

# A cross-sectional study exploring the Covid-19 vaccination landscape in Malta through social media: An insight into experiences, attitudes, and perspectives

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## Abstract

**Background and Aims:** Covid-19 vaccines were disseminated across Europe from the end of 2020. Malta had one of the fastest vaccination rollouts in Europe and by March 2022 most adults had their booster dose. The aim was to investigate adult's perspectives, experiences, and attitudes regarding vaccination in Malta.

**Methods:** An anonymous online survey targeting adult social media users living in Malta was disseminated through social media, with a snowball technique. Demographic information, vaccination uptake, side-effects, perceptions, and experiences were gathered through quantitative and qualitative means. Participants were sub-grouped according to their vaccination status and descriptive analysis through frequency was performed.  $\chi^2$ /Fisher test testing followed by logistic regressions were performed to assess the vaccination perspectives according to vaccination status.

**Results:** Out of 611 participants 79.87% had the booster, 4.91% had two doses awaiting booster, 6.55% refused booster while, 8.67% refused any dose. Booster sub-group when compared to vaccine hesitant sub-group exhibited an association with the perception for the need to "continue wearing masks, maintaining physical distance and hand washing following vaccination" (odds ratio [OR]: 5.97 confidence interval [CI] 95%: 1.09–32.36  $p = 0.04$ ). Those waiting for the booster dose when compared to those refusing booster, exhibited an association with the perspective that "COVID-19 vaccine is the solution to returning to normality" (OR: 5.00 CI 95%: 1.12–22.35  $p = 0.04$ ). The commonest reason for inoculation was to protect against severe disease (63.08% CI 95%: 58.91–67.07). More pronounced booster adverse effects raised concern about future booster doses uptake. Unwillingness among anti-booster and vaccine hesitant arose among high socioeconomic background participants, with concern for vaccine safety and adverse effects.

**Conclusion:** Vaccine hesitancy is low yet, vaccination unwillingness even among highly educated may act as a barrier to control the pandemic. Clear, transparent

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public health communication which targets concerns is crucial, with unified messages from governing bodies optimizing population safety.

#### KEYWORDS

Covid-19, Malta, population health, public opinion, vaccination

## 1 | INTRODUCTION

The year 2020 saw the emergence of a new coronavirus in China that spread globally.<sup>1</sup> Clinical trials for developing a Covid-19 vaccine started early on pandemic as this was envisaged to be the solution to contain this virus.<sup>2</sup> The first Covid-19 vaccine approved in Europe was Comirnaty<sup>®</sup> (messenger RNA) and within a couple of months, other vaccines were approved in staggered fashion (Spikevax<sup>®</sup>—messenger RNA, Vaxzevria<sup>®</sup>—viral vector and Janssen<sup>®</sup>—viral vector).<sup>3</sup> The small European island of Malta, forms part of the European Union and like the rest of the member states received the first batch of Covid-19 vaccine doses at the end of December 2020.<sup>4</sup> A rapid vaccination roll-out was achieved, with over 90% of the population receiving at least one vaccine dose by Summer 2021, following a successful vaccination strategy and low vaccination hesitancy among the population.<sup>4</sup> Indeed, this (85.46 per 100 population) surpassed other small European Islands, Cyprus (71.20 per 100 population) and Iceland (76.76 per 100 population) up to the time of this study (6th February).<sup>5</sup> Vaccination efficiency in Malta was attributed to the small population size which enabled efficient planning. The vaccine framework was set up before arrival of the vaccines in Malta, with purchase of sufficient doses to cover the whole eligible population with the first and second doses while adhering to the manufacturer's dosing schedules. Additionally, vaccination hubs were continuously being opened along with the institution of mobile clinics to meet the demand, while ongoing outreach and vaccination campaigns were present through all types of media.<sup>4</sup>

Later, in September 2021, Malta started the booster dose inoculation among the elderly.<sup>6</sup> The invitation for the booster dose was extended to healthcare workers, front-liners, and teachers in November 2021, while the rest of the adult population could register for the booster as of the end of December 2021.<sup>7</sup> At the time of this study (February 6, 2022), a total of 1,222,529 doses were administered in Malta, out of which 334,448 were booster doses.<sup>8</sup>

The various vaccination strategic planning and their prompt execution enabled fast population vaccination, but adult's perspectives, experiences, and attitudes on Covid-19 vaccination in Malta has never been investigated. The study is set during the rapid dissemination of the booster dose in Malta. Considering that the investigation is based in Malta, a country praised for its fast vaccination roll-out, this study will provide invaluable insights on the vaccination landscape at a population level. This information is useful at a national level in the eventuality of the need for

dissemination of future booster doses as well as at international level for planning a vaccination rollout.

