ФИЗИЧЕСКАЯ АКТИВНОСТЬ И РИСК САХАРНОГО ДИАБЕТА 2 ТИПА В ПОПУЛЯЦИИ УДУПИ (ИНДИЯ)

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ВВЕДЕНИЕ. Во всем мире более 75% взрослых с сахарным диабетом 2 типа (СД2) живут в странах с низким и средним уровнем доходов. Из них 69,2 млн взрослых живут в Индии. Показано, что с повышением уровня физической активности риск развития СД2 снижается на 15–60%. В Индии проводится достаточно много работ по исследованию риска развития СД2. Однако обследования жителей Удупи не проводилось.

ЦЕЛЬ. Выяснить риск развития СД2 с использованием индийской шкалы риска диабета (Indian Diabetes Risk Score, IDRS) и уровней физической активности в популяции Удупи.

МАТЕРИАЛЫ И МЕТОДЫ. В текущее исследование мы включили участников, у которых не было симптомов заболевания и не был диагностирован СД2. Возраст участников колебался от 30 до 65 лет. Пациенты, у которых в анамнезе были какие-либо неврологические заболевания, а также женщины, беременные на момент скрининга, были исключены. Мы регистрировали случайные уровни глюкозы в крови участников исследования, после чего была проведена оценка риска развития СД2 с использованием IDRS (The Indian Diabetes Risk Score). Все участники исследования были разделены на 3 группы: участники с высоким (≥60 баллов), средним (30–50 баллов) и низким (<30 баллов) риском развития СД2. Уровень физической активности измерялся с помощью опросника по физической активности (Global Physical Activity Questionnaire, GPAQ).

РЕЗУЛЬТАТЫ. В исследовании приняли участие 23 960 человек из района Удупи, штат Карнатака. Согласно стратификации риска IDRS, 1,5, 17,9, 27,5% участников в возрасте от 30 до 35 лет, от 36 до 50 лет и старше 50 лет соответственно имели более высокий риск развития СД2. Согласно оценке GPAQ, 14% участников вели сидячий образ жизни, 27,6% вели минимальную физическую активность, 53,7% были достаточно активны и 4,6% были очень активны.

ЗАКЛЮЧЕНИЕ. Из текущего исследования мы пришли к выводу, что 46,9% участников исследования, проживающих в районе Удупи, имели более высокий риск развития СД2.

КЛЮЧЕВЫЕ СЛОВА: сахарный диабет 2 типа; Индийская шкала риска диабета; случайный уровень сахара в крови; физическая активность; образ жизни

PHYSICAL ACTIVITY PROFILE AND RISK OF TYPE 2 DIABETES MELLITUS IN UDUPI (INDIA) POPULATION

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BACKGROUND: Throught the world, More than 75% of adults with type 2 diabetes mellitus (T2DM) live in low and middle-income countries. Amongst which 69.2 million of these adults live in India. Its been shown that, as level of physical activity increases, risk of developing T2DM decreases by 15-60%. Many studies are conducted to find the risk of development of T2DM in the coastal areas of Karnataka. However, the screening of people living in Udupi was not carried out.

AIM: To find out the risk for the development of T2DM using IDRS and physical activity levels in Udupi population.

MATERIAL AND METHODS: In the current study, we included participants who were asymptomatic and undiagnosed to be having T2DM. The participants age ranged between 30–65 yrs. Participants with the history of any neurological conditions and women who were pregnant at the time of screening were excluded. We recorded random blood glucose levels of the participants following which the risk score was obtained using the Indian Diabetes Risk Score (IDRS) and the participants were classified as high risk (score ≥60), moderate risk score (30–50) and low risk (score <30). The level of physical activity was measured using Global Physical Activity Questionnaire.

RESULTS: The study included 23,960 participants from Udupi district, Karnataka. Based on IDRS risk stratification, 1.5%, 17.9%, 27.5% of the participants with the age ange of 30–35 yrs, 36–50 yrs and more than 50 yrs respectively had higher risk of developing T2DM. According to GPAQ score 14% of the participants were following sedentary lifestyle, 27.6% of the were minimally active, 53.7% were very active, and 4.6% were highly active.

CONCLUSION: From the current study we conclude that 46.9% of participants had a higher risk of developing T2DM in future who are living in Udupi district.

