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ORIGINAL REPORT

Clinical validity of the nursing diagnosis risk for unstable blood glucose level in persons with type 2 diabetes mellitus: A case–control study

Lídia R. Oliveira MSc, RN[1] | **Josemberg P. Amaro Undergraduate Nursing**[1] | **Rafaella P. Moreira PhD, MSc, RN**[1] | **Rafael O. P. Lopes PhD, MSc, RN**[2] | **Camila T. Lopes PhD, MSc, RN**[3] | **José E. S. M. Ferreira MSc, RN**[1] | **Tahissa F. Cavalcante PhD, MSc, RN**[1]

[1]Universidade da Integração Internacional da Lusofonia Afro-Brasileira, Redenção, Brazil

[2]Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil

[3]Universidade Federal de São Paulo, São Paulo, Brazil

Correspondence
Tahissa F. Cavalcante, Universidade da Integração Internacional da Lusofonia Afro-Brasileira, Redenção, Brazil.
Email: tahissa@unilab.edu.br

Abstract

Objective: To assess clinical–causal validity evidence of the nursing diagnosis, risk for unstable blood glucose level (00179), in individuals with type 2 diabetes mellitus.

Methods: A case–control study was conducted in 5 primary healthcare units, involving 107 subjects with type 2 diabetes mellitus, 60 in the case group and 47 in the control group. Causality was determined by the association between sociodemographic and clinical factors, risk factors related to the nursing diagnosis, and the occurrence of unstable blood glucose level. An association was considered when the risk factor had a *p*-value of <0.05 and odds ratio >1.

Results: Risk factors, such as stress, inadequate physical activity, and low adherence to therapeutic regimen, were prevalent in the sample. Time since diagnosis between 1–5 and 6–10 years, multiracial ethnicity, and the risk factor of low adherence to therapeutic regimen increased the likelihood of the outcome. Completion of high school education was identified as a protective factor.

Conclusions: The clinical validation of the nursing diagnosis, risk for unstable blood glucose level, has been successfully established, revealing a clear association between sociodemographic and clinical factors and the risk factors inherent to the nursing diagnosis.

Implications for nursing practice: The results contribute to advancing scientific knowledge related to nursing education, research, and practice and provide support for the evolution of nursing care processes for individuals with type 2 diabetes mellitus.

KEYWORDS
case–control studies, glycemic control, nursing diagnosis, type 2 diabetes mellitus

Resumo

Objetivo: Avaliar a evidência de validade clínico-causal do diagnóstico de enfermagem, risco para nível instável de glicose no sangue (00179), em indivíduos com diabetes mellitus tipo 2.

Método: Foi realizado um estudo caso-controle em cinco unidades básicas de saúde, envolvendo 107 indivíduos com diabetes mellitus tipo 2, 60 no grupo caso e 47 no grupo controle. A causalidade foi determinada pela associação entre fatores sociodemográficos e clínicos, fatores de risco relacionados ao diagnóstico de enfermagem e a ocorrência de nível instável de glicose no sangue. Uma associação foi considerada quando o fator de risco tinha um valor de $p < 0.05$ e odds ratio > 1.

Resultados: Fatores de risco como estresse, atividade física inadequada e baixa adesão ao regime terapêutico foram predominantes na amostra. O tempo desde o diagnóstico entre 1 e 5 anos e 6 a 10 anos, a etnia parda e o fator de risco baixa adesão ao regime terapêutico aumentaram a probabilidade do resultado. A conclusão do ensino médio foi identificada como um fator de proteção.

Conclusões: A validação clínica do diagnóstico de enfermagem, risco para nível instável de glicose no sangue, foi estabelecida com sucesso, revelando uma clara associação entre fatores sociodemográficos e clínicos e os fatores de risco inerentes ao diagnóstico de enfermagem.

Implicações para a prática de enfermagem: Os resultados contribuem para o avanço do conhecimento científico relacionado à educação, à pesquisa e à prática de enfermagem e fornecem suporte para a evolução dos processos de cuidados de enfermagem para indivíduos com diabetes.

