

Diabetic Patients' Consumption of Diabetic and High Sugar Content Breakfast Products

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Abstract

Diabetes Mellitus is a metabolic disease that can cause serious damage to the human body if left untreated. High blood sugar level is among the symptoms of this disease, and nutrition therapy is very important in its treatment. On the other hand, breakfast is notable for being the first meal of the day and for containing high-sugar products in terms of nutritional content. Within the scope of the present research, a study was carried out using a semi-structured interview form in order to obtain information about the consumption trends of high sugar-containing and/or diabetic breakfast products in 19 diabetic patients and their situation of producing these products at home. In the study, it was observed that there were significant differences between the participants' tendencies to purchase, produce and consume these products regarding diabetic breakfast products. As a result, when homemade diabetic breakfast products were compared with industrial diabetic foods, it was seen that taste and consistency parameters became prominent. Rapid deterioration and maintaining these products' consistency, color and sweetness were among the difficulties encountered while preparing homemade diabetic breakfast products. It was determined that the participants used stevia, honey, molasses, dates, sweetener, carob, sugar alcohol and cinnamon as sugar substitutes, and pectin, dried nuts, dates and boiling process for thickening the product in making diabetic breakfast products at home. Websites and social media were the most common platforms where participants search for diabetic breakfast recipes. Besides, the participants also stated that diabetic product options were insufficient in out-of-home breakfast places.

Keywords: Diabetes mellitus, Breakfast, High Sugar Containing Breakfast Product, Diabetic Breakfast Product.

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1. Introduction

Diabetes, which is medically known as Diabetes Mellitus (DM), is a metabolic disorder that develops as a result of insufficient secretion of insulin hormone, which is released from the pancreas and controls the use of blood glucose in the body, or defects due to action of insulin (Diabetes Mellitus Study and Training Group, 2014). Various types of diabetes are observed in people, and it is known that among these types, the most common ones are Type I (insulin-dependent) and Type II (non-insulin-dependent) diabetes (Yılmaz, 2010). In the course of the treatment of diabetes, sudden increase or decrease in blood glucose level needs to be avoided by following diabetic nutrition principles. In other words, sugary foods that can lead to sudden fluctuations in blood glucose level should not be preferred and consumed. Nevertheless, it has been

determined in studies conducted that diabetic patients consume sugary products they should not eat in their daily diets, and that especially adult ones could consume high sugar content foods such as honey and jam (Alphan et al., 1994; Gizir, 2019; Üstel, 2013).

In the production of diabetic products, sweeteners are added into the product formulation in place of sugar, and the insufficient sweetness due to the absence of sugar is tried to be met with the sweetness that the sweetener brings to the product. Sweetening agents used in foods to replace sugar are divided into two subgroups, namely natural and artificial, and they are usually added into products not alone but in combination with other sweeteners. The use of sweeteners in food production makes the product both lower in calories in terms of energy value, and ensures that the product becomes consumable by diabetic patients (Çakmakçı & Çelik, 2004; Turkish Food Codex, No: 2006/45).

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Breakfast is one of the most important meals in the daily diet (Baysal, 1999). Products consumed during breakfast can show variation according to various factors (age, gender, physical activity, etc.) and it is stated that 15-25% of daily energy intake should be obtained in the breakfast meal (Sargın, 2019). There are numerous high-sugar content products (jam, marmalade, chocolate spread and halva) among foods to be served to consumers during the breakfast meal. It is known that diabetic patients could consume products such as chocolate spread, honey, jam and marmalade above the daily recommended level in the breakfast meal (Sami et al., 2020). This circumstance diversifies the process towards the development of breakfast products with low sugar content prepared with natural and artificial sweeteners for the consumption of diabetic patients (Carvalho et al., 2013; Demirağ & Şahin, 2012; Kaya et al., 2019). On the other hand, the tendency of diabetic individuals to stay away from products manufactured with artificial sweeteners with the consideration that they are harmful to health (Ural, 2018; Gizir, 2019) makes diabetic products prepared at home prominently. From this viewpoint, research to be conducted in the field of gastronomy regarding consumption tendencies of diabetic patients for breakfast products with high sugar content and the preparation of these products in the home setting are of importance in terms of disclosing issues that should be paid attention in the course of the preparation of breakfast product recipes suitable for the consumption of diabetic patients.

The present study aims to examine the opinions of individuals who need to consume a diet with low refined sugar content depending on DM towards the consumption of breakfast products with high refined sugar content and their diabetic forms in the breakfast meal, and to make suggestions in the field of gastronomy based on the findings.

