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NON-DIABETIC YOUNG AND ADULTS' KNOWLEDGE ABOUT DIABETES: AN EXPLORATORY STUDY

CONHECIMENTO DE JOVENS E ADULTOS NÃO DIABÉTICOS SOBRE O DIABETES: UM ESTUDO EXPLORATÓRIO

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ABSTRACT

Diabetes is a metabolic disorder associated with sedentary behavior, inadequate lifestyle, and unhealthy eating habits, increasingly affecting the Brazilian and global population. Public awareness about the various aspects of this disease is crucial for its prevention. This study aimed to investigate the knowledge of a group of non-diabetic young adults regarding diabetes, particularly type II diabetes mellitus (T2DM), identifying the discrepancies between the knowledge of this population and scientific knowledge. The research adopted a qualitative-quantitative, exploratory approach. Two distinct groups of young adults, aged between 18 and 44 years, participated in the study. A theoretical framework on diabetes was developed, from which a questionnaire was created and administered to the participants. The results revealed that, although some respondents demonstrate satisfactory knowledge about the disease, a significant portion of respondents showed considerable knowledge gaps in their understanding of diabetes. These data indicate that access to accurate information and the the promotion of preventive health is fundamental to improving this scenario. It is concluded that educational strategies focused on disseminating accurate information about diabetes, especially to young

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adults, are essential for preventing and controlling this disease, contributing to the reduction of its incidence and impact on public health.

Keywords: Health; education; prevention; T2DM.

RESUMO

O diabetes mellitus do tipo II é um distúrbio metabólico relacionado ao sedentarismo, estilo de vida inadequado e hábitos alimentares pouco saudáveis, afetando de forma crescente a população brasileira e mundial. A conscientização da população sobre os diversos aspectos que envolvem essa doença é crucial para sua prevenção. Este estudo teve como objetivo investigar os conhecimentos de um grupo de jovens e adultos não diabéticos em relação à diabetes, em especial a diabetes mellitus tipo II (DM2), identificando as discrepâncias existentes entre o conhecimento dessa população e o conhecimento científico atual sobre a doença. A pesquisa adotou uma abordagem quali-quantitativa, de caráter exploratório. Participaram do estudo dois grupos distintos de jovens e adultos, com idades entre 18 e 44 anos. Foi desenvolvida uma estrutura teórica sobre o diabetes, a partir da qual um questionário foi elaborado e aplicado junto aos participantes. Os resultados revelaram que, embora alguns respondentes demonstrem um conhecimento que se aproxima do que a ciência atual apresenta sobre a doença, há uma parcela de respondentes que apresenta discrepâncias consideráveis em seus conhecimentos sobre o diabetes. Esses dados indicam que o acesso a informações seguras e a promoção da saúde preventiva são fundamentais para melhorar este cenário. Conclui-se que estratégias educativas focadas na disseminação de informações acuradas sobre o diabetes, especialmente para jovens e adultos, são essenciais para a prevenção e controle dessa doença, contribuindo para a redução de sua incidência e impacto na saúde pública.

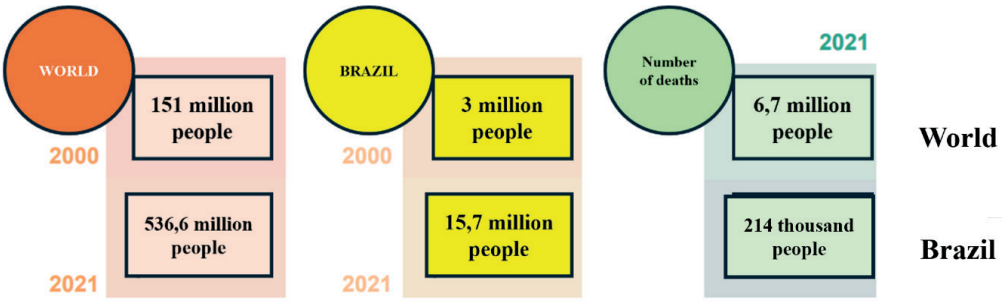
Palavras-chave: *Saúde; educação; prevenção; DM2.*

INTRODUTION

The World Health Organization (WHO) defines diabetes as a chronic metabolic disease characterized by elevated blood glucose levels which, in the long term, can lead to systemic complications (WHO, 2023). This occurs when the pancreas produces insufficient insulin, ceases to produce it, or when the body cannot effectively utilize insulin (IDF, 2023).

Statistical data from various organizations, such as the International Diabetes Federation Atlas and the Ministry of Health, highlight the current landscape of chronic non-communicable diseases, exemplified by Diabetes Mellitus (DM). Non-communicable chronic diseases, particularly Type 2 Diabetes Mellitus (T2DM), have become a significant global public health concern (Muhammad *et al.*, 2025; Chen *et al.*, 2025). Data from the latest edition of the International Diabetes Federation Atlas (IDF Atlas, 2021) indicate that in 2000, approximately 151 million people worldwide had diabetes. By 2021, the number of affected individuals had risen to 536.6 million. In South and Central America, approximately 32 million adults aged 20 to 79 years have a diabetes diagnosis. In Brazil, the number of people with diabetes in the same age group increased from 3 million in 2000 to 15.7 million in 2021 (IDF Atlas, 2021) (Figure 1).

Figure 1 - Statistical Data on Diabetes.



Caption: Data on diabetes in Brazil and worldwide, according to the International Diabetes Federation Atlas (2023) and the Ministry of Health (2023).
Source: Prepared by the author.

Regarding the number of deaths, the IDF Atlas (2021) states that 6.7 million global deaths were attributed to diabetes in 2021. In Brazil, over 214 thousand deaths were attributed to the disease in the same year. Furthermore, data from the Ministry of Health's Non-Communicable Diseases Mortality Monitoring Panel reveal an increase of over 50% in the number of deaths linked to the disease in the last 20 years.

More recently, the campaign titled "Education to protect tomorrow", organized by the WHO in 2022, focused on "[...] the need for better access to quality diabetes education for healthcare professionals and for people living with diabetes" (WHO, 2022, p. 3, authors' translation). Similarly, research conducted by Dias *et al.* (2018) aimed to contribute to the public with diabetes. It is thus evident that both initiatives sought to contribute to the population affected by the disease. It is understood that, beyond contributions to patients afflicted with diabetes, it is important to invest efforts in exploring the knowledge of non-diabetic young adults about the disease, in order to find ways to raise their awareness on the subject.

