

# Knowledge, Psychological Impacts, and Protective Behaviors During the First Wave of COVID-19 Pandemic Among Chinese Immigrants with School-Age Children in Canada

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## Research Article

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## Abstract

**Background:** The impact of COVID-19 on the emotions and behaviors of overseas Chinese immigrants and their families living in Canada has been poorly studied. The purpose of this study was to describe the knowledge, protective behaviors, and psychological impact of COVID-19 on Chinese immigrants and determine whether having school-age children was associated with adverse psychological outcomes.

**Methods:** Using an online survey of 757 Chinese immigrants in Canada from April 2020, data regarding the perceptions of COVID-19, psychological impact, protective behaviors, and sociodemographic characteristics were collected and analyzed. A total of 747 eligible respondents were finally included in the analysis. Most of the participants (65.8%) were female and 77.2% had a university degree or higher.

**Results:** There were no significant differences in knowledge of COVID-19 in participants with or without children aged 16 years or under. Participants with children aged 16 years or under were more likely to perceive themselves as being at greater risk of contracting COVID-19 than those without ( $P=0.023$ ). Participants with children aged 16 years and under were also more likely to feel depressed ( $P=0.007$ ) or stressed ( $P=0.010$ ). In addition, parents with children aged 16 years and under were more likely to adopt protective behaviors, for example, washing and sanitizing hands frequently or disinfecting work and living spaces.

**Conclusions:** For the most part, Chinese immigrants with children aged 16 years and under were more prone to negative emotions, such as stress, anxiety, and fear. These findings may assist key stakeholders with the identification and implementation of policies and interventions to support the needs of parents with young children, during and after the COVID-19 pandemic.

## Background

The COVID-19 pandemic has evolved rapidly with more than 80 million confirmed cases of COVID-19 reported globally, and a mortality rate of about 3.7% at the end of 2020 [1–3]. The COVID-19 outbreak was declared a pandemic by the World Health Organization (WHO) on March 11, 2020 [4]. The first imported case of COVID-19 in Canada was reported on January 25, 2020, and the first community transmission in Canada was reported on March 1, 2020 [5]. Previous studies have noted that the impact of COVID-19 on immigrant communities differs from that of local residents [6]. Prior to March 2020, a large proportion of COVID-19 cases in Canada could be traced to international travellers directly or indirectly linked to Wuhan, Hubei province, China where the novel coronavirus that causes COVID-19 was first discovered [7–8]. Because Chinese immigrants were more likely to have close contact with international travelers, they were at a higher risk for infection in the early stages of the pandemic. Moreover, Asian immigrants in Canada generally tend to be more socioeconomically disadvantaged than native-born Canadians. The disparities and inequities they experience may make them more susceptible to COVID-19 infections and adverse health outcomes, when compared to native-born Canadians [9–11].

Chinese immigrants who were more likely to encounter travelers from COVID-19 hotspots in China reported experiencing a flood of negative emotions, including fear and anxiety [12]. They were also often subject to discriminatory and hateful behaviors including implicit bias, insults, attacks, and racism from people who blamed them for causing the COVID-19 pandemic. [12, 13]. Considering these challenges, we anticipated that there would be more research, programmes and policies specific to the COVID-19 inequities and disparate outcomes experienced by Chinese immigrants in Canada. We were disappointed to find that, although there has been research on knowledge, behaviors, and psychological impacts of COVID-19 on different populations, none has focused on overseas Chinese immigrants with school-age children living in Canada. Furthermore, the lack of effective drugs and vaccines against COVID-19 in the early stage of the pandemic, as well as other uncertainties led to schools and daycare institutions being closed across Canada at the beginning of the epidemic [14, 15]. While most schools provided online courses for students, the familiar structure and social milieu of brick and mortar school were absent for many children and their families [16]. These disruptions were found to worsen behavioral and emotional health in children and their caregivers [17, 18].

