



PREVALENCE OF PREDIABETES AND ITS RISK FACTORS IN AN URBAN COMMUNITY OF EAST SIKKIM

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ABSTRACT **BACKGROUND:** Diabetes mellitus(DM) has been recognised as a public health problem and it has taken an epidemic form with 73 million diabetics in India in 2017^[1]. Diagnosing prediabetes , precursor of diabetes, will reduce the burden and hence the complication. Knowledge of the prevalence of prediabetes will bring about awareness and thus cost- effective strategy can be applied to delay the progression of prediabetes to the stage of frank diabetes.

OBJECTIVE: To find the prevalence of Prediabetes and determine the factors associated with it amongst the Sikkimese population .

MATERIALS AND METHODS : A cross sectional descriptive study, with total enumeration of population aged 20 years and above having domicile of Sikkim(874),was conducted in the Urban field practice area of SMIMS ,Gangtok from August 2013 –August 2014. Clinicosocial data was collected , anthropometric measurement and blood pressure taken and FBG was measured after 8 hours of fasting using blood glucometer and then analysis was done using SPSS Software.

RESULT: On the basis of study, the prevalence of prediabetes was found to be 24.37% . Age, family history, sedentary lifestyle, BMI , WHR and hypertension were significantly associated with prediabetes. There was no significant association with alcohol, education or employment status.

CONCLUSIONS: Comparing with the national figure the burden of diabetes and prediabetes in Sikkim is quite high and thus there is an urgent need for intervention at the precursor stage.

KEYWORDS : Diabetes mellitus, prediabetes, Sikkim ,India, prevalence

INTRODUCTION:

Diabetes is considered as one of the most dangerous disease among all chronic diseases and ranks fourth most common cause of mortality along with coronary artery disease. DM has become a modern day epidemic and its prevalence is increasing.^[2] Type 2 diabetes accounts for up to 90% of all cases of diabetes worldwide. Type 2 diabetes was thought to be the disease of the growing age and usually seen over the age of 40 but these days it is increasingly seen in children. It is stated that the occurrence of type2 diabetes at a younger age is due to overweight which in turn is caused by lifestyle changes like unhealthy eating habits and a sedentary lifestyle.^[3-5]

Diagnosis may be delayed due to various reason and people may come with complications of the disease like blindness, infections in feet, kidney failure, or heart disease^[3-5] and it is also seen that the burden of Diabetes is due to the consequence of complications of the disease which can be divided into two broad categories macro vascular (coronary artery disease, peripheral vascular diseases and atherosclerosis) and micro vascular (like retinopathy, neuropathy and nephropathy).^[6]

The intermediate stage of diabetes, prediabetes ,gives us a window period when we can delay the progression of the disease as well as the complications. Prediabetes have been defined as Fasting blood glucose level of 100mg/dl -125mg/dl ^[7]. Developing country like ours are so focused on the overt disease and their complications that the health centres have been overburdened and the cost of treatment is soaring high. It's time to shift our focus to prevention and managing the precursor stage. Sikkim has the highest prevalence of diabetes in India of around 13.6%.^[8] as per the NPCDCS survey and an article published in The Times of India (2012)^[9]. Another study done in east Sikkim had shown the prevalence of diabetes to be 16.36%^[10]. This necessitates the need to do further indepth study related to diabetes.

The present study was done to find the prevalence of prediabetes and its associated risk factor which will add to the knowledge about diabetes.

METHODOLOGY:

A cross sectional descriptive study was conducted among ethnic population in the Urban field practice area of Urban Health Centre, Tadong under the Department of Community medicine, SMIMS, Gangtok from August 2013 –August 2014. All adults aged 20 years and

above , having domicile of Sikkim were included and total enumeration of the area was done. All eligible individuals were identified and then house to house survey was done. A predesigned and pretested questionnaire which was developed at the institute was used for the survey. The clinico-social data related to diabetes was gathered by personal interview. Anthropometric measurement like weight, height, waist circumference were measured followed by blood pressure and fasting blood glucose. Capillary blood was tested after overnight fasting for 8-12 hours for fasting blood sugar estimation by using glucometer . Participants were requested to refrain from consuming breakfast or any beverages until sample collection was done and the Glucometer (One touch ultra,Lifespan,Johnson and Johnson,Milpitas,CA.) was calibrated before the study and regularly at every three months interval .

Statistical analysis was done using SPSS version 16. Proportion of adults with diabetes mellitus and prediabetes was presented in percentage. Relative risk, chi-square test and 95% confidence interval was calculated for each risk factors and P<0.05 was considered to be statistically significant.

