Characteristics associated with the willingness to receive a COVID-19 vaccine and an exploration of the general public's perceptions: A mixed-methods approach

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ABSTRACT

Demographics and media discourse impact vaccine hesitancy. We explored the New Zealand public's perceptions of COVID-19 vaccines and associated media portrayal, and determined predictive factors associated with willingness to receive vaccines. A community cohort (N = 340) completed online surveys. A logistic regression explored whether characteristics predict willingness to receive the vaccine. Textual data were analysed thematically. Willingness to receive the vaccine was high (90%). Having a postgraduate degree (p =.026), trying to receive an influenza vaccine (p <.001) and fewer concerns (p <.001) predicted willingness. Health keyworkers (p <.001) were less willing. Participants wanted the vaccine for protection and returning to normality. Reasons against receiving vaccines regarded safety, efficacy, and an unclear roll-out plan. The media was reported to generally provide good/positive coverage, but also engage in unbalanced reporting and spreading misinformation. Education strategies should include collaborations between media and scientists and focus on distributing easy-to-access information. Health keyworkers should be reassured of testing/safety.

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1. Introduction

Vaccinations against COVID-19 have been found to be safe, yet uptake remains a challenge. A key issue is vaccine hesitancy; the refusal and slow/delayed uptake or acceptance of a vaccine, as influenced by context, individuals/groups and the vaccine itself [1]. In a representative sample of 804 participants from the United States of America (USA), only two out of five were willing to receive the vaccine [2]. In 2020, 74% of people from New Zealand (NZ) reported wanting to get vaccinated once the COVID-19 vaccine became available, yet only 56% were willing to put their name on the list to get vaccinated [3].

Characteristics can help predict willingness to receive the COVID-19 vaccination among the general public. These include being male, older, married, college-educated, white, from higher socio-economic status groups, having had the influenza vaccine and high perceived benefits of the vaccine [2,4–6]. Misinformation,

spread by conspiracy theorists and the media, can reinforce hesitancy and concerns about receiving COVID-19 vaccines [6–8]. Common concerns include the speed of development, safety and side effects [3,9].

Research that seeks to understand COVID-19 vaccination hesitancy is crucial, as this knowledge can inform public health campaigns [2]. There is limited research into the NZ public's willingness to receive a COVID-19 vaccine. There is also a lack of data on the NZ public's perception of media portrayal of the vaccine. The first case of COVID-19 was confirmed in NZ on the 28th February 2020. Borders were closed to overseas citizens and international travellers until February 2022, to give the population time to be vaccinated. In NZ, only BioNTech/Pfizer was initially approved and distributed to keyworkers working at the border and managed isolation facilities in February 2021. Health keyworkers and the vulnerable (e.g., older adults, immunocompromised) were subsequently vaccinated. Mandates were introduced to those working in the health and disability sector, education and at the borders, with requirements to have received a second dose by 1st January 2022. This paper explores the NZ general public's perceptions of the COVID-19 vaccine when it first became available,

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the associated media portrayal and determines predictive factors associated with willingness to be vaccinated.

2. Material and methods

2.1. Study design, recruitment and sample

This cohort study consisted of three surveys, distributed online during the first 10 weeks of the pandemic (08/05/20–06/06/20), 12 weeks later (30/07/20–03/10/20) and more than six months later (08/03/21–10/04/21). The wider study was on stress and health during the COVID-19 pandemic, with vaccination attitudes assessed at time-point three. Participants were recruited through a link to the study website (https://www.covidstressstudy.com) which was distributed via social media and mainstream media (radio and digital media). Information on patient and public involvement strategies are reported elsewhere [10]. The study website hosted the information sheet, consent form and link to the survey. Participants provided consent and confirmed they were aged 18 years or older and residing in NZ. An initial power calculation showed that 252 participants would be sufficient to detect a R^2 value of 0.1 with 90% power and an alpha of 0.05. There was no upper limit on the sample size [10].

2.2. Data collection and measures

Surveys were hosted on Qualtrics. The first survey contained questions on demographic information (including age, gender, education and ethnicity), engagement in behaviours (exercise, smoking and alcohol consumption), pet ownership and measures for mental wellbeing, including perceived loneliness and the 7-item Generalized Anxiety Disorder (GAD-7) [11]. Participants reported their keyworker status and whether they had tried to receive an influenza vaccine in the last year and their risk of complications due to COVID-19.

