


Cardiovascular risk factors in patients of diabetes mellitus – Integrative review

 <https://doi.org/10.56238/sevened2024.006-026>

Layra Eugenio Pedreira¹, Mariana Gomes de Lima², Gabriel Santos Farias³, Caroline Priscila Furlanetto⁴, Ana Laura Orsi⁵, João Pedro Lima Vaz de Almeida⁶, Angelly Bernardo de Sousa Filho⁷, Yhasmin Fernandes Oliveira⁸, Maria Vitória Santos Assunção Costa⁹, Sonara Santos Miranda¹⁰, Rodrigo Rodrigues da Silva¹¹ and Aline Almeida Barbaresco D'Alessandro¹²

ABSTRACT

Due to the increase in the Risk of Cardiovascular Events, the WHO has advocated for public policies that address social and population issues in primary prevention, with the identification of individuals at high cardiovascular risk being valid in order to individualize treatment. In this sense, diabetics are the group whose main cause of death is CVD, whose medications aimed at controlling this chronic disease have the potential to reduce complications. The objective of this study is to investigate the cardiovascular risk factors in patients with Diabetes Mellitus and their possible repercussions. A search was carried out in the PubMed and LILACS (Latin American and Caribbean Literature in Health Sciences) databases, through the Virtual Health Library (VHL), using the descriptors "Risk Factors for Heart Disease", "Metabolic Syndrome" and "Diabetes Mellitus". The present study evidences Diabetes Mellitus (DM) as a risk factor for cardiovascular complications that enable endothelial dysfunction, vascular inflammation and the formation of atherosclerotic plaques. In summary, the prevention and effective control of Diabetes Mellitus are essential to reduce the impact of cardiovascular complications associated with this condition. Multifactorial approaches, including lifestyle interventions and pharmacological treatment, are essential for the management of cardiovascular risk. Therefore, it is crucial to reinforce prevention strategies, especially for patients with DM, with the aim of improving quality of life and reducing morbidity and mortality related to cardiovascular risk in this vulnerable population.

Keywords: Risk Factors for Heart Disease, Metabolic Syndrome, Diabetes Mellitus.

¹ Medical Student at UnirG in Paraíso do Tocantins

² Medical Student at UnirG in Paraíso do Tocantins

³ Medical Student at UnirG in Paraíso do Tocantins

⁴ Medical Student at UnirG in Paraíso do Tocantins

⁵ Medical Student at UnirG in Paraíso do Tocantins

⁶ Medical Student at UnirG in Paraíso do Tocantins

⁷ Medical Student at UnirG in Paraíso do Tocantins

⁸ Medical Student at UnirG in Paraíso do Tocantins

⁹ Medical Student at UnirG in Paraíso do Tocantins

¹⁰ Medical Student at UnirG in Paraíso do Tocantins

¹¹ Professor of Medicine at UnirG in Paraíso do Tocantins

¹² Professor of Medicine at UnirG in Paraíso do Tocantins



INTRODUCTION

In 2010, the American Heart Association conceptualized what would be considered ideal cardiovascular health, with the objective of reducing morbidity and mortality from cardiovascular diseases (CVD), considered the main causes of death worldwide, exceeding the rate of 33%. In this sense, the Cardiovascular Health Score (CVH) was based on adequate blood pressure, cholesterol and serum glucose levels as biological parameters, and healthy eating, physical activity, ideal body weight and absence of smoking, as modifiable indicators, these being responsible for 70% of CVD deaths. It was found that in 2013, CVH in Brazil was less than 1%, a value far from the ideal rate, being an adjunct in primary cardiovascular surveillance in the country. In the 2019 National Health Survey, there was a 24% increase in the incidence of Diabetes Mellitus (DM), considered a glycemic metric among the CVH parameters. The conditions that increase the risks are correlated with the increase in the survival rate of the Brazilian population, accompanied by the emergence of diseases in the cardiovascular system, with Acute Myocardial Infarction being the main pathology responsible for deaths, followed by Stroke, Arterial Hypertension (SAH) and Atherosclerotic Disease^{1,2}.