2. Method

Diabetes is a disease that substantially affects the daily dietary habits of individuals. Individuals with this disease should consume products with low sugar content and have a lifestyle in accordance with the advice of health experts. For this lifestyle in question to be maintained, manufacturing low sugar content products that diabetic patients need, developing appropriate formulations and making them producible in the home setting carry an importance. Breakfast is the meal that allows consumers to be able to access many high-sugar content foods (jam, marmalade, chocolate spread, halva, etc.). In relation to that, it is

important to conduct research towards examining the consumption tendencies of diabetic patients for breakfast high sugar content products and their status of preparing these products at home and their level of access to alternative formulations.

This is a descriptive qualitative study in which diabetic individuals were interviewed through a semi-structured interview form (Baltacı, 2019). The study design was approved by the İstanbul Gedik University Ethics Committee (June 14, 2021/E-71457743-050.01.04-2021.2.687). The individuals whose views were sought in the scope of the study were selected among type I and type II diabetic patients residing in the province of Istanbul. Nineteen individuals with DM (Type I and Type II) who consume low-sugar foods were reached through their dietitians using the snowball sampling method and interviewed through a semi-structured interview form. The phenomenological design was used in the research. The participants whose opinions were sought were coded as P1 (participant 1), P2, P3. The data obtained were subjected to content analysis. With this approach, it is possible to evaluate the experience of people on certain subjects (Carpenter et al., 2018). The outputs obtained as a result of the content analysis applied to the data are presented under the themes and sub-themes. Due to pandemic conditions, the data were collected via interviews by either phone or computer softwares that allow video calls. In the preparation of the semi-structured interview form, the literature search performed in the scope of the study was taken as a basis, and care was taken to develop original questions for the study's aim. The first section of the interview included questions towards obtaining demographic information, whereas the second section was prepared so that the participant can be examined in the context of gastronomy. The prepared questions were additionally reviewed by expert dietitians serving to diabetic patients.

The research questions were as follows:

1. Do you consume diabetic counterparts of high sugar content breakfast products such as jam, marmalade, etc. in the breakfast meal?
2. Do you purchase diabetic breakfast products from supermarkets or do you prefer to prepare these at home?
3. What kind of differences do you think there are in terms of sensory attributes between diabetic breakfast products you make at home and industrial products you purchase from supermarkets?
4. What are the aspects that you have difficulty in

making diabetic breakfast products at home?

5. Which ingredients do you use as sugar substitute in diabetic breakfast products you prepare at home?

6. Which ingredients do you use to increase the consistency of diabetic breakfast products you prepare at home?

7. What kind of resources do you collect information from when preparing diabetic breakfast products at home?

8. Do you think that diabetic alternatives of breakfast products are offered at an adequate level in out-of-home breakfast places?

The following issues were taken into consideration for the validity and reliability of the study (Kılınç, 2018). In order to ensure traceability and reproducibility, the data were classified under certain themes. The researchers were directly involved in the data collection process, and the views of the participants were directly quoted during the data analysis and evaluation process. The opinions of academicians working in the field of Gastronomy and Culinary Arts and expert dietitians were taken for the preparation of the interview questions and for the evaluation of the data obtained in the study. A literature review was carried out in order to deal with the subject in depth from a conceptual standpoint.

3. Results

Of the 19 participants with the age range of 18-62 years, five were male and fourteen were female. The study included participants from all levels of education, from primary school to graduate school. Eight participants had Type 1 Diabetes and eleven participants had Type 2 diabetes. The age of the participants when they were first diagnosed with DM was determined to be between 1 and 25 years.

In the study, three superordinate themes, namely “diabetic breakfast product consumption”, “preparing diabetic breakfast products at home”, “access to diabetic products in out-of-home breakfast places” and seven subordinate themes were identified.

3.1. Superordinate theme: Diabetic breakfast product consumption

Some of the participants stated that they did not consume diabetic breakfast products, while some stated that they, although rare, could sometimes consume industrial or homemade diabetic breakfast products. It was determined that some participants preferred to purchase diabetic breakfast products, while some others preferred homemade ones. On the

other hand, the participants compared industrially produced and homemade diabetic breakfast products from the sensory point of view touching very different aspects as can be seen in subordinate themes. In this context, the approaches developed by the participants for industrial and homemade diabetic breakfast products were discussed under the subordinate theme headings of “Diabetic breakfast consumption status”, “preference for purchasing/production” and “views on sensory qualities”.

