

Short paper

Italian adults' likelihood of getting COVID-19 vaccine: a second online survey

Luigi Roberto Biasio^{1*}, Guglielmo Bonaccorsi², Chiara Lorini², Daniela Mazzini³ and Sergio Pecorelli⁴

¹ Giovanni Lorenzini Foundation, Viale Piave 35, 20129 Milan, Italy; lrbiasio@gmail.com

² Department of Health Sciences, University of Florence, Italy; guglielmo.bonaccorsi@unifi.it

³ Central Tuscany Local Health Unit, Florence, Italy; daniela.mazzini@uslcentro.toscana.it

* Correspondence: lrbiasio@gmail.com Tel. +39 335 347332

Abstract: Rapid online surveys are an important tool in tracking the public's knowledge and perceptions during infectious disease outbreaks. In June 2020, during the early phases of COVID-19 vaccines development, a survey had been conducted, aimed at assessing attitudes and opinions about vaccination of 885 Italian adults, in addition to their vaccine literacy levels (i.e. skills of finding, understanding and using information about vaccines). In January 2021, the same questionnaire has been administered to a similar population (n=160). Interactive vaccine literacy was significantly higher than in June 2020 (mean score 3.38 vs 3.27 respectively, $P=.0021$). The percentage of participants willing to be vaccinated against COVID-19 was assessed by the means of either-or questions, and was equally high in both surveys (>90%), which is quite reassuring, despite metrics based on categorical scales cannot identify hesitant subjects.

Keywords: COVID-19; online surveys; vaccines; vaccine literacy

1. Introduction

Since the onset of COVID-19 pandemic various surveys have been conducted aimed at assessing people's vaccine acceptance, showing significant differences across countries, ranging from about 40% to >90% [1]. These discrepancies may be linked to the diverse geographical situations and time of execution of the surveys, as well as to the phases of the clinical development of the candidate vaccines and the consequent dissemination of information by the media. In addition, different methodologies have been used to collect data: most of the investigations were self-reported, conducted via the web, some were longitudinal, other were cross-sectional. Moreover, in some studies answers were gathered forcing the respondents to express an either-or opinion (nominal scales), while others used odd-numbered ordinal scales, such as Likert's. The latter allow a more sensitive evaluation of attitudes – also identifying hesitant individuals - and produce a better distribution of data, but may be less objective, leaving the possibility of intermediate or indecisive answers. Findings from this kind of tools are useful to guide communication strategies and information campaigns by public health authorities to counter vaccine hesitancy, but may provide little help when specific individuals' opinions are key to comprehending their instant behavior.

In June 2020, we conducted a rapid online cross-sectional survey [2] to evaluate the feasibility of assessing the levels of health literacy skills about vaccination (vaccine literacy) in 885 Italian adults. Other objectives were to collect opinions and attitudes of the interviewees about candidate COVID-19 vaccines, including willingness to get vaccinated, using nominal scales ('yes' or 'no' questions). Results showed that intention to receive a COVID-19 vaccine was very high (92%) and significantly greater than receiving seasonal influenza vaccine. This investigation also showed quite high levels of functional and interactive-critical vaccine literacy, i.e. individuals' abilities to collect, understand, comprehend and use information about vaccines.

Following conditional marketing authorization for some COVID-19 vaccines granted by the European Medicines Agency (EMA) in December 2020, the survey was repeated targeting a similar population, at a time when vaccination campaigns started in Italy, aimed at verifying whether opinions and attitudes had changed, in particular about the likelihood of vaccine acceptance. Secondary objective was to confirm vaccine literacy skills using a validated scale.

