ADOLESCENTS WITH DM1: KNOWLEDGE ABOUT DISEASE AND DIFFICULTIES IN SELF-CARE

Adolescentes com dm1: conhecimento acerca da doença e dificuldades no autocuidado

Adolescentes con DM1: Conocimiento sobre la enfermedad y dificultades en el autocuidado

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ABSTRACT
Background: type 1 Diabetes Mellitus is a chronic disease increasingly prevalent in children. Thus, it is essential to encourage adherence to self-care and minimize the difficulties experienced. **Objectives:** to characterize the knowledge of adolescents with type 1 diabetes mellitus about their disease and to identify their difficulties in self-care. **Methodology:** quantitative, simple descriptive study. Application of Knowledge Test of Adolescents with DM1 about the disease and the Inventory of Difficulties in Self-Care Roles by Flora & Gameiro (2016). Data collected between June and November 2021 at the Diabetes Consultation of a Hospital in the central region of Portugal. Sample of 34 diabetic adolescents with a mean age of 14.9 (±2.3) years. **Results:** in overall knowledge, adolescents show a level of knowledge between reasonable and good, and it is in domain 1 (Nature of the disease/physiopathology) where they show the highest level of knowledge. In the difficulties in the self-care roles, they show higher percentages of difficulty in maintaining a balanced diet, fighting stress and interventions when facing hypoglycaemia. **Conclusion:** adolescents have difficulties in self-care roles, and the nurses' intervention in the implementation of adjusted therapeutic plans is essential to overcome knowledge gaps and reduce the difficulties identified
Keywords: adolescent, diabetes mellitus type 1, self-care, nursing

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RESUMO
Enquadramento: a Diabetes *Mellitus* tipo 1 enquanto doença crónica é, cada vez mais prevalente, em idade pediátrica, sendo fundamental o incentivo de adesão ao autocuidado e a minimização das dificuldades sentidas. Objetivos: caracterizar o conhecimento de adolescentes com diabetes *mellitus* tipo 1 acerca da sua doença e identificar as suas dificuldades no autocuidado. **Metodologia**: estudo quantitativo, descritivo simples. Aplicação do Teste de Conhecimento dos Adolescentes com DM1 acerca da doença e o Inventário de Dificuldades nos Papéis de Autocuidado de Flora & Gameiro (2016). Recolha de dados de junho a novembro de 2021, na Consulta de Diabetes de um Hospital da região centro de Portugal. Amostra de 34 adolescentes com média de idades de 14.9 (±2.3) anos. **Resultados**: no conhecimento global, os adolescentes apresentam um nível de conhecimento entre o razoável e bom, sendo o domínio 1 (Natureza da doença/fisiopatologia) onde estes apresentam melhor nível de conhecimento. Nas dificuldades nos papéis de autocuidado, apresentam maior dificuldade na manutenção de uma alimentação equilibrada, combate ao stress e intervenções numa hipoglicemia. **Conclusão**: verifica-se dificuldade destes nos papeis de autocuidado, sendo fundamental a intervenção dos enfermeiros na implementação de planos terapêuticos ajustados, no sentido de colmatar falhas de conhecimento e dificuldades identificadas.
Palavras-chave: adolescente, diabetes *mellitus* tipo 1, autocuidado, enfermagem

RESUMEN
Marco contextual: la diabetes mellitus tipo 1 es una enfermedad crónica cada vez más prevalente en niños, por lo que es fundamental fomentar la adherencia al autocuidado y minimizar las dificultades que experimentan. **Objetivos:** caracterizar el conocimiento de los adolescentes con diabetes mellitus tipo 1 sobre su enfermedad e identificar sus dificultades en el autocuidado. **Metodologia:** estudo quantitativo, descritivo simples. Aplicação de Test de Conocimientos de Adolescentes con DM1 sobre la enfermedad y el Inventario de Dificultades en los Roles de Autocuidado de Flora & Gameiro (2016). Datos recogidos entre junio y noviembre de 2021 en la Consulta de Diabetes de un Hospital de la región central de Portugal. Muestra de 34 adolescentes diabéticos con edad media de 14,9 (±2,3) años. **Resultados:** en el conocimiento global, los adolescentes muestran un nivel de conocimiento entre razonable y bueno, y es en el dominio 1 (Naturaleza de la enfermedad/fisiopatología) donde muestran el mejor nivel de conocimiento. En cuanto a las dificultades en las funciones de autocuidado, estos pacientes mostraron mayores porcentajes de dificultad para mantener una dieta equilibrada, combatir el estrés e intervenir ante una hipoglucemia. **Conclusión:** adolescentes tienen una dificultad para los en los roles de autocuidado, siendo fundamental la intervención del enfermero en la implementación de planes terapéuticos ajustados, con el fin de llenar los vacíos de conocimiento y reducir las dificultades identificadas.
Palabras clave: adolescente, diabetes *mellitus tipo 1*, autocuidado, enfermería

