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Original Article

Risk of unstable glycemia in elderly people with type 2 diabetes mellitus

Risco de glicemia instável em pessoas idosas com diabetes mellitus tipo 2

Riesgo de glucemia inestable en ancianos con diabetes mellitus tipo 2

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Abstract

Objective: to assess the risk factors of the nursing diagnosis Risk of unstable glycemia in elderly people with type 2 diabetes mellitus. **Method:** cross-sectional study carried out with 152 elderly people assisted in primary care from August to October 2021. In the nursing consultation, clinical data, loss of plantar protective sensitivity and a checklist with risk factors of unstable NANDA glycemia risk were evaluated. Descriptive analysis and association tests were used. **Results:** 46.7% had HbA1c ≥ 7.0 and higher prevalence of risk factors: Insufficient knowledge about disease control (p<0.001); Insufficient knowledge about modifiable factors (p<0.001); Insufficient control of diabetes (p<0.001); Lack of adherence to the diabetes control plan (p=0.002); and Inadequate blood glucose monitoring (p<0.001). **Conclusion:** risk factors were related to insufficient knowledge and lack of management with the disease, emphasizing the importance of nurses in the planning of appropriate care.

Descriptors: Diabetes Mellitus, Type 2; Risk Factors; Nursing Diagnosis; Old Age Assistance; Primary Health Care

Resumo

Objetivo: avaliar os fatores de risco do diagnóstico de enfermagem Risco de glicemia instável em pessoas idosas com diabetes mellitus tipo 2. **Método:** estudo transversal realizado com 152 pessoas idosas atendidas na atenção primária de agosto a outubro de 2021. Na consulta de enfermagem, avaliaram-se dados clínicos, perda de sensibilidade protetora plantar e *checklist* com fatores de risco do Risco de glicemia instável da NANDA. Empregaram-se análise descritiva e testes de associação. **Resultados:** 46,7% apresentaram HbA1c ≥ 7,0 e maior prevalência dos fatores de risco: Conhecimento insuficiente sobre o controle da doença (p<0,001); Conhecimento

insuficiente sobre os fatores modificáveis (p<0,001); Controle insuficiente do diabetes (p<0,001); Falta de adesão ao plano de controle do diabetes (p=0,002); e Monitorização inadequada da glicemia (p<0,001). **Conclusão:** os fatores de risco foram relacionados ao conhecimento insuficiente e à falta de manejo com a doença, ressaltando a importância do enfermeiro no planejamento de cuidados adequado.
Descritores: Diabetes Mellitus Tipo 2; Fatores de Risco; Diagnóstico de Enfermagem; Assistência a Idosos; Atenção Primária à Saúde

Resumen

Objetivo: evaluar los factores de riesgo del diagnóstico de enfermería Riesgo de glucemia inestable en ancianos con diabetes mellitus tipo 2. **Método:** estudio transversal realizado con 152 ancianos atendidos en la atención primaria de agosto a octubre de 2021. En la enfermería consulta, se evaluaron datos clínicos, pérdida de sensibilidad protectora plantar y se utilizó la lista de verificación con factores de riesgo de NANDA Riesgo para glucemia inestable. Se utilizaron análisis descriptivos y pruebas de asociación. **Resultados:** 46,7% tenían HbA1c ≥ 7,0 y mayor prevalencia de factores de riesgo: Insuficiente conocimiento sobre control de la enfermedad (p<0,001); Conocimiento insuficiente sobre factores modificables (p<0,001); control insuficiente de la diabetes (p<0,001); Falta de adherencia al plan de control de la diabetes (p=0,002); y Monitoreo inadecuado de glucemia en sangre (p<0.001). **Conclusión:** los factores de riesgo se relacionaron con el conocimiento insuficiente y la falta de administración de la enfermedad, destacando la importancia de los enfermeros en la planificación de la atención adecuada.
Descriptores: Diabetes Mellitus Tipo 2; Factores de riesgo; Diagnóstico de enfermería; Asistencia a los Ancianos; Atención Primaria de Salud

Introduction

In the world, there are 537 million people aged 20 to 79 living with diabetes mellitus (DM). This figure is expected to increase to 643 million by 2030 and 783 million by 2045. In 2021, DM was responsible for 6.7 million deaths every 5 seconds. Elderly people with DM have a higher risk of acute and chronic complications of the disease, as they are more prone to episodes of hypoglycemia and hyperglycemia.[1-3]