INTRODUCTION

The nursing diagnosis, *risk for unstable blood glucose level* (00179), has been included in the nutrition domain and in the metabolism class of the NANDA-I taxonomy since 2006, with revisions in 2013, 2017, and 2020, with an evidence level of 2.3. It is defined as "susceptibility to variation in serum levels of glucose from the normal range, which may compromise health" (Herdman et al., 2021). This diagnosis can be identified in individuals with type 2 diabetes mellitus, as they are more prone to glycemic complications, which can result in negative health outcomes (Deshpande et al., 2008).

A clear diagnostic definition assists nurses in the diagnostic process and clinical assessment, ensuring accurate identification of this condition (Lopes & Silva, 2016). Research aimed at validating nursing diagnoses aims to enhance diagnostic accuracy. This validation process comprises three phases: conceptual definition, expert validation, and clinical validation. The nursing diagnosis, *risk for unstable blood glucose level*, has been validated in terms of conceptual analysis and expert validation, with 12 risk factors considered valid by Nemer et al. (2020). However, two of them are not yet included in NANDA-I, as they are new risk factors identified by the authors, namely, the use of medicinal plants and long-distance travel (Herdman et al., 2021; Nemer et al., 2020).

Clinical validation is employed to determine whether previously validated theoretical and content models accurately represent the nursing diagnosis in clinical practice and in patients presumably exposed to it. In the validation process, it constitutes the final stage (Hoskins, 1989; Lopes & Silva, 2016). The evidence level of 2.3 indicates that the nursing diagnosis, *risk for unstable blood glucose level*, has already undergone conceptual analysis, expert evaluation, and clinical studies, but its findings may not be readily generalizable to the broader population. Thus, the ultimate phase, clinical validation, was undertaken with the aim of reevaluating the diagnosis, enhancing its evidence base, and assessing the applicability of the results from previous stages in clinical practice (Lopes & Silva, 2016).

Clinical validation studies are lacking for many nursing diagnoses. This study sought to clinically validate the nursing diagnosis, *risk for unstable blood glucose level*, in adults and older adults with type 2 diabetes mellitus. This research holds significant societal impact, as its outcomes will be of great value to nurses, providing crucial insights into human responses related to glycemic management. These insights can be used to develop and implement care plans tailored to individuals with type 2 diabetes mellitus. Furthermore, the study findings will contribute to the advancement of the NANDA-I taxonomy by aiming to enhance, review, and update this nursing diagnosis.

METHODS

Study design and setting

A non-matched case–control study (Lopes & Silva, 2016) was conducted between May and August 2022 within five primary healthcare units in the State of Ceará, Brazil.

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Participants

The sample consisted of adults and older adults with a medical diagnosis of type 2 diabetes mellitus who were exposed to risk factors for unstable blood glucose levels. Cases were defined as individuals with unstable blood glucose levels, whereas controls were individuals without unstable blood glucose levels, resulting in a total of 107 participants. Cases and controls were deliberately not matched to avoid limiting the exploration of risk factors for unstable blood glucose levels, which may include sociodemographic variables typically used for matching purposes.

To determine the sample size, the formula for an infinite population was employed: $n = [Z\alpha^2 \times p\ (1 - p)]/e^2$. Based on this, sample size calculation was performed considering a 95% confidence level ($Z\alpha$) and a confidence interval width of 7.4% (e). The prevalence of nursing diagnoses related to glycemic management was assumed to be 60%, as reported by Moura et al. (2014). Following the calculation, the target sample size was 172 patients, with 86 participants for both the case group and the control group. However, due to the occurrence of the third wave of COVID-19, caused by the Omicron variant, during the first half of 2022 in Brazil and the consequent rise in acute cases of the disease, data collection was halted to minimize the risk of contamination for both researchers and patients. Thus, the final study sample comprised 107 participants, with 60 in the case group and 47 in the control group.

Individuals with a medical diagnosis of cognitive impairments that hindered data collection were excluded (Folstein et al., 1983). Pregnant individuals were also excluded to minimize confounding bias.

Variables

The nursing diagnosis *risk for unstable blood glucose level* (the focus of clinical validation in this study) is conceptualized by NANDA-I as susceptibility to variation in serum levels of glucose from the normal range, which may compromise health (Herdman et al., 2021).

