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FACTORS ASSOCIATED WITH GLYCEMIC CONTROL OF ELDERLY PEOPLE WITH DIABETES MELLITUS LIVING IN THE COMMUNITY

FATORES ASSOCIADOS AO CONTROLE GLICÊMICO DE PESSOAS IDOSAS COM DIABETES MELLITUS RESIDENTES NA COMUNIDADE

FACTORES ASOCIADOS AL CONTROL GLUCÉMICO DE PERSONAS MAYORES CON DIABETES MELLITUS RESIDENTES EN LA COMUNIDAD

Rogério Donizeti Reis[1], Josiane Leandra Chaves Guersoni Romancini Anicéto[2], Daniela Braga Lima[2], Daniella Pires Nunes[3], Tábatta Renata Pereira de Brito[2].

[1]Itajubá School of Medicine, Itajubá-MG, Brazil.
[2]Federal University of Alfenas, Alfenas-MG, Brazil.
[3]University of Campinas, Campinas-SP, Brazil.

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ABSTRACT

Introduction: The elderly population is growing over the years as well as the prevalence of non-communicable chronic diseases, among them, Diabetes Mellitus.

Objective: To identify factors associated with glycemic control in older adults with Diabetes Mellitus.

Method: This is a cross-sectional study conducted with a sample of 156 older adults with diabetes living in the community of a city located in southern Minas Gerais. A home interview was conducted using a comprehensive questionnaire containing questions related to socio-economic and health aspects. Glycated hemoglobin (HbA1c) was used to verify glycemic control, measured through the HPLC method. Multiple logistic regression was used in statistical data analysis.

Results: It was identified that 66% of assessed older adults with diabetes had adequate glycemic control. In the model adjusted for sex and age, it was found that older adults who reported engaging in physical activity at least once a week (OR = 3.23; 95% CI = 1.30-8.00) and consuming fruits and vegetables daily (OR = 2.48; 95% CI = 1.05-5.83) were more likely to maintain adequate glycemic control.

Conclusion: Engaging in physical activity and regularly consuming fruits and vegetables were associated with glycemic control in assessed older adults, reinforcing the importance of establishing a care plan that incorporates non-pharmacological measures in Diabetes Mellitus treatment.

Keywords: Aged; Diabetes Mellitus; Glycemic Control; Primary Health Care.

RESUMO

Introdução: A população de pessoas idosas cresce ao passar dos anos, assim como a prevalência de doenças crônicas não transmissíveis, dentre elas, o diabetes mellitus.

Objetivo: Identificar os fatores associados ao controle glicêmico em pessoas idosas com diabetes mellitus.

Método: Trata-se de um estudo seccional realizado com uma amostra de 156 pessoas idosas com diabetes residentes na comunidade de uma cidade localizada no Sul do Estado de Minas Gerais. Foi realizada entrevista domiciliar utilizando-se um questionário abrangente contendo questões relacionadas à aspectos socioeconômicos de saúde. A hemoglobina glicada (HbA1c) foi utilizada para verificar o controle glicêmico, sendo dosada por meio do método HPLC. Utilizou-se regressão logística múltipla na análise estatística dos dados.

Resultados: Identificou-se que 66% das pessoas idosas com diabetes avaliadas apresentaram controle glicêmico adequado. No modelo ajustado por sexo e idade, verificou-se que as pessoas idosas que relataram realizar atividade física pelo menos uma vez na semana (OR = 3,23; IC 95% = 1,30-8,00) e consumir diariamente frutas e verduras (OR = 2,48; IC 95% = 1,05-5,83) apresentaram mais chance de manter o controle glicêmico adequado.

Conclusão: Realização de atividade física e consumo regular de frutas e verduras foram associados ao controle glicêmico das pessoas idosas avaliadas, o que reforça a importância de se estabelecer um plano de cuidados que incorpore medidas não farmacológicas no tratamento do diabetes mellitus.

Palavras-chave: Atenção Primária à Saúde; Controle Glicêmico; Diabetes Mellitus; Idoso.

RESUMEN

Introducción: La población de personas mayores crece con el paso de los años, al igual que la prevalencia de enfermedades crónicas no transmisibles, entre ellas, la diabetes mellitus.

