Linkage between Behavioural and Physiological Risk Factors with Type 2 Diabetes Mellitus in Rural Varanasi, India

Hari Shankar[1], Vineeta Singh[2], TB Singh[3]

ABSTRACT

Introduction: Diabetes is an important public health problem, one of our priority non communicable diseases (NCDs) targeted for action by world leaders. Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades. The global prevalence of diabetes has nearly doubled in year 2014 since 1980, rising from 4.7% to 8.5% in the adult population. Study objective was to find out risk factors for Type 2 Diabetes Mellitus among 40 year and above in rural areas of Varanasi.

Material and methods: A community based cross sectional study was conducted in rural areas of Varanasi covering 40 year and above. WHO, STEP approach was used for data collection in this study. RBS and FBS blood sugar measured and diagnosis was confirmed by WHO criteria. χ^2 test was applied to find significant association.

Results: The mean ±SD age of the study subject was 55.19±11.92 years. The prevalence of smoking, alcohol intake, fruits consumption, vegetables consumption and physical activity was 18.3%, 22.7%, 48.1%, 99.8% and 28.8% respectively. The overall prevalence of diabetes was 6.1%. The prevalence of overweight and obesity was found 15.5% and 32.5% respectively, while prevalence of hypertension was 29%.

Conclusion: Study showed that the association between physiological risk factors such as obesity and hypertension with diabetes was statistically significant ($p<0.05$), while behavioural risk factors mentioned above were not statistically significant ($p>0.05$).

Keywords: NCD, Block, Grampanchayt, RBS

INTRODUCTION

Diabetes is one of the largest global health emergencies of the 21st century. Worldwide, the prevalence of chronic, non communicable diseases is increasing at an alarming rate. About 18 million people die every year from cardiovascular disease, for which diabetes and hypertension are major predisposing factors.[1] According to International Diabetes Federation (IDF), an umbrella organization of diabetes associations in 160 countries. IDF, 2015 reports says that world has 415 million diabetics with 215 million males and 200 million females, besides 318 million with impaired glucose tolerance. India has 69.2 million diabetic persons. The prevalence of diabetes 8.7% is second largest prevalence after China.[2] Diabetes is a serious, chronic disease that occurs either when the pancreas does not produce enough insulin (a hormone that regulates blood sugar, or glucose), or when the body cannot effectively use the insulin it produces.[3] Diabetes is an important public health problem, one of our

priority is non communicable diseases (NCDs) targeted for action by world leaders. Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades.[4,5] Globally, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980. The global prevalence (age-standardized) of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in the adult population. This reflects an increase in associated risk factors such as behavioural and physiological. Over the past decade, diabetes prevalence has risen faster in low and middle-income countries than in high-income countries.[6] Diabetes caused 1.5 million deaths in 2012. Higher-than-optimal blood glucose caused an additional 2.2 million deaths, by increasing the risks of cardiovascular and other diseases. Forty-three percent of these 3.7 million deaths occur before the age of 70 years. The percentage of deaths attributable to high blood glucose or diabetes that occurs prior to age 70 is higher in low- and middle-income countries than in high-income countries.[7] According to the Indian Heart Association, India is projected to be home to 109 million individuals with diabetes by 2035.[8] A study by the American Diabetes Association reports that India will see the greatest increase in people diagnosed with diabetes by 2030.[9] The high incidence is attributed to a combination of genetic susceptibility plus adoption of a high-calorie, low-activity lifestyle by India's growing middle class.[10] Keeping this view present study was conducted to find the prevalence of both behavioural and physiological risk factors of diabetes and their association with diabetes in Rural Areas of Varanasi District, Uttar Pradesh, India.

MATERIAL AND METHODS

This was a community based cross-sectional study conducted in two blocks namely Cholapur and Sewapuri of Varanasi.

[1]Associate Professor, Department of Community Medicine, Institute of Medical Sciences, Banaras Hindu University, [2]JRF, Department of Community Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, 221005, [3]Professor (Biostatistics), Department of Community Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, 221005, India

Corresponding author: Dr. Hari Shankar, Associate Professor, Department of Community Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, 221005, India

