





Practical challenges in insulin management and glycemic self-monitoring: The perception of people with Diabetes Mellitus

Desafios práticos no manejo da insulina e automonitoramento glicêmico: percepção de pessoas com diabetes mellitus

Desafíos prácticos en el manejo de la insulina y el autocontrol de la glucemia: percepción de personas con diabetes mellitus

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ABSTRACT

Objective: to understand the main uncertainties and challenges faced by people with Diabetes Mellitus in managing insulin therapy and glycemic self-monitoring. **Method:** a qualitative and descriptive study conducted between March and August 2025 at a public health service specialized in diabetes. The participants were 10 individuals with diabetes using insulin and under a self-monitoring regime. The data were collected by means of semi-structured interviews and analyzed following Content Analysis (Bardin), with due approval from an Ethics Committee. **Results:** three categories emerged: Practical challenges in insulin use (technique, rotation, dose adjustments, and storing and discarding supplies); Barriers to glycemic self-monitoring (how to use the glucometer, frequency, hypo/hyperglycemia management, and interpretation of the results); and Emotional aspects (fear, anxiety, and uncertainty). **Final considerations:** managing insulin and self-monitoring requires health education, multiprofessional support and ongoing follow-up to promote autonomy, self-confidence and adherence to the treatment.

Descriptors: Diabetes Mellitus; Insulin; Self-Care; Glycemic Self-Monitoring; Health Education.

RESUMO

Objetivo: compreender as principais incertezas e desafios enfrentados por pessoas com diabetes mellitus no manejo da insulino terapia e da automonitorização glicêmica. **Método:** estudo descritivo qualitativo realizado em serviço público de saúde especializado em diabetes entre março e agosto de 2025. Participaram 10 pessoas com diabetes em uso de insulina e automonitorização. Os dados foram coletados por entrevistas semiestruturadas e analisados por Análise de Conteúdo (Bardin), com aprovação pelo Comitê de Ética. **Resultados:** emergiram três categorias: desafios práticos na aplicação da insulina (técnica, rodízio, ajustes de doses, armazenamento e descarte de insumos); barreiras na automonitorização da glicemia (uso de glicosímetro, frequência, manejo de hipo/hiperglicemia e interpretação dos resultados); e aspectos emocionais (medo, ansiedade e insegurança), que impactaram a adesão. **Considerações finais:** o manejo da insulina e da automonitorização exige educação em saúde, suporte multiprofissional e acompanhamento contínuo para promover autonomia, segurança e adesão ao tratamento.

Descritores: Diabetes Mellitus; Insulina; Autocuidado; Monitoramento Glicêmico; Educação em Saúde.

RESUMEN

Objetivo: comprender los principales desafíos que enfrentan las personas con diabetes mellitus en el manejo de la insulino terapia y el autocontrol glucémico. **Método:** estudio cualitativo descriptivo en un servicio público de salud especializado en diabetes entre marzo y agosto de 2025. Participaron diez personas con diabetes que utilizaban insulina y se autocontrolaban. Los datos se recolectaron mediante entrevistas semiestruturadas y se analizaron mediante Análisis de Contenido (Bardin), con la aprobación del Comité de Ética. **Resultados:** surgieron tres categorías: desafíos prácticos en la aplicación de la insulina (técnica, rotación, ajustes de dosis, almacenamiento y descarte de insumos); barreras para el autocontrol de la glucemia (uso del glucómetro, frecuencia, manejo de la hipo/hiperglicemia e interpretación de los resultados); y aspectos emocionales (miedo, ansiedad e inseguridad), que impactaron en la adherencia. **Consideraciones finales:** el manejo de la insulina y el autocontrol requiere educación para la salud, apoyo multidisciplinario y seguimiento continuo para promover la autonomía, la seguridad y la adherencia al tratamiento.

Descritores: Diabetes Mellitus; Insulina; Autocuidado; Monitoreo de Glucemia; Educación para la Salud.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic disease presenting high prevalence and recognized as a Public Health problem at the global level. Nearly 589 million adults live with diabetes in the world, including 16.6 million Brazilians. According to Agência Brasil and based on the *Vigitel Brasil 2023* research study and on data from the Ministry of Health¹, at least 6.5 million people need to use insulin in their treatments to control their glycemic levels. Given this, it is acknowledged that using this medication is directly related to glycemic monitoring as an essential self-care aspect²⁻³.