Objetivo: Identificar los factores asociados al control glucémico en personas mayores con diabetes mellitus.

Método: Se trata de un estudio transversal realizado con una muestra de 156 personas mayores con diabetes residentes en la comunidad de una ciudad ubicada en el Sur del Estado de Minas Gerais. Se llevó a cabo una entrevista domiciliaria utilizando un cuestionario integral con preguntas relacionadas con aspectos socioeconómicos de la salud. La hemoglobina glucosilada (HbA1c) se utilizó para verificar el control glucémico, siendo dosificada mediante el método HPLC. Se utilizó la regresión logística múltiple en el análisis estadístico de los datos.

Resultados: Se identificó que el 66% de las personas mayores con diabetes evaluadas presentaron un control glucémico adecuado. En el modelo ajustado por sexo y edad, se observó que las personas mayores que informaron realizar actividad física al menos una vez a la semana (OR = 3,23; IC 95% = 1,30-8,00) y consumir diariamente frutas y verduras (OR = 2,48; IC 95% = 1,05-5,83) tenían más probabilidades de mantener un control glucémico adecuado.

Conclusión: La realización de actividad física y el consumo regular de frutas y verduras se asociaron al control glucémico de las personas mayores evaluadas, lo que refuerza la importancia de establecer un plan de cuidados que incorpore medidas no farmacológicas en el tratamiento de la diabetes mellitus.

Descriptores: Anciano; Atención Primaria de Salud; Control Glucémico; Diabetes Mellitus.

INTRODUCTION

Population aging in Brazil is alarming. In addition to the increase in the proportion of older adults in the population, which, according to the 2022 census, reached 15.6%, there was an important increase in the aging rate. In 2022, the index reached 80.0 (80 older adults for every 100 children aged 0 to 14), whereas in 2010 this index corresponded to 44.8[1].

Population aging, the increase in the prevalence of chronic diseases and the prevalence of obesity are recognized causes of the global emergence of Diabetes Mellitus (DM). Furthermore, it is noteworthy that the prevalence of DM among Brazilian older adults (20%) is higher than in the older adult population in developed countries such as England (9.6%)[2].

DM is a metabolic and multifactorial syndrome that causes the body to develop defects in insulin action or secretion. It is characterized by chronic hyperglycemia and develops through genetic, biological and environmental factors, and can be classified as 1DM and 2DM[3].

2DM is the most common and generally linked to obesity and aging. Initially, it presents insulin resistance and partial deficiency of insulin secretion by pancreatic beta cells and changes in incretin secretion. Clinical forms are correlated with insulin resistance, such as acanthosis nigricans and hypertriglyceridemia[4].

Diabetic complications compromise older adults' functional capacity, which justifies the need to maintain correct glycemic control among these individuals. However, controlling the disease can be difficult due to difficulties in following detailed diet and exercise instructions as well as the challenges of using prescribed antidiabetic medications due to the risk of hypoglycemia[5].

In addition to controlling DM through medication, older adults can use strategies such as physical activity and adequate nutrition. Aerobic exercise performed regularly can prevent complications from the disease and control blood sugar levels. Furthermore, maintaining a diet rich in fiber, which includes consumption of fruits, vegetables and whole grains, combined with the restriction of processed and sugary foods, is essential for controlling the disease[6]. By inserting these strategies daily, an opportune environment is established for health promotion and DM prevention. Furthermore, the tripartite relationship between continuous awareness, education and family support represents fundamental pillars to enable people to adopt a healthy lifestyle, also helping to control the disease[7].

Poor glycemic control among older adults is associated with social, demographic and health behavior characteristics. Adopting healthy attitudes and habits can effectively improve health conditions or alleviate symptoms and complications of DM[8].

Glycated hemoglobin (HbA1c) measurement is a test capable of assessing glycemic control. This is a measure that has low biological variability and predicts the development of chronic metabolic complications at the microvascular and macrovascular levels[9].

HbA1c was initially identified as an "abnormal" hemoglobin in diabetic patients around 1960[10]. It refers to the portion of hemoglobin that binds to glucose present in the bloodstream, making it possible to assess the mean blood glucose level over the last two to three months. High glycemic levels during this period will result in high levels of glycated hemoglobin values[11].

