Original Article

Finnish Diabetic Risk Score: A Tool for Predicting Risk of Undiagnosed Type 2 Diabetes Mellitus

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Abstract

Objectives: The objective of the study was to assess the performance of the Finnish Diabetic Risk Score (FINDRISC) questionnaire for detecting and predicting risk of type 2 Diabetes mellitus (T2DM) in patients attending a primary health centre. **Materials and Methods:** We conducted a cross-sectional study comprising 1530 adult participants, age (>20 yrs) attending Outpatient department of a primary health centre located at Harwan, district Srinagar without a diagnosis of T2DM. The risk of developing T2DM was assessed using the validated and widely used FINDRISC. Total Risk Score of each participant was analysed and compared. **Results:** Data on 1530 participants with unknown diabetes mellitus were analysed.46% of participants were male, and 54% were females. About 55% of participants were literate, 20% were current smokers, 18% had a family history of diabetes mellitus, 15% had a family history of hypertension .48.03% of the study participants have FINDRISC score of less than 7, 28.69% of participants have FINDRISC score between 7-14. Only 3.07% participants have FINDRISC scores of >20. 12% of the participants had a moderate risk for type 2 diabetes of 17% to become diabetic in the next 10 years, and another 10.58% had a high or very high risk of 33-50% to become diabetic in the next 10 years. **Conclusion:** The FINDRISC questionnaire designed by Finnish diabetic association is a useful screening tool to identify unknown T2DM and estimates the probability of a person to develop diabetes within the next 10 years.

Keywords: Finnish diabetes risk score; Type 2 diabetes mellitus; Pre-diabetes; Screening; FINDRISC score in Kashmiris

Introduction

Diabetes mellitus (DM) affects around 8.3% of world's adult population, and World health organization has predicted the total number of cases of DM to rise from 371 million in 2012 to 552 million in 2030 [1]. This increase in the cases of DM may be due to high prevalence and low incidence of the disease, the rising prevalence of overweight and obesity, lack of physical activity, and changes in the demographic characteristics of the population [2]. Among DM cases, more than 90% of patients have type 2 diabetes mellitus (T2DM), and over 50% of cases are undetected [1]. DM risk scores [3]. is an easy, less time consuming, non-invasive, and cost effective approach to assess an individual's risk of Undiagnosed T2DM and dysglycaemia.

In our study we have used Finnish Diabetes Risk Score (FINDRISC) which is one of the most frequently used instruments for assessing the risk of DM [4]. FINDRISC assesses whether an individual has Undiagnosed T2DM or dysglycaemia or the probability of developing T2DM during the following 10 years. However, to our knowledge; no studies have examined the validation of FINDRISC score for detection of UT2DM in Kashmiri population. We performed this study to evaluate the performance of FINDRISC score for screening of UT2DM and any dysglycaemia in a representative sample of the Kashmiri population living in Harwan Zone, district Srinagar.

Materials and Methods

A cross-sectional study was undertaken to evaluate the performance of Finnish Diabetes Risk Score among adult patients (age >20 years) attending Outpatient department of a primary health centre located at Harwan, district Srinagar. Prior ethical clearance from the departmental head was sought out and only those patients who gave written informed consent were included in the study. A total of 1530 patients participated in the study from January 2016 to July 2016. Each participant was selected using systematic sampling where every third adult patient (age >20 years) attending the Outpatient department of primary health care centre was included in the study. Participants with known DM and pregnant women were excluded from the study. We used Finnish Diabetes Risk Score (FINDRISC) designed by Finnish diabetes association which is one of the most frequently used instruments for assessing the risk of DM. It comprises of only eight variables associated with anthropometric parameters and lifestyle factors: Age, BMI, waist circumference, family history of diabetes, and use of blood pressure medication,

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history of elevated blood glucose, daily physical activity, and daily consumption of vegetables, fruit, and berries. Total Risk Score of each participant was analysed and compared. Score Lower than 7 Low: estimated 1 in 100 will develop disease. 7–11 slightly elevated: estimated 1 in 25 will develop disease. 12–14 Moderate: estimated 1 in 6 will develop disease. 15–20 High: estimated 1 in 3 will develop disease. Higher than 20 Very high: estimated 1 in 2 will develop disease. Each study participant was made aware of his FINDRISC score and those having scores ≥12 were given health education about risk and preventive measures for diabetes and participants were advised to carryout blood sugar tests wherever necessary.

