ORIGINAL PAPER

Factors Related to the Intention to Get Vaccinated Against COVID-19 in the Province of New Brunswick, Canada

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Abstract

Vaccine refusal by even a small subset of the population can undermine the success of the vaccination campaigns which are currently underway worldwide. The goal of this study was to identify determinants of intention to receive COVID-19 vaccine. More precisely, it aimed at examining whether socioeconomic factors, levels of mistrust toward authorities, perceived scientific consensus, and perceived severity of COVID-19 can predict vaccination intentions against COVID-19. Vaccination intentions included being ready to get vaccinated, contemplating vaccination, and not considering vaccination. A sample of 399 individuals from New Brunswick, Canada, completed an online survey in March and April 2021. Results revealed that participants who declared they would probably get vaccinated were more likely to report lower levels of mistrust toward authorities, as well as higher perceived scientific consensus and perceived severity of COVID-19, compared to those who did not intend to get vaccinated or remained unsure. Strategies to guide healthcare professionals in assisting their patients in making the best healthcare decision for their family and themselves are discussed.

Keywords COVID-19 · Motivational interviewing · Transtheoretical model · Vaccination intention · Vaccine uptake

Introduction

Safe and effective vaccines against COVID-19 have been approved for adult administration since the end of 2020 [1]. It is anticipated that the COVID-19 vaccination programs currently underway around the globe will mitigate the ongoing spread of the pandemic. However, their success will largely depend on their acceptance by the population. A systematic review of vaccine acceptance [2] based on research from 33 countries published before the end of 2020 documented acceptance rates of COVID-19 vaccines ranging from 24% (in Kuwait) to 97% (in Ecuador). A scoping review on COVID-19 vaccine hesitancy in high-income countries based on research published before March 2021 revealed that vaccine hesitancy rates ranged between 7 and 78%, with Canadians reporting the lowest rates of all [3]. Nevertheless, in April 2021, only 80% of Canadians reported being vaccinated or having the intention to get vaccinated against COVID-19 [4]. Hence, the goal of the current study was to understand the factors that may help improve the acceptance rates of COVID-19 vaccination in a sample of adults in the province of New Brunswick, Canada, at the time when COVID-19 vaccines were becoming more widely available to them.

As vaccination campaigns progressed around the globe, health officials argued that issues with supplies and logistics were being replaced by the challenges pertaining to reaching the people who are more hesitant to get vaccinated [5]. Data collected in 2020 indicated that perception of having insufficient access to the adequate resources about COVID-19 vaccination [6] and low perceived severity of the infection [7, 8] were associated with less positive beliefs and attitudes regarding COVID-19 vaccination. Biswas and colleagues' recent scoping review [9] on vaccine hesitancy and its underlying determinants, which

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included 82 studies that had been published by early 2021, revealed that proportions of vaccine hesitancy, uptake and refusal, and their underlying factors were context specific. Among the most frequent factors documented to be related to vaccination intentions were mistrust in healthcare and in information sources, vaccine side effects, and demographic factors. Al-Amer's systematic review [10] documented that perceptions of risk of exposure and susceptibility to COVID-19, perceived vaccine safety and efficacy, and high exposure to negative information about COVID-19 vaccines were determinants of vaccination intentions. Among the sociodemographic characteristics that were related with increased COVID-19 vaccine hesitancy were being younger, a woman, and having lower education and income [3]. Research highlighted that some factors were more dominant in some regions than in others.

