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Prevalence of prediabetes and diabetes among economically backward tribes, Tamilnadu, India

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ABSTRACT

India has the second largest concentration of tribal population in the world. Indian tribes constitute around 8.3% of nation's total population. To assess the prevalence of Prediabetes and diabetes mellitus among tribal population of Kancheepuram district. Cross sectional study design, Multi stage cluster sampling technique was used, house to house data collection was done for 85 irula tribal people. The Irula are a Scheduled tribe that lives in northern Tamil Nadu and the Nilgiri Hills. They are sort of like a cross between tribals and ordinary southern Indians. Structured questionnaire were used to assess demographic variables (gender, age, educational qualification, marital status, family status, occupation, monthly salary and religion). Measurements taken were height, weight, and blood sugar by finger prick method with glucometer. Above 140 to 199 mg/dl considered as prediabetes and 200mg/dl is considered as diabetes. Prevalence of prediabetes and diabetes mellitus among tribes were 49.4%, 25.9%, poor literacy, poverty and substance abuse makes the tribes more prone to prediabetes and diabetes.

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INTRODUCTION

Emerging trend of diabetes mellitus (DM) is observed worldwide, as by 2025, its prevalence is projected to be 6.3%, which is a 24.0% increase compared with 2003. There will be 333 million (a 72.0% increase) diabetics by 2030 in individuals of 20 to 79 years of age.

The developing world (mainly central Asia and Sub-Saharan Africa) accounted for 141 million people with diabetes (72.5% of the world total) in 2003 (Narayan *et al.*, 2006). Environmental factors like obesity (central or general), physical inactivity, and diet (saturated fats and transfatty acids) and socioeconomic factors are responsible for development of DM (Qiao *et al.*, 2007; Hu *et al.*, 2003).

Diet rich in polyunsaturated fats and long chain omega-3 fatty acids reduces the risk for DM (Adler *et al.*, 1994). The global prevalence of diabetes in 2014 was estimated to be 9% in adults aged 18+ years (World Health Organization, 2007). According to a study by Mohan et al., the overall prevalence of diabetes in India is found to be 12% (Mohan *et al.*, 2007).

MATERIALS AND METHODS

The Irula are a Scheduled tribe that lives in northern Tamil Nadu and the Nilgiri Hills. They are sort of like a cross between tribals and ordinary southern Indians. They have many animist beliefs but have had enough contact with Hindu s to embrace many orthodox Hindu beliefs. The Irula live in villages with special "pollution hut" for menstruating women, lots of mango and jackfruit trees, and ancestral temples with stones in them that represent the dead. Many live in two-room houses with a separate room with a sacred fire. They are known as collectors of honey and hunt with nets and spears (Tribals food society, 2020).

Now the scenario was entirely changed, we have done a study in Kancheepuram district. Here the people settled in plain areas but away from other villagers.

We have conducted the study in Kollam village, Anjur, karanai Puducherry and Nallambakkam. After getting consent from the participants, 85 subjects who fulfilled the inclusion criteria were selected by non-probability convenient sampling technique.

Cross sectional study design was adopted for this study. Structured questionnaire was used to assess the demographic variables like age, marital status, religion, educational status, occupation, monthly salary, family status and religion. Measurements taken were height, weight, and blood sugar by finger prick method with glucometer. Above 140 to 199 mg/dl considered as prediabetes and 200mg/dl is considered as diabetes.

Weight of the subjects was measured with the help of standard weighing scale and height was measured with the help of inch tape. Two blood pressure measurements was measured with the standard digital spygmomanometer interval of 10 minutes. Random blood sugar was measured with the help of a glucometer.

Major Findings of the Study

According to the Table 1, The findings depicted that among 85 subjects most of them women (70.6%). 29.4% belongs to the age group between 30-34 Years. Most of them between the age group between 35-49 yrs. Nearly 95.3% don't have formal education, 91.8% got married. Nobody is working in Government sector. Most of them in poor socioeconomic status(94.1%). Their salary is between Rs.1500-4500.

According to the Table 2, the prevalence of prediabetes is 49.4% and diabetes is 25.9%.

According to Table 3, the p values corresponding to the demographic variables are not significant since they are not less than 0.05 hence we can say that there is no significant association between the demographic variables and blood sugar level.

