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Original Research Article

Assessing the risk of developing type 2 diabetes mellitus among medical students in Chennai using Indian diabetes risk score

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ABSTRACT

Background: Prevalence of type 2 diabetes mellitus [T2DM] is becoming alarmingly high among younger age groups impacting on their physical, mental, social and academic wellbeing and therefore warrants early detection and prevention. The Indian diabetes risk score [IDRS] is an efficient screening tool to detect the high risk individuals at an early stage. Objective of this study is to assess the level of risk of developing T2DM among medical students using the IDRS.
Methods: This cross sectional study was done using the MDRF-IDR Score to identify the 'at risk' medical students. Simple random sampling was used and data collected from among the 251 willing students. Their risk score was calculated using a structured questionnaire. Data was analysed using SPSS Ver.15 software.
Results: This study shows that about 57.4% are moderately at risk and 2% are at high risk for developing diabetes mellitus. About 86.1% medical students belonged to nuclear family, 42.6% had family history of diabetes mellitus, 76.5% carried out moderate physical activity and 50.2% were overweight / obese. Family history of diabetes, lack of physical activity and overweight / obesity were found to be potential risk factors for developing diabetes mellitus ($p<0.0001$).
Conclusions: This study reveals that in the existing urban lifestyle, adolescents and youths are highly vulnerable to diabetes mellitus. Primordial and primary prevention are the most effective preventive measure and therefore, appropriate and stringent lifestyle modifications need to be implemented in order to minimize the risk of developing the disease later in life.

Keywords: IDRS, T2DM, Obesity, Physical activity, Family history

INTRODUCTION

Diabetes is a chronic disease that occurs when the body cannot produce enough insulin or cannot use insulin effectively.[1] Common feature of diabetes is an elevated blood glucose level (hyperglycaemia). Chronic hyperglycaemia is associated with the long term consequences of diabetes that include damage and dysfunction of the cardiovascular system, eyes, kidneys and nerves.[2]

Diabetes mellitus is classified into four type:

1. *Type 1 diabetes*: The Type 1 diabetes is caused by an autoimmune reaction, where the body's defence system attacks the insulin-producing beta cells in the pancreas. As a result, the body can no longer produce the insulin it needs.
2. *Type 2 diabetes*: The body is able to produce insulin but either this is not sufficient or the body is unable to respond to its effects (insulin resistance), leading to a build-up of glucose levels. It is the most

common type, it usually occurs in adults, but is increasingly seen in children and adolescents.

3. *Gestational diabetes*: Women who develop a resistance to insulin and subsequent high blood glucose level during pregnancy are said to have gestational diabetes. The condition arises because of the action of insulin is blocked, probably by hormones produced by the placenta. They are also at increased risk of type 2 diabetes in the future.
4. *Impaired glucose tolerance [IGT] and impaired fasting glucose [IFT]*: People whose blood glucose levels are high but not as high as those in people with diabetes. IGT is defined as high blood glucose levels after eating. IFG is defined as high blood glucose levels after a period of fasting.

People with IGT or IFG and Gestational Diabetics are at high risk of progressing to type 2 diabetes, although this is not inevitable.[1,3]

The diabetes mellitus burden

Diabetes Mellitus is becoming one of the major non-communicable diseases of the World and India has earned the dubious distinction of being the "diabetic capital" of the world. We have 40 million Indians with diabetes and this forms the largest diabetic pool in the world.[2] The prevalence of type 2 diabetes mellitus [T2DM] is increasing in all populations worldwide and is becoming a major risk factor for death and nonfatal complications that will form a large burden to the patients, their families, and the health care system.[4]

Presently the global prevalence of diabetes mellitus is about 9%.[3,5] The prevalence of DM in India is found to be around 8.63%.[1] However, the prevalence of DM in Tamil Nadu is found to be slightly higher at 10.4%.[6] The prevalence of T2DM is rapidly rising all over the globe at an alarming rate. In India alone, the prevalence of diabetes is expected to increase from 31.7 million in 2000 to 79.4 million in 2030.[7]

The number of people with diabetes is increasing due to population growth, aging, urbanization, and increasing prevalence of obesity and physical activity. Over the past 30 years, the status of diabetes has changed from being considered as a mild disorder of the elderly to one of the major causes of morbidity and mortality affecting the youth and middle aged people.[4]

The new estimates show an increasing trend towards younger and younger people developing

Diabetes, a trend that is very worrisome for future generations.[1] Now that Type 2 Diabetes Mellitus is becoming alarmingly high among younger age groups impacting on their physical, mental, social and academic wellbeing warrants early detection and prevention.

