Stratification of risk factors for type 2 diabetes mellitus in health professionals

Estratificação dos fatores de risco de diabetes *mellitus* tipo 2 em profissionais da saúde

Cynthia Kallás Bachur[1]
Ana Flávia Parreira de Morais[2]
Henry Donizete Caetano Vanoni[2]
Isadora Souza Ribeiro[2]
Sarah da Silva Candido[3]

[1] Universidade de Franca, Cursos de Fisioterapia e de Medicina. Franca, SP, Brasil.

[2] Universidade de Franca, Curso de Medicina. Franca, SP, Brasil.

[2] Universidade de São Paulo, Curso de Pós-graduação em Ciências. Ribeirão Preto, SP, Brasil.

Correspondence
Cynthia Kallás Bachur
E-mail: kabachur@gmail.com

Abstract

Aim: Identifying the risk factors for diabetes mellitus in health professors. *Methods*: We used the Finnish Diabetes Risk Score questionnaire with modifications -herein called "Questionnaire: risk of having diabetes"- in order to stratify the risk of developing this pathology within ten years. The questionnaire comprised eight questions whose scoring is presented as follows: low risk <7 points; slightly high risk from 7 to 11 points; moderate risk from 12 to 14 points; high risk from 15 to 20 points; and very high risk> 20 points. *Results*: Fifty professors from the medical course of a private institution participated in the study - mean age was 41.7 ± 10.1 years. According to the score obtained in the questionnaire, 20 (40%) participants presented low risk of developing diabetes mellitus; 12, slightly high risk; 10, moderate risk; and 8, high risk. No participants were classified as very high risk. *Conclusion*: Based on our results, 60% of the herein analyzed sample presented risk of developing type 2 diabetes mellitus within ten years.

Keywords: Diabetes mellitus. Risk factors. Health professionals.

Resumo

Objetivo: Identificar os fatores de risco para o desenvolvimento de diabetes em docentes da área da saúde. *Métodos:* Para estratificar o risco de desenvolver essa patologia em dez anos, utilizou-se o questionário modificado do *Finnish Diabetes Risk Score*, denominado "Questionário: risco de ter diabetes", composto por oito questões, com o escore: risco baixo < 7 pontos; risco pouco elevado entre 7 e 11 pontos; risco moderado entre 12 e 14 pontos;

risco alto de 15 a 20 pontos; e > de 20 pontos, risco muito alto. *Resultados:* Participaram 50 docentes do curso de Medicina de uma instituição privada, com idade média de 41,7 ± 10,1 anos. De acordo com a pontuação obtida no questionário, 20 (40%) participantes apresentaram baixo risco; 12, risco pouco elevado; dez, risco moderado; e oito, risco alto. Nenhum participante foi classificado como tendo risco muito alto. *Conclusão:* A partir desses resultados, observou-se que 60% da amostra analisada apresentam risco de desenvolver diabetes *mellitus* tipo 2 em dez anos.

Palavras-chave: Diabetes *mellitus*. Fatores de risco. Profissionais da saúde.

Introduction

Diabetes mellitus (DM) has been continuously investigated due to its increasing prevalence, besides being often associated with dyslipidemia, hypertension and endothelial dysfunction.[1] According to estimates, nowadays the world population with DM comprises approximately 387 million individuals and this number may increase to 471 million people by 2035.[2] This number is increasing due to population growth and aging, increased urbanization rates, progressive prevalence of obesity and sedentary lifestyle, as well as to increased survival of patients with type 2 diabetes mellitus.[2]

Type 2 diabetes mellitus accounts for 90% of diabetic patients[3] and it is one of the most threatening public health issues in the 21st century. Changes in human behavior and lifestyle,in association with globalization, have dramatically increased Type 2 MD prevalence and incidence worldwide.[4] Among the factors indicating higher risk of developing DM, one finds: age over 45 years, overweight, family history of diabetes, hypertension, dyslipidemia, history of macrosomia or gestational diabetes, previous diagnosis of polycystic ovarian syndrome and cardiovascular, cerebrovascular or peripheral vascular disease.[5]