The WHO (2023) states that, over the past three decades, there has been a dramatic increase in the number of Type 2 Diabetes Mellitus (T2DM) cases. Similarly, the IDF Atlas (2021) and the Brazilian Diabetes Society affirm that 90% of medically diagnosed diabetes cases are attributed to T2DM.

According to investigations conducted in the literature on diabetes, four important categories were defined for consideration and investigation, namely: 1. General knowledge; 2. Diagnostic methods; 3. Risk factors; 4. Prevention measures. The category titled "General knowledge" pertains to the concept of diabetes and statistical data on the disease. Although centuries of scientific documentation exist on diabetes, the disease continues to progress worldwide. According to Sun *et al.* (2022), in 2021, the number of adults aged 20 to 79 years living with the disease globally was 536.6 million, which is equivalent to a 10.5% diabetes prevalence. Projections for 2045 indicate that the estimated number will reach 783.2 million people worldwide with diabetes (a 46% increase), corresponding to approximately 12.2% of the global population. Such data reveal the largest increase in diabetes prevalence from 2021 to 2045 in middle-income countries, exceeding 200 million people. Among a list of

10 leading countries, ranked by the number of people with diabetes, Brazil occupies the 6th position with estimates rising from 15.7 million people with diabetes in 2021 to 23.2 million in 2045. Estimated healthcare expenditure will increase from 966 billion USD in 2021 to 1,054 billion USD, representing a 9.1% increase (Sun *et al.*, 2022).

Authors such as Casarin *et al.* (2022) define diabetes as a global epidemic, considering it a metabolic disorder associated with lifestyle factors, such as unhealthy dietary habits and physical inactivity. They state that it was the third leading cause of death worldwide according to the Brazilian Diabetes Society in 2019, with T2DM being the most common type, as it develops as a non-communicable chronic disease with multiple long-term complications. They consider it a disease with difficult early diagnosis that progresses silently.

Dias *et al.* (2018) emphasize the need to identify people's knowledge levels regarding diabetes, especially T2DM. By administering a questionnaire with questions based on diabetes risk factors, in accordance with information from the Brazilian Diabetes Society, the authors evaluated the knowledge level about T2DM among patients with the disease who were followed by the Pirajá Family Health Unit in Belém-PA. According to the questionnaire responses, the authors identified that almost ⅓ (33.13%) of the study's target audience demonstrated a poor knowledge level regarding the pathology.

From this perspective, concerning general knowledge, it is considered important to explore the understanding of individuals in society regarding what diabetes is (WHO, 2023; IDF, 2023) and current statistical data related to the disease (WHO, 2023; IDF, 2023; SBD, 2023; IDF Atlas, 2021; Sun *et al.*, 2022).

The category of "Diagnostic Methods" relates to the assertion by authors such as Antunes *et al.* (2022), who emphasize the importance of early diagnosis, as well as the adoption of healthy habits to delay the development of complications, also highlighted by Casarin *et al.* (2022). The authors state that diagnosis can be performed through laboratory tests, with the main measurements used for diagnosis being fasting glucose, the oral glucose tolerance test, and glycated hemoglobin. In addition to these, other measurements such as postprandial glucose, fructosamine, C-peptide, capillary blood glucose, and ketone bodies assist in the monitoring of diabetic patients and glycemic control. The study concludes that, through the diagnosis of T2DM, effective treatment measures can be adopted, involving lifestyle changes and medication use, which can delay the development of chronic complications and improve patients' quality of life (Antunes *et al.*, 2021). Guyton and Hall (2021) and Champe (2009) emphasize that the disease develops gradually and is frequently detected with routine examinations, followed by confirmation through specific tests.

The Ministry of Health's Surveillance System for Risk and Protective Factors for Chronic Diseases via telephone inquiry (from Portuguese, Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por inquérito telefônico - Vigitel, 2021) reveals that the increased frequency of medical diagnosis of diabetes is directly related to increasing age and decreasing educational

attainment. Furthermore, it indicates that the greater the exposure and combination of risk factors such as sedentary lifestyle, obesity, hypertension, unhealthy diet, smoking, and alcohol consumption, the higher the actual probability of developing the disease. According to Muhammad *et al.* (2025), dietary practices have a significant impact on reducing the risk of DM-associated complications. Similarly, Nascimento and Silva (2024) emphasize the importance of healthy dietary patterns as a central factor in the prevention and control of diseases like T2DM.

Another important aspect to consider is genetic predisposition, identified by the International Diabetes Federation as a risk factor for the development of the disease, along with poor diet, obesity, physical inactivity, and increased blood pressure. According to Guyton and Hall (2011), studies indicate that genetic factors are associated with the pancreas's ability to secrete and maintain insulin action over a long period.

Consequently, it is considered relevant to explore individuals' knowledge about diabetes-associated risk factors, a fact that led to the establishment of the "Risk Factors" category. Among the risk factors highlighted by authors in this context are obesity, arterial hypertension, smoking, alcohol consumption (Vigitel, 2021), genetic predisposition (IDF, 2023; Guyton; Hall, 2021), sedentary lifestyle, and unhealthy eating habits (Vigitel, 2021; Casarin *et al.*, 2022).

Finally, the "Prevention Measures" category is based on authors such as Casarin *et al.* (2022), who reinforce the need for adherence to healthy lifestyle habits for individuals with a predisposition to develop the disease. Such measures are fundamental for current and future generations to avoid the development of diabetes, as well as the chronic complications associated with T2DM. Champe (2009) highlights that complications include cardiovascular disease with the premature development of atherosclerosis (lipid accumulation in blood vessel walls), diabetic retinopathy (damage to retinal blood vessels), nephropathy (kidney damage), and neuropathy (a condition affecting peripheral nerves). Reducing the risk of developing T2DM and its complications involves a combination of actions in which the patient must maintain a healthy diet, combined with physical activity, weight loss, and glycemic control (Champe, 2009).

In accordance with the findings of these authors (Casarin *et al.*, 2022; Champe, 2009), lifestyle changes, based on the risk factors for the disease's development, are fundamental for minimizing the risk of developing T2DM, as is the adoption of healthy habits for individuals predisposed to diabetes as a means of reducing risks associated with complications arising from the disease.

The presented context reveals a need that justifies the undertaking of the present research. This study seeks to investigate the knowledge of a group of non-diabetic young adults regarding diabetes, especially Type II Diabetes Mellitus (T2DM), identifying the existing discrepancies between the knowledge of this population and current scientific understanding of the disease.