Criteria for the diagnosis of diabetes and Prediabetes^[7]

Physician diagnosis of diabetes and current use of medication for diabetes(insulin or oral hypoglycemic agents) or fasting plasma glucose more than 126 mg/dl

Pre-diabetes or intermediate Diabetes^[7]
Fasting blood glucose 100mg/dl -125mg/dl

RESULTS:

Table 1: Socio-demographic profile of the study population

Characteristics	Gender		Total	
	Male	Female		
Age(years)	20-30	49 (41.5%)	69 (58.5%)	118(100%)
	31-40	113(44.3%)	142(55.7%)	255(100%)
	41-50	106(45.1%)	129(54.9%)	235(100%)
	51-60	73(49.3%)	75(50.7%)	148(100%)
	60 and above	53(44.9%)	65(55.1%)	118(100%)
Education	Professional	21(48.8%)	22(51.2%)	43(100%)
	Graduation and PG	138(48.5%)	146(51.5%)	284(100%)

	Intermediate and HS Pass	103(43.45%)	134(56.5%)	237(100%)
	High school certificate	27(56.2%)	21(43.8%)	48(100%)
	Middle school completion	57(55.3%)	46(44.7%)	103(100%)
	Primary school /literate	28(42.4%)	38(57.6%)	66(100%)
	Illiterate	20(21.5%)	73(79.5%)	93(100%)
Socioeconomic status*	Upper	34(45.3%)	41(54.7%)	75(100%)
	Upper middle	127(42%)	175(58%)	302(100%)
	Lower middle	154(50.8%)	149(49.2%)	303(100%)
	Upper lower	79(40.7%)	115(59.3%)	194(100%)

PG-postgraduate, HS-high secondary
***socioeconomic status as per modified Kuppuswamy scale**

Table 1. shows the demographic profile of the study population. Majority of the population are in the age group of 31-40 years. Female comprised of 55% of the total study population. Literacy level was 90% and most of them were graduates.80% of the females were literate. As per modified Kuppuswamy scale majority of them fall under upper or lower middle class .

On the basis of study, the prevalence of diabetes was found to be 16.36% and that of prediabetes was found to be 24.37%. About 118 individuals(83% of the total diabetic) already knew their diabetic status owing to the ongoing state sponsored program known as the CATCH program where all basic investigation are carried out for all residents of Sikkim.

Table 2.Distribution of risk factor among prediabetes and diabetes

Risk factor	Normal (n=518)	Prediabetes (n=213)	Diabetic (n=143)
Age			
< 40	269	75	29
>40	245	138	114
Gender			
Male	235	85	74
Female	283	128	69
Literacy			
Literate	457	198	126

Table 3.Association between risk factors and prediabetes

Risk factor	Normal (n=518)	Prediabetes (n=213)	RR 95% CI	X ² & p	Diabetic (n=143)	RR 95% CI	X ² & p
Age							
< 40	269	75	1.62	16.27	29	3.22	44.07
>40	245	138	(1.28 – 2.08)	p<0.0001	114	2.21– 4.70	p<0.0001
Gender							
Male	235	85	1.17	1.6	74	0.81	1.58
Female	283	128	(0.92 – 1.47)	p = 0.204	6.9	(0.61 –1.09)	p = 0.20
Literacy							
Literate	457	198	0.53	3.14	126	0.99	0.001
Illiterate	61	15	(0.95-2.44)	0.07	17	(0.63 – 1.09)	p=0.97
Employment							
Employed	424	178	0.91	0.198	94	1.88	16.23
Not employed	94	35	(0.67 – 1.2)	P=0.65	49	(1.4-2.5)	<0.0001
Diet							
Vegetarian	58	36	0.72	3.88	21	0.78	0.98
Mixed	460	177	(0.5-0.9)	0.04	122	(0.52-1.1)	p 0.32
Life style							
Sedentary	250	80	0.73	2.93	92	1.68	10.96
Active	268	133	(0.57-0.9)	0.008	51	(1.2-2.2)	p=0.0009
Tobacco consumption							
yes	180	157	1.7	31.41	65	1.4	5.05
No	338	126	(1.4-2)	<0.001	78	(1.06-1.88)	0.0245
Alcohol consumption							
Yes	232	90	0.9	0.29	63	0.97	0.0036
No	286	123	0.73-1.16	0.58	80	(0.70-1.3)	p=0.95
Family history							
Positive	137	92	1.66	18.90	86	2.9	55.4
Negative	381	121	(1.33-2.8)	<0.001	57	(2.2-3.9)	<0.001
BMI							

Illiterate	61	15	17
Employment			
Employed	424	178	94
Not employed	94	35	49
Diet			
Vegetarian	58	36	21
Mixed	460	177	122
Life style			
Active	250	80	92
Sedentary	268	133	51
Tobacco consumption			
Yes	180	157	65
No	338	126	78
Alcohol consumption			
Yes	232	90	63
No	286	123	80
Family history			
Positive	137	92	86
Negative	381	121	57
BMI			
High	137	162	120
Normal	381	51	82
WHR			
Normal	368	50	61
High	150	163	82
Hypertension			
Yes	104	91	66
No	414	122	77

BMI-body mass index,WHR-waist hip ratio

Table 2. shows that majority of the diabetic(79 %) and prediabetic(64 %) were >40 years. Among the total prediabetes 60% were females. Literacy and employment were high in both diabetic and prediabetic .Compared to normal, 43.1 % of prediabetes and 60 % of diabetic had a strong family history. Majority of the prediabetic had sedentary lifestyle. BMI and WHR were significantly higher in both diabetes and prediabetes.In terms of other co-morbid condition ,42.7 % of prediabetic and 46.1 % of diabetic had hypertension and it is also the condition which causes similar complications giving an additive effect.