This study derives from a larger online COVID-19 epidemiological research project surveying Chinese immigrants in Canada that was launched in March 2020. We hypothesized that although the parents or guardians of children aged 16 years and under were often highly vulnerable to negative emotions due to binary provider and caregiver roles [19], they demonstrated greater motivation to protect their families from being infected with COVID-19, than did the parents or guardians of older children. Our hypothesis was premised on the health belief (HB) model and protection motivational (PM) theory [20, 21, 22, 23]. In the HB model, there are two components of a person's characterization of health behavior to counter the risks of a disease, namely, the perception of severity and susceptibility to the disease, and appraisal of actions to mitigate this risk [20, 21, 22, 23]. Thus, while perceived parental or guardian concern may be higher for older children, specific health concerns and perceived general severity and susceptibility to disease is often higher for younger children. Likewise, parents or guardians may be more motivated to introduce risk mitigation interventions for preventing the transmission of COVID-19 to younger children because they typically have greater control over younger children, as compared to older children, who may not voluntarily comply and often possess greater social independence [20, 21, 22, 23].

The PM theory posits that the adaptation of a protective behavior to counter threats is predicated on how individuals process such threats, and act to cope with the potential harms that can arise from such threats [20, 21, 22, 23]. Because children require care in a manner that fosters their potential to flourish and guarantees their existence and safety from disease and infection, parental desire to protect their children is often directed by intrinsic and extrinsic contextual and social cognitive factors, e.g., motivation, cultural dynamics, children's characteristics (e.g., age, gender) presence or absence of disability, policies, beliefs, knowledge, and socioeconomic factors, etc. [20, 21, 22, 23]. Accordingly, Chinese immigrant parents with younger children may be more motivated to protect them from exposure to COVID-19, than parents with older children because such protections are critical, and younger children generally do not possess the means to avoid such harms [24, 25].

Although governments have developed guidelines for school-age children, and education systems have offered online courses and psychological support to minimize the impact of the pandemic on students, quality of life and mental health related burdens persist [25, 26, 27]. The purpose of this study was to

describe the knowledge, behaviors, and psychological impacts of COVID-19 in a sample of Chinese immigrants in Canada, and to evaluate the impact of having children aged 16 years of age and under on these factors.

## Methods

### Design

An online cross-sectional survey was conducted from April 2 to April 20, 2020.

### Participants

Participation was anonymous and informed consent was required before participants could start the survey. A total of 757 participants were recruited in the study. The questionnaire consisted of two parts. The first part collected general information about the participants. The second part asked generic questions about perceptions and actions related to COVID-19, including protection, psychological impacts, knowledge of COVID-19, and appraisal of crisis management by Canadian health authorities. Participants with children aged 16 years and under were also asked to describe specific actions they would take to protect their children from COVID-19. To better understand the participants' perceptions of COVID-19, the survey included questions about the virus source, transmission routes, and disease susceptibility. Participants were asked to describe their likelihood of getting COVID-19 on a 5-point scale, from "Impossible" (=1) to "Very likely" (=5). Responses of 1 or 2 were coded as perceiving their likelihood as "unlikely", 3 was coded as "neutral", and responses 4 or 5 were coded as "likely". Participants were also asked about the psychological impacts of COVID-19 (including feeling at ease, scared, anxious, depressed, stressed, indecisive, and confused) on a five-point Likert-type scale. For the convenience of analysis, we combined the five categories of psychological feelings into three categories: agree, neutral, and disagree.

### Data analysis

A descriptive analysis was conducted to report the sociodemographic characteristics of participants with or without children aged 16 years and under. Chi-square tests were conducted to compare the knowledge and psychological impacts of COVID-19 between participants with or without children aged 16 years and under. Spearman rank correlation analysis was used to compare the perceived likelihood of getting COVID-19 between participants with or without children aged 16 years and under. Missing data was not imputed. The two-sided analysis used a statistical significant level of 0.05. Data analyses were performed using SPSS statistical software (version 21.0, IBM company, Armonk, NY, USA, 2014). The forest plot was drawn with STATA software (version 16.0, Stata Corp, USA, 2019).

This study was approved by the Health Research Ethics Board, Memorial University of Newfoundland, file number 20201772-ME.

All methods were performed in accordance with the relevant guidelines and regulations.

