

Original Research Article

Diabetes Prevalence and Its Correlation with Non Modifiable Risk Factors in Rural Area of Western India

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Abstract: India has earned the dubious distinction of being the diabetic capital of the world and there are an estimated 62 million people with diabetes in India today. Unfortunately, over half of these people remain undiagnosed as diabetes is a “silent” disease. The need for a simple screening tool for detecting undiagnosed people with diabetes in the community is therefore obvious. The Indian Diabetes Risk Score (IDRS), a simple screening tool for prediction of undiagnosed diabetes. As it is impractical to screen an entire population, we can aim to screen ‘risk groups’ such as high socio-economic strata or those with a high BMI. This study shows a higher prevalence amongst these ‘risk groups’. The Indian Diabetes Risk Score, derived by CURES, proves to be a worthy screening program for early detection of diabetes. This score should be recommended for usage by family physicians & health care workers, so that they may advise their patients in a better manner. There should be implementation of universal screening and primary prevention programs to detect diabetes at an earlier stage before development of complications.

Keywords: Diabetes Mellitus, Age, Family History.

INTRODUCTION

India has earned the dubious distinction of being the diabetes capital of the world and there are an estimated 62 million people with diabetes in India today. Unfortunately, over half of these people remain undiagnosed as diabetes is a “silent” disease. The need for a simple screening tool for detecting undiagnosed people with diabetes in the community is therefore obvious. The Indian Diabetes Risk Score (IDRS) [1], a simple screening tool for prediction of undiagnosed diabetes developed by Dr. Mohan and colleagues at the Madras Diabetes Research Foundation (MDRF), Chennai.

MDRF – IDRS was derived from the Chennai Rural Epidemiology Population Study (CURES) and was internally validated using the data from the Chennai Urban Population Study (CUPS). The MDRF-IDRS uses a scoring system of 0 to 100 and a value of ≥ 60 had a sensitivity of 72.5% and specificity of 60.1% for recognizing undiagnosed diabetes with the Area Under the Curve (AUC) for the Receiver's Operating Characteristic (ROC) Curve of 0.698. This risk score was derived using four simple variables namely age,

family history, physical activity [2], and waist circumference. Individuals were classified as high risk (score ≥ 60), moderate risk score (30 - 50) and low risk (score < 30). A recent study from the same group showed that MDRF - IDRS not only predicted diabetes but also predicted metabolic syndrome [3], even in subjects had normal glucose tolerance

Indian Diabetes Risk Score [IDRS] has been developed based on multiple logistic regression analysis derived from CURES (Controlled Substance Utilization Review and Evaluation System).

Aims and Objectives

The present study entitled was conducted in the Department of Medicine, PDVVPF's Medical College, Ahmednagar over a period of 6 months from July 2015 to Dec 2015. With following aims and objectives:

1. To validate non-modifiable risk factors of IDRS in screening of T2DM.
2. To compare the prevalence of risk factors of diabetes in diabetic and nondiabetic subjects.
3. To detect percentage validity of family history in screening of T2DM.

Indian Diabetes Risk Score [IDRS]

Particulars	Score
Age [years]	
< 35 [reference]	0
35 - 49	20
≥ 50	30
Abdominal obesity	
Waist <80 cm [female], <90 [male] [reference]	0
Waist ≥ 80 – 89 cm [female], ≥ 90 – 99 cm [male]	10
Waist ≥90 cm [female], ≥ 100 cm [male]	20
Physical activity	
Exercise [regular] + strenuous work [reference]	0
Exercise [regular] or strenuous work	20
No exercise and sedentary work	30
Family History [4]	
No family history [reference]	0
Either parent	10
Both parents	20

MATERIAL AND METHODS

The study group included persons who were, either admitted in Department of Medicine, PDVVPF’S Medical College or those attending Medicine Outpatient Department.

Assessment of Indian Diabetic Risk score:

The information for these risk factors can be obtained based on two simple questions. The two questions are:

1. What is your age?
2. Do you have a family history of diabetes? If yes, does your father or mother or both have diabetes?

Inclusion criteria

1. Age group between 30 to 60 year.
2. Cases with IDRS ≥30.

Exclusion criteria

1. Known diabetes cases were excluded.
2. Diabetes Mellitus Type 1
3. Maturity Onset Diabetes of Young
4. Gestational Diabetes Mellitus

The patients were diagnosed as diabetic as per recommendations of WHO and National Diabetes Data Group (American Diabetes Association 2011) [5, 6].

