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Diabetes Prevalence and Its Association with IDRS among Patients' Attendees of Tertiary Care Centre of Jabalpur District of Madhya Pradesh

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Abstract:

Introduction: *Diabetes also known as a "silent disease," exhibiting no symptoms until it progresses to severe target organ damage. Because of increasing burden of the diabetes and its iceberg nature, active and opportunistic effort was attempted for early diagnosis of diabetes by means of screening with the objectives to find out the prevalence and the risk of diabetes mellitus among patients' attendees of tertiary care hospital by using Indian diabetes risk score and to estimate the usefulness of the Indian diabetes risk score for detecting undiagnosed diabetes among patients' attendees of tertiary care hospital.*

Methodology: *A cross sectional study was conducted in a tertiary care hospital during April to July 2016 among attendees of patients who were aged more than 30 years. 406 individuals were screened for Diabetes using IDRS score and Random Blood Sugar.*

Result: *Overall prevalence was found 8.6%, with maximum in males (12.68%) as compared to female (4.47 %) (Chi sqaure= 7.664, df =1, two tailed ρ value= 0.0056). Age specific prevalence was maximum in 61-70 years of age group (13.46 %) and minimum in 30-40 years of age group (4.37%). It was observed that mean blood sugar was increased significantly with low risk individuals to high risk individuals. More than half (57.63%) individuals were in high risk category followed by individuals with moderate risk (37.43%) and low risk i.e. only 4.92% individuals. Obesity, Lack of exercise, family history has been identified as significant risk factors for occurrence of Diabetes.*

An IDRS of less than 60 was optimal for identifying non-T2DM and ≥60 for identifying T2DM (AUC, 0.727; CI, 0.663–0.792; sensitivity, 79.9%; specificity, 83.8%).

Conclusion: *Family history of diabetes and obesity was found as risk factors which significantly contributed in occurrence of Diabetes. IDRS is very useful cost effective tool to detect undiagnosed diabetes in the community and also as very good risk indicator for Diabetes.*

Keywords: ***Diabetes screening, IDRS, prevalence of diabetes.***

Introduction:

Diabetes is a type of chronic and metabolic disease characterized by elevated levels of blood glucose. Type 2 diabetes are most common and usually start in adults age group, which occurs when the body becomes resistant to insulin or doesn't make enough insulin to manage glucose level in blood.(1) Worldwide 415 million of people suffer from diabetes in 2015 and an estimate cases of diabetes increase up 641 million in 2040. In 2015 one in every 11 adult suffered from diabetes and out of total world wide data three fourth diabetic belong to low and middle income country. Prevalence of diabetes increase due to population growth, aging, urbanisation and an increase of sedentary life style and obesity. Healthcare expenditures on diabetes are expected to account for 11.6% of the total healthcare expenditure in the world in 2010.(2) India rank one all over world earning the title "Diabetes capital of the world". Diabetes emerges like an epidemic in Indian population. Initially, which was known to be an epidemic in urban areas but now, increasing rapidly in rural areas too as a result of the socio economic transitions(3). Long-term inadequately controlled of diabetes is associated with a greater risk of developing complications such as cardiovascular disease (CVD), nephropathy, retinopathy, and neuropathy.(4)

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Diabetes also known as a "silent disease," exhibiting no symptoms until it progresses to severe target organ damage.[5] Because of increasing burden of the diabetes and its iceberg nature, active and opportunistic efforts are required for early diagnosis of diabetes by means of screening. Early diagnosis, control and treatment of disease prevent complications and reduce morbidity and mortality caused by diabetes.[6] Through this study we tried for early screening and detection of pre-diabetes and diabetic adults to yield positive health outcomes in society.

Objective:

1. To find out the prevalence and the risk of diabetes mellitus among patients' attendees of tertiary care hospital by using Indian diabetes risk score.
2. To estimate the usefulness of the Indian diabetes risk score for detecting undiagnosed diabetes among patients' attendees of tertiary care hospital.

Methodology:

A cross sectional study was conducted in NSCB Medical College of Jabalpur during April 2016 to July 2016 among attendees of patients who were aged more than 30 years. Study was conducted among 406 individuals. Predesigned questionnaire was used to collect data on socio demographic characteristics, information regarding risk factors like, family history of diabetes, physical activity was inquired, weight, height, waist circumference was measured and random blood sugar was tested by Electronic blood glucose measures device.

SAMPLE SIZE

$N= Z^2PQ/L^2$
N= Sample Size
P = Prevalence (19.5%)
Q= 100-P
L = Absolute error (4%)
Z = Confidence Level (for 95% confidence limits, it is 1.96)

As per study done by Menon VU et al entitled "Prevalence of known and undetected diabetes and associated risk factorsin central kerala" reported prevalence was 19.5 %.[7]

So based on above studies our calculated sample size came 377 by OpenEpi software. After adding 7% of non-respondents i.e. 27 to the above a total, 404 minimum sample size was calculated. We took 406 subjects to conduct this study.