KEYWORDS: type 2 diabetes mellitus; Indian Diabetes Risk Score; random blood sugar; physical activity; lifestyle

According to International Diabetes Federation (IDF), it has been reported that globally 415 million adults have type 2 Diabetes Mellitus (T2DM) and expected to rise upto 642 million by 2040. It has been reported that roughly 75% of adults with T2DM subsist in low and middle-income countries. In India 69.2 million adults are living with T2DM. [1] According to World Health Organization (WHO) report more than 19% of the total population diagnosed for T2DM resides in India.[2] In Costal Karnataka 16% of the population were found to have T2DM.[3]

More than 50% of the population with T2DM in rural India is oblivious about the critical outcome of the disease[4,5], which is an additional cause for exponential growth in the burden of the disease. Early identification and optimization of therapy may pick up results in patients with T2DM. In Southeast Asia T2DM likely stem from lifestyles marked by over-consumption, lack of physical activity, excess stress, overweight, and obesity.[6] It was reviewed that with the steady migration from rural to urban areas, ascend in socio-economic standard, and consequent changes in lifestyle are all upsetting the state of T2DM in India.[7]

There are potential strategies to find out the possible risk for the T2DM and the purpose of which is to identify asymptomatic individuals. Risk factor approach can be looked forward as an aggressive identification for planning prevention strategies and even for early diagnosis.[8] The Indian Diabetes Risk Score (IDRS), a simple screening tool was developed at the Madras Diabetes Research Foundation (MDRF), Chennai by Dr. Mohan and colleagues for prediction of undiagnosed diabetes.[9] The MDRF-IDRS formed a scoring system of 0 to 100 with a score of ≥60 had an optimum sensitivity (72.5%) and specificity (60.1%) for determining undiagnosed diabetes with the Area Under the Curve (AUC) for the Receivers Operating Characteristics (ROC) curve of 0.698.[10] This risk score was derived using four simple variables which included two modifiable and two non-modifiable risk factors namely age, family history, physical activity and waist circumference.

Physical inactivity is measured as the fourth leading risk for global mortality, causing an estimated 3.2 million deaths globally.[11] Large clinical trials have shown that increased physical activity reduces the risk of developing T2DM by 15–60%. Studies have been done to find the risk score in the coastal areas of Karnataka. However, screening of Udupi population was not carried out. Thus, this study aims at finding out the risk for T2DM using IDRS and physical activity levels in Udupi population.

MATERIAL & METHODS

The study was initiated after the approval from institutional ethics committee (IEC) conducted at diabetic clinic, Department of Physiotherapy, Kasturba Hospital, Manipal, Dr. TMA Pai Hospital, Udupi, community centers in Udupi and various Health check-up camps. The study was approved by the Institutional Ethics Committee, Kasturba Hospital, Manipal, Karnataka, India. The convenient study sampling design was used.

In the current study, we included asymptomatic and undiagnosed participants for T2DM whose age ranged between 30yrs–65yrs. Participants with the history of any previous neurological conditions and were pregnant at the time of assessment were excluded. Participants were explained the purpose of the study by principal investigator, those who were willing to take part in the study, written informed consent was obtained. RBS was measured using Accu-check Performa nano-glucometer. Blood pressure was measured in high sitting position, with back straight, feet touching the ground and arm at the level of heart stabilized on hard surface using digital sphygmomanometer Omron (HEM-7121). Both glucometer and digital sphygmomanometer were calibrated periodically.

Along with demographic details of the participants' anthropometric measurements like height, weight, waist circumference was noted. Height was measured stadiometer and weight was measured using health sense personal scale (PS 130). Waist circumference was measured using an inch tape in horizontal plane, at the level of iliac crest at the end of normal expiration.

Risk for the development of diabetes mellitus was assessed using the IDRS and the participants were categorized as high risk if the score ≥60, moderate risk score 30–50 and low risk score <30. The participants level of physical activity was assessed using GPAQ questionnaire, and the overall energy expenditure using GPAQ data was calculated in the form of MET minute/wk. level of physical activity was further classified based on MET minute/week into four groups as Sedentary (0–600 MET-min/wk), minimally active (600–1200 MET-min/wk), active (1200–6000 MET-min/wk) and highly active (≥6000 MET-min/wk).

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 15. A test for normality was done. Normally distributed data were represented as a mean and standard deviation. The level of significance was kept at p≤0.05.

RESULTS

A total of 27,000 participants were screened, based on inclusion and exclusion criteria 23,960 participants were included in the study. The average age of the participants was 49.06 ± 14.44, the mean body mass index (BMI) was 28.8 kg/m². The demographic characteristics of the study

Table 1: Demographic characteristics of the participants (n=23,960)

Variable	Mean ± SD
Age, yrs	49.06 ± 14.44
Weight, kg	57.11 ± 63.23
BMI, kg/m^2	28.80 ± 1.26

Table 2: Parameters of the study participants

Variable	Mean ± SD
RBS, mg %	114.87 ± 41.81
Systolic blood pressure, mm Hg	126.23 ± 24.4
Diastolic blood pressure, mm Hg	94.71 ± 16.5
IDRS score	66 ± 24

participants are mentioned in table 1. The average RBS, BP and IDRS score is mentioned in table 2.

