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Prevalence of Diabetes and Its Risk Factors among the Tribal Population in Rani Development Block, Assam

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Abstract: ***Introduction: Non-communicable diseases (NCDs) like diabetes mellitus recently have become an emerging pandemic globally with disproportionately higher rates in developing countries. In India diabetes is a growing challenge with estimated 8.7% diabetic population in the age group of 20 and 70 years. Earlier considered to be a disease of affluent society's diabetes prevalence is increasing rapidly both in rural and tribal communities as per the recent epidemiological data. Objective: To find the prevalence of Diabetes and its correlates among the tribal population in Rani Development Block, Assam. Materials and methods: A community based cross sectional study was conducted among 310 tribal individuals in Rani Development Block. Population proportion to size sampling technique was used for selection of the subjects. Anthropometric measurements were taken and fasting blood glucose level was estimated using glucometer. Results: The prevalence of diabetes was found to be 9.7%. Dietary factors like increased consumption of red meat and decreased consumption of green leafy vegetables, family history of diabetes, sedentary lifestyle, decreased physical activity and higher BMI were found to be significantly associated with diabetes mellitus.***

Keywords: Diabetes, tribal, rural, fasting glucose level

1. Introduction

Non-communicable diseases (NCDs) recently have become an emerging pandemic globally with disproportionately higher rates in developing countries. [1]Among the NCDs, Diabetes Mellitus (DM) contributes to422 million people worldwide, the majority living in low-and middle-income countries, and 1.5 million deaths are directly attributed to diabetes each year. Both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades. [2]

Diabetes is a chronic, metabolic disease characterized by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys and nerves. The most common is type 2 diabetes, usually in adults, which occurs when the body becomes resistant to insulin or doesn't make enough insulin. [2] It is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation. Between 2000 and 2016, there was a 5% increase in premature mortality from diabetes. In 2019, diabetes was the ninth leading cause of death with an estimated 1.5 million deaths directly caused by diabetes. [3]Diabetes is a growing challenge in India with estimated 8.7% diabetic population in the age group of 20 and 70 years. [4] As per the International Diabetes Federation (IDF) estimates, the global pandemic of DM is expected to affect 642 million people by year 2040 with India to be the home to second largest number of persons with DM.

Earlier considered to be a disease of affluent societies DM prevalence is increasing rapidly both in rural and tribal communities as per the recent epidemiological data. India has highest number of tribals in the world constituting 8.6% (104 million) of its population. [5]. The tribals are probably the most marginalized communities in India and have poor access to health care facilities. Due to rapid epidemiological transitions tribal population is also displaying rising trends of NCDs, similar to those of general population. In Assam data from National Family Health Survey (NFHS) 4 and NFHS 5 shows a visible transition in the proportion of individuals suffering from diabetes towards a higher trend.

Till date, there are only few studies done on diabetes among the tribal population in Assam. In view of the above, the present study was undertaken to estimate the prevalence of Diabetes and its correlates among the tribal population in Rani Development Block, Assam.

2. Methods

The cross sectional study was carried out in the Rani Development Block, a rural area situated on the south-western region of Kamrup District, Assam comprising an area of 323.65 km^2. There are 95 villages out of which 36 villages are comprised of tribal population. The study was done from January 2021 to September 2021. Taking the prevalence of diabetes to be 7.5% [6], 3% absolute error, minimum sample size was calculated to be 309. Adults 30 years of age and above who are permanent residents or those who have been living there for more than 6 months were included in the study. Adults with known or diagnosed psychiatric illness, pregnant women and adults who were on drugs like corticosteroid and beta blockers and critically ill individuals other than the disease under study were excluded.

10 tribal villages were selected by the method of population proportion to size and from each village 31 tribal individuals were selected by house to house visit to give a total number of 310 study participants. If desired sample was not obtained from one village, then adults from adjacent village were taken into consideration. Interview was taken by a pretested

proforma and anthropometric measurements were done like height and weight. The individuals were asked to remain empty stomach next day in morning and were followed up accordingly to test fasting blood glucose level using a glucometer by taking capillary blood. Individuals having blood sugar level greater or equal to 126 mg/dL were taken to be diabetic. Those having blood sugar levels between 100 to 125 mg/dL were taken to be pre diabetic and below 100mg/dL were taken to be normal (American Diabetes Association).

The data collected was compiled in Microsoft Office Excel and analyzed by using INSTAT GRAPH PAD. For descriptive analysis, frequency distributions were computed for all categorical variables. Chi-square test was applied for data analysis and p value <0.05 was considered to be significant.