Individuals above 30yrs, who were attendees of patients admitted in Govt. NSCB Medical College and hospital and were willing to participate in the study were included and pregnant women, non-cooperative individuals were excluded from the study.

Assessment of diabetes risk – The risks for Diabetes we used IDRS score guideline. Which is as follows:

Age [years]		**Scores**
< 35		0
35 - 49		20
≥ 50		30
Abdominal obesity Waist		
Female	**Male**	**Scores**
• Waist <32inch	<35 inch	0
• Waist ≥ 32 – 35inch	35 –38 inch	10
• Waist ≥35 inch	≥39 inch	20
Physical activity		**Scores**
• Exercise [regular] + strenuous work		0
• Exercise [regular] or strenuous work		20
• No exercise and sedentary work		30
Family history		**Scores**
• No family history		0
• Either parent		10
• Both parents		20

On the bases of IDRS score respondent was categorised in to < 30 with low risk, 30-50 as moderate risk and ≥ 60 as high risk individuals.

Random blood sugar- Random blood sugar was taken into consideration when sugar level ≥ 200 mg/dl as diabetic individuals.

Waist circumference was measured to the nearest 1cm at the midpoint between the tip of iliac crest and last costal margin

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in the back and at umbilicus in the front using a non-stretchable tape at the end of normal expiration with the subject standing erect in a relaxed position.

Statistical Methods: Prevalence of Diabetes Mellitus and risk factors are presented as percentages. Relationship between diabetes and risk factors was assessed by Chi-square test. Significant differences between means of unrelated groups, ANOVA was used.

Result:

There were 406 individual who were screened for diabetes by random blood sugar. Glucose level ≥200 mg/dl was used to diagnose diabetes. Overall prevalence was found 8.6%, with maximum in males(12.68%) as compared to female (4.47 %) which was found Statistically highly significant(Chi sqaure= 7.664, df=1, two tailed ρ value= 0.0056) (Table No.1)

Table No. 1: Distribution of individuals according to their sex and RBS status

Sex	RBS <200 mg/dl	Percent	RBS≥200 mg/dl	Percent	Total	Percent
Male	179	87.32	26	12.68	205	50.49
Female	192	95.52	9	4.48	201	49.50
	371	91.37	35	8.62	406	100

(X2=7.664, df =1, two tailed ρ value= 0.0056)

There were 205(50.49%) males and 201(49.5%) females who were included in the study. Maximum individuals belonged to 30-40 years of age group i.e. 33.74% & followed by 41-50 and 51- 60 years age groups (24.13% & 24.63% respectively). Age group of 61- 70 years individuals were 12.8% and > 70 years were 4.67%. Age specific prevalence was maximum in 61-70 years of age group (13.46 %) followed by 51-60 years of age group(12%), >70 years (10.52%), 41-50 years (8.16%) and 30-40 years of age group (4.37%). This difference was not significant statistically (X2= 6.2383, ρ value=.1820)

As per IDRS score maximum individuals were in high risk group i.e. 234(57.63%) followed by individuals with moderate risk i.e. 152(37.43%) and low risk individuals were 20(4.92%). (Table No. 2)

Table No. 2: Distribution of individuals according to their IDRS

IDRS	Frequency	Percentage
<30 (Low Risk)	20	4.92%
30 – 50(Moderate Risk)	152	37.43%
≥60 (high Risk)	234	57.63%
Total	406	100%

It has been observed that mean blood sugar was increased significantly with low risk individuals to high risk individuals. It has been also alarming that more than half (57.63%) individuals were in high risk category followed by individuals with moderate risk (37.43%) and low risk i.e. only 4.92% individuals. (Table 3)

Table No. 3: Distribution of individuals according to their IDRS and Mean Blood Sugar

IDRS Score	Number Individuals (N=406)	Mean Blood sugar
<30 (Low Risk)	20(4.92%)	100.3
30 – 50(Moderate Risk)	152(37.43%)	106.36
≥60 (high Risk)	234(57.63%)	145.25

(One way ANOVA test, df = 2, ρ value= 0.000)

Maximum individuals with random sugar >200 mg/dl were Pre obese (25- <30 score for obesity) i.e. 15.88%, followed by 12.5% Obese (≥ 30 score) and 5.24% Normal individuals (<25score). This difference was found to be statistically significant (X2= 11.65, df = 2, ρ value= 0.029)

Maximum diabetic individuals i.e. 25% had history of diabetes in their both parents, followed by history with either parents i.e. 17.30% and 7.14% had no family history. This differences was statistically highly significant. (X2= 7.314, df= 2, ρ value= 0.025)

In this study we also found that maximum individuals with waist score 20 (≥90cm for females and ≥100 cm for male) were 13%, followed by individuals with waist score 10 (≥80-89 cm for female and ≥90-99cm for male) were 11.81% and 3.91% with waist score 0 (<80 for females and<90 cm for males) and this difference was statistically highly significant(X2=9.1165, df=2, ρ value = 0.010).

