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Population behavior in relation to food care during the COVID-19 pandemic

Comportamento da população em relação aos cuidados com os alimentos durante a pandemia da COVID-19

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ABSTRACT
This study during knowledge and behavior in food care and hygiene before and that of COVID-19 in Brazil. Participants were recruited through social networks for respondents on the sociodemographic aspects of the population's knowledge about coronavirus, social isolation and receiving information on hygiene of food and its packaging. A total of 1,061 participated in the survey, the majority being female (87%), aged up to 35 years (69.9%); 8.8% had or 2.8% had higher education; and 63.6% monthly income was up to 6% monthly. Regarding the hygiene of fruits and vegetables, 56.59% of the participants chose soap and water during the. As for cleaning packages received by delivery, 71% of patients choose to clean packages during the pandemic. In general, the pandemic can be considered in the care with food of COVID-19.

Keywords: Knowledge. Coronavirus. Food Security. Hygiene. Food Manipulation.

RESUMO
Este estudo analisou o conhecimento e comportamento em relação aos cuidados e higiene alimentar antes e durante a pandemia da COVID-19 no Brasil. Os participantes foram recrutados pelas redes sociais para responder um questionário sobre aspectos sociodemográficos, conhecimento sobre coronavírus, isolamento social e recebimento de informações sobre higienização de alimentos e suas embalagens. Participaram da pesquisa 1.061 indivíduos, sendo a maioria do sexo feminino (87%), com até 35 anos (69,9%); 82,8% tinham ou estavam a concluir o ensino superior; e a renda mensal de 63,2% era de até 6 salários mínimos. Sobre a higiene de frutas e hortaliças, 56,59% dos participantes passaram a usar água e sabão durante a pandemia. Quanto a limpeza das embalagens dos alimentos recebidos por *delivery*, 71,85% dos participantes passaram a limpar as embalagens durante a pandemia. De forma geral, pode-se observar modificações significativas nos cuidados com os alimentos durante a pandemia da COVID-19.

Palavras-chave: Conhecimento. Coronavírus. Segurança de alimentos. Higiene. Manipulação de alimentos.

INTRODUCTION

COVID-19, a disease caused by the new coronavirus (SARS-CoV-2), emerged in Wuhan, in China, in December, 2019, and, since then, has spread rapidly all over the world, being declared a pandemic by the World Health Organization (WHO) in March, 2020[1]. Up to this moment, there are more than 128 million cases and 2.8 million registered deaths due to

COVID-19 worldwide. Brazil had its first confirmed case in February 26th, 2020, and, nowadays, it has more than 12 million COVID-19 cases and 321 thousand deaths [2].

Even though it has been over a year since the first confirmed case, the virus continues to spread due to the lack of specific and efficient treatment, as well as by difficulties in the purchase, distribution and application of the vaccines recently developed[3]. In addition, it is valid to highlight that the population's behavior is directly related to the infection's propagation and maintenance of the pandemic [4].

In this sense, the population's knowledge, attitudes and practices in relation to COVID-19 play a fundamental role in determining the readiness of the society in accepting behavioral changes that help controlling the dissemination of the coronavirus[5]. Considering that the population's attitude is influenced by its knowledge and beliefs on the disease, access to true and easy to understand information is of paramount importance to form opinions and, consequently, to act according to them [5].

This can be challenging as, during the pandemic, the populations has received massive quantities of information, especially from social media, in relation to how to avoid the transmission of the coronavirus; what can, many times, cause confusion, doubts and insecurities on what is and is not true in relation to the virus [5]. Knowledge on COVID-19 is provided through different sources: knowledge on similar viruses and diseases; governmental information; social media and the Internet; previous personal experiences, and medical sources. In many cases, the lack of knowledge or misinterpretation of information can be a potential risk for the low levels of the population's participation and commitment to the control measures imposed [4].

Among the information more frequently passed on, that related to food and packages hygiene must be highlighted. Even if up to now there are no sufficient evidence on the transmission of the disease through food [6], food and its package can serve as fomites, word used to designate objects that transfer microorganisms from one person to another [6]

. Considering this, sanitary agencies have been conveying periodic orientations on manipulation and preparation of food in times of COVID-19. Thus, perceiving what the general public knows about such care, and which are their possible misperceptions, is important to enable authorities to promote more efficient information campaigns [4].