3. Results

Out of the 310 tribal respondents 58.1% (180/310) were females and 41.9% (130/310) were males. The mean age of the study population was 44.04±12.9 years, men 46.3±14.3 years and women 42.4 ±11.5 years. Majority (82.6%) among them belonged to Hindu religion and 17.4% belonged to Christianity, majority (91%) were married, 4.8% were unmarried and 4.2% were widowed. Most of the respondents (23.2%) had studied up to High School, followed by 11.9% up to primary school, 11.6% up to middle school, 2.9% Higher Secondary and 6.1% graduation and above while 44.2% were illiterates. There were 48.7% unskilled workers, 18.4% skilled and 3.2% working as professionals.

The overall prevalence of diabetes was 9.7%. The prevalence among males was 14.6% (19/130) and among females was 6.1% (11/180). Among the 30 diabetics 13 (43.3%) were already known diabetics and 17 (56.7%) were newly detected during the study. The prevalence of pre diabetic individuals was 8.4% (Fig 1). Highest number of diabetics were from the age group 60-69 years (26.7%). Majority (60%) of the diabetics were among the literates while 40% were illiterates. Among the different socio-economic classes highest number of diabetics were found in Class IV (12.8%) followed by Class II (11.5%), Class I (8.3%), Class III (7.1%) and lowest in Class V (3.3%). Prevalence of diabetes was more among ever users of tobacco (12.8%) when compared with never users (8.5%) and among the ever users prevalence of diabetes was highest among those who used tobacco for 1 to 5 years (15%). Prevalence of diabetes was significantly associated with decreased consumption of green leafy vegetables (GLV) and increased consumption of red meat but not with fruits, saturated and trans-fat consumption (Table 1). There was significant association of diabetes with family history (Table 2).

Prevalence of diabetes was more among ever users of alcohol (11.3%) when compared with never users (8.6%) and among the ever users prevalence of diabetes was highest among those who used alcohol more than 5 years (13.5%). Tobacco use and alcohol use showed no statistical significance with diabetes (Table 2). There was significant association of diabetes with lifestyle, duration of physical activity and BMI (table 2).

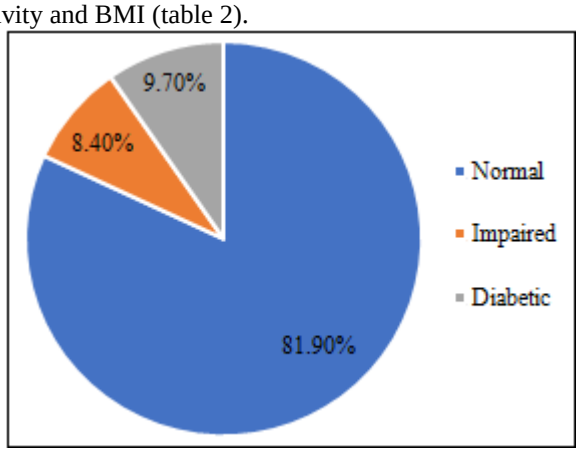

Figure 1: Distribution of the tribal adults as per different levels of fasting blood sugar.

Table 1: Association between diabetes and dietary risk factors

Variables	Diabetic (30)		Non-diabetic (280)		Total (310)	OR (95% CI)	P value
	n (%)	%	n (%)	%	n (%)		
GLV consumption							
5-10 meals pre week	2 (3.8)	6.7	50 (96.2)	17.9	52 (100)	1 (reference)	
< 5 meal per week	22 (9.4)	73.3	213 (90.6)	76.1	235 (100)	2.58 (0.58-11.34)	P=0.30
Once or more than once a month	6 (26.1)	20.0	17 (73.9)	6.1	23 (100)	8.82 (1.6-47.9)	P=0.01
Fruit consumption							
Less than once per week	17 (8.7)	56.7	179 (91.3)	63.9	196 (100)	0.73 (0.34-1.58)	P=0.55
More than once per week	13 (11.4)	43.3	101 (88.6)	36.1	114 (100)		
Red meat per week							
Once or more than once a month	9 (5.6)	30.0	152 (94.4)	54.3	161 (100)	1 (reference)	
<=2 meals	10 (10)	33.3	90 (90)	32.1	100 (100)	1.8 (0.73-4.79)	0.27
3-4 meals	6 (22.2)	20.0	21 (77.8)	7.5	27 (100)	4.82 (1.45-14.93)	0.01
More than 7 meals	5 (22.7)	16.7	17 (77.3)	6.1	22 (100)	4.96 (1.49-16.54)	P=0.01
Saturated fat consumption							
Once or more than once a month	15 (7.5)	50.0	184 (92.5)	65.7	199 (100)	1 (reference)	-
<=2 times per week	7 (10.8)	23.3	58 (89.2)	20.7	65 (100)	1.48 (0.57-3.8)	P=0.57
3-4 times per week	6 (15)	20.0	34 (85)	12.1	40 (100)	2.16 (0.78-5.95)	P=0.22
More than 7 times per week	2 (33.3)	6.7	4 (66.7)	1.4	6 (100)	6.13 (1.03-36.28)	p=0.13
Trans fat consumption							
Once or more than once a month	18 (9.4)	60.0	173 (90.6)	61.8	191 (100)	1 (reference)	-
<=2 times	7 (9.1)	23.3	70 (90.9)	25.0	77 (100)	0.96 (0.38-2.4))	P=0.93

