RESEARCH ARTICLE

RISK ASSESSMENT SCORE OF TYPE 2 DIABETES IN POPULATION OF PATIALA DISTRICT OF PUNJAB

*Rajinder Kaur, Ramandeep Kaur, Parneet Kaur, Arun Kumar Rawat, Tahseena Akhtar and Aadil Islam

Department of Human Genetics, Punjabi University, Patiala-147002, India

ABSTRACT

Diabetes, a fastest growing epidemic of 21st century is rapidly showing an increase in its incidence rate due to the impact of its risk factors. It is a common chronic disease resulting from a genetic-environment interaction along with other risk factors such as obesity, physical inactivity and age.
Objectives: To assess the risk of type 2 diabetes in population of Patiala district of Punjab (India).
Materials and Methods: The present study was conducted on 1500 subjects. Anthropometric parameters such as height, weight, waist circumference, BMI were assessed to fill up Type 2 diabetes risk assessment scale developed by Jaakko Tuomilehto, in 2003.
Results: 1500 subjects comprising 573 (38.2%) males and 927 (61.8%) females were studied. More than 50% i.e. 53.2% subjects fall under low risk score (>7), 34.2% subjects fall under second category (7-11) which showed slightly elevated risk score. Only 6.53% subjects showed moderate risk score (12-14). 5.061% subjects estimated high risk score (15-20) and only 1% of subjects showed very high risk score (>20) towards T2D and their chances of getting disease is 1 in 2.
Conclusion: The subjects who are overweight (BMI >30kg/m²) in the age groups 21-30 years and 61-70 years and physically inactive are at higher risk (>20) for the development of T2D. Waist circumference shows no correlation with the risk for T2D.

INTRODUCTION

Type 2 diabetes (T2D) is becoming a global health burden with more than 80% diabetics in developing countries (International Diabetes Federation, 2013). It is a multifactorial disease caused by a complex interplay between genetic factors (related to impaired insulin secretion, insulin resistance) and environmental factors such as obesity, hypertension, overeating, lack of physical activity, stress as well as aging (Murea *et al*., 2012; Matharoo *et al*, 2013; Sikka *et al*., 2014; Jallu *et al*., 2015; Kaul *et al*., 2015). In this health condition, a person has high blood sugar due to disturbances of carbohydrate, fat and protein metabolism (Boada and Moreno, 2013). The chronic hyperglycemia is associated with long-term damage and failure of different organs especially the eyes, kidneys, nerves, heart and blood vessels (ADA, 2015). About 5% to 10% of T2D is thought to be hereditary caused by abnormal gene passed from parents to child (Hebebrand *et al*., 2009).

Corresponding author: Rajinder Kaur
Department of Human Genetics, Punjabi University,
Patiala-147002, India

Obesity, overweight, waist circumference, physical activity and age are the main parameters associated with the risk of T2D. BMI captures the degree of overweight and obesity, it ignores body fat distribution. Waist circumference measurement is a mean of assessing the levels of visceral fat (Feller *et al*., 2010). Participation in regular physical activity improves blood glucose control and prevent or delay the onset of T2D (Hamman *et al*., 2006). Both moderate walking and vigorous activity are associated with a decreased risk and greater volumes of physical activity may provide the most prevention (Hu *et al*., 1999). Every six seconds a person dies with T2D all over the globe. An epidemic of T2D seen in India due to the adaptation of western dietary habits (Ramachandran *et al*., 1997) and sedentary lifestyle (Hu, 2011; Jallu *et al*., 2015) due to which the country is often referred as the "diabetes capital of the world" (Mohan *et al*., 2007). Socioeconomic factors such as income, literacy and employment also play vital role in T2D (Agardh *et al*., 2011; Bayat *et al*., 2013). This looming epidemic is also expected to trigger a steep rise in the T2D complications such as ischemic heart disease, stroke, neuropathy, retinopathy and nephropathy (Mohan *et al*., 2013).

According to an estimate of International Diabetes Federation (2013), India is predicted to have 65.1 million people affected by T2D in 2013 and the projected figure in 2035 is estimated to be 109 million. The National Urban Diabetes Survey (NUDS), revealed that the prevalence of T2D in the southern part of India is higher (13.5% in Chennai, 12.4% in Bangalore and 16.6% in Hyderabad) as compared to eastern India (Kolkata, 11.7%) northern India (New Delhi, 11.6%) and western India (Mumbai, 9.3%) (Ramachandran *et al.,* 2001). The Indian Council of Medical Research India Diabetes Study (ICMR-INDIA) showed that the weighted prevalence of T2D in Tamil Nadu was 10.4%, in Maharashtra 8.4%, in Jharkhand 5.3%, in Chandigarh 13.6% and that overall 62.4 million people in India suffered from T2D in 2011. Although there are very few studies in India done on the risk factors concerning T2D, the present study involves a cross sectional survey which was done to check the T2D risk assessment score and to assess the role of different risk factors in the population of small district of Punjab.