The Indian diabetes risk score

The Indian diabetes risk score [IDRS] is an efficient screening tool to detect the high risk individuals for Type 2 Diabetes at an early stage.[8] IDRS is a simple, fast, inexpensive, non-invasive, and reliable tool to identify individuals at risk without laboratory tests. The IDRS devised by the Madras diabetes research foundation (MDRF) takes into account family history of DM, waist circumference, age, physical activity to identify the individuals at risk (Table 1).[9]

It has been found that 66% of the Indian diabetes cases are not diagnosed, as compared to 50% in Europe and 33% in the USA. A diabetes risk score will help in devising effective screening strategies to unmask the hidden burden of the disease. The MDRF-IDRS has a sensitivity of 72.5% and a specificity of 60.1% and it was derived, based on the large population based studies, which had been done on diabetes in India. Its advantages are its simplicity and low cost and it is easily applicable for mass screening programme.[10]

Among the youth of today, the medical students have a busy academic schedule and they generally do not have much time for physical exercise and are addicted to different food fads. The effect of the physical inactivity on the prevalence of diabetes can be seen in Chennai rural epidemiology study results (CURES).[11,12]

Based on the above factors we have decided to carry out a study among the medical students to assess their risks of developing type 2 diabetes mellitus in the future using the MDRF-IDRS.

METHODS

Study method

It is a descriptive cross sectional study carried out among the medical students of a Medical College.

Study area and population

This study was carried out among the M.B.B.S students studying in a medical college situated in the suburban area of Chennai city.

Study period

Study was carried out between July-December 2016.

Sample size and sampling method

Simple random sampling was done for a sample size of 251 medical students. The sample size was estimated assuming that 40% of the students would have a moderate to high risk score.[4] The sample size was estimated using the formula $Z\alpha^2pq/L^2$, where, Z - Value of alpha error: 3.84, Prevalence (p) = 40%, q = 60%, Precision (L) = 15% of 'P' = 6. The estimated sample

size was 256. Data of 5 students were avoided because of incomplete data. So the final sample size was 251.

Data collection

A structured interview schedule consisting of socio-demographic details and Indian Diabetes Risk Score was used. Anthropometric measurements and blood pressure were recorded. The students were classified as high risk, moderate risk and low risk, based on the IDRS as per the following score – up to 30 score as low risk, 30-50 score as moderate risk and 60 and above as high risk.

Data analysis

Data was analysed using SPSS Ver.15 software. Frequencies and percentage were calculated. Proportions were compared using Chi Square test to find out any association between the different variables studied.

Ethical considerations

The study was started after getting the ethical clearance from the Institutional Ethical Committee and after obtaining informed consent from the study participants.

Operational definition

IDRS score is computed using the parameters age, waist circumference, physical activity and family history. The minimum score is 0 and the maximum score is 100. The details of scoring and interpretation are given in Table 1.

RESULTS

Table 1 depicts the Indian Diabetes Risk Score [IDRS] among 251 the medical students. The IDRS takes into account the age, waist circumference, physical activity, family history.

Table 1: IDR score among the study group.

Parameters	Criteria	Diabetes risk score	Frequency [N =251]	Percentage
Age				
	< 35 years	0	251	100
	35 - 50 years	20	0	0
	≥ 50 years	30	0	0
Waist circumference				
	Waist <80 cm (32”) in Females OR <90 cm (36”) in Males	0	93	37.1
	Waist 80-89 cm (32-35”) in Females OR 90-99 cm (36-39”) in Males	10	120	47.8
	Waist ≥90 cm (36”) in Females OR ≥100 cm (40”) in Males	20	38	15.1
Physical activity				
	Exercise [regular] + strenuous work [reference]	0	39	15.5
	Exercise [regular] or strenuous work	20	192	76.5
	No exercise and sedentary work at home or work	30	20	8
Family history				
	No family history	0	134	53.4
	Either parent diabetic	10	98	39
	Both parents diabetic	20	19	7.6
Maximum Score		100		
Grade:				
	If the score is ≥60	High risk of having diabetes	5	2.0
	If the score is 30-50	Moderate risk	144	57.4
	If the score is <30	Low risk	102	40.6

All the study participants were below 35 years. About 93 (37.1%) out of 251 had a waist measurement of <80 cm (32”) in females OR <90 cm (36”) in males, 120 (47.8%) had a waist circumference of 80-89 cm (32-35”) in females OR 90-99 cm (36-39”) in males and 38 (15.1%) belonged to ≥90 cm (36”) in females OR ≥100 cm (40”) in males.