A recent study[2] that used data from ELSI-Brazil (Longitudinal Health Study of Brazilian Older Adults) revealed factors associated with pre-diabetes, undiagnosed diabetes and diagnosed diabetes in a representative Brazilian sample, with older age, skin color non-white, smoking, abdominal obesity and hypertriglyceridemia being associated with diabetic conditions. It is noteworthy, however, that studies regarding factors associated with glycemic control among older Brazilian adults are still scarce in the literature.

Therefore, this study aimed to identify factors associated with glycemic control in older adults with DM.

METHOD

This is a quantitative study with a cross-sectional analytical design that is an excerpt from the work entitled "*Associação entre baixo nível de apoio social e comprimento dos telômeros em idosos*"[12]. It is noteworthy that the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) recommendations were followed.

The population that was the basis for this selection is people aged 60 and over living in 2019 in the urban area of a municipality located in southern Minas Gerais. Sample size calculation was obtained using the equation n=[EDFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)], considering – 50% proportions, 95% confidence interval, 1.17 design effect, and population of 10,797 older adults were estimated, resulting in a minimum sample of 435 older adults. The final sample size was 448 older adults, of which 156 reported diabetes, this being the sample considered for this study section.

To select participants, the sample complementation process carried out in the SABE Study (Health, Well-being and Aging), a population-based survey carried out in São Paulo, was used as a basis. The interviewers were dispersed in different regions of the municipality

according to the proximity of their region of residence and, after locating a household with a resident aged 60 or over, they proceeded to locate nearby houses or, at most, within the limits of the neighborhood to which the initial address belonged[13].

Individuals 60 years old or older, able to answer the questionnaire (assessed by the interviewer during the presentation of research and invitation to participate, with those who adequately answered their full name, date of birth and address being included), were included. Individuals with permanent or temporary inability to walk, except with the use of a walking aid device, since in the larger study physical tests were carried out that required preserved mobility, were excluded.

The data was collected between July and December 2019 at two different times. In the first moment, an interview and physical assessment were carried out and, in the second, blood collection. The interview was carried out at older adults' home, and the blood was collected at the Clinical Analysis Laboratory or at older adults' home, depending on their availability to travel to the laboratory. The interviews were carried out by undergraduate and graduate students, trained by the project's coordinating professors regarding the approach, instrument application and questionnaire completion, and lasted an average of one hour. Blood collection was carried out by a qualified laboratory professional within a maximum period of seven days after the interview.

HbA1c test was performed using a blood sample and followed the High Performance Liquid Chromatography (HPLC) method.

Glycemic control identification followed the Guidelines of the Brazilian Diabetes Society (SBD) recommendations regarding the assessment and management of older adults with DM. For healthy older adults, i.e., those with normal life expectancy, no limitations in daily activities, no limiting comorbidities, preserved muscle strength, minimal or absent sarcopenia, the reference value of HbA1c < 7.5% was adopted. For frail older adults, i.e., with reasonable life expectancy, functional and self-care limitations, reduced muscle strength, sarcopenia or malnutrition, the HbA1c reference value adopted was < 8%[4].

Socioeconomic variables were sex, age group, years of study, marital status, living arrangement and family income. Concerning health conditions, multimorbidity, polypharmacy, basic activities of daily living (BADL), instrumental activities of daily living (IADL), body mass index (BMI), depressive symptoms, and cognitive decline were included. As for lifestyle, variables included were physical activity, consumption of milk and dairy products, consumption of fruits and vegetables, and consumption of vegetables. These variables were assessed subjectively through the following questions included in the questionnaire: "Physical activity was assessed through participants' self-report regarding performance, at least once a week,

of: walking, running, weight training, water aerobics, gymnastics, yoga, Tai-Chi-Chuan or other type of physical exercise or sport. Food consumption was assessed using the following questions: "Do you consume: 1) at least one daily portion of milk or dairy products, such as cheese and yogurt?; 2) some type of meat, fish and poultry every day?; 3) two or more daily portions of fruit, vegetables?; two or more weekly servings of vegetables (beans, peas or soy) or eggs?".