In the third survey, eight questions about the COVID-19 vaccine and associated media portrayal were included (see supplementary file). Willingness to take the vaccine was assessed with five response options ranging from extremely unwilling to very willing. For this paper, only the data collected during the first and last surveys on the COVID-19 vaccine are reported. This includes demographic information, whether they had tried to receive a flu vaccine in the last year, anxiety and responses to questions on the COVID-19 vaccine.

2.3. Data analysis

The number of concerns related to receiving the vaccine expressed in question 7 were quantified and included in the statistical analysis. The free text responses to all open-ended items (questions 3, 4, 6–8) were analysed using qualitative methods.

2.4. Statistical analysis

Data were analysed using IBM SPSS (v.27). A logistic regression was conducted to investigate whether baseline variables predicted willingness to take the vaccination. Willingness to be vaccinated was dichotomised and coded as 0 (extremely unwilling, unwilling and unsure) or 1 (willing and very willing). Age, gender and education were entered in the first step. The following predictor variables from time-point 1 were entered subsequently: trying to receive an influenza vaccine in the last year, keyworker status, COVID-19 risk groups, and generalised anxiety disorder. One variable from time-point 3 (the number of vaccine-related concerns) was also entered in this step. Participants who had already received the COVID-19 vaccine at time-point 3 were included in the analysis. This is because they may have been unwilling to take the vaccine, but not had a choice (e.g., for front-line workers). Statistical significance was taken at p < 0.05.

2.5. Qualitative analysis

Textual data were analysed thematically [12] by two authors independently, using an inductive open-coding approach. Intercoder reliability was determined through a raw agreement rate (96.7%) and Cohen's kappa, which showed almost perfect agreement: κ = 0.935. Consensus and final themes were generated through discussion.

3. Results

In total, 340 participants responded to the surveys at the three timepoints. The participants were mostly female (92%) with a mean age of 44 years (SD = 16.7) (Table 1). Most were NZ European (74%) and over half had received a postgraduate degree (54%). Almost half were keyworkers (45%), with most working in healthcare (76%). Only 10% of participants were unwilling to receive the COVID-19 vaccine. The majority (79%) were not at a high risk for COVID-19 complications.

3.1. Number of concerns about the vaccine

In total, 172 participants of 340 (51%) reported concerns about the vaccine. The average number of concerns per respondent was 1.44 (SD = 0.78, range 1–5). Participants most commonly reported concerns related to safety (n = 123, 72%), fast development (n = 29, 17%), efficacy (n = 23, 13%) and other (inconvenience of receiving it, fear of needles, the vaccine masking COVID-19 symptoms or mutating the virus, someone else missing out due to limited supply, receiving an unnecessary vaccine due to having a low risk of getting COVID-19 and of having severe COVID-19 symptoms, and the vaccine containing a 5G microchip) (n = 45, 26%).

3.2. Willingness to receive the COVID-19 vaccine

A binary logistic regression was conducted to explore whether participant characteristics predicted willingness to receive the COVID-19 vaccine (Table 2). The first model was not significant and only predicted 4.1% of the variance in willingness to receive the vaccine, X^2(4, 276) = 5.89, p = 0.21. Only educational attainment (p = 0.024) was a significant contributor. Compared to participants without any university degree, those with a postgraduate degree were more willing to be vaccinated. The fully-adjusted model was significant, explaining 40.4% of the variance in willingness to receive the vaccine, X^2(10, 276) = 64.01, p < 0.001. Having a postgraduate degree (p = 0.026), trying to receive an influenza vaccine in the last year (p < 0.001) and reporting fewer vaccine concerns (p < 0.001) were significantly associated with being willing to be vaccinated. Being a health keyworker was significantly associated with less willingness to be vaccinated (p < 0.001).

3.3. Reasons for and against receiving the vaccine

Five themes described reasons for receiving the COVID-19 vaccine or why participants were unwilling to be vaccinated. Participants highlighted areas in which they wanted to know more about the vaccine. Quotes are presented in the supplementary file.

Table 1
Demographic information of participants who responded to the survey at time-point 3 (N = 340).