According to the*FinnishDiabetesPreventionStudy,*lifestyle changes applied over seven years decreased the incidence of diabetes mellitus by 43%.[6] Results of the Diabetes Prevention Program showed 34% lessincidence of diabetes mellitus cases in a 10-year follow-up due to the adoption of healthy diets and to exercising.[7]

In addition, approximately 50% of the population with diabetes mellitus isnot aware of the disease, which sometimes is not diagnosed until after the associated complications emerge. Therefore, screening campaigns are indicated to identify asymptomatic individuals at increased risk of developing the disease, although there are no clinical trials documenting the resulting

benefits; moreover,the cost-effectiveness ratio is questionable. High-risk individuals require laboratory diagnostic investigation based on fasting glycemia and/or glucose tolerance test.[4]Some studies have pointed out that people who present negative results can be tested every three to five years. Cases of impaired glucose tolerance, impaired fasting glucose or previous gestational diabetes can be tested on a yearly basis.[8]

In light of the need of screening patients with type 2 diabetes mellitus, or patients at high risk of developing it, the aim of the current study was to identify the risk factors for this pathology in health professors.

Methods

The current research is a descriptive cross-sectional study conducted with medical professors in a private higher education institution in the countryside of São Paulo State in 2018.

Participants were personally invited to participate and, after their consent, day and time to respond to the instrument and collect the variables proposed in the study were scheduled, depending on the availability of both parties. The time for answering the questionnaire could not exceed 30 minutes.

The Finnish Diabetes Risk Score (FINDRISC) questionnaire, also called "Questionnaire: risk of having diabetes",iscomposed of eight questions. It was applied to stratify the risk of developing diabetes mellitus within ten years.The instrument was adapted by the Center for Excellence in Diabetes Care ofthe Clinical Hospitalof the Medical School ofUniversity of São Paulo in order tomatchthe Brazilian reality[9] in 2012.The assessed variables comprised: age, BMI, abdominal circumference, exercising, daily intake of fruits and vegetables, use of antihypertensive drugs, history of glycemia level above the reference values and family history of diabetes mellitus. The questionnaire counted on a standardized score to predict the risk of developing diabetes mellitus within the next ten years, as follows: low risk (less than 7 points)- i.e., one in every 100 people may develop the disease; slightly elevated risk (from 7 to 11 points) – i.e., one in 25 people may develop the disease; moderate risk (from 12 to 14points) – i.e., one in every six people may develop the disease; high risk (from 15 to 20 points) - one in every three people may develop the disease; and very high risk (more than 20 points) – i.e., one in every two people may develop the disease.[10]

Participants were subjected to anthropometric evaluation in order to measure their body mass index (BMI), also known as Quetelet index, and to classify whether they were, or not, obese.Based on the clinical practice, BMI is calculated by dividingthe patients' body weight (kg) by the square of their height (cm). It is necessary basing BMI on mathematically defined criteria in order to define obesity for practical application purposes. According to WHO,[11] nowadays, BMI is accepted as an international obesity measurementstandard.

A portable digital scale (Líder Balanças) - 120 kg capacity and 0.1 kg precision - was used to determine participants' weight.The scale was placed on leveled ground and the automatic display was activated when barefoot participantswearing light clothing stepped on the center of its base. A measuring tape (0.5 cm precision) fixed on a smooth wall was used to measure participants' height; participants stood barefoot, with their back straight, heels close to each other and arms extended alongside the body. BMI was classified based on means of constant values. BMI classification complied with the Brazilian ObesityGuidelines, 2016[11]: normal weight between 18.5 and 25 kg/m²; overweight between 25 and 30 kg/m²; obesity between 30 and 40 kg/m²; severe obesity above 40 kg/m².

Participants were placed in supine position and asked to take a deep breath in order to have their waist circumference measuredat the end of the expiration process.The measurement site was the one recording the largest abdominal perimeter between the last rib and the iliac crest. The following values wereclassified ascentral obesity: abdominal waist> 102 cm, for men; and> 88 cm, for women.[11]

A brief explanation was given to participants after questionnaire application and risk stratification. It was donein order toencourage them to adopt preventive strategies such as exercising, self-care, dietary re-education and medical referral of suspected cases.