3-4 times	3 (8.3)	10.0	33 (91.7)	11.8	36 (100)	0.87 (0.24-3.13)	P=0.83
More than 7 times	2 (33.3)	6.7	4 (66.7)	1.4	6 (100)	4.8 (0.82-28.09)	P=0.22

Table 2: Association between diabetes and other risk factors

Variables	Diabetic (30)		Non-diabetic (280)		Total (310)	OR (95% CI)	P value
	n (%)	%	n (%)	%	n (%)		
Family History of Diabetes							
Present	6 (46.2)	20.0	7 (53.8)	2.5	13 (100)	9.75 (3.0-31.3)	p<0.001
Absent	24 (8.1)	80.0	273 (91.9)	97.5	297 (100)		
Tobacco use							
Never	19 (8.4)	63.3	207 (91.6)	73.9	226 (100)	1 (reference)	
1 year to 5 years	3 (12)	10.0	22 (88)	7.9	25 (100)	1.48 (0.40-5.42)	P=0.81
More than 5 years	8 (13.6)	26.7	51 (86.4)	18.2	59 (100)	1.7 (0.7-4.12)	P=0.34
Alcohol use							
Never	16 (8.6)	53.3	170 (91.4)	60.7	186 (100)	1 (reference)	-
1 year to 5 years	4 (8)	13.3	46 (92)	16.4	50 (100)	0.92 (0.29-2.89)	P=0.89
More than 5 years	10 (13.5)	33.3	64 (86.5)	22.9	74 (100)	1.66 (0.71-3.84)	P=0.33
Life style							
Vigorously active	2 (5.4)	6.7	35 (94.6)	12.5	37 (100)	1 (reference)	-
Moderately active	15 (6.2)	50.0	226 (93.8)	80.7	241 (100)	1.15 (0.25-5.24)	P=0.85
Sedentary	13 (40.6)	43.3	19 (59.4)	6.8	32 (100)	11.97 (2.4-58.7)	P=0.0012
Physical activity							
At least 150 min per week	20 (7.9)	66.7	233 (92.1)	83.2	253 (100)	2.47 (1.09-5.63)	p=0.0482
Less than 150 min per week	10 (17.5)	33.3	47 (82.5)	16.8	57 (100)		
BMI							
18.5-24.9	10 (6.6)	33.3	240 (93.4)	50.4	250 (100)	1 (reference)	
25-29.99	14 (29.2)	46.7	34 (70.8)	12.1	48 (100)	9.88 (4.06-24.0)	P<0.0001
>30	6 (50)	20.0	6 (50)	2.1	12 (100)	24.0 (6.56-87.77)	P<0.0001

4. Discussion

In this study the prevalence of diabetes was found to be 9.7% which is lesser than the prevalence of diabetes in rural Assam (15.2%) as per NFHS 5 data. When compared with other studies, lower prevalence of diabetes was found in studies done by Chaturvedula R et al. in Khammam district of Andhra Pradesh (4.13%) and by Ganie MA et al. among tribal population in Kashmir (1.3%) [7, 8] while similar prevalence was found in a study done in Khagrachari Hills of Bangladesh (8.4%) [9].