The outcome variable "unstable blood glucose levels" was defined based on the following criterion: recurrent episodes (at least two) of hypoglycemia and/or hyperglycemia for at least 3 months, with values exceeding or falling below individual treatment targets for type 2 diabetes as established by the Brazilian Diabetes Society (SBD). The reference normal values for adults or older adults with type 2 diabetes are fasting blood glucose levels between 80 and 130 mg/dL, 2-h postprandial blood glucose <180 mg/dL, and bedtime blood glucose between 90 and 150 mg/dL (Pititto et al., 2022). The SBD recommends monitoring glycemic levels and adjusting different medications every 2–3 months during the patient's therapeutic management (Pititto et al., 2022).

The independent variables consisted of risk factors for unstable blood glucose levels validated by Nemer et al. (2020): fasting, inadequate food intake, carbohydrate and lipid-rich food intake, stress, inappropriate insulin use, weight gain, inadequate physical activity, low adherence to therapeutic regimen, long-distance travel, use of medicinal plants, daily glucose monitoring, and insufficient knowledge.

Covariates were classified as follows

- Sociodemographic: age, gender, skin color, occupation, education level, years of education, marital status, cohabitants, income, number of dependents;
- Clinical history: hypertension, other comorbidities, time since diagnosis;
- Anthropometric: weight, height, BMI.

Data sources and procedures

The data collection team consisted of two undergraduate students who attended two training sessions conducted by the principal investigators for the detection of risk factors for unstable blood glucose levels.

The participants underwent an interview and physical examination at the primary healthcare unit through an instrument developed by the researchers. Participant recruitment was conducted through active search in primary healthcare units during 3 days of the week. The study's objectives were explained to the participants, who provided informed consent. Sociodemographic variables were collected through self-report by the participants. The clinical history was assessed through self-report by the participants, with confirmation through consultation of their medical records to minimize recall bias and information bias.

The anthropometric measurements were assessed using a digital or manual scale and measuring tape, at the same primary healthcare unit where the interview with the participants was conducted. The presence of the outcome variable, unstable blood glucose levels, was identified by the researcher through a review of the patients' medical records. In this review, the fasting blood glucose levels recorded in the last 3 months were identified according to the values recommended by the SBD.

The risk factors for unstable blood glucose levels were assessed in accordance with the operational definitions proposed by Nemer et al. (2020). To minimize the possibility of recall bias, a structured questionnaire developed by the researchers, containing all variables of interest for the study, was utilized.

Data analysis

The obtained data were compiled into spreadsheets in Excel for Windows (2010) and analyzed through descriptive and inferential statistics based on the nature of the variable, with the assistance of Stata 13 software. Data were presented as mean, standard deviation, mean with confidence interval, median, and interquartile range. Categorical variables were described through absolute and relative frequencies. To minimize the risk of performance bias, the data were entered into the spreadsheets and cross-checked by the principal researcher.

To evaluate the hypotheses of dependence between independent variables and the outcome variable, the Mann–Whitney test was employed, as the data did not follow a normal distribution. To assess the relationship between categorical variables and the outcome, Fisher's exact test was used. The strength of association between these independent variables and the outcome variable was evaluated using odds ratios (OR) and 95% confidence intervals (95% CI). In all analyses, statistical significance was considered when $p < 0.05$.

Ethical considerations

This study was conducted after obtaining approval from the local research ethics committee, with protocol number 5.357.911, and adhering to national and international ethical standards for research involving human subjects.

RESULTS

In the study, 107 individuals were divided into 2 groups: case and control. In the control group, there were 47 individuals with the nursing diagnosis of risk for unstable blood glucose levels who did not present the outcome of unstable blood glucose levels. In the case group, 60 participants were diagnosed with the risk for unstable blood glucose levels and presented with the outcome of unstable blood glucose levels. The sociodemographic characterization and the association between sociodemographic variables and the outcome of unstable blood glucose levels are presented in Table 1.

The outcome "unstable blood glucose levels" was associated with younger age ($p = 0.008$). Multiracial ethnicity was associated with 3.7 times higher odds of unstable blood glucose levels (OR = 3.71 and $p = 0.040$) compared to individuals with white skin. Conversely, completing high school education was associated with an 82% lower chance of the outcome (OR = 0.18; $p = 0.048$, and 95% CI: 0.03–0.98) compared to being illiterate.

Table 2 presents the relationship between clinical variables (medical history and anthropometric measurements) and the outcome.