Due to the increase in health conditions that lead to an imbalance in cardiovascular homeostasis, the WHO recommended public policies that address social and population issues in basic care, and it is worth highlighting a closer look at individuals considered at high risk, for better therapeutic guidance. Within this group are diabetics, a group whose main mortality factor is CVD, and medications designed to manage this chronic disease can reduce microvascular complications, such as nephropathy, retinopathy and neuropathy, in addition to mitigating systemic cardiovascular events. Furthermore, the United Kingdom Prospective Diabetes Study (UKPDS) was a randomized clinical trial that placed approximately five thousand people under intensive glycemic control for 20 years, in hospitals in England, Scotland and Northern Ireland. From there, it was possible to conclude that hyperglycemia is an independent determinant of coronary heart disease, mainly related to the intrinsic hyperglycemia of type 2 DM, doubling this predictor when concomitant with SAH. In this sense, the present study aims to investigate the determinants involved with cardiovascular risk in patients with Diabetes Mellitus and its possible repercussions, since the complications of this chronic disease are not inevitable, but are preventable in association with strict glycemic and blood pressure control. arterial^{3,4,5}.

MATERIALS AND METHODS

PubMed and LILACS (Latin American and Caribbean Literature in Health Sciences) databases, through the Virtual Health Library (VHL), using the keywords " Risk Factors for Heart Disease ", " Metabolic Syndrome " and "Diabetes Mellitus".



Applying the descriptor “ Risk Factors for Heart Disease ” and “ Diabetes Mellitus” in PubMed , 18,958 results were found. Selecting complete and free texts, 8,474 results were found. Of those within the last 5 year period, this resulted in 3,815 results. Applying the clinical trials filter, 193 results were found, eight of which corresponded to the purpose of the study. The results obtained with the descriptors " Metabolic Syndrome " and "Diabetes Mellitus” were 20,119 articles. Applying the full and free text filters, 8,513 results were found, of those covering the last 5 years, 3,550 results were found. Of those corresponding to clinical trials, 98 results were found, selecting three articles that corresponded to the objective of the study.

In the LILACS database using the descriptor “ Risk Factors for Heart Disease ” and “ Diabetes Mellitus” 464 results were found. Of those that are part of the full texts, 412 results were found. Of those that are within the period of the last 5 years, 163 results were obtained. Among those corresponding to controlled clinical trials, eight results were found, of which six articles are included in the objective of the study . Syndrome " and "Diabetes Mellitus" was 887 articles. Applying the full text filter, 778 results were obtained. Of those covering the last 5 years, 188 results were found. Of those that are part of epidemiological studies, 60 results were found , selecting three articles that correspond to the purpose of the research.

In general, articles from the last five years were included, in Portuguese and English, whose target population is adults who present symptoms and diagnosis of arterial hypertension. At the same time, systematic reviews, case reports and non-primary studies were excluded, as well as articles with irrelevant content, populations different from those established as inclusion criteria, repeated articles and not made available in full and free of charge.

RESULTS

Of the 6 (six) articles selected to prepare the results, 2 (two) were cross-sectional studies, 1 (one) was a cohort study, 2 (two) were randomized clinical trials and 1 (one) was a descriptive cross-sectional study. Therefore, table 1 elucidates the main information in the selected articles.