METHODOLOGY

The study employed an exploratory mixed-methods design with a mixed-methods approach. According to Gil (2002, p. 43), exploratory research aims to "[...] provide greater familiarity with the problem, with a view to making it more explicit or forming hypotheses." Thus, this study sought to explore the knowledge of non-diabetic young adults about the disease, using both qualitative and quantitative approaches, in order to better understand potential discrepancies between their knowledge and current scientific understanding of diabetes.

The research was conducted with two distinct populations: the community belonging to a Private University located in the countryside of the state of Rio Grande do Sul and the community belonging to a Military Institution also located in the countryside of the state of Rio Grande do Sul. These two distinct populations were invited to participate in the study considering the data also evidenced by Vigitel (2021), which correlates the decrease in medical diabetes diagnoses with an increase in educational attainment.

For this purpose, eligibility criteria were established. Inclusion criteria were: a) being a non-diabetic young adult; b) being within the age group of 18 to 44 years; c) being a member of the community from one of the two locations selected for the study. Exclusion criteria were a) being diabetic; b) not being within the age group of 18 to 44 years; c) not belonging to one of the two locations chosen for the study.

Invitations to participants were extended using the following strategies: a) Invitation via QR Code with a link to the questionnaire, displayed in the physical spaces of the two locations where the research was conducted; b) Invitation through the distribution of flyers containing the QR Code for the questionnaire at both research sites; c) Invitation sent via WhatsApp to groups associated with both research sites. Initially, participation from approximately 400 individuals was estimated; however, a total of 201 respondents were obtained, with 89 from the community affiliated with a Military Institution located in the countryside of the state of Rio Grande do Sul, and 112 from the community affiliated with a Private University also located in the countryside of the state of Rio Grande do Sul. Nevertheless, this number of respondents was considered significant for the completion of the study.

For data collection, a questionnaire, comprising both open and closed-ended questions, was developed using Google Forms. The basis for the development of this instrument consisted of relevant information identified in the theoretical framework, particularly considering the categories previously presented. From each category, questionnaire items were established, as illustrated in Table 1. Prior to administering the questionnaire to respondents, this data collection instrument was pre-tested by several volunteer researchers to identify potential inconsistencies and refine the instrument before its use in the research. The responses obtained from these pre-tests were excluded from data analysis. It is important to emphasize that most questionnaire items were constructed using statements to be

evaluated by participants via a Likert scale, where 1 represented "strongly disagree" and 5 represented "strongly agree."

Table 1 - Questionnaire Structure Based on the Theoretical Framework Categories.

CATEGORIES	QUESTIONS/STATEMENTS (Likert scale)
Category 1 General Knowledge	1. I understand the concept and how diabetes develops. 2. I am aware of current statistical data on diabetes in Brazil and worldwide (e.g., number of cases, number of deaths from the disease). 3. I am informed about the projections regarding the advancement of the disease in Brazil and worldwide by 2045. 4. I know reliable data sources that provide me with updated statistics on Diabetes.
Category 2 Diagnostic Methods	5. I am knowledgeable about the existing diagnostic tests for the early detection of diabetes. 6. Early diagnosis of type II diabetes mellitus can reduce the chances of developing other disease-associated complications. 7. I usually undergo routine examinations that allow for the verification of aspects influencing the development of diabetes.
Category 3 Risk Factors	8. Diet is the sole risk factor associated with the development of type 2 diabetes mellitus. 9. Alcohol consumption and smoking can influence the development of diabetes.
Category 4 Prevention	10. Healthy habits (such as healthy eating and physical activity) are important in preventing the development of diabetes. 11. Lifestyle changes can prevent or delay the development of diabetes. 12. I know and adopt all preventive measures for diabetes.

Subtitle: Questions/statements contained in both questionnaires provided for responses.
Source: prepared by the author.

The data were analyzed considering the pre-established and previously mentioned categories: 1. General knowledge; 2. Diagnostic methods; 3. Risk factors; 4. Prevention measures. A deductive approach was adopted - that is, the analysis was conducted based on the topics within these categories, in accordance with information derived from the theoretical framework guiding each one. Furthermore, Implicative Statistical Analysis was employed, as per Dalla Porta (2019). The CHIC (Hierarchical, Implicative, and Cohesive Classification) software was used to generate implicative graphs, applying a binomial distribution with a minimum implication threshold of 0.90. This methodology ensures a statistically robust structure, as recommended by Gras *et al.* (2017). In the analysis, relevant pathways aligned with the research objective were explored.

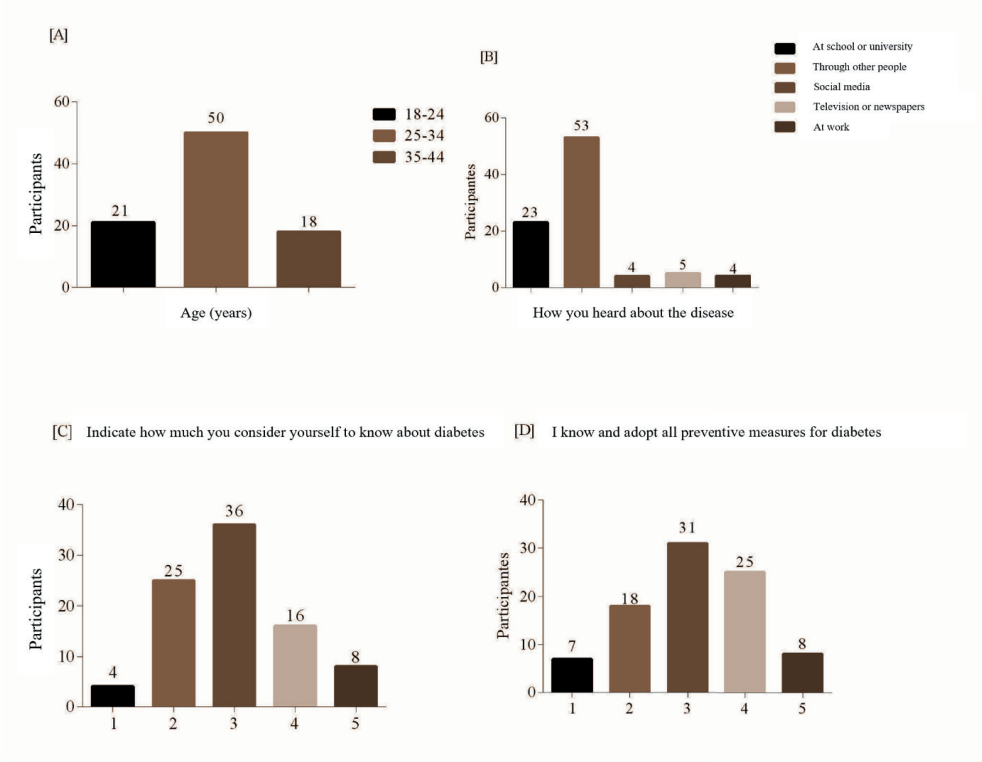
In compliance with the ethical precepts determined by Resolution 510/16 of the National Research Ethics Council (from Portuguese, Conselho Nacional de Ética em Pesquisa - CONEPE), the research was submitted, evaluated, and approved by the Research Ethics Committee. It is important to note that all participants whose data collected and considered in this study read, analyzed, and digitally signed the Free and Informed Consent Form (from Portuguese, Termo de Consentimento Livre e Esclarecido - TCLE) and agreed to participate in the research. Their identities were preserved in this study, as the exact locations where the study was conducted were not disclosed. Furthermore, no individual data was highlighted - general analysis of the main aspects of interest in the study was performed, making it impossible to identify any respondent.

