

# Cooking habits and food choices of individuals with Type 1 Diabetes Mellitus during the pandemic of COVID-19

## *Hábito de cozinhar e escolhas alimentares de indivíduos com Diabetes Mellitus Tipo 1 durante a pandemia de COVID-19*

Manuela Maria de Lima CARVALHAL<sup>1</sup>  0000-0003-1397-0471

Jeane Lorena Lima DIAS<sup>2</sup>  0000-0002-8478-4740

Aline Leão REIS<sup>2</sup>  0000-0002-6131-0606

Talita Nogueira BERINO<sup>2</sup>  0000-0003-2603-9387

Gabriela Correia ULIANA<sup>2</sup>  0000-0001-7042-8254

Daniela Lopes GOMES<sup>2</sup>  0000-0002-0092-3396

---

<sup>1</sup> Universidade Federal do Pará, Núcleo de Medicina Tropical, Programa de Pós-Graduação em Doenças Tropicais. Av. Generalíssimo Deodoro, n. 92, Umarizal, 66055-240. Belém, PA, Brasil. Correspondence to M.M.L. CARVALHAL. E-mail: <manuela.carvalhall@gmail.com>.

<sup>2</sup> Universidade Federal do Pará, Núcleo de Teoria e Pesquisa do Comportamento, Programa de Pós-Graduação em Neurociências e Comportamento. Belém, PA, Brasil.

---

### How to cite this article

Carvalho MML, Dias JLL, Reis AL, Berino TN, Uliana GC, Gomes DL. Cooking habits and food choices of individuals with Type 1 Diabetes Mellitus during the pandemic of COVID-19. Rev Nutr. 2021;34:e210043. <https://doi.org/10.1590/1678-9865202134e210043>

**ABSTRACT****Objective**

To verify the association between cooking habits, socioeconomic data, and food choices of individuals with Type 1 Diabetes Mellitus during the pandemic of COVID-19.

**Methods**

Transversal study with individuals with Type 1 Diabetes Mellitus carried out in July 2020. Socioeconomic data and information about social distancing and food practices were collected with an online form. The research was approved by the university's Ethics and Research Committee (Process number 4.147.663).

**Results**

Out of the 472 participants, 50.9% reported that they have been cooking more during the pandemic. An association between cooking more and having a university degree ( $p < 0.000$ ) was observed. Not being able to comply with social distancing rules because of work necessities was associated with not cooking ( $p = 0.006$ ). Cooking more during the quarantine was associated with eating less than five meals per day ( $p = 0.04$ ), having an appropriate consumption of fruits ( $p = 0.02$ ) and vegetables ( $p = 0.04$ ), and increased water intake ( $p = 0.01$ ).

**Conclusion**

In Brazil, the habit of cooking during the pandemic may represent an increase in domestic work, reinforced by social inequalities. Therefore, comprehending the cooking habits and food choices of people with diabetes may widen the perspectives of health professionals involved in the treatment of the disease and contribute to the elaboration of public policies that take the country's inequalities into account. We emphasize the importance of investing in policies that encourage the development of culinary skills, as well as the habit of cooking as part of the actions of Food and Nutrition Education.

**Keywords:** Cooking. COVID-19. Eating behavior. Healthy eating. Social isolation.

**RESUMO****Objetivo**

Verificar associação entre o hábito de cozinhar, dados socioeconômicos e escolhas alimentares de indivíduos com Diabetes Mellitus tipo 1 durante a pandemia por de COVID-19.

**Método**

Estudo transversal realizado com indivíduos com Diabetes Mellitus tipo 1 durante julho de 2020. A partir de um formulário on-line foram coletados dados socioeconômicos, demográficos, informações sobre o distanciamento social e práticas alimentares durante a quarentena. A pesquisa foi aprovada pelo Comitê de Ética em Pesquisa (parecer 4.147.663).

**Resultados**

Dos 472 participantes, 50,9% relataram estar cozinhando mais durante a quarentena. Observou-se uma associação entre cozinhar mais e ter ensino superior ( $p < 0,000$ ). Não estar realizando distanciamento social porque precisava trabalhar esteve associado a não cozinhar ( $p = 0,006$ ). Quanto à alimentação, cozinhar mais durante a quarentena estava associado a consumir menos de cinco refeições ao dia ( $p = 0,04$ ), ter consumo adequado de frutas ( $p = 0,02$ ) e hortaliças ( $p = 0,04$ ) e ter aumentado a ingestão de água ( $p = 0,01$ ).

**Conclusão**

No Brasil, o hábito de cozinhar durante a pandemia pode representar um aumento do trabalho doméstico, ocasionado pelas desigualdades sociais. Portanto, compreender esse hábito e as escolhas alimentares de pessoas com diabetes, pode ampliar a visão dos profissionais de saúde envolvidos no tratamento e contribuir com a elaboração de políticas públicas que levem em consideração as desigualdades do país. Ressaltamos a importância do investimento em políticas que estimulem o desenvolvimento das habilidades culinárias, bem como do hábito de cozinhar no âmbito das ações de Educação Alimentar e Nutricional.