Compared to individuals with less than 1 year of diagnosis, those with 1–5 years had 4.19 times higher odds of experiencing the outcome (OR = 4.19 and $p = 0.014$), and those with a diagnosis duration between 6 and 10 years had 5.85 times higher odds (OR = 5.85 and $p = 0.001$).

The comparison of risk factors for unstable blood glucose levels between the case and control groups is presented in Table 3.

The risk factors stress, inadequate physical activity, and low adherence to the therapeutic regimen were prevalent among most participants in both groups. Among these factors, low adherence to the therapeutic regimen was responsible for a 3.31-fold increase in the participant's odds of experiencing unstable blood glucose levels (OR = 3.31 and $p = 0.016$). The other variables were not significantly associated with the outcome (Table 3).

DISCUSSION

When evaluating a patient with the nursing diagnosis, *risk for unstable blood glucose levels*, it becomes possible to pinpoint the specific risk factors present in their clinical condition. This assessment serves as the foundation for making informed clinical judgments aimed at formulating tailored nursing interventions that are most effective for the patient's unique circumstances.

This study evaluated the validity of the nursing diagnosis, *risk for unstable blood glucose levels*, in adults and older adults with type 2 diabetes. The most prevalent risk factors were stress, inadequate physical activity, and low adherence to the therapeutic regimen (Table 3). Characteristics significantly related to the occurrence of the diagnosis included younger age, multiracial ethnicity, a diagnosis duration of 1–5 or 6–10 years, and the risk factor of low adherence to the therapeutic regimen.

Stress can raise blood sugar levels in people with type 2 diabetes due to the release of hormones cortisol and adrenaline. This can be particularly harmful to people with diabetes, who already have difficulty maintaining their blood sugar levels control. To manage this, individuals should adopt stress-reduction strategies, such as regular exercise, meditation, therapy, and relaxation techniques.

Inadequate physical activity can be detrimental to the clinical management of type 2 diabetes. According to the World Health Organization (WHO), up to 5 million deaths per year could be prevented if people were more physically active. Statistics show that one in four adults does not engage in physical activity (World Health Organization, 2004). It is encouraged to engage in physical activities for at least 150 min per week to ensure proper clinical management of type 2 diabetes. Regular physical activity not only improves glycemic control but also reduces comorbidities such as hypertension, dyslipidemia, cardiovascular diseases, and mortality, leading to an improved quality of life.

Low adherence to the therapeutic regimen was prevalent in the sample and was associated with the outcome of unstable blood glucose levels ($p < 0.05$). Individuals with this risk factor were found to have 3.31 times greater chances of developing unstable blood glucose levels. The lack of long-term treatment adherence can lead to severe complications such as cardiovascular diseases, neuropathy, retinopathy, nephropathy, and other conditions that can result in amputations and disabilities. Healthcare professionals must understand the reasons for non-adherence in diabetes patients to assist them in managing their condition effectively.

The significant association between multiracial ethnicity and an increased risk of unstable blood glucose levels should be interpreted by considering both physiological and social factors. A recent meta-analysis indicates that even in individuals without diabetes, HbA1c levels are higher in people of Black race compared to White individuals (Rawshani et al., 2015). Even among the older adults, racial differences in HbA1c levels persist, with non-Hispanic Whites, non-Hispanic Blacks, and Mexican Americans having an increased risk of morbidity, mortality, and disability due to high HbA1c levels (Smalls et al., 2020). A study of more than 130,000 individuals with type 2

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TABLE 1 Sociodemographic profile of case and control groups and association with unstable blood glucose levels ($n = 107$).

