Parents’ Willingness to Vaccinate Their Children With COVID-19 Vaccine: Results of a Survey in Italy

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ABSTRACT

Purpose: This cross-sectional study was conducted to assess the parents’ willingness to vaccinate their children with the COVID-19 vaccine and related determinants with specific attention to willingness for adolescents as compared to younger children.

Methods: Data were collected through a confidential online questionnaire.

Results: A total of 607 parents agreed to participate. More than two-thirds of the parents had good knowledge about the modes of transmission of COVID-19, knew that subjects of any age may be susceptible to SARS-CoV-2 infection, and 85.5% correctly indicated the main behavioral preventive measures against COVID-19. With regard to attitudes, 78.7% agreed that COVID-19 is a serious disease, whereas only 42.3% agreed that it is preventable. Overall, 68.5% were willing to vaccinate their children with the COVID-19 vaccine, specifically 74.5% of parents of adolescents and 65.5% of those of younger children, and the results of the multivariate analysis showed that parents of adolescents aged 12–15 years or 16–18 years compared to those of children aged 11 years or less, those who had more than two children, those who reported that their children had been visited by the primary care pediatrician/physician in the previous 12 months, those who agreed that COVID-19 is a serious disease, considered very useful the COVID-19 vaccine, had been vaccinated against influenza in the previous season, and had received at least one shot of COVID-19 vaccine were more likely to be willing to vaccinate their children.

Conclusion: In conclusion, a relevant proportion of parents are willing to vaccinate their children, with the parents of adolescents showing a higher willingness compared to those of younger children. However, there is still room for reducing hesitancy and refusal of the COVID-19 vaccine in this strategic population group by promoting communication to mitigate concerns toward the COVID-19 vaccine.

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As of December 2020, the first COVID-19 vaccine has been approved [1,2], prompting the design and implementation of mass vaccination strategies worldwide. As expected, due to the shortage of vaccines in the first months of the year, strategies have first been oriented to the protection of groups at the highest risk of COVID-19 exposure, transmission, and severe clinical course, such as healthcare workers (HCWs), the institutionalized...
and community elderly, and subjects with underlying medical conditions that were also the categories for which the vaccines had been licensed. Since children and adolescents are mostly asymptomatic or show a mild disease, their vaccination was not a priority in the context of poor vaccine supply, and at the time of the survey, only one vaccine was approved for ≥16-year-old subjects [3]. However, children and adolescents experience the same rates of infection of other population age categories, making them a potential source of infection for more at-risk subjects in their families, in schools, and the community; and several studies have shown that COVID-19, particularly when the delta variant is involved, may be a serious disease even in children and adolescents, with severe complications and need of hospitalizations [4,5].

Exploring the acceptability of vaccinations is crucial before planning vaccination programs, and indeed willingness to receive COVID-19 vaccination has been initially investigated for those groups of the population that for various reasons had been prioritized for the delivery of COVID-19 vaccines, such as HCWs [6,7], the general public [8,9], the elderly [10], prisoners [11,12], and subjects with underlying medical conditions [10,13].

Children and adolescents were not a priority group for vaccination, and COVID-19 vaccines have been more recently licensed for these subgroups; compared to other age categories, specifically, for subjects aged 12–15, a COVID-19 vaccine had been licensed in May 2021 [14–16]. Therefore, at the time of the survey, parents’ willingness to vaccinate their children had not yet been extensively investigated [17–20]. Eventual hesitancy or refusal of parents would be a substantial barrier to the success of the mass vaccination campaign, considering that in Italy, vaccination coverage in children and adolescents for measles (93.8%/89.8%), mumps (93.7%/89.1%), and rubella (93.7%/89.2%) has increased [21], while other recommended vaccinations are still inadequate, ranging from 9.1% for rotavirus to 73.1% for meningitis in children, and from 10.5% for influenza to 58.6% for meningitis in adolescents [21]. Therefore, prompt assessment of factors that may affect vaccine acceptability of parents plays a key role in the development of approaches to increase the acceptance of the COVID-19 vaccine. These factors have been extensively studied for other recommended vaccinations, highlighting substantial and worrying parents’ vaccine hesitancy [22–24], and include facilitators, such as information source and trust in HCWs, [23,25] and barriers, such as low education level and economic status, age, and concerns about vaccines’ efficacy and safety [25,26], as well as emotional factors, promoted by disinformation about the efficacy and safety of vaccinations [27,28].