RESULTS

From the data collected from the research participants, the profile of the respondents was established for both data collection environments. Regarding the number of participants who consented to participate in the research, the developed questionnaire received 89 responses from the community belonging to a Military Institution located in the countryside of the state of Rio Grande do Sul and 112 from the community belonging to a Private University also located in the countryside of the state of Rio Grande do Sul.

Based on the data obtained from the community belonging to the Military Institution, Figure 2 indicates that: a) the average age (n=50; 56.17%) of the participants is 25 to 34 years; b) approximately 60% (n=53) of the participants learned about the disease through other people; c) approximately 73% (n=65/89) of the participants (relative to those who marked 1 to 3 on the Likert scale) indicate having minimal to moderate knowledge about the disease; d) approximately 72% (n=64/89) of the participants (relative to those who marked 3 to 5 on the Likert scale) suggest, through their responses, that they are aware of and adopt preventive measures against the development of diabetes.

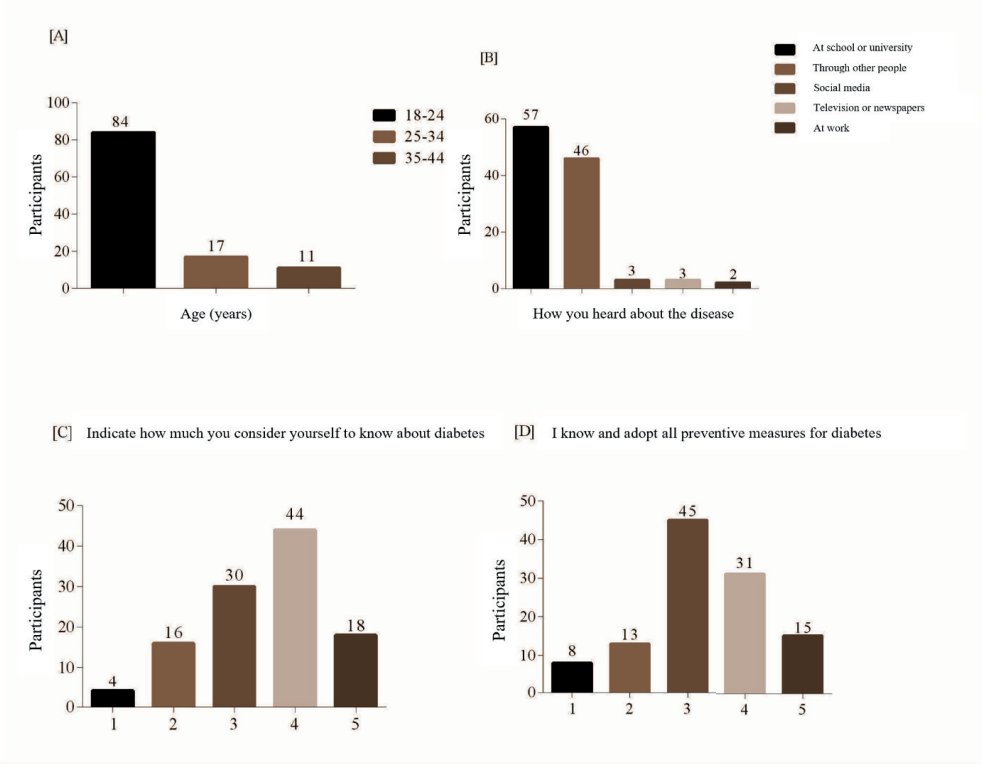
Figure 2 - Profile of participants from the community belonging to a Military Institution located in the interior of the state of Rio Grande do Sul.



Subtitle: Analysis of the profile of research participants within the scope of a community belonging to a Military Institution located in the interior of the state of Rio Grande do Sul, based on the questions/options provided in the questionnaire. (A) and (B) contained pre-established options, while (C) and (D) contained Likert scale options, with (1) representing “strongly disagree” and (5) representing “strongly agree”.
Source: Study’s own data.

From Figure 3, based on the data obtained from the community belonging to a Private University, it is observed that: a) the majority (n=84/112; 75%) of participants are between 18 and 24 years old; b) approximately 51% (n=57/112) of participants learned about the disease at school or university; c) approximately 82% (n=92/112) of participants indicate moderate to high knowledge about the disease (referring to participants who scored 3 to 5 on the Likert scale); d) over 80% (n=91/112) of respondents indicate knowing and adopting preventive measures against the development of diabetes (referring to participants who scored 3 to 5 on the Likert scale).