All collected data were stored in Microsoft Excel spreadsheet for analysis purposes. Next, they were transferred to the Stata 9.0 statistical software for absolute and relative frequency calculations. Quantitative variables (age, weight, height and body mass index) were expressed as mean and standard deviation. Inclusion criterion was Medical School professors of a private educational institution who were present in thedata collectiondays. Professors who did not want to voluntarily participate in the study, and those who reported to have type 2 diabetes mellitus, were excluded from it.

The study was developed after it was approved by the Research Ethics Committee (CAAE protocol n. 73143117.8.0000.5495) in compliance with the ethical and legal principles of Resolution 466/2012. All participants voluntarily signed the Free and Informed Consent Term.

Results

Fifty (50) health-field professors participated in the study: 25 women and 25 men; mean age 41.7 + 10.1 years.

According to the stratification of the risk of developing type 2 diabetes mellitus within ten years, and based on the questionnairescore, 20 (40%) participants presented low risk, 12 presented slightly elevated risk, 10 recorded moderate risk and 8 showed high risk of developing the disease. No

participant was inthe very high-risk category. Table 1 presents associations between the stratification of the risk of developing type 2 diabetes mellitus and variables addressed in the questionnaire.

Table 1. Risk stratification for type 2 diabetes mellitus. Franca, Brazil, 2017.

Variables	Low	Slightly high	Moderate	High
	n (%)	n (%)	n (%)	n (%)
Gender				
Female	9(45)	9(75)	4(40)	3(37.5)
Male	11 (55)	3(25)	6(60)	5(62.5)
Age (years)				
< 45	17(85)	10(83.33)	4(40)	1(12.5)
45-54	2(10)	2(16.66)	3(30)	5(62.5)
55-64	1(5)	0	2(20)	2(25)
> 65	0	0	1(10)	0
BMI				
Normal	13(65)	7(58.33)	2(20)	0
Overweight	7(35)	4(33.33)	6(60)	5(62.5)
Obesity	0	1(8.33)	2(20)	3(37.5)
Abdominal circumference in women (cm)	8(88.88)	5(55.55)	1(25)	0
< 80	1(11.11)	4(44.44)	1(25)	1(33.33)
80 a 88	0	0	2(50)	2(66.66)
> 80				
Abdominal circumference in men (cm)				
< 94	9(81.81)	0	0	0
94 a 102	2(18.18)	2(66.66)	5(83.33)	2(40)
> 102	0	1(33.33)	1(16.66)	3(60)

to be continued

Variables	Low	Slightly high	Moderate	High
	n (%)	n (%)	n (%)	n (%)
Sedentary lifestyle				
Yes	9(45)	10(83.33)	7(70)	5(62.5)
No	11(55)	2(16.66)	3(30)	3(37.5)
Daily intake of fruits/vegetables				
Yes	18(90)	12(100)	8(80)	8(100)
No	2(10	0	2(20)	0
Daily intake of fried food/sweets				
Yes	8(40)	3(25)	3(30)	1(12.5)
No	12(60)	9(75)	7(70)	7(87.5)
Smoking				
Yes	1(5)	1(8.33)	0	0
No	18(90)	9(75)	10(100)	7(87.5)
Former smoker	1(5)	2(16.66)	0	1(12.5)
History of glycemic disorder				
Yes	0	1(8.33)	1(10)	3(37.5)
No	20(100)	11(91.66)	9(90)	5(62.5)
Hypertension				
Yes	0	1(8.33)	3(30)	3(37.5)
No	20(100)	11(91.66)	7(70)	5(62.5)
Family history of DM2				
1st degree of kinship	1(5)	4(33.33)	1(10)	2(25)
2nd degree of kinship	6(30)	6(50)	6(60)	1(12.5)
1st and 2nd degrees of kinship	1(5)	0	2(20)	4(50)
No	12(60)	2(16.66)	1(10)	1(12.5)

Results indicated that 60% of the analyzed sample presented risk of developing type 2 diabetes mellitus within ten years.

Discussion

Sample characterization revealed that most of the population at high risk of developing type 2 diabetes mellitus comprised men, as reported by Bittencourt et al.,[12]

who found that men recorded higher prevalence of high risk (6.6%) than women (0.8%).