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Adequate supervision of the insulin therapy and of glycemic monitoring is essential in managing Diabetes *Mellitus*. Nevertheless, there is a frequent gap between the scientific recommendations and the practices adopted by the patients, especially regarding insulin transportation, storage, preparation and application⁴. Uncertainties and challenges arise in the everyday practice, which is characterized as a risk that can impose severe consequences on users, such as glycemic variations, hyper/hypoglycemia and even death. Insulin is classified as a Potentially Dangerous Medication (PDM) and is included in the high-risk medications class⁴⁻⁵.

According to a cross-sectional study that assessed errors in insulin application⁶, there is an association between dissatisfactory performance in insulin self-application and possible improper monitoring practices, which can be due to uncertainties and challenges that arise during treatment. In addition to reusing needles and improperly handling the devices, factors such as not knowing the proper administration time, incorrect practices such as not disinfecting the skin or not taking the insulin out of the refrigerator beforehand impose financial and emotional costs, as well as dissatisfactory clinical results⁶.

Given the above, insulin management and glycemic self-monitoring are fundamental for DM control. Thus, health education and effective communication are fundamental strategies to reduce complications, improve clinical outcomes and develop more humanized and resolute assistance². Consequently, the current study becomes relevant to elucidate and identify the main uncertainties and challenges faced by people with DM in this context, aiming at providing aids for educational and communication strategies, as well as at devising more effective public policies. This is also in line with Sustainable Development Goal (SDG) 3 (Health and Well-Being), as it contributes to promoting safe care, to strengthening self-care capacity and to improve health outcomes in people with chronic diseases⁷.

In addition, a gap is noticed in the literature as for qualitative surveys exploring the patients' perceptions and experiences about insulin therapy and glycemic self-monitoring. Most research studies focus on biomedical or cost-effectiveness aspects, neglecting the patients' perspective⁸. Thus, the objective of this study is to understand the main uncertainties and challenges faced by people with Diabetes *Mellitus* in managing insulin therapy and glycemic self-monitoring. Consequently, the following question is formulated: Which are the main uncertainties and challenges faced by people with Diabetes *Mellitus* in insulin therapy management and in glycemic self-monitoring?

METHOD

A descriptive study with a qualitative approach developed according to the *CO*nsolidated *CR*iteria for *RE*porting *Q*ualitative *RE*search (COREQ)⁹ guidelines at a secondary-level public health service that is a reference in outpatient assistance specialized in Diabetes *Mellitus*.

The research sought to identify the main uncertainties and needs of people with Diabetes *Mellitus* regarding insulin use and glycemic self-monitoring. The current research is a clipping from a matrix project about developing an educational chatbot on managing insulin therapy and glycemic self-monitoring targeted at people with diabetes. In this stage, it was sought to identify the uncertainties, information needs and difficulties experienced in everyday care, in order to ease defining the essential requirements and contents of the technology. Descriptive field research was employed to such end. According to Minayo¹⁰, this approach is a fundamental instrument to analyze reality, allowing to understand the social demands related to health and to care measures for the disease.

The research was developed from March to August 2025. The participants were 10 individuals with diabetes, selected according to the following inclusion criteria: being regular users of the service; having a Diabetes *Mellitus* medical diagnosis; using insulin; and undergoing glycemic self-monitoring. The patients excluded were those from the pediatric population and those with cognitive impairments that hindered understanding the questions.

The intentional sampling technique was used for the first procedure. The participants were invited to take part in the study while they were waiting for their turn or after the appointments in the service. Previous explanations were provided about the study objectives and the researchers' involvement in the research.

After accepting, each participant was led to a private room in order to preserve their privacy during the individual interview. Semi-structured and individualized interviews were conducted, lasting a mean of 20 minutes and following a script divided into two parts. The first one included the patients' characterization (demographic, socioeconomic and clinical aspects including age, gender, marital status, schooling level, professional training, occupation, income, time since diabetes diagnosis, type of diabetes, time using insulin, complications and associated comorbidities); and open questions related to difficulties and experiences regarding insulin application and glycemic self-monitoring (such as main difficulties, doubts about dose adjustments, how to use the glucometer, confidence in self-application and expectations about an educational chatbot).