MATERIALS AND METHODS

This was a cross sectional survey conducted on Punjabi population of Patiala district of Punjab. The data was collected randomly from overall 1500 individuals comprising 573 (38.2%) males and 927 (61.8) females. General information regarding gender, age, marital status, education, etc. was collected from participants through personal interview. Anthropometric measurements such as height, weight, waist circumference and BMI were taken to fill the Finnish Diabetes Association T2D risk assessment scale developed by Jaakko Tuomilehto in 2003. Scoring level of the T2D risk assessment scale ranges from <7 (very low risk) to >20 (very high risk).

RESULTS

Present survey depicted that more than 60% (n=929) subjects fall in underweight category (BMI <25kg/m²), 33.4% (n=501) subjects in normal weight category (BMI 25-30 kg/m²) and 4.66% (n=70) in overweight category (Table 1). When these categories assessed for the risk for T2D, it was observed that 29.06% underweight (BMI <25kg/m²) subjects showed very low risk for the development of the T2D, only 0.5% of subjects showed very high risk, 1.8% showed high risk, 4% show moderate and 26.53% showed slightly elevated levels for risk against T2D. Most of the subjects (24.13%) with normal BMI (25-30 kg/m²) showed low risk, 6.33% showed slightly elevated risk, 0.6% showed moderate risk, 1.86% showed high risk and 0.26% showed very high risk towards the development of T2D.

In overweight category (BMI >30kg/m²) every subject is under risk to T2D in one or another way. Out of 70 overweight subjects 29 falls under moderate risk, 21 under high risk and 3 under very high risk for T2D. Most of the male subjects (n=289) fall under 94-102 cm waist circumference and 415 females under 80-85 cm waist circumference. Waist circumference did not show much fluctuation for risk for development of T2D (Table 2). High percentage (26.31%) of physically active subjects (n=395) showed very low risk for T2D and very low (0.66%) percentage shows very high risk towards T2D. Similar results were observed in physically inactive participants (Table 3). The results showed that age groups 21-30 years and 61-70 years has very high risk (>20) for the development of T2D followed by age groups 10-20 years, 51-60 years and age group 31-40 years (Table 4).

Table 1. BMI and Risk for T2D (N=1500) in Punjabi population

T2D Risk Score	No. of individuals underweight (BMI <25 kg/m²) n (%)	No. of individuals with normal weight (BMI = 25-30 kg/m²) n (%)	No. of individuals with overweight >30 (kg/m²) n (%)
<7	436 (29.07%)	362 (24.13%)	00
7-11	398 (26.53%)	98 (6.53%)	17 (1.13%)
12-14	60 (4%)	9 (0.6%)	29 (1.93%)
15-20	27 (1.8%)	28 (1.87%)	21 (1.4%)
>20	8 (0.53%)	4 (0.27%)	3 (0.2%)
Total	929	501	70

Table 2. Waist circumference and Risk for T2D (N=1500) in Punjabi population

Waist Circumference T2D Risk Score	Male			Female		
	<94cm, n(%)	94102cm n (%)	>102cm, n (%)	<80cm, n (%)	80-88cm, n (%)	>88cm, n (%)
<7	89 (5.93%)	130 (8.67%)	37 (2.47%)	126 (8.4%)	295 (19.67%)	121 (8.07%)
7-11	49 (3.27%)	98 (6.53%)	54 (3.6%)	134 (8.93%)	98 (6.53%)	80 (5.33%)
12-14	21 (1.4%)	40 (2.67%)	8 (0.53%)	10 (0.67%)	10 (0.67%)	9 (0.6%)
15-20	20 (1.33%)	15 (1%)	3 (0.2%)	2 (0.13%)	10 (0.67%)	26 (1.73%)
>20	-	5 (0.33%)	4 (0.27%)	00	2 (0.13%)	4 (0.27%)
Total	179	288	106	272	415	240

Table 3. Physical Activity and Risk for T2D (N=1500) in Punjabi population

Physical Activity T2D Risk Score	Yes (n (%))	No (n (%))
<7	395 (26.33%)	403 (26.87%)
7-11	274 (18.27%)	239 (15.93%)
12-14	80 (5.33%)	18 (1.2%)
15-20	35 (2.33%)	41 (2.73%)
>20	10 (0.67%)	5 (0.33%)
Total	794	706