The physical activity scoring showed that 39 (15.1%) had heavy physical activity, while 192 (76.5%) had moderate physical activity and only 8% of them had no physical activity. About 19 (7.6%) participants had a positive family history where both parents were affected by Diabetes, while either of the parent was affected in 98

(31%) and there was no positive family history in 19 (7.6%) participants.

Table 2 (Figure 1) shows that 2% of the students were at high risk of developing diabetes mellitus. Females (1.59%) were at more risk compared to males (0.003%). This pattern remained for students belonging to moderate and low risk category also. About 51.2% of male students and 63.5% of female students were at moderate risk of developing diabetes mellitus.

Table 2: IDRS values for the medical students.

S. No	Risk level	Male (%)	Female (%)	Total (%)
1	High risk [score is ≥ 60]	1 (0.003)	4 (1.59)	5 (1.9)
2	Moderate risk [score is 30-50]	64 (25.4)	80 (31.8)	144 (57.4)
3	Low risk [score is <30]	60 (23.9)	42 (16.7)	102 (40.6)
4	Total	125 (49.8)	126 (50.2)	251 (100)

Table 3: Demographic characteristics and other risk factors studied.

S. No	Characteristic	Frequency (n =251)	Percentage
1	**Sex**		
	Male	125	49.8
	Female	126	50.2
2	**Religion**		
	Hindu	201	80.1
	Muslim	13	5.2
	Christian	37	14.7
3	**Type of family**		
	Nuclear	216	86.0
	Joint	27	10.8
	Extended nuclear	8	3.2
4	**Food habit**		
	Vegetarian	31	12.4
	Mixed diet	220	87.6
5	**Blood pressure**		
	Normal	135	53.8
	Prehypertensive	97	38.6
	Stage I hypertension	18	7.2
	Stage II hypertension	1	0.4
6	**Body mass index kg/m^2**		
	Underweight (<18.5)	41	16.3
	Normal (18.5-24.99)	84	33.5
	Overweight (25-29.99)	105	41.8
	Obese (>30)	21	8.4

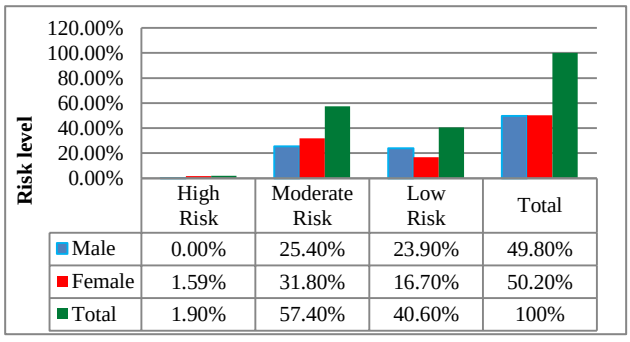

Figure 1: IDRS values for the medical students.

An overall of 57.4% were at moderate risk. 40.6% were at low risk of developing diabetes mellitus. 48% of male and 33.3% of female were at lower risk of developing diabetes mellitus. Women were at more risk of developing diabetes mellitus (50.2%) compared to men (49.8%).

Table 3 explains the demographic characteristics and other risk factors associated, studied among the participants.

All 251 participants were below 35 years of age. Among the 251 participants, 125 (49.8%) were males and 126

(50.2%) were females. Majority 201 (80.1%) of them belonged to Hindu religion, 13 (5.2%) were Muslims, 37 (14.7%) were Christians. Majority 216 (86.1%) belonged to nuclear family, 27 (10.8%) belonged to joint family, 8 (3.2%) belonged to extended nuclear family. Among the study subjects 31 (12.4%) were vegetarians, while 220 (87.5%) consumed mixed diet.