Therefore, this study was conducted to assess the willingness to vaccinate their children with the COVID-19 vaccine and the key predictors of this intention among parents in Italy, with specific attention to willingness for adolescents as compared to younger children.

Methods

Study design and setting

This cross-sectional study was conducted in Italy from April 18 to May 18, 2021, among parents of children and adolescents aged between 1 and 18 years, when COVID-19 vaccination was not yet available for children and adolescents.

A two-stage cluster sampling was used to recruit the parents; in the first stage, 12 schools were randomly selected out of the list of 75 primary and secondary, and of 25 high public schools in the metropolitan area of Naples, in the South of Italy. In the second stage, the parents were recruited from each selected school through a simple random sampling technique.

The sample size was determined before study initiation. It was estimated that approximately 65% of the parents would be willing to vaccinate their children [17–20]; thus, under the assumption of a 60% response rate [29,30], a margin of 5% error, and a 95% confidence level, the “minimum” total sample size was estimated at 583 parents.

Data collection

Before the study initiation, the directors of each selected school were contacted by e-mail through an invitation letter to present the project and then by telephone to obtain their approval and cooperation. Subsequently, selected parents received an e-mail from the school director containing a link through which they had access to the confidential online questionnaire. The questionnaires, distributed through the Google Drive platform (Google Inc. Mountain View, CA, USA), contained a cover letter that explained the purposes of the study and the methods of data collection, assured that the survey was voluntary and that all data would be collected and analyzed confidentially, and specified that the sending back of the completed questionnaire would be considered an implicit consent to participation. The completed questionnaires were automatically uploaded to the Google Drive platform and transferred to a database to proceed with the statistical analysis. No monetary compensation or gift was given to the respondents, and three reminder requests were sent to nonresponders in order to improve the response rate.