Variables	Case $n = 60$	Control $n = 47$	OR	95% CI	*p*-value
Age					0.008[a]
Mean ± SD	57.1 ± 11.0	62.5 ± 10.4			
95% CI	54.2–59.9	59.5–65.6	–	–	
Median (IQR)	59 (51–64)	64 (54–70)			
Sex, *n* (%)					
Female	46 (56.8)	35 (43.2)	1.13	0.42–3.00	0.79[b]
Male	14 (53.9)	12 (46.1)	1	–	–
Ethnicity, *n* (%)					
White	8 (38.1)	13 (61.9)	1	–	–
Black	9 (64.3)	5 (35.7)	2.93	0.59–15.19	0.128[b]
Indigenous	27 (56.3)	21 (43.7)	2.09	0.65–6.92	0.165[b]
Yellow	0 (0.0)	1 (100.0)	*	*	*
Multiracial	16 (69.6)	7 (30.4)	3.71	1.06–12.97	0.040[b]
Occupation, *n* (%)					
Worker	9 (56.3)	7 (43.7)	1	–	–
Unemployed	5 (62.5)	3 (37.5)	1.30	0.17–11.24	0.769[b]
Retiree	25 (46.3)	29 (53.7)	0.67	0.18–2.38	0.484[b]
Homemaker	15 (68.2)	7 (31.8)	1.67	0.36–7.72	0.452[b]
Other	6 (85.7)	1 (14.3)	4.67	0.38–244.7	0.172[b]
Education, *n* (%)					
No formal education	15 (55.6)	12 (44.4)	1	–	–
Incomplete elementary education	33 (66.0)	17 (34.0)	1.55	0.53–4.49	0.367[b]
Complete elementary education	1 (25.0)	3 (75.0)	0.27	0.01–3.98	0.254[b]
Incomplete high school	4 (50.0)	4 (50.0)	0.80	0.12–5.31	0.782[b]
Complete high school	2 (18.2)	9 (81.8)	0.18	0.03–0.98	0.048[b]
Incomplete higher education	4 (66.7)	2 (33.3)	1.60	0.19–20.27	0.618[b]
Complete higher education	1 (100.0)	0 (00.0)	*	*	*
Years of study, *n* (%)					0.156[a]
Mean ± SD	5.22 ± 4.6	6.49 ± 5.23			
95% CI	4.03–6.36	4.95–8.02	–	–	
Median (IQR)	4 (1–7)	0 (6–10)			
Marital status, *n* (%)					
Single	8 (42.1)	11 (57.9)	1	–	–
Married/stable union	37 (64.9)	20 (35.1)	2.54	0.78–8.50	0.079[b]
Divorced	5 (55.6)	4 (44.4)	1.72	0.26–11.59	0.505[b]
Widower	10 (45.5)	12 (54.5)	1.15	0.28–4.73	0.829[b]
Household composition, *n* (%)					
Relatives	46 (59.7)	31 (40.3)	1	–	–
Friends	2 (50.0)	2 (50.0)	0.67	0.05–9.80	0.699[b]
Spouse or partner	12 (63.2)	7 (36.8)	1.16	0.37–3.87	0.785[b]
Alone	0 (0.0)	6 (100.0)	*	*	*
Others	0 (0.0)	1 (100.0)	*	*	*

(Continues)

TABLE 1 (Continued)

Variables	Case $n = 60$	Control $n = 47$	OR	95% CI	p-value
Income (MW), n (%)					
<1 MW	6 (66.7)	3 (33.3)	1	–	–
1 MW	37 (56.9)	28 (43.1)	0.66	0.10–3.44	0.579[b]
>1 MW	17 (51.5)	16 (48.5)	0.53	0.07–3.05	0.418[b]
Number of dependents					0.598[a]
Mean ± SD	2.7 ± 1.6	2.6 ± 1.5			
95% CI	2.3–3.2	2.1–3.0	–	–	
Median (IQR)	2 (2–3)	2 (1–3)			

Note: n = sample; % = percentage; p-value: significance level. (a value of BRL $1212.00).
Abbreviations: 95% CI, 95% Confidence Interval; IQR, Interquartile range; MW, Minimum wage; OR, Odds Ratio; SD: standard deviation.
[a]Mann–Whitney test.
[b]Fisher's exact test.
*impossible to calculate.

TABLE 2 Clinical history and anthropometric profile of the case and control groups ($n = 107$).