Considering the fast spread of COVID-19 worldwide, and the importance of the population's actions in fighting the disease, fast assessment on the population's knowledge and its perception of the infection are necessary to elaborate more efficient public health protocols

in order to mitigate the virus dissemination [4]. Therefore, this study evaluated the population's knowledge and behavior in food care habits during the COVID-19 pandemic.

MATERIALS AND METHODS

RESEARCH DESIGN

In this study, an online cross-sectional survey was conducted to collect information on COVID-19 and food in the social distancing context in Brazil. In order to do this, a questionnaire was elaborated in the Google Forms tool, and the generated link was shared with the public through the social medias Instagram, Facebook and WhatsApp. The link was also shared individually with the researchers' contacts. A standard general description about the research was conveyed in the WhatsApp messages and posts on social media before the link. The inclusion criteria in the research were: agreeing with the research terms and answering all questions in the questionnaire. Aiming to reduce moral and psychological risks, the questions were elaborated, guaranteeing the anonymity of the participants, making it impossible to identify the individual answers.

ETHICAL CONSIDERATIONS

The study was approved by the Research Ethics Committee at the State University of Maringá (protocol n. 4.112.462). Participants were informed that participation was voluntary, without rewards and anonymous, and they had access to the Informed Consent Form at the link of the research. After consenting, participants were directed to the self-applicable questionnaire.

RESEARCH

The questionnaire was available between July 24th and October 23rd, 2020. The questions aimed at relating population data to sociodemographic factors, COVID-19 exams, knowledge on COVID-19/coronavirus, attitudes towards social distancing, general care, getting information about food hygiene during the pandemic and attitudes related to manipulating and preparing food in this period. In total, 42 questions were made, of which 15 specifically assessed the change of behavior after the COVID-19 pandemic (Annex I).

STATISTICAL ANALYSIS

Data were typed and analyzed in Microsoft Excel®, and, after, analyzed using the software SAS (Statistical Analysis Software), version 9.4. The results were synthetized in tables of simple and bivariate frequencies. As risk measure, Odds Ratio (OR) was considered, with IC 95%, calculated from the model adjusted through logistical regression. Prevalence differences between the habits before and during the pandemic were tested by McNemar Test.

RESULTS

All people who agreed to sign the informed consent form were included in the study, a total of 1,061 people participated in this research. The main characteristics of the assessed population were majority were female (87%), 69.9% of the participants were up to 35 years old, 82.8% had concluded or were concluding higher education, and the monthly familiar income of 63.2% of the participants was up to 6 minimum salaries (from R$1,045.00 to R$10,450.00). The detailed socioeconomic characteristics of participants are presented in Table 1.

Table 1. Sociodemographic characteristics of participants

Variables	n	%
Sex		
Female	923	86.99
Male	138	13.01
Age		
Up to 35 years	733	69.09
Over 35 years	328	30.91
Schooling		
Higher education/postgraduation	879	82.85
Without higher education	182	17.15
Income		
Up to 6 minimum salaries	671	63.24
Over 6 minimum salaries	390	36.76

In relation to being examined for COVID-19, from the 1,061 participant, 152 (14.3%) reported being tested, of which 26 (17.1%) had positive results.

KNOWLEDGE ON COVID-19

According to the results obtained on knowledge on COVID-19, we identified significative gaps on the knowledge related to disease prevention, as very few participants believed that attitudes such as using alcohol in gel (n=13, 0.23%), washing hands frequently (n=17, 0.31%) and not touching eyes, nose and mouth (n=21, 0.38%) could avoid SARS-CoV-2 contamination. In addition, some of the participants believed that taking medicines (n=17, 0.31%), being young (n=814, 14.61%) and being an athlete (n=593, 10.65%) could avoid COVID-19.

A total de 872 participants (15.66%) affirmed that, to avoid the coronavirus, it would be appropriate to 'stay home and avoid contact with other people'; 14.94% (n=832) affirmed that to avoid the virus, if you had to leave the house, it would be essential to avoid places with many people, or being close to many people (n=729, 13.09%); and only 14.61% (n=814) affirmed that to avoid the virus wearing a mask whenever out of the house was necessary.