2. Materials and Methods

In January 2021 we conducted a new cross-sectional survey by the same methodology as for the previous one (June 2020). An anonymous online questionnaire, to which the respondents (>18 years of age) could choose to complete or not, was prepared, distributed, and collected by SurveyMonkey™. The same questions used in the first investigation were administered, except for the items regarding COVID-19 and flu vaccines, due to the different situation with respect to the preceding enquiry. All variables of the questionnaire administered in June 2020 are listed in table 1, while the updated items are reported in table 2. Likelihood of getting a COVID-19 vaccine (measured by a nominal scale) has been considered as the primary objective of this new survey. To address the secondary objective (i.e. to confirm vaccine literacy skills) we used a psychometric scale already validated [3], including four functional and eight interactive-critical items. Answers were rated by a forced 4 point Likert scale for frequency. As in previous studies using a similar scale [2, 4, 5], the score was obtained from the mean value of the answers to each item (range 1 to 4), a higher value corresponding to a higher vaccine literacy level.

Distribution of the questionnaire followed the same rules than before, adopting a convenience sample. An URL, linking to the questionnaire, was posted via Facebook or sent via e-mail to the same addressees of the previous survey, selected from the mailing list of Giovanni Lorenzini Foundation (Milan, Italy), asking them to forward the link to others, without communicating back their list of the addressees. A reminder was sent one week later. The addressees were balanced according to three geographical areas, northern, central, and southern Italy & the largest islands (Sardinia and Sicily).

The questionnaire was composed of two pages: on the first page, participants were provided with information about the rationale and scope of the survey, i.e. to gather opinions and attitudes as well as modalities and abilities to collect, understand, and use information about vaccination, including COVID-19 vaccines. Respondents were asked to provide honest answers, were not given any incentives for participation and could reply only once to the survey. They were informed that proceeding to the second page of the survey and completing the questionnaire constituted consent. No targeted replies were purchased. Participants could send answers via PC, tablet, or smartphone.

Statistical analysis has been carried out using MedCalc Statistical Software version 18.2.1 [6] by means of descriptive tables including percentages, means, standard deviations (SD), confidence intervals (CI), medians, and non-parametric tests, as the data did not follow a normal distribution. In particular, Mann-Whitney test for independent variables was used to compare the results of the new survey vs the previous one. Kruskal-Wallis test was applied to assess association between variables. Cronbach's alfa coefficient was calculated to confirm internal consistency of the collected data of vaccine literacy skills. For each analysis, an alpha level = .05 was considered as significant.

Considering the results of the previous survey, assuming a prevalence of 8% refusal, at 95% confidence level and 5% confidence interval, 114 responses were considered to be as the minimum acceptable number.

Table 1. June 2020 survey - tools employed to assess skills, perceptions, attitudes and opinions.

Variable	Measure and Items	Assessment / score
Vaccine Literacy functional skills	When reading or listening to information about future COVID-19 vaccines or current vaccines:	Ordinal, 4 points Likert scale for frequency:

	<ol style="list-style-type: none"> 1. Did you find words you didn't know? 2. Did you find that the texts were difficult to understand? 3. Did you need much time to understand them? 4. Did you or would you need someone to help you understand them? 	Often (1), Sometimes (2), Rarely (3), Never (4)
Vaccine Literacy interactive/ critical skills	<p>When looking for information about future COVID-19 vaccines or current vaccines:</p> <ol style="list-style-type: none"> 1. Have you consulted more than one source of information? 2. Did you find the information you were looking for? 3. Have you had the opportunity to use the information? 4. Did you discuss what you understood about vaccinations with your doctor or other people? 5. Did you consider whether the information collected was about your condition? 6. Have you considered the credibility of the sources? 7. Did you check whether the information was correct? 8. Did you find any useful information to make a decision on whether or not to get vaccinated? 	Ordinal, 4 points Likert scale for frequency: Often (4), Sometimes (3), Rarely (2), Never (1)
Opinions about vaccination	<p>How much do you agree with the following statements:</p> <ol style="list-style-type: none"> 1. <i>'I am not favorable to vaccines because they are unsafe'</i> 2. <i>'There is no need to vaccinate because natural immunity exists'</i> 	Ordinal, 4 points Likert scale for agreement: Totally (1), A little (2), Partially(3), Not at all (4)
COVID-19 vaccines perceptions and attitudes	<p>About future COVID-19 vaccines:</p> <ol style="list-style-type: none"> 1. Will be possible to produce safe and efficacious vaccines? 2. Will you get vaccinated, if possible? 3. Will Authorities succeed in vaccinating the entire population? 4. Would you pay a fee to be vaccinated? 5. Should children be vaccinated too? 	Nominal YES/NO
Current vaccines attitudes	<p>About current vaccines:</p> <ol style="list-style-type: none"> 1. Have you been vaccinated against flu last season? 2. Will you get vaccinated against flu this year? 3. Do you plan to be vaccinated against other infectious diseases? 	Nominal YES/NO