The scales used to assess the variables presented above are presented below. Katz Scale assesses the ability to perform BADL. These activities involve personal care and include six functions, such as toileting, dressing, bathing, mobility, continence and feeding[14]. The measure reflects the degree of dependence. Older adults who were able to perform all BADL without assistance were considered independent.

Lawton-Brody Instrumental Activities of Daily Living assesses older adults' performance in IADL, which are adaptive tasks developed in the community, aimed at independent living. These activities include using transportation, performing household chores (housekeeping and preparing meals), shopping, making phone calls, managing personal finances, and taking medication[15]. Older adults who were able to perform all IADL without assistance were considered independent.

BMI was obtained by dividing body mass in kilograms (kg) by height in meters (m) squared (kg/m^2). BMI was classified according to the cut-off points for older adults recommended by the Ministry of Health: up to 22 kg/m^2, underweight; between 22 and 26.99 kg/m^2, adequate; 27 kg/m^2 or more, overweight[16].

Cognitive Abilities Screening Instrument – Short Form (CASI-S) was developed to detect possible cognitive changes in older adults. It assesses temporal orientation, verbal fluency, spontaneous recall with semantic suggestion (category) and recognition. Given its conciseness and ease of use compared to more traditional tests, CASI-S is of great use for cognitive screening in population studies. The maximum score is 33 points, and the cut-off point for identifying cognitive decline is 23[17].

Geriatric Depression Scale (GDS) is used to identify the presence of depressive symptoms in older adults based on 15 yes/no questions. A score of 6 or higher is considered a positive screen for depressive symptoms[18].

For data analysis, a database was built in Microsoft Office Excel version 2019 (16.0), with double data entry in order to correct possible typing errors. Statistical analyzes were performed using Stata version 17.0. In descriptive data analysis, proportions were estimated. Differences between groups were estimated using Pearson's $\chi 2$ and Fisher's exact tests. For

association analysis, multiple logistic regression was used, and the magnitude of the association was estimated by unadjusted and adjusted Odds Ratio (OR). Variables that presented a p-value less than 0.20 in univariate analysis were included in the final model using the stepwise forward procedure. Variables that did not present statistical significance were kept in the final model for adjustment. In all analyses, a 5% significance level was used.

This research complied with all Resolution 466/2012 recommendations[19]. This work was submitted to the Research Ethics Committee "OMITTED", being approved under Opinion 2.668.936. When recruiting participants, the researchers explained the research objectives and procedures. Upon agreement to participate, the Informed Consent Form (ICF) was presented, read and signed.

RESULTS

Of the 156 older adults with diabetes assessed, it was found that 66% maintained adequate glycemic control in accordance with recommendations for serum levels of glycated hemoglobin. It was observed that the majority were female (69.9%), aged between 60 and 79 years (87.2%), with four years or less of education (67.4%), mean family income between 1 and 2 minimum wages (50.7%) and living with a partner (51.9%). As for health condition, the majority has multimorbidity (91.6%), use polypharmacy (63.4%) and is overweight (61.7%), but are independent in BADL (81.9%) and IADL (57.0%), did not report depressive symptoms (62.9%) and did not present cognitive decline (69.0%).

As for lifestyle, the majority report not performing any type of physical activity weekly (68.9%) and reported daily consumption of at least one portion of: milk or dairy products (69.7%); meat, fish or poultry (74.2%); and fruits and vegetables (79.4%). The majority reported consuming vegetables weekly (94.8%) (Table 1↗).

In relation to the analysis presented in Table 1↗, higher proportions of older adults with multimorbidity (p = 0.027), who performed physical activity regularly (p = 0.009) and who consumed fruits and vegetables (p = 0.027) were observed among those who had adequate glycemic control. Regarding health insurance, a higher proportion of older adults without health insurance was observed among those who did not have adequate glycemic control.

Table 2↗ shows that older adults with multimorbidity (OR = 1.87; 95% CI = 1.04-3.37), who performed physical activities regularly (OR = 3.06; 95% CI = 1.29-7.24) and consumed fruits and vegetables daily (OR = 2.41; 95% CI = 1.09-5.34) were more likely to maintain adequate glycemic control.

