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Nutritional experiences of Turkish university students with type 1 diabetes: a qualitative study

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Abstract

Background This study was performed in order to describe the nutritional experiences of university students with Type 1 diabetes who try to carry on their educational and social lives together in diabetes self-management.

Methods In this descriptive and qualitative study, face-to-face and semi-structured in-depth interviews were performed with 15 university students with Type 1 diabetes, aged 18–30, resided in Istanbul, who were diagnosed with Type 1 diabetes at least 5 years ago. The data collection process was performed by the researchers. The interviews were recorded and transcribed. The data collected in accordance with the phenomenological approach were processed using guided content analysis.

Results In the interview with the participants, whose mean age was 21.86 ± 2.03 years and 66.7% of those were female, 6 themes were listed as positive and negative experiences of students in diabetes management in the university environment, general nutritional preferences, nutritional attitudes in non-routine and social environments, regular nutrition and quality of campus life, nutrition during the exercise/sports period, university support and students' expectations from the environment and explained by their sub-dimensions.

Conclusion The change in living conditions with the transition to campus life, the new social environment, individualization and academic responsibilities make diabetes self-management a challenging, complex and supportive process. This study might guide the enhancement of university students' living conditions with diabetes.

Keywords Nutritional experiences, Self-management, Type 1 diabetes, University students, Campus life

Introduction

Type 1 diabetes (T1D) is a chronic condition that usually occurs in children and adolescents, is characterized by beta cell damage in the pancreas, resulting in decreased insulin production in the body. Current treatment for this condition involves daily insulin injection, blood monitoring, nutrition and lifestyle alterations [1]. Despite the suggested treatment for type 1 diabetes is complex, time-consuming, and costly, it is critical in reducing the onset and progression of diabetes-related complications such as nephropathy, neuropathy, and cardiovascular diseases [2].

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Late adolescence and emerging adulthood is a complex period in which there is a transition to campus and business life. While the individual with type 1 diabetes in emerging adulthood tries to balance emotional imbalance, academic career, economic and social life with diabetes management, glycemic control may often worsen due to all factors. Therefore, this special period of transition from childhood to adulthood is described as a high-risk period for T1D management. Factors such as adolescent changes, adaptation to campus and business life, and transition from pediatric diabetes clinics to adult diabetes clinics require special consideration [3–5]. For this age group, poor planning of both disease management and life components, failure to regulate blood sugar, and consequently increased acute complications may lead to mental and physical comorbid complications in the long term [6, 7].

University is a new period in which the individual leaves the family, new social relations are established, and the sense of independence with increasing responsibility. As with all young adults, it is a part of life for individuals with T1D [4, 8]. Along with the transition to campus life, T1D management is significantly threatened due to the loss of parental support, separation from established peer groups, meeting academic requirements, irregular schedules and routines, impaired eating behaviours, in meal planning/food preparation, increasing alcohol consumption, and a potential desire to ‘adapt’ [4, 8, 9]. The inability to access to food/meals quickly on major university campuses and the inability to get healthy and suitable food in cafeterias also affect the management of diabetes, which requires care. Thusly, the individual burden of health care they share with their family until university can be overwhelming and T1D management can worsen with changing living conditions for university students with T1D [3, 10].

There is limited information in the existing literature regarding university students with T1D transitioning into emerging adulthood. This qualitative study employs a holistic approach to examine the nutritional challenges encountered by university students with T1D within the specific context of campus life as they navigate diabetes self-management, their coping strategies for these challenges, and the factors that facilitate or impede their nutritional self-management. This investigation aims to address this significant gap in the literature. While extant literature focuses on clinical perspectives, this study distinguishes itself by centering on the lived nutritional experiences and coping mechanisms reported by T1D university students themselves, offering a unique vantage point and intending to yield valuable implications for future intervention programs.

Methods

Research design

Phenomenology pattern was utilized to obtain the nutritional experiences and opinions of the participants regarding Type 1 Diabetes. The main objective is to reduce the experiences of individuals to a shared phenomenon [11]. Thus, in parallel to the research design, Creswell [12] describes phenomenological research with the definition of “*a study defining the common meaning of the experiences of a few individuals regarding a concept or phenomenon*”.

Data collection

This descriptive and qualitative study was selected based upon a purposeful sampling method among students living in Istanbul, willing to participate in the research voluntarily, diagnosed with type 1 diabetes at least 5 years ago, aged 18–30, having no communication problems, and studying in an undergraduate program throughout the research. The phenomenological nature of this study’s qualitative research ensured us to focus on understanding participants’ experiences rather than their ability to generalize data. Each interview lasted approximately 20 to 25 min. No participants refused to participate or dropped out during the interviews. Data saturation was reached after the 15th interview, as no new codes or themes emerged, which is consistent with the rationale for concluding the data collection process. The data were collected via an in-depth face-to-face interview by a trained researcher through a pre-prepared research form between April and May 2023. The researcher, (ŞÖÖ, with 15 years of experience as a diabetes dietitian), took care to maintain an impartial attitude during the interviews. The audio of all interviews were recorded digitally, transcribed by a professional service, and compared with the audio recording for accuracy. Each participant had the chance to review their personal transcripts. No prior relationship was established with the participants before the interviews. Participants were informed about the purpose of the study, the nature of the questions, and the role of the researcher as an academic aiming to understand their nutritional experiences related to T1D. This information was shared during the informed consent process. Research permission was obtained with the approval of Fenerbahçe University Non-Interventional Clinical Research Ethics Committee dated 14.06.2023 and numbered 84.2023fb. Participants were informed in advance regarding digital audio recording, and an “Informed Voluntary Consent Form” was obtained. The names of the participants are enumerated and presented for ethical principles.