Survey questionnaire

The questionnaire was prepared ad hoc, adapting survey instruments used in previously published investigations performed by our research group on the willingness of parents to vaccinate their children and after a thorough review of the literature [22–24]. The structured questionnaire collected information on the following topics: (1) sociodemographics and health history of the parent completing the questionnaire, including age, gender, and nationality, type of parent (mother, father or tutor), marital status, number of children, own and partner’s education level and working activity, history of COVID-19 and related symptoms, history of COVID-19 cases in friends, relatives, etc., history of influenza and COVID-19 vaccination and of any side effect; (2) characteristics of the child, including age, underlying medical conditions and related therapy, visit(s) to the primary care pediatrician/physician in the previous 12 months, and history of childhood mandatory and recommended vaccinations, including influenza; (3) knowledge about COVID-19 (modes of transmission and measures of prevention, including vaccination); (4) attitudes about COVID-19, the perceived benefits and risks of related vaccinations and willingness or unwillingness to vaccinate their own child with COVID-19 vaccine and related reasons; (5) sources of information about vaccines, including need for other information about anti-COVID-19 vaccination.
| Characteristics | Total n = 607 | Willingness to vaccinate their children with the COVID-19 vaccine n = 416 (68.5%) |
|----------------|--------------|------------------------------------------------------------------|
|                | N  | %  | N  | %  |
| **Sociodemographic and anamnestic characteristics** |    |    |    |    |
| Gender         |    |    |    |    |
| Female         | 500 | 82.4 | 333 | 66.6 |
| Male           | 107 | 17.6 | 83  | 77.6 |
| Age, years$^{ab}$ | 42.3 ± 6.5$^a$ | 42.5 ± 6.4$^a$ | 42 ± 6.5$^a$ |
| $^{c} t = -0.83; p = .404$ |    |    |    |
| Parents’ willing to vaccinate |    |    |    |    |
| Parents’ unwilling to vaccinate |    |    |    |    |
| Nationality    |    |    |    |    |
| Italian        | 600 | 98.8 | 413 | 68.8 |
| Foreigners     | 7   | 1.2  | 3   | 42.9 |
| $^{d}$ Fisher’s exact $p = .214$ |    |    |    |
| Marital status$^b$ |    |    |    |    |
| Married/cohabiting | 555 | 91.6 | 383 | 69  |
| Unmarried/widowed/separated/divorced | 51  | 8.4  | 33  | 64.7 |
| $^{e} \chi^2 = 0.402; p = .526$ |    |    |    |
| At least one HCW parent |    |    |    |    |
| No             | 542 | 89.3 | 354 | 67.2 |
| Yes            | 65  | 10.7 | 52  | 32.8 |
| $^{f} \chi^2 = 4.44; p = .035$ |    |    |    |
| At least one parent with college degree |    |    |    |    |
| No             | 229 | 37.7 | 147 | 64.2 |
| Yes            | 378 | 62.3 | 269 | 71.2 |
| $^{g} \chi^2 = 3.21; p = .073$ |    |    |    |
| Having contracted COVID-19 |    |    |    |    |
| No             | 519 | 85.5 | 359 | 69.2 |
| Yes            | 88  | 14.5 | 57  | 30.8 |
| $^{h} \chi^2 = 0.675; p = .411$ |    |    |    |
| At least one COVID-19 symptom$^{ab}$ |    |    |    |    |
| No             | 16  | 18.8 | 8   | 50  |
| Yes            | 69  | 81.2 | 47  | 50  |
| $^{i} \chi^2 = 1.866; p = .172$ |    |    |    |
| At least one relative who contracted COVID-19 |    |    |    |    |
| No             | 161 | 26.5 | 189 | 66.1 |
| Yes            | 446 | 73.5 | 227 | 33.9 |
| $^{j} \chi^2 = 1.505; p = .22$ |    |    |    |
| Having received influenza vaccine in the last season |    |    |    |    |
| No             | 431 | 71   | 274 | 63.6 |
| Yes            | 176 | 29   | 142 | 80.7 |
| $^{k} \chi^2 = 16.9; p < .001$ |    |    |    |
| Having received at least one shot of COVID-19 vaccine |    |    |    |    |
| No             | 390 | 64.2 | 246 | 63.1 |
| Yes            | 217 | 35.8 | 170 | 76.9 |
| $^{l} \chi^2 = 15.06; p < .001$ |    |    |    |
| Having experienced side effects after receiving COVID-19 vaccine$^l$ |    |    |    |    |
| No             | 46  | 21.2 | 288 | 66.1 |
| Yes            | 171 | 78.8 | 128 | 33.9 |
| $^{m} \chi^2 = 4.41; p = .036$ |    |    |    |
| Number of children |    |    |    |    |
| 1              | 185 | 30.5 | 124 | 67  |
| 2              | 334 | 55   | 223 | 66.8 |
| >2             | 88  | 14.5 | 69  | 81.4 |
| $^{n} \chi^2 = 4.66; p = .097$ |    |    |    |
| Children’s age, years$^a$ |    |    |    |    |
| ≤11            | 403 | 66.4 | 264 | 65.5 |
| 12–15          | 139 | 29.9 | 99  | 71.2 |
| 16–18          | 65  | 10.7 | 53  | 81.5 |
| $^{o} \chi^2 = 7.27; p = .026$ |    |    |    |
| Children with at least one underlying medical condition |    |    |    |    |
| No             | 542 | 89.3 | 371 | 68.5 |
| Yes            | 65  | 10.7 | 45  | 31.5 |
| $^{p} \chi^2 = 0.02; p = .898$ |    |    |    |
| Children having had at least one visit by the primary care pediatrician/physician in the previous 12 months |    |    |    |    |
| No             | 172 | 28.3 | 106 | 61.6 |
| Yes            | 435 | 71.7 | 310 | 38.4 |
| $^{q} \chi^2 = 5.31; p = .021$ |    |    |    |
| Children vaccinated against influenza |    |    |    |    |
| Characteristics                                                                 | Total n = 607 | Willingness to vaccinate their children with the COVID-19 vaccine n = 416 (68.5%) |
|-------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------|
|                                                                              | N  | %   | N  | %   |
| **Characteristics**                                                          |    |     |    |     |
| **Knowledge about COVID-19 and related vaccination**                          |    |     |    |     |
| Knowledge of main COVID-19 modes of transmission                              |    |     |    |     |
| No                                                                            | 128 | 21.1 | 91 | 71.1 |
| Yes                                                                           | 479 | 78.9 | 325| 28.9 |
| **Knowledge that subjects of any age may be susceptible to SARS-CoV-2 infection** |    |     |    |     |
| No                                                                            | 47  | 7.7  | 28 | 59.6 |
| Yes                                                                           | 560 | 92.3 | 388| 40.4 |
| **Knowledge of main behavioral COVID-19 preventive measures**                 |    |     |    |     |
| No                                                                            | 88  | 14.5 | 64 | 72.7 |
| Yes                                                                           | 519 | 85.5 | 352| 27.3 |
| **Knowledge that COVID-19 vaccine is available in Italy**                     |    |     |    |     |
| No                                                                            | 30  | 4.9  | 17 | 56.7 |
| Yes                                                                           | 577 | 95.1 | 399| 43.3 |
| **Having acquired information about COVID-19 vaccine availability by physicians** |    |     |    |     |
| No                                                                            | 354 | 62   | 244| 68.9 |
| Yes                                                                           | 217 | 38   | 151| 61.1 |
| **Attitudes about COVID-19 and related vaccination**                          |    |     |    |     |
| Belief that COVID-19 is a serious disease                                     |    |     |    |     |
| Uncertain \ Disagree                                                          | 129 | 21.3 | 65 | 50.4 |
| Agree                                                                         | 478 | 78.7 | 351| 49.6 |
| **Belief that COVID-19 is a preventable disease**                             |    |     |    |     |
| Uncertain \ Disagree                                                          | 350 | 57.7 | 233| 66.6 |
| Agree                                                                         | 257 | 42.3 | 183| 33.4 |
| **Concern that their child may contract COVID-19 (1–10 points)**              |    |     |    |     |
| No (<10)                                                                      | 377 | 62.1 | 252| 66.8 |
| Yes (10)                                                                      | 230 | 37.9 | 164| 33.2 |
| **Concern that their children could transmit the infection to family members, cohabitants and acquaintances (1–10 points)** |    |     |    |     |
| No (<10)                                                                      | 308 | 53.6 | 200| 64.9 |
| Yes (10)                                                                      | 267 | 46.4 | 189| 35.1 |
| **Belief that COVID-19 vaccine is useful (1–10 points)**                       |    |     |    |     |
| No (<8)                                                                       | 161 | 26.5 | 59 | 36.7 |
| Yes (8–10)                                                                    | 446 | 73.5 | 357| 63.3 |
| **Sources of information about COVID-19**                                      |    |     |    |     |
| Sources of information about COVID-19 vaccine                                 |    |     |    |     |
| Physicians                                                                    | 368 | 60.7 | 255| 69.3 |
| Other                                                                         | 238 | 39.3 | 161| 30.7 |
| Need to receive additional information about COVID-19 vaccination              |    |     |    |     |
| No                                                                            | 242 | 39.9 | 164| 67.8 |
| Yes                                                                           | 365 | 60.1 | 252| 32.2 |
| Need to receive additional information about COVID-19 vaccination from physicians|    |     |    |     |
| No                                                                            | 344 | 57.7 | 229| 66.6 |
| Yes                                                                           | 252 | 42.3 | 183| 33.4 |

