BMJ Open

Attitudes of Chinese immigrants in Canada towards the use of Traditional Chinese Medicine for prevention and management of COVID-19: a cross-sectional survey during the early stages of the pandemic

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ABSTRACT

Objection The objective of this study was to assess attitudes towards the use of Traditional Chinese Medicine (TCM) for COVID-19 among Chinese immigrants in Canada during the early stage of the COVID-19 pandemic.

Methods A cross-sectional study was conducted in April 2020 in Canada. Individuals aged 16 or older who were of Chinese origin and living in Canada at the time of the survey were invited to participate in an online survey. Descriptive and univariate statistics were performed to describe participant attitudes towards various preventive and treatment measures for COVID-19. Multiple logistic regression was used to identify independent associations with sociodemographic factors and attitudes.

Results A total of 754 eligible respondents were included in the analysis. 65.8% of the participants were female, 77.2% had a university degree or higher and 28.6% were 55 years of age or older. Overall, 48.8% of the study participants believed that TCM was effective in preventing COVID-19% and 46.2% would use TCM if they had COVID-19-related symptoms. However, the corresponding numbers for western medicine were 20.8% and 39.9%, which were statistically lower (p<0.01). Older participants (55+vs <35, OR=3.55 (95% CI 2.05 to 6.14); 35–54 vs <35, OR=1.98 (95% CI 1.27 to 3.08)) and those who were dissatisfied with their income (OR=2.47(95% CI 1.56 to 3.92)) were more likely to believe TCM was effective against COVID-19. Similarly, older participants (55+vs <35, OR=3.13 (95% CI 1.79 to 5.46); 35–54 vs <35, OR=2.25 (95% CI 1.35 to 3.74)), females (OR=1.60 (95% CI 1.15 to 2.23)), and those born in mainland China (OR=10.49 (95% CI 2.32 to 47.39)) were more likely to use TCM if they had symptoms of COVID-19.

Conclusion Despite the lack of scientific evidence to support its use, TCM was widely believed by Chinese immigrants in Canada to be an effective means of preventing COVID-19 and many also stated they would use it if they were experiencing symptoms of COVID-19.

Strengths and limitations of this study

► Our work examines the opinions, beliefs and actions of the Canadian Chinese immigrant community towards Traditional Chinese Medicine for COVID-19 prevention.
► We were able to obtain a large sample size through online recruitment methods.
► Knowledge user and community collaborator organisations have been involved in the research design and project execution, and the survey tool was revised based on their input.
► The study is limited by its cross-sectional nature and by the use of snowball sampling for recruitment, so these findings are not necessarily representative.

immigrants in Canada, most of whom live in the Greater Toronto Area (GTA).[1] Canada reported its first imported COVID-19 case in GTA from mainland China.[2] In the ensuing weeks, most COVID-19 cases in Canada were from China. Given their high geographic density and their close ties with the homeland, Chinese immigrants in the GTA became the most vulnerable immigrant population in Canada in the early stage of the outbreak. In mid-February, around 70–80 individuals per day were still arriving in the GTA from Hubei Province, and many more from other parts of China.[3] Thus, compared with other Canadians, Chinese individuals living in the GTA had more frequent and close interactions with people from areas severely affected by COVID-19 and thus had a significantly higher risk of infection. Chinese communities in Canada, and around the world, were at especially high risk for confusion, fear, anxiety, discrimination and panic related to

INTRODUCTION

According to Statistics Canada, Ontario is home to more than 50% of all Chinese

COVID-19.[4–7] It is also likely that many Chinese immigrants were actively searching for reliable information and advice on COVID-19 prevention. This has enabled rumours and misinformation to spread on social media.[8 9]