Along with demographic information, the participants were asked whether they had hypoglycemia/hyperglycemia throughout their campus life (how often, how, when

do they have more often, how do they manage it), one-day nutrition plans at school, nutrition and beverage preferences on special occasions and social environments, how they managed their nutrition accordingly, regular exercise/sports, how they took insulin, the amount of insulin dose in meals, any support from the university regarding diabetes management/treatment, what their expectations were from the university regarding diabetes management (nutrition in particular), their positive/negative experiences as a diabetic patient at the university, the presence of special products they preferred to diversify their nutrition or to feel better, the effect of nutrition on quality of life, whether their diabetic status was officially noted by the university or whether there was an individual with diabetes at the university. The questions created as a result of the literature review performed by the researchers were open-ended and all-inclusive, encouraging the participants to discuss various experiences. Each question extended until all participants express their thoughts and experiences on the subject. Furthermore, demographic and anthropometric data and HbA1c rates were recorded on the research form. Aforementioned study was carried out and reported using Standards for Reporting Qualitative Research (SRQR) reporting guidelines [13]. While participants were offered the opportunity to review their individual interview transcripts for accuracy (as part of the member-checking process), they were not invited to comment on the synthesized thematic findings of the study. However, participant transcripts were carefully preserved through rich and direct quotations, and themes were derived strictly from the lived experiences shared during the interviews.

Data analysis

Descriptive statistics examined within the scope of the research were collected and analysed for the purpose of better contextualizing the participants. This study used solely a qualitative and phenomenological design. In this context, the obtained data are presented as mean \pm standard deviation ($M \pm SD$) [14]. The data were transcribed and analyzed by deductive content analysis by using MAXQDA 2020 Pro. Directed content analysis method was utilized in this research. The analysis was carried out via interview transcripts that form word-for-word raw notes. The use of the interview form containing expert opinion based upon predefined codes in the research favors the selection of this analysis method. Nevertheless, coding was required in order to organize and interpret the chaos created by this complex data [15]. Therefore, the documentary material was categorized deductively as per predetermined codes. The relevant codes were finally discussed by the research team to resolve the contradictions and reconcile. The coding was done by ŞÖÖ, VÖ and EG (male, 9 years of experience as a qualitative and

mixed method research) with to minimize possible biases in the data analysis process. To obtain validity in qualitative research, long-term participation and continuous observation, triangulation, peer review or questioning, adverse situation analysis, explanation of researcher biases, member control, rich intensive description, external audits are listed [16]. In Creswell's opinion, it will be adequate to utilize two of these strategies in research [12]. Thus, rich and intense description was made with peer review or questioning, member control in this research. Moreover, researchers utilized pre- and post-interview researcher diary notes in order to eliminate external factors i.e. religious, cultural, and political factors. All statistical analysis was performed using IBM SPSS Statistics version 23.

Results

The anthropometric and diabetes-related data of the participants by gender are demonstrated in Table 1. Fifteen university students with T1D (n:10, 66.7%) with a mean age of 21.86 ± 2.03 years participated in the research. The diagnosis age of T1D was detected to be 15.00 ± 4.52 years in males and 11.60 ± 5.42 years in females. The bolus insulin amount of the female and male participants was noted to be 24.3 ± 14.6 (U/day) and 44.9 ± 20.7 (U/day), respectively. The mean BMI of females and males was 22.55 ± 3.33 kg/m² and 25.98 ± 2.00 kg/m², respectively.

Experiences of university students with T1D in diabetes management

The experiences of students with diabetes in their educational lives are quoted and the coding of their positive experiences are shown in Fig. 1. In the interviews, the participants shared the positive experiences of university administration, lecturers, and peers in diabetes management. Several participants value the support they get from various sources, including faculty, classmates, and university facilities.

Factors i.e. access to pharmacies, the abundance and variety of food and beverage areas around the school, and the availability of 24/7 vending machines where they are able to get food and beverages like fruit juice help students with T1D to feel safe. Accessing to food in the university environment was a major concern. Thusly, students related their sense of trust in the relevant fields with their positive experiences. Hence, the statements of some participants on the relevant situation are as follows:

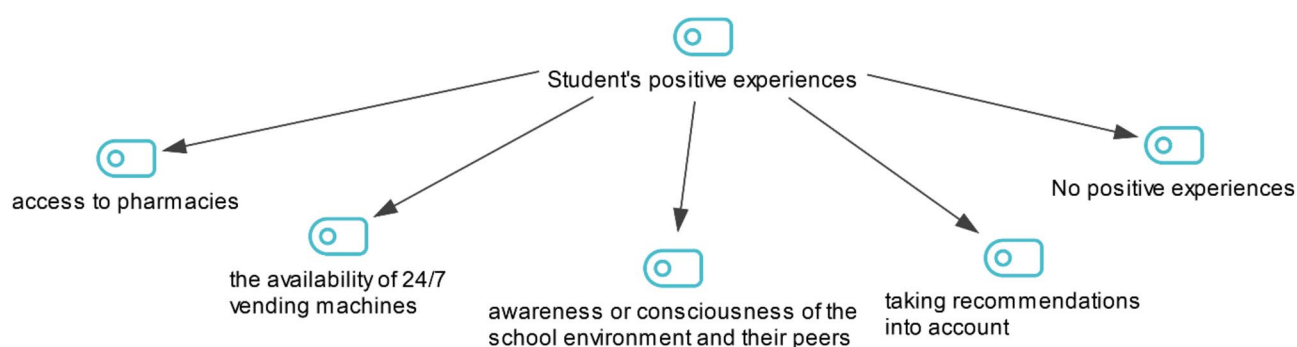
P5: "positively, having plenty of food areas around the school"

P7: "It is very important to have a vending machine on campus since something vital should be supplemented when one have hypoglycemia at that moment."