* Mean ± Standard deviation.
* Number of each item may not add up to total number of study population due to missing values.
* Among those who had contracted COVID-19.
* Among those who had received at least one shot of COVID-19 vaccine.
* Among those who knew that COVID-19 vaccine is available in Italy.
Knowledge questions were close-ended with “yes” or “no” or multiple choices response format. Statements on perception of severity and opportunity for prevention of COVID-19 were on a three-point Likert-type scale (1 = agree, 2 = uncertain, 3 = disagree). Parents’ concern about the risk of their child/children contracting COVID-19 and about the transmission of the infection to family members, cohabitants, and acquaintances were measured on a 10-point Likert scale with a score ranging from 1 (not at all concerned) to 10 (very concerned). Parents’ attitudes regarding the usefulness of the COVID-19 vaccine were measured on a 10-point Likert scale with a score ranging from 1 (useless) to 10 (very useful), and parents’ willingness or unwillingness to vaccinate their own child with a “no” or “yes” format. The parents were also asked to indicate the reasons for their willingness or unwillingness to administer the COVID-19 vaccine to their child with close-ended, not mutually exclusive multiple choices responses. Questions on sources of information were close-ended with multiple choices or “no” or “yes” responses.

Before starting the survey, a pilot study on 50 parents was carried out to ensure correct interpretation, feasibility and reliability of the questions.

The study was approved by the Ethics Committee of the University of Campania “Luigi Vanvitelli.”

