ORIGINAL ARTICLE

A STUDY ON DISTRIBUTION AND DETERMINANTS OF INDIAN DIABETIC RISK SCORE (IDRS) AMONG RURAL POPULATION OF WEST BENGAL

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ABSTRACT

Background: The burden of diabetes is expected to increase by 58%, from 51 million people in 2010 to 87 million in 2030. In rural India the prevalence rate has increased from 1% to 4-10% over last 20 years. IDRS is a cost-effective & simple method for identifying undiagnosed diabetic subject at community level.

Objectives: To find out the distribution of IDRS among the study population and to determine the association of IDRS with socio-demographic & anthropometric factors.

Methods: This community based cross-sectional study was carried out in the rural practice area of (Daspara, Amdanga Block) Dept. of Community Medicine, R.G.Kar Medical College among 250 undiagnosed diabetic people aged ≥ 20 years in August'11 by using a predesigned & pretested schedule containing age, Physical activity, H/o Diabetes in family sex& waist circumference (IDRS component) and religion, SE status, , blood pressure and various anthropometric measurements.

Results: Out of 250, 235 (94%) responded. 133(56.6%) were females & 102 (43.4%) were males. 108 (46%) had moderate risk (IDRS 30-50); 74(31.5%) had high risk (IDRS≥60) and 53(22.6%) had low risk (IDRS<30). In Multinomial Logistic Regression if low IDRS is compared with moderate IDRS female sex (OR-.183), BMI, hypertension (OR-.194) were found to be statistically significant and if low IDRS is compared with high IDRS female sex (OR-.202) , hypertension (OR-.13) & BMI were found to be statistically significant. By doing multinomial logistic regression hip circumference was also found to be statistical significantly associated with IDRS in both male and female.

Conclusion: As the study finds that percentage of low IDRS is low among the three categories of IDRS, it is essential to implement the simple IDRS tool in the community for mass screening so that proper intervention can be carried out to reduce the burden of diabetes.

Key words: Indian Diabetic Risk Score, Rural area, BMI, Multinomial logistic regression.

INTRODUCTION

Diabetes mellitus (DM) is one of the most common non-communicable diseases (NCDs) globally. It is one of the most important leading causes of death in most high-income countries. There is substantial evidence that it is epidemic in many economically developing and newly industrialised countries. The number of studies describing the possible causes and distribution of diabetes over the last 20 years has been extraordinary. These studies continue to confirm that it is the low- and middle-income countries (LMICs) that face the greatest burden of diabetes.[1]According to WHO the total number of people with diabetes is projected to rise to 366 million in 2030[2] but International Diabetes Federation (IDF) estimated that the situation is much worsened as the burden would increase from 366 million (2011) to 552 million (2030).[1] The projection data may vary from different organisation but the problem remains the same as the burden of diabetes is increasing day by day.

India is facing the dual burden of communicable and non-communicable disease (NCD). Among the NCDs the burden of diabetes in India is increasing day by day.[3]According to IDF it is estimated that total number of people with diabetes is projected to rise from 61.3 million (2011) to 101.2 million (2030) and it is second highest in world after China.[1]

In India, though a number of studies have been carried out among the urban population[4-6] a very few studies have been carried out among the rural population. India is predominantly an agricultural nation with 72.2% of

the population residing in rural areas.[7] In rural population, literacy rate is not high enough (58.7%)[8] and to add to this, the shortage of trained personnel for making people aware about diabetes and its complications is yet a big problem. The rural Indian population is undergoing lifestyle transition due to socio-economic growth. Many villages in India have undergone a drastic change in living standards and lifestyles. Real monthly per capita consumer expenditure (MPCE) is estimated to have grown by about 21% from 1993–94 to 2007–08 in rural India.[9] The change in disease profiles brought about by this sudden affluence, and its varied impact on different social classes, largely remain unstudied.