Table 2. January 2021 survey - tools employed to assess attitudes about COVID-19 and flu vaccines.

Variable	Measure and Items	Assessment
COVID-19 vaccines attitudes	<p>About COVID-19 vaccines:</p> <ol style="list-style-type: none"> 1. ...do you think the vaccines developed so far are safe? 2. ...do you think they are efficacious? 3.do you think they overlap, regardless of the production technique used? 4. ...do you intend to get vaccinated against COVID-19? 5. if you could, would you choose which vaccine to take? 6. ...will the Government be able to offer the vaccine against COVID-19 free for everyone? 7. ...would you pay a fee to be vaccinated? 8. ...should vaccination against COVID-19 be made mandatory for everyone? 9. ...should vaccination against COVID-19 be made compulsory for the most at-risk groups? 10. ...do you think children should be vaccinated too? 	Nominal YES/NO

Current vaccines attitudes	About other vaccines:	
	1. ...have you been vaccinated against flu?	
	2. ...you wanted to be vaccinated against the flu, but you couldn't?	Nominal YES/NO
	3. ...have you been recently vaccinated and/or do you intend to be vaccinated soon against other infectious diseases, in addition to influenza and COVID-19?	

3. Results

Answers were collected instantly, right at the time when COVID-19 vaccination campaign started in Italy, from January 12 to January 30, 2021; 160 respondents completed and submitted the questionnaire.

Main findings are reported in Table 3. Cronbach's coefficient values, calculated from the replies to both the functional and interactive-critical scales, were acceptable ($= 0.8030$ and $= 0.7029$, respectively) and comparable to those of the previous survey.

Table 3. – Demographics, Vaccine Literacy (VL) scores and attitudes toward vaccinations. Findings from the June 2020 and January 2021 surveys, and level of significance (Mann-Whitney for independent samples, margin of error 5%).

Variable		June 2020 n = 885	January 2021 n = 160	P
Sex (F %)		50%	62%	= .006
Age classes	18-30 y.s	206 (23%)	89 (56%)	< .001
	31-50 y.s	327 (37%)	36 (23%)	
	51-65 y.s	270 (31%)	33 (20%)	
	>65 y.s	82 (9%)	2 (1%)	
Educational degree	Secondary	356 (40%)	51 (32%)	n.s.
	Tertiary	478 (54%)	102 (64%)	
	Others	21 (6%)	7 (4%)	
Residence area	Northern	260 (30%)	42 (26%)	n.s.
	Central	455 (53%)	103 (65%)	
	Southern	140 (17%)	14 (9%)	
Functional VL mean score (SD) [95% CI]		2.92 (0.70) [2.87 - 2.97]	2.99 (0.63) [2.89 - 3.08]	n.s.
Interactive-critical VL mean score (SD) [95% CI]		3.27 (0.54) [3.23 - 3.30]	3.38 (0.46) [3.23 - 3.30]	= .021
Willing receiving COVID-19 vaccine		816 (92%)	145 (91%)	n.s.
Planning or receiving seasonal flu vaccine		588 (66%)	95 (59%)	n.s.
Planning receiving other vaccines		649 (73%)	104 (65%)	n.s.

3.1. Demographics

Fifty-six percent of participants were in the 18-30 age class (in the preceding survey they were 23%), the remaining were evenly distributed between 31 and 65 years of age; only two persons were over 65. The difference among age groups was highly significant (Mann-Whitney $P < .001$).