In Brazil, Primary Health Care (PHC) is one of gateway for monitoring patients with DM. In this scenario, nurses should consider the individual needs of elderly people in the management of DM in order to contribute to adherence to glycemic control measures and avoid complications resulting from glycemic changes, especially when combined with other risk factors, such as dyslipidemia, obesity and sedentary lifestyle. It is important to recognize that individual conditions can interfere with the ability of the elderly person to perform self-care and thus offer strategies to optimize care for DM.[3]

In monitoring elderly people with type 2 DM (T2DM), special attention should be paid to glycemic variability, a term used for people with DM who have similar mean glucose levels to varying degrees, leading to oscillations in glycemia, with episodes of hyperglycemia and hypoglycemia.[3] The literature demonstrates that the variation in glycemic levels can increase the rate of complications and mortality, in addition to compromising renal structure and function and leading to endothelial dysfunction. These consequences can negatively impact the quality of life of the elderly, in addition to involving high costs related to treatment.[4-5]

In the context of DM2, glycated hemoglobin (HbA1c) is a method that allows evaluation of glycemic control in the long term, as it reflects the mean blood glucose concentration over 8 to 12 weeks. It is known that people with DM with HbA1c measurements ≥ 7.0 have greater glycemic variability.6 The evaluation of HbA1c by nurses is not only valuable for assessing the previous history of the person with DM2, but also for the risk of future glycemic variation and the development of microvascular complications of DM.[7]

In the approach of the elderly person with DM with glycemic variability, nurses act in several scenarios and levels of attention with a focus on the prevention of complications. In the integral perspective, the nurses carry out the nursing consultation in the operationalization of the Nursing Process (NP). Therefore, it is essential to assess the nursing diagnosis (ND) Risk of unstable glycemia (00179), classified in the nutrition domain, metabolism class, inserted in the Nanda taxonomy in 2006 and revised in 2013, 2017 and 2020. The Risk of unstable blood glucose is defined as “susceptibility to the variation of serum glucose levels in relation to the normal range, which can compromise health”.[8:208]

In this sense, we analyzed the risk factors of this ND in people with DM2 and found that 42% of the risk factors identified corresponded to those of NANDA. However, some risk factors were not included in the current version of the Nanda classification, such as age, black race, late diagnosis of DM, daytime sleepiness, macroalbuminuria, genetic polymorphisms, insulin use, use of antidiabetics, use of metoclopramide, inadequate physical activity and low fasting glucose.[9] Other studies have identified nursing diagnoses of elderly people with DM and pointed out a high occurrence of

unstable glycemia risk,[10-12] but there is a lack of research to date, which aimed to specifically analyze the ND Unstable glycemia risk in elderly people.

Thus, it is essential that nurses know all the risk factors of ND Risk for unstable glycemia in order to develop a care plan aimed at preventing complications, effectively guide the elderly about their self-care and achieve better results. This study can fill gaps related to the ND Risk for unstable glycemia, relevant in the context of the DM approach, providing evidence for the practice of nurses. Thus, the objective was to assess the risk factors of the nursing diagnosis Risk of unstable glycemia in elderly people with type 2 diabetes mellitus.

Method

Cross-sectional study carried out according to the guidelines of the instrument Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) in a Basic Health Unit (BHU), of the Primary Health Care of the Federal District (DF), Brazil, place for the monitoring of people with chronic diseases.

A sample calculation was performed in the OpenEpi software, version 3.01, and an estimated population of 340 elderly people with DM2 followed up at the BHU, 95% confidence level, error of 5% and possibility of sample loss of 20% were considered, totaling 169 participants. Sampling was for convenience and recruitment occurred during the routine nursing lecture at the BHU. The inclusion criteria adopted were age greater than or equal to 60 years, both sexes, receiving follow-up at the BHU and having a medical diagnosis of DM2 for at least 1 year. The following exclusion criteria were considered: alteration in mental status, assessed by the Mini Mental State Examination (MMSE); presence of lesions or wounds in the feet; any condition related to peripheral neuropathy, such as leprosy; neuromuscular diagnoses; and elderly people with neoplasms. In the end, 17 elderly people did not complete the data collection, as they did not attend the second day of data collection at the University, ending the sample in 152 elderly people.

