TYPE 2 DIABETES MELLITUS RISK ASSESSMENT SURVEY AMONG MEDICAL STUDENTS

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ABSTRACT

Type 2 diabetes mellitus (T2DM) is increasing among young people due to obesity and changes in lifestyle coupled with the family history of diabetes. Indian Diabetes Risk Score (IDRS) is a simple, low cost and an easily applicable tool used for the screening of T2DM risk. This study aimed to evaluate T2DM risk among the undergraduate medical students by using IDRS. A cross-sectional study was conducted among 318 undergraduate medical and dental students at Nepal medical college and teaching hospital, Jorpati Kathmandu. Detailed demographic history including age, sex, physical activities and a family history of diabetes was taken. Anthropometric measures taken were waist circumference (WC), height and weight. Body mass index (BMI) was calculated. The diabetes risk score was calculated using IDRS. The median age of participants was 22 years. According to IDRS score, two students (0.6%) had a high risk of developing diabetes, 59 (18.6%) students had a moderate risk and 257 (80.8%) students had low risk. Four students (1.3%) had a history of sedentary lifestyle. Similarly, 14 (4.4%) student had waist circumference ≥ 90 cm (36") in females or ≥100 cm (40") in males respectively. About 8 (2.5%) participants had a positive family history of diabetes where both of the parents had diabetes. There was no significant association between IDRS, blood pressure (BP), and hypertension. However; there was a significant association between IDRS and BMI in our study. A sizeable proportion of students had a high or moderate risk of diabetes. BMI was positively associated with IDRS. Both, BMI and diabetes risk can be tackled with a healthy lifestyle and dietary changes among the students. Primordial and primary prevention is the most effective preventive measure, and therefore, appropriate and stringent lifestyle modifications need to be implemented to minimize the risk of developing the T2DM among students.

KEYWORDS

Diabetes mellitus, IDRS, medical students, risk assessment

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INTRODUCTION

Diabetes mellitus (DM) is a major global health problem, which occurs either when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces.[1] The number of people with diabetes has substantially increased between 1980 and 2014, rising from 108 million to current 422 million,[2] and the global prevalence of diabetes is expected to reach 4.4% by 2030.[2] The number of people living with diabetes globally is expected to rise from 366 million in 2011 to 552 million by 2030.[2] World Health Organization (WHO) also estimates that, globally, 422 million adults aged over 18 years were living with diabetes in 2014.[2] Among them the largest numbers of people with diabetes were estimated for the Africa, South-East Asia and Western Pacific Region.[3] A systematic review and meta-analysis on the prevalence of type 2 diabetes mellitus (T2DM) in Nepal reported a minimum of 1.4% to a maximum of 19.0% with a pooled prevalence of 8.4%. The prevalence of T2DM in urban and rural populations was 8.1% (95% CI: 7.3–8.9%) and 1.0% (95% CI: 0.7–1.3%), respectively. T2DM is currently a high-burden disease in Nepal and we need preventive interventions and efforts to control the disease.[4]

Overweight and obesity, together with physical inactivity, are the strongest risk factors for T2DM.[5] According to the World Health Organization (WHO), more than 1 in 3 adults were overweight, and more than 1 in 10 were obese in 2014.[2] Diabetes can damage the heart, blood vessels, eyes, kidneys, and nerves, leading to disability and premature death.[6] Interventions that promote a healthy diet, physical activity and weight loss can prevent T2DM. The longer a person lives with undiagnosed and untreated diabetes, the worse their health outcomes are likely to be.

The global burden of diseases study states that diabetes-related deaths have increased by 93% in the last two decades and will be the 7th leading cause of deaths by 2030.[7] Hence, it is important to screen individuals at an early age in Nepalese context to increase the quality of life and prevent from delayed complications.