Table 1 Demographic, anthropometric and diabetes-related data of participants by gender

Variables	Female (n = 10, %66.7) (M ± SD)	Male (n = 5, %33.3) (M ± SD)	Total (n = 15, %100) (M ± SD)
Age (years)	21.70 ± 2.00	22.20 ± 2.28	21.86 ± 2.03
Type 1 DM age at diagnosis (years)	11.60 ± 5.42	15.00 ± 4.52	12.73 ± 5.24
HbA1c (%)	8.10 ± 1.05	7.06 ± 0.92	7.75 ± 1.10
Basal insulin (U/day)	29.15 ± 7.46	23.12 ± 9.78	27.14 ± 8.47
Bolus insulin (U/day)	24.31 ± 14.62	44.92 ± 20.74	31.1 ± 19.01
Total insulin (U/day)	53.46 ± 15.69	68.04 ± 27.96	58.32 ± 20.79
Body Weight (kg)	63.30 ± 9.33	84.80 ± 7.82	70.46 ± 13.5
Height (cm)	167.6 ± 6.51	180.5 ± 5.31	171.9 ± 8.69
BMI (kg/m ²)	22.55 ± 3.33	25.98 ± 2.00	23.69 ± 3.33
BMI classification			
Normal	7(70.0%)	2(40.0%)	9(60.0%)
Overweight	3(30.0%)	3(60.0%)	6(40.0%)

BMI = body mass index; M = mean; SD = standard deviation

**Fig. 1** Students' positive experiences

Besides, it is seen a positive experience having the required facilities in the management of hypoglycemia when they have hypoglycemia within the university. The fact that instructors and peers are being thoughtful and supportive for diabetes is also among the positive experiences of students.

P.2: "My positive experience is my professors' attitudes against me are very nice, for instance, when I was sick in class, I had no trouble having permission."

P.10: "Positively, my professors support me. I experienced hypoglycemia on the road once. I was late for class as I had to stop and drink juice, my professor told it was okay, I could attend class, which made me happy. "

It was specified that they were afraid of having hypoglycemia during the exam, however, with the tolerance of the attendants, they could take the exam having foods/drinks such as sugar, fruit juice, etc. they needed in the management of hypoglycemia, and eventually, the

behaviors of the instructors in this aspect create the perception of positive experience.

P.3: "Positively, I was afraid of experiencing hypoglycemia during the exam when I had recently accepted my condition. As the observers did not allow anything apart from pen and paper during the exam, I always asked if I could tell about my condition and attend with fruit juice, and even if i don't have hypoglycemia at the moment, it is good for me. "

Moreover, it is regarded as a positive experience that they do not have to conceal their devices thanks to the high awareness or consciousness of the school environment and their peers which showing that university administration or related decision mechanisms enhance the positive perception of students in their experiences. Examining the answers of the participants, it was also expressed that some students did not share any experience regarding positive experience.

P.6: "Both my professors and my classmates encourage me. When i have hypoglycemia, they just under-

stand. My dormitory mates also supported me a lot when I have hypoglycemia. I had severe hypoglycemia following a workout. My friend noticed me at that moment. S/he brought my blood glucose meter and measured my blood glucose and helped me. “

P.1: “it makes me feel good that they pay regard to my suggestions at university.”

The coding regarding T1D students’ negative experiences with their peers, instructors, and university facilities is given in Fig. 2. They stated that some instructors could not be helpful since they were not aware of the condition of the students, and this made diabetes management challenging.

P.1: “Once when I took the exam, I had hypoglycemia. So I wanted to get out of the class. I said I would eat something and come back right away. They did not allow me, I couldn’t get out of the classroom. This was the negative incident that have experienced.”

P.12: “Teachers are not aware of the condition of most students. I got out of class and the professor was angry with me about where i was going. I told him/her that I was diabetic. I said that i have to get out and eat something, it’s lunchtime for me. That incident annoyed me a little bit.”

University cafeterias are essential areas where students are able to access to the healthy meals. The absence or closure of cafeterias on campus complicates diabetes management. Particularly during hypoglycemia, not being able to get food/drink is considered as a significant problem. Some students stated that they skipped meals due to the absence of a cafeteria or canteen, and that they searched for a decent meal. During this search, they

expressed that they encountered hypoglycemia and were late for classes.

P.10: “On my campus, the cafeteria closes at 5 o’clock, I had hypoglycemia once when I stayed in the library and could not find food, I did not have cash for the vending machine, I had to have biscuits from my friends.”

P.2: “There was no cafeteria or canteen at the university for a while. At that time, while I was having hypoglycemia, I had to go out and buy some food from the market and I was late for class.”

The lack of diabetes awareness in the university environment, the constant requirement to explain themselves and diabetes, was a major source of stress and frustration for students. This led to not controlling blood glucose in social environment, postponing or skipping insulin injections.

P.10: “Negatively, time to time I cannot control my blood sugar in social environments, and I postpone insulin injection. For instance, it is challenging to measure my blood sugar on the road without a sensor. “

They stated that they encountered negative experiences with technological devices such as insulin pumps and continuous blood glucose meters utilized in diabetes management due to lack of awareness of instructors and their peers. Some students using insulin pumps expressed their experiences during the exam period and told about the negative experiences before, during and after the exam. Participants stated reluctance to give short-term leave from the exam, device control and additional time, especially during exam.

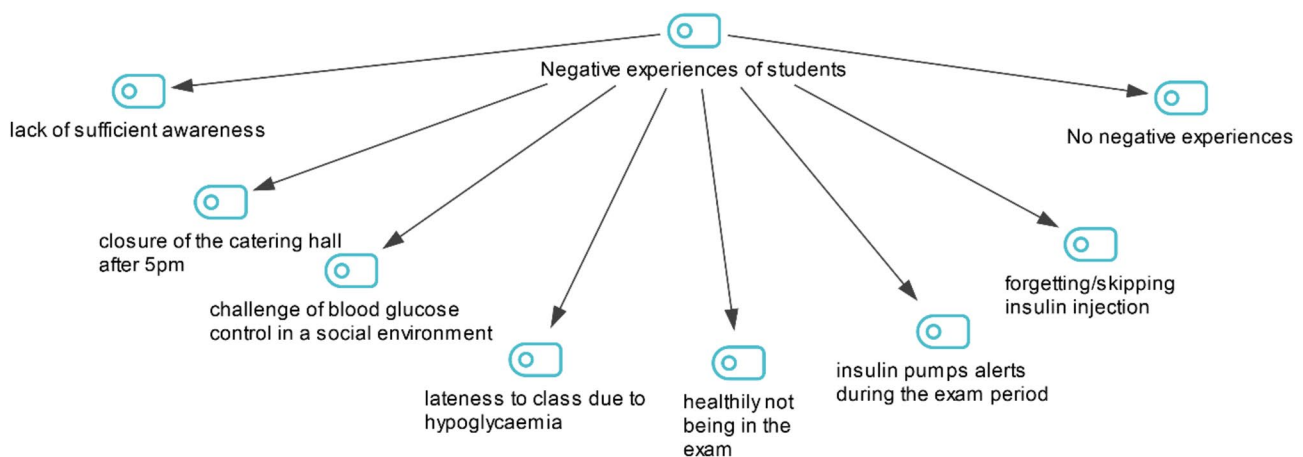


Fig. 2 Negative experiences of students

P.1: *I received a notification from the pump during the exam and I had to check it, I had to explain it to the exam observor that the device I was using was for my health.*