Data collection took place between August and October 2021, in two days, one at the BHU and the other at the University. On the first day, the participant was scheduled

to appear fasting at the BHU to collect blood and perform the following biochemical tests: fasting glycemia; HbA1c; total cholesterol; triglycerides; high density lipoprotein (HDL); and low density protein (LDL). After blood collection, a snack was offered to the participant. Data were collected by nurses and nursing students during the nursing consultation, which was held in a private office at the BHU and guided by a structured instrument divided into demographic and clinical data.

The nursing consultation lasted a mean of 40 to 50 minutes. The duration of the disease and the number of medications were verified in the medical records of the elderly. The International Physical Activity Questionnaire (iPAQ) was applied to measure the level of physical activity of the elderly. Blood pressure was measured according to the recommendations of the Guidelines of the Brazilian Society of Cardiology.[13] A questionnaire was prepared in *checklist* format and listed the twelve risk factors corresponding to those listed in NANDA's ND Risk for unstable blood glucose.[8]

The diagnosis of loss of plantar protective sensitivity was based on the abnormal response to the protective sensitivity test concomitant with a second alteration in the assessment of vibratory, painful sensitivity or Achilles reflex. The participant was instructed to keep his eyes closed during all exams, which were performed three times in the same place, alternating two true and one false applications. They were considered normal when two of the three applications were correct. The protective sensitivity test was performed with a 10g monofilament in the hallux, first, third and fifth head of the metatarsals of each foot. The vibratory sensitivity was verified with the tuning fork in the distal phalanx of the hallux. The Achilles reflex was considered abnormal when the response of the reflex was absent or diminished with the hammer on the Achilles tendon. Painful sensitivity was assessed with an acute blunt instrument on the dorsum of the hallux.[14-15]

After the consultation, the participant was scheduled for the second day of collection, at the University, to perform the anthropometric and body composition assessment. Participants were instructed on the procedures for preparing the bone densitometry exam. The assessment of waist circumference (WC), weight and height, to calculate the body mass index (BMI), was performed according to the method established by the Guidelines of the Brazilian Association for the Study of Obesity and

Metabolic Syndrome.[16] The percentage of body fat (BF) was assessed in the DEXA dual-energy X-ray absorptiometry exam.

Data were analyzed in the Statistical Package for Social Science (SPSS - IBM®), version 25.0, and presented using frequency, percentage, confidence interval (95% CI) of the nominal variables, and median (Md) and interquartile range (IQ- 25^{th} percentile – 75^{th} percentile) for the numerical variables. Participants were divided into two groups: with glycemic control (those with HbA1c <7.0) and glycemic uncontrolled (HbA1c ≥ 7.0).[3] Tests of association between nominal variables were used. To assess the normality of the data, we opted for the Kolmogorov-Smirnov test, using the Mann-Whitney test for non-normal variables. The significance level established was 0.05.

The research was approved by the Research Ethics Committee of the University of Brasilia with opinion number 4.876.336/2021 and CAAE 45733521.0.0000.8093, on July 30, 2021, and followed all the recommendations of Resolutions 466/2012, 510/2016 and 580/2018 of the Ministry of Health. Those who accepted the invitation received the written information about the research and the researcher in charge obtained the Informed Consent Form from each participant.

Results

The study included 152 elderly people with DM2, most of whom were female, aged less than 70 years, retired and with systemic arterial hypertension (SAH). In the iPAQ classification, 38.8% were irregularly active and 17.8% were sedentary. Loss of protective plantar sensitivity was present in 34.2% of the participants. Elderly people were divided into two groups: those with HbA1c <7.0 (n=81; 53.3%) and with HbA1c ≥ 7.0 (n=71; 46.7%). In Table 1, when comparing the characteristics of the elderly, it was observed that in those with HbA1c ≥ 7.0 there was a higher prevalence of insulin use (p<0.001) and loss of plantar protective sensitivity (p=0.001).

Table 1 – Demographic and clinical characteristics of the elderly according to the HbA1c classification. (n=152). Brasília, DF, Brazil, 2021.