**Palavras-chave:** Culinária. COVID-19. Comportamento alimentar. Alimentação saudável. Isolamento social.

## INTRODUCTION

In February 2020, the COVID-19 pandemic started in Brazil [1]. A report of 72.314 cases of COVID-19 published by the Chinese Center for Disease Control and Prevention showed an increase in the mortality of diabetic people during the pandemic [2]. If contaminated with COVID-19, individuals with Type 1 Diabetes Mellitus (T1DM) and Type 2 Diabetes Mellitus (T2DM) without glycemic control [glycated hemoglobin (HbA1C)  $\geq 10\%$ ] are more likely to have a worse prognosis, and cases may evolve to death more easily compared to those with good glycemic control (HbA1c  $\leq 7\%$ ) [3].

Current studies with people diagnosed with T1DM, which focus on the pandemic period, emphasize the importance of maintaining an appropriate glycemia control in this population, assessing a few behaviors that may influence the glycemia management [4-6].

One of the most important aspects of controlling glycemia is adhering to healthy eating habits that ensure proper food consumption, preventing and correcting nutritional deficiencies. This may boost immunity and grant better prognoses in cases of infection by COVID-19 [7].

Quarantine and social distancing were carried out in Brazil as prevention measures aimed to diminish the disease's impact [8]. However, it is possible that these social distancing measures may impair the glycemic control in patients with T1DM due to restrictions of outdoor physical activities, psychological issues, deregulated sleep, and ingestion of unhealthy food [9]. Isolation can impact the individuals' eating routine, leading to a considerable increase of high-energy dense foods' ingestion [10].

According to *Fundação Oswaldo Cruz* (Fiocruz, Oswaldo Cruz Foundation), there was a decrease in the consumption of fresh foods during the pandemic, while the consumption of industrialized foods (ultra-processed and processed) increased, such as packaged snacks and frozen foods, chocolates and sweets, mainly by young adults [11]. Still, some studies show that, in this period, individuals with diabetes lowered their adherence to diets, with rising consumption of carbohydrates and snacks, although an increase in the consumption of fruits has been reported [5,12]. Thus, the prolonged permanence at home may affect individual choices regarding cooking habits and buying ready-made foods in a higher frequency [13].

In this context, one of the behaviors studied as a form of adhering to eating better are cooking habits, which have been associated with improvements in eating attitudes and self-efficiency, promoting the adoption of healthier eating habits in adults and children [14,15]. In Brazil, the reformulation of the *Guia Alimentar para a População Brasileira* (Dietary Guidelines for the Brazilian Population) was a step toward stimulating this habit in the attempt to improve the quality of the population's food [16].

Jomori *et al.* [17] mention that the term "cooking skills" is still not very clearly defined in the literature. However, it is generally understood as the individual's ability to perform tasks that involve all the stages of food preparation, having as fundamental requirements cooking confidence and individual knowledge.

According to *Marco de Referência de Educação Alimentar e Nutricional para as Políticas Públicas* (Reference of Food and Nutritional Education for Public Policies) [18], the habit of preparing their own meals contributes to autonomy, which, according to national and international guidelines for diabetes, is related to self-management [19;20]. In this context, the American Association of Diabetes Educators mentions that part of diabetes self-care is linked to healthy behaviors, including the adoption of healthy eating [21].

Grabia *et al.* [22] aimed to assess the impact of the COVID-19 pandemic, nutrition, and health behaviors in individuals with T1DM and T2DM in Poland, and observed that more than half of the participants started cooking during this period, though the associated factors were not assessed. Regarding the period before the pandemic, it was observed that people with T2DM obtained significantly improved levels of glycated hemoglobin and, consequently, improved glycemia control, from interventions focusing on culinary and economic skills [23]. Nonetheless, despite these benefits, in a study with adult Spanish people during isolation due to COVID-19, less than half of the participants (44.4%) cooked [24].

Hence, aware of the benefits of preparing their own meals in promoting a healthy diet, and given the scarcity of studies on this theme that assess the associated factors in individuals with T1DM, it is expected that people with T1DM who cooked more during the period of social distancing, present better eating habits. Therefore, the present study intended to verify the association between cooking habits, socioeconomic and demographic data, and food choices of individuals with T1DM during the pandemic of COVID-19 in Brazil.

## METHODS

---

This is a transversal, descriptive, and analytical study. It was carried out in July 2020, when measures of social distancing were in place in Brazil. The sample was selected by convenience sampling with non-probabilistic methods. Participation was voluntary, anonymous, and subject to acceptance of the Informed Consent Form (ICF). The study included individuals over 18 years old, of both sexes, and diagnosed with T1DM. To reduce the chances of another audience taking the online survey, participants chose their condition on the form (T1DM, not diagnosed with diabetes, having other types of diabetes, being a child/adolescent, or caregiver). When the answer was not equivalent to the expected audience, the survey closed automatically.

Data from people who marked an alternative besides diagnosed T1DM were excluded at the beginning of the online form. When people did not complete the survey or did not agree with the terms of the ICF, choosing the option "I do not accept to participate" available at the beginning of the form, the survey closed automatically.