We also found that maximum 11.28% of individuals with diabetes were not doing any exercise, and had sedentary life style, 6.77% individuals with diabetes told that either

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regular exercise or exhausting work and none were found with diabetes who were doing both regular exercise and tiring works, though this difference was not significant(X2= 4.3798, df=2, ρ value= .1119)

A ROC curve was obtained to determine the optimal cut point for identifying non-T2DM and T2DM cases. An IDRS of less than 60 was optimal for identifying non-T2DM and ≥60 for identifying T2DM (AUC, 0.727; CI, 0.663–0.792; sensitivity, 79.9%; specificity, 83.8%).

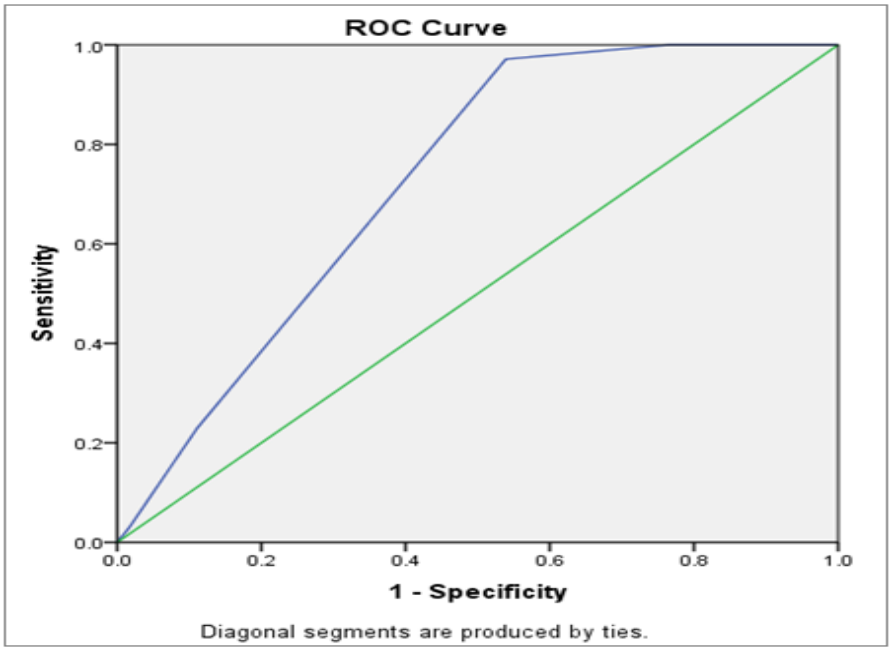

Table No. 4: Evaluation of different cut‑offs of Indian diabetic risk score for diagnosis of type 2 diabetes mellitus (N=406)

IDRS	Sensitivity	Specificity	PPV	NPV	Youden index	LR for positive test	LR for negative test
≥10	100%	0.00%	8.62%	100%	-0.82	1.00	0.00
≥20	100%	0.81 %	8.68%	100%	-0.36	1.01	0.00
≥30	100%	5.39 %	9.07%	100%	-0.36	1.06	0.00
≥40	100%	11.32 %	9.62%	100%	-0.79	1.13	0.00
≥50	100%	23.45 %	10.97%	100%	-0.67	1.31	0.00
≥60	97.14%	46.09 %	14.53%	99.42 %	0.43	1.80	0.06
≥70	51.43%	72.51%	15.00%	94.06%	0.24	1.87	0.67
≥80	22.86%	88.95%	16.33%	92.44%	0.12	2.07	0.87
≥90	2.86%	98.38%	14.29%	91.48%	0.27	1.77	0.99

In the Receiver operating characteristic analysis, IDRS had an area under the curve of 0.727 (P < 0.001). The best cut‑off was IDRS 60 with a sensitivity, specificity, and Youden index of 97.14%, 46.09%, and 0.43, respectively. The findings of our study indicate that IDRS has excellent predictive value for detecting undiagnosed diabetes in the community and IDRS is also a much stronger risk indicator than examining individual risk factors like age, family history, obesity, or physical activity.