P.4: *I was too excited for the final exam of a critical course that I studied hard for, my blood glucose level suddenly began to drop and I could not elevate it whatever I did. I could not take the exam that day. Afterwards I took the make-up exam.*

The fact that university attendants and other students are largely ignorant of T1D and their lack of awareness of the tools utilized in diabetes management and the needs of students results in students with diabetes to encounter numerous challenges in campus life. It was reported that they had to skip insulin injection due to additional living conditions came along with university life, exam intensity, and transportation challenges.

P.9: *"When I was at school, there were times that I forgot insulin at home, and my father brought it from home."*

P.10: *"Negatively, sometimes I cannot check my blood glucose in social environments, I postpone insulin injection. For example, it is difficult to measure my blood sugar on the road without a sensor."*

General nutritional preferences and attitudes of university students with T1D

Participants were asked about their experiences with nutrition, which is a substantial part of diabetes management with the transition to campus life. Students their nutrition-focused experiences in meal preferences, meal preparation, and diabetes management. Many students mentioned that they paid regard to the meals they prepared at home, that they were careful not to use sugar, however, that they made their own recipes by seeking healthy and suitable recipes for diabetes in case of emergence of a desire for dessert.

P.6: *"For example, if it is to be at home, I consume what my mother did without adding compote or jam sugar".*

P.12: *"I desire dessert, I look at the dessert recipe suits healthy diabetes on the internet. I make and eat it by myself."*

P.13: *"For example, I buy diabetic jam home. When a dessert is to be made at home, if it says 1 cup of sugar in the recipe, I began adding half a cup."*

Students with diabetes stated that they did not prefer sugar-free special products made with sweeteners and consumed regular foods by portion control. Students who work out regularly reported that they made a special effort to balance their blood glucose

before and after training and paid attention when planning meals.

P.1: *"Instead of diabetic halva, I consume regular halva based on portion control, which makes more sense to me."*

P.5: *"Yes, especially ice cream motivates me in summer, yet sure I consume it by portion control. I love summer fruits a lot, yet I try to balance them between my daily meals."*

Attitudes of participants on diabetic products and sweeteners, their consumption habits and their experiences with nutritional preferences in diabetes management were questioned. A general cautious approach to diabetic products and sweeteners has been observed. Participants believe that these products are inadequate in providing blood glucose control and may even complicate diabetes management. The majority of participants remarked the significance of portion control and balanced nutrition in diabetes management. There are various opinions regarding diabetic products and sweeteners. Some individuals do not prefer diabetic products, whereas others prefer to meet their sweet needs with alternative methods.

P.1: *"I never prefer diabetic products. It is smarter than consuming the sweetener-sweetened products it contains."*

P.4: *"I was using diabetic jam to feel good, however, I do not consume it anymore as it makes my blood glucose irregular, besides, I used to prefer diabetic crackers and biscuits, but I do not prefer it since it causes weight gain, and even when I see diabetic products, I immediately go away."*

P.4: *"I did not need sweeteners because I consume tea and coffee without sugar."*

P.8: *"I consume carbohydrates, proteins and fats in my diet by balancing them all."*

P.11: *"I usually try to avoid white bread. I'm trying to consume bran or rye bread or something."*

P.13: *"There are diabetic halva and diabetic cookies as special products. Gluten-free products, whole wheat pasta, noodles."*

Diferent approaches to the dietary habits and sweetener usage of individuals with diabetes vary based upon personal preferences and blood glucose control necessities. Some people avoid diabetic products, whereas others prefer to prepare their own healthy recipes or natural alternatives.

Nutritional attitudes of university students with T1D in Non-Routine environments

The coding of the participants' diets in non-routine environments is given in Fig. 3. An important issue for

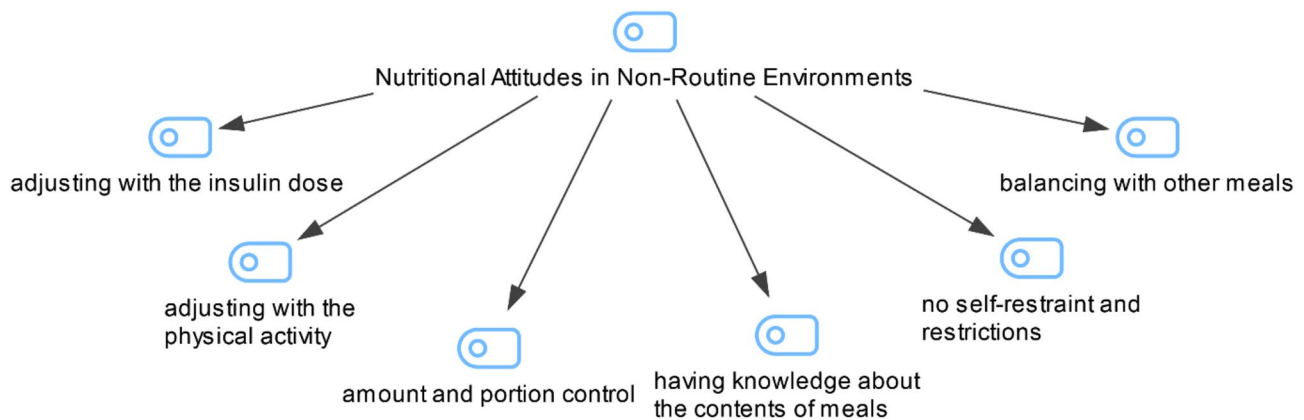


Fig. 3 Codes for students' nutritional attitudes in non-routine settings

students with T1D is that diabetes affects social interactions and choices in the university environment. A significant aspect of the university is peer socialization, all students desire to be part of the social activities proposed by campus life. The subject of nutrition in non-routine environments such as special occasions and social events has been addressed with the code of non-routine environments. It has been stated that information is attained regarding the amount and content of food/beverages consumed in social environments and thus it is possible to control the blood glucose level.