Statistical analysis was done using SPSS statistical software v 20.0. Statistical methods included the t-test, one-way analysis of variance, and the chi-square test. Data was presented by mean ±, Standard Deviation $p< 0.05$ was considered statistically significant.

Results

Complete data on 1530 participants with unknown diabetes mellitus were available. Of these participants, 704 (46%) were male, Age (mean ± SD = 61.4 ± 6.2 years) and 826 (54%) were females, Age (Mean ± SD =59.6±5.9). About 55% of participants were literate, 20% were current smokers, 18% had a family history of diabetes mellitus, 15% had a family history of hypertension and there was no significant difference in values for blood pressure among participants of both sexes [Table 1].

Table 1: Baseline characteristics of study participants

Variables	Total	Men	Women	p-value*
Subjects %	1530	704 (46%)	826 (54%)	
Age, Mean (SD)	60 (6)	61.4 (6.2)	59.6 (5.9)	0.14
Education % (n)	840 (54.9)	489 (58.2)	351 (41.8)	<0.01*
Current Smoking % (n)	293 (19.1)	289 (41.05)	4 (0.48)	<0.01*
Family History of Diabetes mellitus % (n)	276 (18.03)	141 (51.08)	135 (48.91)	0.03
Family history of hypertension % (n)	235 (15.35)	121 (51.48)	114 (48.51)	<0.01*
[1]Systolic Blood pressure, Mean (SD)	124 (6.9)	128 (15.8)	121 (17.1)	<0.01*
[1]Diastolic Blood pressure, Mean (SD)	77 (9.9)	79 (9.9)	75.8 (9.7)	<0.01*
[2]FINDRISC Score	11.45 (4.80)	11.10 (4.77)	12.18 (4.80)	

[1]Data are presented as mean ± SD for continuous variables; [2] WILCOXON rank sum test P<0.05

Almost half of the study participants have FINDRISC score of less than 7, one third of participants have FINDRISC score between 7-14. Only 3.07% participants have FINDRISC scores of >20. The study sample characteristics are described in relation to FINDRISC categories in Table 2.

Table 2: Evaluation of participants according to FINDRISC diabetic risk score

Variables	< 7 (n =735)	7-11 (n =439)	12-14 (n =184)	15-20 (n=125)	>20 (n =47)
Age (yrs)					
<45 yrs	128 (17.41%)	87 (19.81%)	52 (28.26%)	31 (24.80%)	13 (27.65%)
45-54 yrs	116 (15.78%)	93 (21.18%)	29 (15.76%)	7 (6.08%)	2 (4.25%)
55-64 yrs	359 (48.84%)	136 (30.97%)	57 (30.97%)	39 (33.91%)	14 (29.78%)
>64 yrs	132 (17.95%)	123 (28.01%)	46 (25.0%)	48 (41.73%)	18 (38.29%)
BMI					
<25 kg/m^2	696 (94.69%)	343 (78.13%)	71 (38.58%)	33 (26.40%)	0 (0.0%)
25-30 kg/m^2	39 (5.30%)	90 (20.50%)	103 (55.97%)	66 (52.80%)	18 (38.29%)
>30 kg/m^2	0 (0.0%)	7 (1.59%)	10 (5.43%)	26 (20.8%)	29 (61.70%)
Waist Circumference					
<94 cm for men/<80 cm for women	619 (84.21%)	338 (76.99%)	27 (14.67%)	22 (17.60%)	0 (0.0%)
94-102 cm for men/80 -88 cm for women	116 (15.78%)	58 (13.21%)	111 (60.32%)	42 (33.60%)	4 (8.51%)
>102 cm for men/>88 cm for women	0 (0.0%)	43 (9.79%)	46 (25.0%)	61 (53.04%)	43 (91.48%)
Less than 30 minutes of physical activity	0 (0.0%)	21 (4.78%)	13 (7.06%)	11 (9.56%)	10 (4.7%)
History of Antihypertensive drugs	42 (5.71%)	72 (16.4%)	101 (54.89%)	98 (85.21%)	44 (93.61%)
History of High blood glucose	0 (0.0%)	35 (7.97%)	64 (34.78%)	67 (58.26%)	47 (100%)
Diabetes in Family					
No History	735 (100%)	426 (97.03%)	157 (85.32%)	45 (39.13%)	0 (0.0%)
2nd Degree Relatives	0 (0.0%)	0 (0.0%)	1 (0.54%)	2 (1.73%)	1 (2.12%)
1st Degree Relatives	0 (0.0%)	13 (2.96%)	26 (14.13%)	68 (59.13%)	46 (97.87%)

