ORIGINAL ARTICLE – COMMUNITY MEDICINE

Assessment of the risk of developing Diabetes mellitus using IDRS among rural adult population of Salem district, Tamilnadu.

Dr M. Vijayakarthikeyan[1], Dr S. Sangeetha[2]

[1]Assistant Professor, [2] Professor & HOD, Department of Community medicine, Vinayaka Mission's Kirupananda Variyar Medical College & Hospitals, Vinayaka Mission's Research Foundation(Deemed to be university)- Salem 636308

ABSTRACT

Background:

Global prevalence of type 2 diabetes mellitus (T2DM) is about 9%. In India the prevalence is around 8.63%. The Indian diabetes risk score [IDRS] is an simple and cost effective screening tool to detect Diabetes mellitus risk at an early stage.

Objectives:

1. To assess the level of risk of developing type 2 diabetes mellitus among the rural population using the IDRS.
2. To find out the factors associated with the risk of developing T2DM.

Materials and methods:

It is a community based cross sectional study conducted in the Veerapandi village of Salem district. Sample size is 410 and systematic random sampling method is used to select the samples. Data was collected using the pretested structured questionnaire. Data was entered in MS Excel and analysed using SPSS Version 21.

Results:

Among 410 samples, 40% were males and 60% were females. Using IDRS 42.7% are at moderate risk,29% are at high risk and about 28.3% are at low risk for developing Diabetes Mellitus. Marital status, education, occupation, smoking, alcohol usage and obesity are factors associated (P value < 0.05) with diabetes mellitus risk. Around 12.7% belonged to obese category as per their BMI and 20.5% were hypertensives.

Conclusion:

This study reveals that 71.7% are at risk for developing diabetes mellitus risk. Stringent lifestyle modifications and timely interventions need to be implemented in order to curb this problem of Diabetes mellitus.

Keywords: Risk factor, Screening, Obesity, Physical activity.

Corresponding Author

Dr. M. Vijayakarthikeyan, 358/12, Gupthanagar 1 st cross, Angammal colony, Salem-9, Email-vijay.doc09@gmail.com, Mobile no – 9566986240.

INTRODUCTION:

In the 21st century Diabetes mellitus has emerged as a major public health threat.[1] Diabetes mellitus is a metabolic disease resulting due to the abnormality in the carbohydrates, fats and protein metabolism characterized by hyperglycemia. Diabetes mellitus patients suffer from absolute or relative insulin deficiency and action.Globally diabetes mellitus is an important non communicable disease with voluminous increase in its prevalence in the last two decades.[2]As per the International Diabetes Federation (IDF) about 415 million worldwide are living with diabetes mellitus and by the year 2040 it is projected to increase to 642 million.[3,4] The factors responsible are increase in the population growth, physicalinactivity, unhealthy lifestyle and obesity.[5] Diabetes mellitus affects all age groups without any urban rural difference.[6,7]

India is the diabetic capital of the world with increasing burden day by day. It is projected that India will be home to nearly 100 diabetic patients by 2030.[8]Among the diabetic patients every 5th one is an Indian.[9] Prevalence of Diabetes mellitus at the national level is 9% and in some southern parts of the country it is as high as 20%.[10] Tragically in India nearly 50-60% of them are undiagnosed and unaware of their diabetic status.[11]

Diabetes mellitus being an iceberg disease early diagnosis and prompt treatment remains the key interventions available for control. Early identification of the patient can be strengthened by mass screening camps for the general public and the target groups for these activities will be adults above 30 years of age.[12] Prevention strategy for Diabetes mellitus involves primordial prevent and primary prevention by creating awareness among the general public and also by elimination of risk factors like physical inactivity, smoking, alcohol intake, obesity and consuming junk foods.[13]

Simple and most economical tool for screening the patients for diabetic risk is IDRS (Indian Diabetic Risk Score). IDRS was developed by Mohan et al from the CURES (Chennai Urban Rural Epidemiology Study) study done in Chennai.IDRS incorporates 4 risk factors, 2 two modifiable risk factors (Waist circumference and physical activity) and twonon-modifiable risk factors (Age and family history of Diabetes Mellitus). sensitivity and specificity of IDRS for detecting diabetic risk is 72.5% and 60.1%. Major advantages of IDRS for using IDRS are its simplicity, understandability and cost effectiveness.[14,15]

In a country like India with limited resourcesIDRS will be the ideal cost effective tool for detecting diabetes risk. With this background the study was planned to assess the level of risk of developing Type 2 Diabetes Mellitus among rural adults using the IDRS and to identify the factors associated with it.