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DISCUSSION

The study was carried out among tribal population in Athanavoor Primary Health Centre in Yelagiri hill station of Vellore District, Tamilnadu. Individuals aged 25 to 65 years were selected for the study. Blood samples were collected to estimate Fasting Blood Sugar and Serum Cholesterol levels. Out of 104 participants, 29(27.9%) are males and 75(72.1%) are females. The proportion of participants who had diabetes mellitus is 3.8% (Nikkin and Stanly, 2016).

The study was conducted in 410 adult Katkaris (women 219) of both sexes of $\geq$18 years of age in three adjoining tehsils of the district. Information was obtained on socio demographic parameters, educational level, dietary pattern, and substance abuse. Prevalence of overweight, hypertension, and diabetes was measured using standard field-based procedures and techniques. Katkaris, who are mostly landless manual laborers, subsist on a protein-poor, imbalanced diet. About half of women and one-third of men have body mass index (BMI) <18.5 kg/m^2, an indication of undernutrition. On the other hand, about 2% of participants were obese (BMI $\geq$30 kg/m^2). The overall prevalence of hypertension and diabetes was 16.8% and 7.3%, respectively.

Subjects were recruited from five districts of Kashmir valley using multistage cluster sampling by probability proportional to size (PPS) technique. A total of 6808 subjects were recruited in this study including 2872 (42%) men and 3936 (58%) women with mean age of 39.60 $\pm$ 20.19 years and 35.17 $\pm$ 16.70 years, respectively. About 1.26% (0.5% males and 0.9% females) had DM and 11.64% had prediabetes based on HbA1c cutoffs. Increasing age, body mass index and family history portend significant risk factors while smoking and sedentary lifestyle increased the risk marginally. Although the prevalence of DM among tribals of Kashmir valley is lower than general population, the higher prediabetes to DM ratio may indicate a future trend of increasing DM prevalence in this disadvantageous subpopula-

Table 1: Demographic Variables

S. No.	Demographic Variables	Class	No. of respondents	Percentage
1	Gender	Female	60	70.6%
		Male	25	29.4%
2	Age	30-34 Years	20	23.5%
		35-49 Years	40	47.1%
		50-60 Years	15	17.6%
		60-80 Years	10	11.8%
3	Educational Qualifications	Completed elementary education	1	1.2%
		Elementary education	1	1.2%
		Finished middle school	1	1.2%
		High school graduate	1	1.2%
		There is no formal education	81	95.3%
4	Marital Status	Married	78	91.8%
		Separatist	1	1.2%
		Widow	6	7.1%
5	Occupation	100 days job	1	1.2%
		Private job	33	38.8%
		Self employment	43	50.6%
		Unemployment	8	9.4%
6	Monthly Salary	1500-4500	80	94.1%
		4500-8000	5	5.9%
7	Family Status	Joint family	28	32.9%
		Nuclear	57	67.1%
8	Religion	Hindu	84	98.8%
		Muslim	1	1.2%

Table 2: Blood sugar Level

S. No.	Glucose Level	No. of respondents	Percentage
1	Normal Glucose	21	24.7%
2	Pre-diabetes	42	49.4%
3	Diabetes Mellitus	22	25.9%

tion (Ganie *et al.*, 2020).

Prevalence of diabetes among indigenous groups varies and it is high in some groups like New Zealand Maori, Greenland Inuit while it is low in some traditional populations like Orang Asli of Malaysia (Roglic, 2016). Highest incidence of diabetes was reported among Pima Indians living in Arizona in United States of America (Wild *et al.*, 2004). Prevalence of diabetes and prediabetes among tribal population of India is low when compared to the general population. The study reported that 4.6 percent of the Raica community in Rajasthan has diabetes and it was absent among camel milk 19 consuming people from the same community in 2002 (Agrawal *et al.*, 2007). A study done in tribal population of Arunachal Pradesh in 2012 showed that the prevalence of diabetes was 8.3 percent and of impaired glucose tolerance was 21.8 percent (Yajnik, 2009). A cross sectional study done in Himachal Pradesh demonstrated that migration of traditional tribes into an urban community increases their cardiovascular risk factors. The prevalence of diabetes among urban tribals was 9.2 percent whereas among traditional tribes it was 6.7 percent (Kapoor *et al.*, 2014). High prevalence of diabetes among tribal people of northeast India where 19.8 percent of the people had diabetes with another 12 percent pre diabetes (Zaman and Borang, 2014). A study documented that around 5