High	137	162	4.5	151.62	120	8.2	153.3
Normal	381	51	(3.2-6)	<0.0001	82	(5.4-12.4)	<0.0001
WHR							
Normal	368	50	4.35	137.55	61	1.5	38.4
High	150	163	(3.2-5.7)	<0.0001	82	(1.18-2.11)	<0.0001
HTN							
Absent	104	91	2.05	38.42	66	2.4	38.53
Present	414	122	(1.6-2.54)	p<0.0001	77	(1.87-3.2)	<0.0001

WHR-waist hip ratio, BMI- body mass index, HTN- hypertension, RR- Relative risk

Relative risk(RR) was estimated for various risk factors and the association was assessed using chi-square and p value <0.05 was considered significant. Table 3. shows higher risk of prediabetes among people >40 years (RR-1.62,1.28-2.08) and the association was found to be significant. Female, illiteracy, unemployment, vegetarians had higher risk but it was found to be insignificant. Tobacco user had higher risk of being prediabetic (RR-1.7,1.4-2) which was found to be significant. Alcohol had no association with prediabetes. Individuals with family history of diabetes had higher risk of prediabetes(RR-1.66,1.33-2.8) and it was found to be significant. Individuals with high BMI and WHR had nearly four to five times higher risk of having prediabetes and the association was found to be statistically significant. Hypertension was the comorbid condition which increased the risk of prediabetes and was found to be significantly associated.

DISCUSSION:

In this study, 213 of the 874 respondents were found to have prediabetes, thereby giving the prevalence of diabetes as 24.3%.

SITE study which was a cross-sectional study conducted during 2009-10 in 10 Indian states screening 2,000 patients from each state showed a prevalence of prediabetes as 18.4% in the study population.^[11]

Majority of the studies done in India show lower prevalence, A study done among adults in urban slums of Bangalore in 2012-13 showed prevalence of prediabetes to be 11.57%^[12]. A cross-sectional survey of 2227 subjects was conducted from April 2008 to June 2009, aged ≥ 20 years in the urban Chandigarh population, by Ravikumar et al where the prevalence was found to be 15.7%.^[13] The NUDS study show the prevalence of IGT as 16.8 per cent in Chennai, 14.9 per cent in Bengaluru, 29.8 per cent in Hyderabad, 10 per cent in Kolkatta, 10.8 per cent in Mumbai and 8.6 per cent in New Delhi. Hyderabad here shows prevalence comparable to the present study^[14]. The Amrita Diabetes and Endocrine Population Survey(ADEPS), a cross-sectional survey done in urban areas of Ernakulam district in Kerala estimated prevalence of prediabetes to be 11.2 per cent.^[15]

A study CURES in Chennai has reported a decreased prevalence of prediabetes in an urban population compared to earlier studies done in the same city (16.8% in 2000 to 10.2% in 2004).^[16]

Our study shows higher risk among those above the age of 40 years (RR-1.6,1.28-2.08) similarly Prediabetes was higher in those above the age of 40 years(OR-7.7,2.17)^[17]. Another study also showed higher risk (OR-1.4,1.01-1.8) in those above 45 years^[12]

Gender had no significant association with prediabetes in our study though it was higher among females but other study show gender preference with higher risk among males(1.46,2.34)^[17] and in another study higher among females(OR-1.6,0.9-1.8)^[12]

Regarding Family history studies have shown a strong correlation with diabetes and prediabetes.[reffiff]^[18] our study shows a strong association with RR of 1.66(1.3-2.8) similarly other study too showed significant association with OR 1.9(1.3-2)^[12]

Higher BMI(RR-4.5,3.2-6) was a risk for prediabetes in our study, similar finding was seen in other study(OR -1.5,2.13)^[17] and also in another study^[12,19] Our study showed higher risk of prediabetes among those with high WHR(RR-4.35,3.2-5.7) similar finding was seen in other studies too (OR-1.4,2.28)^[17] also in another study^[12]. Hypertension was significantly associated with prediabetes. Similar result was also noted in other studies^[17]

CONCLUSION:

The present study revealed a 24.37% prevalence of prediabetes among

respondents in Tadong. Age above 40years, high BMI, WHR and positive family history were found to be significantly associated therefore these risk factors can be looked out for and targeted. Study shows that Sikkim has one of the highest prevalence of diabetes and this has necessitated the need for studies like this where we focus on the precursor stage The association seen with various variables show that health education and a structured screening procedure will help in diagnosing prediabetes and thus we can delay its progression to diabetes and also its complication. It also highlights the changing lifestyle in hilly and tribal area thus drawing focus on preventive measures and thus health education should start from school students to motivate them to modify their lifestyle and also stress upon regular checkup to reduce the overall burden.

LIMITATION:

Causal inference cannot be drawn as it is a cross sectional study. Glucometer was used for measuring blood sugar level though calibration was done regularly.

Source of support:nil

Conflict of interest: none

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