When questioned about care with food and packages, 90.2% of participants presumed that sanitizing packages with water and soap, or 70% alcohol, could eliminate the coronavirus. An expressive parcel of these (80%) believed that they could be infected by consuming contaminated food, and, in this case, 12.82% stopped consuming some type of food during the pandemic ($p<0.005$).

POPULATION'S ATTITUDE TO SOCIAL DISTANCING

In relation to the authorities' recommendations, 58.18% of participants affirmed following all the social distancing rules, and 41.19% affirmed that they were not following social distancing rules. Participants with higher education/postgraduation had 47.3% (OR=0.483) more chance ($p=0.0001$) to follow orientations of isolation than participant with lower levels of schooling. Also, participants with income higher than six minimum salaries had 42.28% (OR=0.572, $p=0.0001$) more chances to follow orientations for isolation than those with lower income (Table 2).

Table 2. Odds Ratio (OR) results obtained by logistic regression for the variables sex, age, schooling, and income, in relation to the variable question

Variables	OR	$IC_{95\%}$	p-value
Question: 'In relation to the orientations for social isolation given by the authorities, are you being able to follow them?'			
Sex (male vs female): yes	1.184	[0.819 ; 1.711]	0.3699
Age (up to 35 vs 36 or + years): yes	0.786	[0.601 ; 1.027]	0.0774
Schooling (without vs with higher education): yes	0.483	[0.350 ; 0.667]	0.0001*
Income (up to 6 vs over 6 minimum salaries): yes	0,.572	[0.441 ; 0.742]	0.0001*
Question: 'What is your routine of activities during quarantine?'			
Sex (male vs female): I do not go out	2.062	[0.703 ; 6.049]	0.1877
Sex (male vs female): I go out sometimes	1.428	[0.964 ; 2.117]	0.0758
Age (up to 35 vs 36 or + years): I do not go out	0.964	[0.481 ; 1.932]	0.9179
Age (up to 35 vs 36 or +years): I go out everyday	1.138	[0.836 ; 1.548]	0.4105
Schooling (without vs with higher education): I do not go out	0.994	[0.451 ; 2.190]	0.9874
Schooling (without vs with higher education): I go out sometimes	1.250	[0.870 ; 1.796]	0.2269
Income (up to 6 vs over 6 minimum salaries): I do not go out	2.808	[1.484 ; 5.314]	0.0015*
Income (up to 6 vs over 6 minimum salaries): I go out sometimes	1.453	[1.073 ; 1.967]	0.0157*
Question: 'Who has frequented your house during quarantine?'			
Sex (male vs female): with visitors	1.107	[0.767 ; 1.599]	0.5858
Age (up to 35 vs 36 or +years): with visitors	1.488	[1.128 ; 1.963]	0.0049*
Schooling (without vs with higher education): with visitors	1.457	[1.055 ; 2.014]	0.0224*
Income (up to 6 vs over 6 minimum salaries): with visitors	1.543	[1.185 ; 2.011]	0.0013*
Question: 'During quarantine, how frequently do you go to the supermarket?'			
Sex (male vs female): more than twice a month	0.596	[0.409 ; 0.869]	0.0072*
Age (up to 35 vs 36 or +years): more than twice a month	1.344	[1.031 ; 1.753]	0.0287*
Schooling (without vs with higher education): more than twice a month	0.920	[0.666 ; 1.270]	0.6115
Income (up to 6 vs over 6 minimum salaries): more than twice a month	1.011	[0.786 ; 1.300]	0.9327
Question: 'Nowadays (during quarantine), what is the main mean of transportation that you use?'			
Sex (male vs female): collective	0.434	[0.133 ; 1.415]	0.1661
Age (up to 35 vs 36 or +years) collective	1.532	[0.771 ; 3.042]	0.2230
Schooling (without vs with higher education): collective	2.303	[1.224 ; 4.335]	0.0097*
Income (up to 6 vs over 6 minimum salaries): collective	4.273	[1.800 ;10.147]	0.0010*

*Significative to the confidence level of 95%
Vs. = versus.

In relation to their routine of activities, most participants (70.97%) informed going out of the house sporadically to do some activity. Those that went out every day to work or to do another regular activity amounted to 70.97%. Only 4.34% of participants affirmed staying home all the time, not going out for anything. In this sense, we observed that participants with income higher than six minimum salaries had 45.30% (OR=1.453) more chances (p=0.0157) of sometimes going out of the house and 2.8 (OR=2.808) more chances of not going out of the house than the interviewees with lower income (Table 2).