All population aged 40 years and above of both genders were included in this study. According to Census 2011, the population of the Varanasi District is 36, 76,841, of which male and female are 19, 21,857 and 17, 54,984 respectively. The total population 40 year and above is approximately 27.4%. Out of which male and female are 26.7% and 28.0% respectively.[11] Considering lowest prevalence of diabetes 12.7%, design effect 1.5 and 10% non-response rate the total sample size was calculated 1955 but it rounded off 2000. Interview schedule was used to collect the baseline data. Ethical approval was taken from Institute Ethical Committee. Information was collected in step manner after taking written consent of participants. Accu-check active glucometer was used to measure blood sugar level. At initial level random blood sugar was taken and diabetes was confirmed after fasting capillary blood testing. Participants were informed one day before taking blood sample in next day. A person is defined, as diabetic if she/he is taking insulin or any oral hypoglycaemic drug or with a fasting capillary blood glucose concentration ≥126 mg/dl). 144 respondents were denied to participate further in the study at the stage of fasting blood sugar test. So that further data was collected on 1856 individuals instead of 2000. OMRON digital arm blood pressure monitor hbp-1100 was used for blood pressure measurement. The mean value of the 2nd and 3rd measurement was used for the analysis. Hypertension was defined as blood pressure ≥140/90 mmHg. OMRON digital body weight scale (HN-283) was used for weight measurement and Stadiometer was used for height measurement. BG Prasad classification was used to classify respondents in different economic status (Revised for 2018).[12] Overweight and obesity is assessed by measuring body mass index (BMI).[13] The statistical analyses were carried out, using SPSS software (trial version 22.0). Frequency tables, cross-tables and correlation analysis were done to analyze the data.

RESULTS

Demographic characteristics of study subject: Demographic characteristics of any population are strong determinants of the well-being of that population; hence, it is essential to review background characteristics of a population before deep analysis of other issues related to it. As shown in [Table 1] the males and females were 39.4% and 60.6% respectively. The mean ±SD age of the study subject was 55.19±11.92 years. More than one third (36.4%)

Variables	(N=1856)	(%)
Age (in years)		
40-49	675	36.4
50-59	454	24.5
60-69	443	23.8
≥ 70	284	15.3
Gender		
Male	731	39.4
Female	1125	60.6
Religion		
Hindu	1765	95.1
Muslim	91	4.9
Caste		
SC/ST	440	23.7
OBC	1061	57.2
Others	355	19.1
Marital Status		
Married	1579	85.1
Others (Unmarried/Divorced/Widow/Widower/Separated)	277	14.9
Education		
Illiterate	1125	60.6
Primary and Middle	368	19.8
High School and Intermediate	266	14.4
Graduate and Above	97	5.2
Occupation		
Homemaker	886	47.7
Unskilled Labour	675	36.4
Skilled Labour	229	12.3
Service (Govt. /Pvt.)	66	3.6
Type of Family		
Nuclear Family	549	29.6
Joint Family	1307	70.4
Socio-economic Class of the Family		
Upper Class (Rs. 6574 and above)	27	1.6
Upper Middle Class (Rs. 3287-6573)	93	5.0
Middle Class (Rs. 1972-3286)	159	8.6
Lower Middle Class (Rs. 986-1971)	609	32.6
Lower Class (Rs. 985 and Below)	968	52.2

Table-1: Demographic characteristics of study subject

Variables under study	No.(1856)	(%)
Smoking history		
Smoker	340	18.3
Non smoker	1516	81.7
Alcohol History		
Consume	422	22.7
Not consume	1434	77.3
Physical Activity		
Active	534	28.8
Non active	1322	71.2
History of Fruit consumption		
Consume	893	48.1
Not consume	963	51.9
History of Vegetable consumption		
Consume	1852	99.8
Not consume	4	0.2
Body Mass Index (BMI)		
Underweight (<18.4 kg.)	262	14.1
Normal (18.5-22.9 kg.)	703	37.9
Overweight (23-24.9 kg.)	288	15.5
Obese (≥25 kg.)	603	32.5
Diabetes history		
Non diabetic	1742	93.9
Diabetic	114	6.1
Hypertension		
Normotensive	1317	71.0
Hypertensive	539	29.0
DM*: Diabetes Mellitus		

Table-2: Prevalence of behavioural and physiological risk factors of study subject