## 2 | MATERIALS AND METHODS

### 2.1 | Study design and participants

A cross-sectional study was carried out using an online anonymous questionnaire as the tool of measure, using Google Forms. At the time of the survey, Malta was experiencing a high surge in Covid-19 cases, and an online survey was considered the most appropriate and safest mode of dissemination through the use of the social media platform Facebook<sup>®</sup> and LinkedIn<sup>®</sup>. This mode of dissemination was regarded as appropriate since social media is mostly used to share public opinion and its users represent a substantial proportion of the global population.<sup>9</sup> Indeed, in 2021 it was reported that 420 K social media users, mostly to Facebook<sup>®</sup>, were registered in Malta, which contributes to a substantial proportion of the adult population (20+ years total population of 425,382).<sup>10,11</sup> It needs to be noted that social media users also include business, associations, groups and potentially individuals with duplicated accounts.

The target population was the adult population (18+ years) holding a social media account and residing in Malta. These inclusion criteria were clearly indicated within the social media post that was posted by the authors as well as part of the survey's introductory page before the participant gained access to the questionnaire.

Ethical approval was granted by the University of Malta Research Ethical Committee (MED-2022-00017).

### 2.2 | Sample size and sampling design

Using social media as the dissemination platform does not enable sample randomization. The latest reported figure (420 K) of social media users in Malta<sup>10</sup> was considered as an estimate representation of the target population. The sample size was calculated using an online calculator while considering a confidence interval of 95% and a margin of error of 5%.<sup>12</sup> The required sample size was estimated at 384 participants. Of note, since the target population utilized for sampling does not necessarily represent adults at an individual level, authors aimed for a higher sample size. However due to the nature of social media surveys, participation is very dependent on the survey's link exposure among users as well as the interest of users to participate in the survey.

## 2.3 | Questionnaire and data collection

The questionnaire was adopted from existing survey instruments that were identified following literature review.<sup>13–16</sup> Only a few questions were self-designed by the authors based on their expertise and the objectives of this study. The survey was prepared in English and in Maltese, following a back translation process.

The survey consisted of different sections (i) socio-demographic characteristics (gender, age, residing district, education level, employment and whether living with someone), (ii) perceptions regarding the Covid-19 vaccine, (iii) whether two vaccine doses, booster dose or no vaccine doses were taken, (iv) reasons for not taking the booster dose or any dose, (v) presence of any adverse effects following two doses and/or the booster, (vi) whether Covid-19 disease was acquired, and (vii) whether participants suffered from any chronic disease (defined as having a non-communicable disease that lasts for 3 months or longer<sup>17</sup>). A copy of the questionnaire is included as supplemental material.

As part of the questionnaire, three free-text sections were provided for participants to share comments on: (i) adverse effects experienced following the booster dose when compared to full vaccination; (ii) health status following booster dose; and (iii) health status following full vaccination.

The first online page of the survey gave a detailed account of what the study was about, the aim of the study and who was eligible to participate. Participants were informed that they could opt out of the questionnaire at any time, but should they consider taking part, they would be giving their informed consent to participate. Only participants in agreement of these terms and selecting to continue to the questionnaire gained access to the questions. All answers (except for the free-text sections) were mandatory for participants to move from one section to another and complete the questionnaire submission.

The link to the survey was disseminated through social media posts by the authors on January 25, 2022. A snowball technique was followed to increase participation, where the authors encouraged their social media followers to post the link to the survey on their social media page as well as share it with all their social media followers. The survey was closed off when no new response was registered for two consequent days. The survey link was available between January 25 and February 6, 2022.

## 2.4 | Outcomes

The outcomes of the study were to assess for the perspectives, experiences, and attitudes on Covid-19 vaccination in Malta among adult social media users. The sample size was based on the registered social media users. Considering that registered social media users relate to a substantial proportion of the adult population in Malta, the authors cautiously propose that the outcomes will be broadly representative of adults with a social media account.