METHODOLOGY:

STUDY DESIGN:

It is a community based descriptive cross sectional study.

STUDY AREA:

Veerapandi village which is a rural area of Salem district and the field practice area of Vinayaka Missions Kirupananda Variyar

Medical College and Hospitals.is chosen as the study area.

STUDY POPULATION:

Adult persons belonging to 20-60 years and residing permanently in the study area at the time of data collection forms the study population.

STUDY PERIOD:

The study was carried out for a period of 3 months from December 1st 2019 to February 29th 2020.

SAMPLE SIZE:

Sample size was calculated from a previous study conducted by S. Gopalakrishnan in a rural area in 2017, At risk of developing diabetes mellitus recorded in this study was 59.4%.[16] The sample size was calculated using the formula $N = Z\acute{\alpha}^2pq/ [L]^2$ where Z = 1.96, p = 59.4%, q =40.6% (100-59.4), L = 5 (Relative precision). Accounting 10% for non-response, the final sample size was rounded off to 410 (N).

SAMPLING METHOD:

Systematic random sampling technique was used to select the study participants. Sampling Interval (N/n) is calculated as follows: [N= Total number of households in Veerapandi =1548, n = sample size = 410. N/n=1548/410= 3.8]. Every 4th household is selected for identifying adult population between 20-60 years of age.

INCLUSION CRITERIA:

Adult population belonging to 20-60 years who are residing in the study area and those who gave consent to participate in the study were included.

EXCLUSION CRITERIA: Known diabetic patients and those who did not give consent to participate in the study were excluded.

STUDY TOOL:

A pre tested structured questionnaire was used as a study tool for data collection. The questionnaire consists of socio demographic details, IDRS questions, smoking history, alcohol history, food habits and physical measurement (Height, Weight and BMI).

DATA COLLECTION:

The data collection was carried out by II Year MBBS Block posting C batch students. Entire batch of students were divided into six groups each containing four members. Orientation sessions to the students regarding the purpose of the study and the questionnaire was given prior to data collection. Each group visited the houses in the village and collected the data The questionnaire was used to collect the data from the study participants by interview method after obtaining informed consent.

DATA ANALYSIS:

The data was entered in Microsoft excel and analysis was done using SPSS software version 21. Descriptive and analytical statistics were used to explain the study variables.

INFORMED CONSENT:

The study participants were explained about the purpose of the study and informed consent was obtained before data collection.

RESULTS

Sociodemographic characteristics of the study population

Among the study participants, 40% were males and the remaining 60% were females**.** With regard to marital status 83.4% were married and the remaining 16.6% are either

unmarried or widower. About 20.2% are illiterate,24.1% had studied upto middle school and 20.2% had completed only primary school.as per occupation, 51.7% and 25.6% of the study participants are involved in semiskilled and skilled works respectively. Around 32.2% belonged to lower middle Socioeconomic status and 22.9% belonged to upper lower Socioeconomic status. Nearly 69.7% are from nuclear family and 22.2% are from jointfamily.

Table 1: Sociodemographic characteristics of the study population

Sl. No	Socio-Demographic Variable	Frequency (N=410)	Percentage (%)
1.	*Sex*		
	Male	164	40
	Female	246	60
2.	*Religion*		
	Hindu	380	92.7
	Muslim	18	4.4
	Christian	12	2.9
3.	*Marital Status*		
	Unmarried	51	12.4
	Married	342	83.4
	Widower	17	4.2
4.	*Education*		
	Illiterate	83	20.2
	Primary School	83	20.2
	Middle School	99	24.1
	High School	81	19.8
	Post High School Diploma	17	4.1
	UG/PG	43	10.5
	Professional	4	1
5.	*Occupation*		
	Unemployed	33	8
	Unskilled	36	8.8
	Semiskilled	212	51.7
	Skilled	105	25.6
	Farmers/Clerks/Shop Owners	13	3.2
	Semi professional	8	2
	Professional	3	0.7
6.	*Socio Economic Status*		
	Upper	67	16.3
	Upper Middle	69	16.8
	Lower Middle	132	32.2
	Upper Lower	94	22.9
	Lower	48	11.7
7.	*Type of Family*		
	Nuclear Family	285	69.5
	Joint Family	91	22.2
	Three Generation Family	34	8.3