When testing variables with p < 0.20 in the final model and adjusting it by sex and age, it was found that factors associated with glycemic control in the sample studied were physical activity and consumption of fruits and vegetables. Older adults who reported performing physical activity at least once a week (OR = 3.23; 95% CI = 1.30-8.00) and consuming fruits and vegetables daily (OR = 2.48; 95% CI = 1.05-5.83) were more likely to maintain adequate glycemic control (Table 3↗).

Figure 1↗ shows the AUROC representing the quality of the final model, indicating that the associated factors were able to explain 69% of glycemic control.

DISCUSSION

The study aimed to identify factors associated with glycemic control in older adults with DM. It was found that physical activity and regular consumption of fruits and vegetables increase the chances of older adults maintaining adequate glycemic control.

In this study, 68.9% of older adults did not practice physical activities. Evidence shows that inactive older women or those with a low level of physical activity have worse glycemic control. Physical activity is one of the pillars in the treatment of chronic non-communicable diseases, as it brings benefits in reducing mortality from cardiovascular diseases. Diabetic patients should be encouraged to minimize sedentary behavior whenever possible and within their ability to achieve positive health outcomes[20].

A study[21] carried out with 248 people in Tanzania showed that 79.8% of those interviewed reported not practicing physical activities. The American Diabetes Association[22] states that moderate-intensity exercise improves glucose control, reducing the acute and chronic consequences of DM. Patients with diabetes should perform at least 150 minutes of aerobic exercise and resistance training two to three times a week and follow the principle of progressive resistance training[22].

For the authors[23], the reduction of glycemic values can be achieved by increasing insulin activity through aerobic activities and expanding muscle mass through resistance training. Aerobic and resistance exercises, combined, significantly improve glycemic control and reduce cardiovascular risk in 1DM and 2DM. Regular physical activity reduces oxidative stress and increases insulin sensitivity, and both processes play a fundamental role in the pathogenesis of diabetes[24].

Regarding consumption of fruits and vegetables, the authors[25] carried out a study with 315 participants where vegetables and fruits were consumed seven and five times a week, respectively. Among food groups, fruits had a significant association with HbA1c, increasing the chance of achieving HbA1c < 7 by approximately 17%.

In Brazil, according to the healthy eating guide for people over 70 years of age, consumption of cereals, pasta and C vegetables should be six servings. In relation to fruits, the recommended is two servings. In relation to vegetables, milk and derivatives, the recommended is three servings. In relation to meats, eggs, beans and nuts, the recommended is two servings[26].

A prospective cohort study based on ADDITION – Cambridge with 401 people between the ages of 40 and 69 years with a 5-year follow-up period observed that consumption of fruits and vegetables increased in the first year, but reduced in the fifth year, whereas the variety remained unchanged. At baseline, fruit and vegetable consumption was 489.5 grams/day; in the first year, it was 555.1 grams/day and 495.8 grams/day in the fifth year of follow-up. It was observed that HbA1c at baseline was 6.7%; in the first year, it was 6.3% and 6.8% in the fifth year of follow-up[27].

As for the sample of this study, there is a convergence with what was carried out in Recife, where 202 older adults with DM (73.3%) were female, (46%) had partners, (88.5%) and lived with other people[21].

Reported income and low education are important factors that lead to poor adherence and poor glycemic control. Carvalho associates the importance of income and a high level of education with greater access to health services, including the acquisition of health insurances[28]. Not having a health insurance is also associated with inadequate glycemic control[29].

Low education is common among people who seek public health services, and in the elderly population this is even more common[21]. In this research, the prevalence of years of study was ≤ 4 years, which demonstrates the difficulty in accessing education for older adults, which directly impacts glycemic control.

In relation to multimorbidity (91.6%), older adults were more likely to have poor glycemic control, a result converging with a study by Urina-Jassir *et al*[30], where 85% of the sample had more than one chronic condition with prevalence in women.

Polypharmacy (63.4%) is associated with unfavorable outcomes. In a study[31], the authors highlighted the high prevalence of polypharmacy in people with diabetes and suggest that this condition can have a substantial impact on several negative outcomes related to diabetes health.

Concerning depression and cognitive decline, results found in the study[32] indicate that patients with uncontrolled DM have a strong association between worsening cognitive functions. Diabetic people have a two or three times higher prevalence of depressive symptoms compared to an individual without the disease. Depression has a harmful impact on glycemic control and poorly controlled diabetes intensifies these symptoms[4].