INTRODUCTION

According to the World Health Organization (WHO), Diabetes Mellitus (DM) is characterized as a chronic disease that occurs when the pancreas does not produce sufficient insulin or when the body does not use the insulin it produces effectively (WHO, 2020). There are various types of DM, with the most common type in childhood and adolescence being DM type 1 (DM1). DM1 results from the destruction of the ß cells of the Langerhans islets in the pancreas, leading to absolute insulin therapy being necessary to ensure survival (Direção Geral da Saúde, 2011). In Portugal, data from 2015 revealed a prevalence of DM1 in 3857 children and young people (aged between 0-19 years), corresponding to 0.20% of the population in that age group. Data from 2017 and 2018 show a decrease in the total number of cases, respectively, 3220 and 2819, corresponding to a prevalence of 0.17% and 0.15%, respectively. (Direção-Geral da Saúde, 2020).

The World Health Organization (2011) defines adolescence as the period between 10 and 19 years of age. Flora & Gameiro (2016b) mention that the most significant challenges faced by adolescents with DM1 are related to their concerns about the course of the disease, the need to follow a dietary plan, and adjusting to a routine of social commitments. Fragoso, Cunha, Fragoso, & Araújo (2019), from a broader perspective, add that the difficulties experienced by diabetic adolescents encompass aspects such as adapting to the disease and the dilemmas of being diabetic. They also mention aspects related to the influence of the family and healthcare services.

Furthermore, adolescence itself is marked by a period of significant change. Coupled with this change, living with a chronic disease demands increased adaptation from both adolescents and their families on all levels. The success of this transition relies on the early and specialized intervention of healthcare professionals, thereby ensuring the quality of life for adolescents and their families.

Our aim in carrying out this study is to delineate the understanding of adolescents with type 1 diabetes mellitus concerning their condition and to pinpoint the challenges they encounter in self-care.

CONTEXT/THEORETICAL BACKGROUND

The cause of type 1 diabetes (DM1) is rooted in insulin deficiency prompted by the loss of pancreatic beta cells, resulting in episodes of hyperglycaemia. This makes it a chronic disease. (Direção-Geral da Saúde, 2019). It is also important to note that before the onset of the known symptoms of type 1 diabetes (DM1), months or even years before this onset, autoantibodies may appear, as this is an autoimmune disease rooted in genetic predisposition. The initiation of this condition is thus the trigger for autoimmunity (the presence of at least one autoantibody). Subsequently, glucose intolerance develops, and in a later stage, DM1 emerges. The risk of progression to the symptomatic stage of the disease is associated with the number of existing autoantibodies and the age at seroconversion (the age at which the presence of one of the autoantibodies is detected) (Direção Nacional da Saúde, 2015).

According to the guidelines established by the International Society for Paediatric and Adolescent Diabetes (2018), the criteria for diagnosing diabetes mellitus (DM) are as follows: (1) the presence of classic diabetes symptoms (polyuria, nocturia, enuresis,

polydipsia, and weight loss) and a serum glucose level ≥200 mg/dl; (2) fasting serum glucose (>8h) ≥ 126 mg/dl; (3) serum glucose after an Oral Glucose Tolerance Test (OGTT) ≥200 mg/dl (2h), using a glucose load of 1.75 g/kg up to a maximum of 75g; and (4) Haemoglobin A1c (HbA1c) ≥ 6.5%. It is worth noting that it is commonly accepted that the OGTT is considered unnecessary if one of the initial criteria is present (Direção-Geral da Saúde, 2019).