Statistical analysis

The results of the descriptive analysis are reported as frequencies, percentages, means, and standard deviations (SD). Bivariate appropriate tests (t-tests, chi-square tests, and Fisher exact test) have been used to assess the associations between each of the independent characteristics and parents’ willingness to vaccinate their children with the COVID-19 vaccine. After performing the exploratory bivariate analyses, a multivariate stepwise logistic regression model was performed to assess the independent predictors of the explored parents’ willingness according to the Hosmer and Lemeshow model building strategy. Specifically, only those variables found to be associated at the p value < .25 level were introduced into the model [31].

Backward stepwise procedures were applied so that the final model only included characteristics providing a significant explanation of outcomes, in which the criterion for entering and being retained in the model was a p value respectively of .2 and .4 [31]. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were presented, and the two-sided statistical tests were set at p ≤ .05 statistical significance. A detailed description of the independent variables included in the model is reported as Appendix A1. Analyses were performed using Stata 15 software [32].

Results

Sociodemographic and anamnestic characteristics of parents and children

Of the 1,000 parents invited, 607 agreed to participate in the study for a response rate of 60.7% and the main parents’ and children’s characteristics are described in Table 1. A large majority of responding parents (82.4%) were females, the average age was 42.3 years (range:22–63), most were married/cohabiting (91.6%), in more than half of the families there was at least one parent with a college degree (62.3%), and in 10.7% at least one HCW parent, two-thirds (66.4%) were parents of children aged <11 years, and more than two-thirds (69.5%) had more than one child.

Parents reporting to have contracted COVID-19 were 14.5%, and 81.2% of them had had at least one COVID-19 symptom. One-third of parents (35.8%) had received at least one shot of the COVID-19 vaccine, 78.8% of them had experienced side effects after receiving the vaccine, and 29% of participants had received influenzavirus during the previous influenza season.

Regarding children’s characteristics, one in ten (10.7%) had at least one underlying medical condition, and 6.6% took medications. More than two-thirds of parents (71.7%) reported that their children had been visited by the primary care pediatrician/physician in the previous 12 months, and 64.5% of them had had more than one visit, 31.5% had been vaccinated at least once against influenza, 7.6% had not received the childhood vaccinations (diphtheria, hepatitis B, polio, tetanus, Haemophilus influenzae type b, pertussis), 6.7% and 14% had not received measles/mumps/rubella and varicella vaccine, respectively, and only 34.3% of the eligible children had been vaccinated against Human Papillomavirus.

Parents’ knowledge regarding COVID-19 and related vaccination

More than two-thirds of the parents (78.9%) correctly reported the modes of transmission of COVID-19 (through respiratory droplets and by touching a surface contaminated by SARS-CoV-2), whereas one in four (24.9%) indicated that COVID-19 is transmitted only through respiratory droplets. Almost all participants (92.3%) knew that subjects of any age may be susceptible to SARS-CoV-2 infection and 85.5% correctly indicated the main behavioral preventive measures against COVID-19 (wearing a mask, staying at least 1 meter apart from other people, avoiding crowded places, and frequently washing one’s hands). Moreover, only 54% knew that the vaccine is an effective preventive measure, and almost all (95.1%) knew that the COVID-19 vaccine is available in Italy. Among those who have this knowledge, 38% indicated that they had heard of the COVID-19 vaccine from physicians.

Parents’ attitudes regarding COVID-19 and related vaccination

When parents were asked about their attitudes, 78.7% agreed that COVID-19 is a serious disease, whereas only 42.3% agreed that it is preventable. One third of participants (37.9%) were very concerned about their children’s risk of contracting COVID-19 with an overall mean value of eight out of a maximum score of 10, and almost half (46.4%) that their children could transmit the infection to family members, cohabitants, or acquaintances with an overall mean value of 8.3. Moreover, almost three-quarters of parents considered the COVID-19 vaccine very useful (72.3%) with an overall mean value of 8.3, and 68.5% were willing to vaccinate their children against COVID-19, specifically 74.5% of parents of adolescents and 65.5% of those of younger children.