Proportion of diabetes among Hindu tribals were 9.8% and among Christians were 9.3%. Vijayakymar G and co-workers found the prevalence of diabetes to be highest among the Christians (21.9%) followed by Muslims (20.2%) and lowest among the Hindus (11.0%). [10] An overview study done by U. Singh showed religion wise prevalence of diabetes in rural Bengal to be highest in Hindus (5.4%), lowest in Muslims (4.8%) while Christians had 5.1%. [11]

The prevalence of diabetes among the tribals was highest among the individuals whose education was up to Higher secondary level (22.2%) followed by those who had studied up to primary school (18.9%). Patil R and her co-worker have found that the majority of diagnosed cases of type 2 diabetes mellitus had primary education, i. e., 12 (28.57%) followed by secondary education 11 (26.19%) and illiterate 11 (26.19%) while the percentage of type 2 diabetes mellitus was less in the subjects who were educated above higher secondary. [12] In the study done by Oliveria CM et al. prevalence of diabetes was found to be high (13.7%) among individuals with high education status and low (7.1%) in individuals with low education status which was significant at p<0.001. [13]

Regarding socioeconomic class, disease like diabetes was considered to be a disease of the affluent society until recently. Similarly, in this study prevalence of diabetes was highest in the individuals from class IV (12.8%) followed by class II (11.5%). Distribution of diabetes among lower socioeconomic classes was shown in studies by Corsi DJ and Subramanian SV [14] and, Patil R and Gothankar J [12]. The higher prevalence of diabetes in the present in lower socioeconomic class may be due to the rural setup of the study area.

Positive family history was found to be significantly associated with diabetes among tribals. Observation by Bharati DR et al. was found to be in conformity with the present study. [15] Panda PS et al. observed that 7% of the diabetic individuals had family history of diabetes [2.5 (1.2-5.0)]. [16]

Diabetes was found to be significantly associated with lower intake of green leafy vegetables and increased consumption of red meat among the tribals. Similar findings were reported in a review done by Olfert MD and co-worker [17] while another review done by Rasala AB and coworkers indicated an inverse association between consumption of fresh vegetables and fruit, whole grains, lean dairy, fish, nuts and the risk of type 2 diabetes. Food groups that seemed to increase the risk of type 2 diabetes were red and processed meat, refined grains, sugar-sweetened beverages. [18]

No association was found between intake of saturated and trans-fat with diabetes in the study population. Findings were in conformity in a review and meta analysis done by

Souza R et al which showed that diabetes was not related to intake of saturated fats or trans fats. [19] Contradictory findings were reported in the studies by Mozaffarian D, where he discussed that even-chain saturated fatty acids were associated with an increased incidence of type 2 diabetes. [20] In a study done by Liu B et al., a significant association was found between plasma total trans fatty acids (TFAs) and diabetes. [21]

Tobacco and alcohol use has been known to be associated with most of the non-communicable diseases. However, no association of diabetes was seen with tobacco use and alcohol use in our study. Finding confirming our observation was reported in the study by Negi PC et al. where it was found that consumption of tobacco had no association with diabetes. [22] Keith RJ et al. observed a significant association between dose of tobacco exposure and levels of fasting glucose levels in unadjusted or partially adjusted models, but not in fully adjusted models. [23] Association of alcohol with diabetes was seen in studies done by Cullmann M et al. [24] However, Holst C. et al. observed lowest risk of diabetes at 14 drinks/week in men and at 9 drinks/week in women, relative to no alcohol intake. [25]

Diabetes is often regarded as a lifestyle disease. Highest number of diabetics were seen among the individuals with sedentary lifestyle among the study sample. Similar findings were reported by Joseph JJ et al. and contradicted by Negi PC et al. where no association was found between diabetes and sedentary lifestyle. [26, 22]

Diabetes was found to be significantly associated in individuals whose duration of physical activity was less than 150 minutes per week. Similar findings were reported from the study done by Brugnara L et al. [27]

Further, the prevalence of diabetes was 50% among those who had BMI>30 followed by 29.2% among those who had BMI 25 to 29.99, which showed a significant association. The study findings were confirmed by Tilaki KH and co worker where it was observed that the mean of BMI was significantly higher among diabetic in both sexes. [38] Gray N et al. have observed that higher than normal BMI was consistently associated with an increased probability of being diagnosed with type 2 diabetes mellitus. [29]

5. Conclusion

The prevalence of diabetes was found to be lower in the tribal population in comparison to the overall prevalence of diabetes in Assam. It was found that lower intake of GLV, higher intake of red meat contributed to diabetes contributed significantly to development of diabetes, which can be intervened by effective behaviour change communication. Furthermore, family history of diabetes, sedentary lifestyle, decreased physical activity and higher BMI were found to be significantly associated with diabetes. Changes have been observed in the lifestyle of the population, which could have contributed to the above findings. No similar studies have been done in the past in the same region, against which comparisons could be made. Therefore, future research in this direction is anticipated along with the attention of the concerned authorities to come up with appropriate policy interventions to lower down the prevalence of diabetes and associated risk factors in the area.

6. Future Scope

This article may address the existing problems in health care in the tribal community and allow for further planning and management with a view to reduce the growing burden of diabetes in the marginalized society.

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