152	29	181 (23.5)
		Graduate	336	51	387 (49.9)
		Post-graduate	139	10	149 (19.2)
4	Per Capita Income	Upper	121	20	141 (18.1)
		Middle	307	52	359 (46.4)
		Lower	248	27	275 (35.5)
	Total		676 (87)	99(13)	775 (100)

*Figures in parenthesis is showing Percentage values (%).

(Table 3) 590 study participants out of total 775 government employees who were included in the study were checked for diabetes with Oral Glucose Tolerance Test. 79(13.39%) out of total 590 study participants checked for blood sugar were found to be diabetes. Out of them, 21.51% were found to be tobacco consumers but the difference was not found statistically significant as per chi-square test between the prevalence of diabetes among tobacco users & non-users. 39(49.37%) out of 79 diabetics have positive family history of diabetes. An association between positive family history of diabetes and prevalence of diabetes was found statistically significant in the present study as per chi-square test. Per capita income and education of study participants were not found associated with Diabetes as per chi-square test. Physical activity as per Leisure Time Physical Activity guideline^[16] was recorded they were divided into four groups and association between physical activity and Diabetes was not found statistically significant as per chi-square test.

Discussion:

In our study, the majority of subjects were males (88%) and in the age of 41-49 years (63%). This was similar to the study conducted by Ramachandran et al.^[17] The literacy rate in our study subjects was high (86.5%) and another study conducted by Shah V et al has reported literacy rate 64%.^[18] Our study was conducted among employees, which might be reason for higher reported literacy rate. Our study showed the prevalence of diabetes to be 13.38%. The study conducted by Ramachandran et al has also reported prevalence of diabetes 14%, which similar to the reported prevalence of present study.^[17] The prevalence of diabetes was found nearly 11% in female and 13% in male but in our study, there is no statistically significant difference was found with gender and diabetes. Similar findings were reported in a study conducted by Pushpa et al in Karnataka, India.^[19] It differed from the earlier

Table 2: An association of Risk factors with Hypertension in study population (N=775)

Sr. No.	Risk factors		Hypertension		Total*	χ^2 value	P-value
			Yes	No			
1	Tobacco product user	Yes	59	86	145(18.7)	2.11	0.146
		No	216	414	630(81.3)		
2	Family history	Positive	97	105	202(26)	18.75	<0.05
		Negative	178	395	573(74)		
3	Per Capita Income	Upper	59	82	141(18.1)	4.54	0.1
		Middle	115	244	359(46.4)		
		Lower	101	174	275(35.5)		
4	Physical activity	Grade 1	116	263	379(48.9)	9.27	0.025
		Grade 2	143	214	357(46.1)		
		Grade 3	16	21	37(4.8)		
		Grade 4	0	2	2(0.3)		
5	Education	Primary	19	39	58 (7.4)	10.7	0.01
		Secondary	61	120	181(23.5)		
		Graduation	125	262	387(49.9)		
		Post Graduation	70	79	149(19.2)		

*Figures in parenthesis is showing Percentage values (%).

estimate that prevalence of diabetes was more amongst males in a study conducted by Ramachandran et al.^[17] In our study the overall prevalence of diabetes was 13.38% and the prevalence increased as age advanced. Similar results were seen in a house to house survey carried out in New Delhi by Verma et al, the peak prevalence was in the age group of 60-65.^[20] Our study showed less prevalence of diabetes and hypertension in subjects doing regular physical exercise which is similar to findings the study carried out by in Singapore L Wong et al^[21] and study conducted by Pushpa et al^[19] in Karnataka, India. Our study did not show any significant association between the occurrence of Diabetes, Hypertension with tobacco consumption. Similar results were seen in a study carried out by L Wong et al^[21] and in a study conducted by Pushpa et al^[19] in Karnataka, India. 50% of the all diabetics have positive family history and association between

diabetes and family history was found statistically significant ($p < 0.001$). This finding was similar to the study done by Ramachandran et al^[17] and in a study conducted by Pushpa et al^[19] in Karnataka, India. In the present study, there is no association found between education and Diabetes. Similar findings were reported in a study conducted by Pushpa et al in Karnataka, India.^[19]

Conclusion and Recommendations:

Thus, in present study prevalence of known risk factors of Diabetes and Hypertension were found to be very high than state average figures.^[22] There was statistically significant association found between prevalence of Hypertension and Diabetes with positive family history of that disease. The findings were consistent with other studies. The decreased physical exercise was found to have a significant association with hypertension. The

Table 3: An association of Risk factors with Diabetes in study population

Sr. No.	Risk factors		Hypertension		Total*	χ^2 value	P-value
			Yes	No			
1	Tobacco product user	Yes	17	83	100(16.9)	1.353	0.245
		No	62	428	490(83.1)		
2	Family history	Positive	39	90	129(21.7)	40.38	<0.01
		Negative	40	421	461(78.3)		
3	Per Capita Income	Upper	21	177	198(33.6)	2.00	0.36
		Middle	41	238	279(47.3)		
		Lower	17	96	113(19.1)		
4	Physical activity	Grade 1	37	237	274(46.4)	0.33	0.95
		Grade 2	38	248	286(48.5)		
		Grade 3	4	24	28(4.7)		
		Grade 4	0	2	2(0.4)		
5	Education	Primary	2	36	38(6.4)	2.56	0.46
		Secondary	19	109	128(21.7)		
		Graduation	43	263	306(51.9)		
		Post Graduation	15	103	118(20)		

*Figures in parenthesis are showing Percentage values (%).

employees must be encouraged to adopt healthy lifestyle like to increase physical activity. Knowledge about diabetes mellitus is a prerequisite for individuals to increase awareness and to take self-action in adopting control measures against them. Periodic screening should be done for early detection and treatment of the disease like diabetes and hypertension.

Limitations of the study:

The study was conducted among the employees of the government and which are mainly involved in the sedentary work. Thus, results of the present study couldn't be generalised as the sample of the study is not representing the entire community. Only few variable of interest were included in the study. But, the result of the present study can be helpful to conduct the large-scale study.

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Declaration:

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Conflict of Interest: Nil

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