Considering that vaccine uptake and its underlying factors can vary by region and evolve with time, it is important to study intention to get vaccinated against COVID-19 in various populations and groups. We have yet to gain a comprehensive picture of what factors influence Canadians' intentions about getting immunized with a COVID-19 vaccine. Identifying factors of vaccine hesitancy among Canadians is crucial to help tailor effective strategies that will support community-based interventions and vaccination programs. Thus, the specific goals of our study were to determine Canadians' vaccine intentions and to further identify factors that may help promote the acceptance of COVID-19 vaccination among Canadians who have not yet been vaccinated. The stages of change construct of the transtheoretical model were applied [11] to better understand the beliefs, attitudes and barriers that drive vaccine hesitancy in different vaccine-hesitant subgroups. According to this model, the process of behavior change is defined through a continuum from pre-contemplation (not thinking about behavior change), to contemplation (considering making a change), to preparation (planning to make a change), to action (adopting the behavior), and to maintenance (sustaining a modified behavior). The transtheoretical model has been applied across a broad range of health-related behaviors, such as physical activity [12], risk-taking behaviors [13], and vaccination [14]. With the current study, we explored the factors influencing whether individuals are ready to get vaccinated against COVID-19, are contemplating vaccination, or are not considering vaccination. A multinomial logistic regression investigated the predictive utility of socioeconomic factors, levels of mistrust toward authorities, perceived scientific consensus, and perceived severity of COVID-19. In light of previous research, it was hypothesized that individuals with lower socioeconomic status, higher levels of mistrust toward authorities (e.g., governmental and pharmaceutical), lower perceived scientific consensus, and lower perceived severity of COVID-19 would be more likely to be in the precontemplation or contemplation stages of change compared to those in the preparation stage to get vaccinated.

Methods

Sample

Four hundred and fifty-six individuals were recruited for the study. Inclusion criteria were to be a resident of New Brunswick, Canada. Fifty-seven participants were excluded from the analyses due to missing data, leaving a final sample of 399 (341 female, 58 male). Participants' ages ranged from 25 to 57 years (M = 41.35, SD = 5.06). Most identified as Caucasian (96%) and reported French (77%) or English (18%) being the language primarily spoken in their household.

Procedure

We conducted a cross-sectional online survey. Research protocol was approved by the institutional research ethics board. Participants were recruited via an email sent to all parents of a School District and via announcement on social media, as well as through various community-based organizations mailing lists. Potential participants were invited to complete an online survey between March 9th 2021 and April 19th 2021. Participants were entered into a draw for five prepaid cards (value of $75 each).

Measures

Sociodemographic Characteristics

Sociodemographic characteristics were measured with questions about age, level of education (including primary, secondary, and postsecondary education), and annual family income (in increments of 20 000$). Participants also reported their gender and ethnicity, their primary language spoken at home, and whether they are working in healthcare.

Intention to Get Vaccinated Against COVID-19

Participants' intentions to get vaccinated against COVID-19 was assessed with the following question, "Do you intend to get vaccinated against COVID-19?". This question was answered using a 6-point Likert-type scale (1 = I have already been vaccinated against COVID-19, 2 = Yes, absolutely, 3 = Yes, probably, 4 = Probably not, 5 = No, absolutely not, 6 = Not sure).

Mistrust Toward Authorities

Mistrust toward authorities and stakeholders involved in vaccination was measured with four items adapted from Jolley and Douglas [15]. Participants were asked to indicate their level of agreement with each of the following statements about vaccination stakeholders (e.g., government, pharmaceutical companies) "I no longer trust those involved in vaccination", "The opinions of those involved in vaccination are no longer as important to me as they once were", "I feel tricked, cheated, or deceived by those involved in vaccination", "I am very disappointed with those involved in vaccination". Participants indicated their agreement on a six-point scale (1 = Strongly disagree, 6 = Strongly agree). The higher the average score, the greater the participants' feelings of disillusionment and mistrust towards authorities involved in vaccination. The Cronbach's alpha for the four items was 0.94.