Variables	Case ($N = 60$)	Control ($N = 47$)	OR	95% CI	p-value
Hypertension, n (%)					
Yes	39 (52.7)	35 (47.3)	1.57	0.63–4.03	0.399[a]
No	21 (63.6)	12 (36.4)	1	–	–
Other comorbidities, n (%)					
Yes	10 (45.5)	12 (54.5)	0.58	0.20–1.67	0.336[a]
No	50 (58.8)	35 (41.2)	1	–	–
Time since diagnosis, n (%)					
<1 Years	5 (27.8)	13 (72.2)	1	–	–
1–5 Years	29 (61.7)	18 (38.3)	4.19	1.13–17.26	0.014[a]
6–10 Years	18 (69.2)	8 (30.8)	5.85	1.32–27.67	0.001[a]
>10 Years	7 (50.0)	8 (50.0)	2.28	0.43–12.40	0.261[a]
Weight (kg)					0.660[b]
Mean ± SD	69.4 ± 15.5	68.5 ± 15.5			
95% CI	65.4–73.4	63.9–73.1			
Median (IQR)	65 (59–93)	64 (59–74)			
Height (m)					0.124[b]
Mean ± SD	1.53 ± 0.10	1.55 ± 0.10			
95% CI	1.50–1.55	1.52–1.57			
Median (IQR)	1.50 (1.46–1.58)	1.55 (1.50–1.60)			
BMI (kg/m^2)					0.265[b]
Mean ± SD	29.8 ± 6.8	28.0 ± 6.9			
95% CI	28.0–31.6	26.0–30.0			
Median (IQR)	28.6 (24.9–34.2)	27.6 (23.8–31.3)			

Abbreviations: 95% CI, 95% confidence interval; IQR, interquartile range; OR, odds ratio; SD, standard deviation.
[a]Fisher's exact test.
[b]Mann–Whitney test.
*impossible to calculate.

TABLE 3 Risk factors for unstable blood glucose level in the case and control groups ($n = 107$).

Variables, *n* (%)	Case (*N* = 60)	Control (*n* = 47)	OR	95% CI	*p*-value[a]
Fasting					
Present	5 (41.7)	7 (58.3)	0.52	0.12–2.07	0.360
Absent	55 (57.9)	40 (42.1)	1	–	–
Insufficient food intake					
Present	6 (37.5)	10 (62.5)	0.41	0.11–1.39	0.171
Absent	54 (59.3)	37 (40.7)	1	–	–
Diet high in carbohydrates and fats					
Present	41 (62.1)	25 (37.9)	1.90	0.80–4.51	0.160
Absent	19 (46.3)	22 (53.7)	1	–	–
Stress					
Present	26 (47.3)	29 (52.7)	0.47	0.21–1.10	0.080
Absent	34 (65.4)	18 (34.6)	1	–	–
Inappropriate use of insulin					
Present	1 (100.0)	0 (0.0)	*	*	*
Absent	59 (55.7)	47 (44.3)	1	–	–
Weight gain					
Present	9 (69.2)	4 (30.8)	1.90	0.48–8.98	0.381
Absent	51 (54.3)	43 (45.7)	1	–	–
Inadequate physical activity					
Present	52 (57.8)	38 (42.2)	1.54	0.48–5.03	0.437
Absent	8 (47.1)	9 (52.9)	1	–	–
Low adherence to the therapeutic regimen					
Present	22 (75.9)	7 (24.1)	3.31	1.18–10.16	0.016
Absent	38 (48.7)	40 (51.3)	1	–	–
Long distance travel					
Present	9 (47.4)	10 (52.6)	0.66	0.21–2.00	0.451
Absent	51 (58.0)	37 (42.0)			
Use of medicinal plants					
Present	9 (45.0)	11 (55.0)	0.58	0.19–1.72	0.268
Absent	51 (58.6)	36 (41.4)	1	–	–
Daily blood glucose monitoring					
Present	52 (54.2)	44 (45.8)	0.44	0.07–2.00	0.341
Absent	8 (72.7)	3 (27.3)	1	–	–
Insufficient knowledge					
Present	10 (52.6)	9 (47.4)	0.84	0.28–2.61	0.802
Absent	50 (56.8)	38 (43.2)	1	–	–

Abbreviations: 95% CI: 95% confidence interval; OR, odds ratio.
[a]Fisher's exact test.
*impossible to calculate.

diabetes in Sweden found that the impact of ethnicity on glycemic control is more significant than the effects of income and educational level. Despite receiving prompt treatment for type 2 diabetes and having more medical appointments, immigrants from non-Western regions had poorer glycemic control. In Brazil, it cannot be overlooked that Black individuals have less access to healthcare services and education, directly affecting the possibility of diagnosis, treatment, adherence to treatment, and consequently, clinical stability and outcomes.