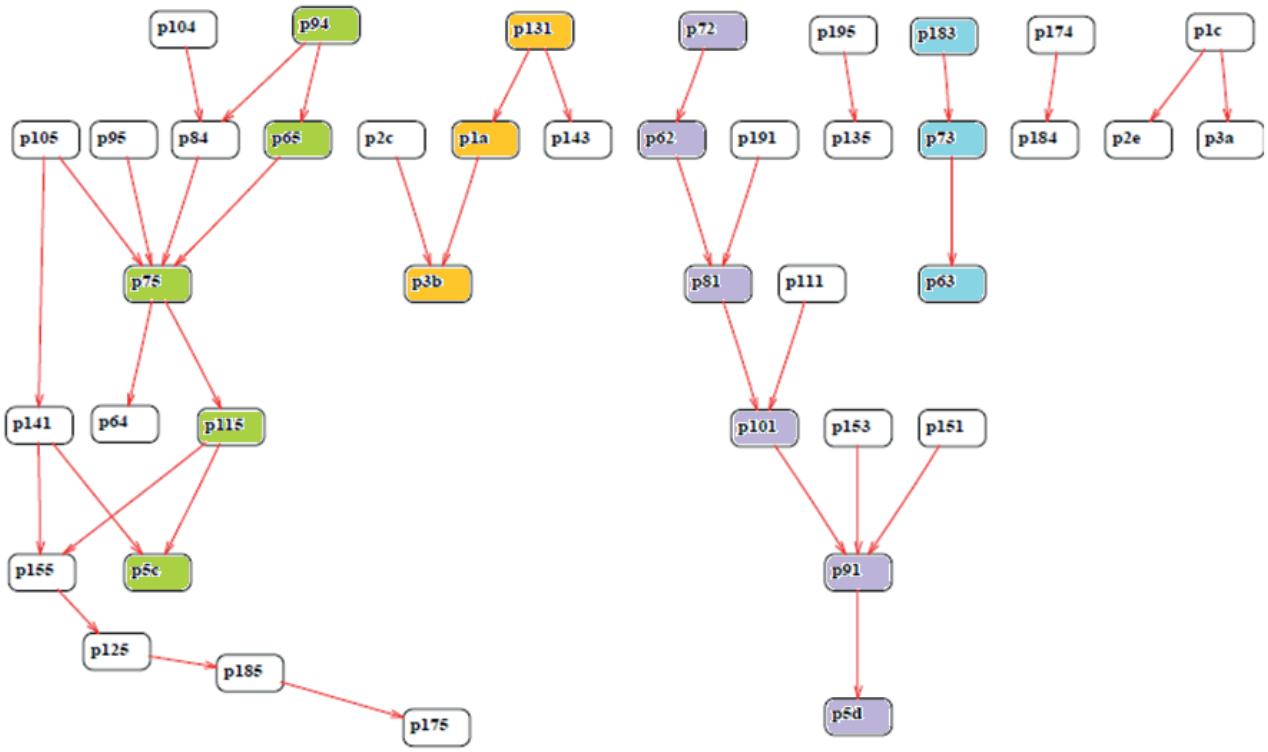
Figure 3 - Profile of participants from the community belonging to a Private University located in the interior of the state of Rio Grande do Sul.



Subtitle: Analysis of the profile of research participants within the community belonging to a Private University located in the interior of the state of Rio Grande do Sul, based on the questions/options available in the questionnaire. (A) and (B) contained pre-established options, while (C) and (D) contained Likert scale options, with (1) representing "strongly disagree" and (5) representing "strongly agree".
Source: Study's own data.

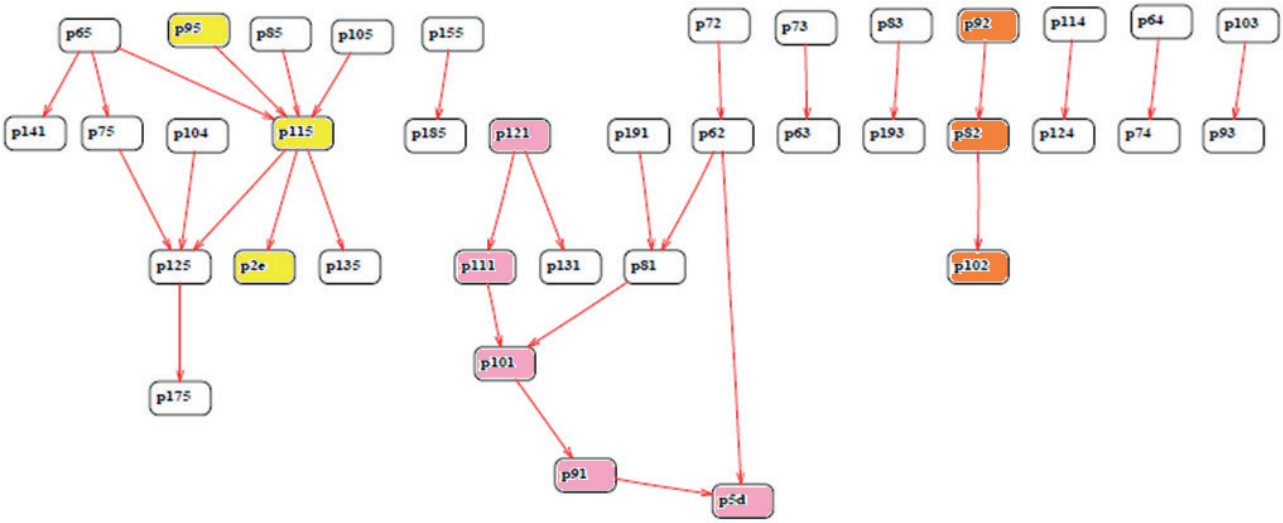
Figures 4 and 5 present the implicative graphs obtained from the Implicative Statistical Analysis, derived from data collected from the community belonging to a Private University and from the community belonging to a Military Institution, both located in the countryside of the state of Rio Grande do Sul.

Figure 4 - Generated Implicative Graph (respondents from the community belonging to a Private University located in the interior of the state of Rio Grande do Sul)



Legend: Implicative graph generated from the responses obtained from participants of the community belonging to a Private University located in the interior of the state of Rio Grande do Sul.
Source: study's own data.

Figure 5 - Generated Implicative Graph (respondents from the community belonging to a Military Institution located in the interior of the state of Rio Grande do Sul)



Subtitle: Implicative graph generated from the responses obtained from voluntary participants of the community belonging to a Military Institution located in the interior of the state of Rio Grande do Sul.
Source: study's own data.

The paths highlighted in different colors represent the implications explored in this research, due to their relevance and alignment with the research objective. Table 2 presents the explored paths (implications) considered relevant for this study.

Table 2 - Relevant Paths (Implications) Explored in the Study.