This research was approved by the Research Ethics Committee of the Center for Tropical Medicine of the Federal University of Pará, under process number 4.147.663, following the Helsinki Declaration.

Data collection was performed using an online form built on a digital platform in the opinion survey format. A pilot study was carried out with two participants to assess the time taken to complete the form and proper understanding of the questions. Participants were attracted by virtual invitations published on the social media networks Facebook® (Menlo Park, United States of America), Instagram® (Menlo Park, United States of America), Whatsapp® (Menlo Park, United States of America), and in social media groups targeted at people with T1DM.

The following information was collected: (a) Socioeconomic, demographic, and social distancing data: sex; age; schooling (no higher education and higher education, complete or ongoing); income during the pandemic (remained the same or increased; decreased); the Brazilian macro region where they lived; type of distancing measures adopted (total, those who were did not leave their homes for any activity; partial, leaving only to buy food and medicines; no distancing because they needed to work outside; no distancing because they did not agree with the measures; distancing for family reasons, despite not agreeing); (b) Eating habits during the quarantine, compared to the pattern before the pandemic: cooking habits (cooking more than before; cooking as much as before; cooking less than before; they did not know how to cook; they did not like to cook, but someone else was cooking); increase in food consumption (increased a lot; increased a little; remains the same; decreased); number of daily meals (less than five meals; five or more meals a day); daily fruit consumption (appropriate, consumption of two to three servings; and inappropriate, consumption of less than two servings or more than three); daily vegetable consumption (appropriate, corresponding to two or more servings; and inappropriate, less than two servings); sweets consumption (much more than before; a little more than before; remains the same; decreased); consumption of ultra-processed foods, considering frozen ready-made foods such as nuggets, cheese bread, pizza, or pasta (more than before; the same or less than before); delivery meals (does not order or orders less; orders the same or more than before); and water intake (equal; less; more than before).

For statistical analysis, we used the Statistical Package for Social Science software, version 21 (Chicago, United States of America). The Kolmogorov-Smirnov normality test was applied, and the descriptive results were expressed in absolute frequency and proportion. For the analytical assessment, the cooking variable had its categories grouped in order to classify it as yes, if they were cooking more, or no, regardless of the reason. The Chi-Square test of independence was applied with adjusted residual analysis, considering a level of statistical significance of  $p < 0.05$ .

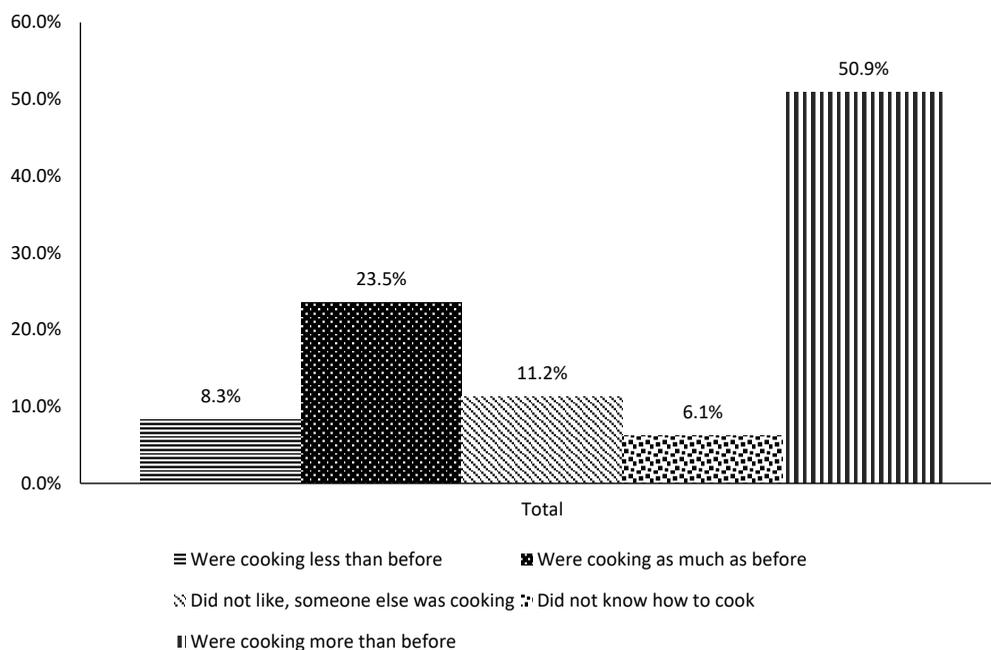
## RESULTS

The research evaluated 472 individuals with T1DM. Most were female (86.0%), aged between 25 and 44 years old (57.0%), had reached higher education (78.4%), kept or increased their incomes during the pandemic (53.2%), and lived in the Southeastern region of Brazil (47.1%).

Regarding the cooking habits, 50.9% of the participants reported that they were cooking more during the quarantine, followed by 23.5% who were cooking as much as before. About 11.2% reported that they did not like to cook, but someone else cooked at home. Only 8.3% affirmed they were cooking less than before, and 6.1% said they did not know how to cook (Figure 1).