Analyzed variables	Total	HbA1c		P value
		<7.0	≥ 7.0	
	n(%)	n(%)	n(%)	
Sex				0.546
Female	98 (64.5)	54 (66.7)	44 (62.0)	
Men	54 (35.5)	27 (33.3)	27 (38.0)	
Age				0.834
< 70 years	95 (62.5)	50 (61.7)	45 (63.4)	
≥70 years	57 (37.5)	31 (38.3)	26 (36.6)	
Marital status				0.397
Single	18 (11.8)	8 (9.9)	10 (14.1)	
Married	91 (59.9)	47 (58.0)	44 (62.0)	
Divorced	12 (7.9)	9 (11.1)	3 (4.2)	
Widowed	31 (20.4)	17 (21.0)	14 (19.7)	
Years of schooling				0.268
0	18 (11.8)	8 (9.9)	10 (14.1)	
1 to 8 years.	98 (64.5)	57 (70.4)	41 (57.7)	
> 8 years	36 (23.7)	16 (19.7)	20 (28.2)	
Retiree				0.245
Yes	91 (59.9)	52 (64.2)	39 (54.9)	
N	61 (40.1)	29 (35.8)	32 (45.1)	
SAH				0.898
Yes	130 (85.5)	69 (85.2)	61 (85.9)	
N	22 (14.5)	12 (14.8)	10 (14.1)	
Insulin use				<0.001
Yes	38 (25.0)	9 (11.1)	29 (40.8)	
N	114 (75.0)	72 (88.9)	42 (59.2)	
Smoking				0.533
Yes	13 (8.6)	8 (9.9)	5 (7.0%)	
N	139 (91.4)	73 (90.1)	66 (93.0)	
Alcoholism				0.101
Yes	15 (9.9)	11 (13.6)	4 (5.6%)	
N	137 (90.1)	70 (86.4)	67 (94.4)	
IPAQ				0.633
Active/Very active	66 (43.4)	38 (46.9)	28 (39.4)	
Irregularly active	59 (38.8)	29 (35.8)	30 (42.3)	
Sedentary	27 (17.8)	14 (17.3%)	13 (18.3)	
Sleep				0.138
Normal	78 (51.3)	37 (45.7)	41 (57.7)	
Difficulty sleeping	74 (48.7)	44 (54.3)	30 (42.3)	
Loss of protective plantar sensitivity				0.001
Absent	100 (65.8)	63 (77.8)	37 (52.1)	
Present	52 (34.2)	18 (22.2)	34 (47.9)	

* n(%); HbA1c: glycated hemoglobin; SAH: systemic arterial hypertension; IPAQ: International Physical Activity Questionnaire

In Table 2, a longer DM time (Md=10 years) was observed in the group of elderly people with HbA1c ≥ 7.0 (p=0.004). The number of medications consumed daily (Md=6.0) was also higher in this group (p=0.011) than in the group of participants with lower HbA1c. Regarding WC, in Table 2, it was found that the group with higher HbA1c had higher WC measurements (p=0.002). Regarding biochemical tests, the group with HbA1c ≥ 7.0 showed higher median values of fasting glycemia (p<0.001) and triglycerides (p=0.031).

Table 2 - Clinical and biochemical characteristics of the elderly according to the HbA1c classification. Brasília, DF, Brazil, 2021. (n=152)

	HbA1c		
Analyzed variables	<7.0	≥ 7.0	P value
Time of DM (years)	6.0 (2.0 - 15.0)	10.0 (5.0 - 17.0)	0.004
Number of medications	5.0 (3.0 - 7.0)	6.0 (4.0 - 8.0)	0.011
BMI (Kg/m²)	28.5 (25.6 - 32.4)	28.8 (26.2 - 31.8)	0.529
BF	41.0 (34.7 - 45.2)	40.2 (32.9 - 44.9)	0.358
WC - cm	96.0 (90.0 - 102.0)	101.0 (96.0 - 107.0)	0.002
SBP (mmHg)	156.0 (137.5 - 168.0)	154.0 (132.0 - 169.0)	0.757
DBP (mmHg)	89.0 (80.0 - 102.5)	90.0 (80.0 - 101.0)	0.913
Glycemia (mg/dL)	109.0 (97.0 - 121.5)	172.0 (138.0 - 210.0)	<0.001
LDL cholesterol (mg/dL)	206.0 (180.5 - 241.0)	196.0 (177.0 - 259.0)	0.987
Triglycerides (mg/dL)	133.0 (95.7 - 184.0)	160.0 (113.0 - 216.0)	0.031
HDL (mg/dL)	52.0 (46.0 - 62.0)	51.0 (43.0 - 59.0)	0.178
LDL (mg/dL)	115.0 (99.1 - 146.7)	108.6 (96.2 - 131.0.)	0.115