Inductive thematic saturation was adopted when no new codes or topics were identified in the exploratory phase of the analysis corresponding to each interview. Subsequently, sample saturation was verified during the process when the transcribed testimonies were analyzed, which happened at the tenth interview¹¹. The analysis of the findings was grounded on the theoretical framework of Bardin's Content Analysis¹², as it allows identifying meanings, patterns and signifying structures present in discourse. This framework was chosen because it enables systematically organizing testimonies, grouping them into units of meaning and assembling analytical categories that are consistent with the study qualitative nature. For data analysis, the interviews were recorded in a digital device with due authorization, transcribed in full and submitted to Categorical Thematic Analysis¹². The analytical process followed the classic content analysis stages: 1) Pre-analysis; 2) Exploration of the material; and 3) Processing, inference and interpretation of the results, using the frequency thematic content analysis technique.

The *IRaMuTeQ* software program was employed to ease this process, which enabled performing the similarity analysis and favored identifying the connections between words and nuclei of meaning found in the text *corpus*¹³. The data were categorized based on the nuclei of meaning identified in the participants' testimonies, listing three thematic categories: 1) Practical challenges in insulin use; 2) Barriers to glycemic self-monitoring; and 3) Emotional aspects and those associated with adapting to the treatment.

The research observed all norms set forth in National health Council Resolution No. 466/2012¹⁴, such as the subjects' autonomy, beneficence, non-maleficence, fairness and anonymity. The interviews were coded with the letter "P" (for "Participants") to designate them in an alphanumeric sequence from 1 to 10. All the participants signed two copies of a Free and Informed Consent Form, one of them being handed in to each participant and with the researchers keeping the other; the subjects also assented to recording the interviews. Due approval was requested to the unit manager and to the Board of Directors of the specialized center, and the project was approved by a Research Ethics Committee under Opinion No. 88667325.8.0000.5534.

RESULTS

The study participants were 10 individuals, with predominance of women, mean age of 39.3 years old (from 20 to 63), married or in stable union, with Higher Education, and half of them earning up to one minimum wage. Table 1 presents the characterization of two participants.

Table 1: Sociodemographic data corresponding to the participants. Fortaleza, CE, Brazil, 2025.

Variables		n	f(%)
Type of diabetes	Type 1 Diabetes <i>Mellitus</i>	5	50
	Type 2 Diabetes <i>Mellitus</i>	4	40
	Diabetes due to other causes	1	10
Gender	Female	8	80
	Male	2	20
Marital status	Married/Stable union	7	70
	Single	2	20
	Widowed	1	10
Schooling level	Higher Education	5	50
	Complete High School	3	30
	Others	2	20
Monthly income	Up to 1 minimum wage	5	50
	More than 1 minimum wage	5	50
Clinical conditions	DM-related complications	6	60
	Associated comorbidities	7	70
Time since diagnosis	1 year	1	10
	>5 years	2	20
	>10 years	7	70
Time using insulin	>1 year	1	10
	>5 years	1	10
	>10 years	8	80

As for DM type, five and four of them presented Type 1 and Type 2 Diabetes *Mellitus*, respectively. The mean time since the diagnosis was 10.8 years (min=1; max=30); six participants presented complications such as neuropathy, foot problems and retinopathy; and seven reported comorbidities, mainly arterial hypertension and dyslipidemia.

The difficulty rotating the application sites for proper insulin absorption is shown in the statements from two participants. In addition, the everyday challenge of lowering glycemic levels, presence of lipodystrophy and improper application technique were frequently reported, with emphasis on the practical aspect of insulin therapy.

[...] Then I find it difficult, I don't manage to apply it on my arm, I only apply it in the belly. I just can't find the right place. The only difficulty is that the blood glucose level takes some time to go down. (P2) I find it a little difficult to apply the insulin; I apply it twice sometimes because I think it didn't get into my body. (P4)

Another topic addressed was related to storing and discarding the supplies. The participants addressed the need for adequate guidelines from health professionals, considering that any information coming from third parties (external to the health service) can be incorrect and lack scientific grounds.