Traditional Chinese Medicine (TCM), the origins of which can be traced back thousands of years, has a culturally significant role as a traditional medicine among Chinese populations and its use is often integrated with western medicines.[10] TCM encompasses a broad range of therapies, such as herbal medicine, acupuncture, massage, Qigong and dietary therapy.[10] Ever since the COVID-19 outbreak started, TCM has been officially promoted in China by government officials, state media and medical experts as an integral part of the COVID-19 prevention and treatment plan.[11–15] Specifically, according to Chinese state media, the State Administration of TCM claimed there are six effective TCM recipes for COVID-19.[11–15] In addition, TCM is easily available and is not subject to the same strict regulations as Western medicine is (in both China and Canada). This, coupled with the lack of other effective means against COVID-19, has made TCM a popular preventive measure in mainland China despite the lack of scientific evidence.[16] Several news reports have highlighted how these mixed messages are leading to confusion in Chinese communities in Canada, and how many individuals are profiting from promoting unproven remedies.[17–19]

As part of the Canada's COVID-19 rapid response plan, a Chinese community-based COVID-19 epidemiological project was launched in March 2020 and this current study was derived from that larger project.[20] The objective of this current study was to assess the attitudes towards the use of TCM in relation to Western medicine among Chinese immigrants in Canada during the early stage of the COVID-19 pandemic. We hypothesised that Chinese Canadians would believe more in TCM than in Western medicine as a means to prevent COVID-19. Further, we investigated sociodemographic factors associated with belief in and presumed use of TCM, and we anticipated that older adults and new immigrants would be more likely to use TCM.

METHODS

Study design and participants

An online cross-sectional survey in both Chinese and English was conducted from 2 April 2020 to 20 April 2020. Chinese immigrants, aged 16 or older, who had been born in China but currently lived in or would be living in Canada for at least 6 months were invited to participate. The survey questionnaire was delivered through various methods including WeChat (85.5% of participants), emails (7.7%) and Chinese media homepage links (6.8%). Potential participants were required to read a brief statement describing the study, anonymity assurance and participant rights. They then had to click a button saying they consented to participating before they could start the survey. Participation was anonymous

so, in order to avoid possible multiple submissions, there were no incentives for participation and IP addresses of submissions were tracked. Identifiers, such as WeChat ID and IP address were removed before analysis. The questionnaire consisted of two parts. The first part collected general information about participants. The second part surveyed the perceptions and actions related to COVID-19, including knowledge of COVID-19. In addition to being asked about their beliefs in the effectiveness of different prevention methods against COVID-19 in this section of the survey, participants were also asked what they would do if they were experiencing symptoms of COVID-19. Participants were also surveyed on the psychological impacts of COVID-19 and on their appraisal of crisis management by Canadian health authorities, but these results are not covered in this paper.

Outcome variables

Respondents were given a list of statements and asked to indicate whether the statement was correct. One of the statements was 'Traditional Chinese medicine can prevent COVID-19.' If participants responded 'yes' to this statement, they were regarded as believing TCM was effective in preventing COVID-19 ('belief in TCM'). Similarly, participants were asked if they agreed that 'Western medicine can prevent COVID-19.' In a separate question, participants were asked 'What would you do if you start showing typical symptoms of COVID-19?' On the list of potential response options were 'consume Traditional Chinese Medicine,' 'consume Western medicine,' 'contact family doctor,' 'contact for COVID-19 testing,' and 'self-isolation.' Further details on the survey items and response options can be found in online supplemental appendix.

Covariates included in the model were age group, gender, marital status, educational attainment, current residing province, household income satisfaction and self-rated health. Income satisfaction (five-point Likert-type scale, reduced to a three-point scale for analysis) was used to reflect their subjective assessment of wealth and socioeconomic status. For the convenience of analysis, we combined the five categories of psychological feelings into three categories, which are dissatisfied, neutral and satisfied.

Public involvement

Knowledge users and community collaborators are an integral part of the research team and they directly participated in the research design and project execution. Before collecting data, this project was well promoted in the Chinese community in Canada. The final survey tool was revised based on the input from many organisations and collaborators. Since May 2020, Chinese communities and study participants have been receiving research updates through the media, Zoom public forums and several community organisation websites (such as www.cniw.org). The Confederation of Chinese Alumni Associations is the official knowledge user and the Center

for New Immigrants Wellbeing is the official community partner of the project.

