

Refining Cardiovascular Risk Assessment in Type 2 Diabetes: SCORE2-Diabetes Perspective

Redefinindo a Avaliação do Risco Cardiovascular em Diabetes Mellitus Tipo 2: A Perspetiva SCORE2-Diabetes

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Abstract:

Introduction: Patients with diabetes have been classified as having a high or very high cardiovascular risk. The 2021 guidelines from the European Society of Cardiology (ESC) emphasize the ongoing need for improved development of risk scores specifically tailored for evaluating cardiovascular risk in individuals with type 2 diabetes *mellitus*. Acknowledging this necessity, the ESC guidelines of 2023 introduced SCORE2-Diabetes, a predictive model created to assess the 10-year cardiovascular disease (CVD) risk specifically in type 2 diabetes *mellitus* patients. By combining traditional and diabetes-specific risk factors, this innovative tool aims to enhance risk stratification and management, providing a nuanced approach to prevent cardiovascular diseases in this high-risk population.

This study aims to calculate and analyze the changes in cardiovascular risk within a cohort of patients with diabetes, utilizing the SCORE2-Diabetes.

Methods: Cross-sectional, observational, descriptive and unicentric study. A cohort of patients aged 18 or older with type 2 diabetes, attending the Day Hospital, was included. Individuals on steroids or erythropoietin-stimulating agents, those undergoing dialysis, pregnant patients, and anyone who could not comply or provide informed consent were excluded. Data was collected to calculate SCORE2-Diabetes, including age, gender, age at diabetes onset, glycated hemoglobin, HDL cholesterol, total cholesterol, LDL cholesterol, creatinine, systolic blood pressure and smoking status. Descriptive and inferential analysis was performed using STATAv18 software.

Results: A sample of 60 patients was considered, with 53 ultimately selected for inclusion. The median age was 68 years old (IQR 59; 75), with males constituting 58% of the sample and smokers 11%. Median glycated hemoglobin was 7% (IQR 6.5, 8.1). Utilizing the SCORE2-Diabetes for cardiovascular risk stratification, results showed 8% of patients at low risk, 32% at moderate risk, 44% at high risk, and 16% at very high risk. Notably, 40% of patients were classified as low or moderate risk, a significant finding given that previous guidelines

typically categorized individuals with diabetes *mellitus* as high or very high risk. These downgraded patients were younger, with smaller disease duration and higher estimated glomerular filtration rate ($p < 0.05$).

Conclusion: Our findings reveal a substantial proportion of patients previously categorized as high or very high risk now falling into the low or moderate-risk categories. The simplicity in calculation emphasizes SCORE2-Diabetes potential to refine precision in managing cardiovascular risk for this high-risk population.

Keywords: Cardiovascular Diseases; Diabetes Mellitus, Type 2; Heart Disease Risk Factors.

Resumo:

Introdução: Os pacientes diabéticos têm tendencialmente sido classificados como tendo um risco cardiovascular elevado ou muito elevado. As recomendações de 2021 da European Society of Cardiology (ESC) enfatizam a necessidade constante de melhorar as calculadoras de risco desenhadas especificamente para avaliação de risco cardiovascular em pacientes com diabetes *mellitus* tipo 2. Reconhecendo esta necessidade, as recomendações da ESC de 2023 introduzem o SCORE2-Diabetes, um modelo criado para avaliar o risco a 10 anos de doença cardiovascular especificamente em paciente com diabetes *mellitus* tipo 2. Através da integração de fatores de risco cardiovasculares tradicionais com fatores específicos que pretendem traduzir a extensão da doença diabética, esta ferramenta inovadora tenta melhorar a estratificação de risco e tratamento, providenciando uma abordagem detalhada para a população com risco cardiovascular muito elevado.

Este estudo tem como objetivo calcular e analisar alterações de risco cardiovascular, dentro da coorte de pacientes com diabetes utilizando o SCORE2-Diabetes.

