Assessment of Risk Factors of Type 2 Diabetes Mellitus in an Urban Population of district Bareilly

Mohammad Suhail Khan[1,*], Atul Kumar Singh[2], Shyam Bihari Gupta[3], Sumit Saxena[4], Sonam Maheshwari[5]

[1]Post Graduate Student, [2]Associate Professor, [3]Professor, [4,5]Assistant Professor,
Dept. of Community Medicine, Sri Ram Murti Smarak Institute of
Medical Sciences, Bareilly

***Corresponding Author**
E-mail: mohammadsuhailk@gmail.com/ drsumitsaxena22@gmail.com

Abstract

Introduction: Diabetes exhibits the iceberg phenomenon i.e. the burden of disease is much higher than what we see. Today in this world of industrialisation, prevalence of diabetes is increasing day by day. In urban population prevalence of diabetes is more as compared to rural population. It is estimated that there are currently 285 million people with diabetes worldwide and this number is set to increase to 438 million by the year 2030. So there is a need to know the real picture of diabetes in the community and risk factors which can cause diabetes mellitus.

Objectives: To asses risk factors of type 2 diabetes mellitus in an urban population. To determine the prevalence of type 2 diabetes mellitus in study population. To find out the risk factors of type 2 diabetes mellitus in study population.

Material & Methods: It was a Cross Sectional observational Study done Area covered under Urban Health Training Centre of SRMS Institute of Medical Sciences, Bareilly. Study subjects: Adults age more than 30 years in area under Urban Health Training Centre (UHTC). Study Period was from 14 February 2014 - 14 February 2015**.**

Results: The overall prevalence of Diabetes Mellitus in the present study was found to be 97 (15.2%). Out of these, almost half 46 (7.18%) were newly diagnosed while the remaining half were known diabetics. 61 (9.5%) of the study population was found to have Impaired Fasting glucose. Age, Socio-economic status, General caste and Family History, BMI and Waist Circumference was found to be statistically significant.

Access this article online	
Quick Response Code:	Website: www.innovativepublication.com
	DOI: 10.5958/2394-6776.2016.00010.2

Introduction

The reverberation of India's swift progress in demographic and epidemiological transition has resulted in a bigger challenge of double burden of Communicable Diseases and Non-Communicable Diseases. Non-Communicable Diseases, which are often accompanied by long-standing disabilities, have a direct economic impact on households and communities both in terms of uptake of health services and loss of income or labour productivity due to illness. Since then, the disease has gradually evolved into a major public health problem[1.] Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease. In 2000, India (31.7 million) topped the world with the highest number of people with diabetes mellitus followed by China (20.8 million) with the United States (17.7 million) in second and third place respectively. According to Wild et al. the prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India. It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India, while China (42.3 million) and the United States (30.3 million) will also see significant increases in those affected by the disease. India currently faces an uncertain future in relation to the potential burden that diabetes may impose upon the country[2]. Diabetes is fortunately one of the most preventable of all non-communicable diseases. Primary prevention strategies can be formulated based on the known risk factors for diabetes. It is largely the result of excess body weight and physical inactivity and common in individuals over the age of 40. There is a higher incidence of type 2 diabetes in urban than in rural areas as well as incidence is associated with population whose lifestyle has changed from traditional patterns to a modern "Westernized" model[3].

Diabetes mellitus was first described in India in the ancient texts of Charaka and Sushruta (1500 BCE). India is second only to China which is home to 92.3 million diabetics[4].

Scarcity of good quality epidemiological data is a serious limitation in developing countries like India. Several important questions regarding the regional distribution, determinants, and interventions for diabetes remain unanswered like there are large regional disparities in prevalence of diabetes in India with low prevalence in rural and high prevalence in urban subjects and disease is more prevalent in southern regions as compared to northern and eastern parts of the

country. There is a growing epidemic of diabetes in India so reliable and informative epidemiological evidence is vital to quantify impacts and predictors of disease and to facilitate formulation of prevention and control strategies. In Uttar Pradesh state there is very few area specific data available regarding diabetes mellitus with this background, the present study is planned to find out an area specific data on Type II Diabetes Mellitus in urban population of Bareilly city.

Objectives

To determine the prevalence of Type 2 Diabetes Mellitus in study population.

To find out the risk factors of Type 2 Diabetes Mellitus in study population.

Material & Methods

Study Unit: The study subjects consisted of males and females in the age group of 30 years and above and belonging to Bareilly city.

Study Design: Cross Sectional Study

Sampling frame: The sampling frame consisted of urban wards (slum and non-slum locality) of Bareilly City. All men and women aged 30 year and above in selected localities were included in the sampling frame of our study.