Data analysis

A descriptive analysis was conducted to show the distribution of sociodemographic characteristics of the sample, stratified by outcome variables. Comparisons between categorical groups were analysed using Pearson's χ^2 test. The independent association between selected independent variables and TCM belief/practice was estimated using ORs and 95% CIs as an estimate of the relative risk from multivariate logistic regression models, adjusted for potential clustering and confounding. Based on univariate logistic analysis, any variable whose univariate test had a $p<0.20$ was considered as a candidate for the multivariate model. Missing data were not included into the analyses.

Forest plots were used to present ORs and the corresponding 95% CIs from the multivariate models. Two-sided tests with a significance level of 0.05 were used. The data analyses were performed with SPSS statistical software (V.21.0, IBM). The forest plot was produced using Stata software (V.16.0, StataCorp).

RESULTS

A total of 764 individuals responded to the survey, 757 of which completed the informed consent and were eligible to participate. Of the eligible respondents, 754 (258 males and 496 females) participants completed at least 50% of the survey questions, and these participants were included in our data analysis. Table 1 details the characteristics of study participants.

When being asked to choose which prevention measures participants believed were effective against COVID-19, using TCM (48.8% (368/754)) was the most popular prevention measures among the options given (table 2). In contrast, only 20.8% (157/754) of people believed that Western medicine was effective in preventing COVID-19. In addition, more males believed in Western medicine compared with females (26.4% vs 17.9%, p=0.008). Interestingly, 81.5% (128/157) of those who believed Western medicine was effective also believed TCM was effective at preventing COVID-19. While there were very few who believed in Western medicine but not TCM (3.8% (29/754)), there was a number who believed in TCM but not Western medicine (31.8% (240/754)). Nearly half of participants did not believe either TCM nor Western medicine could prevent COVID-19 (47.3% (357/754)) and a small portion believed both were effective (16.9% (128/754)).

Table 3 describes the results for what participants would do if they were experiencing symptoms of COVID-19. Overall, more than 90% of participants indicated that they would self-isolate (97.1%) and contact local public health agents for the COVID-19 test (91.6%), while only 55.2% would contact their family doctor. The results further suggest that 46.2% would take TCM and, as expected,

Table 1 Characteristics of study participants (n=754)

Characteristics	Participants n	%
Province		
Ontario	633	84.0
British Columbia	58	7.7
Other provinces	63	8.4
Gender		
Male	258	34.2
Female	496	65.8
Age group		
<35	144	19.1
35–54	393	52.1
55+	216	28.6
Birthplace		
Mainland China	731	96.9
Other places	23	3.1
Living in Canada		
≤5 years	166	22.0
>5 years	587	77.9
Marital status		
Married/common law	565	74.9
Other	189	25.1
Education		
High school or lower	39	5.2
College	127	16.8
University (bachelor's degree)	321	42.6
Postgraduate (master's or higher)	261	34.6
Healthcare worker		
Yes	53	7.0
No	700	92.8
Living arrangements		
Living alone	77	10.2
Not living alone	677	89.8
Employment		
Employed	286	37.9
Retired	89	11.8
Other	379	50.3
Income satisfaction		
Dissatisfied	140	18.6
Neutral	293	38.9
Satisfied	295	39.1
Health status		
Poor	32	4.2
Average	194	25.7
Good	517	68.6

*System missing data were not shown in this table.

Table 2 Participants' beliefs in the effectiveness of Traditional Chinese Medicine (TCM) and/or Western medicine in preventing COVID-19

Prevention methods	Total (n=754)	Male (n=258)	Female (n=496)	$\chi^2(1)$	P value
TCM	368 (48.8)	115 (44.6)	253 (51.0)	2.812	0.107
TCM, but not western medicine	240 (31.8)	64 (24.6)	176 (35.5)	8.918	0.003*
TCM and western medicine	128 (17.0)	51 (19.8)	77 (15.5)	2.168	0.153
Western medicine	157 (20.8)	68 (26.4)	89 (17.9)	7.286	0.008*
Western medicine, but not TCM	29 (3.8)	17 (6.6)	12 (2.4)	7.979	0.006*
Neither TCM nor Western medicine	357 (47.3)	126 (48.8)	231 (46.6)	0.349	0.591