Among the study subjects, 135 (53.8%) were normotensive while 97 (38.6%) were pre hypertensive and 18 (7.2%) were suffering from stage I hypertension whereas 1 (0.4) had stage II hypertension. Nearly 21 (8.4%) study subjects were obese and 105 (41.5%) were overweight. 41 (16.3%) were underweight and only 84 (33.5%) were normal.

Table 4 shows the association between various risk factors and the IDRS score. There is strong association between risk factors like sex of the individual, overweight / obesity, family history, physical activity and IDR Score. These were found to be potential risk factors for developing diabetes mellitus ($p<0.0001$) There was no significant association between type of family, Diet, blood pressure measurements and IDR Score.

Table 4: Association between risk factors and IDRS.

S. No	Risk factor	N	IDRS >30	Chi square value	P value
1	Sex				
	Female	126	84 (66.7%)		
	Male	125	65 (52%)	5.6	0.018*
2	Family type				
	Nuclear	216	128 (59.3%)		
	Others	35	21 (60%)	0.007	0.934
3	Nutrition				
	Vegetarian	31	20 (4.5%)		
	Mixed	220	129 (58.6%)	0.4	0.533
4	Blood pressure				
	Hypertensive	19	14 (73.7%)		
	Normal	232	135 (58.2%)	1.7	0.186
5	Body mass index				
	Overweight/obese	126	64 (50.8%)		
	Normal	125	85 (68%)	7.7	0.006*
6	Family History				
	Present	114	98 (85.9%)		
	Absent	132	50 (37.8%)	59.015	0.0001*
7	Physical Activity				
	Moderate to Severe	228	130 (57%)		
	No Physical Activity	20	20 (100%)	14.2129	0.0001*

*Statistically significant at 95% CI level.

DISCUSSION

The present study shows that 1.9% of the medical students are at high risk of developing type 2 diabetes mellitus as per the IDRS assessment, similar to the study conducted by Bhatia et al which showed that 1% were at a high risk among their study participants.[13] Whereas, other studies conducted by Subramani et al, Chowdhury et al, Kumar et al, and Mohan et al showed more number of people were at a high risk of developing type 2 diabetes mellitus i.e. 12.1%, 31.5%, 18.66%, 31.2% respectively.[14-17]

Moreover, 57.4% were at moderate risk of developing diabetes mellitus, which was similar to other studies Bhatia et al (68%), Subramani et al (74.7%), Chowdhury et al (46%), Kumar et al (50%), Mohan et al (50.32%).[13-17]

The results of the study done by Vardhan et al showed that nearly 1/3rd of the young medical students had moderate to high-risk diabetes scores. This study shows that about 5% were in the high-risk category, which is much higher to the 1.9% in our study, while about 28% were in the moderate risk category which is much lower to 57.4% of the moderate risk group in our study.[10]

In our study 40.6% were at lower risk of developing diabetes mellitus. Bhatia et al (31%), Subramani et al (13.3%), Chowdhury et al (22.5%), Kumar et al (31.34%), Mohan et al (18.48%) also showed similar results.[13-17]

Our study mainly concentrated on medical students who were below 35 years of age. In the studies by Subramani et al, Chowdhary et al, Kumar et al also more number of participants were below 35 years of age, 54.5%, 47.2%, 49% respectively, while in the study by Mohan et al

majority were either between 36–49 years (34.24%) or above 50 years (34.24%).[14-17]

The results regarding the presence of family history of diabetes in our study was much similar to that of the studies by Bhatia et al and Subramani et al.[13,14] About 53.4% had a negative family history in our study, whereas 68% had a negative family history in the study by Bhatia et al and 83.4% in the study by Subramani et al. In 7.6% of the study participants, both the parents were diabetic and 39% of either one of them was diabetic, similar to Bhatia et al (both –3%, single parent – 29%) and Subramani et al (both –5.1%, single parent – 11.5%).[13,14]

In our study nearly 76.5% of the participants have moderate physical activity while 15.5% do heavy physical activity and 8% do not do any physical activity. This is similar to the study done by Subramni et al, where 74.7% do moderate activity and 17.2% and 9.5% do heavy and no physical activity respectively.[14] Whereas in the study by Bhatia et al 49% do moderate physical activity, 41% do not do any physical activity and 10% do heavy physical activity.[13]

Our study shows significant association between the Gender, Body Mass Index, Family History, Physical activity and IDR Score, which is similar to the study by Chowdry et al. where Gender and Body Mass Index were also significantly associated with the IDR Score. In addition to this, there was also significant strong association between Hypertension and IDR Score in Chowdry et al study.[15]