Método: Estudo transversal, observacional, descritivo e unicêntrico. Foi incluída uma coorte de pacientes com 18 ou mais anos com diabetes tipo 2, que frequentam regularmente o Hospital de Dia. Indivíduos em tratamento com esteroides, agentes estimulantes de eritropoietina, em diálise, grávidas e qualquer indivíduo que não pudesse cumprir ou fornecer consentimento informado foram excluídos. Foram recolhidos

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dados para calcular o *SCORE2-Diabetes*, incluindo idade, sexo, idade de início da diabetes, hemoglobina glicada, colesterol HDL, colesterol total, colesterol LDL, creatinina, pressão arterial sistólica e hábitos tabágicos. Foi realizada uma análise descritiva e inferencial utilizando o *software* STATAv18,3.

Resultados: Foi considerada uma amostra de 60 pacientes, dos quais 53 foram incluídos. A mediana da idade foi 68 anos (IQR 59; 75), com homens a constituir 58% da amostra e fumadores 11%. A mediana de hemoglobina glicada foi de 7% (IQR 6,5; 8,1). Utilizando o *SCORE2-Diabetes* para estratificação do risco cardiovascular, os resultados dividem 8% dos pacientes em baixo risco, 32% em risco moderado, 44% em risco elevado e 16% em risco muito elevado. A salientar que 40% dos pacientes foram classificados como de risco baixo ou moderado, dado significativo uma vez que as recomendações anteriores categorizavam indivíduos com diabetes *mellitus* em risco elevado ou muito elevado. Os pacientes cujo risco foi diminuído eram mais jovens, tinham menor duração da doença e maior taxa de filtração glomerular estimada ($p < 0,05$).

Conclusão: Os nossos resultados revelam uma proporção substancial de pacientes anteriormente categorizados como risco elevado ou muito elevado que agora se enquadram nas categorias de risco baixo ou moderado. A facilidade de cálculo destaca o potencial do *SCORE2-Diabetes* para refinar a precisão no cálculo e gestão do risco cardiovascular para a população de risco elevado.

Palavras-chave: Diabetes Mellitus Tipo 2; Doenças Cardiovasculares; Fatores de Risco de Doenças Cardíacas.

Introduction

Patients with diabetes are often classified as having a high or very high risk of developing CVD, based on previous ESC guidelines.¹ This increased risk emphasizes the necessity for healthcare providers to accurately assess and manage cardiovascular (CV) risk in these patients to prevent CVD, a leading cause of morbidity and mortality in this group.

Managing type 2 diabetes *mellitus* (T2DM) requires a holistic approach, not just focusing on changing lifestyle and controlling blood sugar levels, but also addressing cardiovascular risks. This involves personalized interventions like treating dyslipidemia and using medications with proven cardiovascular benefits, such as SGLT2 inhibitors and GLP-1 receptor agonists.²

Traditional risk assessment models have provided valuable insights into the CV risk landscape; however, their effectiveness for the diabetic population is often compromised by a lack of specificity and sensitivity to diabetes-related factors.³ The European Society of Cardiology (ESC) has recognized the urgent need for more refined risk assessment tools. In 2021, ESC guidelines underscored the deficiency in existing risk scores not tailored for individuals with T2DM.

In response, the SCORE2-Diabetes was developed and introduced in the 2023 ESC guidelines, an innovative predictive model that marks a significant leap forward in CV risk management for T2DM patients. The SCORE2-Diabetes tool is crafted to estimate the 10-year CVD risk specifically in this patient cohort, integrating both traditional risk factors—such as age, sex, smoking status, blood pressure, and cholesterol levels—and diabetes-specific factors, including glycemic control (HbA1c), duration of diabetes, and estimated glomerular filtration rate (eGFR).²

The integration of this new score into clinical practice is imperative, yet its implications are still being delineated. Our primary aim is to compare cardiovascular risk stratification in patients with T2DM according to the previous ESC 2021 guidelines and the updated ESC 2023 guidelines, which include SCORE2-Diabetes. In addition, as a secondary aim, we sought to explore clinical and therapeutic differences between patients classified as low–moderate versus high–very high risk, to better understand the implications of this new stratification.

The primary aim of this study is to calculate and analyze the cardiovascular risk of Type 2 Diabetic patients using the novel stratification methods recommended in the 2023 guidelines in comparison with the previous methods, as seen in Table 1. The secondary aim is to compare demographic and clinical characteristics as well as therapeutic approaches between patients in the different risk categories according to the 2023 guidelines.