Early identification of the high-risk individuals would help in taking an appropriate intervention in the form of dietary changes and increased physical activity, thus helping to prevent, or at least delay, the onset of diabetes. Due to its complications and high cost of clinical management, it is very essential for early diagnosis and prevent from its complications. Furthermore, the laboratory based diagnosis of diabetes; it's monitoring and treatment is costly and cannot be assessable to all level in rural areas under the health care system of Nepal. Thus, identification of at-risk individuals is critical to prevent diabetes in Nepal. Recently, risk scores based on simple anthropometric and demographic variables have been devised to detect high-risk individuals. Among them, Indian Diabetes Risk Score (IDRS) which includes a simple four-item tool seems to be most appropriate for the screening of diabetes risk in Nepalese context.[8] IDRS is an easily approachable tool which can even be used by the community health worker to screen the high-risk population. The IDRS has a sensitivity of 72.5% and specificity of 60.1% and is derived based on the largest population-based study on diabetes in India CURES (Chennai Urban Rural Epidemiology Study).[8] The advantages of IDRS are its simplicity, low cost and is easily applicable to mass screening programmes.[8] This study aims to calculate the diabetic risk score for Nepalese medical students by using the IDRS and by correlating it with the BP, BMI and family history of Hypertension.

MATERIALS AND METHODS

A cross-sectional study among 318 undergraduate medical (MBBS) and dental (BDS) students at Nepal medical college and teaching hospital (NMCTH), Kathmandu was conducted. The study was carried out between April-July 2018. Ethical clearance was obtained from Nepal Medical College, Institutional Review Committee (NMC-IRC). Written consent was taken from all students prior to data collection. All information collected was kept confidential, and student's participation was voluntary. All students present on the days of data collection were included in the study, whereas students with a known history of T2DM, Polycystic ovary disease (PCOD), and thyroid disorder were excluded from the study.

A standardized semi-structured predesigned and pre-tested IDRS questionnaire in English was used to capture the demographic information and family history. IDRS is a four-item tool that asks participants' age, abdominal obesity, physical activity and family history of diabetes. Age, physical activity, and family history of diabetes are self-reported by the participants whereas; abdominal obesity was measured in terms of waist circumference (WC). Measurement of the WC was taken directly on the body with light clothing midway between the lowest rib and the iliac crest. The average of three measurements nearest to 0.5 cm was taken with legs close together after a normal expiration using a non-stretchable measuring tape.[9] The measurement were taken by the biochemistry resident under the direct supervision of faculty in a separate room for boys and girls respectively. The weight of the participants was measured using a digital (Seca 876) weighing scale to the nearest 0.5 kilograms (kg) with the participant not wearing shoes. The height was taken using a (Seca 217) stadiometer to the nearest 0.5 cm with the participant standing upright with the heel, buttock and upper back along the same vertical plane. BMI was calculate by dividing the weight in kg by the square of the height in meters. Participant's weight status was characterized as underweight (BMI <18.5) normal weight (18.5≤ BMI <23), overweight (23≤ BMI <27.5), and obese (BMI ≥27.5) as per the World Health Organization (WHO) recommendation for Asians.[10] The family history of hypertension was also enquired for correlation. The IDRS score criteria for each item response is given in Table 2. The cumulative score of IDRS ranges from 0-100, an IDRS of <30 were categorized as low risk, 30-50 as medium risk and a score > 60 was considered high risk for diabetes.[8]

Blood Pressure was measured using a microlife digital BP machine (BP3BJ1-4D). Three consecutive readings of BP were taken following a 5-minute rest to allow the participants vitals return to at-rest values. The BP was read to the nearest millimeter of mercury (mmHg) with the participant seated, and a mean reading was calculated from the three readings.[11] Hypertension was defined as systolic BP of 140 mmHg or more and/or diastolic of 90 mmHg or more, according to the 7th Joint National Committee of High BP. JNC-7. Similarly, Pre-hypertension was defined as a systolic BP of 120–139 mmHg and/or a diastolic BP of 80–89 mmHg.[12] Descriptive analysis was carried out to evaluate the risk of developing diabetes in them and presented categorically in percentage. Chi-square and Mann-Whitney U test were performed to find the group differences in IDRS score. For all statistical tests, two-tailed p-values <0.05 were considered statistically significant.

RESULTS

The median age of our study group was 22 years and ranged between (20-22) years. Out of 318 students, 157 (49.4%) were males and 161 (50.6%) females. The risk of developing diabetes was found to be high among 2 (0.6%), moderate in 59 (18.6%) and low in 257 (80.8%) of the students.

Table 1: IDRS values for the medical students.