An association was found between cooking more during the pandemic and having higher education ( $p < 0.000$ ). Not adhering to social distancing because of work was directly associated with not cooking ( $p = 0.006$ ) (Table 1).

Most of the participants reported a general increase in the amount of consumed food (61.2%): 50.4% reported having five or more daily meals; 42.6% had appropriate fruit consumption; 53.4% had appropriate vegetable consumption; and 47.9% reported having increased their sweets consumption to some degree; 31.4% affirmed to be consuming more ultra-processed foods; 28.4% reported an increase in water intake; and 46.0% ordered delivery meals in a lower frequency or did not order such meals at all.



**Figure 1** – Characterization of the cooking habits of individuals with Type 1 Diabetes Mellitus during the pandemic of COVID-19 in Brazil, 2020. (n=472).

**Table 1** – Association between the cooking habits, socioeconomic, and demographic data of individuals with Type 1 Diabetes Mellitus during the pandemic of COVID-19 in Brazil, 2020 (n=472).

	Cooking habits				p-value**
	Yes		No		
	n	%	n	%	
Sex					
Female	210	44.5	196	41.5	0.34
Male	30	6.4	36	7.6	
Age (years old)					
18-24	79	16.7	82	17.4	0.72
25-44	141	29.9	128	27.1	
45-59	20	4.2	22	4.7	
Schooling					
No higher education	30	6.4 <sup>(-)</sup>	72	15.2 <sup>(+)</sup>	<0.000*
Higher education	210	44.5 <sup>(+)</sup>	160	33.9 <sup>(-)</sup>	
Income during the pandemic					
Remained the same or increased	119	25.2	132	28.0	0.11
Decreased	121	25.6	100	21.2	
Macro-region					
North	13	2.8	20	4.2	0.05
Northeast	43	9.1	54	11.4	
Midwest	26	5.5	11	2.3	
Southeast	117	24.8	105	22.3	
South	41	8.7	42	8.9	
Type of distancing					
Total	52	11.0	37	7.8	0.006*
Partial	165	35.0	145	30.7	
No distancing because they needed to work	22	4.7 <sup>(-)</sup>	45	9.5 <sup>(+)</sup>	
No distancing because they did not agree	0	0.00	1	0.2	
Distancing for family reasons, despite not agreeing	1	0.2	4	0.9	

Note: Residual analysis: <sup>(+)</sup>Significant association <sup>(-)</sup>Negative significant association; \* $p < 0,05$ ; \*\*Chi-square test.

Cooking more during quarantine was associated with consuming less than five meals a day ( $p=0.04$ ), having appropriate fruit ( $p=0.02$ ) and vegetable consumption ( $p=0.04$ ), and increased water intake ( $p=0.01$ ) (Table 2).

## DISCUSSION

The present study found associations between the cooking habits, socioeconomic and demographic data, and food choices of individuals with T1DM during the pandemic of COVID-19 in Brazil. Regarding cooking habits, half of the sample cooked more during social distancing. In the study by Grabia *et al.* [22], 65% of participants with T1DM and T2DM reported that they started preparing their meals during social distancing due to COVID-19 in Poland. No other studies were found that verified cooking habits in people with diabetes during the pandemic. However, regarding the general population, Carroll *et al.* [25], a study with 256 families with young children in Canada during the pandemic found that 70% of mothers and 68% of fathers reported spending more time cooking compared to the pre-pandemic period. For the French population, Deschasaux-Tanguy *et al.* [26] described the eating behavior of 37.252 adults during the period of social distancing. They observed that 47.6% of the participants were cooking more. In Spain,

**Table 2** – Association between the cooking habits and food choices of individuals with Type 1 Diabetes Mellitus during the pandemic of COVID-19 in Brazil, 2020 (n=472).

	Cooking habits				p-value**
	Yes		No		
	n	%	n	%	
Increase in food consumption					
A lot	50	10.6	48	10.2	0.95
A little	97	20.6	94	19.9	
Remains the same	51	10.8	53	1.2	
Decreased	42	8.9	37	7.8	
Number of daily meals					
<5	130	27.5 <sup>(+)</sup>	104	22.0 <sup>(-)</sup>	0.04*
≥5	110	23.3 <sup>(-)</sup>	128	27.2 <sup>(+)</sup>	
Daily fruit consumption					
Appropriate	114	24.2 <sup>(+)</sup>	87	18.4 <sup>(-)</sup>	0.02*
Inappropriate	126	26.7 <sup>(-)</sup>	145	30.7 <sup>(+)</sup>	
Daily vegetable consumption					
Appropriate	139	29.5 <sup>(+)</sup>	113	23.9 <sup>(-)</sup>	0.04*
Inappropriate	101	21.4 <sup>(-)</sup>	119	25.2 <sup>(+)</sup>	
Sweets consumption					
Much more than before	36	7.6	40	8.5	0.31
A little more than before	85	18.0	65	13.8	
Remains the same	82	17.4	93	19.7	
Decreased	37	7.8	34	7.2	
Consumption of ultra-processed foods					
More than before	75	15.9	73	15.5	0.96
The same or less than before	165	34.9	159	33.7	
Delivery meals					
Does not order or orders less	114	24.2	103	21.8	0.49
Orders the same or more than before	126	26.7	129	27.3	
Water intake					
Equal	89	18.9 <sup>(-)</sup>	112	23.7 <sup>(+)</sup>	0.01*
Less	69	14.6	68	14.4	
More than before	82	17.4 <sup>(+)</sup>	52	11.0 <sup>(-)</sup>	

Note: Residual analysis: <sup>(+)</sup>Significant association; <sup>(-)</sup>Negative significant association; \*p<0,05; \*\*Chi-square test.