CONCLUSION

This study reveals that about 60% of the medical students we studied are at the risk of developing T2DM in the future. This indicates that a major percentage of them who have high risk and moderate risk scores could be a pre-disposing factor for diabetes at a younger age. The present urban sedentary lifestyle makes the adolescents and youths highly vulnerable to diabetes mellitus. It is widely acknowledged that primordial and primary prevention are the most effective intervention measures to prevent T2DM. Therefore, appropriate and stringent lifestyle modifications need to be implemented in order to minimize the risk of the disease occurrence in the adulthood.

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REFERENCES

1. IDF Diabtes Mellitus, What is diabetes? 6th edition, p22. Available at: file:///Users/user/Downloads/english-6th.pdf. Accessed on 23 Mar 2017.
2. Wild S, Roglic G, Green A, Sicree R, King H. Global burden of diabetes mellitus in the year 2000. Global Burden of Disease 2000. Available at: http://www.who.int/healthinfo/statistics/bod_diabetes.pdf. Accessed on 23 Mar 2017.
3. Diabetes Fact sheet N°312 Reviewed November 2016. WHO Media centre. Available at: http://www.who.int/mediacentre/factsheets/fs312/en/. Accessed on 23 Mar 2017.
4. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes, estimates for the year 2000 and projections for 2030. Diabetes Care. 2004;27:1047–53.
5. Global Status Report on Non communicable Diseases: 2014 WHO. P243. Available at: http://apps.who.int/iris/bitstream/10665/148114/1/9789241564854_eng.pdf. Accessed on 23 Mar 2017.
6. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, et al. Prevalence of diabetes and prediabetes in urban and rural India: phase I results of the Indian Council of Medical Research–INdiaDIABetes (ICMR–INDIAB) study. Diabetologia. 2011;54:3022-27.
7. Huizinga MM, Rothman RL. Addressing the diabetes pandemic: A Comprehensive approach. Indian J Medical Res. 2006;124:481-4.
8. Lindstorm J, Tuomihelto J. The diabetes risk score-a practical tool to predict type-2 diabetes risk. Diabetes care. 2003;26;725-31.
9. Mohan V, Deepa R, Deepa M, Somannavar S, Datta M. A simplified Indian Diabetes Risk Score for screening undiagnosed diabetic subjects. J Assoc Physicians India. 2005;53:759-63.
10. Vardhan A, Prabha MRA, Shashidhar MK, Shankar N, Gupta S, Tripathy A. Value of Indian Diabetes Risk Score among Medical Students and Its Correlation with Fasting Plasma Glucose, Blood Pressure and Lipid Profile. J Clin Diagn Res. 2012;6(9):1528-30.
11. Mohan V, Shanthivani CS, Deepa R. The glucose intolerance (diabetes and IGT) in a selected south Indian population with a special reference to the family history, obesity and the life style factors. J Assoc Physicians India. 2003;51:771–7.
12. Mohan V, Krishnan G, Datta M. Association of the physical inactivity with the components of the metabolic syndrome and coronary artery disease-CURES. Diabet Med. 2005;22:1206–11.
13. Bhatia T, Maitreyi O, Vimisha D, Sonalika B, Gerhard F, Vaidehi L et.al. Type 2 Diabetes Mellitus: Risk Evaluation and Advice in undergraduate students in Mumbai. Int J Pharm Sci Invent. 2014:3(4):37-40.
14. Raja S, Uma D, Udhay S, Stephen T, Karthik, Seshadhri et.al. Assessment of Risk of Type 2

Diabetes Mellitus Among Rural Population in Tamil Nadu by using Indian Diabetic Risk Score. Middle-East J Sci Res. 2014;21(1):223-5,
15. Chowdhury R, Mukherjee A, Lahiri SK. A Study on distribution and determinants of Indian Diabetic Risk Score (IDRS) among rural population of West Bengal. National J Med Res. 2012;2(3):282-6.
16. Gupta SK, Singh Z, Purty AJ, Vishwanathan M. Diabetes prevalence and its risk factors in urban Pondicherry. Int J Diabetes Dev Ctries. 2009;29(4):166-9.
17. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian J Med Res. 2007;125(3):217-30.

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