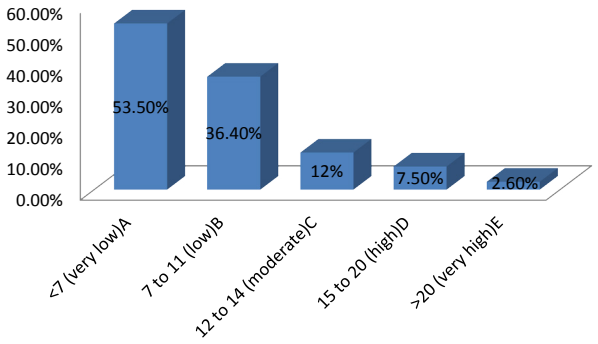
Data are presented as n (%). FINDRISC: Finnish Diabetes Risk Score.

Distribution of the results of the FINDRISC questionnaire is shown in Figure 1. Twelve percent of the participants had a moderate risk for type 2 diabetes of 17% to become diabetic in the next 10 years, and another 10.58% had a high or very high risk of 33–50% to become diabetic in the next 10 years. Of the 1530 participants, 346 (22.61%) participants had a FINDRISC score of ≥ 12.

Discussion

In this study we report on Finnish Diabetes Risk Score for estimating the probability of a person to develop diabetes within the next 10 years. Use of such a scoring system is of great significance and could prove to be cost effective, reliable, valuable and easy to use screening tool for detecting risk

of diabetes. In countries like India where there is a marked explosion of diabetes and over half of the cases remain undiagnosed, FINDRISC scoring system can be used by primary care physicians at a primary care setup in determining 10 year risk of developing DM.



Corresponding estimated diabetes probability within 10 years: A 1%, B 4%, C 17%, D 33%, E 50%

Figure 1: Distribution of Finnish Diabetes Risk Score (FINDRISC) in the study population (N=1530).

The current study assessed the performance of the FINDRISC questionnaire, and clearly demonstrates that this scoring system can work reasonably well as screening tool, detecting undiagnosed T2DM in the general population. Findings in this study showed a positive association between the FINDRISC score and undiagnosed T2DM in the general population. Using the cut-off Score values of greater or equal to 14 in men and women, 11.24% (9.68-12.8), this screening tool had good performance in identifying undiagnosed T2DM. The results of our study were comparable with the results from earlier studies. Viitasalo et al. [5] reported a prevalence of FINDRISC ≥ 14 (12.9%) in the Finnair personnel, Gyberg et al. [6] in an online work-place survey in Sweden have found a prevalence of FINDRISC ≥ 15 in an online workplace survey in to be 8.4%. Another study from Bulgaria by Tankova et al. [7] among 2169 subjects demonstrated FINDRISC score ≥ 12 of 10.1% ± 3.4 in non-glucose tolerance group and 13.8 ± 4.3 in impaired fasting glycaemia group which is in accordance with results of our study. Franciosi [8] conducted a study on 1377 individuals and found diabetic risk score values showed a marked variation according to glucose metabolism categories, 8.7% +/- 3.0 in normo-glycaemic individuals, 9.5% +/- 3.1 in individuals with impaired fasting glucose, 9.9% +/- 3.3 in individuals with IGT, and 12.0% +/- 3.5 in individuals with type 2 diabetes. Studies have shown that T2DM is a major and an important independent risk factor for developing cardiovascular disease and death [9]. Therefore, early identification of individuals with undiagnosed T2DM and detecting individuals at risk for developing T2DM in near future is essential for early implementation of preventive measures, reducing economic costs and morbidity associated with diabetic complications [10]. The FINDRISC score was originally developed with the intention to use in prospective settings to detect high risk individuals for development of T2DM. We have used it in a cross-sectional setup for estimating risk of getting T2DM in the near future. The results of our study are in accordance with other studies using different validated risk scores [11-14]. Furthermore, different studies have used different cut off values of FINDRISC score to identify individuals at high risk. Saaristo et al. [15] in their study found 13% of study participants above the cut of value of 12, which is comparable to that of our study. T2DM is a disease with high prevalence and low incidence so its detection is often delayed and at the time of diagnosis advanced complications are frequently present. Hence, using FINDRISC score which is a simplified and valid questionnaire as a preliminary screening tool followed with more invasive and accurate diagnosis in primary care constitutes a cost effective and practical method with a potentially high national impact in terms of public health.