When questioned about having visitors, that is, 'who has frequented your house during quarantine', 62.96% of participants affirmed not having visitors, while 37.04% affirmed having them. The frequency of receiving visits of other people in their house was not influenced by the sex. However, participants younger than 35 years (OR=1.488; p=0.0049), with lower level of schooling (OR=1.457; p=0.0224) and income lower than six minimum salaries (OR=1.543; p=0.0013) had 50% more chances of having visitors in their homes (Table 2).

Participants were also questioned on how many times they went to the supermarket before and during the pandemic, and the results demonstrate that people started to go more often to the supermarket during the month (p<0.001). Before the pandemic, 55.98% of participants went to the supermarket twice a month at maximum, and during the pandemic, this percentual rose to 86.80% (Table 3). Frequent trips to the supermarket were not conditioned to schooling nor income (Table 2). Women went 40.40% less times (p=0.0072) to the supermarket than men. Participants older than 35 years had 34.40% (OR=1.344) more chances (p=0.0287) to go to the supermarket more than twice a month than participants younger than 35 years.

Table 3. Participants' habits in relation to frequency of going to the supermarket and use of means of transportation before and during the pandemic

Variables	Before		During		p-value
	n	%	n	%	
Question: 'During quarantine, how frequently do you go to the supermarket?'					
Up to twice a month	467	44.02	140	13.20	0.0001*
More than twice a month	594	55.98	921	86.80	
Question: 'Before quarantine, what was the main mean of transportation that you used?'					
Collective	238	22.43	48	4.52	0.0001*
Restrictive	823	77.57	1013	95.48	

*Significative to the confidence level of 95%

In relation to the mean of transportation used before the pandemic, 22.34% of participants used some type of collective transportation, while, during the pandemic, the percentual fell to 4.52% (Table 3). Participants with lower level of schooling had more than double (OR=2.303; p=0.0097) the chances of having to use collective transportation, and those with income lower than six minimum salaries had four times more chances (OR=4.273; p=0.0010) of having to use collective transportation (Table 2).

General attitudes and practices during the pandemic

Concerning the use of masks, the majority (99.5%) affirmed using them when they went out of the house, demonstrating a preference for cloth masks (84.1%) followed by the surgical masks (7%), non-woven fabric (4.3%), N95 masks (3.5%) and masks of other material (1.1%).

In relation to data on the first action when arriving home after shopping in the supermarket, of the participants that indicated as first habit during the pandemic to wash their hands (n=278), only 35.25% had this habit before the pandemic (p<0.001). And, of the participants that had as first habit taking off their shoes when arriving home (n=604), only n=196 (32.45%) had this habit before the pandemic (p<0.001). In this topic, we observed that participants with higher level of schooling had 55% (OR=1.551) more chances (p=0.0414) of taking off their shoes when arriving home than those who did not have higher education. Participants with income higher than six minimum salaries had 68% (OR=1.680) more chances (p=0.0045) of taking their shoes when arriving home than those that had lower income (Table 4).

Table 4. Odds ratio (OR) results obtained by logistic regression for the variables sex, age, schooling, and income, in relation to the variable question

Variables	OR	$IC_{95\%}$	p-value
Question: 'During the pandemic, what is the first thing you do when arriving home after shopping at the supermarket?'			
Sex (male vs female): washing hands	0.689	[0.399 ; 1.188]	0.1801
Sex (male vs female): taking off shoes	1.087	[0.651 ; 1.813]	0.7505
Age (up to 35 vs 36 or +years): washing hands	1.095	[0.717 ; 1.673]	0.6735
Age (up to 35 vs 36 or +years): taking off shoes	1.422	[0.979 ; 2.065]	0.0647
Schooling (without vs with higher education): washing hands	1.240	[0.777 ; 1.978]	0.3665
Schooling (without vs with higher education): taking off shoes	1.551	[1.020 ; 2.357]	0.0400*
Income (up to 6 vs over 6 minimum salaries): washing hands	0.968	[0.643 ; 1.460]	0.8784
Income (up to 6 vs over 6 minimum salaries): taking off shoes	1.680	[1.175 ; 2.402]	0.0045*
Question: 'During quarantine, do you clean food packages When you arrive from the supermarket/bakery/butchery?'			
Sex (male vs female): yes	1.149	[0.766 ; 1.724]	0.4997
Age (up to 35 vs 36 or +years): yes	1.821	[1.312 ; 2.532]	0.0003*
Schooling (without vs with higher education): yes	1.724	[1.220 ; 2.433]	0.0020*
Income (up to 6 vs over 6 minimum salaries): yes	1.524	[1.127 ; 2.062]	0.0062*