Variable	N [%]
Age (years)	43.6 ± 16.7 (18–84)
Gender	
Female	313 [92]
Male	25 [7]
Other	2 [1]
Ethnicity	
New Zealand European	253 [74]
Other	61 [18]
Chinese	11 [3]
Indian	8 [2]
Māori	5 [2]
Samoan	2 [1]
Education	
No tertiary education	95 [28]
Bachelor's degree	63 [19]
Post-graduate degree	182 [54]
Keyworker status	
Not a keyworker	188 [55]
Keyworker	152 [45]
Health Keyworker	116 [34]
Other Keyworker	36 [11]
Willingness to receive COVID-19 vaccine	
Willing	291 [90]
Not willing/unsure	33 [10]
Tried to get flu vaccine in last year	
Yes	229 [67]
No	111 [33]
Received COVID-19 vaccine	
Yes	15 [5]
No	309 [95]
COVID-19 risk groups	
Risk (some and increased)	72 [21]
No risk	268 [79]

3.3.1. Protection against COVID-19

In total, 314 participants reported reasons for wanting to receive the vaccine. The most common reason was for protection (*n* = 149, 47%). The vaccine was understood as a means of reducing/preventing mortalities and severe infections, and in possibly reducing transmission. Participants wanted to protect themselves and the wider community, including their families, friends, work colleagues, the vulnerable and those who cannot receive the vaccine for health reasons.

Some healthcare professionals were willing to receive the vaccine to protect their patients, themselves and their family members. A small number of frontline healthcare workers reported peer pressure to receive the vaccine and needed to receive it to continue working.

3.3.2. Going back to normal

Participants (*n* = 79/314, 25%) cited that the vaccine was necessary for society to go "back to normal." Many stated that they were willing to receive the vaccine, as it was required for international travel (i.e., vaccine passports) and for borders to re-open. Thirteen participants reported being willing to receive the vaccine to prevent more lockdowns and restrictions to daily life.

3.3.3. Safety concerns

Safety concerns were the most commonly (*n* = 126/281, 45%) reported reason for being unwilling to be vaccinated. Participants cited hearing/reading about people who had experienced severe reactions or died after receiving a vaccine, which made them feel nervous. Eleven women were concerned about the safety of receiving the vaccine during pregnancy or breastfeeding. Safety concerns were exacerbated by sentiment about rushed development of the mRNA vaccine technology and perceptions of inadequate testing/research. According to participants, the testing phase was too short and so long-term effects on health (e.g., infertility or exacerbating an underlying auto-immune disorder) were not clear. Some participants labelled the vaccine "experimental."

Participants wanted to know more about the safety of the vaccine, including for pregnant/breastfeeding women, children, and those with pre-existing conditions. They were interested in knowing how it works, the ingredients, how it was developed, how it was tested and in which groups. Long-term data were desired.

3.3.4. Contested efficacy

Some participants (*n* = 21/281, 7%) had concerns about efficacy. Doubts pertained to whether the vaccine could prevent infection and transmission of COVID-19 or reduce severe symptoms (if infected). Participants wanted to see more evidence for long and short-term efficacy, and know whether the vaccine was effective against new, evolving strains. They wanted to see international data, to determine how successful vaccination programs were. They also wanted to know whether and how many booster vaccines would be required.

Table 2
Logistic regression for factors associated with willingness to receive COVID-19 vaccine (n = 276).

Variable	Step 1				Step 2			
	β	Wald	Exp(B)	Sig. (P-value)	β	Wald	Exp(B)	Sig. (P-value)
Age	0.00	0.00	1.00	0.96	−0.01	0.15	0.99	0.68
Gender[a]	0.35	0.20	1.41	0.50	−0.78	0.77	0.46	0.29
Education[b,1]	0.10	0.04	1.11	0.82	0.06	0.01	1.06	0.94
Education[b,2]	0.96	4.83	2.62	0.024*	1.27	4.94	3.55	0.026*
Flu vaccine[c]					1.67	8.69	5.31	<0.001*
Keyworker status[d,1]					−2.01	11.42	0.13	<0.001*
Keyworker status[d,2]					−0.02	0.00	0.98	0.85
COVID-19 risk groups[e]					−0.35	0.35	0.70	0.62
GAD-7					0.22	0.26	1.02	0.68
Number of concerns					−1.22	23.76	0.30	<0.001*
Model Statistics								
Step 1: Nagelkerke R^2 = 0.04, X^2 = 5.89, p =.21								
Step 2: Nagelkerke R^2 = 0.40, X^2 = 64.01, p <.001								

Note. * denotes significance at *P* <.05.
Willingness to receive COVID-19 vaccine was coded 0 = no, 1 = yes.
[a] 0 = female, 1 = male; [b]0 = no university degree, 1 = bachelor's[1], 2 = postgraduate[2]; [c]0 = no, 1 = yes; [d]0 = not keyworker, 1 = health keyworker[1], 2 = other keyworker[2]; [e]0 = no risk, 1 = risk.