In the present study, the risk stratification for the development of type 2 diabetes was done based on IDRS under which 6.9% were under lower risk category, 24.9% were under moderate risk category, and 68.2% were under higher risk category table 3. Using GPAQ, level of physical activity was estimated of the study participants. Based on MET value participants were classified as sedentary, minimally active, very active and highly active. 14% of the participants were under sedentary lifestyle category, 27.6% participants were minimally active, 53.7% participants were very active, and 4.6% were highly active. 8.0% of the participants below 35 yrs of age, 15.5% participants between 35–49 yrs and 18.1% participants above 49 years fall under sedentary and minimally active PA levels and 7.8% and 14.7% of the male participants and 6.2%, and 12.9% of the female participants fall under sedentary and minimally active level of physical activity category respectively table 4. Significant correlation was found between IDRS score and level of physical activity R$_s$ 0.04 table 5.

DISCUSSION

Simplified Indian diabetes risk Score is a tool that can be used for identifying the risk of T2DM in future. It includes both the modifiable and non-modifiable risk factors which contribute to predicting the risk of T2DM. In the present study, we have used simplified Indian diabetes risk Score for identifying newly detected high-risk participants in the Udupi population.

In the current study, based on IDRS risk stratification 68.2% participants have a higher risk of developing T2DM in Udupi population. Similar findings were reported in the study conducted in urban Pondicherry,[12] urban slum in Pune[13] and the rural areas of Tamil Nadu[14] with 31.2%, 36.55% and 18.66% of the population having a higher risk score respectively. The difference in the risk prevalence between the current study and the one with Pondicherry and Pune may be due to lifestyle and environmental variation and dietary modification of the population.

A study conducted in Southern Indian population in coastal Karnataka found out that using an IDRS score, 62.2% of people living with undiagnosed diabetes in that population could

Table 3: Risk for development of type 2 diabetes mellitus based on The Indian Diabetes Risk Score

Risk		IDRS range	Percentage value
Low risk		<30	6.9%
Moderate risk	score	30–50	24.9%
High risk		>60	68.2%

Table 4: Risk stratification and physical activity profile of the participants

PA level	IDRS Categorization			
	Low risk %	Moderate risk %	High risk %	Total %
Sedentary & minimum active, 0–600 MET-min/wk & 600–1200 MET-min/wk	1.8	18.6	23.3	41.7
Very active & highly active, 1200–6000 MET-min/wk & ≥6000 MET-min/wk	4.1	28.6	25.7	58.3

Table 5: Association between risk stratification and physical activity profile

Variable	Mean	p value
IDRS and PA levels	6.109	0.047

be detected with a specificity of 73.7%.[15] A similar study was conducted using IDRS to Distinguish T2DM from Non-T2DM in which an IDRS of less than 60 was optimal for identifying non-T2DM and ≥60 for identifying T2DM with a sensitivity and specificity of 79.9% and 83.8%.[16] A study was done in Srilanka using IDRS to screen undiagnosed diabetes wherein the study concluded the screening tool as a simple, low-cost and a non-invasive tool for stepwise community level screening.[17]

PA has beneficial effects on glucose metabolism with an increase in PA levels there can be an increase in peripheral insulin sensitivity which in turn increases muscle glucose uptake. In the present study, 14% and 27.6% of the participants fall under sedentary and minimally active PA levels of which 7.8% and 14.7% of the male participants and 6.2% and 12.9% of the female participants fall under the same PA levels. A similar study was performed which found that physical inactivity was 67.3% and 71.0% for males and females, but the study included young population.[18]

In a meta-analysis which included low versus high PA, leisure time activity, occupational activity, walking and cardiorespiratory fitness, showed a significant statistical reduction in most of the activities and these were associated with 25–40% reduction in the relative risk of T2DM, while walking, occupational activity and cardiorespiratory fitness was associated with 15%, 15% and 55% decrease in the relative risk

of T2DM, respectively. Besides, participants with increased PA levels or those into high PA levels over time had a 36% and 41% and subsequently had a lower risk of T2DM.[19] Lower PA levels in the present study can be associated with other risk factors, including BMI and the waist circumference on the higher side and participants above 49 years of age were minimally active in most of the PA domains including occupational PA or recreational PA thus showed more of a sedentary lifestyle.

CONCLUSION

The present study concludes that based on IDRS risk stratification 68.2% participants have a higher risk of developing T2DM in future. Regarding physical activity levels, 14% and 27.6% of the participants included in the study falls under sedentary and minimally active.

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