*Significative to the confidence level of 95%

Few participants (4.7%) stated that their first action upon arriving home during the quarantine was to sanitize the packaging. When questioned on packages' hygiene, 75.49% of participants affirmed sanitizing food packages when arriving from the supermarket, being that the majority (81.93%) used alcohol 70%, 17.31% a bleach solution, 0.62% vinegar, and 0.13% hydrogen peroxide.

When the attitude of sanitizing food packages when arriving from the supermarket/bakery/butchery was related to the variables sex, age, schooling, and monthly income, only the variable sex did not show significative odds ratio. Participants who were 36 or older had 82% (OR=1.821) more chances (p=0.0003) of cleaning packages than the younger group age (Table 4). Participants with higher education had 72% (OR=1.724) more chances (p= 0.0020) of cleaning the packages than those with lower level of schooling. Also, participant with income superior to six minimum salaries had 52% (OR=1.524) more chances (p=0.0062) of cleaning food packages when arriving from the supermarket/bakery/butchery.

INFORMATION SOURCE ON FOOD HYGIENE DURING THE PANDEMIC

From the total of participants, 81.43% affirmed getting some type of information on food and packages hygiene during the pandemic. The main sources mentioned were: social media (59.86%), television programs (35.9%), information from friends and family (1.18%), university or specialized magazine (1.08%), all media (0.59%), others (0.49%), work environment (0.39%), works or studies in the health field (0.3%), and radio (0.2%). In relation to trusting and understanding the information, approximately 73% of the participants affirmed trusting and having no doubts on this information. From those that showed some doubt, 18.53% trusted the information, and only 11% checked the information with another source. 47.45% of participants who affirmed having no doubts also checked the information with another source.

HABITS RELATED TO FOOD MANIPULATION AND PREPARING

Table 5 shows data related to the attitudes and practices of participants in manipulating and preparing food before and during the COVID-19 pandemic. When questioned on the first action done before preparing food, the majority (61.73%) affirmed washing their hands, from which the great majority (96.18%) already had this habit before the pandemic. It was also observed that participants who were 36 or more had 50% (OR=1.509) more chances (p=0.0034)

of washing their hands than those that were up to 35 years old (Table 6). The second most common attitude before preparing food was cleaning the place of its preparation, being that a small parcel of the population had this habit before (12.53%, n=133).

Table 5. Participants' habits on manipulating food before and during the pandemic

Variables	Before		During		p-value
	n	%	n	%	
Question: When you are going to prepare food, what do you do first?					
I do not wash my hands	25	3.82	-	-	0.0001*
I wash my hands	630	96.18	655	100.00	
Question: When you are going to prepare food, what do you do first?					
I do not clean the place of preparing food	10	7.52	-	-	0.0001*
I clean the place of preparing food	123	92.48	133	100.00	
Question: How do you clean/sanitize fruit and vegetables?					
I do not use water and soap	176	56.59	-	-	0.0001*
I use water and soap	135	43.41	311	100.00	
Question: How do you clean/sanitize fruit and vegetables?					
I do not use bleach	180	45.23	-	-	0.0001*
I use bleach	218	54.77	398	100.00	
Question: How do you clean the kitchen's sink, countertop, and table?					
I do not clean with alcohol 70º	79	53.74	-	-	0.0001*
I clean with alcohol 70º	68	46.26	147	100.00	
Question: How do you clean the kitchen's sink, countertop, and table?					
I do not clean with water and soap	12	1.57	-	-	0.0001*
I clean with water and soap	750	98.43	762	100.00	
Question: During quarantine, when you receive food from delivery, do you clean the packages?					
No	598	95.22	-	-	0.0001*
Yes	30	4.78	628	100.00	