Table 1 - Articles selected to prepare the results.

| Title | Authors/Year | Kind of study | goal | Conclusion |
|---|--|-----------------------------------|---|--|
| Prevalence of diabetes complications and associated comorbidities in family medicine at the Mexican Social Security Institute | O VALLE-LUNA <i>et al.</i> , 2018 ⁷ | Cross-sectional study | To compare the prevalence of complications and chronic comorbidities in patients with DM2 in 36 family medicine units from five chapters of the Mexican Social Security Institute (IMSS) | The prevalence of chronic complications of diabetes showed geographic and gender differences in the IMSS. Older age and longer duration of diabetes were important factors associated with diabetes in IMSS. |
| Risk factors associated with glycemic control and metabolic syndrome in patients with type 2 diabetes mellitus Villavicencio, Colombia. | PIÑEROS-GARZON; RODRIGUEZ-HERNANDEZ, 2019 ⁶ | Cross-sectional study | To identify risk factors potentially associated with glycemic control and metabolic syndrome (MS) in patients with DM2 at a Health Services Institution (IPS) in Villavicencio, Colombia. | Despite being a controlled population and being monitored, a high percentage of patients had inadequate metabolic control, increasing cardiovascular risk. |
| Evaluation of Metabolic Syndrome and Its Associated Risk Factors in Type 2 Diabetes: A Descriptive Cross-Sectional Study at the Komfo Anokye Teaching Hospital, Kumasi, Ghana | AGYEMANG-YEBOAH <i>et al.</i> , 2019 ⁹ | Cross-sectional descriptive study | Investigate metabolic syndrome, its prevalence and risk factors associated with type 2 diabetes at Komfo University Hospital Anokye, Kumasi, Ghana. | The prevalence of metabolic syndrome in the observed and studied population was 90.6%, with women being the most affected. Risk factors tend to increase the burden of metabolic syndrome in type 2 diabetes, such as increased plasma triglycerides, high level of body fat, low educational level, and higher anthropometric measurements of waist and hip circumference, waist-to-hip ratio, and BMI. |
| Heart failure with insulin degludec versus glargine U100 in patients with type 2 diabetes at high risk of cardiovascular disease: DEVOTE 14 | PRATLEY <i>et al.</i> , 2019 ¹⁰ | Randomized clinical trial | To investigate baseline factors and treatment differences that are associated with an increased risk of hospitalization for HF (HF) and gain a better understanding of the possible association between severe hypoglycemia and subsequent increased risk of hHF. | In patients with type 2 diabetes mellitus and at high cardiovascular risk, there were no differences in treatment regarding hospitalization for heart failure (ICH). Previous heart failure (HF) was the strongest predictor of future ICH events, and there was an association between severe hypoglycemia and subsequent ICH. |
| Risk factors for type 1 and type 2 myocardial infarction | WERESKI <i>et al.</i> , 2021 ⁸ | Randomized clinical trial | To evaluate predictors of future type 1 and type 2 myocardial infarction events during 1-year follow-up of a population of consecutive patients who presented to the hospital | Traditional cardiovascular risk factors generally related to type 1 myocardial infarction also have relevant predictors of type 2 myocardial infarction. |

| | | | | |
|---|---|--------------|--|--|
| | | | with suspected acute coronary syndrome. | |
| Combinations of metabolic syndrome and diabetes mellitus risk | VERA-PONCE <i>et al.</i> , 2022 ¹¹ | Cohort study | To determine the combinations of metabolic syndrome for type 2 diabetes mellitus risk in a sample of Peruvian residents. | Risk stratification according to the combination of GAA components, low HDL and altered waist circumference could provide important value in predicting the development of T2DM. |

DISCUSSION

Diabetes Mellitus (DM) not only represents a global epidemic, but is also an important risk factor for the development of cardiovascular complications. Factors such as urbanization, industrialization and changes in lifestyle contribute to the increase in the prevalence of DM, making it a significant challenge for healthcare systems around the world. Chronic hyperglycemia associated with DM plays a central role in the pathogenesis of cardiovascular complications, promoting endothelial dysfunction, vascular inflammation and the formation of atherosclerotic plaques. Therefore, it is clear that the relationship between type 2 diabetes mellitus (DM2) and increased cardiovascular risk is well established. Several studies have analyzed this relationship, which noted a higher incidence of these problems in older patients and those with a longer disease progression. Furthermore, men had more complications, while women showed a higher incidence of heart failure and comorbidities. The study highlights the urgent need to reinforce strategies to prevent these complications, especially in patients with DM2^{6,7,8}.