## 2.5 | Statistical analysis plan

Data was exported to an Excel sheet. Only fully filled questionnaires (excluding free-text questions) were included in the analysis. The quantitative data collected was categorical and was subdivided into four sub-groups according to their vaccination status: (i) fully vaccinated awaiting booster; (ii) booster dose; (iii) fully vaccinated but do not want booster dose; and (iv) no vaccination. The study population characteristics was explored by stratifying the different socio-demographic variables (age groups, district, education level, employment and live with someone) according to the four-vaccination status sub-groups.

The vaccination attitudes and perspectives questions presented in this study were adapted from the literature.<sup>13</sup> For purposes of comparative analysis, the vaccination sub-group “fully vaccinated awaiting booster” was compared to “fully vaccinated but do not want booster,” while the “booster” sub-group was compared to “have not had any doses” sub-group. Comparisons were done between the “Agree” and the “Disagree” selections for each perspective statement. The “undecided” selection was omitted from this comparative assessment on the grounds that the participant was reporting an undecided perception.  $\chi^2$  test and Fisher's exact test (<5 value) were used to compare each perspective statement. A *p* value of <0.05 was considered as significant. Logistic regression models were performed to assess whether significant perspective statements following univariate analyses showed association with vaccination attitudes following adjustment for gender, age group, residing district, education level, employment, living with someone, suffering from a chronic disease, acquiring Covid-19, and experiencing Long Covid.

The attitudes toward vaccination uptake were also explored through descriptive analysis between different pre-defined reasons provided as part of the survey. The attitudes toward vaccine uptake were compared between those that took two doses (fully vaccinated) and those that took three doses (booster dose). Additionally, the predefined reasons for opting out of vaccination were compared between those opting out of the booster and not having any dose.

Vaccination experience was investigated through a two-fold approach. A quantitative descriptive analysis of the adverse effect/s experienced by those fully vaccinated and those getting the booster dose was performed. The vaccination experience was further explored among those that contributed to the free-text sections. This followed a two-stage coding and triangulation protocol. The responses were sorted and read for the first time. Convergence coding was used to identify key themes from each data source. The final coding framework was constructed through a second read and by convergence agreement between the authors.

## 3 | RESULTS

A total of 611 adults completed our survey (no questionnaires needed to be discarded due to partial completion), with a female predominance (74.47%; *n* = 455), mostly between the ages of 30–39 years (41.73%; *n* = 255). The majority reported having taken

the booster dose (79.87%;  $n = 488$ ), while 4.91% ( $n = 30$ ) had two vaccine doses and were awaiting the booster appointment. However, 6.55% ( $n = 40$ ) reported taking the two vaccine doses but refused to take the booster, while 8.67% ( $n = 53$ ) did not opt to take any vaccine dose. Table 1 provides the socio-demographic characteristics of the study population including whether Covid-19 infection was acquired and whether they suffered from any chronic disease stratified by their vaccination status. Most of the anti-booster and vaccine hesitant cohorts had a higher education level, were employed, lived with someone, never acquired the Covid-19 infection, and did not suffer from a chronic disease.

### 3.1 | Perceptions on COVID-19 vaccination

As part of the survey, participants were provided with 10 different statements about Covid-19 vaccine, as shown in Table 2. A significant difference in perception was present between those that welcomed all vaccine doses (booster sub-group) versus the vaccine hesitant. Similarly, this was reflected between those fully vaccinated but awaiting the booster dose and those opting out of the booster dose. Interestingly, agreement was observed across most participants, irrelevant of their vaccination status regarding the assertion that anyone suffering from a health condition should take the vaccine and that the vaccine does not provide long-term protection against Covid-19. Even though the anti-booster cohort shared similar perceptions with the vaccine hesitant, the majority reported that the vaccine helps in mortality and hospitalization reduction, while disagreeing that the taking the vaccine is useless.

Logistic regression modeling comparing those opting for the booster against the vaccine hesitant, following adjustment, established a positive association with the perception to "continue wearing masks, maintaining physical distance and hand washing following vaccination" (odds ratio [OR]: 5.97 confidence interval [CI] 95%: 1.09–32.36  $p = 0.04$ ) and with the disagreement that "vaccines control lives and freedom" (OR: 30.17 CI 95%: 1.96–51.02  $p = 0.05$ ). A negative association was present with the disagreement that "Mass vaccination is essential for the population to be protected against COVID-19" (OR: 0.11 CI 95%: 0.02–0.76  $p = 0.03$ ).