*Significative to the confidence level of 95%

Table 6. Odds ratio (OR) results obtained by logistic regression for the variables sex, age, schooling, and income in relation to the variable question

Variables	OR	$IC_{95\%}$	p-value
Question: 'When you are going to prepare food, what do you do first?'			
Sex (male vs female): washing hands	1.118	[0.776 ; 1.610]	0.5489
Age (up to 35 vs 36 or +years): washing hands	1.509	[1.146 ; 1.987]	0.0034*
Schooling (without vs with higher education): washing hands	1.367	[0.990 ; 1.888]	0.0577
Income (up to 6 vs over 6 minimum salaries): washing hands	1.280	[0.987 ; 1.659]	0.0624
Question: 'During quarantine, when you receive food from delivery, do you clean the packages?'			

Sex (male vs female): yes	1.131	[0.734 ; 1.743]	0.5776
Age (up to 35 vs 36 or +years): yes	1.894	[1.334 ; 2.688]	0.0004*
Schooling (without vs with higher education): yes	2.009	[1.379 ; 2.926]	0.0003*
Income (up to 6 vs over 6 minimum salaries): yes	1.420	[1.042 ; 1.936]	0.0264*
Question: 'Considering habits during meals, you usually:'			
Sex (male vs female): use napkin or cutlery	1.253	[0.874 ; 1.794]	0.2194
Age (up to 35 vs 36 or +years): use napkin or cutlery	1.456	[1.112 ; 1.906]	0.0063*
Schooling (without vs with higher education): use napkin or cutlery	1.066	[0.772 ; 1.473]	0.6965
Income (up to 6 vs over 6 minimum salaries): use napkin or cutlery	1.036	[0.804 ; 1.334]	0.7861

*Significative to the confidence level of 95%

Concerning how to sanitize fruit and vegetables before and during the pandemic, we observed that from the 311 participants that sanitize fruit and vegetables with water and soap, 56.59% did not have this habit before the pandemic. There were more participants (n=398) that usually sanitize fruit and vegetables with bleach instead of water and soap. However, of these, less than half had the habit of using bleach before (Table 5).

In relation to products used to clean the kitchen's sink, countertop, and other surfaces, the majority (n=762) used water and soap before the pandemic. Of the participants that used alcohol 70% (n=147), 53.74% did not use it before the pandemic. Among the participants that used bleach, 29.2% did not use a measure to prepare the bleach solution, while 24.1% affirmed using some measure. Only 5.4% of participants affirmed using 'pure' bleach, directly from the bottle, to sanitize food packages and surfaces.

Participants were also questioned in relation to cleaning food packages received through delivery. The majority (71.859%) of participants had as a habit cleaning the packages during the pandemic, of which 95.22% (n=598) did not have this habit before the pandemic (Table 5). When relating this habit to socioeconomic variables, except the variable sex, all others presented significant differences (Table 6). Participants who were 36 years or older had almost 90% (OR=1.894) more chances (p=0.0004) of sanitizing packages than those up to 35 years. Participants with higher education/postgraduation had double (OR=2.009) the chances (p=0.0003) of sanitizing packages, and participants with income superior to six minimum salaries had 42% (OR=1.420) more chances (p=0.0264) of sanitizing packages than respondents with lower income (Table 6).

Regarding habits during meals, 58.44% of participants affirmed using cutlery or napkins, and 41.56% confessed touching food with their hands during meals. In this point,

participants who were 36 years or older had 45.6% (OR=1.456) more chances (p=0.0063) of using napkins or cutlery than younger participants (Table 6).

DISCUSSION

After five months of the distancing measure implementation, this study offers a broad view on the changes on care and hygiene of food in Brazil caused by the COVID-19 pandemic. The assessment of different social groups, with different ages and schooling levels, enabled to understand the perception and interpretation of participants to information in the media and other information sources.

To better understand these findings regarding knowledge on COVID-19, it is necessary to first highlight the Brazilian context in the fight against the pandemic, especially because risk perception and population behavior depend not only on scientific knowledge, but also on trustful and qualitative information about the disease. Since the beginning of the COVID-19 pandemic, Brazil faced a negationist wave from some governmental authorities. Thus, each state defined which measures it would adopt, since there were no measures at the national level. Due to divergences between the federal government, state governors, and health agencies, there was a polarization in the way the population deals with health measures, motivated by distinct and antagonist attitudes, which made it difficult to fight the disease [7,8].