*Values expressed as median and interquartile range; HbA1c: glycated hemoglobin; DM: diabetes mellitus; BMI: body mass index; BF: body fat; WC: waist circumference; SBP: systolic blood pressure; DBP: diastolic blood pressure; HDL: high density lipoprotein; LDL: low density protein.

In the assessment of the participants, it was observed that all had the ND Risk for unstable glycemia. Of the ND risk factors Risk for unstable glycemia, the most prevalent in the total sample were inadequate self-management of diabetes (68.4%), sedentary lifestyle (56.6%), inadequate food intake (46.7%) and excessive weight gain (38.2%). Table 3 shows the comparison of risk factors between the study groups, and it is possible to observe a higher prevalence of the following risk factors in the group of participants with HbA1c ≥ 7.0: inadequate self-management of diabetes (p<0.001); inadequate

adherence to the treatment regimen (p=0.002); inadequate self-monitoring of blood glucose (p<0.001); inadequate knowledge about modifiable factors (p<0.001); and inadequate knowledge about disease management (p<0.001).

Table 3 – Frequency of risk factors for nursing diagnosis Risk for unstable glycemia in the elderly according to the HbA1c classification. Brasília, DF, Brazil, 2021. (n=152)

	Total		HbA1c		
Risk factors	n (%)	95% CI	<7.0	≥ 7.0	P value
Inadequate self-management of diabetes	104 (68.4)	60.7 - 75.4	38 (46.9)	66 (93.0)	<0.001
Sedentary Lifestyle	86 (56.6)	48.6 - 64.3	43 (53.1)	43 (60.6)	0.353
Inadequate food intake	71 (46.7)	38.9 - 54.6	35 (43.2)	36 (50.7)	0.356
Excessive weight gain	58 (38.2%)	30.7 -46.0	32 (39.5)	26 (36.6)	0.715
Inadequate adherence to treatment regimen	42 (27.6)	21.0 - 35.1	14 (17.3%)	28 (39.4)	0.002
Inadequate self-monitoring of blood glucose	35 (23.0)	16.9 - 30.2	9 (11.1)	26 (36.6)	<0.001
Overstress	34 (22.4)	16.3 - 29.5	17 (21.0)	17 (23.9)	0.663
Inadequate knowledge about modifiable factors	29 (19.1)	13.4 - 25.9	5 (6.2)	24 (33.8)	<0.001
Inadequate knowledge about disease management	28 (18.4)	12.9 - 25.1	6 (7.4)	22 (31.0)	<0.001
Excessive weight loss	27 (17.8)	12.3 - 24.4	14 (17.3%)	13 (18.3)	0.869
Ineffective self-management of medications	25 (16.4)	11.2 - 22.9	10 (12.3)	15 (21.1)	0.145

* n(%); HbA1c: glycated hemoglobin; 95% CI confidence interval of 95%

Discussion

A sample of elderly people with a sociodemographic profile similar to that observed in another study with people with DM was analyzed.10 It is noteworthy that sociodemographic factors interfere with the behavior of elderly people, influencing chronic diseases, such as DM. Despite the existing recommendations of individualized glycemic goals for the elderly,[1,17] most participants in this study had high HbA1c. As poor glycemic control is associated with higher mortality rates, both hypoglycemia and hyperglycemia in the elderly are related to higher numbers of hospitalizations.[18]

Avoiding unstable glycemia is important in the care of elderly people with DM2. It is known that keeping HbA1c below 7.0 reduces complications in both type 1 and type 2 DM. Therefore, this study analyzed a sample of elderly diabetics who were classified into

two groups according to HbA1c, being similar in terms of demographic and clinical characteristics, except for the use of insulin and the presence of loss of plantar protective sensitivity. The group with HbA1c ≥ 7.0 had a higher number of participants who used insulin. It is noteworthy that an unstable metabolic control is often observed in patients on insulin therapy.[19]