Pérez-Rodrigo *et al.* [27] found that 14.1% of individuals who did not cook started cooking. Therefore, an observable increase in the cooking habits during the quarantine corroborated the study of Ruiz-Roso *et al.* [28], in which people spent more time preparing food and improving their eating habits due to measures of social distancing.

In the present study, the reasons for cooking more during the pandemic were not investigated. However, we must highlight the great inequalities concerning income and access to food in Brazil [29]. During the pandemic, according to Silva Filho and Gomes Júnior [30], social distancing measures directly affected the income of a large part of Brazilians, contributing to an increase in food insecurity.

Mazzonetto, Dean, and Fiates [31] conducted an integrative review of the perception of individuals about cooking in the domestic environment in a period before the pandemic. They observed that for Brazilians, cooking also contributes to the control of family expenses and livelihood, even food resources and scarce financial resources. Therefore, Uggioni *et al.* [29] affirm that because of social inequalities in Brazil, food preparation can represent an increase in domestic work for some people, while for others, it can help reduce emotional stress, being a form of leisure and relaxation.

It is also important to note that, according to Uggioni *et al.* [29], there was an increase in the number of influencers and chefs transmitting cooking classes online due to the need for social distancing. That may contribute to the development of culinary skills, promotion of healthy eating, and exchange of recipes, which reinforce social connections and affective memories involving food [29]. In the study by Byrne *et al.* [23] the authors noted that educational plans that include the development of culinary skills (recipe preparation and meal planning) aimed at people with diabetes can positively impact the treatment of these patients, increasing self-efficacy and improving glycemic control.

Regarding socioeconomic and demographic data, the present study showed that most participants had completed higher education courses, and there was a significant association between cooking more during the pandemic and this category of schooling. Grabia *et al.* [22] observed that 49% of the participants with T1DM also had higher education. In the study by Pal *et al.* [32] assessing the knowledge, attitudes, and practices of young adults with T1DM concerning COVID-19 during the lockdown in India, it was observed that 41% of participants had completed undergraduate-level schooling, and 32% had completed graduate-level schooling.

We did not find any studies that analyzed the association between schooling and cooking habits in subjects with T1DM. However, according to the *Pesquisa Nacional por Amostra de Domicílios Contínua* (PNAD, Continuous National Household Sample Survey) [33], in Brazil, performing household chores increases in direct proportion with the level of schooling. So, in 2018, 90.1% of Brazilians with complete higher education levels performed domestic activities, compared with 82.2% of activities performed by people with no education or with incomplete basic education [33].

In the study by Deschasaux-Tanguy *et al.* [26] carried out in France, the authors found that those who reported spending more time cooking had higher levels of education. One hypothesis for these results is that individuals with higher levels of schooling may be more concerned with their health; therefore, they seek ways to improve their eating behaviors, such as preparing their meals. Another hypothesis is that people with higher educational levels may have greater chances of working at home, thus causing an increase in domestic responsibilities, among them, the preparation of food.

As for the type of social distancing measures adopted, not doing it because of work was associated with not cooking. In the study by Bracale and Vaccaro [34], the authors mention that food preparation, including items like bread, pizzas, and cakes, can be analyzed as a way to rediscover family ties, to spend time together during the period of social distancing, besides being a positive reaction associated with boredom due to the reduction of activities and routine under the policy of mandatory homestay. It is important to highlight that, in the present study, we did not investigate which foods were prepared by the evaluated subjects. However, we suggest that this association may be related to the lack of changes in the participants' routines. Thus, it may not have been necessary to seek alternatives, such as food preparation, to spend time and ease the boredom of staying at home.

In this study, a positive and significant association was found between the cooking habits and the consumption of fewer than five meals a day during social distancing. Besides observing that participants with T1DM and T2DM started cooking during the pandemic, Grabia *et al.* [22] found that 3% of individuals were consuming one to two meals a day, 50% consumed three to four meals a day, and 47% consumed more than five meals a day. Nevertheless, the authors did not assess the association between the variables. Hence, from the results of the present study, we hypothesize that when individuals prepare their meals, they decrease in daily fractioning due to the process of cooking requiring more time and daily organization. Besides, the fact that the individual remains at home for long periods may generate a decrease in daily physical activities, with a consequent reduction in energy expenditure, causing less hunger and, therefore, less fractioning of meals. On the other hand, staying at home for long periods can increase demands, such as home office, care for children, and monitoring of online classes, which are also factors that can influence less fractionation of meals due to decreased time availability.