IDRS Risk Level	Female %	Male %	Total %
Low Risk Score	77.0	84.7	80.8
Moderate Risk Score	21.7	15.3	18.6
High Risk Score	1.2	0	0.6

About 240 (75.5%) out of 318 students had a waist measurement of <80 cm (32”) in females or <90 cm (36”) in males whereas, 64 (20.1%) had a waist circumference of 80-89 cm (32-35”) in females or 90-99 cm (36-39”) in males and 14 (4.4%) belonged to ≥90 cm (36”) in females or ≥100 cm (40”) in males respectively. The scoring for physical activity (table-2) showed that 1 (0.3%) student is doing regular and heavy physical activity, while 198 (62.3%) were doing moderate physical activity whereas, 115 (36.2%) were doing mild physical activity and 4 (1.3%) of them had no physical activity & lived sedentary lifestyle. Similarly, about 8 (2.5%) participants had reported that, both of their parents had Diabetes, while either of the parents was

Table 2: Components of Indian Diabetes Risk Score among Study Participants (N=318).

Components of IDRS	Score	Frequency (n)	Percentage (%)
Age in years:			
<35	0	318	100.0
35-49	20	-	-
>50	30	-	-
Abdominal obesity (Waist Circumference)			
<80cm F, < 90cm M	0	240	75.5
• Female: 80-89cm, Male 90-99cm	10	64	20.1
Female: >90cm, Male >100cm	20	14	4.4
Physical activity			
Vigorous exercise + strenuous work	0	1	0.3
Moderate exercise or strenuous work	10	198	62.3
Mild exercise and work	20	115	36.2
No exercise & Sedentary at work	30	4	1.3
Family History of Diabetes			
Both nondiabetic parents	0	258	81.1
Either parent Diabetic	10	52	16.4
Both parents Diabetic	20	8	2.5
IDRS Risk Level			
Low Risk Score	<30	257	80.8
Moderate Risk Score	30-50	59	18.6
High Risk Score	> 60	2	0.6

Table 3: Demographic characteristics and other risk factors studied.

Characteristics	Frequency (Percentage)	IDRS<30	IDRS ≥30	Chi-square	p-value
Age, Median (IQR)	20.0 (20-22)				
Sex				3.036	0.081
Male	157(49.4)	133(51.8)	24 (39.3)		
Female	161(50.6)	124(48.2)	37 (60.7)		
Systolic Blood Pressure, Median (IQR)	120 (110-120)				
Diastolic Blood Pressure, Median (IQR)	80.0 (70.0-80.0)				
Body Mass Index(BMI) Kg/m2				13.294	0.004*
Median (IQR)	21.5 (19.6-23.5)				
Underweight (BMI <18.5)	35 (11.0)	31 (12.1)	4 (6.6)		
Normal weight (18.5≤ BMI <23)	187 (58.8)	159 (61.9)	28 (45.9)		
Overweight (23≤ BMI <27.5)	80 (25.2)	58 (22.6)	22 (36.1)		
Obese (BMI ≥27.5)	16 (5.0)	9 (3.5)	7 (11.5)		
Family History of Hypertension				3.405	0.182
Non hypertensive parents	196 (61.6)	153 (59.5)	43 (70.5)		
Either parent hypertensive	110 (34.6)	95 (37.0)	15 (24.6)		
Both parents hypertensive	12 (3.8)	9 (3.5)	3 (4.9)		
*P-Value statically significant <0.05					

affected in 52 (16.4%) student and there was no family history of diabetes among 258 (81.1%) participants.

The IDRS risk level scored as low, moderate and high for female was 77%, 21.7% and 1.2% whereas, it was 80%, 18.6% and 0.6% respectively for male. Among the study population, 35 (11%) of them were underweight, 16 (5%) were obese, 80 (25.2%) were overweight, and 187 (58.8%) have normal BMI. The risk factor regarding family history of hypertension showed that 34.6% (110) have either parent's hypertensive and 3.8% (12) of them have both parents hypertensive.

Among the association between different risk factor factors studied with IDRS score, BMI (p<0.004) was found to be significant, whereas sex, BP and a family history of hypertension were not significant.