Variables	Total (1856)	Diabetic status				p value
		Diabetic		Non diabetic		
		No.	%	No.	%	
Age (in Years)						0.004
40-49	675	27	4.0	648	96.0	
50-59	454	37	8.1	417	91.9	
60-69	443	37	8.4	406	91.6	
≥70	284	13	4.6	271	95.4	
Gender						0.001
Male	771	62	8.5	669	91.5	
Female	1125	52	4.6	1073	95.4	
Caste						0.014
SC/ST	440	28	6.4	412	93.6	
OBCs	1061	53	5.0	1008	95.0	
Others	365	33	9.3	322	90.7	
Religion						0.280
Hindu	1756	106	6.0	1659	94.0	
Muslim	91	8	8.8	83	91.2	
Socio Economic status (SES)						0.001
Upper	120	17	14.2	103	85.8	
Middle	159	13	8.2	146	91.8	
Lower	1577	84	5.3	1493	94.7	
Currently smoking						0.977
Smoker	340	21	6.2	319	93.8	
Non smoker	1516	93	6.1	1423	93.9	
Alcohol consumption						0.241
Alcoholic	422	31	7.3	391	92.7	
Non alcoholic	1434	83	5.8	1351	94.2	
Fruit consumption						0.167
Consume	893	62	6.9	831	93.1	
Not consume	963	52	5.4	911	94.6	
Physical activity						0.216
Active	534	27	5.1	507	94.9	
Not active	1322	77	6.6	1535	93.4	
BMI						0.05
Underweight	262	8	3.1	254	96.9	
Normal	703	26	3.7	677	96.3	
Overweight	288	23	8.0	265	92.0	
obese	603	57	9.5	546	90.5	
Systolic Blood Pressure						0.05
Non hypertensive	1317	62	4.7	1255	95.3	
Hypertensive	539	52	9.6	487	90.4	
Diastolic Blood Pressure						0.03
Non hypertensive	1588	90	5.7	1498	94.3	
Hypertensive	268	24	9.0	244	91.0	

Table-3: Association of behavioural and physiological risk factors with diabetic status

participants belonged to the age group 40-49 years, while 15.3% were in age groups 70 years and above. Majority of the respondents were from Hindu religion (95.1%). More than half of respondents were from Other Backward Caste (OBC) 57.2%. Out of total, 85.1% study subjects were currently married and 14.9% were unmarried/divorced/ widow/widower/separated. Only 20% respondents were educated up to high school and above, while 60% of total respondents were illiterate. Nearly half of the respondents were from labour occupation (48.7%). Half of respondents were belonged to low socio economic status.

Behavioural and Physiological risk factors of study subject: There are number risk factors for diabetes. Smoking, alcohol intake, unhealthy dietary habits, physical inactivity and history of diabetes, hypertension, overweight and obesity are behavioural and physiological risk factors respectively. In present study these factors were also measured along with other socio-economic factors. Overweight and obesity was assessed by BMI. [Table 2:] shows that the prevalence of smoking, alcohol intake, fruits consumption, vegetables consumption and physical activity was 18.3%, 22.7%, and 48.1%, 99.8% and 28.8%

respectively. The overall prevalence of diabetes was 6.1%. The prevalence of overweight and obesity was found 15.5% and 32.5% respectively, while prevalence of hypertension was 29%. As shown in [Table 3:] there was statistical association between BMI and hypertension with diabetes. (p<0.05), however no such relation was established between smoking, alcohol intake, fruits consumptions and physical activity with diabetes(p>0.05).

DISCUSSION

Present study shows that the prevalence of diabetes was 6.1%. Out of this 54.4% and 45.6% were males and females respectively. Muninarayana et al, 2010 reported the prevalence of type 2 DM in rural Tamaka, Kolar 10%, of this 71% and 29% were males and females respectively.[14] It is higher but males were more diabetic than females and same pattern with present study. Another study conducted by Jangra et al, in rural blocks of district Rohtak also reported higher prevalence of diabetes (9.2%).[15] Ghopade et al, 2013 reported 5.8% prevalence in his study.[16] Approximately similar finding is found in present study (6.1%). Prevalence increases with increasing age in both males and females. Bharti et al, 2011 reported higher prevalence 14.2% in persons aged ≥50 years than in persons aged between 20 and 49 years, the difference was statistically significant.[17] Study reveals that smokers, alcoholics, physically inactive and those who do not consume fruits were more diabetic than those who were non smoker, non alcoholic, physically active and consume fruits. Ramchandran et al 2004, WHO NCD Global status report 2014, Kanungo et al, 2016 found the prevalence of diabetes 6.36%, 8.5% and 6.06% respectively.[18,19,20] Little et al, found the overall prevalence of diabetes and prediabetes as 10.8% and 9.5% respectively.[21] The present finding shows that overweight/ obesity increases the risk of diabetes as compared to normal BMI. Barik et al, 2016 reported that the people having decreasing level of physical activity are more likely to be diagnosed with diabetes.[22]

CONCLUSION

In present study diabetes was found to be statistically significant with physiological risk factors such as overweight and obesity and hypertension (p<0.05), but behavioural risk factors was not significantly associated with diabetes (p>0.05), although they were more prone for diabetes. Hence focused should be given on life style modification specially 40 year and above along with early detection and full treatment of hypertension.