Modeling comparing fully vaccinated but awaiting the booster dose against those opting out of the booster dose, after adjustments, established a positive association with "COVID-19 vaccine is the solution to returning to normality" (OR: 5.00 CI 95%: 1.12–22.35  $p = 0.04$ ). A negative association was present with the disagreement that "Mass vaccination is essential for the population to be protection against COVID-19" (OR: 0.28 CI 95%: 0.09–0.89  $p = 0.03$ ).

### 3.2 | Experiences and attitudes on the COVID-19 vaccination

Most of the participants opted to take the two-dose vaccine to avoid contracting a severe form of Covid-19 as well to protect themselves

and others. These reasons were also evident for those opting to take the booster dose. Interestingly a proportion of the participants felt that they had no other choice but to take the vaccine as they were urged by society or their workplace. Table 3 provides a list of the different reasons for opting to take the two-dose and the booster vaccine among the study population.

Adverse effects following inoculation were reported by most of the participants, with the commonest adverse effect being pain at the injection site followed by fatigue. However, "pain at the injection site" was more pronounced following the booster dose than the two-dose vaccine. Similarities and differences in the reported postinoculation adverse effects following the two-doses and the booster dose are shown in Table 3.

On analyzing the free text, a total of 236 participants shared their experience with regard to the adverse effects following the booster dose, and health status following vaccination. Three themes were identified (i) "booster led to more severe adverse effects than the other doses" ( $n = 111$ , 47.03% CI 95%: 40.46–53.61), (ii) adverse effects were less severe following the booster when compared to previous doses ( $n = 23$ , 9.75% CI 95%: 6.41–14.44), and (iii) adverse effects experienced were perceived the same following all doses ( $n = 102$ , 43.22% CI 95%: 36.85–49.81). It is evident that experiencing more severe adverse effects following the booster dose was the commonest reported experience with some symptoms such as fatigue and back pain being experienced for a continuous period across months. A participant stated "I WONT TAKE BOOSTER 2, 3, 4, ETC... SINCE MY HEALTH GOT WORSE THAN EVER AFTER TAKING BOOSTER. CONTINUOUS LOWER BACK PAIN DAY AND NIGHT!!" while another participant reported "Felt tired for quite a long period of time. Months". Indeed, the commonest reasons for those opting out of the booster were the concerns on the vaccine safety and adverse effects, as shown in Table 4. Similar reasons were expressed by the vaccine hesitant, as shown in Table 4. In addition, a proportion of these shared the belief that once they were infected by Covid-19, they were immune for life.

## 4 | DISCUSSION

The study set out to explore the Covid-19 vaccination landscape among the Maltese adult population. The key findings were the positive perspectives toward vaccination by most of the participants. Although a proportion of the participants having high socioeconomic background opted out of vaccination, which is contradictory to finding reported by the neighboring country, Italy.<sup>18</sup>

The study participants reported different socio-demographic characteristics which were in par with those reported by Malta's national statistics office on a population level.<sup>11</sup> However, the findings need to be interpreted with the proviso that there was a female predominance and only a small proportion of the elderly population participated. The strong female participation can be attributed to the fact that females tend to be more health conscious than males and as already reported, both locally and internationally,