Methods

We performed a cross-sectional, observational, descriptive and unicentric study. A convenience sample was included. The inclusion criteria were patients aged 18 or older with type 2 diabetes, attending regularly to the Day Hospital of a tertiary hospital. Individuals with type 1 diabetes and pregnant patients were excluded.

We consulted the electronic medical records of these patients to collect demographic and clinical data. The last data available from the Day Hospital appointment was collected, including age, gender, age at diabetes onset, glycated hemoglobin, HDL cholesterol, total cholesterol, LDL cholesterol, creatinine, systolic blood pressure, active smoking status, previous ASCVD and target organ disease (TOD). Estimated glomerular filtration rate (eGFR) was calculated from serum creatinine values. Clinical ASCVD includes angina pectoralis, history of acute myocardial infarction (MI), acute coronary syndrome (ACS), arterial revascularization, stroke and peripheral artery disease (PAD), and clearly established ASCVD evidenced through imaging, like plaques visualized on a coronary angiography, carotid ultrasound, or CT-angiography. Medication use was recorded from patient files.

Patients were classified according to cardiovascular based on 2021 ESC guidelines and compared to SCORE2-Diabetes from 2023 ESC guidelines.

Table 1: Comparing clinical guidelines and LDL target

Risk categories	ESC 2021	ESC 2023	LDL target recommendations according to CVC risk
Low	-	Patients with T2DM not fulfilling the very high-risk criteria and a 10-year CVD risk <5% using SCORE2-Diabetes	No specific target
Moderate	Patients with well controlled short-standing DM (e.g. <10 years), no evidence of target organ disease (TOD) and no additional ASCVD risk factors	Patients with T2DM not fulfilling the very high-risk criteria and a: 10-year CVD risk 5 to <10% using SCORE2-Diabetes	100 mg/dL (2.6 mmol/L)
High	Patients with DM without ASCVD and/or severe TOD and not fulfilling the moderate risk criteria	Patients with T2DM not fulfilling the very high-risk criteria and a: 10-year CVD risk 10 to <20% using SCORE2-Diabetes	70 mg/dL (1.8 mmol/L)
Very High	Patients with DM with established ASCVD and/or severe TOD:87, 93-95 <ul style="list-style-type: none"> • eGFR <45 mL/min/1.73 m² irrespective of albuminuria • eGFR 45-59 mL/min/1.73 m² and microalbuminuria (ACR 30 -300 mg/g) • Proteinuria (ACR >300 mg/g) • Presence of microvascular disease in at least 3 different sites (eg. microalbuminuria plus retinopathy plus neuropathy) 	Patients with T2DM with: <ul style="list-style-type: none"> • Clinically established ASCVD or • Severe TOD or • 10-year CVD risk ≥20% using SCORE2-Diabetes 	55 mg/dL (1.4 mmol/L)

Patients with ASCVD and/or severe TOD (defined as eGFR <45 mL/min/1.73 m² irrespective of albuminuria; eGFR 45–59 mL/min/1.73 m² with microalbuminuria [urinary albumin-to-creatinine ratio (UACR) 30–300 mg/g; stage A2]; proteinuria [UACR >300 mg/g; stage A3]; or the presence of microvascular disease in at least three different sites [e.g., microalbuminuria (stage A2) plus retinopathy plus neuropathy]) were classified as very high risk and therefore not assessed using the SCORE2-DM.

Descriptive and inferential analysis were performed using STATAv18 software. Data is presented as absolute and relative frequencies (categorical variables), median and interquartile range (continuous variables). Significance of differences among groups was assessed with Mann–Whitney U for continuous variables and Chi-square tests for categorical variables. Statistical significance was defined as $p < 0.05$. Only p -values were reported, and confidence intervals were not calculated.

During the preparation of this work, the author(s) used ChatGPT to improve readability. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Confidentiality of Data: The authors declare that they have followed the protocols of their work center on the publication of data from patients.

Protection of Human and Animal Subjects: The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics

committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki as revised in October 2024).