PATHS (IMPLICATIONS)	DESCRIPTION OF THE PATH (IMPLICATION)
p94 - p65 - p75 - p115 - p5c	This path (implication) is highlighted in green in the graph of Figure 4. p94 - "I am informed about the projections regarding the disease's progression in Brazil and worldwide for 2045" - Response: High agreement p65 - "On a scale of 1 to 5, indicate how much you believe you know about diabetes" - Response: Maximum agreement p75 - "I understand the concept and how diabetes develops" - Response: Maximum agreement p115 - "I have knowledge regarding existing diagnostic tests for the early detection of diabetes" - Response: Maximum agreement p5c - "How did you hear about the disease? Response: At school or university"
p95 - p115 - p2e	This path (implication) is highlighted in light yellow in the graph of Figure 5. p95 - "I am informed about the projections regarding the disease's progression in Brazil and worldwide for 2045." - Response: Maximum agreement p115 - "I have knowledge regarding existing diagnostic tests for the early detection of diabetes." - Response: Maximum agreement p2e - "What is your level of education? Response: Postgraduate degree"
p72 - p62 - p81 - p101 - p91 - p5d	This path (implication) is indicated in purple in the graph of Figure 4. P72 - "I understand the concept and how diabetes develops." - Response: Low concordance P62 - "On a scale of 1 to 5, indicate how much you believe you know about diabetes." - Response: Low concordance P81 - "I am aware of current statistical data on diabetes in Brazil and worldwide." - Response: Minimal concordance P101 - "I know reliable data sources that provide me with updated statistics on Diabetes." P91 - "I am informed about the projections regarding the progression of the disease in Brazil and worldwide by 2045." - Response: Minimal concordance P5d - "How did you hear about the disease?" - Response: Through other people

p92 - p82 - p102	This path (implication) is indicated in orange in the graph of Figure 5. P92 - "I am informed about the projections regarding the progression of the disease in Brazil and worldwide by 2045." Response: Low concordance P82 - "I am aware of current statistical data on diabetes in Brazil and worldwide (e.g., number of cases, number of deaths due to the disease)." Response: Low concordance P102 - "I know reliable data sources that provide me with updated statistics on Diabetes." Response: Low concordance
p121 - p111 - p101 - p91 - p5d	This path (implication) is indicated in pink in the graph of Figure 5. P121 - "Early diagnosis of type II diabetes mellitus can reduce the chances of developing other complications associated with the disease." Response: Minimal concordance P111 - "I have knowledge regarding existing diagnostic tests for the early detection of diabetes." Response: Minimal concordance P101 - "I know reliable data sources that provide me with updated statistics on Diabetes." Response: Minimal concordance P91 - "I am informed about the projections regarding the progression of the disease in Brazil and worldwide by 2045." Response: Minimal concordance P5d - "How did you hear about the disease?" Response: Through other people
p131 - p1a - p3b	This path (implication) is indicated in strong yellow in the graph of Figure 4. P131 - "I usually undergo routine examinations that allow for the verification of aspects influencing the development of diabetes." Response: Low concordance P1a - "What is your age?" Response: 18 to 24 years old P3b - "What is your occupation?" Response: Student
p183 - p73 - p63	This path (implication) is indicated in blue in the graph of Figure 4. P183 - "Lifestyle changes can prevent or delay the development of diabetes." Response: Moderate concordance P73 - "I understand the concept and how diabetes develops." Response: Moderate concordance P63 - "On a scale of 1 to 5, indicate how much you believe you know about diabetes." Response: Moderate concordance

Source: Prepared by the author.

It should be noted that, to prevent redundancy and facilitate text organization, the results will be explored and discussed in the "Discussion" section, in accordance with the established categories of analysis.

DISCUSSION

Regarding Category 1, which pertains to General Knowledge, the path p94 ("I am informed about the projections regarding the progression of the disease in Brazil and worldwide by 2045" - Response: high agreement) - p65 ("On a scale of 1 to 5, indicate how much you believe you know about diabetes" - Response: high agreement) - p75 ("I understand the concept and how diabetes develops" - Response: high agreement) - p115 ("I have knowledge regarding existing diagnostic tests for the early detection of diabetes" - Response: high agreement) - p5c ("How did you hear about the disease? Response: In school or university") from the implicative graph of the community belonging to a Private University located in the countryside of the state of Rio Grande do Sul, highlighted in green (Figure 4), illustrates a profile of respondents who not only possess a deep and comprehensive understanding of diabetes (p65; p75) but also indicate that their initial education about the disease likely occurred in academic settings (p5c). This pattern highlights the positive impact that education in academic environments can have on the understanding and management of chronic health conditions such as diabetes. This implication suggests that educational institutions played a fundamental role in building a solid knowledge base about diabetes for these individuals.

In the path represented by p95 ("I am informed about the projections regarding the progression of the disease in Brazil and worldwide by 2045." - Response: high agreement) - p115 ("I have knowledge regarding existing diagnostic tests for the early detection of diabetes." - Response: high agreement) - p2e ("What is your educational attainment? Response: Postgraduate degree") in the implicative graph generated from data obtained from the community belonging to a Military Institution located in the countryside of the state of Rio Grande do Sul, highlighted in light yellow (Figure 5), it illustrates the connection between a high degree of information concerning the disease's future projections (p95), in-depth knowledge regarding diagnostics (p115), and a high level of education (p2e). This finding underscores that the level of education can facilitate or be associated with greater access to and comprehension of complex medical information. This pattern suggests that advanced education can play a crucial role in enabling individuals to access, understand, and utilize medical information for personal health management. The ability to remain well-informed and understand the broader context of the disease can, therefore, be positively influenced by the level of education attained.

It is observed that, in both environments, positive influences stemmed from the educational settings in which the respondents were or are currently embedded. The implications suggest that these individuals demonstrate general knowledge about diabetes and its development mechanism, as well as preventive measures, and that this knowledge was acquired in academic settings. These data corroborate the assertion made by Vigitel (2021), which links the decrease in diabetes diagnoses to a high level of education. The findings also corroborate the study by Zhang *et al.* (2025), which identified that patients with a deeper understanding of the disease have a greater awareness of the risks of

complications. Similarly, Teo *et al.* (2025) demonstrate, in their study, that their participants attribute an important role to diabetes education in increasing disease awareness.

Muhammad *et al.* (2025), within the context of their study, argue that individuals with higher educational attainment tend to demonstrate greater health awareness, as well as enhanced nutritional literacy, a fact that consequently culminates in better diabetes prevention among this population. The study by Njee *et al.* (2025) also pointed out that limited health awareness and literacy ultimately impose significant barriers to diabetes prevention efforts.