3.3.5. Unclear roll-out plan

Some participants (*n* = 33/308, 11%) wanted to know more about the vaccine roll-out program, including when the general population could receive the vaccine, and how the program was going to ensure equitable uptake and be managed by general practices. The plan in NZ was described as being more vague than that in the UK and USA, which had dedicated resources (i.e., mass vaccination clinics) and a clearer timeline.

3.4. Perceptions of the media portrayal of the COVID-19 vaccine

Participants accessed many sources to obtain information on the COVID-19 vaccine (see Fig. 1), including government communications (*n* = 258), online news sites (*n* = 166) and news TV (*n* = 146). The least common sources were word of mouth (*n* = 49) and newspapers (*n* = 58).

Three themes explained what was good and bad about the media portrayal of the COVID-19 vaccines, and how this coverage could be improved. The supplementary file presents the quotes/evidence.

3.4.1. Informative, positive and good coverage

Media portrayal was reported by 29% of participants (*n* = 82/281) as generally informative, positive and providing good coverage of the vaccine. Participants reported that media portrayals have been clear, careful, consistent, timely, and evidence-based. Potential improvements included providing more detail on the vaccine such as people's experiences and the roll-out plan.

3.4.2. Reputable communication

Some participants (*n* = 29/281, 10%) reported that government communications and outreach by scientists via the media gave good portrayals about the COVID-19 vaccine. Government communications included 1 pm sessions live-streamed to Facebook as well as their campaign, and website. This was seen as informative, reliable and sometimes preferred over other sources (e.g., TV or online sites). Radio shows, online news sites and cartoon illustrations were identified by participants as effectively communicating science, whereby the media gave scientists a voice.

Room for improvement included more reporting of science by journalists, which requires them to learn to interpret and understand scientific information or for involvement by scientists (e.g., checking media articles prior to publication). Other improvements included simplifying the information presented, making the sources easier to navigate and providing links to reputable sources.

3.4.3. Misinformation and unbalanced reporting

The media was identified by some participants (*n* = 56/281, 20%) as a means to easily spread misinformation through misleading headlines and 'sound bites' of information that exclude context and enable scaremongering. Participants reported that social media (especially Facebook) gave 'anti-vaxxers' and conspiracy theorists a platform to spread false information. Thirteen participants were concerned that reporting conspiracy theories and anti-vaccine discourse by the mainstream media would misinform the public on the safety of the vaccine, and ultimately deter them from obtaining one.

The mainstream media, especially online news sites, were also reported by participants (*n* = 54/281, 19%) to portray the vaccine in a sensationalised, biased and unbalanced manner. Controversial headlines were identified to generate click-bait and readership. There was no consensus amongst participants as to whether the vaccine was too negatively or positively framed. Positive framing tended to ignore evidence on side effects, while the negative framing tended to emphasise the side effects and critique the quality, safety and expiry-dates of the vaccine.
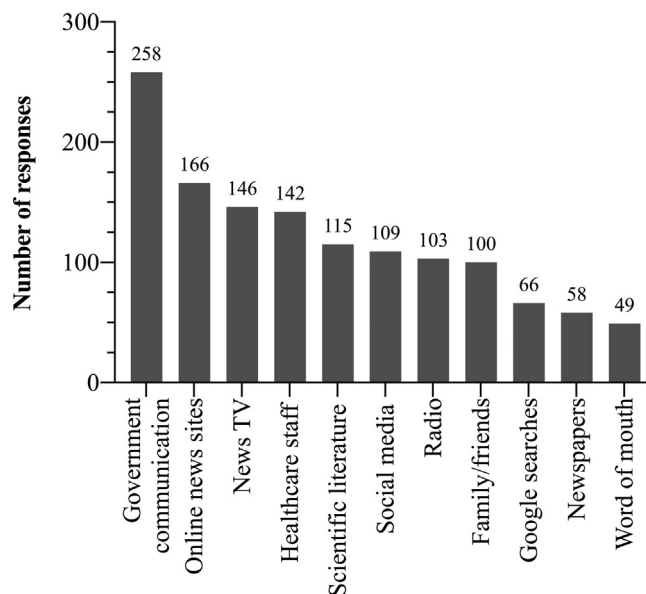

Fig. 1. Sources of information accessed for information on the COVID-19 vaccine.