[...] It's the place, where to store everything, where to keep it, that's what matters. Yes, some people put the pens in the fridge. I don't keep them in the fridge, I keep them outside the fridge. I still have a doubt. Am I doing it right or wrong? Why does that woman put her insulin in the fridge? (P5)

Figure 2 was prepared based on the testimonies given by the people with diabetes, emphasizing the main aspects that were highlighted related to the difficulties found regarding insulin therapy.

Difficulties handling insulin	Participants' testimonies
Application technique	Sometimes I take the pen and I can't see. I do find it difficult, I see blurred. (P1) [...] the difficult thing is to apply it to the skin, everything's terrible, I just can't find the right place. (P5) As I don't see well because of my sight, I'm afraid of choosing the wrong dose or of letting the insulin drop. (P10) Those reloadable pens, they're not easy to use [...]. (P3)
Choosing and rotating the application sites	[...] I don't quite know which the right places are, I go measuring three fingers in distance from each insulin application site. (P6) My main everyday difficulty is choosing the application site, always trying to remember to choose a place close to the last application. (P7) My favorite place to apply it is the arm. I don't like applying it on my belly or legs, but the arm [...] is there any problem? (P1)
Dose adjustments	I don't mess with the dosage [...] I'm afraid of using more or less and having a bad time. (P1) I don't mess, I don't know how to increase, I'd increase, I think I need, but I think that way, it makes no effect. (P2) Now my doubt is this: if diabetes is at two hundred and fifty, two hundred and twenty, how much can I apply? Should I apply the eighteen? Or do I need to apply a little more? [...] (P3)
Storing insulin	One thing I find it difficult is knowing if the insulin is still good. Kinda, I sometimes have doubts during transportation, knowing if it's really working? Can it lose its quality perhaps? (P4)
Discarding sharps	[...] I only change the needle once a day. That's right, isn't it? I'm also not sure about that [...] (P5) I'm not sure if I have to discard the sharps, where to keep the insulin pens, the strips [...]. (P4)

Figure 2: Practical challenges in insulin use. Fortaleza, CE, Brazil, 2025.

It was observed that some of them were insecure as for adjusting the insulin dose on their own, expressing fear of applying inadequate amounts and suffering adverse consequences. It is noted that most of them did not know how to handle the proper insulin dose even when adjustments were required, such as in severe and persistent hypoglycemia and hyperglycemia cases, as exemplified in the following report:

[...] I'm not confident enough to adjust my insulin dose. I think my doses aren't so well adjusted. I'm not confident that, kinda, I'm gonna apply it and everything's gonna be OK. It's already happened that the dose was too high and I got hypoglycemia. (P4)

Some participants reported uncertainties regarding the proper procedures to handle and discard the sharps used in their treatment. In addition to the difficulties related to handling insulin and storing and discarding supplies, the participants also reported problems in the glycemic self-monitoring process, issues described in the category presented below.

Challenges in glycemic self-monitoring

When analyzing this category, it was revealed that the challenges faced by the participants in glycemic self-monitoring were related to four main dimensions: Difficulties using and operating the glucometer and reactive strips; Uncertainties as for frequency and right moment to measure capillary blood glucose; How to manage hypo/hyperglycemia situations; and Interpretation of the results obtained.

The participants reported technical failures and operational uncertainties, such as reading errors in the glucometer, strip rejection and need to replace batteries. Difficulties handling the device were frequently mentioned, as well as reconciling capillary blood glucose with the everyday routine (especially in work contexts), leading to omit monitoring before applying insulin, as observed in the following testimony:

I find it difficult to find some time to do capillary blood glucose, depending on how things are at work when I'm very busy. (P7) The glucometer makes me go nuts sometimes [...] at the beginning, when I started using the glucometer, the nurses taught me to use only the basic stuff, only the technique to check the blood glucose level. (P2)

Figure 4 shows the difficulties managing glycemic self-monitoring according to the testimonies of people with diabetes, allowing to identify nuances inherent to the personal and clinical contexts revealed in their statements.