1. Patients with classical symptoms of hyperglycemia or hyperglycemic crisis plus random blood glucose concentration ≥ 200 mg/dl (≥11.1 mmol/L).
2. Fasting plasma glucose ≥ 126 mg/dl (≥7 mmol/L), fasting is defined as no caloric intake for at least 8 hours.
3. Two hours plasma glucose > 200 mg/dl (≥ 11.1 mmol/L) during an oral glucose tolerance test. The test should be performed as described by WHO, using a glucose load containing the equivalent of 75 gm anhydrous glucose dissolved in water.

4. HbA_{1C} ≥6.5%. The test should be performed in a laboratory using a method that is National Glycohemoglobin Standardization Program (NGSP)-certified and standardized to the Diabetes Control and Complications Trial (DCCT) assay.

RESULTS

The table-1 shows study consists of 500 cases out of which 300(60%) were male and 200(40%) were females. Among the 300 male cases 14.6%, 43.3%, 42% were belonged to the age group of 31-40, 41-50, and 51-60 respectively. Among the 200 female 11%, 36%, 53% were belonged to the age group of 31-40, 41-50, and 51-60 respectively.

The table-2 shows 70% of both males and females belonged to the IDRS of ≥60. And 30% belonged to risk score of 30-50.

The table-3 shows HbA_{1C} class > 6.5 includes 18.3% of the males and 15.5% of the females.

The table-4 shows among 202 cases of age group 41-50 148 cases(73%)&among the 232 cases of age group of 51-60 176 cases(75.8%) cases belonged to the IDRS Class of ≥60. Indicating risk score increase with the age [7], which is statistically significant with P value 0.001

The table-5 shows among the 500 cases 17.2% of cases shows HbA_{1C} >6.5. Among these 58.1% of cases belongs to the age group of 51-60. And 33.7% belongs to the age group of 41-50. Indicating T2DM more prevalent among the age group of 41-60, which is statistically significant with P value of 0.01.

The table-6 shows 64% of study cases belonged to the urban area and 36% belonged to the rural areas. Among 320 urban cases 260 cases (81.25%) & among

the 180 rural cases 90 cases (50%) cases belonged to IDRS ≥ 60 %. Even though it is statistically significant it may be biased because of higher number of urban cases in the study.

The table-7 shows 20.62% (66) of urban & 11.11% (20) rural study cases respectively belonged to HbA1C > 6.5.

The table-8 shows 76% of cases were literate and 24% were illiterate. Among the 76% of literate 83% were belonged to IDRS ≥ 60 . Even though statistically significant it may be biased because of higher number of literates in the study.

The table-9 shows 7.8% of study population had both parents with the history of diabetes, among which 89% cases belonged to IDRS class ≥ 60 . And 85.8% with single parent h/o DM belonged to IDRS ≥ 60 . This is statistically significant.

The table-10 shows 46.1% cases with both parental history of DM had HbA1C > 6.5. Among the detected 86

diabetic cases 18 cases had both the parental history of diabetes [8].

Among the 500 study cases 86 cases had HbA1C ≥ 6.5 . 81.39% of cases that is 70 of the detected 86 diabetic cases belonged to IDRS ≥ 60 . Indicating good sensitivity of test.

The table-12 shows, of the total 500 study cases 88 (17.6%) cases had the FBS > 126mg/dL. Among these 88 cases 72 cases (81.8%) belonged to IDRS ≥ 60 and 44 cases had FBS between 110-126mg/dl 41 cases (93.1%) within these belonged to IDRS ≥ 60 .

The table-13 shows 90 cases had 2h PG > 200mg/dl. 73 cases (81.1%) of these 90 cases belonged to IDRS ≥ 60 . This is statistically significant.

The table-14 shows 35 cases (89%) of the 39 with both parental history of DM belonged to IDRS ≥ 60 . 176 cases (75%) of 232 cases with age group of 51-60 years belonged to IDRS ≥ 60 . 184 (74%) of the 248 cases with light physical activity had IDRS ≥ 60 .

Table 1: Distribution of Cases According To Age and Sex

S. No.	Age Groups (in yrs)	Sex			
		Male	%	Female	%
1	31-40	44	14.67	22	11.00
2	41-50	130	43.33	72	36.00
3	51-60	126	42.00	106	53.00
	Total	300	60.0	200	40.0

Table 2: Distribution of Cases According To Sex

S. No.	IDRS	Sex			
		Male	%	Female	%
1	30-50 (n=150)	90	30.00	60	30.00
2	≥ 60 (n=350)	210	70.00	140	70.0
	Total (n=500)	300	100.0	200	100.0