## Results

Among 757 eligible participants, 742 (258 males and 484 females) were included in the subsequent data analysis and responded to the question on whether they have a child 16 years of age or under. 39.4% [292/742] of respondents stated they had at least one child 16 years of age or under. Nearly 60 percent of participants ranging in age from 35 to 54 had children aged 16 years and under. Of those participants who said they had poor health, less than one third had children aged 16 years and under. Further details on participant characteristics are presented in Table 1.

**Table 1** Characteristics of study participants (n=742)

Characteristic†		Participants with children ≤16 years, n (%)	
		Yes (n=292)	No (n=450)
Province	Ontario	245 (39.4)	377 (60.6)
	British Columbia	22 (38.6)	35 (61.4)
	Other provinces	25 (39.7)	38 (60.3)
Gender	Male	97 (37.6)	161 (62.4)
	Female	195 (40.3)	289 (59.7)
Age group	≤34	17 (12.0)	125 (88.0)
	35-54	228 (58.8)	160 (41.2)
	55+	46 (21.8)	165 (78.2)
Birthplace	Mainland China	286 (39.8)	433 (60.2)
	Other places	6 (26.1)	17 (73.9)
Living in Canada	No more than 5 years	69 (42.9)	92 (57.1)
	More than 5 years	223 (38.4)	357 (61.6)
Marital status	Married/Common law	259 (46.5)	298 (53.5)
	Other	33 (17.8)	152 (82.2)
Education	High school or less	20 (51.3)	19 (48.7)
	College/University	177 (40.2)	263 (59.8)
	Master degree or higher	93 (36.0)	165 (64.0)
Health worker	No	266 (38.7)	422 (61.3)
	Yes	26 (49.1)	27 (50.9)
Living status	Living alone	3 (4.0)	72 (96.0)
	Not living alone	289 (43.3)	378 (56.7)
Employment status	Employment	97 (34.3)	186 (65.7)
	Retire	28 (31.5)	61 (68.5)
	Other	167 (45.1)	203 (54.9)
Income satisfaction	Dissatisfied	51 (37.0)	87 (63.0)
	Neutral	126 (43.4)	164 (56.6)
	Satisfied	105 (36.3)	184 (63.7)
Health status	Poor	9 (29.0)	22 (71.0)
	Average	77 (39.9)	116 (60.1)
	Good	201 (39.6)	306 (60.4)

† System-missing was classified into the category “Other” if such a response option category existed

for that survey item.

Table 2 describes participants’ knowledge of the COVID-19 pandemic, specifically regarding the source, transmission route, and disease susceptibility. While most participants actively paid attention to information related to COVID-19 through various channels, there were still a considerable number of participants who had some misconceptions about COVID-19. Specifically, 36.1% of participants believed that the virus might originate from a high-level biosafety laboratory, even though only 6.2% of them consider COVID-19 as a kind of biological weapon. Almost all participants agreed that physical contact and respiratory droplets (e.g., saliva) are important routes for transmitting the COVID-19 virus. A total of 72.9% of participants were aware of airborne transmission. Although more than 60% of the participants agreed that the elderly and immunosuppressed were vulnerable populations, more than half of them also agreed that “in general, all populations are susceptible to COVID-19” (note that these were not mutually exclusive options). As shown in table 3, regardless of whether the participants have children aged 16 years and under, there were no significant differences in their knowledge of COVID-19. When

participants were asked about their perceived likelihood of contracting COVID-19, a significant difference was observed between those with and without children aged 16 years and under ( $\chi^2(2) = 7.513, P=0.023$ ).