The Government of India has already initiated a national programme named 'National programme for prevention and control of cancer, diabetes, cardiovascular diseases & stroke' (NPCDCS). The strategies proposed will be implemented in 20,000 Sub Centres and 700 Community Health Centre in 100 Districts across 21 States during 2010-12. During this national programme for diabetes opportunistic screening would be done on a designated day through blood glucose measurement by glucose strip method by ANM and/or health worker (M).[10]

Unfortunately more than 50% of the diabetic subjects in India remain unaware of their diabetes status, which adds to the disease burden similar to the world scenario as **183 million** people (50%) with diabetes are **undiagnosed.**[1] Several prospective studies have shown that measures of lifestyle modification help in preventing the onset of diabetes.[11] Early identification of the high risk

individuals would help in taking appropriate intervention in the form of dietary changes and increasing physical activity, thus helping to prevent,

or at least delay, the onset of diabetes. This means that identification of at risk individuals is extremely important if we are to prevent diabetes in India.

Recently, risk scores based on simple anthropometric and demographic variables have been devised to detect high risk individuals named Indian Diabetes Risk Score (IDRS).[12] This IDRS is a simple tool which can be used by the community health worker to screen the high risk population. With this background the present study designed to find out the distribution of IDRS among the study population and to determine the association of IDRS with socio-demographic & anthropometric factors.

MATERIALS AND METHODS

It was Community based observational study with cross sectional study design. The study was in the rural practice area of (Daspara, Amdanga Block) Dept. of Community Medicine, R.G.Kar Medical College during 1st August 2011 to 31st August 2011. All the people aged ≥ 20 years of age and un-diagnosed diabetic in the Daspara hamlet were included in the study. A total 250 people were satisfying the inclusion criteria. Among them 235 people were present during the study period. 15 people couldn't be traced after 3 consecutive visits to their family.

A predesigned & pretested schedule containing age, Physical activity, H/o Diabetes in family sex & waist circumference (IDRS component) and religion, SE status, , blood pressure and various anthropometric measurements viz. weight, height, hip circumference was used to collect data.

Waist circumference was measured with a non stretchable tape to the nearest .1cm at the midpoint between the lowest rib and the iliac crest.[13] Socio-economic status was assessed by modified BG Prasad Scale based on AICPI august 2011.[14] Grade of physical activity was assessed by asking the following questions:

1. How physical demanding is your work (occupation)?
2. Do you exercise regularly in your leisure time?
3. How would you grade your physical activity at home?

The IDRS analysis was done with the help of the four parameters. If age <35years score=0, if 35-49 years score=20 & if >50 years score=30; If Waist circumference <80 cm [female] , <90 [male] =0, Waist ≥ 80 – 89 cm [female], ≥ 90 – 99 cm [male] 10, Waist ≥90 cm [female], ≥ 100 cm [male] =20; if Physical activity Exercise [regular] + strenuous work =0, Exercise [regular] or strenuous work= 20, No exercise and sedentary work= 30; if Family history of diabetes No family history =0,Either parent =10 & Both parents= 20. If the total score is <30 then risk is low, score is 30-50 then risk is moderate and score is >60 risk is high.

Weight was measured to the nearest 0.1 Kg and weighing machine was used for weight measurement. Height was measured against a non stretchable tape fixed to a vertical wall, with the participant standing on a firm/level surface and it was measured to the nearest 0.5cm. Hip circumference was measured with a non-stretchable tape to the nearest .1 cm at the widest part of the hips; usually this corresponds to the groin level for women and about 2-3 inches below the navel in men.[13]

Blood pressure was measured by using the standardized sphygmomanometer. All the participants were requested to take rest for ten minutes. Blood pressure was measured in the sitting posture with two separate readings were taken at an interval of minimum five minutes. The average of the two readings was taken and JNC VII classification was followed.[15]

Verbal consent was taken from each individual before commencement of the study. Statistical analyses were performed with SPSS PC Windows version 16.0 .We had divided the study population in to three groups. We had done ordinal and multinomial logistic regression to assess the predictors.