In relation to BMI, overweight older adults are more likely than normal-weight patients to have poor glycemic control. When BMI is high, they are more likely to develop insulin resistance and obesity, which leads to systemic inflammation[33].

Older adults must have functional capacity and a state of independence to perform ADLs to be classified as having autonomy in their home/society activities[21]. The years of life lived associated with comorbidities such as type 2DM favor the development of functional dependence, impacting BADL and IADL[34].

With regard to food, study participants (69.7%) reported daily consumption of at least one portion of milk or dairy products, (74.2%) meat, fish, poultry, fruits and vegetables, and (94.8%) vegetables.

A diet rich in red meat and its derivatives, vegetables, seafood, condiments, fungi and algae, main grains and poultry, but low in whole grains and tubers and preserves is associated with poor glycemic control in older adults. Older adults who adhere to dietary patterns high in saturated fat and cholesterol are at greater risk of obesity and type 2DM[35].

Milk and dairy products are essential to the human body, as they contribute as a source of calories and are suppliers of amino acids, which serve as building and renewing materials. Proteins of animal origin are of high biological value, i.e., they have a better amino acid composition compared to vegetable protein sources[26].

Regarding the limitations of this study, it should be noted that it is a sample derived from a larger study, which is not representative of older adults with diabetes. Physical activity and food consumption assessment was carried out using self-reported questions and, despite including polypharmacy in the analyses, hypoglycemic medications were not considered separately.

CONCLUSION

The present research revealed that factors associated with glycemic control among older adults assessed are physical activity and regular consumption of fruits and vegetables, regardless of the sex and age of participants. These findings highlight the need to invest in training and health education, since schooling is related to a more adequate diet.

Additionally, regular consumption of vegetables can help reduce hemoglobin A1C levels, an important marker of glycemic control in individuals with diabetes. This data highlights the importance of a balanced and healthy diet for older adults in controlling diabetes, reinforcing that diets rich in fruits and vegetables are essential for maintaining metabolic health. Regular physical activity also contributes to improving glycemic control and, consequently, the quality of life of older adults. Therefore, it is imperative that health policies encourage regular physical exercise for this population.

It is extremely important that health professionals work to guide and motivate older adults to adopt healthy eating habits and an active lifestyle. Health education must be implemented, and educational strategies must be developed to improve the level of knowledge of older adults about the importance of diet and exercise in controlling diabetes.

Based on the results of this study, professionals can develop more effective, personalized intervention programs based on scientific evidence, directing their efforts towards specific areas such as nutrition and physical activity, which can result in significant improvements in the health and quality of life of older adults.

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Authors
Rogério Donizeti Reis
https://orcid.org/0000-0002-3457-2133
Josiane Leandra Chaves Guersoni Romancini Anicéto
https://orcid.org/0000-0001-6429-603X
Daniela Braga Lima
https://orcid.org/0000-0002-6755-9744
Daniella Pires Nunes
https://orcid.org/0000-0002-4679-0373
Tábatta Renata Pereira de Brito
https://orcid.org/0000-0001-9466-2993

Corresponding Author/Autor Correspondente
Rogério Donizeti Reis – Faculdade de Medicina de Itajubá, Itajubá-MG, Brasil.
rogerio.reis@fmit.edu.br

Authors' contributions/Contributos dos autores
RR: Data curation, formal analysis, methodology, writing – original draft, writing – review and editing.
JA: Data curation, formal analysis, methodology, writing – original draft, writing – proofreading and editing.
DL: Conceptualization, data curation, funding acquisition, research, oversight, validation, writing – review and editing.
DN: Research, validation, writing – review and editing.
TB: Conceptualization, data curation, formal analysis, funding acquisition, research, methodology, project administration, supervision, validation, writing – original draft, writing – review and editing.
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Table 1 – Sample characterization according to socioeconomic, health, lifestyle and glycemic control aspects. Alfenas, 2019, (n=156).