**Table 2** Knowledge of COVID-19 (n=742)

Knowledge of COVID-19	Total n (%)	Participants with children $\leq 16$ years, n (%)		$\chi^2(1)$	P
		Yes (n=292)	No (n=450)		
<b>K1. Virus source†</b>					
Wild animals	280 (37.7)	102 (34.9)	178 (39.6)	3.382	.338
High bio-safety laboratory	268 (36.1)	117 (40.1)	151 (33.6)		
A kind of biological weapon	46 (6.2)	18 (6.2)	28 (6.2)		
Other	148 (19.9)	55 (18.8)	93 (20.7)		
<b>K2. Transmission route</b>					
Airborne	541 (72.9)	223 (76.4)	318 (70.7)	2.916	.091
Contact transmission	698 (94.1)	276 (94.5)	422 (93.8)	0.175	.752
Droplet transmission (e.g., saliva)	726 (97.8)	285 (97.6)	441 (98.0)	0.132	.798
Oral-fecal transmission	429 (57.8)	158 (54.1)	271 (60.2)	2.713	.110
Other	69 (9.3)	22 (7.5)	47 (10.4)	1.778	.198
<b>K3. Susceptible population</b>					
Older people (older than 50)	445 (60.0)	179 (61.3)	266 (59.1)	0.354	.592
Teenagers	84 (11.3)	28 (9.6)	56 (12.4)	1.438	.239
People who are immune suppressed	506 (68.2)	205 (70.2)	301 (66.9)	0.898	.375
All people are equally susceptible	401 (54.0)	153 (52.4)	248 (55.1)	0.525	.498

†Responses to the question on virus source were mutually exclusive, so only one Chi-square test was performed, whereas the responses to questions on transmission route and susceptible populations were not necessarily mutually exclusive so Chi-square tests were performed for each row.

\* indicates statistically significant difference at the level of 0.05.

Furthermore, the perceived likelihood of getting COVID-19 was positively correlated with having children aged 16 years and under (Spearman's  $\rho = 0.102, P\rho = 0.007$ ), with a Spearman rank correlation coefficient equal to 0.102 (Table 3).

**Table 3** Perceived likelihood of getting COVID-19 (n=742)

Perceived likelihood of getting COVID-19	Participants with children $\leq 16$ years, n (%)		$\chi^2(2)$	$P_{\chi^2}$	$\rho$	$P_{\rho}$
	Yes (n=292)	No (n=450)				
			7.513	.023*	.102	.007*
Unlikely	96 (35.7)	196 (46.0)				
Neutral	126 (46.8)	173 (40.6)				
Likely	47 (17.5)	57 (13.4)				

\* indicates statistically significant difference at the level of 0.05.

To assess the psychological impact of the pandemic, we asked participants about how they felt the pandemic had affected their psychological wellbeing.. Overall, more than half of them did not feel relaxed, nearly half felt anxious and stressed, and more than one-third felt scared and confused (Table 4). Consistent with our hypothesis, more parents of children aged 16 years and under suffered from negative emotions such as not feeling at ease ( $\chi^2 = 6.077, P = 0.047$ ), depressed ( $\chi^2 = 10.033, P = 0.007$ ), and stressed ( $\chi^2 = 9.253, P = 0.010$ ).

**Table 4** Psychological feelings about COVID-19

Feeling	Total n (%)	Participants with children ≤16 years, n (%)		$\chi^2(2)$	P
		Yes (n=292)	No (n=450)		
At ease				6.077	.047*
Disagree	358 (54.7)	143 (57.4)	215 (53.0)		
Neutral	211 (32.2)	67 (26.9)	144 (35.5)		
Agree	86 (13.1)	39 (15.7)	47 (15.7)		
Scared				2.155	.344
Disagree	180 (25.1)	69 (24.2)	111 (25.6)		
Neutral	254 (35.4)	94 (33.0)	160 (37.0)		
Agree	284 (39.6)	122 (42.8)	162 (37.4)		
Anxious				3.269	.194
Disagree	170 (23.8)	63 (22.3)	107 (24.8)		
Neutral	223 (31.2)	81 (28.6)	142 (32.9)		
Agree	321 (45.0)	139 (49.1)	182 (42.2)		
Depressed				10.033	.007*
Disagree	273 (43.2)	97 (37.9)	176 (46.8)		
Neutral	191 (30.2)	74 (28.9)	117 (31.1)		
Agree	168 (26.6)	85 (33.2)	83 (22.1)		
Stressed				9.253	.010*
Disagree	178 (25.9)	65 (23.4)	113 (27.6)		
Neutral	194 (28.2)	66 (23.7)	128 (31.2)		
Agree	316 (45.9)	147 (52.9)	169 (41.2)		
Indecisive				3.827	.149
Disagree	255 (38.9)	96 (36.0)	159 (41.0)		
Neutral	225 (34.4)	89 (33.3)	136 (35.1)		
Agree	175 (26.7)	82 (30.7)	93 (24.0)		
Confused				3.940	.139
Disagree	205 (31.4)	72 (27.6)	133 (33.9)		
Neutral	202 (30.9)	80 (30.7)	122 (31.1)		
Agree	246 (37.7)	109 (41.8)	137 (34.9)		