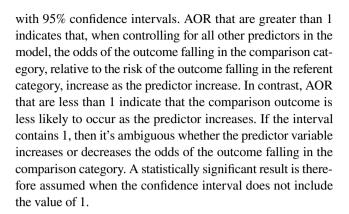## Perceived Scientific Consensus About Vaccination

Participants' perceived level of scientific consensus about vaccination was assessed by two items asking them to rate their belief that there is consensus among scientists about the safety (item 1; see also Damnjanović et al. [16]) and the effectiveness (item 2) of COVID-19 vaccines using a Likert scale (1 = No consensus, 7 = Total consensus). The higher the average score, the greater consensus the participants believe there is between scientists about the safety and the effectiveness of COVID-19 vaccines. The Spearman-Brown reliability coefficient for the two items was 0.95.

Perceived Severity of COVID-19

Participants' perceived severity of consequences related to contracting COVID-19 was assessed with one item ("I think contracting COVID-19 could have very serious consequences for me or my family members") answered on a Likert-type scale (1 = Completely disagree, 4 = Completely agree).

Statistical Analysis

Data were analyzed using statistical software SPSS v.27. Descriptive statistics were first carried out to characterize the sample and key variables as a function of stages of change (i.e., precontemplation, contemplation, preparation, and action). A multinomial logistic regression analysis was then conducted to test the predictive importance of selected determinants (i.e., years of education, household income, perceived severity of the virus, perceived scientific consensus, and mistrust toward authorities) to COVID-19 vaccination intention. The effect of each predictor was interpreted using adjusted odds ratio (AOR)

with 95% confidence intervals. AOR that are greater than 1 indicates that, when controlling for all other predictors in the model, the odds of the outcome falling in the comparison category, relative to the risk of the outcome falling in the referent category, increase as the predictor increase. In contrast, AOR that are less than 1 indicate that the comparison outcome is less likely to occur as the predictor increases. If the interval contains 1, then it's ambiguous whether the predictor variable increases or decreases the odds of the outcome falling in the comparison category. A statistically significant result is therefore assumed when the confidence interval does not include the value of 1.

Results

Sample Characteristics

Table 1 presents descriptive statistics of socio-demographic characteristics and determinants of intention to get COVID-19 vaccine by stages of change. The transtheoretical model was used to group participants according to their intention to get COVID-19 vaccine. Responses on the intent to get vaccinated question were categorized by classifying participants in one of four main stages of change: precontemplation (extremely unlikely; 7.3%), contemplation (somewhat unlikely or unsure; 12.5%), preparation (somewhat or extremely likely; 54.4%), and action (already vaccinated; 25.8%).

Multinomial Logistic Regression

The regression was carried out on those who have not been vaccinated yet, with the dependent variable being the three stages of intention: precontemplation, contemplation, and preparation. The preparation stage was used as the reference category. Results revealed that the model is a significant fit to the data, $\chi^2(10) = 245.38$, $p < 0.001$. As shown in Table 2, participants were more likely to be in the preparation stage, than in the precontemplation and contemplation stages, if they reported lower levels of mistrust toward authorities, as well as higher perceived scientific consensus and perceived severity of COVID-19. Lower levels of education and lower household incomes were associated with the likelihood of being in the contemplation stage, and in the precontemplation stage, respectively. Overall, the model correctly classified 86.1% of the participants.

Discussion

Our study provides important insight on predictors of COVID-19 vaccine uptake among a Canadian sample. Overall, we found that most participants were planning on

Table 1 Descriptive data for included (N = 399) and excluded (N = 57) participants