Data collected in the current study complied with the multicenter study entitled "Prevalence of Diabetes in Brazil", which recorded increasing DM2 prevalence as patients aged: 2.7% for 30-59-year-old patients and 17.4% for 60-69-year-old ones; i.e., 6.4-fold increase.[2]

Sedentary lifestyle results complied with studies available in the literature, according to which, although the population knows about sedentary lifestyle-related issues, it still denies exercising. The main justifications for such behavior are lack of time or motivation; or even fatigue resulting from exhaustive workdays.[13] Besides sedentary lifestyle, it is worth highlighting the impact of daily fried food intake on the herein evaluated risk.

Carolino et al.[14] observed that approximately 66.66% of patients have a sedentary lifestyle and 69.69% of them adopt an unhealthy diet. Unhealthy diet is understood as the intake of saturated/ trans fats, sodium and simple carbohydrates.

According to the Portuguese Cardiology Foundation, tobacco is a risk factor for diabetes mellitus, besides having "multiplicative effect" on it.[15] The number of smokers in the present study was low, as shown in table 1.

Based on BMI, 44% of the participants in the current study were overweight and 12% were obese. The risk of developing diabetes mellitus decreased as the overweight and obesity rates decreased among the population at high risk of developing the disease. This outcome corroborated the study by Zardo et al.,[10] who assessed industrial workers and found 58.7% prevalence of BMI> 25, as well as 20% and 80% overweight prevalence in the population at high-risk of developing DM; the risk of developing the disease also decreased as patients' BMI decreased.

According to Escobar,[16] overweight, mainly abdominal obesity, contributes to the development of diabetes mellitus because it leads to increased resistance to glucose uptake by muscles, besides increasing glucose production in, and removal from, the liver; fact that favors the onset of glucose intolerance. Abdominal obesity was also classified as an important risk factor for DM in the current study, due to the association between increased abdominal circumference and higher risk of developing type 2 diabetes mellitus. One hundred percent (100%) of the population in the

high-risk category presented abdominal circumference at moderate or high risk for cardiovascular events, thus corroborating the study by Zardo et al.[10]

In addition, 37.5% of high-risk individuals reported having hypertension; this rate has progressively decreased in the other risk groups. This statistic corroborated Medeiros et al.,[17] who conducted a study with public servants and found significant association between fasting blood glucose and arterial hypertension.The aforementioned association increases the risk of developing diabetes mellitus by up to three times, since hypertension is linked to increased resistance to insulin and antihypertensive drugs, which are factors that may lead to complications.[18] In addition, both pathologies increase the overall cardiovascular risk and predispose patients to cardiovascular events such as thrombosis, heart attack and stroke, thus increasing morbidity and mortality rates.[19]

Our results corroborate the scientific literature, which reports that family history is an important risk factor, mainly for individuals older than 40 years.[14] Family history in the first degree of kinship increases the chances of developing type 2diabetes mellitus by two to six times.[14]

The Brazilian Diabetes Society[2] annually promotes the World Diabetes Day in November as an attempt to provide essential information about this disease to the population. Despite all the initiatives, actions should be taken to encourage the promotion of healthy habit and risk stratification practices, such as the continuous monitoring of health conditionsin several populations.The awarenessabout the risk, and its stratification,is the only way to reduce the high rate of people affected by type 2 diabetes mellitus.

Conclusion

Based on results in the present study, it is possible suggesting the implementation of campaigns focused on stratifying the risk of having people developing type 2 diabetes mellitus. Stratification is an effective screening strategy that enables identifying people who may develop this disease, so they can be encouraged to change their life habits in order to prevent complications.

Contributors

CK Bachur, AFP Morais, HDC Vanoni and IS Ribeiro contributed to the study elaboration and design, as well as to data analysis and interpretation. CK Bachur and SS Candido contributed to the writing of the manuscript, as well as to its adaptation to the norms of the journal. All authors reviewed and approved the last version of the manuscript. Conflict of interest: The authors declare no conflict of interest.

References

1. Brasil. Ministério da Saúde. Estratégias para o cuidado da pessoa com doença crônica: diabetes mellitus. Brasília: Ministério da Saúde; 2013. Cadernos de Atenção Básica, n. 36.

2. Sociedade Brasileira de Diabetes. Diretrizes da Sociedade Brasileira de Diabetes (2017-2018). São Paulo: Clannad; 2017.