**TABLE 1** Socio-demographic characteristics of the study population by vaccination status

	Fully vaccinated awaiting booster (n = 30)	Booster (n = 488)	Fully vaccinated do not want booster (n = 40)	Have not had any doses (n = 53)	Total (n = 611)
<b>Sex</b>					
Male (n, %)	1 (3.33)	123 (25.21)	11 (27.5)	17 (32.08)	152 (24.88)
Female (n, %)	28 (93.33)	364 (74.59)	27 (67.50)	36 (67.92)	455 (74.47)
Prefer not to say (n, %)	1 (3.33)	1 (0.21)	2 (5.00)	0	4 (0.65)
<b>Age group</b>					
18–19 (n, %)	2 (6.67)	10 (2.05)	1 (2.50)	0.00	13 (2.13)
20–29 (n, %)	4 (13.33)	84 (17.21)	3 (7.50)	5 (9.434)	96 (15.71)
30–39 (n, %)	13 (43.33)	191 (39.14)	28 (70.00)	23 (43.40)	255 (41.73)
40–49 (n, %)	6 (20.00)	65 (13.32)	16 (5.00)	19 (35.85)	96 (15.71)
50–59 (n, %)	3 (10.00)	91 (18.65)	2 (5.00)	5 (9.43)	101 (16.53)
60–69 (n, %)	2 (6.67)	40 (8.20)	0.00	1 (1.89)	43 (7.04)
70–79 (n, %)	0.00	7 (1.43)	0.00	0.00	7 (1.15)
<b>District</b>					
Northern Harbor (n, %)	8 (26.67)	142 (29.10)	6 (15.00)	22 (41.51)	178 (29.13)
Southern Harbor (n, %)	4 (13.33)	57 (11.68)	6 (15.00)	7 (13.21)	74 (11.29)
South Eastern (n, %)	3 (10)	456 (11.48)	4 (10.00)	6 (11.32)	69 (11.29)
Western (n, %)	4 (13.33)	88 (18.03)	8 (20.00)	5 (9.43)	105 (17.18)
Northern (n, %)	10 (33.33)	94 (19.26)	12 (30.00)	5 (9.43)	121 (19.80)
Gozo (n, %)	1 (3.33)	51 (10.45)	4 (10.00)	8 (15.09)	64 (10.47)
<b>Education level</b>					
Up to secondary (n, %)	2 (6.67)	30 (6.15)	1 (2.50)	5 (9.43)	38 (6.22)
Up to sixth form (n, %)	7 (23.33)	84 (17.22)	4 (10.00)	8 (15.09)	103 (16.86)
Undergraduate (n, %)	16 (53.33)	184 (37.70)	17 (42.50)	23 (43.40)	240 (39.28)
Postgraduate (n, %)	5 (16.67)	190 (38.93)	18 (45.00)	17 (32.08)	230 (37.64)
<b>Employment status</b>					
Employed (n, %)	20 (66.67)	370 (75.82)	34 (85.00)	43 (81.13)	467 (76.53)
Unemployed (n, %)	0.00	2 (0.41)	1 (2.50)	3 (5.66)	6 (0.98)
Student (n, %)	5 (16.67)	57 (11.68)	2 (5.00)	0.00	64 (10.47)
Retired (n, %)	1 (3.33)	33 (6.76)	0.00	1 (1.89)	35 (5.73)
Stay home (n, %)	4 (13.33)	26 (5.33)	3 (7.50)	6 (11.32)	39 (6.38)
<b>Live with someone</b>					
Yes (n, %)	29 (96.67)	454 (93.03)	37 (92.50)	45 (84.91)	565 (92.47)
No (n, %)	1 (3.33)	34 (6.97)	3 (7.50)	8 (15.09)	46 (7.53)
<b>Acquire Covid-19 infection</b>					
Yes (n, %)	14 (48.28)	81 (16.67)	11 (28.95)	16 (31.37)	122 (19.97)
No (n, %)	15 (51.72)	406 (83.33)	27 (71.05)	37 (68.63)	486 (79.38)
<b>Suffer from chronic disease</b>					
Yes (n, %)	8 (26.67)	121 (24.80)	5 (12.50)	7 (13.21)	141 (23.08)
No (n, %)	22 (73.34)	367 (75.20)	35 (87.50)	46 (86.79)	470 (76.92)

TABLE 2 Perceptions on the Covid-19 vaccination across the different vaccination status study population