Results

Sixty patients with type 2 diabetes *mellitus* (T2DM) were initially assessed. After applying the inclusion and exclusion criteria, 53 patients met the inclusion criteria. The median age of the included patients was 68 years, with 58% being male, and the median HbA1c level was 7.05. The cardiovascular risk factors and presence of target organ diseases are summarized in Table 2.

Half of these patients were excluded from the scoring assessment due to the presence of atherosclerotic cardiovascular disease (ASCVD) or severe target organ disease. Among the 25 T2DM patients eligible for assessment using SCORE2-Diabetes, two patients (8%) were classified as low risk, 8 (32%) as moderate risk, 11 (44%) as high risk, and 4 (16%) as very high risk of cardiovascular events, as illustrated in Fig. 1.

Remarkably, 40% of patients ($n = 10$) fell into the low or moderate-risk categories. This distinction is noteworthy, as it reflects a younger age profile ($p < 0.05$) compared to the high and very high-risk groups (Table 2).

An interesting observation is the gender distribution among risk categories: women constitute 70% of the low-risk population, 53% of the moderate-risk population, and 60% of the high-risk population.

Table 2: Population characterization

	All (n=53)	Patients assessed with SCORE2-Diabetes score (n=25)	SCORE2-Diabetes: High and very high risk (n=15)	SCORE2-Diabetes: low and moderate risk (n=10)	p-value
Age [median (IQR)]	68 (59 – 75)	61 (54 – 71)	71 (65-74)	55 (51 – 57)	0.0011
Male / female, %	58% / 42%	40% / 60%	47% / 53%	30% / 70%	0.405
Age at diabetes onset [median (IQR)]	49 (40 – 56)	48 (42-52)	50 (43-59)	46.5 (37-51)	0.1568
Glycated hemoglobin [median (IQR)]	7 (6.5-8.1)	7 (6.8-7.9)	7.2 (6.8 – 8.3)	6.9 (6.3-7.5)	0.1481
HDL cholesterol [median (IQR)]	43 (37 – 52)	46 (39-52)	41 (37-48)	51 (45-69)	0.0591
Total cholesterol [median (IQR)]	147 (112 – 177)	155 (131-195)	152 (121-180)	178.5 (147 – 201)	0.2118
LDL cholesterol [median (IQR)]	73 (48 – 93)	79 (55-93)	77 (51 – 96)	91 (70-93)	0.5979
Estimated glomerular filtration rate [median (IQR)]	69 (37-98)	96 (76-103)	93 (48-96)	103 (101-110)	0.0050
Systolic blood pressure [median (IQR)]	125 (120 – 135)	125 (120-135)	130 (120-140)	120 (120 – 130)	0.1165
Active smoking, %	11%	12%	20%	0%	0.132
Target organ disease					
None	41.5%	88%	80%	100%	0.132
Microvascular	20.8%	12%	20%	0%	
Macrovascular	34.0%	0%	0	0%	
Both	3.77%	0%	0	0%	
LDL below target (according to 2023 ESC guidelines)	50%	54.2%	40%	77.8%	0.0783
LDL below target (according to 2021 ESC guidelines)	50%	54.2%	40%	77.8%	0.0783
Medication					
Acid acetylsalicylic	35.8%	16%	20%	10%	0.5127
Oral anticoagulation	11.3%	8.0%	13.3%	0%	0.2382
Antihypertensive	67.9%	64%	73.3%	50%	0.2433
ACE inhibitors	22.6%	28%	33.3%	20%	0.4760
Angiotensin II receptor blockers	34.0%	28%	33.3%	20%	0.4760
Betablocker	37.7%	28%	33.3%	20%	0.4760
Bolus insulin	50.9%	44%	53.3%	30%	0.2593
Basal insulin	81.1%	68%	86.7%	40%	0.0164
Biguanides	56.6%	68%	66.7%	70%	0.8638
SGLT2 inhibitor	60.4%	64%	66.7%	60%	0.7389
GLP1 agonist	41.5%	52%	66.7%	50%	0.8728
Glitazones	1.9%	0%	0%	0%	NA
Sulfonylurea	7.5%	12%	13.3%	10%	0.8055
Gliptin	20.8%	12%	6.7%	20%	0.3248
High intensity statin	24.5%	8%	13.3%	0%	0.2382
Moderate intensity statin	54.7%	52%	53.3%	50%	0.8728
Low intensity statin	0%	0%	0%	0%	NA
Ezetimibe	34%	32%	33.3%	30%	0.8638
PCSK9 inhibitor	3.8%	0%	0%	0%	NA
Fenofibrate	13.2%	12%	10%	10%	0.8055