	COVID-19 vaccine intention				Excluded participants[a] N = 57[b]
	Precontemplation N = 29	Contemplation N = 50	Preparation N = 217	Action N = 103	
	N (%)				
Gender					
Male	5 (17.2)	7 (14)	41 (18.9)	5 (4.9)	10 (17.5)
Female	24 (82.8)	43 (86)	176 (81.1)	98 (95.1)	46 (80.7)
Missing	–	–	–	–	1 (1.8)
Healthcare worker					
Yes	5 (17.2)	9 (18)	21 (9.7)	88 (85.4)	13 (22.8)
No	24 (82.8)	41 (82)	196 (90.3)	15 (14.6)	34 (59.6)
Missing	–	–	–	–	10 (17.5)
Age					
20–29	0 (0)	2 (4)	4 (1.8)	0 (0)	3 (5.3)
30–39	16 (55.2)	18 (36)	57 (26.3)	36 (35)	15 (26.3)
40–49	10 (34.5)	27 (54)	140 (64.5)	59 (57.3)	29 (50.9)
50–59	2 (6.9)	2 (4)	6 (2.8)	6 (5.8)	4 (7.0)
Missing	1 (3.4)	1 (2)	10 (4.6)	2 (1.9)	6 (10.5)
	Mean (SD)				
Years of education	15.66 (2.74)	14.95 (2.20)	16.79 (2.58)	17.94 (3.11)	16.21 (3.04)
Household income[c]	4.55 (1.82)	5.30 (2.67)	6.78 (2.59)	8.02 (2.40)	5.85 (2.44)
Perceived severity	2.00 (.89)	2.40 (.83)	3.12 (.79)	3.11 (.75)	2.95 (.88)
Scientific consensus	2.53 (1.56)	3.29 (1.25)	5.25 (1.21)	5.38 (1.25)	4.55 (1.66)
Mistrust toward authorities	5.22 (.81)	3.72 (1.21)	1.91 (.88)	1.64 (.73)	2.88 (1.72)

[a]For the 57 excluded participants, 12 were in the precontemplation stage (21.2%), 6 in the contemplation stage (10.5%), 23 in the preparation stage (40.4%), and 16 in the action stage (28.1%)

[b]Twenty-six of the excluded participants had missing data for years of education, 11 for household income, 15 for perceived severity, 19 for scientific consensus, and 10 for mistrust toward authorities

[c]The average household income is estimated to be equivalent to $71,000 in the precontemplation stage, $86,000 in the contemplation stage, $115,600 in the preparation stage, $140,400 in the action stage and $97,000 for the excluded participants
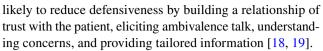
getting vaccinated once eligible or had already been vaccinated against COVID-19. Even though the idea of getting vaccinated was met with openness or enthusiasm by most of our sample, a significant proportion (17.8%) of participants were in the contemplation (COVID-19 vaccine hesitancy) or precontemplation (COVID-19 vaccine reluctance) stages of readiness to become vaccinated against COVID-19. These individuals tended to report more mistrust toward authorities, to perceive that there was little consensus between scientists about COVID-19 vaccination, and to worry less about the consequences for their family or themselves if they were to contract COVID-19. The most direct implication of these results is the need to offer a more personalized approach and tailor public health information and educational strategies

when promoting vaccination uptake. Understanding factors that characterize patients in the precontemplation and contemplation stages of change process will help health professionals recognize the concerns that act as barriers to vaccination and guide them to respond accordingly.

Considering our results, key strategies can be implemented at the population and individual level. At the population level, public health officials need to customize messages to ensure that scientific information is clearly and timely explained, especially regarding uncertainty and risk management. As underlined by Capurro and colleagues [17], it is crucial that health officials and political leaders deliver clear and consistent public messages and correct communication messages that were not interpreted as intended. Indeed,

Table 2 Results of the multinomial logistic regression analysis exploring determinants of COVID-19 vaccine intention

	Adjusted odds ratio	[95% CI]
Preparation vs. precontemplation		
Household income	0.65	[.48, .89]
Years of education	0.87	[.63, 1.18]
Perceived severity	0.39	[.16, .92]
Scientific consensus	0.55	[.31, .97]
Mistrust toward authorities	14.51	[5.86, 35.89]
Preparation vs. contemplation		
Household income	0.87	[.72, 1.04]
Years of education	0.76	[.61, .95]
Perceived severity	0.41	[.23, .73]
Scientific consensus	0.50	[.34, .73]
Mistrust toward authorities	2.56	[1.68, 3.91]

$R^2 = .56$ (Cox-Snell), .55 (McFadden). Model $\chi^2(10) = 245.38$, $p < .001$

in a context of rapidly changing scientific knowledge, an open and data-supported communication of uncertainty can reduce politicization, skepticism, and mistrust [17]. Moreover, media reporters play a major role in how uncertain and rapidly changing information is framed and communicated to overcome misinformation and disinformation.