RESULT

Among the respondents 102(43.4%) were male and 133 (56.6%) were female. We had stratified the age group of the respondents according to IDRS and 111(47.2%) were in the age group of 20-34 years, 67(28.5%) were in the age group of 35-49 years and 57(24.3%) were ≥ 50 years. In our study respondents 120(51.1%) were Hindu and 115(48.9%) were Muslim (Table No.1).

Table 1: Distribution of respondents according to socio-demographic profile (n=235)

Category	Number (%)
Age group (years)	
20-34	111 (47.2)
35-49	67 (28.5)
≥ 50	57 (24.3)
Sex	
Male	102 (43.4)
Female	133 (56.6)
Religion	
Hindu	120 (51.1)
Muslim	115 (48.8)
Socio-economic Status	
Upper	-
Upper Middle	36 (15.3)
Lower Middle	66 (28.1)
Upper Lower	53 (22.6)
Lower	80 (34)

According to IDRS 74(31.5%) respondents had score >60(high risk) and 108(46%) respondents had score between 30-50 (moderate risk). While 53(22.5%) respondent had score < 30 (low risk) (Table No.2)

Table 2: Distribution of IDRS among respondents

Score Category	Number (%)
>60(high risk)	74 (31.5)
30-50(Moderate risk)	108 (46.0)
<30(low risk)	53 (22.5)

As the outcome of IDRS is three viz. low risk, moderate risk and high risk; to see association of IDRS score with various socio-demographic and anthropometric measurement should be seen with ordinal regression. But regarding this aspect the assumption of testing parallel line had been violated. So we had to do multinomial regression.

If we compare low risk of IDRS with moderate risk of IDRS; then female sex, BMI and presence of hypertension were found to be statistically significant. Religion had not found to be statistically significant factor for development of moderate IDRS in comparison to low risk IDRS. If multinomial logit estimate comparing females to males for low IDRS with moderate IDRS given the other variables in the model are held constant females relative to males is 1.698 unit lower of having moderate IDRS. In other words, females are less likely than males to have moderate IDRS. If we consider the Odds Ratio (OR=.183) female had .183 odds chance of having in the moderate group of IDRS comparing to male and it is statistically significant(p=.000). On the contrary in multinomial logit model muslims had .374 units more chance to be in the moderate IDRS group in comparison to low IDRS but it is not statistically significant. The study population without hypertension had .194 odd chance of having being in the group of moderate IDRS group comparison to low IDRS group i.e. the people with hypertension would have more chance of being in the moderate IDRS group. When we are comparing BMI with low and moderate IDRS group and taking the people with BMI> 27.5 as reference we have found that as the BMI of the people are decreasing the chance of being in the moderate IDRS group is also decreasing in compare to low IDRS group.(Table No.3)

Table 3: Determinants of IDRS (Multinomial Regression) (Comparison b/w low IDRS with Moderate IDRS)

Factors	β- coeff.	OR	95% CI	P value
Sex				
Male(Ref)				
Female	-1.698	.183	.086-.391	.000*
Religion				
Muslim (Ref)				
Hindu	.374	1.646	.741-3.426	.183
BMI				
BMI-4 (>27.5) (Ref)				
BMI-1 (<18.5)	-18.624	.081	.02-.326	.000*
BMI-2 (18.5-22.9)	-17.814	.183	.054-.622	.000*
BMI-3 (23-27.5)	-17.695	.206	.077-.552	.000*
HTN				
Yes(Ref)				
No	-1.641	.194	.052-.718	.014*