		Fully vaccinated awaiting booster (n = 30) n (%)	Fully vaccinated do not want booster (n = 40) n (%)	p Value	Booster (n = 488) n (%)	Have no had any doses (n = 53) n (%)	p Value
Perspective: The Covid-19 vaccine provide protection from getting the infection?	Agree	17 (56.67)	15 (37.50)	0.26	311 (63.73)	4 (7.55)	<0.001
	Disagree	7 (23.33)	12 (30.00)		126 (25.82)	42 (79.25)	
Perspective: The Covid-19 vaccine causes more side effects than those reported	Agree	7 (23.33)	30 (75.00)	<0.001	146 (29.92)	51 (96.23)	<0.001
	Disagree	7 (23.33)	1 (2.50)		177 (36.27)	0	
Perspective: Mass vaccination is essential for the population to be protection against Covid-19	Agree	24 (80.00)	12 (30.00)	<0.001	416 (85.25)	3 (5.66)	<0.001
	Disagree	2 (6.67)	13 (32.50)		23 (4.71)	41 (77.36)	
Perspective: It is essential to continue wearing masks, maintaining physical distance and hand washing following vaccination	Agree	26 (86.67)	20 (50.00)	<0.001	396 (81.15)	20 (37.74)	<0.001
	Disagree	1 (3.33)	13 (32.50)		43 (8.81)	23 (43.40)	
Perspective: The Covid-19 vaccine provides long term protection against Covid-19 infection	Agree	9 (30.00)	1 (2.50)	<0.001	109 (22.34)	1 (1.89)	<0.001
	Disagree	11 (36.67)	25 (62.50)		204 (41.80)	47 (88.68)	
Perspective: Those suffering from health issues should take the vaccine	Agree	20 (66.67)	20 (50.00)	0.52	363 (74.39)	22 (41.51)	<0.001
	Disagree	3 (10.00)	5 (12.50)		31 (6.35)	15 (28.30)	
Perspective: The Covid-19 vaccine reduced deaths and hospitalization	Agree	21 (70.00)	19 (47.50)	0.14	387 (79.30)	11 (20.75)	<0.001
	Disagree	3 (10.00)	8 (20.00)		40 (8.20)	30 (56.60)	
Perspective: Taking the Covid-19 vaccine is useless	Agree	4 (13.33)	5 (12.50)	0.60	21 (4.30)	25 (47.17)	<0.001
	Disagree	20 (66.67)	17 (42.50)		389 (79.71)	8 (15.09)	
Perspective: The Covid-19 vaccine is the solution to returning to normality	Agree	17 (56.67)	2 (5.00)	<0.001	323 (66.19)	1 (1.89)	<0.001
	Disagree	4 (13.33)	26 (65.00)		59 (12.09)	45 (89.91)	
Perspective: The Covid-19 vaccine is controlling our lives and freedom	Agree	12 (40.00)	35 (87.50)	<0.001	170 (34.84)	47 (88.68)	<0.001
	Disagree	9 (30.00)	2 (5.00)		243 (49.80)	2 (3.77)	

**TABLE 3** Comparisons between the two-dose and booster vaccine doses reasons for uptake and postinoculation adverse effects

	Two doses uptake (n = 558) n (%; CI 95%)		Booster uptake (n = 488) n (%; CI 95%)	
Reasons	Wanted to avoid severe disease	352 (63.08, 58.91–67.07)	Wanted to avoid severe disease	306 (62.70, 58.23–66.92)
	Wanted to travel	159 (28.49, 24.82–32.47)	Wanted to travel	141 (28.89, 24.95–33.17)
	Wanted to lead a normal life	248 (44.44, 40.29–48.68)	Wanted to lead a normal life	235 (48.16, 43.65–52.69)
	Wanted to help eradicate the virus	220 (39.43, 35.37–43.63)	Wanted to help eradicate the virus	200 (40.98, 36.61–45.50)
	Right thing to do to protect myself and others	363 (65.05, 60.92–68.98)	Right thing to do to protect myself and others	305 (62.50, 58.02–66.78)
	I am a vulnerable person had to protect myself	41 (7.35, 5.39–9.92)	I am a vulnerable person had to protect myself	34 (6.97, 4.94–9.69)
	Urged by my social environment	70 (12.54, 9.97–15.65)	Urged by my social environment	69 (14.14, 11.24–17.62)
	Following the advice of public health	1 (0.18, 0.01–1.16)	Following the advice of public health	1 (0.20, 0.01–1.32)
	Due to work	7 (1.25, 0.55–2.69)	Due to work	5 (1.02, 0.38–2.52)
Adverse effects	Pain at injection site	291 (52.15, 47.92–56.36)	Pain at injection site	338 (69.26, 64.93–73.29)
	Fatigue	281 (50.36, 46.13–54.58)	Fatigue	228 (46.72, 42.24–51.26)
	Muscle aches and pains	215 (38.53, 34.50–42.72)	Headaches	163 (33.40, 29.26–37.81)
	Headaches	204 (36.56, 32.58–40.73)	Muscle aches and pains	159 (32.58, 28.48–36.97)
	Fever	182 (32.62, 28.77–36.71)	Fever	122 (25.00, 21.27–29.13)
	Chills	157 (28.14, 24.48–32.10)	Chills	115 (23.57, 19.92–27.64)
	Joint aches and pains	144 (25.81, 22.27–29.69)	Joint aches and pains	106 (21.72, 18.20–25.70)
	Back pain	87 (15.59, 12.74–18.83)	Back pain	80 (16.39, 13.28–20.05)
	Redness at injection site	63 (11.29, 8.84–14.28)	Redness at injection site	61 (12.50, 9.76–15.84)
	Asymptomatic	47 (8.42, 6.32–11.12)	Asymptomatic	49 (10.04, 7.59–13.14)
	Diarrhea	28 (5.02, 3.42–7.26)	Numbness in legs/arms	25 (5.12, 3.41–7.57)
	Vomiting	10 (1.79, 0.91–3.38)	Diarrhea	20 (4.10, 2.59–6.37)
	Palpitations/chest pain	7 (1.25, 0.55–2.69)	Pins & needles/electrical shocks	15 (3.07, 1.79–5.13)
	Change in menstruation cycle	6 (1.08, 0.44–2.45)	Swollen lymph nodes	9 (1.84, 0.90–3.60)
	Nausea	6 (1.08, 0.44–2.45)	Vomiting	8 (1.64, 0.76–3.33)
	Swollen lymph nodes	3 (0.54, 0.14–1.70)	Palpitations/chest pain	6 (1.23, 0.50–2.79)
	Insomnia	2 (0.36, 0.06–1.43)	Respiratory problems	5 (1.02, 0.38–2.52)
	Flu-like symptoms	2 (0.36, 0.06–1.43)	Nausea	3 (0.61, 0.16–1.94)
	Dizziness	1 (0.18, 0.01–1.16)	Pain in both legs	2 (0.41, 0.07–1.64)
	Allergic reaction	1 (0.18, 0.01–1.16)	Change in menstruation cycle	2 (0.41, 0.07–1.64)
Pulmonary embolism	1 (0.18, 0.01–1.16)	Dizziness	2 (0.41, 0.07–1.64)	
		Flu-like symptoms	1 (0.20, 0.01–1.32)	