The correlation between cardiovascular events in patients with diabetes mellitus is explained by a study carried out in Colombia. The analysis carried out by two researchers with a group of Colombian men and women with DM2 demonstrated that obese patients were 1.2 times more likely to have cardiovascular diseases than individuals with a BMI below 30kg/m². Furthermore, the study showed that individuals whose disease was uncontrolled (DM2) also had coronary syndrome. Such data obtained served to confirm and support that cardiovascular risks are exacerbated and predisposed by DM2 . Furthermore, a study carried out at the university hospital in Ghana with diabetic individuals also concluded that obesity and uncontrolled DM2 are factors that predispose to the development of diseases of the cardiovascular system^{6,9}.

Pratley 's research *et al.* (2019) ¹⁰ show that heart failure is the most common consequence of DM2 and is responsible for leading a large number of individuals to death. The study highlighted that those patients who followed the correct treatment through the use of oral medications or the use of insulin had a lower chance of developing cardiovascular problems when compared to those who did not use medications or used them irregularly. This highlights the need to control and care for DM2 in order to avoid possible systemic complications that lead to loss of quality of life and death¹⁰.



The studies by Vera-Ponce *et al.* (2022)¹¹ highlight hyperglycemia as a crucial risk factor for the development of cardiovascular complications in patients with DM. The analysis reveals that the combination of high waistline, hyperglycemia and low HDL-cholesterol levels significantly increases the risk of type 2 DM, emphasizing the importance of glycemic control in cardiovascular risk management. Furthermore, they highlight the interconnection between metabolic factors and cardiovascular risks, highlighting the role of central obesity and insulin resistance in increasing cardiovascular risk in diabetic patients¹¹.

Wereski's study *et al.* (2021)⁸, in turn, demonstrates that patients with DM share a similar profile of cardiovascular risk factors with patients who develop myocardial infarction, both type 1, associated with atherosclerotic plaque rupture, and type 2, multifactorial. This reinforces the need for multifaceted approaches in managing cardiovascular risk in patients with DM, including lifestyle interventions and pharmacotherapy, recognizing the common association of DM, hyperlipidemia, and prior history of coronary artery disease in both types of myocardial infarction.

FINAL CONSIDERATIONS

The present study highlights diabetes mellitus (DM) as a risk factor for cardiovascular complications, enabling endothelial dysfunction, vascular inflammation and the formation of atherosclerotic plaques. Studies highlight that men and senescent individuals present more complications in cardiovascular clinical conditions, and it is imperative to establish preventive measures to avoid these complications.

Similarly, research shows a greater risk of worsening the clinical situation in patients with obesity and patients with uncontrolled DM had frequent coronary syndromes, as they are more prone to insulin resistance in the body. Furthermore, adherence to treatment with oral or injectable medications, such as insulin, corroborates the reduction in the rate of systemic complications in the body.

Furthermore, patients with increased HDL-cholesterol, hyperglycemia and high waist circumference are risk factors as they are more likely to develop insulin resistance. These characteristics are associated with atherosclerotic plaque rupture in type 1 DM and multifactorial complications in type 2 DM.

In short, prevention and effective control of diabetes mellitus are essential to reduce the impact of cardiovascular complications associated with this condition. Comprehensive approaches, including lifestyle interventions and pharmacological treatment, are essential for managing cardiovascular risk. Therefore, it is crucial to reinforce prevention strategies, especially for patients with DM, with the aim of improving quality of life and reducing morbidity and mortality related to cardiovascular risk in this vulnerable population.