In this sense, regarding knowledge about the coronavirus, most believed that keeping distance from other people and wearing a mask whenever they left the house was the best to avoid the disease, following a similar attitude of populations from other studies conducted in China and Pakistan [9,10]. On the other hand, less than 1% of participants believed that using alcohol in gel, washing hands, and not touching the face reduced the chance of coronavirus infection. These data are in disagreement with the Center for Disease Control and Prevention's (CDC) recommendations, which indicate to frequently wash hands with water and soap for at least 20 seconds before touching the mask, manipulating food and touching the face, after using the bathroom, blowing the nose, coughing or sneezing, leaving a public place, or caring for someone sick. In cases of unavailability of water and soap, an alcohol 70% based hand sanitizer must be used on the hand surface until it is dry [11].

Regarding attitudes for the prevention of COVID-19, the majority of participants affirmed that they are following social distancing rules, going out only to what is considered essential, such as buying food, and wearing a mask. Interviewees with high levels of schooling

and income were significantly more prone to adhere to social distancing, similar to the results of a study conducted in the Northeastern region of Brazil, which indicated that more favorable life conditions played a fundamental role in the population's adherence to social isolation and hygiene measures [12].

Another important measure that contributed to COVID-19 prevention was urban mobility restrictions. Analyzing data on the use of means of transportation before and during the pandemic, it was observed an expressive reduction on the use of public transportation during the pandemic, while there was a substantial rise in the use of private automobiles in the same period. As observed by Pasqual & Petzhold (2020), how people move around the city has been highly affected by the pandemic.

People's attitudes in relation to the pandemic have as background the information received and the knowledge produced on the subject. In this sense, more than 80% of the participants affirmed receiving some information on food and packages hygiene. However, more than one third reported checking information, and that their main sources were the Internet, specifically social media, followed by conventional media, what is in accordance to related studies [14].

When related to answers about knowledge on the coronavirus and food care, it was observed that, despite the majority of the participants believing that COVID-19 can be contracted by consuming contaminated food, less than a third of the participants declared stopping consuming some type of food during the pandemic. Current evidence indicates that the virus transmission through food is improbable[6]. However, surfaces and objects contaminated with SARS-CoV-2 used during the preparation of consumption can act as fomites to disease transmission [6]. It is known that different surfaces, such as plastic, stainless steel, and cardboard, can act as fomites, allowing the virus survival for up to 72 hours [15,16].

Even though transmission by contact with surfaces is not considered the main COVID-19 transmission route, cleaning and disinfecting surfaces daily is one of the measures broadly publicized. Data obtained in this study indicate that participants already used water and soap in sanitizing the kitchen's sink, countertop, and other surfaces, as it is recommended by health agencies [17,18]. During the COVID-19 pandemic, alcohol 70% began to be part of surfaces' cleaning routine for 7% of the participants in this study, which is in accordance with FINGER et al. (2021), who reported that alcohol based disinfectants were the preferred products to cleaning surfaces by the population studied.

Regarding hygiene of fruit and vegetables, CDC and FDA (Food and Drug Administration) recommend that fruit and vegetables should be sanitized before consumption, cutting and cooking. To do this, it is recommended to wash fresh fruit and vegetables, including those that have peels which will not be consumed, with running water, so dirt and microorganisms in the surface do not get in the inside of the food. To rub firm products, such as melon, watermelon, cucumber and others, a clean brush can be used. The use of soap, detergent and disinfectant substances is not recommended in washing fruit and vegetables, as they can be absorbed even after rinsing, leaving residues that can harm the consumer. After washing, fruit and vegetables should be dried with a towel or a paper towel [6,18,20]. However, in Brazil, the National Health Surveillance Agency (ANVISA) recommends that, after washing fruit and vegetables in running water, they should be submersed in a bleach solution, using a specific product, for 10 minutes. Afterwards, fruit and vegetables must be rinsed in running water and refrigerated until consumption [21].

Our results indicate that about 38% of the participants reported attitudes contrary to recommendations on the hygiene of fruit and vegetables, as they use soap, detergent and vinegar. During quarantine, more than 40% of participants modified how they used to sanitize fruit and vegetables. These changes can be interpreted as: negative, since 16% of participants started to use soap, which is against the recommendations; or positive, since 17% of participants started to wash fruit and vegetables with water, and submersing them in a bleach solution, as it is recommended by ANVISA [21].