Sample size: The study conducted by **R. M. Anjana et al. (2011)**[5] "Prevalence of diabetes and pre-diabetes in urban and rural India. The study revealed that overall prevalence of diabetes in Chandigarh was 13.6%, 10.4% in Tamil Nadu, 8.4% in Maharashtra and in Jharkhand 5.3%. In Chandigarh, a city of North India, the prevalence was 14.2% in urban areas and in the rural areas, the prevalence was 8.3%. So, Chandigarh was considered for calculating the sample size. Using the formula $4pq/d^2$ i.e. p is 14.2%, d is 20% relative error so 580 samlple size came out, than adding 10% non-respondent i.e 58, 638 came out taking round figure, sample size came out to be 640.

Methodology: The present study was carried out in area covered under Urban Health Training Centre. UHTC covered both slum area and non-slum area.1 Slum area was selected and 1 Non-slum area was selected through simple random sampling for obtaining desired sample size. Ethical clearances were taken from the institution.

House to house survey was done and information about the purpose of study was given to all study subjects and a verbal consent was taken from them, before filling the questionnaire. Houses were selected using simple random sampling. All eligible individuals in the visited house were included in the study.

The subjects were briefed about the procedure of investigation and advised to remain fasting till their blood sample for blood sugar examination was collected. Repeat visit was made on the consecutive day early in the morning to measure fasting capillary blood glucose level with the help of Accue Check-Glucometer. Quetelet's index used to calculate BMI. It was checked by using the formula weight in (kg)/ Height in $meter^2$. Kuppuswamy's scale used to calculate socioeconomic status. **Inclusion criteria:** All individuals 30 years of age and above irrespective of disease status were screened for diabetes. **Exclusion criteria**: Type 1 diabetes patients, Pregnant females, Those who were seriously ill, Non co-operative subjects.

Statistical test: Here we take blood sugar as a discreet variable to measure Diabetes mellitus and the variance of blood sugar is greater than mean of blood sugar so, Negative Binomial distribution fits well on blood sugar data. That's why negative binomial regression is applied to find out the risk in different categories with its respective reference category.

Results

The overall prevalence of Diabetes Mellitus in the present study was found to be 15.2%. Of these, almost half 7.1% were newly diagnosed while the remaining were known diabetics. 9.5% of the study population was found to have Impaired Fasting glucose. (**Table 1**)

Increasing trend of diabetes had been shown in all age group, maximum prevalence of diabetes mellitus was found between the age group of 60-69 years i.e (25.5%) followed by (20.5%) in 50-59 years and (14.5%) in 40-49 age group. The minimum was noted in 30-39 year age group i.e (4.2%). A decline of prevalence of diabetes mellitus was also found in the age group ≥ 70 i.e. (12.9%). The results were found to be statistically significant. The prevalence of Impaired Fasting Glucose was maximum in 50-59 years age group (16.2%) while minimum in 30-39 years age group (5.3%). **(Table 2)**

The prevalence of Diabetes Mellitus was almost same in class I and class II (21.0% and 21.3% respectively) followed by class III has (16.3%), class IV has (10.4%) and class V has (8.8%). Similar trend was also seen in IFG that more prevalence was seen in class I (11.8%) and class II (11.4%) as compare to class IV (7.2%) and class V (8.8%).

The prevalence of diabetes mellitus was more in upper class as compared to lower class and the association with the Diabetes Mellitus was also found statistically significant. (p value=0.04) **(Table 3)**

In Family History 98 had one parent family history and 36 had two parent family history. Prevalence of diabetes mellitus was maximum in those having both parents family history (36.1%) followed by one parent family history (30.7%) while minimum (10.7%) prevalence noted those were not having family history of diabetes. Association was found statistically significant between family history of diabetes mellitus

and prevalence of diabetes**.** However, in prevalence of IFG maximum was also in both parents family history subjects (19.4%) followed by (17.3%) in one parent family history and minimum was with no family history (6.8%). **(Table 4)**

The study shows as the BMI increases the prevalence of Diabetes Mellitus increases. Maximum number of diabetic individuals (30.4%) was found in obese class II followed by obese class I (23.5%) and pre obese (19.8%), whereas minimum number of diabetic individuals (8.7%) was in underweight class. Similar trend was seen in IFG prevalence. Maximum were from obese class II (34.8%), followed by (16.1%) in obese class I and in pre -obese (8.0%) and the minimum were form underweight category (3.4%). The association was found statistically significant between diabetes mellitus and BMI. (p value= 0.00) (**Table 5)**

On applying Negative Binomial Regression test increasing age, Socio-economic status, Family History, BMIs was found to be statistically significant (**Table 6**)

Table 1: Prevalence of Type II Diabetes Mellitus and impaired fasting glucose among study Population

	Diabetes Mellitus		Prevalence of Type II DM	Impaired Fasting Glucose	Normal	Total
	Known Diabetic	New Diagnosed				
Number	51	46	**97**	61	482	640
%	7.9	7.1	**15.2**	9.5	75.3	100