Table 2 IDRS score among the study population

S. no	Criteria	Diabetic risk score	Frequency (N-410)	Percentage (%)
1	*Age*			
	.< 35 Yrs	0	141	34.4
	35-50 Yrs	20	158	38.5
	.> 50 Yrs	30	111	27.1
2	*Physical activity*			
	Regular exercise with strenuous activity in home or work	0	83	20.2
	Regular exercise or strenuous activity in home or work	20	195	47.6
	Sedentary activity in home or work	30	132	32.2
3	*Waist circumference*			
	Male-< 90 cms or Female < 80 cms	0	188	45.9
	Male 90-99 cms or Female 80-89 cms	10	167	40.7
	Male- ≥ 100 cms or Female ≥ 90 cms	20	55	13.4
4	*Family history of diabetes mellitus*			
	No diabetes in parents	0	314	76.6
	Either of the parent is diabetic	10	88	21.5
	Both the parents are diabetic	20	8	2
	Minimum score-0 and Maximum score-100 If the total score < 30 – Low Risk **30 To 50 – Moderate Risk** **> 60 – High Risk**			

DRS Score among the study participants

In this study, about 38.5% belonged to 35-50 years of age and 34.4% belonged to < 35 years of age. As depicted in Table 2 only 20.2 are involved in strenuous physical activity and 32.2% are involved in sedentary activity. While measuring the waist circumference of the participants only 45.9% had values below the diabetic risk cut off. Nearly 76.6% of the respondents had no diabetes mellitus in their family and in 21.5% of them either of their parent is diabetic. Among the study participants, 42.7% are at moderate risk for developing Diabetes Mellitus (Score 30-50),29% are at high risk for developing Diabetes Mellitus (Score > 60) and about 28.3% are at low risk for developing Diabetes Mellitus (Score < 30). With respect to sex, females are having higher risk for developing Diabetes Mellitus (18.5%-high risk,26.3%-moderate risk and 15.2%-low risk) compared to males (10.5%-

high risk,16.4%-moderate risk and 13.1%-low risk.

Figure 1: Sex wise distribution of IDRS risk

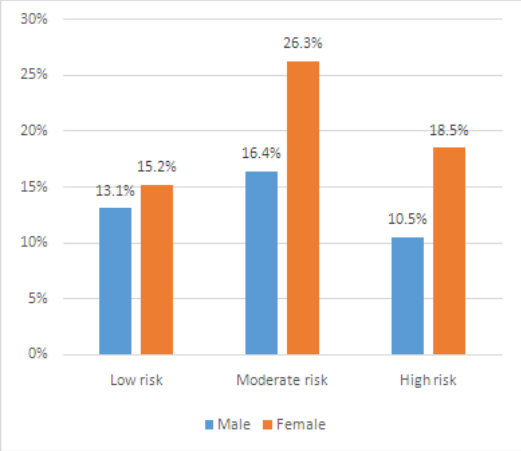
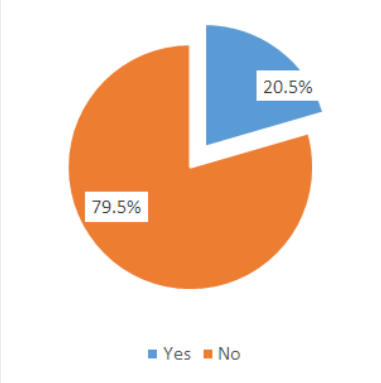


Figure 2: Hypertensives among the study population



Behavioural risk factors among the study population

In this study,10% of the study samples are smokers and 4.6% are using smokeless tobacco. About 16.3% are using alcohol. Only 4.6% are vegetarian and the remaining 95.4% are mixed diet takers. WHO BMI classification was used in this study and it revealed that nearly 12.7% belonged to obese category as per their BMI.Hypertension was assessed using JNC 8 criteria and according to it 20.5% are hypertensives (Figure 2).