Ideas for combating misinformation included debunking common myths by providing more information on how vaccines work and their manufacture. Other ideas included having behavioural and social scientists engage vaccine-hesitant members of the public, publishing scientifically correct information, using accurate headlines and not giving vaccine hesitant people or conspiracy theorists a platform. Participants suggested that re-framing of information should take a collectivist and public health angle, and include community leaders which is particularly important for vaccine-hesitant individuals or those who do not trust the government.

4. Discussion and conclusion

To our knowledge, this is the first study to also directly explore some of the general public's perceptions of the media portrayal of the COVID-19 vaccine. Overall, our sample were more willing to receive the vaccine compared to previous research conducted in the USA, China, NZ and Belgium [2,3,5,13]. The overall willingness (90%) aligns with the current vaccination rate, whereby 94% of the NZ eligible population (aged over 11 years old) were vaccinated with two doses on the 30th March 2022. On average, the number of concerns per participant was low. Consistent with previous literature, people who had higher levels of education, previously tried to receive (or had received) an influenza vaccine and reported fewer concerns about COVID-19 were significantly more willing to be vaccinated [2,4,7,14,15].

Surprisingly, health or social care workers were less willing to be vaccinated than non-keyworkers. This may be explained by perceptions on insufficient testing and fast development, whereby keyworkers were among the first to receive the vaccine, and therefore unable to observe others receiving it first. Keyworkers may have become complacent given that NZ did not experience the same level of hospitalisation and deaths as other countries. This was reported previously, whereby worry about COVID-19 and perceived risk was significantly lower in NZ than in the UK [10]. Explanations in the qualitative data pointed to the removal of choice among health staff. Research from 1,917 health and social workers in the UK supports this, demonstrating that those who felt pressure to receive a COVID-19 vaccine were more likely to decline an invitation to be vaccinated [16]. Reports from NZ show that a group of

healthcare providers have spread misinformation and penned an open letter opposing the vaccine [17]. Researchers should explore which keyworkers might be less willing to receive the vaccine and provide clear, positively framed information on vaccine safety.

Some of the reasons for receiving the vaccine were consistent with those reported before it was available, including protection of self, family and community, and to return to normal life [3]. A focus on collectivism may motivate people to get vaccinated by balancing perceptions of personal risk and societal benefit [18]. Concerns pertaining to safety and efficacy have previously been reported [3,9]. However, the data uncovered some conspiracy theories rife in NZ, including that the vaccine is made from aborted foetuses, contains 5G microchips and will exacerbate autoimmune conditions, and that those who receive it will experience infertility and die suddenly at 60 years of age.

Consistent with the literature, participants thought that social media was less trustworthy, given that misinformation was more likely to be spread [19]. However, they also reported that the mainstream media spread misleading information, engaged in sensationalist reporting and gave conspiracy theorists a platform. Future collaboration between media and scientists, or upskilling journalists in scientific literacy is needed. Information needs to be accessible, combat misinformation, positively framed, and accurate about adverse effects (e.g., UK *Covid Vax Facts* [20] chatbot) [18].

The mixed-methods approach enabled a deeper exploration of participants' perceptions as previous research has used multiple-response answers when exploring concerns about vaccine uptake [3,9]. The small and non-representative sample limits the generalisability of our findings, especially to countries where multiple vaccines are approved, males, ethnic minority groups and people without access to the Internet. A proxy (willingness) was used rather than actual behaviours.

This study provides novel insights into factors that predict willingness to receive the COVID-19 vaccine and explores media portrayal. Future interventions should distribute accessible and scientifically accurate information and focus on combating misinformation in healthcare workers. Collaboration between the media and scientists may promote reliable information.

Ethical approval

Ethical approval was granted by the Auckland Health Research Ethics Committee on May 5th, 2020 (Ref: AH1326).

6. Contributions

NG and EB managed recruitment and data collection. NG and CG analysed the data and prepared the first draft of the manuscript. All authors (NG, CG, KV and EB) contributed to the study design, interpretations of the findings and approved the final version of the manuscript. NG and CG contributed equally.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.vaccine.2022.04.092.

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