Variables	Total n (%)	Yes (%)	No (%)	p
Gender				
Male	47(30.1)	28(27.2)	19(35.8)	0.264
Female	109(69.9)	75(72.8)	34(64.2)	
Age group				
60 to 69 years	68 (43.6)	46 (44.6)	22 (41.5)	0.510
70 to 79 years	68 (43.6)	42 (40.8)	26 (49.1)	
80 years or older	20 (12.8)	15 (14.6)	5 (9.4)	
Years of study				
> 4 years	48 (32.6)	33 (34.0)	15 (30.0)	0.622
≤ 4 years	99 (67.4)	64 (66.0)	35 (70.0)	
Marital status				
With partner	81 (51.9)	51 (49.5)	30 (56.6)	0.401
No partner	75 (48.1)	52 (50.5)	23 (43.4)	
Home arrangement				
Does not live alone	129(84.3)	82 (80.4)	47 (92.2)	0.059
Lives alone	24(15.7)	20 (19.6)	4 (7.8)	
Family income				
> 2 minimum wages[a]	46 (31.9)	29 (29.6)	17 (37.0)	0.647
> 1 and ≤ 2 minimum wages	73 (50.7)	52 (53.1)	21 (45.6)	
≤ 1 minimum wage	25 (17.7)	17 (17.3)	8(17.4)	
Multimorbidity				
No	13 (8.4)	5 (4.9)	8 (15.9)	0.027
Yes	141 (91.6)	97 (95.1)	44 (84.6)	
Polypharmacy				
No	56 (36.6)	35 (34.6)	2 (40.4)	0.486
Yes	97 (63.4)	66 (65.3)	31 (59.6)	
BADL[b]				
Independent	122 (81.9)	79 (80.6)	43 (84.3)	0.578
Dependent	27 (18.1)	19 (19.4)	8 (15.7)	
IADL[c]				
Independent	86 (57.0)	59 (59.7)	27 (52.0)	0.366
Dependent	65 (43.1)	40 (40.4)	25 (48.1)	
BMI				
Low weight	13(8.4)	8(7.8)	5(9.6)	0.558
Eutrophic	46(29.9)	28(27.5)	18(34.6)	
Overweight	95(61.7)	66(64.7)	29(55.8)	
Depressive symptoms				
No depression	98 (62.9)	65 (63.1)	33 (62.7)	0.918
With depression	58 (37.1)	38 (37.0)	20 (37.8)	
Cognitive decline				
No decline	107 (69.0)	72 (70.0)	35 (67.3)	0.741
With decline	48 (31.0)	31 (30.1)	17 (32.7)	
Physical activity				
No	102(68.9)	62(62.0)	40(83.3)	0.009
Yes	46(31.1)	38(38.0)	8(16.7)	
Consumption of milk and dairy products				
No	47(30.3)	35(34.0)	12(23.0)	0.163
Yes	108(69.7)	68(66.0)	40(77.0)	
Consumption of meat, fish or poultry				
No	40(25.8)	31(30.0)	9(17.3)	0.086
Yes	115(74.2)	72(70.0)	43(87.7)	
Consumption of fruits and vegetables				
No	32(20.6)	16(15.5)	16(30.7)	0.027
Yes	123(79.4)	87(84.5)	36(69.3)	
Consumption of vegetables				
No	8(5.2)	7(6.8)	1(1.9)	0.203
Yes	146(94.8)	96(93.2)	50(98.1)	

Table 2 – Univariate analysis of socioeconomic, health and lifestyle aspects associated with glycemic control. Alfenas, 2019, (n=156).