\* indicates statistically significant difference at the level of 0.05.

In terms of protective behaviors against COVID-19, parents of children aged 16 years and under were found to have adopted protective behaviors, such as covering a sneeze with elbows or tissue paper, washing hands frequently (with soap), wearing a mask in public, maintaining social distance, limiting use of public transportation, avoiding or canceling group activities, and educating children about preventative behaviors (Figure 1, Additional file 1: Table S1).

Although fathers performed well, mothers performed significantly better at wearing masks in public places and maintaining social distance ( $P=0.034$  and  $P=0.001$ , respectively). Almost all participants claimed they wash their hands frequently, while only two-thirds of them used alcohol-based hand sanitizer. More than three in four mothers (>75 percent) said they would disinfect their surroundings, while only approximately 60 percent of fathers responded that they would ( $\chi^2(1) = 10.13$ ,  $P=0.002$ ). A similar trend was observed for wearing gloves in public, where mothers fared better ( $\chi^2(1) = 11.72$ ,  $P=0.001$ ). During the early period of COVID-19, 80.6 percent of parents of children aged 16 years and under said they would stock up on some non-perishable food and supplies and 67.1% said they would buy dietary supplements or medicines. Compared to fathers, significantly more mothers said they would stock up on non-perishable food and supplies (85.1% vs. 72.2%,  $\chi^2(1) = 7.02$ ,  $P=0.011$ ) and buy dietary supplements or medicines (72.3% vs. 56.7%,  $\chi^2(1) = 7.15$ ,  $P=0.008$ ). Prior to the school closures, very few parents stated that they would ask their children to stay at home (35.1% for fathers and 27.2% for mothers), however, 83.2 percent of them stated they would ask their children to avoid group activities.

## Discussion

In response to the COVID-19 epidemic, the Canadian government has adopted various policies and measures to promote epidemic-related research, for example, the CIHR 2020 supported by New Frontiers in Research Fund (NFRF). Due to the high contagious and fatality rate of COVID-19, all schools and daycare institutions in Canada were closed at the beginning of the COVID-19 outbreak [28 29, 30]. Although the government has developed a guideline for school-age children, and education systems have offered online courses and psychological support to minimize the impact of the pandemic on students and their families, some of these measures have had unintended consequences [31].

This current research was part of a large research project in the Chinese community in Canada. This study was conducted during the second month of Canada's nationwide lockdown of the COVID-19 pandemic. During this period, there was a general state of confusion and panic about COVID-19 both within and outside Canada [31, 32, 33]. This is the first comprehensive study on the knowledge, behaviors, and psychological impacts related to COVID-19 in an overseas Chinese population. It is also one of the preliminary studies focusing on parents or guardians of young school age children from an overseas immigrant population. These findings may help governments with identifying and supporting the unique needs of parents with young children.

Our study demonstrates the benefit of the Canadian government's effort to promote knowledge related to COVID-19 through various channels and methods, as most participants had basic knowledge of COVID-19, such as the transmission routes and main prevention measures [34]. Nonetheless, parents with and without children aged 16 years and under, were found to hold both accurate and inaccurate views about the COVID-19 pandemic. These findings are like those reported in previous literature [35, 36, 37]. In the initial stages of the pandemic, many participants panicked and actively sought out as much information as possible from reliable and unreliable sources [38, 39].