P.6: "On birthdays, I calculate the carbohydrate amount of the cake and add it my evening meal, when I consume it with meals and make the proper insulin, my blood sugar gets better."

P.7: "If I eat outside, I calculate carbohydrates again. If it is a very complex meal involving fats, proteins, carbohydrates, or appetizers, then it is hard to calculate carbohydrates. In that case I estimate the dose."

P.10: "I manage it according to the carbohydrate count when I eat fast food or on birthdays."

An important step in the self-management of diabetes is to be careful in food selections and to manage the insulin dose correctly. Instead of restricting themselves on nutrition, students prefer to consume healthy foods by paying regard to portion control. As dessert consumption increases especially in social environments, it is quoted with the following statements that the participants behave in the direction of preferring favorite desserts under the condition of portion control.

P.1: "Since I can more or less guess what the food contains, I do not eat as much as everyone else, yet I consume it by paying attention to the amount."

P.3: "As such social environments are predetermined, I take care to consume meals throughout the day in

a balanced way and consume them in portion control depending on where I am going."

P.6: "I calculate the carbohydrate amount of the cake on birthdays and add it my evening meal. My blood sugar gets better when I consume it along with meals and make the proper insulin."

Participants stated that in order to provide optimal glucose control, they chose from the available meals in social environments, managed the insulin dose by counting carbohydrates, did more physical activity and injected an additional dose of insulin if necessary. Furthermore, they make adjustments in accordance with portion control and carbohydrate amount in fast food. Additionally, it was stated by the students that balancing was made with other meals with the following sentences;

P.1: "If I want to consume a little much, I will definitely try to maintain the balance of my other meals, but we can also feel like snacking and having the main course. In these cases, I adjust the dose of my insulin."

P.3: "If I eat too much, I walk on the treadmill, so I balance the next meal."

P.13: "When I go to the cinema, I usually don't have popcorn, I have it when I go with someone. I do not eat main meals, for example, on that day, what I eat accounts for the main meal."

Socializing with their peers at campus events is important for this age group. Despite not all students at the university prefer to consume alcohol, this is the period when they are exposed to risky behaviors i.e. tobacco, alcohol and drug use. As with some students, these preferences are among the consumption preferences of students with T1D. Students expressed that they pay attention to portion control in alcoholic environments to maintain an active social life.

P.14: "If it is an alcoholic environment, I consume a maximum of 2 portions of alcohol. I don't eat a lot of cake on birthdays or take two bites from a thin slice and stop."

Nonetheless, it was also observed that the students did not make any restrictions on special days or during social activities. They stated that they changed their diet in order to adapt to their peers, especially in such environments.

P.1: "I never restrict myself"

P.2: "I do not limit myself too much, and I do not like being restricted because when I am restricted, I feel to eat even more."

P.7: "there is no extra difference."

Regular nutrition and quality of life in university students with type 1D

The positive and negative experiences of the participants on the quality of life of a regular and healthy diet, which is a substantial part of diabetes self-management, were questioned. Especially in the moments of hypoglycemia and hyperglycemia, the students expressed that they felt bad and had trouble on focusing, avoid social life, felt unhappy, incomplete, and lonely.

P.2: "Of course it does. When there are imbalances in my blood glucose, I am very inactive and sleepy in my social life. This situation reflects to the people around me."

P.3: "Nutrition is important to me. When I have hypoglycemia outside, people around me also panic, I usually do not reflect much, only those I have influence on."

P.9: "On days when I cannot control my diet, my quality of life is adversely affected by the increase/decrease in blood sugar at night. For example, if I am studying, I have a concentration problem."

Some participants stated that they were afraid of body weight gain when they have an irregular and unbalanced diet, that diabetes caused an increase in stress, and that they reflected their anger to their environment during hyperglycemia.

P.13: "I think my stress increases after diabetes. I can be incredibly furious at a person who approaches me during hyperglycemia."

P.4: "I am usually a very calm person, yet sometimes there is a sudden anger. In fact, I get very angry at what I will never get angry at, and this is very obvious and people around me say as if your blood sugar is high."

It has been quoted that food preferences affect blood sugar levels, that they feel the need to constantly check, and therefore, diabetes directly or indirectly affects social life.

P.7: "It affects me a lot, my blood sugar is high for 3 hours after eating pizza, etc., so I need to constantly check and make insulin shot. I am constantly looking at the sensor on the phone or measuring blood sugar on the finger. I feel comfortable when I eat salad. Those kinds of nutrients definitely affect. And I get uncomfortable when I eat too much in a row, the effects are mixed with the blood individually."

P.10: "The point of my life, that is, everything I have, even making an insulin shot, is related with the food I eat."

Contrary to the above-mentioned situations, the participants also emphasized the positive effects of regular and balanced nutrition on quality of life. Maintaining a diet program, paying attention to mealtimes and keeping them under control enable you to be more active in terms of spiritual well-being and fitness. Being more mentally vigorous, better focused on work, and raised mood during the day are also among the positive effects of nutrition. Implementing the appropriate nutritional treatment, both physical and mental health are invested, and the feeling of happiness increases as a result. It is believed that healthy nutrition contributes to the development and progression of the body. When the diet is adhered to and blood sugar is monitored regularly, the quality of life also enhances. Feeling energetic about this situation was expressed as;

P.2: "I can say that I live better than a normal human life when I eat regularly."

P.13: "so when you can really control it, my quality of life increases."