Diabetic breakfast consumption status

When the diabetic breakfast product consumption status of the participants was examined, it was seen that three different consumption tendencies came into prominence. Some participants stated that they consumed the products in question moderately often, whereas some others indicated that they consumed them less often. Some other participants, on the other hand, stated that they did not consume diabetic products in their breakfast meal.

“Rarely. Sometimes, when I feel like it, I make them myself at home and consume them.” (P4)

“I only consume homemade jam 1-2 days a week.” (P18)

“I do not consume diabetic foods. I often consume their normal equivalents.” (P15)

Preference for purchasing/production

While some of the participants stated that they did not include diabetic breakfast products in their daily diets, the other participants who consume these products were divided into three subgroups: those who consume only homemade products, those who prefer only industrial products and those who consume both product groups.

“I both purchase them from the supermarket, and sometimes. I try to make them myself at home.” (P3)

“I do not purchase them from supermarkets; I make them at home. I put in less sugar than the regular recipe. My dietitian recommended that I do it that way.” (P4)

Views on sensory qualities

In the sensory comparison between industrial type diabetic breakfast products sold in supermarkets and those made in the home setting, the parameters of consistency and taste came into prominence, and both positive and negative views regarding the relevant sensory parameters were expressed by the participants. On the other side, although the participants were asked to make comments about sensory parameters, some

discussed the subject with respect to product content and especially made negative references towards additives used in industrial type products.

“An artificial taste exists in those I purchase from supermarkets; but when I make it at home, I still use sugar, thus the one I make at home are much better.” (P4)

“The consistency and taste of those prepared at home are not always the same.” (P3)

“The consistency of the one I purchase from supermarkets is more like the one made by our mothers, however, the diabetic jam I make at home turns to be more aqueous. The industrial one is better.” (P8)

“Those in supermarkets include additives; I do not prefer them.” (P5)

“Additives, being sweetened with sugar analogues, additional fats, preservative substances are disturbing...” (P14)

3.2. Superordinate theme: preparing diabetic breakfast products at home

The aspects the participants had difficulty in preparing diabetic products in the home setting are the inability to adjust sensory parameters of products such as consistency, color and taste as desired and the spoilage of the products they make in a shorter time compared to industrial products. In the preparation of diabetic breakfast products in the home setting, the participants made use of wide variety of products, mainly stevia, honey and molasses, as sugar substitute, and various plant products as thickening agents. In addition, it was observed that regarding access to diabetic breakfast product recipes, written resources, dietitian recommendations and personnel experiences were utilized as well as Internet-based resources. In this context, the production of diabetic breakfast product in the home setting were discussed under the superordinate theme heading of “preparing diabetic breakfast products at home” with the subordinate theme headings of “problems encountered during production”, “preference for sugar substitute”, “consistency adjustment” and “access to recipe”.

Problems encountered during production

The participants were understood to encounter four main problems in preparing diabetic breakfast products in the home setting. These were identified to be the inability to achieve suitable product consistency, not obtaining desired product color, inadequate sweetness level of the product and the spoilage of products in shorter time compared to industrial

counterparts.

“Consistency and taste. Producing them similar to non-diabetic counterparts and the same at every time.” (P3)

“I cannot adjust its sweetness. I add less sugar.” (P6)

“Color and spoilage time.” (P14)

“I cannot know of any other ingredient to replace sugar. My dietitian also does not recommend sweeteners.” (P4)

Preference for sugar substitute

It was observed that some participants do not use any substitute to replace sugar and that some others mentioned the name of more than one substitute ingredient. The ingredients expressed to be used as sugar substitute were stevia, honey, molasses, dates, artificial sweeteners, sugar alcohols and cinnamon.

“... If I had made them, I would have preferred honey and molasses or dates.” (P2)

“I have tried couple of dessert recipes with stevia and carob flour...” (P18)

“I do not use sweeteners. I put in less sugar than the regular recipe.” (P4)

“We add less sugar than the regular recipe.” (P13)

Consistency adjustment

The participants were determined to make references to the boiling process as well as ingredients, such as citric acid, water, pectin, cinnamon, nuts and dates, in adjusting the consistency of diabetic breakfast products.

Access to recipe

It was stated by the participants that they mostly utilized web pages as well as Internet-based platforms such as Instagram and YouTube to access recipes for obtaining diabetic breakfast products. On the other hand, printed books as well as dietitians also came to the forefront of accessing recipes.

3.3. Superordinate theme: access to diabetic products in out-of-home breakfast places

A large majority of the participants expressed that access to diabetic breakfast products was insufficient in out-of-home settings where breakfast is served.