After the diagnosis of DM, a therapeutic plan should be established with the aim of maintaining good disease control, preventing symptoms, averting late complications, and reducing the risk of acute decompensations (Flora & Gameiro, 2016a). In this regard, proper management of the therapeutic regimen becomes essential and should take into account two fundamental aspects: (1) the triad of "diet, physical exercise, and insulin therapy," and (2) self-monitoring and self-control of DM (Flora & Gameiro, 2016a, p. 19). Indeed, ineffective glycaemic control can trigger acute complications, including hypoglycaemia, diabetic ketoacidosis, and hyperosmolar hyperglycaemic syndrome. Additionally, chronic complications such as cardiovascular diseases, blindness, kidney failure, or lower limb amputation may also occur (National Health Directorate, 2015). Adolescence is a transitional period between childhood and adulthood characterized by profound physical changes and a significant increase in cognitive abilities. It is also marked by an enrichment of emotional experiences and a more sophisticated structuring of the socialization process (Directorate-General of Health, 2013).

According to Meleis' Theory of Transitions, a transition is defined as "The passage from one life phase, condition, or state to another; it is a multidimensional concept encompassing the elements of the process, the time span, and perceptions. The process implies phases and sequences, the time span indicates an ongoing yet bounded phenomenon, and perceptions are related to the meaning of the transition for the person experiencing it" (Meleis, 2010, pp. 25-26). In this context, adolescents with chronic illnesses experience two types of transition: (1) the developmental transition inherent to adolescence itself, and (2) the health-disease transition due to the illness (Azevedo, 2010). When compared to children, seemingly due to the unique nature of the developmental phase they are going through, adolescents have greater difficulties in accepting the illness, alternating between moments of conflict and harmony with their family, friends, and even themselves. Therefore, the responsibility for therapeutic management imposed by the disease itself can occur at times when acceptance of the illness has not yet taken place, which can have a negative impact on self-care (Fragoso, Cunha, Fragoso, & Araújo, 2019).

According to Orem's Theory of Self-Care Deficit (1991), self-care is defined as the practice of activities that individuals initiate and perform for their own benefit, aiming at maintaining life, health, and well-being. Self-care in diabetes management demands regular medical appointments from adolescents. Alongside these regular appointments, there is a set of procedures that adolescents undergo, including the monitoring of urine and blood analyses, glucose monitoring, medication management, management of hypoglycaemia and hyperglycaemia, maintaining a healthy diet, and engaging in regular physical exercise (Moreira, et al., 2016).

Flora & Gameiro (2016) point out that the difficulties faced by adolescents often revolve around their level of knowledge about DM1. The control of DM1 and the attitudes adopted by adolescents towards the disease are directly influenced by their understanding of their own condition. It can be inferred that the lack of this knowledge can potentially lead to insecurity and fears. The same authors also emphasize that the support and follow-up of adolescents with DM1 and their families are crucial for disease management and the minimization of medium and long-term impact and complications (Flora & Gameiro, 2016a). In this sense, it is understood that a differentiated and timely intervention by healthcare teams will have very positive repercussions on the quality of life of adolescents with DM1, as well as their families (Fragoso, Cunha, Fragoso, & Araújo, 2019).

In light of the above, nurses who work alongside these adolescents and their families should possess a greater knowledge base that enables them to plan and implement more effective and tailored therapeutic plans. Thus, the desire and determination to conduct this study arose, with the research question being: "What is the knowledge about the disease, and what are the self-care difficulties faced by adolescents with DM1?"

METHODOLOGY

This is a quantitative study of a simple descriptive nature. The sample included 34 diabetic adolescents under the care of the Diabetes Clinic at a Central Hospital in the Central region of Portugal. It was considered a non-probabilistic, accidental, or convenience sample. To constitute the sample, five cumulative inclusion criteria were established: (1) adolescents diagnosed with DM1, (2) not hospitalized, (3) aged between 11 and 18 years, (4) adolescents and parents/legal representatives without cognitive deficits, and (5) adolescents and parents/legal representatives who willingly agreed to participate in the study after being adequately informed. Given the cumulative nature of the established inclusion criteria, all adolescents who did not meet the cumulative criteria for inclusion were excluded.

The choice of the age range of 11-18 years was a methodological decision based on considerations of adolescents' maturity and potential for autonomy self-care roles. Additionally, it aligns with the fact that the paediatric diabetes clinic includes young individuals only up to the end of their 18th year. Data collection was carried out using a questionnaire consisting of three parts. The first part consisted of 4 questions aimed at characterizing the sample socio-demographically. The second part of the questionnaire was the Knowledge Test for Adolescents with Type 1 Diabetes Mellitus about the disease (Flora & Gameiro, 2016a), and the third part of the questionnaire corresponded to the Inventory of Difficulties in Self-Care Roles Related to Diabetes (Flora & Gameiro, 2016b).