*Indicates a statistically significant difference between males and females at the level of 0.05 for the two-sided Pearson χ^2 test.

females (50.8%) were more likely than males (37.2%) to take TCM (p<0.001). The corresponding proportion for taking Western medicine was 39.9% and there was no significant difference between genders. Of those who would use Western medicine, most would also use TCM (74.0% (223/301)). Approximately 1 in 10 would use Western medicine but not TCM (10.3% (78/754)), while approximately one in six would use TCM but not Western medicine (16.6% (125/754)). Just under half of participants would not use either TCM nor Western medicine (43.5% (328/754)), and just under one third would use both (29.6% (223/754)).

Based on descriptive analyses, we further assessed factors associated with belief in TCM and presumed usage. After univariate logistic regression analysis (table 4), variables with p values less than 0.20 were considered as candidates for the multiple logistic regression analysis, including: gender, age, birth place, length of stay in Canada, education level, employment status, income satisfaction, and health status, for the 'belief in TCM' for preventing COVID-19 outcome; and gender, age, birth place, stay in Canada, marital status, education, health worker, living status, and income satisfaction, for the 'usage of TCM' if participants believed they had COVID-related symptoms

outcome. Forest plots were used to display adjusted ORs from the multivariate logistic regression (figure 1). As expected, older people were more likely to believe in TCM for prevention against COVID-19 than their younger counterparts (35–54 vs under 35, OR (95% CI)=1.98 (1.27 to 3.08); 55 or older vs under 35, OR (95% CI)=3.55 (2.05 to 6.14)). Similarly, older people would be more likely to use TCM if they believed they had COVID-related symptoms (35–54 vs under 35, OR (95% CI)=2.25 (1.35 to 3.74); 55 or older vs under 35, OR (95% CI)=3.13 (1.79 to 5.46)). Although females and males did not differ in their beliefs of TCM as an effective preventive measure, females were more likely than males to agree that they would use TCM if they believed they had COVID-related symptoms (OR (95% CI)=1.60 (1.15 to 2.23)). Participants who did not live alone were more likely than those living alone to use TCM if they had COVID-19 symptoms (OR (95% CI)=1.85 (1.02 to 3.36)). Compared with those who were satisfied with their income, those who were dissatisfied were more likely than to believe TCM was effective at preventing COVID-19 (OR (95% CI)=2.47 (1.56 to 3.92)). However, income satisfaction had no significant association with whether or not participants would use TCM if they had symptoms of COVID-19. Further, those born in mainland

Table 3 Measures participants agreed they would take after the appearance of COVID-19-related symptoms

Measures	Total (n=754)	Male (n=258)	Female (n=496)	$\chi^2(1)$	P value
Self-isolation	732 (97.1)	253 (98.1)	479 (96.6)	1.329	0.362
Contact for COVID-19 testing	691 (91.6)	234 (90.7)	457 (92.1)	0.459	0.491
Contact family doctor	416 (55.2)	147 (57.0)	269 (54.2)	0.516	0.488
Take TCM	348 (46.2)	96 (37.2)	252 (50.8)	12.626	<0.001*
Take TCM, but not Western medicine	125 (16.6)	25 (9.7)	100 (20.2)	13.456	<0.001*
Take TCM and Western medicine	223 (29.6)	71 (27.5)	152 (30.6)	0.796	0.401
Take Western medicine	301 (39.9)	104 (40.3)	197 (39.7)	0.025	0.876
Take Western medicine, but not TCM	78 (10.3)	33 (12.8)	45 (9.1)	2.530	0.130
Take neither Western medicine nor TCM	328 (43.5)	129 (50.0)	199 (40.1)	6.739	0.011*

*Indicates a statistically significant difference between males and females at the level of 0.05 for the two-sided Pearson χ^2 test.
TCM, Traditional Chinese Medicine.