Table 2: Age wise prevalence of Diabetes Mellitus and impaired fasting glucose

Age	Diabetics	Impaired Fasting Glucose	Normal	Total	
30-39	8 (4.2%)	10 (5.3%)	172 (90.5%)	190	**Chi-square value=46.75, df=8, (p value=0.00)**
40-49	21 (14.5%)	16 (11.0%)	108 (74.5%)	145	
50-59	24 (20.5%)	18 (16.2%)	75 (64.1%)	117	
60-69	40 (25.5%)	13 (8.3%)	104 (66.2%)	157	
≥70	4 (12.9%)	4 (12.9%)	23 (74.1%)	31	
Total	**97 (15.2%)**	**61 (9.5%)**	**482 (75.3%)**	**640**	

Table 3: Association of Diabetes Mellitus and Impaired Fasting Glucose according to Socio-Economic Status

Socio Economic Status (Kuppuswami Socio Economic status)	Diabetes Mellitus (%)	Impaired Fasting Glucose (%)	Normal	Total	
Class I	16 (21.0 %)	9 (11.8%)	51 (67.1%)	76	**Chi-square value=15.548, df=8 (pvalue=0.04)**
Class II	26 (21.3%)	14 (11.4%)	82 (67.2%)	122	
Class III	27 (16.3%)	17 (10.3%)	121 (73.3%)	165	
Class IV	23 (10.4%)	16 (7.2%)	181 (82.2%)	220	
Class V	5 (8.8%)	5 (8.8%)	47 (82.4%)	57	
Total	**97(15.2%)**	**61 (9.5%)**	**482 (75.3%)**	**640**	

Table 4: Association of Diabetes Mellitus and Impaired Fasting Glucose according to Family History

Family history	Diabetes Mellitus	IFG	Normal	Total	
Absent	54 (10.7%)	37(6.8%)	415(82.0%)	506	**Chi-square value=59.81 df=4 (p value=0.00)**
One parent	30 (30.7%)	17 (17.3%)	51 (52.0%)	98	
Both parent	13 (36.1%)	7 (19.4%)	16 (44.4%)	36	
Total	**97 (15.2%)**	**61 (19.5%)**	**482 (75.3%)**	**640**	

Table 5: Association of diabetes mellitus and Impaired Fasting Glucose according to their Body Mass Index (based on Quetelet's Index)

BMI	Diabetes Mellitus (%)	Impaired Fasting Glucose (%)	Normal	Total	
<18.5 (Underweight)	5 (8.7%)	2 (3.4%)	51 (87.9%)	58	**Chi-square value=47.23 df=8 (p value=0.00)**
18.5-24.9 (Average)	32 (10.4%)	25 (8.1%)	248 (81.3%)	305	
25-29.9 (pre obese)	37 (19.8%)	15 (8.0%)	134 (72.0%)	186	
30-34.9 (Obese class I)	16(23.5%)	11 (16.1%)	41 (60.2%)	68	
35.0 – 39.99 (Obese class II)	7 (30.4%)	8 (34.8%)	8 (34.7%)	23	
Total	**97(15.2%)**	**61 (9.5%)**	**482 (75.3%)**	**640**	

Table 6: Variables of Diabetes Mellitus among urban population in Bareilly "Prevalence ratio from Negative Binomial Regression"

Variables	B	Exp. (B)	95% CI	p value
Age				
30-39(Ref)	-	-	-	-
40-49	0.345	1.319	0.884-1.879	**0.006**
50-59	0.453	1.668	0.449-1.968	**0.012**
60-69	1.667	2.045	0.599-2.549	**0.034**
≥70	0.996	1.889	0.991-2.999	**0.021**
Socio Economic Status				
Class I	1.489	4.119	5.339-2.229	**0.001**
Class II	1.208	3.219	4.517-2.289	**0.032**
Class III	0.983	1.717	0.978-2.399	**0.021**
Class IV	0.783	1.110	0.768-2.167	**0.001**
Class V(Ref)	-	-	-	-
Family History				
Absent	-0.674	0.672	0.571-1.682	**0.000**
One parent	-0.496	0.857	0.901-1.111	**0.002**
Both parent(Ref)	-	-	-	-
BMI				
<18.5 (Underweight)	-0.447	0.675	0.385-1.287	**0.037**
18.5-24.9 (Normal)	-0.689	0.789	0.778-1.288	**0.025**
25-29.9 (Overweight)	-0.889	0.899	0.675-1.222	**0.042**
30-34.9 (Obesity 1)	-0.498	1.124	0.786-1.675	**0.031**
35-39.9 (Obesity 2)(Ref)	-	-	-	-

Discussion

In the present study overall prevalence of diabetes mellitus in the study subjects was found to be 15.2%. Almost similar type of prevalence reported in multicentric study carried out by **R. M. Anjana et al. (2011)**[5] who reported the prevalence of diabetes mellitus among urban population of 20 years and above as 14.2% in Chandigarh. Slightly lower prevalence found as compared to our study might be due to inclusion of lower age group in this study. **Socioeconomic class:** The prevalence of diabetes mellitus in the present study was highest among middle socioeconomic class 21.31% followed by upper socioeconomic class 21.05% and least in the lower socioeconomic class 8.8%. **Ramachandran A et al (2001)**[6] also reported prevalence of diabetes mellitus to be more among high-income group.