The applicability of FINDRISC scores may vary between populations, and therefore, these should be validated in each population beforehand. It is worth mentioning that there are several methodological differences between the several studies that have validated the FINDRISC questionnaire; modified or shortened versions have been used, in some studies the plasmatic glycaemia tests have been only performed in subjects with a particular score, and in other cases pre-diabetes or metabolic syndrome has been also considered as an outcome [16-19]. Therefore, the present study should be compared to these previously conducted studies with caution.

Limitations of the Study

First, the participants were drawn from a single primary healthcare Centre located at Harwan, district Srinagar and, thus, the results may not be applicable to the rest of Jammu and Kashmir state. Secondly, sample size was relatively small but findings were in accordance with other studies in different populations [20,21]. Thirdly, diagnosis of T2DM using biochemical markers were not done for patients with higher FINDRISC scores. Fourth, more respondents in our study were women, and this may partly be explained by behavioural habits, women are more likely to participate in completing questionnaires, they visit Health care providers more often, and usually they spend more time at home.

Conclusion

The FINDRISC questionnaire designed by Finnish diabetic association is a useful screening tool to identify unknown T2DM and estimates the probability of a person to develop diabetes within the next 10 years. The questionnaire is a reliable, valuable and easy to use screening tool which can be used in a primary care setup. The findings may help the health care professionals to substantiate the possible improvement in glucose metabolism and lifestyle changes, and better convince people at high risk of T2D to take action towards healthier lifestyle habits.

Conflict of Interest

All authors disclose that there was no conflict of interest.

References

1. Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes Atlas: Global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract 2011; 94:311–312. doi:10.1016/j.diabres.2011.10.029 PMID:22079683

2. Waugh NR, Shyangdan D, Taylor-Phillips S, Suri G, Hall B. Screening for type 2 diabetes: a short report for the National Screening Committee. Health Technol Assess 2013; 17:1–90.

3. Lee CM, Colagiuri S. Risk scores for diabetes prediction: the

International Diabetes Federation PREDICT-2 project. Diabetes Res Clin Pract 2013; 100:285–286.