Table 3: Association between the demographic variables and Blood Glucose Level

S. No.	Demographic Variables	Class	Glucose Level			Chi-Square Level	DF	P-Value
			Normal Glucose	Pre-diabetes	Diabetes Mellitus			
1	Gender	Female	11	30	19	6.005	2	0.050
		Male	10	12	3			
2	Age	30-34 Years	6	12	2	8.666	6	0.193
		35-49 Years	8	20	12			
		50-60 Years	4	4	7			
		60-80 Years	3	6	1			
3	Educational Qualifications	Completed elementary education	0	0	1	7.959	8	0.437
		Elementary education	0	1	0			
		Finished middle school	0	1	0			
		High school graduate	1	0	0			
		There is no formal education	20	40	21			
4	Marital Status	Married	20	39	19	3.253	4	0.516
		Separated	0	0	1			
		Widow	1	3	2			
5	Occupation	100 days job	0	0	1	4.939	6	0.552
		Private job	9	18	6			
		Self employment	11	20	12			
		Unemployment	1	4	3			
6	Monthly Salary	1500-4500	21	39	20	1.842	2	0.398
		4500-8000	0	3	2			
7	Family Status	Joint family	10	12	6	2.731	2	0.255
		Nuclear	11	30	16			
8	Religion	Hindu	21	41	22	1.036	2	0.596
		Muslim	0	1	0			

percent of the tribal population of Yercaud hills in Tamil Nadu had diabetes and 7.5 percent of them had pre diabetes (Radhakrishnan and Ekambaram, 2015). According to a systematic review, the prevalence of diabetes in tribal India was 5.9 percent, ranging from 0.7 percent to 10.1 percent. Prevalence of impaired fasting glucose was 5.1 percent - 13.5 percent and impaired glucose tolerance was 6.6 percent - 12.9 percent (Oommen *et al.*, 2016).

Prevalence of diabetes mellitus among the study population was 3.3% and prevalence of pre diabetes was 7.6%. This study showed low prevalence of diabetes mellitus among the tribal population as compared to that of general population. This may be due to less prevalence of insufficient physical activity reported among this population (Ford *et al.*, 1997). In 2010, Oommen et al. reported that prevalence of diabetes mellitus in rural Vellore was 9.2 % (Upadhyay *et al.*, 2013).

Generally prevalence of diabetes and pre diabetes among tribal population were less as compared to general population in India (Organisation mondiale de la santé, 2014). Recently an increasing trend of diabetes mellitus is reported among the tribal population of India but regional and ethnic variations exist (UNFPA, 2007). High prevalence of diabetes & pre diabetes were reported in north east India in two studies (8.3% & 21.8%) and (19.8% & 12%) respectively (Thomas *et al.*, 2012; Zaman and Borang, 2014). (6.9%) moderate prevalence

based on fasting blood sugar (kandpal et al. Low prevalence of diabetes was reported by Agrawal et al. (4.6%) (). Similar results have been reported by Radhakrishnan et al. in Tamil Nadu (5% had diabetes and 7.5% had pre diabetes)(20). Upadhyay RP et al. estimated the pooled prevalence of diabetes in tribal India as 5.9 % (Upadhyay *et al.*, 2013).

According to this study, the prevalence of prediabetes and diabetes mellitus among tribes were 49.4%, 25.9%, it gives alarm to the society

Prevalence of diabetes is almost equal among two sexes which is comparable to the study done (Vani Kandpal *et al.*, 2016). In this study overweight ($\geq$23 kg/m2) and hypertension were found to be significantly associated with diabetes mellitus after adjusting for other factors which is similar to other studies (Zaman and Borang, 2014; Upadhyay *et al.*, 2013).

Prevalence of diabetes mellitus and pre diabetes were 3.3% and 7.6% respectively. Overweight and hypertension were found to be significantly associated with diabetes mellitus (Ruban, 2017). Two stage cluster sampling method was used. Modified WHO STEPS instrument/Questionnaire was administered by the principal investigator. Following variable were collected.

CONCLUSION

Poor literacy rate, poverty plays a major role in developing the prediabetes and diabetes among tribals. Awareness is very poor among tribal people. Repeated awareness programmes needed to control the prediabetes and diabetes. Many people don't have formal education. Updating the health information is very difficult among them. Effective Information education communication packages should be developed to improve awareness among irular tribes and measures to be taken to improve their educational status.

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Competing Interest

There is no competing interest

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Authors Contribution

Mr Kanmani helped in data collection; Mrs Geetha prepared the manuscript and the suggestions given by Dr.C.Kanniammal.

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