Table 4 Univariate logistic regression analyses for belief in TCM effectiveness and presumed use of TCM for COVID-19
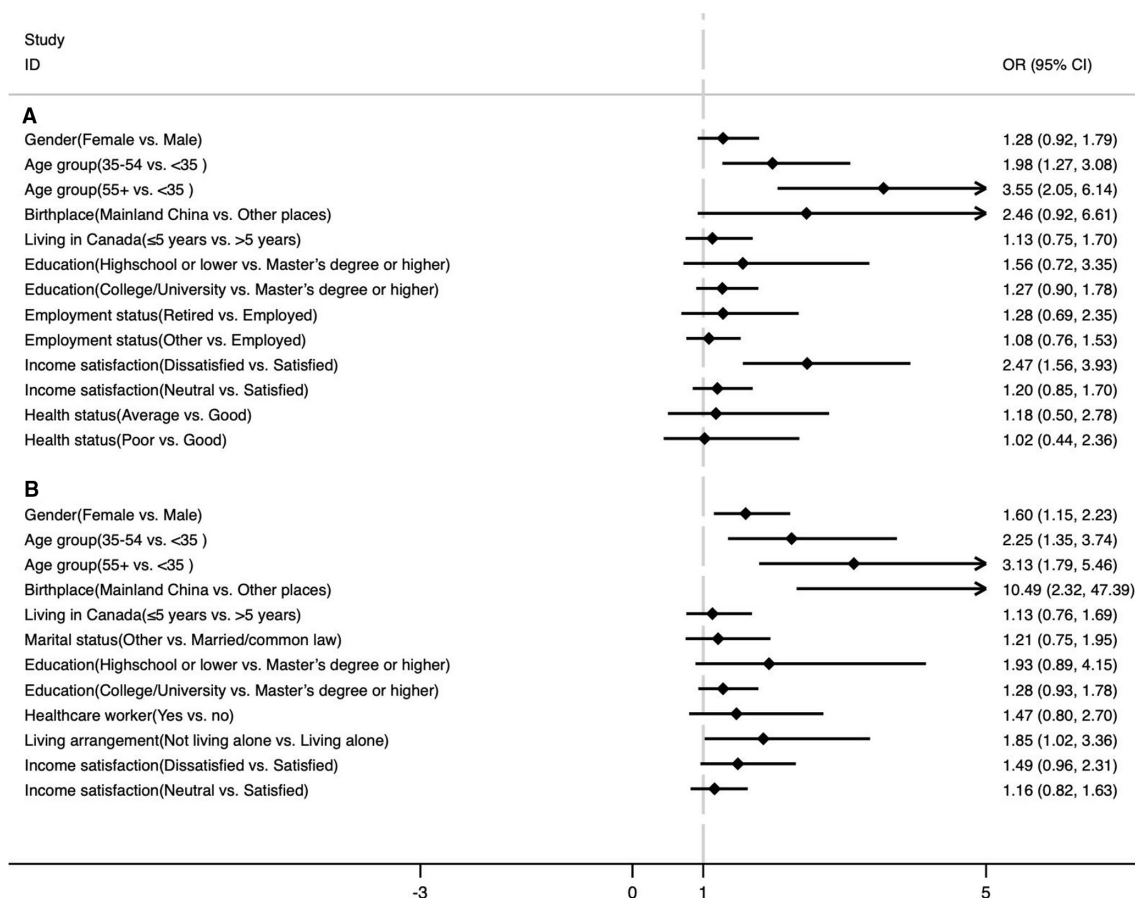
Characteristics	(a)Believes TCM is effective at preventing COVID-19		(b)Would use TCM if they had COVID-19 symptoms	
	OR (95% CI)	P value	OR (95% CI)	P value
Gender				
Male	1.00	–	1.00	–
Female	1.30 (0.96 to 1.75)	**0.094**	1.74 (1.28 to 2.37)	**<0.001**
Age group				
<35	1.00	–	1.00	–
35–54	1.91 (1.28 to 2.85)	**0.002**	2.59 (1.71 to 3.92)	**<0.001**
55+	3.24 (2.08 to 5.05)	**<0.001**	2.80 (1.78 to 4.40)	**<0.001**
Birthplace				
Other places	1.00	–	1.00	–
Mainland China	2.23 (0.90 to 5.49)	**0.081**	5.96 (1.76 to 20.23)	**0.004**
Living in Canada				
≤5 years	1.00	–	1.00	–
>5 years	1.29 (0.91 to 1.82)	**0.154**	1.27 (0.90 to 1.79)	**0.187**
Marital status				
Other	1.00	–	1.00	–
Married/common law	1.10 (0.79 to 1.52)	0.586	1.46 (1.05 to 2.05)	**0.026**
Education				
Postgraduate (master's degree or higher)	1.00	–	1.00	–
College or University (bachelor's degree)	1.36 (1.00,1.85)	**0.047**	1.32 (0.97 to 1.80)	**0.076**
High school or lower	1.34 (0.68 to 2.62)	0.399	1.33 (0.68 to 2.60)	0.414
Healthcare worker				
No	1.00	–	1.00	–
Yes	1.09 (0.63 to 1.91)	0.754	1.71 (0.97 to 3.02)	**0.063**
Living arrangement				
Living alone	1.00	–	1.00	–
Not living alone	1.23 (0.77,1.98)	0.390	1.90 (1.15 to 3.13)	**0.012**
Employment status				
Employed	1.00	–	1.00	–
Retired	2.23 (1.36 to 3.65)	**0.001**	1.12 (0.69 to 1.80)	0.645
Other	1.18 (0.87 1.61)	0.289	1.12 (0.82 to 1.53)	0.470
Income satisfaction				
Satisfied	1.00	–	1.00	–
Neutral	1.15 (0.83 to 1.59)	0.412	1.10 (0.79 to 1.52)	0.567
Dissatisfied	2.25 (1.48 to 3.40)	**<0.001**	1.44 (0.96 to 2.16)	**0.075**
Health status				
Good	1.00	–	1.00	–
Average	1.32 (0.95 to 1.83)	**0.103**	1.24 (0.89 to 1.73)	0.200
Poor	1.70 (0.82 to 3.52)	**0.152**	1.27 (0.62 to 2.59)	0.515