A significant association was observed between the habit of cooking more and the appropriate consumption of fruits and vegetables. According to the Brazilian Diabetes Society [19], appropriate consumption of fruits and vegetables contributes to a better supply of antioxidants, helping to modulate the oxidative stress observed in individuals with diabetes. No studies were found to relate these variables in people with T1DM in the context of the pandemic. However, Grabia *et al.* [22] also observed an increase in the consumption of fresh fruits and vegetables. Similarly, Carroll *et al.* [25] observed that in addition to mothers and fathers spending more time cooking during the pandemic, there was an increase in fruit consumption for parents and children. Even so, both studies did not assess associations between cooking and the consumption of fruits and vegetables. In a study of subjects with T2DM during the lockdown in India, the authors found that 20% of the sample reported increased fruit consumption, and 7% started eating fruit during the lockdown [12]. Ruiz-Roso *et al.* [28] examined the impact of the lockdown on eating habits in patients with T2DM and found a significant increase in vegetable consumption. For the authors, this can be explained as families have more free time at home to prepare more elaborate meals. However, none of the studies investigated cooking habits.

A systematic review and meta-analysis investigated the effects of culinary interventions on dietary intake, anthropometric measures, behavioral change, cardiometabolic outcomes, and quality of life in children and adults in the general population before the pandemic discovered that studies that used culinary workshops as interventions found that these are associated with improvements in eating attitudes, self-efficiency, and a healthier food intake, which includes the increase in the ingestion of vegetables, fruits, and food rich in fiber, besides reducing the ingestion of fatty food after cooking workshops [15]. These data corroborate the findings of the present study, indicating that the habit of cooking is related to an improvement in the quality of the food consumed. Hence, the importance of Food and Nutrition Education to encourage the habit of preparing meals during and after the period of social distancing is demonstrated as a strategy to motivate the adoption of healthier eating practices.

An association between the increase in water intake and the habit of cooking more was also observed. Not cooking was also associated with the maintenance of the water intake pattern prior to quarantine. In the study by Grabia *et al.* [22], an increase in water intake in individuals diagnosed with T1DM and T2DM was also observed. Deschasaux-Tanguy *et al.* [26] found as well that during confinement, in addition to the increase in cooking habits, 13% of the participants reported an increase in water intake, but no association between the two variables was assessed. Based on the results of the present research and the authors cited, the hypothesis suggested is that during the preparation of meals, individuals remember to drink more water because they are in the storage and supply place, unlike those who were not cooking any more than before and maintained the same water intake.

One of the present study's limitations is being an online survey, which limits the participation only to individuals with internet access. In addition, the instrument used has not been validated. However, the questions were based on the pillars of the treatment of people with T1DM recommended by the Brazilian Diabetes Society [19], in addition to sociodemographic information that we consider to interfere with the habit of cooking. Another limitation is not having evaluated the glycemic control of individuals, making it impossible to analyze whether there was an association between increased frequency of cooking and improvement in glycemic control. In addition, we did not investigate which foods were prepared by the participants and the reasons that led to the increase in the cooking habits.

However, this study was the first to make associations between the habit of cooking, socioeconomic and demographic factors, and eating habits in individuals with T1DM. No other studies analyzing these associations were found. Therefore, the need for further studies on this topic involving people diagnosed with T1DM is emphasized, since the relation between cooking and improving the quality of food choices in the general population and glycemic control in patients with T2DM is well established in the literature [14,15, 23]. Other studies are suggested to identify the determinants involved in increasing the practice

of preparing meals during the pandemic, since it can occur due to social inequalities, increased domestic activities, decision to improve eating habits, to have better glycemic control, and others.

## CONCLUSION

The present study observed the associations between the increased cooking habits during the pandemic of COVID-19, and high schooling, consuming less than five meals a day, appropriate consumption of fruits and vegetables, and increased water intake. Not cooking was associated with not practicing social distancing because of work and with a water intake equal to the previous period of the pandemic.

Despite its limitations, the study importantly showed the scenario in which people with T1DM are inserted and emphasized the lack of similar studies in the literature. It is also important to highlight that during the pandemic in Brazil, the habit of cooking may represent an increase in domestic activities, reinforced by social inequalities. Therefore, understanding these individuals' cooking habits and food choices can broaden health professionals' views, in addition to pointing out ways to modify public policies, even in the post-pandemic period.

It is extremely important to increase investments in public policies in the country, which encourage the development of cooking skills, as well as the habit of cooking as part of the actions of Food and Nutrition Education and Education in Diabetes, once the preparation of the food may not only encourage healthier eating, but also contribute to autonomy and self-care for people with diabetes.