P.14: "I also become much more mentally vigorous. I am more focused on what I am doing"

the state of being happy was expressed as;

P.12: "I feel fresh both mentally and physically"

P.14: "When I have a balanced diet, my mood increases during the day." and state of feeling normal was expressed as;

P.5: "I think that nutrition has a positive effect on my quality of life. Because in fact, if you eat healthy, I think your body grows and progresses accordingly."

P.6: "If we adapt to the diet and properly take our blood sugars and what we eat decently, our quality of life goes well."

P.15: "everything is getting much better and my quality of life is increasing."

P.11: "I stop my pump when I do sports"
P.15: "If it is too high, I make insulin shot."

Nutritional attitudes of type 1D university students during exercise/sports period

The coding of the participants' regular exercise/sports and nutrition is given in Fig. 4. It was reported that students who do sports regularly measure their blood sugar before doing sports and take a snack if it is low. Additionally, it was reported that meals were consumed two hours before exercising and it was aimed to increase the amount of carbohydrates. Besides, it has been reported that foods with high protein content are preferred as blood sugar increases instantly during sports.

P.3: "I measure my blood sugar before doing sports. If there is a chance of dropping, I begin sports after having a snack. I prefer bananas for snack, it makes me feel better. During sports, my blood sugar rises momentarily. That's why I prefer foods with high protein content."

P.6: "I definitely measure my blood sugar prior to begin sports."

P.11: "If I'm going to go for a walk or whatever, I take juice with me, as my blood sugar may suddenly drop."

P.15: "I increase my carbohydrate amount during sports time. When I work out, I consume a lot of protein as my body needs it. In the evening, I consume my meal up to 2 hours before workout. "

Some students take additional doses of insulin or stop their pumps in order to do sports. This attitude is expressed through the following statements.

P.6: "I am taking an additional dose of insulin."

Unlike the students above, students who cannot do sports explain their behaviours in this aspect (some expressing that they are uncomfortable with the current situation) with factors i.e. lack time, academic performance concern, etc.

P.1: "unfortunately, I cannot spare time for sports in my life pattern."

P.5: "No, I don't. Sadly, I cannot spare time to sports because I take school and work at the same time. "

P.10: "no, I don't."

Type 1D university students' expectations from the university and the environment

Participants were asked whether the university administration, faculty and related units had knowledge about being a diabetic individual and how this knowledge supported them. In the interviews on university support, the majority of the students stated that their schools offered certain academic support.

P.1: "my HbA1c and blood parameters are monitored by my professors at the university."

P.2: "However, I get suggestions regarding nutrition from the dean of the Faculty of Health Sciences."

P.13: "I got it once, I cannot tell I got continuous support. For the content of the course, the dietitian lady comes and..... even the name of our professor. S/he came and told us about the carbohydrate count. It was only for a week. "