Conversely, the path p72 ("I understand the concept and how diabetes develops" - Response: low agreement) - p62 ("On a scale of 1 to 5, indicate how much you believe you know about diabetes" - Response: low agreement) - p81 ("I am aware of current statistical data on diabetes in Brazil and worldwide." Response: Minimal concordance) - p101 ("I know reliable data sources that provide me with updated statistics on Diabetes." Response: Minimal concordance) - p91 ("I am informed about the projections regarding the progression of the disease in Brazil and worldwide by 2045." Response: Minimal concordance) - p5d ("How did you hear about the disease? Response: Through other people") identified in the implicative graph of the community belonging to a Private University located in the interior of the state of Rio Grande do Sul, highlighted in purple (Figure 4), suggests that a limited understanding among some respondents regarding the basic concepts of diabetes (p72) is associated with an equally limited self-assessment of their knowledge about the disease (p62). This fact indicates that a deficiency in basic comprehension can hinder interest in or the search for detailed statistical information (p81; p101; p91), leading to a predominance of information acquired informally through other individuals (p5d). This datum may indicate a greater reliance on non-scientific sources for understanding the disease.

Similarly, the path p92 ("I am informed about the projections regarding the progression of the disease in Brazil and worldwide by 2045." Response: low concordance) - p82 ("I am aware of current statistical data on diabetes in Brazil and worldwide (e.g., number of cases, number of deaths from the disease)." Response: low concordance) - p102 ("I know reliable data sources that provide me with updated statistics on Diabetes." Response: low concordance) in the implicative graph of the community belonging to a Military Institution located in the countryside of the state of Rio Grande do Sul, highlighted in orange (Figure 5), also demonstrates limited knowledge about the disease's future projections (p92), linked to an equally low concordance in p82 regarding knowledge of current statistics. Low awareness of current statistics (p82) also results in limited knowledge of reliable data sources (p102). This path suggests that individuals who are not well-informed about the future of the disease also tend to be less informed about current data, indicating a correlation between the lack of current information and the difficulty in identifying or accessing reliable sources that could provide accurate and updated information.

The minimal/low concordance of these respondents regarding their own knowledge of diabetes and their lack of engagement in seeking reliable sources of health information corroborate what

was identified by Dias *et al.* (2018). In their study, Dias *et al.* (2018) demonstrated that the participants in their research, when questioned about risk factors for diabetes, exhibited poor knowledge of the disease. An important difference between the studies, in addition to the data collection instrument used, is that the target audience of Dias *et al.* (2018)'s study were diabetic patients. In the case of the present research, the respondents are young and non-diabetic adults. Thus, based on the results observed in the paths highlighted in purple and orange, the necessity for greater awareness among these individuals concerning general knowledge about diabetes is also evident.

Regarding Category 2, which pertains to Diagnostic Methods, the path p121 ("Early diagnosis of type II diabetes mellitus can reduce the chances of developing other complications associated with the disease." Response: low agreement) - p111 ("I have knowledge regarding existing diagnostic tests for the early detection of diabetes." Response: low agreement) - p101 ("I know reliable data sources that provide me with updated statistics on Diabetes." Response: low agreement) - p91 ("I am informed about the projections regarding the progression of the disease in Brazil and worldwide by 2045." Response: low agreement) - p5d ("How did you hear about the disease?" Response: Through other people) observed in the implicative graph generated from the data of the community belonging to a Military Institution located in the countryside of the state of Rio Grande do Sul, highlighted in pink (Figure 5), reveals that some respondents exhibit a trajectory of limited knowledge and lack of access to reliable and detailed information about diabetes. The low concordance with the importance of early diagnosis (p121) is directly linked to a lack of knowledge about available diagnostic tests (p111), which reflects a disconnect from current (p111) and future (p91) discussions about diabetes management and progression, possibly impacting these respondents' perception of the urgency and seriousness of the condition. This sequence of misinformation culminates with the report that knowledge about diabetes was acquired through other people (p5d), rather than from scientific or educational sources, reflecting a limited engagement with professional health sources.

The implication represented by the path p131 ("I usually undergo routine examinations that allow for checking aspects influencing the development of diabetes." Response: low concordance) - p1a ("What is your age?" Response: 18 to 24 years old) - p3b ("What is your occupation?" Response: Student.) from the graph of the community belonging to a Private University located in the countryside of the state of Rio Grande do Sul, illustrated in strong yellow (Figure 4), demonstrates a low frequency of routine examinations associated with diabetes (p131) among young adults (18 to 24 years old) (p1a). This may indicate a perception of lower risk or reduced awareness of the importance of these examinations in this age group. Young adults may not feel as vulnerable to chronic health conditions like diabetes or may be less engaged in preventive health practices due to a perception of generally good health. This implication also shows that these same respondents are students (p3b). This result may suggest limited awareness of preventive health.

These results align with Teo *et al.* (2025), as the authors, in their study, found that younger adults tend to have less knowledge about diabetes. The authors observed that younger participants

were more prone to indifference towards diabetes, exhibiting a mindset that disease prevention could be postponed until later in life (Teo *et al.*, 2025). According to Almeida, Freitas, and Nascimento (2024), there has been a significant increase in the prevalence of T2DM in children and adolescents in recent years. In this context, Pires *et al.* (2024) emphasize that early diagnosis is fundamental to prevent severe complications of the disease. They also state that investing in health education and preventive measures is important to reduce the growing impact of this global epidemic.

Regarding Category 3, which concerns Risk Factors, a moderate perception concerning the concept (p73), the development of diabetes (p73), and lifestyle changes (p183) is evidenced by some respondents in the implication p183 ("Lifestyle changes can prevent or delay the development of diabetes." Response: Moderate concordance) - p73 ("I understand the concept and how diabetes develops." Response: Moderate concordance) - p63 ("On a scale of 1 to 5, indicate how much you believe you know about diabetes." Response: Moderate concordance) in the graph of the community belonging to a Private University located in the countryside of the state of Rio Grande do Sul, highlighted in blue (Figure 4). This path suggests that, although some respondents believe that lifestyle changes can impact the development of diabetes (p183), they do not appear to be fully convinced or informed about the extent of this impact. The implication with both p73 and p63, both with the same score (3 points on the Likert scale), indicates a direct correlation between the belief in lifestyle changes and the understanding of how diabetes develops, as well as the respondents' awareness of their moderate knowledge. This may reflect a knowledge base that is moderate, not completely developed, or fully applied.

Silvério *et al.* (2024) comment that the main factors for the development of T2DM in young individuals are associated with a sedentary lifestyle and poor eating habits. They also emphasize the importance of prevention strategies and health education to raise awareness among the young population, in addition to continuous investigation into T2DM with a view to reducing the incidence of the disease.