Bold font indicates variables with p value under 0.20 to be included in multiple logistic regression.
TCM, Traditional Chinese Medicine.

China were more likely than those born elsewhere to use TCM if they had COVID-19-related symptoms (OR (95% CI)=10.49 (2.32 to 47.39), but they were not more likely to believe it was effective for prevention. The level of educational attainment was not associated with either outcome variable.

DISCUSSION

Consistent with our hypothesis, TCM is regarded by many Chinese immigrants in Canada as an effective means of COVID-19 prevention and treatment, despite a lack of scientific evidence to support its use. According to the 2016 Statistics Canada report, people of Chinese origin

Figure 1 Multiple logistic regression for (A) believes TCM is effective at preventing COVID-19 and (B) Would use TCM if they had COVID-related symptoms. Variables with p value under 0.20 in the univariate logistic regression analysis were included in this multiple logistic regression analysis. TCM, Traditional Chinese Medicine.

account for about 5% of the total population.[21] In general, overseas Chinese populations share similar cultures and lifestyles,[22 23] and it is likely that their belief and practices towards TCM are close as well and this could explain why we did not find an association between length of stay in Canada and attitudes towards TCM. Moreover, because of these similarities, these results have broad implications, warranting further investigation to determine the actual effectiveness of TCMs against COVID-19 and their safety in this use. If evidence refutes claims of effectiveness, this should be communicated to members of these communities.