4. Lindström J, Tuomilehto J. The diabetes risk score: a practical tool to predict type 2 diabetes risk. Diabetes Care 2003; 26:725–731. PMID:12610029
5. Viitasalo K, Lindström J, Hemiö K, Puttonen S, Koho A, Härmä M, et al. Occupational health care identifies risk for type 2 diabetes and cardiovascular disease. Prim Care Diabetes. 2012;6:95–102.
6. Gyberg V, Hasson D, Tuomilehto J, Rydén L. Measuring risk online – Feasibility of using FINDRISC in an online workplacesurvey. Prim Care Diabetes. 2012;6:103–107.
7. Tankova T, Chakarova N, Atanassova I, Dakovska L. Evaluation of the Finnish Diabetes Risk Score as a screening tool for impaired fasting glucose, impaired glucose tolerance and undetected diabetes. Diabetes Res Clin Pract. 2011;92:46–52
8. Franciosi M, De Berardis G, Rossi MC, Sacco M, Belfiglio M, Pellegrini F, et al. Use of the diabetes risk score for opportunistic screening of undiagnosed diabetes and impaired glucose tolerance: the IGLOO (Impaired Glucose Tolerance and Long-Term Outcomes Observational) study. Diabetes Care 2005; 28:1187-1194.
9. Narayan KM, Gregg EW, Fagot-Campagna A, Engelgau MM, Vinicor F. Diabetes-A common, growing, serious, costly, and potentially preventable public health problem. Diabetes Res Clin Pract 2000; 50Suppl 2: S77S84.
10. American Diabetes Association. Standards of medical care in diabetes--2014. Diabetes Care 2014; 37 Suppl 1: S14-S80 [PMID: 24357209 [DOI: 10.2337/dc14-S014].
11. Glumer C, Carstensen B, Sandbaek A, Lauritzen T, Jorgensen T, Borch Johnsen K. A Danish diabetes risk score for targeted screening: The Inter99 study. Diabetes Care 2004;27:727-733.
12. Lorenzo C, Okoloise M, Williams K, Stern MP, Haffner SM. The metabolic syndrome as predictor of type 2 diabetes: the San Antonio heart study. Diabetes Care2003;26:3153-3159.
13. Park PJ, Griffin SJ, Sargeant L, Wareham NJ. The performance of a risk score in predicting undiagnosed hyperglycemia. Diabetes Care2002;25:984-988.
14. Baan CA, Ruige JB, Stolk RP. Performance of a predictive model to identify undiagnosed diabetes in a health care setting. Diabetes Care1999;22:213-219.
15. Saaristo T, Peltonen M, Saarikoski L, Sundvall J, Eriksson JG, Tuomilehto J. Cross-sectional evaluation of the Finnish Diabetes Risk Score : a tool to identify undetected type 2 diabetes, abnormal. 2005;2(2):67–72.
16. Lahoz C, Mostaza JM, Cabo EE, Río VC, Group S-. Performance of the Finnish Diabetes Risk Score and a Simplified Finnish Diabetes Risk Score in a Community-Based , Cross-Sectional Programme for Screening of Undiagnosed Type 2 Diabetes Mellitus and Dysglycaemia in Madrid , Spain : The SPREDIA-2 Study. 2016;1–17
17. Gomez-arbelaez D, Alvarado-jurado L, Ayala-castillo M, Forero-naranjo L, Anthony P, Lopez-jaramillo P, et al. Evaluation of the Finnish Diabetes Risk Score to predict type 2 diabetes mellitus in a Colombian population : A longitudinal observational study. 2015;6(17):1337–1344.
18. Dugee O, Janchiv O, Jousilahti P, Sakhiya A, Palam E, Nuorti JP, et al. Adapting existing diabetes risk scores for an Asian population : a risk score for detecting undiagnosed diabetes in the Mongolian population. BMC Public Health [Internet]. 2015;1–9. Available from: http://dx.doi.org/10.1186/s12889-015-2298-2299
19. Väätäinen S, Cederberg H, Roine R, Keinänen-kiukaanniemi S. Does future diabetes risk impair current quality of life ? A cross-sectional study of health-related quality of life in relation to the Finnish Diabetes Risk Score (FINDRISC). 2016;1–15.
20. Soriguer F, Valdés S, Tapia MJ, Esteva I, Ruiz de Adana MS, Almaraz MC, et al. Validation of the FINDRISC (FINnish Diabetes RIsk SCore) for prediction of the risk of type 2 diabetes in a population of southern Spain. Pizarra Study].. Med Clin(Barc) 2012; 138: 371-376 [PMID: 21939990 DOI: 10.1016/j.medcli.2011.05.025].
21. Barengo NC, Acosta T, Arrieta A, Ricaurte C, Mayor D, Tuomilehto JO. The DEMOJUAN study group. Screening for people with glucose metabolism disorders within the framework of the DEMOJUAN project (demonstration area for primary prevention of type 2 diabetes, JUAN Mina and Barranquilla, Colombia). Diabetes Metab Res Rev 2013.