More than half of our participants believed that all people are equally susceptible to COVID-19. They assumed that no one is exempt from the COVID-19 pandemic, which was possibly a reflection of people's fear of the pandemic [40, 41]. When participants were asked about their perceived likelihood of getting infected with COVID-19, those who had children aged 16 years and under were more likely to believe they would get infected, suggesting a greater degree of pessimism. As mentioned in previous literature, parents of minors are usually more sensitive to major external events which are more likely to generate negative emotions such as stress and anxiety [42, 43].

Consistent with our hypothesis, most of the participants had different levels of negative psychological emotions [44, 45, 46]. Specifically, being a parent of children aged 16 years and under was associated with stronger negative psychological impacts. Similar findings have since been observed in other populations of parents outside of Canada [44, 45, 46]. Because COVID-19 is the most serious global infectious disease outbreak in the past century [47, 48], persistent fears about the pandemic and uncertainty about the future will inevitably lead to negative emotions. This trend is like that observed in previous literature on other outbreaks of infectious diseases [48, 49, 50, 51, 52]. Children under the age of 16 often require more companionship and support from families and friends than older children. Therefore, parents need to devote substantive time and energy on them [53]. The innate behaviors of children and the necessity for social interaction in development present unique challenges to social distancing or isolation. These behaviors and needs probably contribute to their parents' feelings of unease, depression, and stress.

Despite their pessimistic emotions, most parents with children aged 16 years and under were still willing to actively respond to the WHO's protective-behavior guidance on effective prevention of COVID-19 during the pandemic. They were also willing to implement corresponding health protective-behaviors.

Compared with other ethnic groups in Western countries, Chinese immigrants were more likely to use masks in public places to help prevent coronavirus infection at the beginning of the pandemic [54]. This behavior may have been inspired by the quick, large-scale control of COVID-19 spread using effective measures, including wearing masks, seen in China [55, 56, 57]. Most parents undertook protective behaviors to protect their family members during the pandemic, including mask wearing, social distancing, limiting group activities, limiting use of public transit, educating their children about preventive behaviors, and stocking up on non-perishable food and supplies. We also observed some gender differences with mothers being more likely than fathers to agree to undertaking certain protective behaviors.

## Conclusions

There were several limitations in our research. First, this research was based on an online survey, as it was the only feasible method to reach this subpopulation during the pandemic. Therefore, the survey subjects do not represent the entire population of Chinese immigrants in Canada. Furthermore, it is likely that people who were willing to participate in the survey may have been more concerned about the pandemic which may have resulted in selection bias. In addition, our research is a cross-sectional study which began to recruit participants during the start of the second month of the pandemic. Due to the lack of longitudinal data, we cannot comment on changing trends in participants' beliefs, behaviors, and psychological impacts over time. Finally, the focus of this paper is descriptive and so our univariate analyses do not control for confounding variables.

In conclusion, Chinese immigrants with children aged 16 years and under were more prone to negative emotions during the COVID-19 pandemic, than those without children aged 16 years and under. This may have been partly due to the intrinsic nature of these children and their need for social interaction which made isolation and social distancing more difficult for them than for adults. The difficulties in keeping them isolated and maintaining their social distance, may have exacerbated the anxiety, frustration, and stress of their parents who are obligated to keep them safe. Despite these negative psychological impacts, most parents surveyed reported taking numerous effective measures to protect themselves and their families. Gender differences were observed for some measures and activities.

## Abbreviations

CIHR: The Canadian Institutes of Health Research; COVID-19: Coronavirus disease; HB: Help Belief model; IBM: International Business Machines; LLC: Limited NFRP: New Frontiers in Research Fund; NY: New York; PM: Protection Motivational theory; SPSS: Statistical Product and Service Solutions; STATA: Statistics

## Declarations

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### Authors' contributions

P.P.W contributed to the conception and design of this manuscript. Y.J.K, L.G.S and F.Y.S analyzed the data and drafted the first version of the manuscript.

P.P.W, Y.J.K, L.G.S, F.Y.S, L.X.Y, W.G.Z, X.L.W, A.E, and E.Z subsequently revised and edited the manuscript.