Our study results suggest older Chinese immigrants were more confident in the effectiveness of TCM for preventing and managing the symptoms of COVID-19. Those born in mainland China were more likely to say they would use TCM if they had symptoms of COVID-19. For belief in effectiveness for prevention, there was no statistical significance observed between participants born in mainland China and those born elsewhere (figure 1). These findings may be related to the participants' closeness to mainland China, where TCM was widely promoted and used for managing COVID-19 at the start of the pandemic.[11–15] We suspect the association with age could be related to older immigrants perhaps

having more traditional upbringings than younger generations. The lack of association between length of stay in Canada suggests beliefs in TCM persist even after living in Canada for longer periods of time where participants would be more exposed to Westernised medicines and beliefs about health. With respect to the association between belief in TCM and lower levels of income satisfaction, this could be explained by how, in China, TCM is traditionally more affordable and thus accessed more than Western medicine by families with less economic resources, resulting in these families having more experience with TCMs than families which were more well-off. Under the current public medical framework in China, although Western medicines and treatments were dominant, many TCMs still occupied a considerable market due to their mild side effects and potential for benefit.[24 25] While TCMs may be unlikely to cause direct harms, indirect harm could result from over-reliance on TCMs, thus potentially delaying or outright avoiding seeking care from practitioners of Western medicine. Indeed, medical professionals have cautioned against non-evidence-based therapies as potential sources of harm associated with the COVID-19 pandemic.[26]

While it is not surprising to observe gender differences in this study, explanations may not be straightforward.

Several possible explanations exist. For one, to a large extent, females usually take on the role of caregiver for their family members and thus need to pay more attention to health-related information.[27] Moreover, as mentioned in previous literature on COVID-19, women in China tended to have a more optimistic attitudes towards the pandemic outcome and were more likely to adopt more preventive behaviours than men.[28]

The large portions of participants who said they would not take either TCM or Western medicine for prevention or for COVID-19 symptoms suggests that many participants were well aware that nothing had yet been proven effective for either prevention or treatment of symptoms. Interestingly, while nearly one-third of participants believed in TCM but not Western medicine, for prevention, only one-sixth said they would use TCM but not Western medicine if they had symptoms of COVID-19. This finding suggests that participants were more comfortable relying on only TCM for prevention, and less comfortable relying on only TCM in the case of symptoms. Indeed, we found significant overlap between participants who would use both TCM and Western medicine if they had COVID-19 symptoms. This finding fits with previous research which found that two-thirds of older Chinese immigrants in Canada use a combination of TCM and Western health services to support their health.[29] Thus, the preference for using both TCM and Western medicine among our participants could reflect this general trend among Chinese immigrants to integrate the two medicines, but it could also reflect current messaging around the COVID-19 treatment protocols and research in China that supports integration of TCM and Western medicine.[12 30]

Our study has several limitations. The first limitation is due to the fact that this survey was conducted online. Thus, by no means was the study sample representative to the entire Chinese population in Canada, especially considering how the use of snowball sampling may have introduced selection bias. The results are also more applicable to Chinese immigrants from mainland China given they are over-represented in our sample. Nonetheless, the use of online recruitment and survey administration was chosen as it allowed the rapid recruitment of a large sample. Second, those willing to participate in the survey are likely more concerned about the epidemic, which inevitably leads to a self-selection bias. Thirdly, due to restrictions on the length of our survey, we could not get enough detailed information about the specific types participants would use. However, it can be safely assumed TCM in this survey would be understood as herbal medicine or over-the-counter manufactured traditional medicine.[31 32] Additionally, we did not ask participants about if they had any barriers to accessing TCM or Western medicine, which might have affected their responses on whether they would use TCM or Western medicine if they were experiencing symptoms. Finally, we did not ask participants if they had previously used TCM for other purposes, so it is not possible to say how their belief in TCM for COVID-19 prevention or presumed use of TCM if they were symptomatic differs from their general beliefs and practices related to TCM.

CONCLUSION

The results indicate that TCM is believed by many Chinese immigrants in Canada to be effective, and likely is frequently used, for COVID-19. Future studies are warranted to explore the reasons behind the observed phenomenon. More importantly, given TCM's wide acceptance for a variety of uses by Chinese populations around the world and, given its wide acceptance by Chinese immigrants in Canada for COVID-19, its general lack of proven efficacy and safety for COVID-19 should be properly communicated.

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of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

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