REFERENCE

1. Tabish SA. Is diabetes becoming the biggest epidemic of the twenty-first century?. International Journal of health sciences 2007;1:5.
2. International Diabetes Federation Available from: http://www.diabetesatlas.org/component/attachments/?task=download&id=116. IDF Diabetes Atlas, 7th edn. Brussels, Belgium. [Last accessed on 2016 Jan 19].
3. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo Jr JL, Jones DW, Materson BJ, Oparil S, Wright Jr JT, Roccella EJ. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. Jama. 2003;289:2560-71.
4. Islam SM, Purnat TD, Phuong NT, Mwingira U, Schacht K, Fröschl G. Non-Communicable Diseases (NCDs) in developing countries: a symposium report. Globalization and health. 2014;10:81.
5. Maher A, Sridhar D. Political priority in the global fight against non–communicable diseases. Journal of global health. 2012 Dec;2(2).
6. World Health Organization. World Health Organization Global Report on Diabetes. WHO Library Cataloguing-in-Publication Data. 2016.
7. Public Health Agency of Canada, Diabetes in Canada: Facts and figures from a public health perspective 2011; Ottawa,
8. Indian Heart Association Why South Asians Facts Web. 30 April 2015.http://indianheartassociation.org/why-indians-why-south-asians/overview/
9. Wild, Sarah, Gojka Roglic, Anders Green, Richard Sicree, and Hilary King. Global Prevalence of Diabetes. Diabetes Care. American Diabetes Association, 26 Jan. 2004. Web. 22 Apr. 2014.
10. Kleinfield NR. Modern Ways Open India's Doors to Diabetes. New York Times; Retrieved 8 June 2012.
11. Singh SP, Sharma H, Khwaja SZ, Singh KP, Yadav SK, Gautam RK et al. Prevalence of type 2 diabetes mellitus in rural population of India- a study from Western Uttar Pradesh. International Journal of Research in Medical Sciences 2017; 5: 1363-67.
12. Pandey VK, Aggarwal P, Kakkar R. Modified BG Prasad's Socio-economic Classification-2018: The need of an update in the present scenario. Indian J Comm Health 2018; 30: 82-4.
13. National Program for Prevention and Control of Diabetes, Cardiovascular Disease and Stroke, A Manual for Medical Officer Developed under the Government of India, WHO Collaborative Program ;2008-2009.
14. Muninarayana C, Balachandra G, Hiremath SG, Iyengar K, Anil NS. Prevalence and awareness regarding diabetes mellitus in rural Tamaka, Kolar. Int J Diabetes Dev Countries 2010;30:18-2.
15. Jangra A, Malik JS, Singh S, Sharma N. Diabetes mellitus and its socio-demographic determinants: a population-based study from a rural block of Haryana, India, Int J Adv Med 2019;6:30-34.
16. Ghorpade AG, Majgi SM, Sarkar S, Kar SS, Roy G, Ananthanarayanan PH et al. Diabetes in rural Pondicherry, India: a population-based study of the incidence and risk factors. WHO South-East Asia Journal of Public Health 2013;2: 3-4.
17. Bharti DR, Pal R, Kar S, Rekha R, Yamuna TV, Basu M. Prevalence and determinants of diabetes mellitus in Puducherry, South India.J Pharm Bioaalied Sci 20111;3:513-8.
18. Ramachandran A, Snehalatha C, Baskar ADS, Mary S,

Sathish Kumar CK, Selvam S, et al. Temporal changes in prevalence of diabetes and impaired glucose tolerance associated with lifestyle transition occurring in the rural population in India. Diabetologia 2004;47:860–5.

19. World Health Organization. Global action plan for the prevention and control of non communicable diseases, 2013-2020. Available from: http://www.who.int/nmh/events/ncd_action_plan/en. Accessed 8 September 2016.

20. Kanungo S, Mahapatra T, Bhowmik K, Mahapatra S, Saha J, Pal D, et al. Diabetes scenario in a backward rural district population of India and need for restructuring of health care delivery services. Epidemiol 2016;6:10-13.

21. Little M, Humphries S, Patel K, Dodd W, Dewey C. Factors associated with glucose tolerance, prediabetes, and type 2 diabetes in a rural community of south India: a cross-sectional study. Diabetol Metab Syn 2016;8:21.

22. Barik A, Mazumdar S, Chowdhury A, Rai RK. Physiological and behavioral risk factors of type 2 diabetes mellitus in rural India. BMJ Open Diabetes Research and Care 2016; 4:000255.

International Journal of Contemporary Medical Research
ISSN (Online): 2393-915X; (Print): 2454-7379 | ICV: 98.46 | Volume 6 | Issue 5 | May 2019

E5

Section: Community Medicine