REFERENCES

1. Motta, A. C. S. V., Bousquet-Santos, K., Motoki, I. H. L., & Andrade, J. M. D. L. (2023). Prevalence of ideal cardiovascular health in the Brazilian adult population - National Health Survey 2019. **Epidemiologia e Serviços de Saúde, 32**. <https://doi.org/10.1590/s2237-96222023000300006>
2. Matos, G. G., Pacheco, R. L. C. B., Magalhães, L. B. N. C., & Avena, K. de M. (2022). Mortality from cardiovascular diseases: A comparative analysis between the medical and non-medical populations in Brazil. **International Journal of Cardiovascular Sciences**. <https://doi.org/10.36660/ijcs.20200406>
3. Malta, D. C., Pinheiro, P. C., Azeredo, R. T., Santos, F. M., Ribeiro, A. L. P., & Brant, L. C. C. (2021). Prevalence of high cardiovascular risk in the Brazilian adult population according to different criteria: comparative study. **Ciência & Saúde Coletiva, 26**, 1221–1231. <https://doi.org/10.1590/1413-81232021264.01592021>
4. Martins, E. B., Lima, E. G., Pitta, F. G., Carvalho, L. N. S., Queiroz, T. D. de, & Serrano Júnior, C. V. (2020). Pharmacological therapy and cardiovascular risk reduction for type 2 diabetes. **Revista da Associação Médica Brasileira, 66**, 1283–1288. <https://doi.org/10.1590/1806-9282.66.9.1283>
5. Holman, R. (2022). Brief history of the UK Prospective Diabetes Study: Rury r Holman, for the ukpds group. **British Journal of Diabetes, 22**, S32–S35. <https://doi.org/10.15277/bjd.2022.359>
6. Piñeros-Garzón, F. S., & Rodríguez-Hernández, J. M. (2018). Risk factors associated with control glycemic and metabolic syndrome in patients with type 2 diabetes mellitus. **Universitas Médica, 21**, 61–71. <https://doi.org/10.22267/rus.192101.140>
7. Ovalle-Luna, O. D., Jiménez-Martínez, I. A., Rascón-Pacheco, R. A., Gómez-Díaz, R. A., Valdez-González, A. L., Gamiochipi-Cano, M., et al. (2019). Prevalence of diabetes complications and associated comorbidities in family medicine from the Mexican Social Security Institute. **Gaceta Médica de México, 155**, 30–38. <https://doi.org/10.24875/GMM.18004486>
8. Wereski, R., Kimenai, D. M., Bularga, A., Taggart, C., Lowe, D. J., Mills, N. L., et al. (2022). Risk factors for type 1 and type 2 myocardial infarction. **European Heart Journal, 43**, 127–135. <https://doi.org/10.1093/eurheartj/ehab581>
9. Agyemang-Yeboah, F., Eghan, B. A. J., Annani-Akollor, M. E., Togbe, E., Donkor, S., & Oppong Afranie, B. (2019). Evaluation of metabolic syndrome and its associated risk factors in type 2 diabetes: A descriptive cross-sectional study at the Komfo Anokye Teaching Hospital, Kumasi, Ghana. **BioMed Research International, 2019**, 4562904. <https://doi.org/10.1155/2019/4562904>
10. Pratley, R. E., Emerson, S. S., Franek, E., Gilbert, M. P., Marso, S. P., McGuire, D. K., et al. (2019). Cardiovascular safety and lower severe hypoglycaemia of insulin degludec versus insulin glargine U100 in patients with type 2 diabetes aged 65 years or older: Results from DEVOTE (DEVOTE 7). **Diabetes, Obesity & Metabolism, 21**, 1625–1633. <https://doi.org/10.1111/dom.13699>
11. Vera-Ponce, V. J., Talavera, J. E., Torres-Malca, J. R., & De La Cruz-Vargas, J. A. (2022). Combinations of metabolic syndrome and risk of diabetes mellitus. **Revista Cubana de Medicina Militar, 51**.