Both instruments are validated for the Portuguese population. The Knowledge Test for Adolescents with Type 1 Diabetes Mellitus about the disease is a questionnaire-type instrument consisting of 25 multiple-choice questions. Each question comprises three alternatives, with only one correct answer. These 25 questions are divided into five domains of knowledge about the disease: (1) Nature of the disease/physiopathology; (2) Acute and chronic complications of DM1; (3) Insulin administration; (4) Capillary blood glucose assessment; and (5) Health

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maintenance. It is important to note that despite this instrument already being validated with 20 questions for the Portuguese population, it currently has an improved version in accordance with the 2019 guidelines. This updated version includes 5 new questions that were in the validation phase and await publication by the authors.

The choice of this improved version is due to the fact that this instrument is now even more robust, with better psychometric properties, as assured by the authors. Our aim is to determine knowledge both overall and within each knowledge domain through their respective scores: (Number of correct answers / Total number of items) x 100. As such, knowledge ranges from 0% to 100%, with 0% representing the minimum and 100% representing the maximum. To classify the level of knowledge, it is categorized into three levels. Values below 50% correspond to a low or insufficient level of knowledge, values between 50% and 80% are considered reasonable knowledge, and values above 80% indicate a good level of knowledge. The third part of the questionnaire corresponded to the Inventory of Difficulties in Self-Care Roles, which has been adapted from the original and validated for the Portuguese population by Flora & Gameiro (2016a). The Inventory of Difficulties in Self-Care Roles is an instrument consisting of 18 questions (items) distributed across four dimensions: (1) Health maintenance, (2) Disease control, (3) Diagnosis, Treatment, and Medication in DM1, and (4) Participation in healthcare services. Each dimension, in turn, consists of several items. Evaluation is carried out using a 4-point Likert scale that ranges between the semantic fields: (1) no difficulty; (2) some difficulty; (3) quite a bit of difficulty, and (4) a lot of difficulty.

All stages of the study followed the fundamental principles determined by the code of ethics, including anonymity and confidentiality, the right to self-determination, protection against discomfort and harm, privacy, and the right to fair and equitable treatment. To ensure these principles in the development of the research study, the respective commitment statement of the investigators and their supervisors was prepared during the project's conception. Permission for the use of the two instruments (Knowledge Test for Adolescents with Type I Diabetes Mellitus and Inventory of Difficulties in Self-Care Roles) was requested from the authors, and permission was obtained through email correspondence.

To conduct data collection, permission was requested from the Board of Directors and the Ethics Committee of the respective Hospital Centre to carry out the study. Only after obtaining their approvals (No. CA-143/2021-0t_MP/CC) were the data collection instruments administered to participants who met all the established inclusion criteria for the study. Participants were informed about the study's objectives and purpose, as well as the method used to obtain data. Confidentiality of information and participant anonymity were ensured, and an informed consent form was provided. Since these are minors, to comply with all ethical and legal requirements, consent for the adolescent's participation was also requested from their legal representative who accompanied them to the mentioned appointment. Data analysis was conducted using the specialized statistical data processing software SPSS® (Statistical Package for the Social Sciences) version 25. In the data analysis, the collected information was explored using descriptive statistical techniques, including measures

of central tendency (such as mean and median) and measures of dispersion such as standard deviation, as well as absolute and relative frequencies.

RESULTS

Data collection was carried out between June and November 2021, resulting in a total of 34 fully completed questionnaires. Therefore, there was no need to exclude any responses.

Thus, this study included 34 adolescents, with an average age of 14.9 years (±2.3) (minimum of 10 and maximum of 18 years). Among them, 64.6% (n=23) identified as female, and 32.4% (n=11) identified as male. Regarding the educational background of the sample, 17.6% (n=6) were in the 5th to 6th year of schooling, 38.2% (n=13) were in the 7th to 9th year of schooling, and 44.1% (n=15) were in the 10th to 12th gr year of schooling. The most common residential area was the northern region of Portugal (85.3%).

Table 1 presents the results of correct answers per question and per domain of the Knowledge Test for Adolescents with Type 1 Diabetes Mellitus. Regarding overall knowledge about Diabetes and associated care

(including responses to all questions), an average score of 78.18% (±10.18) correct answers was obtained.