## REFERENCES

1. Croda J, Oliveira WK, Frutuoso RL, Mandetta LH, Silva DCB, Sousa JDB, *et al.* Covid-19 in Brazil: advantages of a socialized unified health system and preparation to contain cases. *Rev Soc Bras Med Trop.* 2020;53:2-7. <https://doi.org/10.1590/0037-8682-0167-2020>
2. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China. *Jama.* 2020;323(13):1239-42. <https://doi.org/10.1001/jama.2020.2648>
3. Holman N, Knighton P, Kar P, O'Keefe J, Curley M, Weaver A, *et al.* Risk factors for COVID-19-related mortality in people with type 1 and type 2 diabetes in England: a population-based cohort study. *Lancet Diabetes Endocrinol.* 2020;8(10):823-33. [https://doi.org/10.1016/S2213-8587\(20\)30271-0](https://doi.org/10.1016/S2213-8587(20)30271-0)
4. Caruso I, Molfetta S, Guarini F, Giordano F, Cignarelli A, Natalicchio A, *et al.* Reduction of hypoglycaemia, lifestyle modifications and psychological distress during lockdown following SARS-CoV-2 outbreak in type 1 diabetes. *Diabetes Metab Res Rev.* 2020;1-7. <https://doi.org/10.1002/dmrr.3404>
5. Verma A, Rajput R, Verma S, Balania VKB, Jangra B. Impact of lockdown in COVID 19 on glycemic control in patients with type 1 Diabetes Mellitus. *Diabetes Metab Syndr Clin Res Rev.* 2020;14(5):1213-6. <https://doi.org/10.1016/j.dsx.2020.07.016>
6. Assaloni R, Pellino VC, Puci MV, Ferraro OE, Lovecchio N, Girelli A, *et al.* Coronavirus disease (Covid-19): how does the exercise practice in active people with type 1 diabetes change? A preliminary survey. *Diabetes Res Clin Pract.* 2020;166. <https://doi.org/10.1016/j.diabres.2020.108297>
7. Gupta R, Ghosh A, Singh AK, Misra A. Clinical considerations for patients with diabetes in times of COVID-19 epidemic. *Diabetes Metab Syndr Clin Res Rev.* 2020;14(3):211-2. <https://doi.org/10.1016/j.dsx.2020.03.002>
8. Parmet WE, Sinha MS. Covid-19: the law and limits of quarantine. *Englans J Med.* 2020;18-20. <https://doi.org/10.1056/NEJMp2004211>
9. Chowdhury S, Goswami S. COVID-19 and type 1 diabetes: dealing with the difficult duo. *Int J Diabetes Dev Ctries.* 2020;40(3):315-20. <https://doi.org/10.1007/s13410-020-00846-z>