Glucagon-like peptide-1 (GLP1); sodium-glucose cotransporter 2 (SGLT2);

When comparing the previous risk assessment with the updated 2023 ESC guidelines (Fig. 2), we notice a shift in cardiovascular risk classification. A new classification of patients, specifically the low-risk group, is identified, while the

high-risk category shows a fragmentation, with some patients now considered moderate risk and others very high risk. Furthermore, there is an increase in the number of patients classified as very high risk.

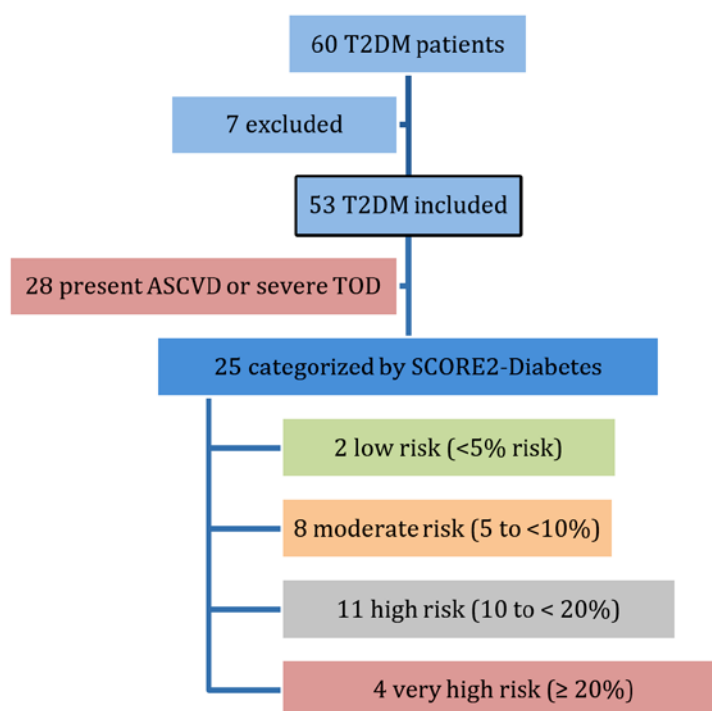


Figure 1: Flowchart of T2DM patients analysed and their cardiovascular risk classification, according to SCORE2-Diabetes

Fourteen patients (26%) experienced changes in their risk categorization. Notably, four patients (8%) escalated to a higher risk category, while ten patients (19%) were downgraded.

The single patient previously categorized as moderate risk, has now moved to the lowest risk category. Additionally, one patient has moved from high risk to low risk, while eight patients have shifted from high to moderate risk. Notably, patients previously classified as very high risk remain unchanged in their risk categorization.

On the other hand, it is noteworthy that 4 (8%) of the patients previously categorized as high risk have been reclassified as very high risk. This reclassification entails a more demanding LDL target goal and a suggestion for the use of SGLT2 inhibitors and GLP1 agonists.

Among patients assessed with high or very-high risk by SCORE2-Diabetes, 66.7% were prescribed SGLT2 inhibitors and GLP1 agonists. However, there were no significant differences comparing with patients with lower cardiovascular risk, as these drugs were also frequently prescribed to them, with 60% receiving iSGLT2 and 50% receiving GLP1 agonists as part of their treatment regimen.