females experienced higher adverse effects following Covid vaccination,<sup>19,20</sup> which might have prompted them to participate more in this study. Apart from the fact that females are known to participate more than males in online surveys.<sup>21</sup> Despite this, all the study participants were exposed to the same Covid-19 situation experienced in Malta over the past two years, including the same governance environment and public health advice.<sup>4,22</sup> It is evident that a general high level of

trust in science, public health and government was present among the study participants, which is known to be the main driver for vaccination compliance.<sup>23–25</sup> A strong perception toward vaccination was observed mostly among those opting for three doses in this study, even after adjusting for potential confounders. Although, a proportion opted to take the vaccine out of the necessity to continue to work and lead a social life. This comes at the backdrop where just a

Reasons for opting out of the booster dose (n = 40)	n (%), CI 95%
I am afraid of the side effects	23 (57.50, 41.01–72.58)
I am afraid after hearing so many scary stories following the booster dose by others	16 (40.00, 25.28–56.61)
I do not want to be administered anything whose long term safety profile is unclear	26 (65.00, 48.26–78.90)
I believe vaccination is not necessary	5 (12.50, 4.69–27.60)
I have already been infected by Covid-19, hence immune against it	8 (20.00, 9.61–36.41)
I do not do what others do	7 (17.50, 7.89–33.36)
I took the two-dose vaccination but due to side effects I experienced I do not want to take the booster	13 (32.50, 19.07–49.24)
Exempted from booster due to severe side effects	1 (2.50, 0.13–14.73)
Reasons for opting out of any dose (n = 53)	n (%), CI 95%
I am afraid of the side effects	31 (58.49, 44.18–71.58)
I am afraid after hearing so many scary stories following vaccination by others	19 (35.85, 23.49–50.25)
I do not want to be administered anything whose long term safety profile is unclear	40 (75.47, 61.42–85.81)
I believe vaccination is not necessary	10 (18.87, 9.89–32.41)
I have already been infected by Covid-19, hence immune against it	16 (30.19, 18.74–44.51)
I do not do what others do	7 (13.21, 5.91–25.95)
The short term protection of the vaccine makes it not worth it	2 (3.77, 0.66–14.08)
Not convinced the vaccine is safe at all	15 (28.30, 17.20–42.56)