Table 3: Distribution of Cases According To Sex

S. No.	Sex	HBA1c					
		<5.6	%	5.7 -6.4	%	> 6.5	%
1	Male(n=300)	161	53.89	84	28.0	55	18.3
2	Female(n=200)	122	61.0	47	23.5	31	15.5
	Total	283	56.6	131	26.2	86	17.2

P value is 0.2688

Table 4: Distribution of cases according TO AGE

S. No.	IDRS	Age Groups (in years)					
		31-40 % (n=66)		41-50 % (n=202)		51-60 % (n=232)	
1	30-50 (n=150)	40	60.61	54	26.74	56	24.14
2	≥ 60 (n=350)	26	39.39	148	73.26	176	75.86

P value 0.001

Table 5: Distribution of cases according to age

S. No.	Age	HBA1c					
		<5.6	%	5.7 -6.4	%	> 6.5	%
1	31-40 (n=66)	32	11.31	27	20.61	7	8.14
2	41-50 (n=202)	120	42.40	53	40.46	29	33.72
3	51-60 (n=232)	131	46.29	51	38.93	50	58.14
	Total(n=500)	283	56.6	131	26.2	86	17.2

P value 0.0101

Table 6: Distribution of cases according to residence

S. No.	IDRS	Residence			
		Urban	%(n=320)	Rural	%(n=180)
1	30-50(n=150)	60	18.50	90	50.00
2	≥60 (n=350)	260	81.50	90	50.00

P value < 0.0001

Table 7: Distribution of Cases According To Residence

S. No.	Residence	HBA1C					
		<5.6	%	5.7 -6.4	%	> 6.5	%
1	Urban(n=320)	179	55.93	75	23.43	66	20.62
2	Rural(n=180)	104	57.77	36	20.0	20	11.11
	Total	283	56.6	131	26.2	86	17.2

Chi-square: 5.457

P value is 0.0653

Table 8: Distribution of Cases According To Educational Status

S. No.	Religion	IDRS				Total %	
		30-50	%(n=150)	≥60	%(n=350)		
1	Illiterate	86	71.66	34	28.34	120	24.00
2	Literate	64	16.84	316	83.16	380	76.00
a)	Primary School	(48)	75.00	(56)	17.72	(104)	27.37
b)	Secondary	(16)	25.00	(72)	22.78	(88)	23.16
c)	Graduate	-	-	(156)	49.37	(156)	41.05
d)	Postgraduate	-	-	(32)	10.13	(32)	8.42

P value < 0.0001

Table 9: distribution of cases according to family history of DM

S. No.	IDRS	Family History of DM					
		NO H/o DM (n=299)	%	Single parent H/o DM (n=162)	%	Both parents with H/o DM(n=39)	%
1	30-50(n=150)	123	41.13	23	14.2	04	10.26
2	≥60 (n=350)	176	58.87	139	85.80	35	89.74

P value < 0.0001

Table 10: distribution of cases according to family history of DM

S. No.	Family History of DM	HbA1C					
		<5.6% (n=283)		5.7-6.4 %(n=131)		≥6.5%(n=86)	
1	No H/o DM(n=299)	192	64.2	73	24.4	34	11.3
2	Single parent H/o DM (n=162)	82	50.61	46	28.3	34	20.98
3	Both parents with H/O DM(n=39)	09	23.07	12	30.76	18	46.1

Table 11: Distribution of cases according to HbA1c

S. No.	IDRS	HbA1C					
		<5.6 (n=283)	%	5.7 – 6.4 (n=131)	%	≥6.5 (n=86)	%
1	30-50(n=150)	115	40.6	19	14.5	16	18.6
2	≥60 (n=350)	168	59.3	112	85.4	70	81.39

P value < 0.0001

Table 12: Distribution of cases according to fasting plasma glucose

S. No.	IDRS	Fasting Plasma Glucose					
		<110mg/dl (n=368)	%	110-126 mg/dl (n=44)	%	>126mg /d (n=88)	%
1	30-50(n=150)	131	35.5	03	6.8	16	18.1
2	≥60 (n=350)	237	64.5	41	93.1	72	81.8

P value < 0.0001

Table 13: Distribution of cases according to two hours plasma glucose

S. No.	IDRS	2 Hours Plasma Glucose					
		<140mg/d l(n=327)	%	140-199 mg/dl(n=83)	%	>200mg/d l(n=90)	%
1	30-50(n=150)	115	35.1	18	21.6	17	18.8
2	≥60 (n=350)	212	64.8	65	78.3	73	81.1

P value <0.0001

Table 14: Relation of various risk factors to IDRS score

S.No	Risk factor	% of Cases with IDRS ≥60
1	Both Parents with DM	89%
2	Age≥51 years	75%