Factors associated with diabetes mellitus risk

In this study, statistically significant association (P value < 0.05) was present between sociodemographic variables like marital status, Education and occupation with diabetic risk. The Risk factors significantly associated(P value < 0.05) with diabetic risk are smoking, alcohol usage and obesity

Table 4: Behavioural risk factors among the study population

S.no	Risk factor	Frequency (N-410)	Percentage (%)
1	**Smoking**		
	Yes	41	10
	No	369	90
2	**Smokeless tobacco usage**		
	Yes	19	4.6
	No	391	95.4
3	**Alcohol usage**		
	Yes	67	16.3
	No	343	83.7
4	**Food habits**		
	Vegetarian	19	4.6
	Mixed diet	391	95.4
5	**Obesity**		
	Yes	52	12.7
	No	358	87.3

Table 3: Risk of developing diabetes mellitus among the study population

S.no	Total IDRS score	Risk of developing diabetes mellitus	Frequency (N-410)	Percentage (%)
1	< 30	Low risk	116	28.3
2	30-50	Moderate risk	175	42.7
3	> 60	High risk	119	29

Table 5: Association between sociodemographic variables and IDRS score

Sl. no	Sociodemographic Variables	IDRS Score > 30		P value	Chi-square value	Odds ratio (95% CI)
		Yes	No			
1.	***Gender***					
	Males	110	54	**0.089**	2.893	**0.68 (0.44-1.06)**
	Females	184	62			
2.	***Religion***					
	Hindu	107	273	0.829	0.042	0.91 (0.40-2.06)
	Others	9	21			
3.	***Marital status***					
	Married	252	90	**0.048***	3.972	1.73 (1.00-2.98)
	Unmarried/Widower	42	26			
4.	***Education***					
	< High school	203	62	**0.002***	8.855	1.94 (1.25-3.01)
	≥ High school	91	54			
5.	***Occupation***					
	< Skilled work	206	55	**0.021***	5.336	1.74 (1.08-2.80)
	≥ Skilled work	88	41			
6.	***Socioeconomic status***					
	Upper/Middle class	180	88	**0.005***	7.872	0.50 (0.30-0.81)
	Lower class	114	28			
7.	***Type of family***					
	Nuclear	206	79	0.697		1.09 (0.68-1.74)
	Others	88	37			
*** P value < 0.05 is statistically significant at 95% CI**						

Table 6: Association between risk factors and IDRS score

Sl. no	Risk factors	IDRS Score > 30		P value	Chi-square value	Odds ratio (95% CI)
		Yes	No			
1.	***Smoking***					
	Yes	26	15	< **0.0001*j**	22.421	4.59 (2.34-9.03)
	No	101	268			
2.	***Smokeless tobacco usage***					
	Yes	15	4	0.472	0.523	1.51 (0.49-4.65)
	No	278	112			
3.	***Alcohol usage***					
	Yes	41	26	**0.038***	4.363	0.56 (0.32-0.96)
	No	253	90			
4.	***Food habits***					
	Vegetarian	15	4	0.475	0.514	1.50 (0.48-4.63)
	Mixed diet	279	112			
5.	***Obesity***					
	Yes	47	5	**0.002***	10.239	4.22 (1.63-10.90)
	No	247	111			
6.	***Hypertensives***					
	Yes	63	21	0.452	0.564	1.23 (0.71-2.13)
	No	231	95			
*** P value < 0.05 is statistically significant at 95% CI**						

DISCUSSION:

Sociodemographic characteristics of the study population

In this study female preponderance was seen (60% females) which is similar to the studies by Mongjam Meghachandra Singh (59% females and 41% males), Gore CA (52.2% females and 47.8% males) and Patil RS (65.5% females and 34.5% males).[17,18,19] Whereas in studies by Raja (73.9% males and 26.1% females) and Jayakirurthiga S (73.9% males and 26.1% females) male preponderance was seen.[4,20]