Time of diagnosis was also significantly associated with a significant increase in the likelihood of unstable blood glucose. The possible explanation for these data is that the longer the time since diagnosis, the higher the probability that the patient will not maintain treatment adherence, consequently leading to the clinical outcome of unstable blood glucose. However, this relationship is not well established in the literature. Previous studies have shown no relationship between the time since diagnosis and adherence to type 2 diabetes treatment, whereas others have indicated a relationship between a longer time since diagnosis and better treatment adherence. Interestingly, some authors suggest that, regardless of medication adherence, over time, the effectiveness of hypoglycemic medications may be reduced due to the occurrence of complications such as cancer and cardiovascular diseases, as well as the lack of timely medication dose adjustments.

Indeed, most study participants had hypertension, which requires attention as the presence of this comorbidity may interfere with the treatment of type 2 diabetes and the occurrence of unstable blood glucose. Hypertension is consistently prevalent among patients with type 2 diabetes. The presence of both diabetes and hypertension can result in a negative interaction that amplifies the harmful effects of these diseases on both micro- and macrovascular levels. Therefore, diabetes management requires an integrated approach, including dietary interventions, lifestyle modifications such as physical activity, and hormonal adjustments, including the use of insulin if necessary. As diabetes mellitus is strongly influenced by lifestyle, an effective management strategy should emphasize behavioral and habit changes in individuals.

In this study, most participants did not engage in fasting, nor did they have insufficient food intake. However, a considerable proportion of the case group exhibited dietary intake rich in lipids. Healthier dietary habits contribute to optimal glycemic management in patients with type 2 diabetes, as most of these individuals are overweight or obese. Weight loss through dietary restrictions directly assists in diabetes control. Research has shown that different high-quality dietary models were associated with significant reductions in all-cause mortality, cardiovascular diseases, cancer, and type 2 diabetes by 22%, 22%, 15%, and 22%, respectively. These findings reinforce the earlier notion that nutritional interventions are relevant for achieving proper glycemic management.

Regarding medication adherence, evidence suggests that interventions aimed at promoting adherence to antidiabetic medications can be educational, behavioral, emotional, economic, or multifaceted (a combination of the aforementioned). A systematic review showed that multifaceted interventions, addressing various non-adherence factors, were comparatively more effective in improving medication adherence and glycemic management in patients with type 2 diabetes than single strategies (Sapkota et al., 2015). Multiple factors contribute to non-adherence to treatment, such as inaccessible care, patient's the limited knowledge of the disease process, insufficient family support for the patient's daily self-care, complex medication regimens, and unsatisfactory health messages from healthcare professionals (Masaba & Mmusi-Phetoe, 2021).

To maintain proper glycemic management, patients must be encouraged to adhere to both pharmacological and non-pharmacological treatments. Adherence to the non-pharmacological aspect is one of the most significant challenges for patients with diabetes, as maintaining a healthy diet (especially free from sugars) and regular physical exercise can be quite challenging (Masaba & Mmusi-Phetoe, 2021). Factors that can hinder adherence to pharmacological treatment in patients with type 2 diabetes include the patient's limited understanding of their own health status and the necessary strategies to maintain internal balance, as well as the challenges of everyday life, including economic and social challenges. Therefore, it is essential for healthcare professionals to consider patients' perceptions during therapeutic prescription and work toward aligning the beliefs of the medical team and the patient to customize treatment and health recommendations to the needs and specificities of each person, thus minimizing barriers and challenges (Rezaei et al., 2019).

Regarding the complexity of type 2 diabetes treatment, it is essential to highlight that low to moderate treatment complexity was described in a study as a factor contributing to better adherence. High medication regimen complexity was associated with inadequate glycemic management. Thus, healthcare teams should seek to simplify medication regimens to improve medication adherence and, consequently, enhance glycemic control (Ayele et al., 2019). Therefore, it is crucial that during follow-up consultations, all patient questions are addressed to increase the potential for adherence to treatment.