“For upscale places, yes; for average priced places, no; generalizing may not be appropriate. It changes depending on the price or locality and accommodation place.” (P14)

4. Discussion

It was determined in the study that some of the participants whose views were sought did not consume diabetic breakfast products, some others, on the other hand, consumed them moderately or rarely. The participants consuming these products were divided into three subgroups. According to this grouping, some participants preferred both homemade and industrial-type diabetic breakfast products, whereas some stated that they preferred either industrial or homemade products. In the statements of the participants who indicated to preferred homemade diabetic breakfast products, there was an emphasis on dietitian control and the fact that homemade products are healthier. It was understood that the participants who compared homemade and industrial type diabetic breakfast products in terms of sensory attributes underlined consistency and taste parameters. It was expressed that homemade diabetic breakfast products were poor in taste than industrial counterparts, whereas industrial diabetic breakfast products were sweeter but have artificial taste. Sugar used in the formulation of breakfast products such as jam and marmalade not only gives sweetness to the product, but also provides consistency and shapes product texture (MEGEP, 2011; Saldamlı, 2014). The fact that homemade diabetic breakfast products are of lower quality in terms of taste when compared to industrial counterparts results from the low sugar content present in the product recipe, as the participants also stated. On the other hand, the reason that industrial-type products have a sweeter but artificial taste is most likely artificial sweeteners used in the product formulation. This probably arises from that artificial sweeteners (eg, aspartame, saccharin) used in the production of diabetic products are substantially sweeter compared to sucrose (Çakmakçı & Çelik, 2004), thus rendering industrial-type diabetic products sweeter than homemade ones. On the flip side, the fact that artificial sweeteners give artificial sweetness characterized by metallic and bitter tastes to the product (Yılmaz, 2007) led to the participants to perceive artificial taste in industrial-type diabetic products. However, it was also observed that some participants made references to health concerns a lot while describing industrial-type products in terms of sensory attributes. Similar to the findings of Ural (2018) and Gizir (2019), it is possible to state that the tendency of the participants to stay away from products with artificial sweeteners with the view that they are harmful to health takes precedence over the sensory properties of the products in question. Taking the consistency parameter into consideration, it was

concluded that the participants were not always able to achieve the same consistency in low sugar content diabetic breakfast products they made in the home setting, and that they consider the consistency of industrial products was better than that of homemade diabetic breakfast products. In the food industry, the insufficient consistency ensuing from the absence of sugar in manufacturing diabetic breakfast products can be compensated with the help of a wide variety of water-binding substances (Çakmakçı & Çelik, 2004), especially low methoxyl pectin (Üstün & Tosun, 1998), and the consistency desired by consumers can be procured. Apart from this, the insufficient consistency as a result of the deficiency of fruit-based acid, which has a role in shaping the desired consistency in jams, can also be eliminated by the addition of acid to the formulation (Cemeroğlu et al. 2003 as cited in Seymen, 2019). In this context, the addition of an acidity regulating agent to achieve the desired consistency in industrial-type products also makes these products more consistent compared to homemade ones. The most common problem that the participants experienced in preparing diabetic breakfast products in the home setting is the inability to adjust product color, consistency and sweetness. Additionally, another problem experienced with homemade diabetic breakfast products is that their shelf life is short and they spoil in a considerably short time. The poor taste of homemade diabetic breakfast products is probably due to the fact that the participants added sugar into the product recipe lower than that specified in the regular recipe and did not use suitable and enough amount of sweeteners to replace sugar. Also, the inability to achieve the desired consistency in homemade products arises from not eliminating low viscosity resulting from insufficient sugar with the use of alternative food additives and ingredients and not obtaining the acidity level needed in the home setting (MEGEP, 2011; Saldamlı, 2014; Cemeroğlu et al. 2003 as cited in Seymen, 2019; Çakmakçı & Çelik, 2004). The fact that the participants were not able to attain the desired product color in the home setting is probably due to that the participants did not have a product recipe with proper attributes. Probable reasons for the short product shelf life are the inadequacy of the heat treatment applied to the product as well as the product's water activity values not at the desired level. Water activity, which is the ratio of the water vapor pressure of the food to the vapor pressure of pure water at the same temperature, is an important parameter that gives information about whether microbial growth would occur in food. The water activity value should be kept below 0.6 in order to prevent microbial growth in

a food product (Certel & Ertugay, 1996; Saldamlı, 2014). In this sense, sucrose used in the manufacture of high sugar content breakfast products increases the food microbial durability by lowering the water activity of the product. It may be considered that the desired decrease in water activity cannot be achieved due to using either no or very little sugar in homemade diabetic breakfast products. On the other side, the inability to perform acidity regulation process carried out in the industrial production in the home setting may have also led to the acidity induced microbial barrier not being achieved to the desired extent. Therefore, it is possible to state that product stabilization in industrial type diabetic breakfast products is ensured by the use of antimicrobial additives, the regulation of acidity and the application of adequate heat treatment.