Ninety-eight percent of participants were native Italian speakers.

Females were 62%, while in June 2020 they were 50% (Mann-Whitney $P = .006$).

Differences between areas of residence and educational degree were not statistically significant, while the occupational status showed marked differences, with a higher percentage of students (43%), with respect to the first survey (14%) (Mann-Whitney $P < .001$) and much less employed and retired persons. Information sources were very similar in both investigations with the highest preference for internet and streaming (81%), followed by TV (47%) and social media (40%).

3.2. Vaccine literacy, attitudes and opinions

Regarding vaccine literacy skills, scores were similar between the two surveys for both the functional and the interactive-critical scales, although the latter was significantly higher in January 2021 (score 3.38 ± 0.46 vs 3.27 ± 0.54 , Mann-Whitney $P < .05$).

In January 2021, results have shown that 91% of respondents intended to receive one of the COVID-19 vaccines, the majority (89%) trusting their safety and efficacy. However, 50% of interviewees believed that the characteristics of various vaccines do not overlap with each other, and 60% would prefer to choose which one to receive. Fifty-nine percent of respondents were in favor of a mandatory COVID-19 vaccination, and 69% considered the Government capable to offer the vaccine free for everyone, whereas many (79%) were willing to pay for the shot; 69% percent believed that children should be immunized too.

Regarding flu immunization, 38% of respondents had been vaccinated against flu during the last seasonal campaign. In addition, 21% didn't succeed to receive the shot due to vaccine shortage. Sixty-five percent declared their intention to be immunized against other infectious diseases, in addition to COVID-19 and influenza.

The majority of respondents disagreed completely with both statements: '*I am not favorable to vaccines because they are unsafe*' (77%) and '*There is no need to vaccinate because natural immunity exists*' (82%). Few respondents were partially in disagreement (20% and 14%, respectively) and much fewer were partially in agreement (3% and 4%, respectively). Answers in total agreement with both statements were very rare (<1%). These proportions were not significantly different from the precedent survey. Noteworthy, positive opinions about vaccines for both statements were significantly associated with higher interactive-critical vaccine literacy levels (Kruskal-Wallis $P < .05$), likelihood to accept COVID-19 ($P < .001$) and flu vaccination ($P < .05$), but not with functional vaccine literacy, any of the age classes, gender, education or occupational status.

4. Discussion

Although not corresponding exactly to the same panel, the populations of our first and the second survey were analogous. From the results of the survey conducted in January 2021, using the same methodology, the percentage of respondents willing to be vaccinated (91%) was very similar to that observed in June 2020, when vaccines were still in Phase 1 and 2 of the clinical development. Yet, the number of respondents to the second questionnaire was much less ($N = 160$) although it was addressed to the same population target. Also, there were significant differences between the two surveys with respect to some demographic variables and interactive-critical vaccine literacy skills of the respondents.

Noteworthy, this recent survey confirms that in Italy the vast majority of respondents trust the safety and efficacy of the COVID-19 vaccines recently authorized, which is an important finding and reassuring for the future uptake, although 60% of them would prefer to choose which one to receive. Also relevant is the proportion of individuals available to pay a fee to get immunized. Regarding flu immunization, only 38% were vaccinated, albeit this might be linked to the mean young age of the respondents and to the fact that some of the participants weren't able to get vaccinated because of the vaccine shortage during the recent flu immunization campaign.

Also encouraging is the observation that most of the opinions about vaccination were positive, although some respondents were just partially in disagreement with the statements considering vaccines unsafe and useless. The significant association of positive opinions with interactive-critical vaccine literacy levels confirms the relevance of people's abilities in understanding and comprehending information about vaccination.