One of the primary consequences of poorly managed diabetes mellitus is macrovascular and microvascular complications that can occur in the short and/or long term. A study that assessed the prevalence of vascular complications in patients with type 2 diabetes in 38 countries found that the average duration of diabetes diagnosis was 4.1 years, and the hemoglobin A1c level was 8.0%. The total prevalence of microvascular and macrovascular complications was 18.8% and 12.7%, respectively. The most common microvascular complications were peripheral neuropathy (7.7%), chronic kidney disease (5.0%), and albuminuria (4.3%), whereas the most common macrovascular complications were coronary artery disease (8.2%), heart failure (3.3%), and stroke (2.2%) (Kosiborod et al., 2018). Thus, there was similarity with the findings of the present study concerning the duration of diagnosis, which also showed that individuals with a longer diagnosis duration are more likely to have unstable blood glucose, which can lead to the aforementioned complications.

An important finding of the study was the statistically significant relationship between younger age and the outcome of unstable blood glucose. One hypothesis that can explain this situation, according to other studies, is that young people generally have a greater habit of consuming fast food and other sugar-rich foods compared to older individuals (Cha et al., 2018; Ntarladima et al., 2022). Additionally, younger individuals or those who have been recently diagnosed may have an inadequate perception of the threat related to the disease (Dehdari & Dehdari, 2019).

In our research, a higher level of education was related to a reduced chance of unstable blood glucose. In line with these findings, the incidence of diabetes is higher (10.4 per 1000 people) among adults with less than a high school education, 7.8 per 1000 people for those with a high school diploma, and 5.3 per 1000 people for those with more than a high school education (Hill-Briggs et al., 2021). Therefore, it

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is important for healthcare professionals to be attentive to the social determinants of health of these patients because they directly impact the adherence to type 2 diabetes treatment and, consequently, the maintenance of proper glycemic management.

Limitations

This case–control study was not matched, thus ensuring equivalence between the case and control groups in terms of relevant characteristics cannot be guaranteed. Without direct correspondence between participants in the two groups, significant differences in important variables, such as age, gender, or other factors, may exist, potentially impacting the outcomes. Besides the lack of matching, it is important to acknowledge that this study was conducted within a specific healthcare setting, involving a limited sample of patients. For robust generalizability, future research should consider investigating nursing diagnoses related to glycemic management in a more extensive and diverse population. Additionally, given the limited number of statistically significant findings, it may be prudent to refine or nuance the conclusion.

CONCLUSION

The nursing diagnosis, *risk for unstable blood glucose level*, and the unstable blood glucose condition itself are common problems in adults and older adults with type 2 diabetes. Demographic characteristics, health history, and treatment adherence are associated with a higher chance of unstable blood glucose and corroborate the etiologies that make up the nursing diagnosis *risk for unstable blood glucose*.

IMPLICATIONS FOR NURSING PRACTICE

Identifying the completion of high school education as a protective factor against glycemic instability underscores the necessity of enhancing educational interventions for patients with lower educational backgrounds to improve their comprehension of treatment guidelines. In this context, nurses assume a crucial role in creating and delivering health information in a manner that is accessible and comprehensible to patients from diverse educational backgrounds.

Nurses should also be vigilant about the duration since diagnosis, optimizing medication regimens, ensuring attendance at appointments, and addressing worsened blood glucose levels despite patients reporting adherence to their therapeutic routines. The impact of skin color on glycemic stability underscores the importance of delivering individualized care with intensified follow-up, motivation, and resolution of adherence barriers.

Additionally, this study underscores the requirement for further, continuous research into the factors influencing unstable blood glucose in diverse contexts. Furthermore, it highlights the importance of translating these findings into clinical practice.

AUTHOR CONTRIBUITIONS

Lídia R. Oliveira, Rafaella P. Moreira, Rafael O. P. Lopes, Camila T. Lopes, and Tahissa F. Cavalcante conceived the study, designed it, drafted the manuscript, and substantially contributed to the revision of the manuscript for important intellectual content. Lídia R. Oliveira, Josemberg P. Amaro, and José E. S. M. Ferreira performed the data extraction and contributed substantially to the data extraction, data analysis, and interpretation. All authors have read and approved the final version of the manuscript.

CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest.

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ETHICS STATEMENT

None.

ORCID

Rafaella P. Moreira PhD, MSc, RN https://orcid.org/0000-0003-2341-7936
Tahissa F. Cavalcante PhD, MSc, RN https://orcid.org/0000-0002-2594-2323

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