**TABLE 4** Reasons for opting out of vaccination doses across the study population

few days before registration for the booster dose was open for the public, a mandate was put in place where only those holding a valid vaccine pass (two vaccine doses valid for 3 months and booster valid for 9 months) could enter all entertainment establishments including cafes, restaurants, and bars, as well as work in the catering and leisure sectors.<sup>26</sup> Despite this, a proportion of those already fully vaccinated with two doses opted not to take the booster. General mistrust in the vaccine was the dominant factor for resistance to take the booster or any vaccine dose, coinciding with other findings.<sup>27</sup> Experiencing adverse effects following the two-dose vaccination as well as concern regarding adverse effects appeared to have played an important role in the study's participants decision not to take the booster dose. Indeed, most of this cohort, along with the vaccine hesitant participants, perceived that the Covid-19 vaccine causes more adverse effects than those reported. This coincides with challenges faced by other European countries, resulting in vaccine hesitancy.<sup>28</sup> Interestingly, although most of the anti-booster cohort perceived the vaccine to be controlling their freedom and lives and that the vaccine is not a solution to return to normality, in contrast to the vaccine hesitant, they perceived the vaccine to be useful and reduces mortality and hospitalization. This suggests that although on a personal level they were not ready to take the booster, on a population level vaccination was perceived as beneficial. On evaluating this cohort's (opting out of booster) socio-demographic

characteristics, these were mostly young (30–49 years), with high education, healthy and never contracted Covid-19. These features could have had a determinate role in their decision not to take the booster. Indeed, these characteristics coincide with findings of a UK based study that determined these factors to be leading to population unwillingness to receive a booster dose.<sup>29</sup> The attitude perceived by some skeptics that having acquired prior Covid-19 infection provides long term immunity will inevitably have negative repercussions especially among the elderly and vulnerable individuals. This may result in a surge of hospital admissions and deaths, especially with the emergence of highly transmissible variants such as Omicron and its ability to evade the immune system.<sup>30</sup>

Several postvaccination adverse effects appeared to have been experienced by the study participants. The mostly commonly reported adverse effects including pain at the injection site, fatigue, headaches and muscle pains that coincide with the literature.<sup>31</sup> These adverse effects were observed to be more prominent following the booster dose, an indication of a higher immune response.<sup>32</sup> Other uncommon reported adverse effects were reported such as menstruation cycle changes, which have been linked with an immune activation effect as a response to the viral infection as well as hormonal influence arising from immune stimulation.<sup>33</sup>

This study should be considered in the context of its strengths and limitations. This is the first study in Malta to explore vaccination



attitudes, perceptions and experiences and thus provides timely information that public health officials and policy makers can utilize to mitigate vaccination hesitance and increase vaccine uptake. This observational study was disseminated using social media and appeared to have been well accepted by the adult population, managing to capture a good proportion of adults across different socioeconomic strata. Although the response of this study was almost double the calculated sample size required, which was based on the registered number of social media users in Malta, it still does not necessarily reflect the experiences, attitudes, and perspectives of all the general adult population in Malta. Sampling was based on the registered number of social media users which does not reflect only individual users. Furthermore, not every adult has a social media account, especially within the elderly population, which is reflected in this study by low participation above an age threshold. Hence, while the study findings may not be entirely representative of the whole adult population in Malta, it may be cautiously inferred that this study provides an adequate snapshot of the experiences, attitudes, and perspectives of registered adults to social media. A female dominant response was achieved, this follows the literature that females tend to respond more to online surveys than their male counterparts.<sup>21</sup> The study's results could have been influenced by this female dominant survey landscape.

The small size could have affected the statistical power of the study—a larger study is recommended. Another factor to note is that the survey link could be accessed to anyone holding a social media account, including people not residing in Malta and younger (not eligible) population. Due to the anonymous nature of the survey, it is not possible to ensure that all participants fell within the eligibility criteria of the study. There is also the possibility of self-reporting and recall bias, as with any questionnaire. Additionally, the behavior of the participants with regard to vaccination might have changed following completion of this survey.

## 5 | CONCLUSION

The adult population generally accepted the Covid-19 vaccine although unwillingness to take the booster dose or any dose was mostly based on concern for vaccine safety and adverse effects. This may act as a barrier to maintain the progress done so far in controlling the pandemic. Urgent public health action is required to ensure that communication with the public is clear, transparent and targets the concerns identified. It is also important that a unified message from the state is put forward while ensuring the safety and wellbeing of the whole population.

## AUTHOR CONTRIBUTIONS

**Sarah Cuschieri:** Conceptualization; data curation; formal analysis; methodology; project administration; writing – original draft; writing – review and editing. **Stephan Grech:** Methodology; project administration; writing – review and editing. **Victor Grech:** Supervision; writing – review and editing. All authors have read and approved the final version of the manuscript.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions. The corresponding author had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

## TRANSPARENCY STATEMENT

The lead author Sarah Cuschieri affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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