Variables	*OR*	*p*	*CI*
Gender			
Male	1.00		
Female	1.45	0.265	0.73-30.4
Age group			
60 to 69 years	1.00		
70 to 79 years	0.70	0.473	0.38-1.56
80 years and older	1.43	0.532	0.46-4.45
Years of study			
> 4 years	1.00		
4 years or less	0.83	0.623	0.39-1.73
Marital status			
With partner	1.00		
No partner	1.32	0.402	0.68-2.58
Family income			
> 2 minimum wages[a]	1.00		
1 to 2 minimum wages	1.45	0.352	0.66-3.18
Lower than 1 minimum wage	1.24	0.676	0.44-3.49
Home arrangement			
Does not live alone	1.00		
Live alone	2.86	0.068	0.92-8.88
Cognitive decline			
No decline	1.00		
With decline	0.88	0.742	0.44-1.81
Depressive symptoms			
No depression	1.00		
With depression	0.96	0.918	0.48-1.91
Multimorbidity			
No	1.00		
Yes	1.87	0.035	1.04-3.37
Polypharmacy			
No	1.00		
Yes	1.27	0.486	0.64-2.54
BADL[b]			
Independent	1.00		
Dependent	1.29	0.578	0.52-3.19
IADL[c]			
Independent	1.00		
Dependent	0.73	0.366	0.37-1.43
BMI			
Low weight	1.00		
Eutrophic	0.97	0.965	0.27-3.44
Overweight	1.42	0.565	0.42-4.72
Physical activity			
No	1.00		
Yes	3.06	0.011	1.29-7.24
Consumption of milk and dairy products			
No	1.00		
Yes	0.58	0.166	0.27-1.25
Consumption of meat, fish or poultry			
No	1.00		
Yes	0.48	0.090	0.21-1.11
Consumption of fruits and vegetables			
No	1.00		
Yes	2.41	0.029	1.09-5.34
Consumption of vegetables			
No	1.00		
Yes	0.27	0.232	0.03-2.29

Table 3 – Final model of factors associated with glycemic control. Alfenas, 2019, (n=156).

Variables	$_{Ajusted}$OR	*p*	*IC*
Gender			
Male	1.00		
Female	1.86	0.121	0.84-4.07
Age (cont.)	1.05	0.052	0.99-1.11
Physical activity			
No	1.00		
Yes	3.23	0.011	1.30-8.00
Consumption of fruits and vegetables			
No	1.00		
Yes	2.48	0.036	1.05-5.83

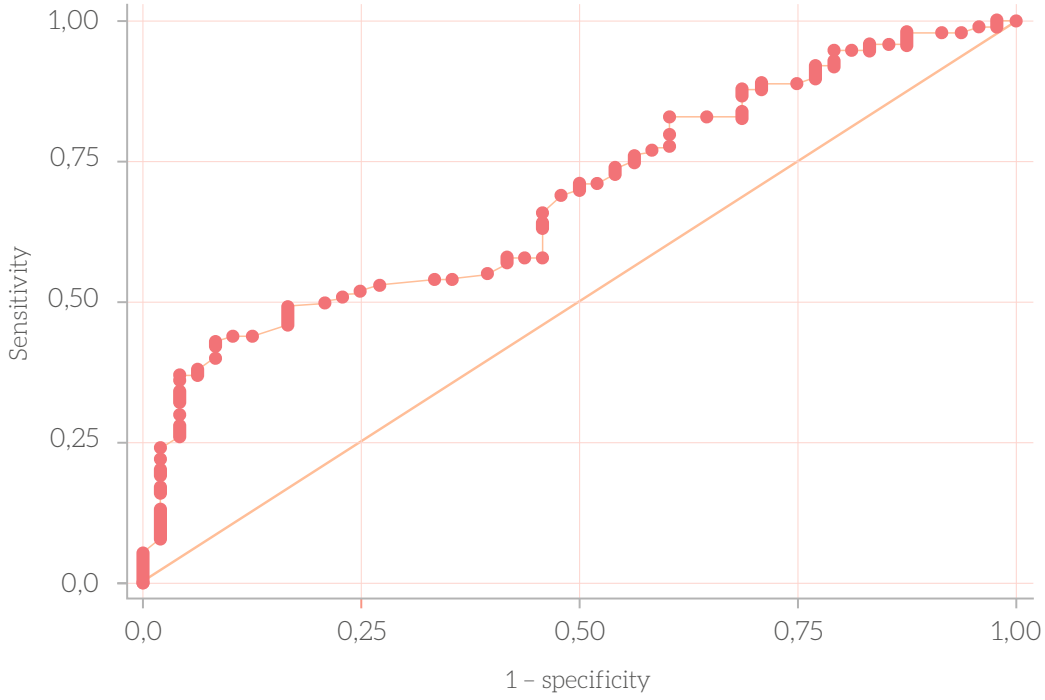


Figure 1 – Area under the ROC curve representing the fit of the final logistic regression model.