DISCUSSION

In this cross-sectional study, 318 medical students were enrolled. IDRS was used to predict the risk of developing diabetes among them. As all the students were less than 35 years of age since, they obtained a score of zero for age. Thus, the IDRS score was calculated using physical activities, waist circumference and family history of diabetes. After computing IDRS scores, it was found that out of 318 students, risk of developing diabetes was high in 2 (0.6%), moderate in 59 (18.6%) and low in 257 (80.8%) students as per assessment. A similar study conducted by Bhatia *et al*. (n=222) among medical students, which showed that 1% were at high risk among their study participants.[13] Whereas, other studies from India showed higher proportion of medical students in high and medium risk categories.[14-17]

About 18.6% were in the moderate risk category which is much lower than 57.4% of the moderate risk group in similar study done among medical student in India by Gopalakrishnan *et al.*[18] In our study, 80.08% were at low risk of diabetes. Similar study among students done by Bhatia *et al.* shows 31% which is less than half compared to our study.[13] This may be due to different socio-behavioral characteristics of the study participants.

The results regarding the presence of a family history of diabetes in our study was much similar to that of the studies by Bhatia *et al.* and Subramani *et al.*[13,19] About 81.1% had a negative family history of diabetes in our study, whereas 68% had a negative family history in the similar study by Bhatia *et al.* and 83.4% in the study by Subramani *et al.* among 505 participants. In 2.5% of the study participants, both the parents were diabetic, and 16.4% of students had either one of them diabetic, similar to Bhatia *et al.* where both parents 3% and either parent 29%.[13] Another study by Subramani *et al.* shows both parents 5.1% and either parent 11.5%.[19]

A sedentary lifestyle may be important cause for obesity which can also increases the BMI. Similarly, 1.3% of students were not doing any exercise other than their daily routine activities. This is a big concern for future risk of diabetes, as without exercise they may get more obese in the future with the more stress-

related medical profession. Thus, these students should be encouraged for physical activity. Since medical students have a busy schedule, generally they do not have much time for physical exercise.

Abdominal obesity, another important risk factor for diabetes is found to be 24.5% among students. So, they should be closely monitored and followed for next consecutive year for increased risk of abdominal obesity in the future with the continuation of the same lifestyle and dietary habit. As mentioned in Table-2 it has clearly shown that, as the abdominal obesity increases, risk score also increases. Thus, they should be followed up every year for a screening of type 2 DM. Furthermore, it was also found that type 2 DM has a strong genetic component thus; family history of DM is also playing a very important factor for increased risk. The life time risk of developing T2DM is 40% for individuals who have one parent with T2DM and almost 70% if both parents are affected. The risk is higher if the mother, rather than the father, is affected.[20] Thus, the students with a family history of type 2 DM should regularly be followed and monitored for early diagnosis of pre-diabetes or T2 DM.

Our attempt in this study was to identify individuals at risk by using IDRS. Further investigations like blood glucose estimation for those having IDRS > 60 is the 2nd step for screening the individuals. So, unnecessary investigations for identification of type 2 DM can be avoided, and this would definitively reduce the economic burden on the patient. To prevent the increasing morbidity and mortality due to obesity-related T2 DM and cardiovascular disease in developing countries like Nepal, there is an urgent need to initiate large-scale community intervention programs and also should focus to increase physical activity and healthier food options, particularly for adolescent and young adults. International health agencies a nd the respective government should intensively focus on primordial and primary prevention programs for obesity and the metabolic syndrome in adolescent and young adults.

Our study shows a significant association between the BMI and the IDRS Score. However, there is no significant association of IDRS seen among different risk factors like blood pressure and Gender. Whereas, in a similar study conducted among a rural population of West Bengal, there was a significant association between hypertension and IDRS score study done by Chowdry *et al*.[21] There are some limitations in our study also, This tool has so far not been validated in Nepalese context. Also, we were not able to compare the different risk group with their fasting and postprandial blood sugar level. This is limited to single center study. A separate study on the risk assessment of diabetes by IDRS in a multiple age groups of student with multi-centric study is needed.

In conclusion, a substantial proportion of students had a high or moderate risk of diabetes. BMI was positively associated with IDRS. Both, BMI and diabetes risk can be tackled with a healthy lifestyle and dietary changes among the students. Primordial and primary prevention is the most effective preventive measure, and therefore, appropriate and stringent lifestyle modifications need to be implemented to minimize the risk of developing the T2DM among students.

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