The enhance of hygiene measures and the enforcement of good practices in food care during the pandemic have contributed significatively to diminishing other diseases. For example, diseases transmitted by food are related to inadequate hygiene practices during manipulation and preparation of food. Due to the pandemic, the population paid more attention to washing hands correctly, cleaning environments, objects and surfaces, what hampers food contamination by pathogens [22].

Despite COVID-19 being characterized as a respiratory disease, some patients presented gastrointestinal symptoms, such as alteration in taste, nausea, vomiting, abdominal pain, and diarrhea [23]. Many studies have found SARS-CoV-2 genetic material in feces samples, raising the possibility of fecal-oral transmission [11,24,25]. However, this type of transmission has not been proven [23].

Both food consumption and eating habits suffered significative impacts during the pandemic. Due to social isolation, consumers adhered to the use of online shopping platforms,

which allow buying food on the Internet and receiving it at home through delivery. Apart form the convenience and practicality provided by these services, there is a reduction of contact between people, which would be unavoidable in physical stores [27]. In Brazil, the delivery services grew significantly during the pandemic, reaching 9% in weekdays and 10% in the weekend [28]. However, regarding the how often these systems were used, the results obtained in this study indicated a reduction in the frequency of online food shopping by part of the population interviewed, which is in accordance with the findings of a study conducted in Lebanon, Tunisia and Jordan that demonstrated a rise of around 14% in the proportion of those that stopped buying food online through delivery services during the pandemic [29]. Nevertheless, it was possible to observe a rise of new users, in which around 44% of participants adhered to these services during the pandemic. This rise may be justified by the apprehension of part of the population in frequenting supermarkets, avoiding thus exposing themselves to the risk of contamination. Chenarides et al., (2021), reported in a study that 75% of participants preferred using online services due to fear of the pandemic, and 66% did not feel safe in physical stores.

Due to the lack of information on the SARS-CoV-2 transmission, and of studies evidencing the virus viability in different types of surfaces [15], sanitizing food packages was highly recommended in the beginning of the COVID-19 pandemic. It is important to highlight that in the period of data collection for this study, packages hygiene was still a recommended practice, considering that they could act as fomites. For this reason, it was observed that more than 70%of participants sanitized food packages with alcohol 70% when arriving from the supermarket or receiving them from delivery during the pandemic. These findings were similar to those of other studies conducted in Brazil, Lebanon, Tunisia and Jordan, which demonstrated a rise in the disinfection of food packages by the population [19,29]. Also, results obtained in this research showed that people older than 36 years and high levels of schooling and income had more chances of sanitizing packages received by delivery.

Online surveys, such as the one employed in this study, are a promising method to evaluate the population's knowledge and attitudes, especially during crisis of infectious diseases of rapid spread. However, some limitations of this model must be taken into consideration, such as: I) participants were recruited through different social media platforms (WhatsApp, Facebook, Instagram), what restricted sampling only to those that had access to the Internet and social media. II) The number of participants involved, and the distribution of socioeconomic characteristics are restricted in relation to the Brazilian population; thus, unfortunately, not reflecting its whole. The results in this study provided a general view on the

attitudes, practices and behavior changes in relation to food care during the pandemic, and this information may serve as baseline to enhance prevention strategies and the fight against COVID-19. This study is relevant because, when knowing the behavior of the population with food hygiene, one can plan health education strategies, awareness about good food handling practices and prevention of foodborne diseases.

As a suggestion for future research and continuity of this proposed theme, a larger population in the post-pandemic can be evaluated, observing if the changes were maintained, that is, if the pandemic was in fact a definitive precursor to the change in behavior.

CONCLUSION

This study offered a general view on the attitudes and habits of the population in the care of food. It was possible to observe a significative change, especially in relation to sanitizing fruit and vegetables, surfaces used in the preparation of food (kitchen's sink, countertop, and table), and food packages received by delivery. It was also possible to observe that individuals who are 36 years or older tend to take care consistent to good practices on food manipulation, as they wash their hands before preparing food, sanitize packages received by delivery, and use napkins or cutlery during meals.

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