*Statistically Significant

If we compare low risk of IDRS with severe risk of IDRS; then female sex, BMI and presence of hypertension were found to be statistically significant. Religion had not found to be statistically significant factor for development of severe IDRS in comparison to low risk IDRS. If multinomial logit estimate comparing females to males for low IDRS with severe IDRS given the other variables in the model are held constant females relative to males is 1.599 unit lower of having severe IDRS. In other words, females are less likely than males to have severe IDRS. If we consider the Odds Ratio (OR=.202) female had .202 odds chance of having in the severe group of IDRS comparing to male and it is statistically significant(p=.000). On the contrary in multinomial logit model Hindu had .260 units less chance to be in

the severe IDRS group in comparison to low IDRS but it is not statistically significant. The study population without hypertension had .130 odd chance of having being in the group of severe IDRS group comparison to low IDRS group i.e. the people with hypertension would have more chance of being in the severe IDRS group. When we are comparing BMI with low and severe IDRS group and taking the people with BMI> 27.5 as reference we have found that as the BMI of the people are decreasing the chance of being in the severe IDRS group is also decreasing in compare to low IDRS group.(Table No.4)

Table 4: Determinants of IDRS (Multinomial Regression) **(Comparison b/w low IDRS with Severe IDRS)**

Factors	**β- coeff.**	**OR**	**95% CI**	**P** value
Sex				
Male(Ref)				
Female	-1.599	.202	.088-.464	.000*
Religion				
Muslim (Ref)				
Hindu	-.260	.771	.347-1.710	.522
BMI				
BMI-4 (>27.5) (Ref)				
BMI-1 (<18.5)	-19.087	.051	.015-.173	.000*
BMI-2 (18.5-22.9)	-18.487	.093	.036-.243	.000*
BMI-3 (23-27.5)	-17.871	.173	.017-.773	.000*
HTN				
Yes(Ref)				
No	-2.044	.130	.034-.490	.003*

*Statistically Significant

In the IDRS analysis waist circumference is taken into account as because it measures the central obesity more appropriately.[16] We have tried to measure the association of IDRS with hip circumference. In multinomial logit estimate male and female in both groups increase in hip circumference is associated of being in the higher group of IDRS in comparison to lower IDRS group (Table No. 5 & Table No.6)

Table 5: Hip circumference (HC) with IDRS(Multinomial Regression) (Comparison b/w low IDRS with Moderate IDRS)

Factor (HC)	β- coeffi.	OR	95% CI	p value
Male	.069	1.071	1.012-1.134	.018*
Female	.086	1.09	1.017-1.169	.015*

*Statistically significant

Table 6: Hip circumference (HC) with IDRS (Multinomial Regression) (Comparison b/w low IDRS with Sever IDRS)

Factor (HC)	β- coeffi.	OR	95% CI	p value
Male	.138	1.148	1.073-1.228	.000*
Female	.130	1.139	1.057-1.228	.001*

*Statistically significant

DISCUSSION

In this study, we used simplified Indian Diabetes Risk Score for identifying high risk subjects in rural West Bengal. This is of great significance as use of such scoring system can prove to be a cost-effective tool for screening of diabetes. Further use of such a risk score would be of great help in developing countries like India where there is a marked explosion of diabetes and over half of them remain undiagnosed. 31.5% of study population had high risk score (>60) for diabetes. A similar type of study conducted by Mohan et al.[3] found 43% of study population in the high risk group and another study by Gupta et al.[17] found 19% of study population in the rural Tamilnadu to be in the high risk group.

Various studies in the west used different diabetes risk scores, based on simple anthropometric, demographic and behavioural factors to detect undiagnosed diabetes.[18,19] We also used diabetes risk score suitable for detecting undiagnosed diabetes in South Asia. The risk score used in this study are those recommended by American Diabetes Association.[20] In our study we also found that people with lower body mass index (BMI) had lower chance of being in the higher group in the IDRS. According to the study conducted by Gupta et al.[18] similar findings were seen in rural Tamilnadu. Hypertension is an important non-communicable disease and in our study we found that people without hypertension had lower chance of being in the higher IDRS group. We also had taken into account hip circumference as the predictor of IDRS category and it was found to be a significant predictor for assessing the IDRS.

CONCLUSION

This study estimates the usefulness of simplified Indian Diabetes Risk Score for identifying high risk diabetic subjects in the community. This simplified diabetes risk score has categorised the risk factors based on their severity. Use of IDRS can make mass screening for diabetes in India more cost effective.

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