Large variability in COVID-19 vaccine acceptance rates has been reported worldwide, varying from 40% up to >90% [1, 7, 8]. Moreover, recent surveys have shown over the time a reduction of the acceptance, probably linked to the infodemic and decreasing trust in information from the media – often contradictory – and in governmental communication. In a US longitudinal panel survey, self-reported likelihood of getting a COVID-

19 vaccine declined from 74% in April to 56% in December 2020, despite the press releases of high vaccine efficacy for two mRNA vaccines, prior to Emergency Use Authorization granted from the FDA [9].

An investigation carried out via the web in Italy in September 2020 has shown that only 54% would have accepted to receive a COVID-19 vaccine (data collected by an ordinal scale) [10]. On the contrary, we observed a high proportion (>90%) willing to get vaccinated from both the online cross-sectional surveys conducted in June 2020 and January 2021, where data were gathered by the means of a nominal variable (affirmative or negative replies) [2].

As mentioned, discrepancies between results may be linked to population diversities, geographical situations, time of execution of the studies, in addition to the different methodologies adopted for data collection: in some studies nominal scales have been employed, whereas 4 or 5 point ordinal scales were used in others. Interestingly, the proportion of individuals unwilling to be vaccinated (13%) during the first week of our survey in June 2020, was similar to that shown in another inquiry of 1004 adults conducted in Italy a few days before, in May 2020, using a 5 point Likert scale. In this study, 41% of the participants declared to be unwilling (15%) or hesitant (26%) towards COVID-19 vaccines [11, 12]. This investigation has been repeated in December 2020, showing a similar proportion (16%) of individuals refusing to get vaccinated [13]. From our survey in June, the intention to be vaccinated improved in the second week of data collection, from 88% to 96%, along with a significant increase in positive perceptions about candidate (at that time) vaccines. This corresponded, time-wise, to the announcement (June 13, 2020), largely reported by the media, of the agreement between the Europe's Inclusive Vaccines Alliance (IVA) and a vaccine manufacturer to supply massive doses of vaccine, starting by the end of 2020.

Regarding the low number of participants, repeated cross-sectional studies have a greater possibility of losing respondents with respect to longitudinal panel surveys. In addition, the number of surveys currently proposed on the web, as well as the saturation of the public with the huge amount of contradictory news about the pandemic may have a negative impact on the number of respondents, in particular when using a convenience sampling, instead of recruiting participants by professional panel providers. On the other hand, probably also thanks to the infodemic, individuals are improving their ability to understand and use information: this appears to be confirmed by the higher interactive-critical vaccine literacy levels observed with respect to the previous investigation, while the functional skills were similar. Other limitations of the study, in addition to the small number of participants, are the same as for all online surveys: self-reported metrics may not correlate with future behavior, in particular for small samples of the population.

The way to an acceptable vaccination coverage against SARS-CoV-2 and herd immunity is still long and difficult, and will be characterized by an increasing amount of information that may enhance cognitive and emotional overload in the population. Online surveys will continue to have an important role in order to better address communication and counter vaccine hesitancy. All methodologies used to collect and analyze data may be useful, depending on the different objectives that next studies will be aimed to achieve.

5. Conclusions

Rapid online surveys are an important tool in tracking the public's knowledge and perceptions during infectious disease outbreaks, especially when face-to-face research is restricted due to control measures. Opinions and attitudes of the respondents to a survey conducted in January 2021, using either-or questions, were positive despite the small sample size, and similar to those shown during the early phases of the clinical development of COVID-19 vaccines, with >90% willing to get vaccinated. Eventually, thanks to future increase of knowledge about their efficacy and safety, many of the hesitant persons identified by other studies will probably accept the vaccination. This reinforces the need of

proper communication strategies and educational campaigns to raise and maintain the public's confidence

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Informed Consent Statement: The study was performed following the Declaration of Helsinki as revised in 2013 and the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines [14]. Giovanni Lorenzini Foundation approved the survey. Necessary measures were taken to ensure anonymity, including the privacy policy adopted by SurveyMonkey™. Informed consent of participants was requested online.

Data Availability Statement: Data supporting reported results are available upon request to the corresponding Author.

Conflicts of Interest: The authors declare no conflict of interest.

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