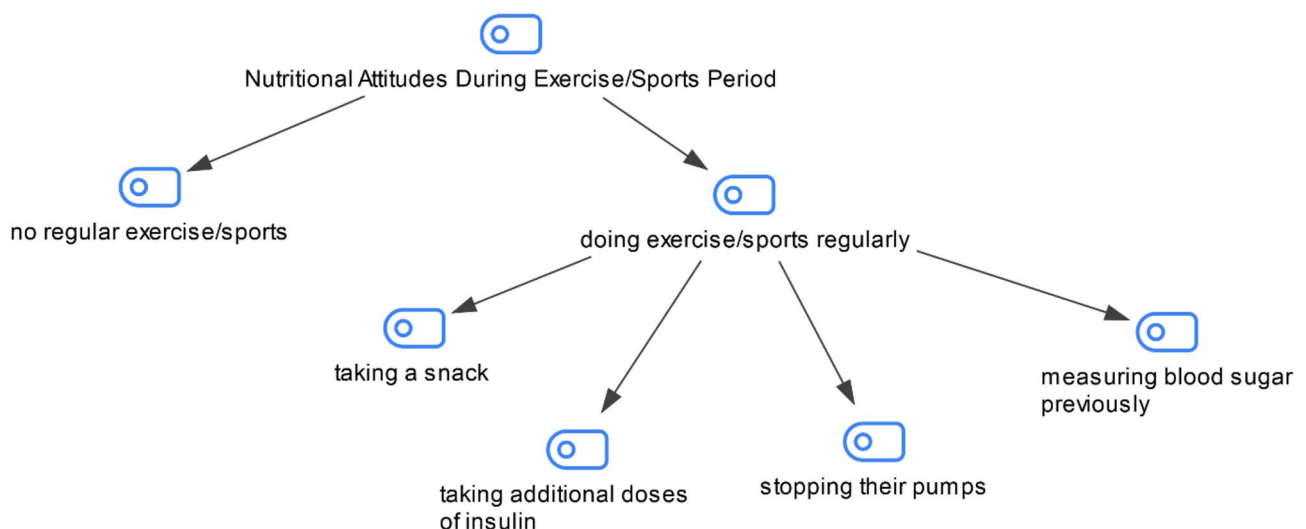


Fig. 4 Coding of students' regarding doing regular exercise/sports

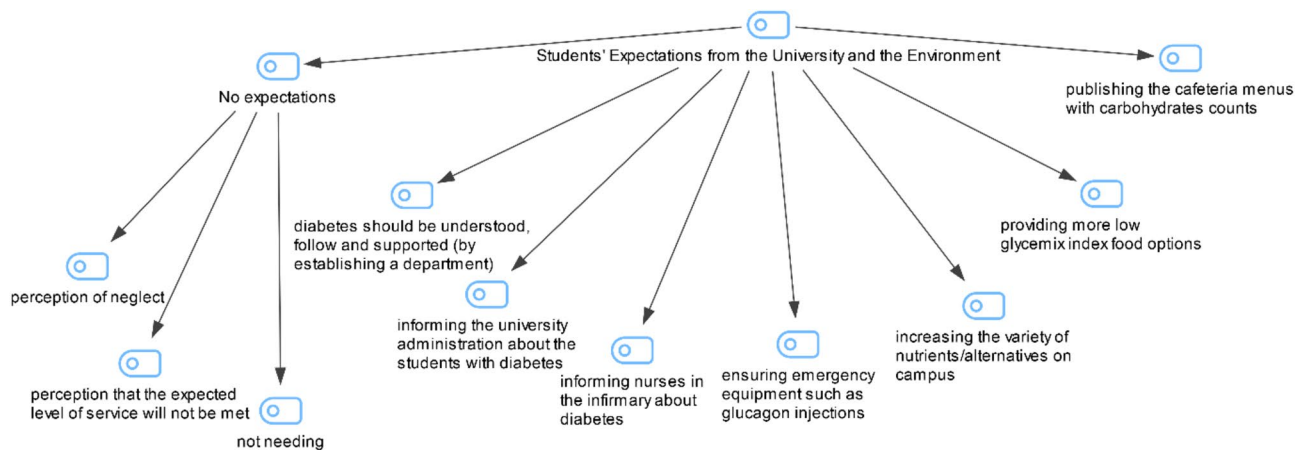


Fig. 5 Coding of students' expectations from people around them

The students expressed that their diabetes was officially recorded in the university's records and hence they were regularly supported. Others told that they were recorded in the university's disability unit and that they were happy that the administration had information on their diabetes. A few of the participants expressed that the university was not aware of this issue and that they said this situation when they were registered, however, they did not know whether they were recorded or not. Some of them mentioned that they did not state their diabetes to the university administration or the disabled unit and told their close friends and some faculty members.

P.14: "I receive logistical support. My blood sugar meter device is electronic. It has a device that integrates with the pump, i.e. Dexcom. I can go to the health center and have it installed when necessary."

P.1: "it is already being followed at my university, so it is in the records."

P.13: "Yes, it is known, I mentioned this to the school when I attended the university."

P.10: "Unfortunately, there is no official record, it is as well-known as I have shared with some of my lecturers and friends."

P.15: "No, it is not known that I had diabetes at the university. No one has known about this since I started university. People didn't know apart from my close friends."

Some students mentioned that they were close to their university's diabetes team and that they also received professional support. Nonetheless, some students expressed that they did not receive any support and that they intervened on their own. Others told that it was a study they performed with their diabetic friends.

P.3: "I filled out a form at the beginning of the university. They added me to a messaging group, however, I didn't get any support other than that."

P.9: "no, I do not receive any support, no, I am already self-sufficient."

P.11: "I don't, there is something that we carry out only with our diabetic friends with the support of Professor..."

It is clear that the level of support among students and the level of knowledge of the university vary in accordance with individual experiences and the opportunities proposed by the university.

The coding of the participants' expectations from their environment is presented in Fig. 5. Students' expectations from the university administration and social environment were questioned. Explanations on their expectations stated that the students did not have much expectation from the university and thought that they were their own doctors in matters related to their own health and that they knew about themselves better than other people. For the expectations regarding nutrition, it was stated that they did not follow a special diet since they were diabetic and consumed the food that other students did.

P.4: "I have no expectations from my university. I don't think they'll care much."

P.9: "I do not have any particular expectations regarding nutrition the reason is I do not think that I should have a special diet as I have diabetes. As normal students eat, I eat those meals in the cafeteria. "

Nevertheless, it was highlighted that students with diabetes should be understood and supported by the school administration. Thus, it is recommended that the university administration be informed regarding the presence of students with diabetes, that nurses in the infirmary be

informed about diabetes, and that emergency equipment such as glucagon injections be available.

P.10: "Particularly in the Faculty of Health Sciences, a conference /training may be conducted. We see it in lessons, however, students usually don't know much, they ask me."

P.6: "Nurses in the infirmary at the university may be informed about diabetes. A student who has recently been diagnosed with diabetes and a student who has gone away to university to his/her family may encounter hypoglycemia and lead to adverse results with the wrong treatment method until he/she understands it."

P.8: "at least one glucagon injection can be found in the infirmary."

P.15: "At least it would be nice to have someone who is interested in the school. I would like to see at least such a situation in case of emergency and to be helped in such situations with diabetic patients like me."

Moreover, students with diabetes reported that it would be useful to publish the cafeteria menus in advance and to write down the amount of energy and especially carbohydrates of food. They quoted that there is a need to increase the variety of nutrients/alternatives around the university and to find foods having a low glycemic index.

P.1: "I cannot manage the cafeteria in terms of nutrition, but I try to manage my food preferences on my own behalf. There is a menu table for the day at the entrance of the cafeteria, where the energy amount of the meals is written on, and I think it may be better to write the nutrient content, especially the amount of carbohydrates."

P.3: "Besides, alternative options can be diversified especially in terms of bread in order to facilitate daily flow in the cafeteria. For example, if there was an alternative to toast with bran bread instead of sugar-free drinks, biscuits or white bread toast, my preference options would increase."

Discussions

Considering the lack of Türkiye data in the literature, this qualitative study assessed the nutritional experiences of Turkish university students with T1D, the obstacles they encounter on nutrition, and the effect of the new lifestyle that began with campus life on their self-care. In other studies, issues i.e. challenges in diabetes self-management, academic success concern, peer issues and stigma, denial of diabetes, feelings of rebellion and anger, loss of parental involvement, limited support of university administration for diabetes due to the extra effort

of students with T1D to control blood glucose levels between classes or during exams, not being allowed to eat and drink in classrooms, navigating university campuses and not being able to reach healthy foods have been described [4, 17–20]. The problems specified in our study in establishing diabetes self-care routines and maintaining optimal glycemic control are compatible with the common findings found in other qualitative studies.

T1D self-care behaviours involve planned and regular insulin administration, participation in physical activity, and attention to food consumption. Self-care is influenced by various factors i.e. experiences, skills, symptoms, physiological changes, psychological components such as stress and anxiety, personal and cultural values, self-efficacy, access to care, and having support from others [10,19,21]. In our study examining participants' experiences in diabetes management, the students expressed they were experienced in insulin injection and that they developed methods appropriate for educational activities (exams, curriculum, etc.). Nonetheless, the complexity and continuity of diabetes self-care avoids students from performing the necessary practices in some cases. Students stated that they felt obliged to skip insulin injection in social environments and during educational activities. Lack of knowledge of the surrounding people regarding the insulin pump and continuous glucose monitoring devices is among the negative experiences that students have to constantly explain. Besides, they reported that they had to miss insulin injection due to factors such as exam intensity and transportation difficulties. Similar studies have reported behaviours such as skipping insulin doses or hiding injections due to social stigma, constant self-disclosure, lack of awareness, and desire to adapt [2, 4, 7, 20, 21].