It was determined that the participants mostly used stevia, honey, molasses, dates, artificial sweeteners and carob as a sugar substitute in the preparation of diabetic breakfast products in the home setting. In addition to those, it was also observed that cinnamon, sugar alcohols and fructose can also be utilized to replace sugar for the same purpose. The sugar substitutes that the participants mentioned are seen to be employed in the industry as well. Indeed, sugar alcohol, stevia, artificial sweeteners and honey, which the participants stated that they utilize, are also used in the industrial manufacture of low sugar content food products (Güneş et al., 2018; Dizlek & Giritlioğlu, 2018; Palamutoğlu et al., 2018; Kılınc, 2015; Güldane, 2014). A quantitative study carried out on 400 participants living in the province of Istanbul to investigate the sugar and sugary products consumption habits of individuals has concluded that participants made use of sweetening agents such as dates, honey and artificial sweeteners as sugar substitutes (Çiftci, 2019), similar to our findings.

The participants were observed to access the recipes for diabetic breakfast products with low sugar content mostly through web pages and social media. There are web pages with the aim of health communication where both healthy individuals and those with certain health problems follow in relation to health concerns and could get answers to their questions. On these web pages, patients can ask questions to health experts about their diseases and access informative content (Tosyalı & Sütçü, 2016). Social media is another channel in which access to food recipes is provided. The fact that social media users present food recipes they prepare enriched with photographs and video recordings in social media, experience sharing as well

as the realization of communication between individuals make social media an important platform for users who are interested in special food recipes (Çaycı, 2019; Akdeniz & Temeloğlu, 2022).

Diabetic individuals have breakfast not only at home but also in food enterprises that offer services in the field of gastronomy. The participants whose views were sought in the scope of the study expressed that they had negative experiences in terms of accessing diabetic options of breakfast products in out-of home settings and that diabetic products were not at sufficient level among the breakfast product varieties offered to them. One participant on the other hand indicated being able to access enterprises with menus suitable for diabetes in out-of home settings, however complained about the expensiveness of the menus offered in these places. In parallel with our research findings, in another study in which the views of individuals with Type 1 Diabetes Mellitus on food and beverage enterprises were sought, it was reported that menus suitable for diabetic patients are more expensive than regular menus. Besides, in the same study, it was also determined that diabetic patients identify enterprises with appropriate menus through web pages or mobile applications and go there accordingly, and they do not go to places where they ascertain that the menu content is not appropriate (Gürkan & Ulema, 2020).

5. Conclusion

Breakfast, one of the most notable meal present in the daily diet, provides access to many products with high sugar content (jam, marmalade, chocolate spread, halva, etc.). In this context, it is of significance to conduct research in the field of gastronomy directed for the preparation of recipes of diabetic breakfast products with high stability and likability in terms of taste, consistency and color parameters and long shelf life for diabetic patients who have to consume a low sugar diet. In addition, it is also important for food and beverage enterprises that serve breakfast to include diabetic breakfast products in their menus and to announce these products to their customer base through their web pages or mobile applications. On the other hand, within the scope of gastronomic tourism, different countries and cities can be visited, and the products belonging to the geography in question can be tasted. In relation to that, in order to make gastronomic tourism convenient for diabetic patients, the fact that professionals trained in gastronomy and culinary arts develop diabetic forms of breakfast products belonging to their own cuisine matters. Based on the present

study, the consumption of high sugar content products in diabetic individuals can be examined for other meals in addition to breakfast, and in the light of the results to be obtained, studies can be carried out to develop new recipes on a meal basis that can be consumed in the diabetes-specific diet to forestall the consumption of high sugar content products. Besides, new studies can be performed in the field of gastronomy and culinary arts towards increasing the number of culinary medicine chefs who would be able to develop special recipes for patients who have to follow a special diet due to health problems.

Declaration of Competing Interest

The authors declare that they have no financial or non-financial competing interests.

Author's Contributions

E. Ercan (ORCID: 0000-0002-3487-4991): Conceptualization, Investigation, Methodology, Visualization, Writing-Original Draft Preparation, Editing, Resources.
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