Table 4. Age and Risk for T2D (N=1500) in Punjabi population

Age (years) / T2D Risk Score	10-20 yrs n (%)	21-30 yrs n (%)	31-40 yrs n (%)	41-50 yrs n (%)	51-60 yrs n (%)	61-70 yrs n (%)	>70 yrs n (%)
<7	150 (10%)	432 (28.8%)	149 (9.93%)	46 (3.07%)	10 (0.67%)	00	5 (0.33%)
7-11	94 (6.27%)	94 (6.27%)	112 (7.47%)	110 (7.33%)	57 (3.8%)	40 (2.67%)	10 (0.67%)
12-14	10 (0.67%)	18 (1.2%)	12 (0.8%)	32 (2.13%)	20 (1.33%)	2 (0.13%)	4 (0.27%)
15-20	3 (0.2%)	13 (0.87%)	21 (1.4%)	26 (1.73%)	6 (0.4%)	2 (0.13%)	7 (0.47%)
>20	2 (0.13%)	4 (0.27%)	1 (0.07%)	00	2 (0.13%)	4 (0.27%)	2 (0.13%)
Total	259	561	295	214	95	48	28

Calculations showed that more than 50% i.e. 53.2% (n=798) subjects fall under low risk (>7) (1 in 100) for developing T2D, 513 (34.2%) individuals fall under second category (7-11) which showed that these subjects come under slightly elevated risk for developing T2D i.e. 1 in 25. Only 98 (6.53%) subjects showed moderate risk (12-14) i.e. 1 in 6 will develop disease. 76 (5.061%) subjects estimated high (15-20) risk i.e. 1 in 3 and very few subjects 15 (1%) showed very high risk (>20) towards the T2D and their chances of getting disease is 1 in 2. Out of 1500 subjects under study only 107 individuals confessed of suffering from T2D. From these 107 diabetics, 42 were males and 65 were females. Majority of them (n=103) live with their families and only 4 individuals live alone. Most of the diabetics are uneducated (n=35). Majority of them (n=67, 62.6%) showed health complications such as retinopathy (n=16, 14.9%) neuropathy (n=4, 3.7%), nephropathy (n=10, 9.3%) and cardiovascular diseases (n=23, 21.49%).

DISCUSSION

The present study which is conducted in the Patiala district of Punjab gave us an emphasis on the risk assessment of T2D (Qiao *et al.*, 2003). BMI is an important factor and the overweight subjects (BMI >30kg/m²) are under high risk for T2D. Various different studies conducted in Northwest India showed the same results and substantiates our findings (Matharoo *et al.*, 2013; Sikka *et al.*, 2014; Jallu *et al.*, 2015). The increasing frequency of overweight individuals in Punjabi population can be due to the habit of consumption of high calorie diet. Waist circumference did not revealed any correlation with the risk of T2D in present as well as previous studies. Our study showed no significant correlation between Waist circumference and T2D. However studies by Mamtani *et al.*, 2014 and others showed Waist circumference is genetically correlated with incident Type 2 diabetes. Physically active subjects shows very low risk for T2D and inactive subjects shows high risk towards T2D. The previous studies done by the Laaksonen *et al.* in 2005 and Villegas *et al.* in 2006 explained that moderate and vigorous physical activity was associated with a lower risk of T2D. Evidence from clinical trials which included physical activity as an integral part of life style interventions suggested that it plays an important role in delaying or preventing the development of T2D in those at risk both directly by improving insulin sensitivity and reducing insulin resistance and indirectly by beneficial changes in body mass and body composition. The prevalence of diabetes increases with age in many populations. The present study assessed that the subjects in the age groups

21-30 years and 61-70 years has very high risk (>20) for the development of T2D. The previous study done among 11 Asian cohorts by the *Decoda Study Group* in 2003 showed that the prevalence of T2D increased with age and reached the peak at 70-89 years of age in Chinese and Japanese subjects but reached at the peak at 60-69 years of age followed by a decline at the 70 years of age in Indian subjects. At 30 –79 years of age, the 10-year age-specific prevalence of T2D was higher in Indian subjects than in Chinese and Japanese subjects. Advancing age was found to be a non modifiable risk factor among 50-59 years of age group (Jallu *et al.*, 2015).

Conclusion

The present study investigates the influence of various risk factors on T2D which includes BMI, waist circumference, physical activity and age. The risk assessment score concluded that the subjects who are overweight (BMI >30 kg/m²); in the age groups 21-30 years and 61-70 years and physically inactive are at higher risk (>20) for the development of T2D. Waist circumference shows no correlation with the risk for T2D.

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