Difficulties managing glycemic self-monitoring	Participants' testimonies
Use and operation of the glucometer and strips	[...] it's already happened many times in my machine, it doesn't read the blood glucose values [...]. (P1) In the blood glucose technique you have to prick the right place in the finger. I do it near the light because I don't see well. And when the glucometer shows an error, the strip is rejected and I do the blood glucose again. (P3) When using the glucometer, I'm confused about the time, how to adjust date and time, going back to see the blood glucose reading [...]. (P4) [...] now that the nurse has talked to me, I didn't know that they (strips) can't be exposed to sunlight, a lot of sunlight. (P6) [...] when the glucometer shows an error, I throw away the battery and buy a new one [...]. (P8) I don't know what to do in the glucometer to see previous readings [...]. (P10)
Proper frequency/moment for capillary blood glucose	[...] I find it difficult to find some time to do capillary blood glucose, depending on how things are at work when I'm very busy. (P7) I applied myself some insulin once, I didn't check my diabetes level before. I almost died. Do you know what my blood glucose reading was? 60. I was wrong [...] I didn't check, but I should have. (P1)
Managing hyperglycemic and hypoglycemic situations	[...] I know it just can't be 90 at all, and that up to 110 is normal. And you have a value after two hours, but I don't know for sure [...]. (P6) What I understand is that blood glucose should be up to 200 at the most. If it goes down too much, I get hypoglycemia [...]. (P2) [...] when I'm hypoglycemic, I eat some brown sugar, drink some water and wait a little, it's still imbalanced [...]. (P3)
Interpreting the results	[...] those letters, that HI [...] I only know that I sometimes try to check and it looks as if it's not reading anything, it's so high that the machine reads nothing, it seems that, I don't know what it means. (P1) [...] the small letters it shows, HI, LO, and some numbers [...] I don't know what that means. (P2) I find it difficult to know the right values for blood glucose, you know? I understand that HI is when it's above 500, but that LO I don't know, and it's already appeared [...] it was after I lost my baby. Mixed up emotions with everything else, you know? (P4) [...] some letters appear sometimes and I don't know what they mean [...]. (P8)

Figure 3: Challenges in glycemic self-monitoring Fortaleza, CE, Brazil, 2025.

Emotional aspects and those associated with adapting to the treatment

Exerting impacts on the others, the third thematic category is related to the emotional aspects that were strongly addressed by the participants, such as the following: feelings of fear, anxiety, frustration, insecurity, perception of difficulties and importance of professional/family support. The participants' testimonies reveal that the insulin therapy requirements generate fear, discomfort and wear out that can turn into obstacles hindering their treatment:

[...] it's not easy, to tell you the truth. Counting carbohydrates demands sound mental health, in addition to the application itself [...]. (P4)

I've never applied it by myself. I'm afraid of breaking that needle. I'm afraid, I'm easily frightened [...] I've never applied it. (P1)

The biggest obstacle when using insulin is physical discomfort. The application routine becomes exhausting over time. (P9)

[...] at the beginning, I trembled just thinking about the application. (P10)

In addition to insulin therapy, self-monitoring was also pointed out as a process that triggers negative feelings. The reports indicate that, although essential for diabetes management, self-monitoring is marked by feelings of anxiety and by physical limitations that affect these people's everyday experience. One of the testimonies revealed the relationship between glycemic self-monitoring and feelings of anxiety, especially given high readings, a situation that was intensified after experiencing a miscarriage:

[...] and another thing that kinda, that even made me loss my baby. I was very anxious when checking my blood glucose. Then I felt really bad when it was high [...]. (P4)

The physical consequences from repeated finger pricks throughout the day were also mentioned, which result in pain and discomfort, oftentimes emerging as a barrier to adhering to the treatment, as shown in the following testimonies:

The difficult thing with glyceimic monitoring for me is overpricking, it quite peels my fingers off, I don't pierce all fingers, they get purple. (P4) I find it difficult following some essential guidelines in the treatment [...] pricking my fingers several times a day to measure blood glucose with the glucometer causes recurrent discomfort. (P9)

They also revealed the need for professional and emotional support due to all the wear out and requirements demanded by the treatment. Guidelines, diabetes-related education and psychological follow-up are fundamental while applying the insulin therapy and in glyceimic self-monitoring, as shown in the testimonies:

[...] in addition to that, guidelines to deal with the emotional wear out about the application routine would help a lot. (P9)

Explaining everything as it should be done [...] they sometimes just give it to you but don't explain how to use it. It's also necessary to include what to do when blood glucose is too low, what to do when it's too high [...]. (P6)

[...] when I got there they said, it's there, and I had to learn to apply it by myself. I think that insulin shouldn't be given at random. Everyone here needs to know how to use it [...]. (P3)

In synthesis, the results evidence that insulin management and glyceimic self-monitoring are not limited to a technical practice; they also involve a significant emotional dimension with important implications in the life of people with diabetes.