Discussion

The study reveals four main findings: (1) A considerable proportion of type 2 diabetes *mellitus* (T2DM) patients are deemed ineligible for SCORE2-DM application owing to the presence of severe target organ damage (TOD) and atherosclerotic cardiovascular disease (ASCVD); (2) The emergence of a previously

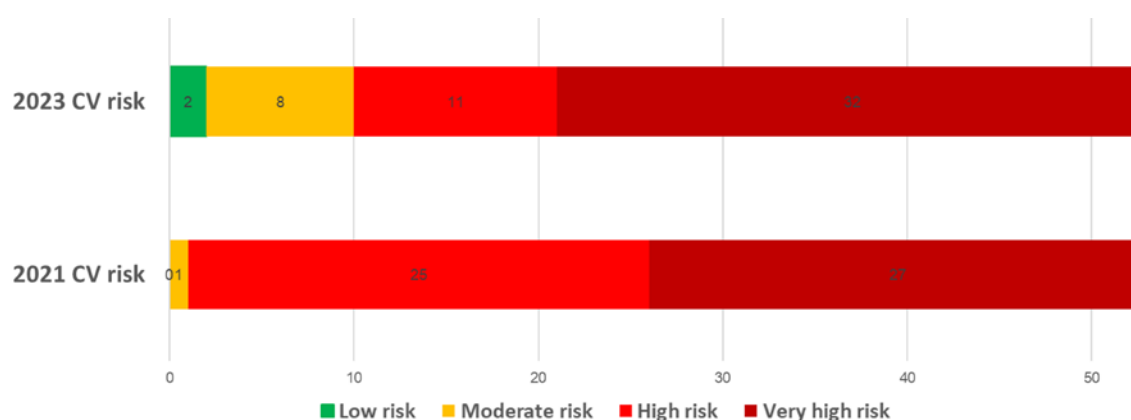


Figure 2: Risk stratification of the 53 included patients, according to previous and current guidelines

unrecognized cohort of patients characterized by low cardiovascular risk; (3) Patients previously classified as “high risk” are divided into moderate risk and very high risk categories; (4) Patients previously classified as very high risk remain unchanged in their risk categorization.

To our knowledge, this study represents the first application of SCORE2-DM in Portuguese clinical practice, allowing us to assess disparities compared to previous recommendations. In comparison to the 2021 ESC guideline cardiovascular (CV) risk stratification, our observations indicate a higher proportion of patients now falling into the moderate or newly established low-risk categories.

Type 2 diabetes *mellitus* (T2DM) and dyslipidemia are notable for their prevalence, interconnectedness, and significant contribution to cardiovascular disease (CVD). With the global incidence of T2DM escalating to epidemic levels, the focus on its relationship with dyslipidemia has intensified.^{4,5} Cardiovascular risk score is also of particular interest due to LDL target. The 2023 guidelines maintain the LDL-cholesterol (LDL-c) targets as before, <55 mg/dL for very high-risk patients, <70 mg/dL for high-risk patients, <100 mg/dL for moderate-risk patients, without any clear recommendation for patients at low CV risk due to lack of evidence.^{2,1}

The initial challenge facing clinical practice lies in managing the newly identified category of patients now classified as low risk. How should physicians proceed? Should they empirically lower LDL targets or simply disregard this new classification and manage these patients similarly to those in the moderate-risk category?

Our data suggest that the patients currently scoring lower are predominantly younger. However, to increase physicians concerns, a recent study conducted in Denmark, comparing newly diagnosed T2DM patients with the general population regarding their 10-year risk of developing CV disease, revealed that the 10-year CVD risks were higher in T2DM patients of both sexes and across all age groups, particularly among younger individuals. This finding suggests that all patients with newly diagnosed T2DM should be considered at high risk for CV disease, contrary to current guidelines stratification.⁶

Given the reality that women are often underdiagnosed and undertreated when it comes to cardiovascular events,⁷ it begs an important question. Does this new approach to risk stratification stand to exacerbate the issue, further entrenching the disparities in cardiovascular health care for women?

Luca *et al*, from Romania, similarly evaluated 70 T2DM hospitalized patients based on CV risk stratification according to both previous and current ESC guidelines. Interestingly, in their population, the question regarding the management of patients classified as low risk was not addressed, as no patients were categorized as low risk.⁸ This discrepancy may be attributed to Romania being classified as a region with very high CV risk, unlike Portugal, which is categorized as a region with moderate CV risk.