The knowledge about the disease was then studied by analysing the five domains of the Knowledge Test for Adolescents with Type 1 Diabetes Mellitus. The average knowledge in each domain ranged from 87.25% to 68.14%, indicating a level of knowledge between reasonable and good. The average proportion of correct answers in the "Nature of the disease/physiopathology" domain was 87.25%, making it the domain with the highest proportion of correct answers. It was followed by the "Acute and chronic complications of DM1" domain with an average of 83.82% correct answers, followed by the "Health maintenance and disease control" domain with an average of 76.42% correct answers. Next was the "Insulin administration" domain with an average of 70.59% correct answers, and finally, the "Capillary blood glucose assessment" domain with an average of 68.14% correct answers.

Table 1

Proportion of Correct Answers per Question and per Domain of the Knowledge Test for Adolescents with Type 1 Diabetes *Mellitus*

Domain (D)	Question	Correct Answers n (%)	% mean	SD
D1 Nature of the disease/physiopathology	Q1	30 (88.2%)	87.25%	23.23
	Q2	31 (91.2%)		
	Q4	28 (82.4%)		
D2 Acute and chronic complications of DM1	Q5	31 (91.2%)	83.82%	19.88
	Q6	27 (79.4%)		
	Q7	32 (94.1%)		
	Q8	22 (64.7%)		
	Q9	29 (85.3%)		
	Q10	30 (88.2%)		
D3 Insulin administration	Q11	34 (100.0%)	70.59%	15.92
	Q12	8 (23.5%)		
	Q13	30 (88.2%)		
	Q21	1 (100.0%)		
D4 Capillary blood glucose assessment	Q14	29 (85.3%)	68.14%	25.50
	Q15	15 (44.1%)		
	Q22	28 (82.4%)		
	Q23	18 (64.3%)		
D5 Health maintenance and disease control	Q3	33 (97.1%)	76.42%	13.98
	Q16	20 (58.8%)		
	Q17	27 (79.4%)		
	Q18	29 (85.3%)		
	Q19	17 (50.0%)		
	Q20	34 (100.0%)		
	Q24	25 (73.5%)		
	Q25	22 (66.7%)		
Overall Knowledge			78.18%	10.18

The results obtained from the application of the Inventory of Difficulties in Self-Care Roles for Adolescents with DM1 are presented in Table 2.

From the analysis of the results obtained, the majority of adolescents (55.9%) reported no difficulty in weight control (DMS1); however, an equal number (n=19) indicated some difficulty in maintaining a balanced diet (DMS2). Avoiding tobacco consumption (DMS3) was an aspect that the vast majority (84.8%) reported having no difficulty with, and the same applied to avoiding alcohol consumption (DMS4), reported by 81.8%. Engaging in leisure activities (DMS5) is seen as an effortless task by the majority of respondents (73.5%), although 23.5% reported some difficulty. Similarly, coping with stress (DMS6) appears to be a task that 44.1% of adolescents find somewhat difficult. On the other hand, participating in physical activities (DMS7) is not a difficulty for 58.8% of adolescents, although 38.2% admit to facing some difficulty. Among the results obtained, maintaining a balanced diet stands

out as the primary difficulty mentioned (55.9%), along with coping with stress (44.1%). It is also worth noting that the dimension rated the least challenging in terms of difficulty was "Participation in healthcare services."

Table 2

Descriptive Statistics for Responses to the Inventory of Difficulties in Self-Care Roles for Adolescents with DM1