DISCUSSION

The participants' difficulties managing the insulin therapy were presented, and they highlight the practical complexity inherent to using this medication. Corroborating the findings presented, the literature shows that insulin administration is experienced as a barrier in the initial phases, with emphasis on the recurrent errors that impair the treatment: unawareness regarding the proper application time; not taking the insulin out of the refrigerator before using it; and reusing disposable materials and not alternating application sites, which all contribute to the incidence of traumas in these sites^{6,15}.

All this evidence described in the literature is in consonance with the experiences reported by the participants that presented more difficulties rotating the application sites and developed local lipodystrophies. In the reports, the application technique was performed permeated by plenty of insecurity and uncertainty¹⁵. Consequently, the importance of practical training and ongoing follow-up for this population group becomes clear. Health professionals should review the patients' application technique in each consultation, in order to detect possible mistakes and clear doubts. Health education is an ongoing, active, individualized and dialog-based process¹⁶⁻¹⁷.

Diabetic retinopathy, a common microvascular complication that is specific to *Diabetes Mellitus*, poses a 34.6% visual impairment risk, hindering medication management¹⁸. In the participants' testimonies, it was a difficulty pointed out during dose application and definition. Without the ability to properly see the insulin amount to be administered, patients expose themselves to a risk of severe complications, as insulin is classified as a Potentially Dangerous Medication (PDM); in other words, it poses a high risk of triggering significant adverse events and even severe harms to the patients when not properly used^{4,18}. The fact that the participants presented complications, especially retinopathy and neuropathy, can justify the difficulties reported to properly see the dose and regarding the application technique precision.

Furthermore, doubts about storing the insulin and difficulties controlling blood glucose levels were pointed out in the interviews. Proper storage is fundamental for a successful therapy, as inadequate insulin preservation harms the medication stability, reducing its efficacy¹⁷. It was also possible to notice doubts among the research participants as to reusing needles and syringes for insulin injections. However, this is not a practice recommended by the Brazilian Diabetes Society (*Sociedade Brasileira de Diabetes*, SBD), as it can lead to unwanted complications like lipohypertrophias and local infections, interfering in insulin absorption and in blood glucose control¹⁹.

It is important to note that most of the participants reported having been provided with few guidelines about insulin use at treatment initiation, which contributed to uncertainties and insecurity arising. They also signaled uncertainties as for insulin dose adjustments, applying it even in hypoglycemic situations. The medications used in *Diabetes Mellitus* are the most frequent PDMs and require implementing a complex educational process based on individualizing each diabetic patient²⁰.

Absence of guidance and strategies to reduce insecurity and errors, as well as not reviewing the detailed instructions in insulin therapy management, represent barriers to empowering the patients regarding their own

treatment. However, lack of time and of health professionals in the services can be directly linked to this negative result¹⁷. Even when the schooling levels found in the sample are predominantly High School and Higher Education, this fact did not remove technical uncertainties, indicating that lack of continuing education bears a significant weight on insulin management and glycemic monitoring¹⁶⁻¹⁷.

This insecurity can be perceived not only in medication management but also in glycemic self-monitoring, and is characterized by difficulties understanding the readings and uncertainties about blood glucose targets²¹. A qualitative study that included children with Type 1 diabetes revealed that they did not know what glucose was and presented difficulties explaining its relationship with diabetes²². In this sense, the testimonies given by the participants included in the current study show unawareness about glycemic readings in the glucometer such as HI and LO, acronyms for blood glucose values above the upper limit and below the lower limit the device can measure, respectively.

Knowing the blood glucose targets for a proper treatment and identifying hyper and hypoglycemic situations are indispensable factors to avoid future complications. The participants reported difficulties correcting hypoglycemia; therefore, it becomes essential to offer training to patients and caregivers alike so that they can identify the symptoms at the beginning and respond effectively³.