Furthermore, the number of medications consumed daily was higher in the group of participants with high HbA1c. The Brazilian Diabetes Society reinforces the need for individualized care for the elderly, since polypharmacy is common in this population and influences frequent hypoglycemia and hyperglycemia.[5]

Loss of plantar protective sensitivity was present in greater numbers in those with HbA1c ≥ 7.0. It is known that diabetic neuropathy is one of the most prevalent chronic complications of DM, since up to half of individuals with DM may develop neuropathy during the disease. In this context, it is important to mention that emerging evidence suggests that glycemic variability is considered an independent risk factor for diabetic neuropathy.[19] In Taiwan, a study with people with DM showed that HbA1c variability was strongly associated with the severity of diabetic neuropathy, and patients with higher HbA1c values had higher BMI, triglycerides and a higher proportion of use of insulin, SAH and metabolic syndrome.[20]

It is important to highlight the care of nurses with the feet of people with DM. Loss of protective sensitivity is a warning sign, as these patients are subject to the onset of diabetic foot ulcer formation. The Brazilian Diabetes Society establishes that nurses are one of the professionals involved in the assessment of foot sensitivity people with DM, thus emphasizing the unique role of nurses in this care. It is evident that, when there is already a loss of protective sensitivity in the feet, patients should be assessed at established intervals, which can vary every one, three, six months and even annually, according to the established risk classification.[3]

Authors point to the ability of DM to cause changes in the health of patients, affecting their daily lives, especially those who use insulin and have more than 10 years of disease, which reinforces the need for guidance on the disease, prevention of complications and self-care.[21] Encouraging healthy practices to control risk factors associated with DM2 can decrease the incidence of the disease and its complications,

which demonstrates the important role of nursing in health education and in the implementation of preventive measures.[12]

Regarding the risk factors of ND Risk for unstable blood glucose, the most prevalent in the sample studied was inadequate self-management of diabetes, confirmed by the high frequency in those with HbA1c ≥ 7.0. In a research in Brazil, this risk factor was evidenced in 92.6% of hypertensive patients and people with DM.22 It is known that the control of a chronic disease, such as DM2, goes beyond biological aspects, but it is still considered that the assessment of glycemic control through HbA1c is a widely used marker. Therefore, the control of DM2 is challenging and necessary for better prognosis of people with DM, but it is noteworthy that elderly people present unique challenges.

The adoption of healthy behaviors is important, however it can be a challenge for elderly people with DM2, who may have difficulty adapting and negatively interfere with their physical and psychological state. In this sense, a study conducted in PHC, in Brazil, evaluated the self-care activities of elderly people and observed that the activities that presented the most difficulties were eating sweets, evaluating blood sugar and performing physical activity,[21] corroborating the results of this research.

In the context of DM2, glycemic control is directly affected by uncontrolled or poor nutritional control. A literature review investigated the most prevalent ND in people with DM and showed that 38.0% had unstable glycemia risk, pointing out that one of the reasons that prevent food adherence is the difficulty of people with DM to modify their eating habits and adapt the new eating pattern to the whole family.[12] In this context, in this study, a greater number of elderly people with inadequate knowledge about the management of the disease and its modifiable factors were observed in the group with HbA1c ≥ 7.0. In this line, another study showed a significant correlation between literacy and self-management of DM2 in the elderly, which requires skills, such as the ability to understand information.[23]

In Mexico, a sample of elderly people with a mean age of 72.3 years and a mean time of DM2 of 13 years was assessed and it was observed that 82.8% had unstable glycemia risk, since most did not have sufficient knowledge about the management of DM2, ineffective drug management and did not adhere to the therapeutic plan,

specifically the food plan, with low intake of vegetables, high consumption of sugary drinks and carbohydrates.[10] Therefore, the adoption of a diet aims to reduce the periods of hypo- and hyperglycemia, in addition to achieving a goal of HbA1c<7.0% to prevent micro and macrovascular complications in the long term.[3]