#Y.K, L.G.S, and F.S made equal contribution

All authors read, reviewed and approved the final manuscript.

### Ethics declarations

#### Ethics approval and consent to participate

This study was approved by Health Research Ethics Authority at Memorial University. All methods were performed in accordance with the relevant guidelines and regulations.

All participants signed an informed consent to participate statement included in the questionnaire via the internet.

#### Consent for publication

Individual-level data not presented. Not applicable.

#### Availability of data and materials

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

#### Competing interests

The authors declare that they have no competing interests.

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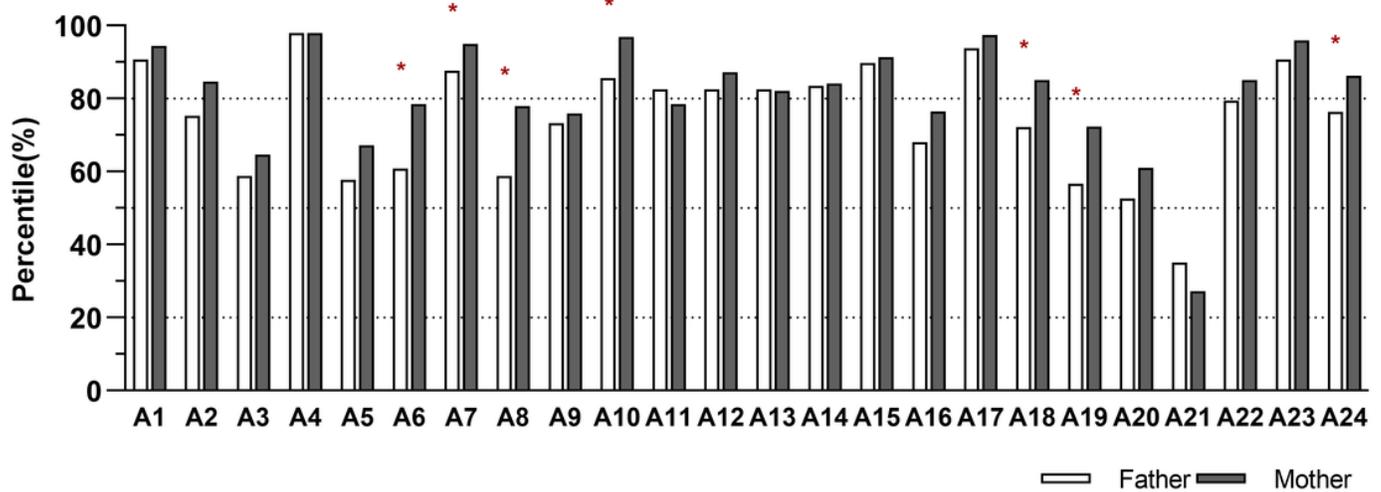
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## Figures



**Figure 1**  
 Reported protective behaviors during the COVID-19 pandemic among different gender subgroups (fathers and mothers) of parents of children 16 years and under (n=292). A1: Cover sneeze with elbow or tissue paper; A2: Avoid touching nose, mouth, and eyes; A3: Use serving utensils for shared food during mealtime; A4: Wash hands frequently (using soap); A5: Sanitize hands frequently (using hand sanitizer); A6: Disinfect home/work surroundings; A7: Wear mask in public; A8: Wear gloves in public; A9: Keep the room well ventilated; A10: Keep social distance (at least 2 meters); A11: Change greeting procedures (e.g., avoid handshakes, hugs); A12: Self-isolation when experiencing cold/flu/COVID-19 symptoms; A13: Report to relevant organization when COVID symptoms appear; A14: Self-isolation for 14 days after encounter with presumptive or confirmed COVID-19 case; A15: Reduce using of public transportation; A16: Work or study at home; A17: Cancel group activities; A18: Stock non-perishable food items and supplies; A19: Purchase dietary supplements and/or medicines; A20: Improve diet quality; A21: Ask children to stay home (prior to school closure); A22: Ask children to avoid group activities; A23: Educate children about preventative behaviors; A24: Ask children to study from home. \* indicates statistically significant difference at the level of 0.05.

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