About 20.2% are illiterate,24.1% had studied upto middle school and 20.2% had completed only primary school in this study. In study by Mani G 30% were illiterates and 39% had attended 6-10 years of schooling.[21] Ramiah R did a study in which 37.73% were graduate and 13.4% had studied upto high school.[22] With respect to occupation, 51.7% and 25.6% of the study participants are involved in semiskilled and skilled works respectively.in study by Brindha P 53.5% were involved in agriculture related activities and 6.9% were unemployed.[23]

Nearly 32.2% of the respondents belonged to lower middle Socioeconomic status and 22.9% belonged to upper lower Socioeconomic status. In Nagalingam S study 38.8% belonged to upper class and 33.6% belonged to upper middle class.[24]Whereas in study by Jayakirurthiga S 46.3% belonged to lower middle and 28.4% belonged to upper lower Socioeconomic status.[20] About 69.7% are from nuclear family and 22.2% are from joint family in this study which is similar to studies by Brindha P (59.4% nuclear family and 39.6% joint family) and Nagalingam S (73% nuclear family and 27% joint family).[23,24]

IDRS score

In this study, about 38.5% belonged to 35-50 years of age and 34.4% belonged to < 35 years of age. Nearly 76.6% of the respondents had no diabetes mellitus in their family and in 21.5% of them either of their parent is diabetic in this study. Meghwal S did a study in which 43.9 % of them belonged to > 50 years and 31.2 % belonged to 35-50 years of age and also 88.5% had no family history of Diabetes mellitus.[25]In Pothukuchi Madhavi KV study, 44.9% had age > 50 years and 31.4% had age between 35-50 years and also 93.3% did not have Diabetes mellitus in their family.[26]

Based on the IDRS score, 42.7% are at moderate risk,29% are at high risk and about 28.3% are at low risk for developing Diabetes Mellitus in this study.Ashok P study observed that 5%, 55%, and 38% are in High, Moderate, and Low risk group for developing Diabetes mellitus.[27] Meanwhile

in Vallepalli C study,35.8% had an IDRS of more than 60 (high risk), 57.6% had an IDRS 30 to 50 (moderate risk) and the remaining 25 (6.6%) had an IDRS less than 30 (low risk).[28]Khandhedia SA study observed that 66.8% were in moderate risk category, 22.8% were in high risk category and 10.4%were in low risk category.[29]

Risk factors for developing Diabetes mellitus

In this study,10% of the study samples are smokers and 4.6% are using smokeless tobacco. About 16.3% are using alcohol. Only 4.6% are vegetarian and the remaining 95.4% are mixed diet takers. Around 12.7% belonged to obese category as per their BMI and 20.5% were hypertensives. In Nagalingam S study 19.7% were smokers,23% were alcoholics,25.7% were vegetarian and 74.3% were non vegetarian.[24] Gopalakrishnan S study observed that 7.6% of them are hypertensives,50% of them belonged to overweight/obese category and 12.3% of the study participants were vegetarians.[16] In Oruganti A study,36.5% were obese and 23% belonged to overweight category.[30]

Factors associated with Diabetes mellitus risk

In this study, statistically significant association (P value < 0.05) was present between variables like marital status, Education, occupation, smoking, alcohol usage and obesity with diabetes mellitus risk. In Gopalakrishnan S study, Family history of diabetes, lack of physical activity and overweight / obesity were found to be potential risk factors for developing diabetes mellitus ($p<0.0001$).[16] In Acharya AS study, statistically significant association of diabetes risk with marital status, education, body mass index and systolic blood pressure was reported.[9]Brinda p study recorded that age was the only factor associated with diabetes mellitus risk.[23] Comparing age, gender, socio-economic status with diabetes risk category, age is associated with diabetes risk category in study by Jayakirurthiga S.[20]

CONCLUSION:

In this study, 71.7% are at risk of developing Diabetes mellitus in the future. Diabetes mellitus being an iceberg disease primordial, primary prevention and secondary prevention strategies must be applied to this population. Periodic screening camps must be conducted to this target group to identify the previously undiagnosed. Lifestyle modifications like regularly physical activity, avoidingsmoking, avoiding alcohol intake and following healthy diet are interventions that will help in controlling this problem.

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