The results suggest a lack of awareness regarding prevention, the theme of Category 4. The lack of awareness about preventive health, evidenced by the low frequency of routine examinations, demonstrates a concern when compared to data presented by authors such as Antunes *et al.* (2022) and Casarin *et al.* (2022). These authors, respectively, emphasize the importance of early diagnosis to delay the development of significant complications associated with diabetes and the adherence to healthy lifestyle habits for people who do or do not have a predisposition to developing the disease. Furthermore, the research by Candido, Simões, and Ishiuchi (2024) sought to compare the costs related to screening and monitoring patients with T2DM and investments in prevention campaigns. As a result, the authors concluded that despite the fundamental nature of screening and monitoring efforts, prevention strategies offer a more financially advantageous impact on the Public Health System (SUS). The authors highlight that resource savings, relief of the healthcare system's burden, and improved quality of life for the population can be achieved through the promotion of educational campaigns and lifestyle changes (Candido; Simões; Ishiuchi, 2024).

Overall, it is observed that some respondents possess satisfactory knowledge regarding diabetes. This knowledge encompasses the four categories established in the theoretical framework. However, the presence of young and adult individuals with considerable gaps in their understanding of the disease can also be identified. This result corroborates other studies conducted on diabetes, such as the study by Teo *et al.* (2025), which states that although most of their participants were quite well-informed about diabetes, participants also felt there was still much information about diabetes prevention that they were unaware of.

The implications of the present study demonstrate a strong relationship between this discrepancy and the respondents' access to or search for scientific and accurate information. Those who have access to or have sought scientific and accurate information, such as that found in academic settings, appear to be more aware of the disease. Conversely, those with conceptual gaps and misinformation regarding future projections, diagnostic tests, and risk factors seem to acquire their knowledge, for the most part, through other individuals.

In addition, another relevant finding that deserves emphasis is that some respondents demonstrated a low frequency of undergoing routine examinations associated with diabetes. The analysis indicated that these respondents are students, young adults aged 18 to 24 years. This reveals a gap in this group's general understanding of diabetes, its diagnostic methods, and, primarily, its prevention. This result illustrates the necessity of investing in raising awareness among young adults about preventive health.

Regarding disease education, Zhang *et al.* (2025) suggest that it is necessary to adapt the methods of educating about diabetes, depending on the target audience. They argue that scientific and formal information can often become inaccessible and inappropriate for populations who do not attend formal learning environments, for instance. They comment that healthcare professionals should differentiate the population according to age, education level, and other means to further expand diversified health education methods, adapted to patient needs and preferences (Zhang *et al.*, 2025). This diversification of methods related to disease education can allow for greater reach across all audiences, increasing effectiveness regarding general knowledge of diabetes. Silva *et al.* (2024, p. 811) corroborate this idea, stating that "[...] health education programs play a crucial role in the global strategy for T2DM prevention, but their successful implementation requires a multifaceted approach, including cultural adaptation, continuous support, and methodological rigor." In the same vein, Cruz *et al.* (2025) point out that educational actions are increasingly necessary, not only to raise awareness about diabetes but also to promote the population's capacity to act in preventing this issue.

CONCLUDING REMARKS

This research aimed to investigate the knowledge of a group of young and non-diabetic adults regarding diabetes, especially type II diabetes mellitus (T2DM), identifying the existing discrepancies

between this population's knowledge and current scientific knowledge about the disease. This objective was achieved, as it was possible to comprehend current scientific knowledge through literature and compare it with the knowledge of the study participants, particularly regarding the four categories that were created based on literature: general knowledge, diagnostic methods, risk factors, and prevention.

Based on these categories, a data collection instrument (questionnaire) was developed using Google Forms to be administered to the research participants. The collected data were analyzed qualitatively and through Implicative Statistical Analysis. The results suggest that there is a group of respondents, from both locations, who possess satisfactory knowledge regarding diabetes. However, it was also possible to identify that, in both locations, there are young and adult individuals with considerable knowledge gaps about the disease.

The implications demonstrated that information about diabetes and the theoretical understanding of the physical and biological mechanisms of the disease, acquired in educational settings, are effectively associated with practical and applied knowledge, crucial for disease management and prevention. This pattern suggests that education can play a crucial role in enabling individuals to access, understand, and utilize advanced medical information for personal health management. Thus, the importance of the educational environment as a tool for health information and education is further reinforced.

On the other hand, a significant finding worth highlighting is that some respondents demonstrated a low frequency of undergoing routine diabetes-related examinations. Compounded by limited knowledge, a tendency is identified for young adults to exhibit a lower perception of risk or awareness regarding the importance of routine screenings, given that they may not feel as vulnerable to chronic health conditions such as diabetes.

This confluence of limited perceptions and knowledge concerning diabetes culminates in a limited awareness of preventive health. Consequently, young adults are observed to be less engaged in preventive health practices to prevent or minimize the development of chronic diseases like diabetes and their future health impacts.

Thus, the results of this research highlight the positive impact that education can have on the understanding and management of chronic health conditions such as diabetes. Furthermore, the necessity of raising awareness among young adults regarding diabetes-related preventive health becomes evident. Therefore, when reflecting on methods to educate them on the subject, the importance of investing efforts in two main areas is emphasized. The first concerns education, through the promotion of access to scientific and accurate information on the topic. The second pertains to the importance of preventive health, which includes attention to risk factors and the significance of performing routine diagnostic examinations, even in youth.

Ongoing public health campaigns targeting non-diabetic young adults can enhance awareness and encourage engagement in preventive health practices. Furthermore, widespread dissemination of

information about future projections can play a crucial role in motivating individuals to seek a better understanding of the disease, leading to greater proactivity in diabetes prevention and management.

Based on the results of this study, the impact of education on the understanding and management of diseases such as DM can be reinforced, highlighting the need for greater awareness of preventive health among non-diabetic young adults. Moreover, it can offer insights for the development of public health campaigns focused on promoting access to scientific information about DM and encouraging preventive health (attention to risk factors and routine examinations, even in youth). Finally, these data highlight the importance for non-diabetic individuals to seek knowledge, increase their risk perception, and proactively engage in preventive practices and routine examinations to avoid the development of DM.

Although an informative study regarding DM, the current study focused on identifying knowledge gaps and risk perception in a specific group (non-diabetic young adults), without delving into the efficacy of specific educational interventions or the measurement of direct changes in health behavior. These limitations delineate important directions for future investigations, which can, thus, significantly expand contributions to public health and access to information about DM.

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