Dimension	Item	No difficulty	Some difficulty	Considerable difficulty	A lot of difficulty	Med	M	SD
	DMS1	55.9%	32.4%	11.8%	0.0%	1.0	1.56	0.70
	DMS2	38.2%	55.9%	5.9%	0.0%	2.0	1.68	0.59
	DMS3	84.8%	9.1%	6.1%	0.0%	1.0	1.21	0.55
Maintenance of health	DMS4	81.8%	12.1%	3.0%	3.0%	1.0	1.27	0.67
	DMS5	73.5%	23.5%	2.9%	0.0%	1.0	1.29	0.52
	DMS6	26.5%	44.1%	20.6%	8.8%	2.0	2.12	0.91
	DMS7	58.8%	38.2%	2.9%	0.0%	1.0	1.44	0.56
	DCD1	79.4%	14.7%	5.9%	0.0%	1.0	1.26	0.57
Disease control	DCD2	55.9%	29.4%	11.8%	2.9%	1.0	1.62	0.82
	DCD3	64.7%	23.5%	11.8%	0.0%	1.0	1.47	0.71
	DCD4	91.2%	8.8%	0.0%	0.0%	1.0	1.09	0.29
	DTMD1	70.6%	23.5%	5.9%	0.0%	1.0	1.35	0.60
	DTMD2	67.6%	32.4%	0.0%	0.0%	1.0	1.32	0.47
Diagnosis, Treatment, and Medication in DM1	DTMD3	61.8%	29.4%	8.8%	0.0%	1.0	1.47	0.66
	DTMD4	73.5%	17.6%	2.9%	5.9%	1.0	1.41	0.82
	DTMD5	73.5%	17.6%	8.8%	0.0%	1.0	1.35	0.65
Participation in healthcare services	DPSS1	91.2%	5.9%	2.9%	0.0%	1.0	1.12	0.41
	DPSS2	94.1%	2.9%	0.0%	2.9%	1.0	1.12	0.54
Overall difficulties						1.33	1.40	0.36

DISCUSSION

Diabetes mellitus is a complex and challenging chronic disease. This difficulty is more pronounced in children and adolescents, especially during the adolescent period when the issue involves the transition from parental dependence to a more independent life, which can impact treatment adherence and metabolic control of diabetes(Filipe, 2016). The data collection instrument used in this study was designed to characterize the sample and operationalize the variables related to knowledge about the disease and difficulties in self-care roles.

Regarding the results obtained in terms of overall knowledge, the adolescents demonstrated a level of knowledge ranging from reasonable to good (78.18% ± 10.18); these results are consistent with those obtained by Flora & Gameiro (2016).

Regarding the results of the domains in the Knowledge Test for Adolescents with Type 1 Diabetes Mellitus, adolescents demonstrated better levels of knowledge in the "Nature of the Disease/Pathophysiology" domain, followed by the "Acute and Chronic Complications of Type 1 Diabetes *Mellitus*" domain. In the study conducted by Flora & Gameiro (2016). In the

study conducted by Flora & Gameiro (2016), it's worth noting that while these two domains were also identified with the highest scores, unlike the findings in this study, the domain that obtained the highest score was the "Acute and Chronic Complications" domain, followed by the "Nature of the Disease/Pathophysiology" domain.

In relation to the domain with the lowest scores, indicating lower levels of knowledge, this study's results identify the "Capillary Blood Glucose Assessment" domain as the least well-understood. These findings differ from those of the study conducted by Moreira et al. (2016), where the domain with the lowest scores was "Nature of the Disease/Pathophysiology." This difference can be explained by the presence of a specialized nursing team in the Diabetes Clinic of the hospital where this study was conducted. This team focuses on enhancing disease literacy among children and families, believing that the intervention should be a child- and family-centred process, addressing timely education and supporting individual needs. The significance of this specialized nursing team becomes apparent in this study, as adolescents reported fewer difficulties in the "Participation in healthcare services" dimension. This indicates excellent access to the healthcare system and effective communication and coordination with the healthcare team. It is important to emphasize that this result contradicts the findings of Flora & Gameiro (2016b), where the "Participation in healthcare services" dimension was highlighted as one of the major difficulties. When analysing the results individually, it is evident that, regarding domain 1 (Nature of the Disease/Pathophysiology), the question in which the highest number of adolescents made

mistakes is related to the symptoms of hyperglycaemia, indicating a low level of knowledge.

It thus becomes important to compare this result in terms of knowledge with the result obtained in the Inventory of Difficulties in Self-care Roles of Adolescents with DM1, where only 17.6% of adolescents reported having difficulty in responding to hyperglycaemia. Given this disparity between the knowledge score and the lack of recognition of difficulty, it is understood that these results may indicate the need to invest in literacy enhancement programmes regarding hyperglycaemia symptoms, as well as the need for training for appropriate intervention.

In Domain 2 (Acute and Chronic Complications of Type 1 Diabetes Mellitus), adolescents demonstrated less knowledge regarding how to respond to hypoglycaemia without associated symptoms. This contrasts with the findings of Filipe's study (2016), where the author reported that 83.0% of participants claimed they could independently manage/reverse episodes of hypoglycaemia/hyperglycaemia.