3. O que é Diabetes? Sociedade Brasileira de Endocrinologia e Metabologia [Internet]. 26 mar. 2007. [acesso em: 7 jun. 2018]. Disponível em: https://www.endocrino.org.br/o-que-e-diabetes/

4. Marinho NBP, Vasconcelos HCA, Alencar AMPG, Almeida PC, Damasceno MMC. Risco para diabetes mellitus tipo 2 e fatores associados. Acta Paul Enferm. 2013; 26(6):569-574.

5. Moraes SA, Freitas ICM, Gimeno SGA, Mondini L. Prevalência de diabetes mellitus e identificação de fatores associados em adultos residentes em área urbana de Ribeirão Preto, São Paulo, Brasil, 2006: Projeto OBEDIARP. Cad Saúde Pública. 2010: 26(5):929-941.

6. Lindstrom J, Ilanne-Parikka P, Peltonen M, Aunola S, Eriksson JG, Hemiö K, et al. Finnish Diabetes Prevention Study Group. Sustained reduction in the incidence of type 2 diabetes by lifestyle intervention: follow-up of the Finnish Diabetes Prevention Study. Lancet. 2006; 368:1673-1679.

7. Knowler WC, Fowler SE, Hamman RF, Christophi CA, Hoffman HJ, Brenneman AT, et al. Diabetes Prevention Program Research Group. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. Lancet. 2009; 374(9702):1677-1686.

8. American Diabetes Association. Standards of medical care in diabetes - 2013. Diabetes Care. 2013; 36(Supl. 1):S11-S66.

9. São Paulo. Prefeitura. Secretaria Municipal da Saúde. Núcleo de Excelência no Atendimento ao Diabético do Hospital das Clínicas. Questionário: risco de ter diabetes [internet]. [acesso em: 7 jun. 2017]. Disponível em: https://www.prefeitura.sp.gov.br/cidade/secretarias/upload/saude/arquivos/programas/Questionario_Risco_de_ter_Diabetes_Telessaude.pdf

10. Zardo M, Bassan MB, Farias KCM, Diefenthaeler HS, Grazziotin NA. Rastreamento de fatores de risco para diabetes tipo 2 em trabalhadores de uma indústria da cidade de Concórdia-SC. Perspectiva, Erechim. 2015; 39(145):85-95.

11. Associação Brasileira para o Estudo da Obesidade e da Síndrome Metabólica. Diretrizes brasileiras de obesidade, 2016. 4 ed. São Paulo: ABESO; 2016.

12. Bittencourt A, Vinholes DB. Assessing the risk for type 2 diabetes mellitus in bank employees from the city of Tubarão, Santa Catarina state, Brazil. Sci Med. 2013; 23(2):82-89.

13. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Vigitel Brasil 2011. Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico. Brasília: Ministério da Saúde; 2012.

14. Carolino IDR, Fernandes CAM, Tasca RS, Marcon SS, Cuman RKN. Fatores de risco em pacientes com diabetes mellitus tipo 2. Rev Latino-Am Enfermagem. 2008; 16(2). Disponível em: http://www.scielo.br/pdf/rlae/v16n2/pt_11.pdf

15. Fundação Portuguesa de Cardiologia. [acesso em: 7 jun. 2018]. Disponível em: http://www.fpcardiologia.pt/

16. Escobar FA. Relação entre Obesidade e Diabete Mellitus Tipo II em Adultos. Cadernos UniFOA. 2009; (11):69-72.

17. Medeiros CCM, Bessa GG, Coura AS, França ISX, Sousa FS. Prevalência dos fatores de risco para diabetes mellitus de servidores públicos. Rev Eletr Enf. 2012; 14:559-69.

18. Francisco PMS, Belon AP, Barros MBA, Carandina L, Alves MCGP, Goldbaum M, et al. Diabetes auto-referido em idosos: prevalência e fatores associados e práticas de controle. Cad Saúde Pública. 2010; 26(1):175-184.

19. Bruno A, Pereira LR, Almeida HS. Avaliação da prevalência de fatores de risco para o desenvolvimento de diabetes mellitus tipo 2 em pacientes da Clínica Unesc Saúde. Demetra: Alimentação, Nutrição & Saúde; 2014; 9(3); 661-680.