Regarding the risk factor sedentary lifestyle, the assessment should be multiprofessional, including physicians, nurses, nutritionists and physical educators, requiring an assessment of the conditions in elderly people to perform regular physical activity, one of the main behaviors that improve glycemic control. In this study, more than half of the sample was sedentary or irregularly active. It is known that the neglect of physical activity makes the elderly with DM2 more vulnerable to complications, development of other chronic diseases, obesity and cardiovascular diseases; however it should be performed with caution and supervision due to the risk of hypoglycemic episodes.[11]

Thus, a meta-analysis confirmed that physical activity improves glycemic control and suggested that it may be associated with a reduction in glycemic variability, especially in patients with higher BMI and shorter disease duration, since in the early stage of DM2 insulin resistance tends to be the main cause of hyperglycemia.[24] In addition, another meta-analysis concluded that physical activity, even less intense, such as walking, can improve glycemic control, induce anthropometric changes and promote quality of life in patients with DM2.[25]

Physical activity is, therefore, an important factor for glycemic control and improves the mobility of the elderly. Prior to the adoption of a physical activity program, patients should be systematically screened for the presence of macrovascular and microvascular complications. The Brazilian Diabetes Society recommends that a combined exercise program between aerobic (20 to 30 minutes of moderate to intense), resistance exercise, flexibility/stretching and body balance can be implemented.[3]

In relation to overweight, nurses should frequently encourage elderly people with DM2 to adopt lifestyle strategies that avoid excessive weight gain or promote weight loss. Reducing body weight improves glycemic control and may even ease the need for medications.[3] In this study, it was observed that participants with HbA1c ≥ 7.0 had higher waist circumference, a significant predictor for cardiovascular diseases, since it is

related to visceral adipose tissue with consequent increase in cytokines and insulin resistance.[26] Therefore, overweight should be monitored by the nursing team with guidance from a nutritionist, with the prescription of an individualized eating plan, according to the preferences, eating habits and taste of the elderly.[3]

Lifestyle modification is an important starting point for all elderly people with DM2; however, very restrictive diets are not recommended. Careful assessment of clinical, functional, psychosocial factors, personal preferences and even coping ability is required before outlining a treatment strategy.[2] Thus, it is recognized that the monitoring of elderly people with DM2 should be carried out in PHC so that the lack of adherence to the DM control plan is not observed, mainly evidenced by those who are overweight, sedentary and with high glycemic levels.

With regard to self-monitoring of blood glucose, the recommendation is that people with DM monitor their glucose level at least four times a day, since the frequency of monitoring is associated with improvement in HbA1c. However, for economic, social and even psychological reasons, some patients, especially elderly people, may present difficulties. In recent years, the development of new technologies for blood glucose monitoring has helped patients to control blood glucose alterations, avoiding symptoms and complications resulting from hyperglycemia and/or hypoglycemia. On the other hand, it is essential that nurses have knowledge, develop skills and act in the education of patients for the correct use of the technologies available to people with DM.[3]

The following limitations are pointed out: the impossibility of establishing a cause and effect relationship due to the cross-sectional design; and the possibility of memory bias for the self-reported variables.

The findings of this study contribute to the knowledge about the theme and reflection on the risk factors of ND Risk for unstable glycemia in elderly people with DM2. The results may support individualized nursing planning with care strategies that overcome the challenge of glycemic control. The importance of nurses in the face of the risk of unstable glycemia presented by the elderly stands out, since they are a prominent health professional inserted in the multidisciplinary team of care for patients with DM2, in the context of primary care. Given the specificities of this population, nurses should use their communication and education skills of the patient and

implement behavioral change techniques. The results highlight, therefore, the importance of the use of ND in clinical practice to know the risk factors for unstable glycemia, which allow a safe decision making and thus control the progression of the disease and reduce the risks of complications of DM.

Conclusion

In this study, the risk factors for the nursing diagnosis Risk for unstable glycemia in elderly people with DM2 were identified and inappropriate self-management of diabetes, sedentary lifestyle, inadequate food intake and excessive weight gain were highlighted. In participants with HbA1c ≥ 7.0, there was a higher prevalence of the following risk factors: inadequate self-management of diabetes; inadequate adherence to the treatment regimen; inadequate self-monitoring of blood glucose; inadequate knowledge about modifiable factors; and inadequate knowledge about disease management.

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