10. Bhutani S, Cooper JA. COVID-19-related home confinement in adults: weight gain risks and opportunities. *Obesity*. 2020;28(9):1576-7. <https://doi.org/10.1002/oby.22904>
11. Fundação Oswaldo Cruz. ConVid: Pesquisa de Comportamentos. Rio de Janeiro: Fundação; 2020 [2021 Apr 28]. Available from: <https://convid.fiocruz.br/index.php?pag=objetivos>
12. Ghosh A, Arora B, Gupta R, Anoop S, Misra A. Effects of nationwide lockdown during COVID-19 epidemic on lifestyle and other medical issues of patients with type 2 diabetes in north India. *Diabetes Metab Syndr Clin Res Rev*. 2020;14(5):917-20. <https://doi.org/10.1016/j.dsx.2020.05.044>
13. Sidor A, Rzymiski P. Dietary choices and habits during COVID-19 lockdown: experience from Poland. *Nutrients*. 2020;12(6):1-13. <https://doi.org/10.3390/nu12061657>
14. Mills S, White M, Brown H, Wrieden W, Kwasnicka D, Halligan J, *et al*. Health and social determinants and outcomes of home cooking: a systematic review of observational studies. *Appetite*. 2017;111:116-34. <https://doi.org/10.1016/j.appet.2016.12.022>
15. Hasan B, Thompson WG, Almasri J, Wang Z, Lakis S, Prokop LJ, *et al*. The effect of culinary interventions (cooking classes) on dietary intake and behavioral change: a systematic review and evidence map. *BMC Nutr*. 2019;5(1):1-9. <https://doi.org/10.1186/s40795-019-0293-8>
16. Ministério da Saúde (Brasil). Guia alimentar para a população brasileira [Internet]. 2. ed. Brasília: Ministério da Saúde; 2014[2018 Sep 19]:1-158 p. Available from: <http://www.saude.gov.br/bvs>
17. Jomori MM, Vasconcelos FAG, Bernardo GL, Uggioni PL, Proença RPC. The concept of cooking skills: a review with contributions to the scientific debate. *Rev Nutr*. 2018;31(1):119-35. <https://doi.org/10.1590/1678-98652018000100010>
18. Ministério do Desenvolvimento Social e Combate à Fome (Brasil). Marco de referência de educação alimentar e nutricional para as políticas públicas. 2012. 68 p. Available from: <http://mds.gov.br/caisan-mds/educacao-alimentar-e-nutricional/marco-de-referencia-de-educacao-alimentar-e-nutricional-para-as-politicas-publicas>
19. Sociedade Brasileira de Diabetes. Diretrizes da Sociedade Brasileira de Diabetes 2019-2020. São Paulo: Clanad Editora Científica; 2019 [cited 2020 Nov 8]:1-490. Available from: <https://www.diabetes.org.br/profissionais/images/DIRETRIZES-COMPLETA-2019-2020.pdf>
20. American Diabetes Association (United States). Facilitating behavior change and well-being to improve health outcomes: standards of medical care in diabetes, 2021. *Diabetes Care*. 2021;44:S53-72. <https://doi.org/10.2337/dc21-S005>
21. American Association of Diabetes Educators. Role of the diabetes educator in inpatient diabetes management. Chicago: Diabetes Educator; 2016 [2021 Apr 28]. Available from: <https://www.diabetes.org.br/profissionais/images/2018/diretrizes-em-diabetes/role-of-the-diabetes-educator-in-inpatient-diabetes-anegement.pdf>
22. Grabia M, Markiewicz-żukowska R, Puścion-Jakubik A, Bielecka J, Nowakowski P, Gromkowska-Kępką K, *et al*. The nutritional and health effects of the COVID-19 pandemic on patients with diabetes mellitus. *Nutrients*. 2020;12(10):1-15. <https://doi.org/10.3390/nu12103013>
23. Byrne C, Kurmas N, Burant CJ, Utech A, Steiber A, Julius M. Cooking classes: a diabetes self-management support intervention enhancing clinical values. *Diabetes Educ*. 2017;43(6):600-7. Available from: <https://doi.org/10.1177/0145721717737741>
24. Rodríguez-Pérez C, Molina-Montes E, Verardo V, Artacho R, García-Villanova B, Guerra-Hernández EJ, *et al*. Changes in dietary behaviours during the COVID-19 outbreak confinement in the Spanish COVIDiet study. *Nutrients*. 2020;12(6):1-19. <https://doi.org/10.3390/nu12061730>
25. Carroll N, Sadowski A, Laila A, Hruska V, Nixon M, Ma DWL, *et al*. The impact of covid-19 on health behavior, stress, financial and food security among middle to high income canadian families with young children. *Nutrients*. 2020;12(8):1-14. <https://doi.org/10.3390/nu12082352>
26. Deschasaux-Tanguy M, Druesne-Pecollo N, Esseddik Y, Szabo de Edelenyi F, Alles B, Andreeva V, *et al*. Diet and physical activity during the COVID-19 lockdown period (March-May 2020): results from the French NutriNet-Sante cohort study. *medRxiv*. 2020;(May). <https://doi.org/10.1101/2020.06.04.20121855>
27. Pérez-Rodrigo C, Citores MG, Hervás Bárbara G, Litago FR, Casis Sáenz L, Aranceta-Bartrina J, *et al*. Cambios en los hábitos alimentarios durante el periodo de confinamiento por la pandemia COVID-19 en España. *Rev Esp Nutr Comunitaria*. 2020;26(2):28010. <https://doi.org/10.14642/RENC.2020.26.2.5213>

28. Ruiz-Roso MB, Padilha PC, Mantilla-Escalante DC, Ulloa N, Brun P, Acevedo-Correa D, *et al.* Covid-19 confinement and changes of adolescent's dietary trends in Italy, Spain, Chile, Colombia and Brazil. *Nutrients*. 2020;12(6):1-18. <https://doi.org/10.3390/nu12061807>
29. Uggioni PL, Elpo CMF, Geraldo APG, Fernandes AC, Mazzonetto AC, Bernardo GL. Cooking skills during the Covid-19 Pandemic. *Rev Nutr*. 2020;33(e200172):1-6. <https://doi.org/10.1590/1678-9865202033e200172>
30. Silva Filho OJ, Gomes Júnior NN. The future at the kitchen table: COVID-19 and the food supply. *Cad Saúde Pública*. 2020;36(5). <https://doi.org/10.1590/0102-311x00095220>
31. Mazzonetto AC, Dean M, Fiates GMR. Perceptions about home cooking: an integrative review of qualitative studies. *Ciênc Saúde Coletiva*. 2020;25(11):4559-71. <https://doi.org/10.1590/1413-812320202511.01352019>
32. Pal R, Yadav U, Grover S, Saboo B, Verma A, Bhadada SK. Knowledge, attitudes and practices towards COVID-19 among young adults with Type 1 Diabetes Mellitus amid the nationwide lockdown in India: A cross-sectional survey. *Diabetes Res Clin Pract*. 2020;166:108344. <https://doi.org/10.1016/j.diabres.2020.108344>
33. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional por Amostra de Domicílios Contínua contínua: outras formas de trabalho 2018. Rio de Janeiro: Instituto; 2018[2021 Apr 28];1-16. Available from: [https://biblioteca.ibge.gov.br/visualizacao/livros/liv101560\\_informativo.pdf](https://biblioteca.ibge.gov.br/visualizacao/livros/liv101560_informativo.pdf)
34. Bracale R, Vaccaro CM. Changes in food choice following restrictive measures due to Covid-19. *Nutr Metab Cardiovasc Dis*. 2020;30(9):1423-6. <https://doi.org/10.1016/j.numecd.2020.05.027>

Received: March 16, 2021

Final version: May 3, 2021

Approved: June 10, 2021