Lack of awareness on the medical effects of diabetes in the university setting was also a negative experience for students. It was stated that they felt insecure, especially due to severe episodes of hypoglycemia which they might need help, in which case not being able to access food/drink quickly was a significant problem. They also expressed that they had focus problems in cases of hypoglycemia or hyperglycemia, they avoided social life, felt unhappy and incomplete, and felt lonely. In similar, Malova et al. noted in their study that students with T1D had difficulty in carrying snack foods with them at all times, and when they did not bring snack foods with them, they had problems in reaching decent food on campus [7]. In the research of McFadden et al., it was suggested that students with Type 1D carried snacks with them, so they were ready to regulate their blood glucose away from home [19]. In the study of Kellet et al., two-thirds of the students mentioned that the self-management of diabetes became more challenging with campus life. Approximately half of them reported that their

glycemic controls deteriorated after they started university and that they experienced recurrent hypoglycemia [22]. Both in our study and in the literature, it is observed that hypoglycemia is a major concern for university students with T1D. Therefore, new strategies should be promoted in order to eliminate embarrassment-stigmatization, challenges in accessing food and lack of awareness that lead to hypoglycemia attacks.

University cafeterias are both regular and supervised areas where students can access to healthy meals. In our study, reaching to healthy foods was essential for students. For the students with T1D, the lack of healthy food options on campus, incompatibility of meal plans with cafeteria working hours, inappropriate menus in cafeterias, inadequate and misinformation regarding the menu make diabetes management difficult. Also, other studies have reported that access to healthy foods is challenging due to the academic program, large campuses, limited time between classes, participation in other activities, dining hall setup and the content of the meals offered [3, 4, 18, 20]. In another study, it was detected that inappropriate cafeteria working hours and incorrect information about the content of the meals made diabetes self-management difficult [7].

A substantial issue for students with T1D is that diabetes affecting social interactions and choices in the university environment. In our study, we found that students made changes in non-routine settings such as special occasions and social activities, such as skipping meals, predicting meal content, preferring protein-rich foods, and increasing insulin injection. By the transition to university life, the individual with T1D is in a constant change between living a normal student life and having diabetes and managing diabetes [2, 20]. Hence, they require various resources and supports to handle the difficulties they face on campus. In this context, network, community and peers are accepted as the most frequently used supports on university campuses [20, 23]. In our study, the students expressed that they were officially registered at the university, that knowing their diabetes made them happy and that they were regularly supported. However, some students mentioned that they did not report that they had diabetes during university registration but only told their close friends and some instructors. Nonetheless, the students stated that they did not have much expectation from the university administration and that they took more active individual responsibility for their self-care. Even though there were differences of opinion among the participants, the students expressed that they needed to be understood and supported by the university administration. In numerous studies, it has been suggested that the university administration directs students with T1D to campus disabled units, however, students do not identify themselves as a

disabled person and therefore do not enroll in the disabled unit [9, 20, 23]. Particularly, the fear of being distinctive, stigmatization and social isolation prevents university students with T1D from going to such centers. This situation causes students to take initiative for the requirements of diabetes self-management and to experience more social anxiety and loneliness [7, 20]. In a study performed on university students with T1D, it was stated that student health centers on university campuses should be improved on diabetes. Besides, it has been reported that students require peer support and emotional support in addition to the extra burden of campus life [19]. Hagger and et al. noted that the problems experienced by the students in the exams, the lack of knowledge of the university staff and institutional barriers also negatively affect diabetes management [9]. Despite more peer and social support is known to help improve diabetes management and outcomes, students' efforts to be normal may prevent them from receiving this support [3, 4]. This situation may cause serious problems in diabetes self-management of T1D students who have just experienced both significant adulthood and campus life. In order to prevent these problems, it is required to educate students with T1D regarding the significance of campus disability centers, to encourage them to connect with support systems, and to ensure that the university administration makes the required managements.

Conclusion

Along with the beginning of campus life, the student starts to manage his/her diabetes self-care completely and adapting to changing living conditions creates obstacles in diabetes management. This causes the student to experience mental, physical and behavioural problems. In our research, the participants stated that the facilities on campus, university management, diabetes awareness of staff and peers, the effectiveness of support programs, and academic and social activities were efficient in diabetes management. The carbohydrate content of all food and beverages available in campus cafeterias, dining halls, and vending machines should be clearly indicated. The consistent provision of cafeteria and dining hall services, aligned with campus life, should be ensured. Diversity in dining hall menus should be enhanced. Students and university staff should receive education on diabetes awareness and emergency response. Healthcare personnel in the campus infirmary should be trained in diabetes management, and the infirmary should be equipped to facilitate rapid intervention. It is obvious that there is a necessity to examine on-campus problems in more detailed manner and to enhance awareness.

One of the limitations of this study is the geographical location of the participants. Our data were obtained from T1D students living in Istanbul, the largest providence in

Türkiye, and receiving university education in this city. There may be differences between reaching to health care and diabetes self-care skills of university students in various regions of Türkiye. This may affect student responses. Another limitation of the study is the small sample size and limited diversity. This may affect the generalizability of the results collected.

Abbreviations

T1D	Type 1 diabetes
BMI	Body mass index
95%CI	95% confidence interval
M	Mean
SD	Standard deviations

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Author contributions

ŞÖÖ and MG contributed to the conception and design of the study. VÖ, ŞÖÖ and EG collected article data, analyzed all survey data, and contributed to all statistical analyses and interpreted data. ŞÖÖ and VÖ wrote the manuscript. All authors contributed to the article and approved the submitted version.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Competing interests

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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