DISTRIBUTION OF NEWLY DETECTED DIABETIC PATIENTS (N=86) IN REFERENCE TO VARIOUS VARIABLES (Table 15)

Among the 86 detected diabetic 63 cases had HbA1c>8 indicating higher blood sugar levels and delay in diagnosis of diabetes. This suggests need of good screening tool for early detection of diabetes. (Table-15A)

The prevalence of neuropathy in present study was 11.6%. And was seen in cases with higher HbA1c levels. (Table-15B)

The nephropathy was found in 16.27% (14) of newly detected diabetic cases. The nephropathy was more prevalent among a case with higher HbA1c levels [9]. (Table-15C)

The retinopathy was found in 13.9 % (12) of newly detected diabetic cases. The retinopathy was more prevalent among a case with higher HbA1c levels [10, 11]. (Table-15D)

Among 86 newly detected diabetic cases 20 cases had past history of Hypertension, 5 cases had past history of CAD and one case had past history of CVA [12]. (Table-16)

Table 15A: Distribution of patients according to HbA1c

S. No.	*HbA1c Range (%)	No. of patients (n=86)	Percentage (%)
1	6.5 – 7.0	14	16.2
2	7.1 – 8.0	09	10.4
3	8.1 – 10	32	37.20
4	>10	31	36.04

Table 15B: Prevalence of neuropathy in newly detected diabetic patients

S. No.	Neuropathy	HbA1c (%)			
		6.5-7.0(n=14)	7.0-8.0(n=09)	8.0-10(n=32)	>10 (n=31)
1	Present(n=10)	-	-	04	06
2	Absent (n=76)	14	09	28	25

Table 15C: Prevalence of nephropathy in newly detected diabetic patients

S. No.	Nephropathy	HbA1c (%)			
		6.5-7.0(n=14)	7.0-8.0(n=09)	8.0-10(n=32)	>10 (n=31)
1	Present(n=14)	-	01	06	07
2	Absent (n=72)	14	08	26	24

Table 15D: Prevalence of retinopathy in newly detected diabetic patients

S. No.	Retinopathy	HbA1c (%)			
		6.5-7.0(n=14)	7.0-8.0(n=09)	8.0-10(n=32)	>10 (n=31)
1	Present(n=12)	-	-	04	08
2	Absent (n=74)	14	09	28	23

Table 16: Distribution of newly detected diabetic patients according to past history

S. No.	Past History	IDRS	
		30-50 (n=16)	≥60 (n=70)
1	Absent(n=54)	16	38
2.	Present(n=32)	-	32
a)	Hypertension	-	20
b)	CAD	-	05
c)	CVA	-	01
d)	Others	-	06

CONCLUSION

The following inferences were drawn from the study of 500 cases

1. In present study 300(60%) were male and 200(40%) were female.
2. 70% of both male and female belonged to the IDRS of ≥60. And 30% belonged to risk score of 30-50.
3. In present study, IDRS Class of ≥60 included 73% of cases of age group 41-50, 148 cases & 75.8% cases of age group of 51-60.
4. In present study of 500 cases 17.2% of cases showed HbA1C >6.5. Among these 58.1% of cases belonged to the age group of 51-60. And 33.7% belonged to the age group of 41-50. Indicating T2DM more prevalent among the age group of 41-60. Which is statistically significant with P value of 0.01.
5. 64% of study cases belonged to the urban area and 36% belonged to the rural areas.
6. In present study 76% of cases were literate and 24% were illiterate. Among the 76% of literate 83% were belonged to IDRS≥60.
7. In present study 62.4% of the cases had no history of addiction and 37.6% cases had history addiction to tobacco chewing, smoking or

alcohol. IDRS ≥60 included 75% cases without addiction and 61.7% cases with addiction. This was statistically insignificant.

8. In these study 39 cases had both parental history of DM and 162 cases had single parental history of DM. 89% of the cases with both parental h/o DM and 85.8% of the cases with single parent h/o DM belonged to IDRS ≥ 60.
9. In this study 88 cases had the FBS>126mg/dl. 90 cases had 2hPG >200mg/dl. Both included 86 cases with HbA1C >6.5.
10. Among the 86 detected diabetic 63 cases had HbA1C>8. Neuropathy was found in 11.6%, nephropathy was found in 16.27%, retinopathy was found in 13.9% of the newly detected diabetic cases.
11. Among the 500 study cases 86 cases had HbA1C ≥ 6.5. 70 of the detected 86 diabetic cases belonged to IDRS≥60. Indicating good sensitivity of test (81.39%) and moderate specificity of test (32.3%). And it proved to be cost effective screening test.

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