At the individual level, health professionals should be prepared to discuss with vaccine reluctant patients the value of the different recommendations made by health authorities and governments, the consensus between scientists about the benefits of the COVID-19 vaccination, and the risks for their family or themselves of contracting COVID-19, as well as the inherent uncertainty about COVID-19. However, simply providing information and trying to debunk myths are unlikely to be sufficient in modifying entrenched health behaviors such as vaccination refusal, and may even increase defensiveness and hesitancy [18]. A motivational interviewing approach is likely to yield better results (see Gabarda & Butterworth [19] for a discussion on the use of motivation interviewing approach as part of the best practices to address COVID-19 vaccine hesitancy). With this approach, the goal is to reinforce patients' motivations for and commitment to a specific health goal, such as getting vaccinated against COVID-19. It is a collaborative approach in which the health care professional works with the patient to elicit and explore his/her reason to choose a specific change or behavior. It puts emphasis on creating an atmosphere of acceptance and compassion in which to explore a patient's real concerns [18]. This approach is less likely to be met with resistance than the traditional approach of trying to persuade with facts and scare tactics. By supporting individual autonomy, health professionals who favor motivational interviewing are more likely to reduce defensiveness by building a relationship of trust with the patient, eliciting ambivalence talk, understanding concerns, and providing tailored information [18, 19].

It is important to acknowledge the current study limitations. Selection bias cannot be ruled out: potential participants were told that the study focused on experience, behavior, and values regarding the COVID-19 vaccine. Therefore, it is possible that participants were more open to COVID-19 vaccination than those who chose not to participate. In addition, the sample is relatively small and is comprised of parents of school-aged children from a particular area of Canada. Therefore, precautions need to be taken before generalizing to other groups or the entire country. From a medical point of view, the fact that most participants who were not yet vaccinated reported high interest in getting a COVID-19 vaccine in the future is very positive. However, we acknowledge that the small number of participants in the precontemplation and contemplation stages can affect the stability of the regression results. Additional studies with larger sample size are needed to further explore vaccination intention.

Conclusions

Vaccination is the most powerful prevention tool against the current pandemic [8] and, fortunately, most individuals intend on getting vaccinated. Nevertheless, a non negligeable number of individuals intend on refusing the COVID-19 vaccine or are hesitant to receive it. Compared to those who intend on getting vaccinated, these individuals report more mistrust toward authorities, are less likely to perceive that there is consensus between scientists about COVID-19 vaccination and tend to be less worried about the consequences for their family or themselves if they were to contract COVID-19. Using a motivational approach to address their questions could help health professionals working in New Brunswick in assisting their patients in making the best healthcare decision for their family and themselves. The optimal outcome would be that the individuals in the precontemplation stage of change become at least open to the idea that vaccination can lower risks for themselves, their loved ones, and their community as well as improve their lives. This would help individuals in the contemplation stage of change move to the preparation stage of change and start to plan to get vaccinated. Identifying socio-demographic characteristics and understanding factors that influence vaccination intentions toward COVID-19 could also be crucial to tailor public health initiatives in terms of communication, education, and intervention strategies.

Declarations

Conflict of interest No conflict of interest to declare.

Ethical Approval Ethic approval obtained from the Ethics Committee of the Faculté des études supérieures et de la recherche, Université de Moncton. File # 2021-022.

Consent to Participate All participants gave free and informed consent to participate in the research.

Consent for Publication Not Applicable.

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