Discussion

It has been predicted that Diabetes is going to be a very important public health importance with its long term impact on health of an individual. As it is a leading cause of coronary heart disease, Nephropathy, Neuropathy in long term it is essential to screen and treat them before the onset of any complications.[8]

In present study prevalence of diabetes mellitus was found 8.6%, which is significantly higher in males(12.68%) than females (4.47 %). The study done by Reshma S Patil and Jayashree S Gothankari, reported 4.6% in both the sex.[9] Ramchandran et al, Shrestha U K et al found higher prevalence in males than females[10,11] while Arora V et al, Acemoglu H et al, Ananad K et al Bener A et al found higher prevalence in females than males.[8,12,13,14]

In our study we found that age specific prevalence was maximum in 61-70 years of age group (13.46 %) followed by 51-60 years of age group(12%), >70 years (10.52%), 41-50 years (8.16%) and 30-40 years of age group (4.37%).

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This indicates higher prevalence in elderly population compare to younger population. This difference was not significant statistically (chi square = 6.2383, ρ value=.1820). Singnificant association between increasing age and diabetes was reported by Rao C R et al, Shah S K et al, Arora V, Ramchandran A et al, Ravikumar P et al.[15,16,8,10,17] Acemoglu H et al, Anand K et al, Shrestha U K et al also found increase in prevalence of diabetes with increase in age.[12,13,11] Centre for disease Control and prevention 2011 reported that Prevalence of diabetes was 3.7% in the age group of 20-44 years, while 13.7 % in the age group 45-64 years and the highest percentage i.e. 26.9% was found in the age group of ≥ 65 years. Increasing trend of diabetes with age was also reported by Shelton, 2006 and Suastika et al 2011.[18, 19]

Chang and Halter, 2003 and Maedler et al gave reason that aging induces decrease insulin sensitivity and alteration of beta cell functional in the face of increasing insulin resistance.[20,21]

In present study we found that mean blood sugar was increased significantly with low risk individuals to high risk individuals. We got an alarming result of 57.63% individuals with high risk category followed by 37.43% individuals with moderate risk and low risk i.e. only 4.92% individuals. Study done by Anand Vardhan, Adhikari Prabha M.R. et all on "Value of Indian Diabetes Risk Score among Medical Students and Its Correlation with Fasting Plasma Glucose, Blood Pressure and Lipid Profile" also found significant correlation with IDRS with fasting plasma glucose (P=0.001, r = 0.472), where mean FPG was 84 ± 3.63mg/dl in the low risk groups, 88 ± 4.93mg/dl in the moderate risk groups and 94 ± 6.50mg/dl in the high risk groups.[22]

This increased risk was mainly due to lack of physical activity observed in present study.

Central obesity is one of the important risk factor for diabetes mellitus and in our study also we found maximum individuals with random sugar >200 mg/dl were Pre obese individuals (25- <30 score for obesity) i.e. 15.88% and obese (≥ 30 score) i.e. 12.5%. Other studies also showed association between diabetes and abdominal obesity (Rao C R etal, Bener A et al,Singh R B et al).[15,14,23] Ramchandran A et al, Ravikumar P et al also reported significant association of central obesity with diabetes.[10,17]

In current study maximum diabetic individuals i.e. 25% had history of diabetes in their both parents, followed by history with either parents i.e. 17.30% and 7.14% had no family history, which was statistically highly significant. This shows that Family history of diabetes mellitus is one of the major contributing factor responsible for causing diabetes in next generation. So, we can use this as an starting point for preventive intervention for diabetes in next generation.

Similar findings were reported by Bener A et al in his study.[14] Rao

CR et al, Shah S K et al, Ramchandran et al, Ravikumar P et al, Lee E T et al have also reported a significant association of diabetes with family history in their study.[15, 16,10,17, 24]

We also found that maximum 11.28% of individuals with diabetes were not doing any exercise, and had sedentary life style, 6.77% individuals with diabetes told that either regular exercise or exhausting work and none were found with diabetes who were doing both regular exercise and tiring works. It reflects that one can protect himself /herself to become obese and thus diabetes by performing regular exercise. Reshma S Patil, Jayashree S Gothankar et al found that diabetes mellitus was more prevalent in sedentary workers or those who perform mild activity.[9] Rao C R et al found maximum persons engaged in moderate activity.[15] while Singh R B et al showed significant association between sedentary activity and diabetes.[23] Shah S K et al reported decreasing physical activity was associated with diabetes.[16] Satman I et al found that diabetes was inversely associated with physical activity in his study.[25] Globally physical inactivity accounts for 14% of diabetes mellitus and it also acts as a major risk factor for obesity which again has significant relation with diabetes mellitus.[26]

Limitation of the study: We conducted this study in one tertiary care centre of Jabalpur city of Madhya Pradesh, further study is required to validate our result by conducting the study in other clinical settings.

Conclusion

The overall prevalence of Diabetes Mellitus found in our study was

8.6%. Family history of diabetes and obesity was found as risk factors which significantly contributed in occurrence of Diabetes. We would recommend IDRS as very useful cost effective tool to detect undiagnosed diabetes in the community and also as very good risk indicator for Diabetes. It can be also used for early preventive intervention planning for those groups.

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