In Domain 3 (Insulin Administration), the question where the highest number of incorrect responses was recorded pertains to the storage and conservation of insulin after it is opened, with only 8 out of the 34 respondents answering correctly. So, the results obtained align with the findings of Flora & Gameiro (2016a). They reveal that the majority of adolescents displayed a noticeable lack of knowledge regarding the storage of insulin after it has been opened. This is because, after opening, an insulin cartridge does not require refrigeration and can be kept at room temperature (between 15 and 30ºC), in a cool place, shielded from light and sudden temperature fluctuations (Sousa, Neves & Carvalho, 2019).

In domain 4 (Capillary Blood Glucose Monitoring), adolescents showed less knowledge regarding lancet replacement. The literature suggests that for each capillary puncture, a new lancet should be used, as repeated use of the same lancet makes it duller, resulting in more painful skin punctures (Direção-Geral da Saúde, 2019). The results obtained in the study are in line with the findings of the study conducted by Kaneto & Damião (2015), where the highest error rate in glucose monitoring was observed in the lancet changing item, with 87.5% of respondents changing them inappropriately.

As for the results obtained from applying the Inventory of Difficulties in Self-Care Roles of Adolescents with DM1, concerning overall difficulties, it can be concluded that adolescents generally exhibited little difficulty in managing self-care roles. This aligns with the findings of Flora & Gameiro (2016b).

In an individual analysis by difficulty dimension, the dimension that adolescents reported as the most challenging was "Health Maintenance." According to the results, it was observed that the items where adolescents reported difficulties in a higher percentage were related to maintaining a balanced diet, managing stress, and engaging in physical exercise. These results align with findings from other studies. Moreira et al. (2016) also observed that one of the difficulties reported by participants was dietary control (55.0%). Pereira, Neto, Moleiro & Gama (2015) found that regarding physical exercise, 49% of participants did not engage in regular physical activity, 20% engaged in physical activity one to two times a week, and 31% exercised three or more times a week. In the "Disease Control" dimension, it was found that adolescents had the most difficulty with items related to recognizing the importance of glycated

haemoglobin, results that are also consistent with those from the study by Flora & Gameiro (2016b). In the "Diagnosis, Treatment, and Medication" dimension, adolescents reported having difficulty dealing with hypoglycaemia and hyperglycaemia. As previously mentioned, these results do not align with those of Filipe (2016), where it was found that 83.0% of participants were able to manage/reverse episodes of hypoglycaemia/hyperglycaemia on their own. In the "Diagnosis, Treatment, and Medication" dimension, although adolescents admitted to having difficulty adjusting insulin based on capillary blood glucose readings, the proportion found in this study is much lower when compared to the one obtained in the study by Flora & Gameiro (2016), where this difficulty was identified by 29.4% of adolescents as being quite challenging.

It is also worth mentioning that, during the study, some limitations arose that were not attributable to the researchers but may have had an impact on the results. Specifically, due to the COVID-19 pandemic, there was lower adherence to in-person appointments, which significantly affected the sample size.

CONCLUSION

Based on the interpretation of the results obtained, it can be observed that the level of knowledge among adolescents with DM1 regarding the disease ranges from reasonable to good. Concerning the difficulties mentioned by adolescents, it can be concluded that, overall, they experience little difficulty in managing self-care roles. When analysing difficulty by dimensions, it is observed that the items where adolescents reported the greatest difficulty were in maintaining a balanced diet, managing stress,

recognizing the importance of HbA1c, identifying signs/symptoms of hypoglycaemia and hyperglycaemia, interventions in cases of hypoglycaemia, and adjusting insulin based on capillary blood glucose levels.

Considering the implications of this research for clinical practice, it is intended that the contribution obtained from the publication of this work will enhance health literacy regarding DM1. Additionally, the results obtained are expected to empower nurses who are part of the teams supporting these adolescents with information that will enable them to ensure more effective care for diabetic adolescents and their families. This can be achieved through tailored, individualized, and guidance-oriented therapeutic plans, particularly taking into account the identified areas of lesser knowledge and/or greater self-care management difficulties. On the other hand, concerning the training of these professionals, it is also deemed important to empower these nurses through specialized training for evidence-based practice. This should involve ongoing assessment and monitoring of the patients they care for, including the study of effective disease knowledge and the identification of experienced difficulties.

It is also understood that in future research, it would be important to analyse the relationship between age and the level of knowledge among adolescents, as well as the difficulties they experience. Additionally, extending the study to include caregivers would help gain insight into their knowledge and the difficulties they may also identify.

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