The need for educational reinforcement both about handling the glucometer and checking previous records and about adjusting date and time was also verified. On the other hand, few doubts were observed in relation to the capillary blood glucose technique. Although the device offers resources such as pre- and post-meal measurement recording, hypoglycemia alarms and date/time settings, it was observed that they are not fully used, which reinforces the importance of health professionals providing guidelines about how to handle the glucometer²¹.

There were some issues regarding storage and care for the reactive strips, as those kept in open boxes deteriorated faster, with the possibility of impairing reliability of the results. It is also noted that environmental and sampling conditions exert a significant influence on the precision of blood glucose measurements²¹.

In all, the need for multiple digital punctures a day, insulin administration on different body areas and continuous monitoring of glycemic levels were identified as treatment aspects associated with a negative emotional burden. The fact that the mean time since the diabetes diagnosis was over ten years reveals a chronic treatment process marked by cumulative wear out, which can explain the intense feelings like anxiety, fear and frustration reported by the participants²³.

Added to the physical discomfort caused by the applications and punctures, the anxiety triggered by simply watching the glycemic values emerges as a relevant barrier to adhering to the therapy. The predominance of women, adults in productive age and with prolonged time since diagnosis found in the sample can contribute to the accumulation of experiences, but also to higher emotional wear out related to the self-care demands. The presence of comorbidities and complications among the participants helps explain the diversity of doubts and insecurities reported in the interviews, especially those related to the application technique, to dose adjustments and to how to handle hypo and hyperglycemic situations. These findings evidence the need for empathy and welcoming on the part of health teams, as well as the importance of ongoing psychological support to face these requirements²³.

Study limitations

The following study limitation is pointed out: the research was developed in a single health unit specialized in diabetes. This is also a subjective topic that can be influenced by biopsychosocial aspects. Consequently, it becomes relevant to replicate this research in other *loci*, so that the results can be compared and expanded.

FINAL CONSIDERATIONS

The current study presented the experiences and perceptions of people with diabetes related to insulin use and to glycemic monitoring. This is a complex process permeated by challenges that involve both technical aspects such as application technique, dose adjustments, storage and disposal of supplies and emotional aspects, expressed in the form of feelings of fear, anxiety and insecurity in the face of the treatment.

The results provide valuable aids to understand the main uncertainties and difficulties experienced by people with diabetes in terms of insulin use and glycemic self-monitoring, which can be leveraged to qualify care in the diabetes context. All the evidence points to the need to implement ongoing, systematized and patient-centered educational strategies, considering the technical and emotional aspects involved in the treatment. Thus, it is believed that this study contributes to strengthening the care practices, favoring the development of educational and psychosocial interventions that promote greater autonomy, self-confidence and adherence to the treatment among people with diabetes.

Thus, the importance of health education with a potential to contribute to improvements in self-care, autonomy and adherence to the therapy is highlighted. Future studies may analyze the effectiveness of several interventions in the short-, medium- and long-term, exploring their impact on clinical outcomes and on optimizing resources in the various scenarios involving health care for people with diabetes.

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Conceptualization, D.L.C. and S.K.P.O.; methodology, D.L.C. and S.K.P.O.; software, D.L.C.; validation, D.L.C., V.A.L.F., L.V.O. and S.K.P.O.; formal analysis, D.L.C., V.A.L.F., L.V.O. and S.K.P.O.; investigation, D.L.C.; resources, D.L.C. and S.K.P.O.; data curation, D.L.C. and S.K.P.O.; manuscript writing, D.L.C.; review and editing, D.L.C., V.A.L.F., L.V.O. and S.K.P.O.; visualization, D.L.C., V.A.L.F., L.V.O. and S.K.P.O.; supervision, D.L.C. and S.K.P.O.; project administration, D.L.C.; financing acquisition, D.L.C. and S.K.P.O. All authors read and agreed with the published version of the manuscript.

Use of artificial intelligence tools

Authors declare that no artificial intelligence tools were used in the composition of the manuscript "*Practical challenges in insulin management and glyceimic self-monitoring: The perception of people with Diabetes Mellitus*".