Ramchandran A et al again in **(2007)**[7] stated that Prevalence of diabetes was found to be lower in the low socio-economic group living in urban areas compared with the high income group. This was probably related to the physical activity of the low income group as most of them were involved in moderate to strenuous physical activity at work. **Family History:** The present study revealed that 30.7% of diabetics having positive family history in one parent and 36.1% in both the parents. It was also found that diabetes was significantly higher among people having positive family history in comparison to person having negative family history. **Kumar P et al (2013)[8], Valliyot D et al**

(2014)[9] and Kumar SS et al (2014)[10], also showed that there was strong association with family history and Diabetes Mellitus. **Obesity:** In the present study it was observed that the prevalence of Diabetes Mellitus shows a marked difference among those having higher BMI and those are having lower BMI. **Pandya H et al (2011)**[11] showed that prevalence of obesity is more in diabetic's individuals. **Jayawardena R (2012)[12]** concluded in his study that higher BMI and high waist hip ratio had increased risk of diabetes mellitus.

Conclusion

Overall **prevalence** of Diabetes Mellitus in the present study was found to be **15.2%.** Of these, almost half **7.1%** were **newly diagnosed** while the remaining were known diabetics**. 9.5%** of the study population was found to **have Impaired Fasting glucose**. Increasing trend of diabetes had been seen in all age groups. **Prevalence** of diabetes mellitus was almost **same** in **class I and class II** followed by class III class IV and class V. **BMI increases** the **prevalence** of Diabetes Mellitus **increases**. Maximum numbers of diabetic individuals was found in obese class II followed by obese class I and pre obese.

Acknowledgments: Authors are thankful to the chairman, Shri Dev Murti, SRMSIMS for making suitable arrangements for the research work. Special thanks to the Dr. S.B.Gupta for their constant support.

Conflict of Interest: There is no conflict of interest

Source of Support: Nil

References

1. Barik D, Arokiasamy P. Economic Burden of Non-communicable Diseases in India. Annual meeting of population association of America, Boston, USA. 2014: 1-4.
2. Kaveeshwar SA, Cornwall J. The current status of diabetes mellitus in India. Australasian Medical journal 2014;7(1):45-48.
3. WHO's Certified: Global Status Report on Non Communicable Disease. Cited 2014 March 8. Available from www.who.int/ncd.
4. Gupta M, Singh R, Lehl SS. Diabetes in India: a long way to go. Int J Sci Rep 2015;1(1):1-2.
5. Anjana MR, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R et al. The Indian Council of Medical Research–India Diabetes (ICMR–INDIAB) Study: Methodological Details. J Diabetes Sci Technol 2011;5(4):906–914.
6. Ramachandran A, Snehalatha C, Kapur A, Vijay V, Mohan V, Das AK, et al. High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey. Diabetologia 2001;44:1094-101.
7. Ramachandran A. Socio-Economic Burden of Diabetes in India. JAPI 2007;55:9-12.
8. Kumar P, Mallik D, Mukhopadhyay DK, Sinhababu A, Mahapatra BS, Chakrabarti P. Prevalence Of Diabetes Mellitus, Impaired Fasting Glucose, Impaired Glucose Tolerance, And Its Correlates Among Police Personnel In Bankura District of West Bengal. Indian Journal of Public Health2013;57(1)24-28.
9. Valliyot B, Sreedharan J, Valliyot SB, Muttappallymyalil J. Demographic parameters associated with Type 2 Diabetes Mellitus in North Kerala, India. American Journal of Research Communication 2014;2(9):39-48.
10. Kumar SS, Singh BD. Biochemical Parameters Variations in Type–II Diabetes Mellitus: Special Reference in Rewa Region. Asian Journal of Research in Chemistry 2014;7(10):877-881.
11. Pandya H , Lakhani JD, Patel N. Obesity is becoming synonym for diabetes in rural areas of India also – an alarming situation. Int J Biol Med Res 2011;2(2):556-60.
12. Ranil Jayawardena R, Ranasinghe P, Byrne NM, Soares MJ, Katulanda P, Hills AP. Prevalence and trends of the diabetes epidemic in South Asia: a systematic review and meta-analysis. BMC Public Health 2012;12:380:1-11.