Due to the change in cardiovascular (CV) risk classification, 19% of patients (10) will now have lower LDL-c targets. This may potentially decrease the necessity for lipid-lowering agents like statins and postpone the initiation of dyslipidemia treatment in these individuals. Conversely, 8% (4) of patients have been categorized into a higher cardiovascular risk group, warranting a lower threshold for the commencement of statin therapy.

Risk stratification significantly impacts medication choices beyond statins and LDL targets. According to the 2023 ESC guidelines, patients classified as having very high cardiovascular (CV) risk and atherosclerotic cardiovascular disease (ASCVD) should initially receive treatment with SGLT2 inhibitors and GLP-1 receptor agonists. This recommendation is based on recent studies demonstrating a reduction in the primary ASCVD-based composite outcome, encompassing cardiovascular death, myocardial infarction (MI), or stroke. In patients with T2DM without ASCVD or severe TOD but with a calculated 10-year CVD risk of $\geq 10\%$ as determined by the SCORE2-Diabetes risk calculator, treatment with SGLT2 inhibitors and/or GLP-1 receptor agonists may be considered to mitigate CV risk. This consideration is independent of glucose control concerns, as it is assumed that a certain level of predicted CVD risk equates to 'severe TOD risk'. For patients classified as having low or moderate CV risk, there is currently no evidence supporting the use of these therapeutics as a first-line approach.

The authors would like to highlight that the patients in this study have shown a very good metabolic control, with a median HbA1C of 7.05%. This good glycemic management could help explain why a larger proportion of patients were classified in a lower risk group, even though there was no statistical significance when comparing different groups values of median glycated hemoglobin.

SCORE2-Diabetes stands out as a remarkable tool for precisely assessing patients, and we can confirm its ease of accessibility. However, one limitation we wish to underscore with this score is its reliance on the estimated glomerular filtration rate (eGFR) derived from serum creatinine levels as an indicator of kidney disease. Creatinine, while commonly used as a marker, has inherent limitations in accurately reflecting kidney disease progression. Its reliability can be influenced by various factors, including changes in muscle mass, dietary protein intake, catabolic states, volume status, certain medications, and non-renal factors, among others. Moreover, creatinine levels may only rise in the later stages of kidney damage, signifying significant impairment has already occurred. A more suitable and commonly employed marker for assessing kidney function could be the albumin/creatinine ratio, providing a more precise insight into kidney functioning. Ideally, a combination of both markers should be considered for the identification of kidney disease, ensuring a comprehensive assessment of renal health.⁹

Apart from the interesting findings of our study, some limitations prevent the generalization of the results. Firstly, the small sample size and single-center methodology restrict the

extrapolation of the findings. Secondly, the study was conducted in a cohort comprising only patients followed at the Day Hospital and using continuous glucose monitoring, which may include more complex patients requiring higher levels of insulin treatment, longer disease duration, and consequently higher cardiovascular risk. However, this leads us to wonder if in other less complex scenarios, even more patients will be classified as belonging to the "low risk" group, with unclear support in guidelines.

Future studies are essential to provide answers to this question and assist physicians in appropriately managing low-risk T2DM patients.

Conclusion

SCORE2-Diabetes stands out as a more precise tool in cardiovascular risk stratification for diabetic populations, offering classification into four risk categories instead of the previous three. Our analysis using this new calculator revealed that fourteen patients (26%) changed their risk categorization. While a greater number of patients were downgraded to lower cardiovascular risk classifications, possibly leading to a more conservative approach to dyslipidemia management and delayed initiation of risk-modifying drugs, it is noteworthy that patients previously classified as very high risk remained unchanged. Moreover, the overall number of patients in the very high-risk group increased, according to the 2023 ESC guidelines. ■

Contributorship Statement

FS - Data collection and manuscript writing

ICC and NM - Data collection

NG and AJ - Provision of data and analysis tools

MA - Data analysis and manuscript writing

All authors approved the final version to be published.

Declaração de Contribuição

FS – Recolha de dados e redação do manuscrito

ICC e NM – Recolha de dados

NG e AJ - Fornecimento de dados e ferramentas de análise

MA - Análise de dados e redação do manuscrito

Todos os autores aprovaram a versão final a ser publicada.

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