The results of the univariate analysis are reported in Table 1 and were partially confirmed by those of the stepwise logistic regression analysis performed to estimate predictors of the willingness to vaccinate, which showed that parents of adolescents aged 12–15 years (OR = 1.73; 95% CI 1.03–2.91), or 16–18 years (OR = 2.92; 95% CI 1.32–6.44) compared to those of children aged 11 years or less, those who had more than two children (OR = 2.13; 95% CI 1.04–4.36), those who reported that their children had been visited by the primary care pediatrician/...
physician in the previous 12 months (OR = 1.85; 95% CI 1.17–2.93), those who agreed that COVID-19 is a serious disease (OR = 1.7; 95% CI 1.05–2.75), considered the COVID-19 vaccine very useful (OR = 5.98; 95% CI 3.85–9.28), had been vaccinated against influenza in the previous season (OR = 1.73; 95% CI 1.06–2.83), and had received at least one shot of COVID-19 vaccine (OR = 5.12; 95% CI 1.68–15.61) were more likely to be willing to vaccinate their children (Table 2).

The most frequently reported reasons by parents of adolescents and younger children to vaccinate against COVID-19 were being favorable to vaccinations (59.2% and 65.4%, respectively), willing to protect older or with underlying medical conditions family members/cohabitants (43.4% and 38.8%, respectively), trust in the effectiveness of the COVID-19 vaccine (40.8% and 35%, respectively), and concern about the risk for their child to contract COVID-19 (29.6% and 33.8%, respectively). Reasons for refusing to vaccinate their children against COVID-19 included concern about the safety (69.4% and 61.4%, respectively) and the effectiveness (10.2% and 17.4%, respectively) of COVID-19 vaccine, and lack of COVID-19 vaccine recommendation by the primary care pediatrician/physician (14.3% and 19.7%, respectively).

Sources of information

All parents reported to have received information about COVID-19 vaccination, and physicians were the main source of information (60.7%). However, almost two-thirds of the parents (60.1%) reported that they felt the need to receive additional information about COVID-19 vaccination, with 69% of them preferring to be informed by physicians.

Discussion

There is no doubt that the development and uptake of vaccines are fundamental actions in the strategies aimed at tackling the COVID-19 pandemic. However, the availability of a vaccine, as well as its adequate production and distribution are not sufficient if vaccine acceptance and uptake in the target populations do not reach the specific threshold for the interruption of transmission. At the time of this survey, about 87% and 66% of subjects aged ≥80 years and between 70 and 79 years, respectively, had received at least one shot of COVID-19 vaccine, and more than 70% of those aged ≥80 years had completed the vaccination schedule. In this context, the inclusion of children and

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**Table 2**

Multiple logistic regression analysis about willingness to vaccinate their children with the COVID-19 vaccine according to several explanatory variables

| Variable | Willingness to vaccinate their children with COVID-19 vaccine | OR | 95% CI | p |
|----------|-------------------------------------------------------------|----|--------|---|
| Log likelihood = -291.38, $\chi^2 = 141.12$ (11 df), p < .0001, No. of obs = 575 |
| Children's age, years | | | | |
| <11 | 1.00$^a$ | | | |
| 12–15 | 1.73 | 1.03–2.91 | .038 |
| 16–18 | 2.92 | 1.32–6.44 | .008 |
| Number of children | | | | |
| 1 | 1.00$^a$ | | | |
| 2 | 1.22 | .77–1.94 | .398 |
| >2 | 2.13 | 1.04–4.36 | .039 |
| Having received at least one shot of COVID-19 vaccine | | | | |
| No | 1.00$^a$ | | | |
| Yes | 5.12 | 1.68–15.61 | .004 |
| Having received influenza vaccine in the last season | | | | |
| No | 1.00$^a$ | | | |
| Yes | 1.73 | 1.06–2.83 | .028 |
| Belief that COVID-19 vaccine is useful (1–10 points) | | | | |
| No (<8) | 1.00$^a$ | | | |
| Yes (8–10) | 5.98 | 3.85–9.28 | <.001 |
| Belief that COVID-19 is a serious disease | | | | |
| Uncertain/Disagree | 1.00$^a$ | | | |
| Agree | 1.7 | 1.05–2.75 | .029 |
| Children had at least one visit by the primary care pediatrician/physician in the previous 12 months | | | | |
| No | 1.00$^a$ | | | |
| Yes | 1.86 | 1.17–2.93 | .008 |
| Having experienced side effects of COVID-19 vaccine | | | | |
| No | 1.00$^a$ | | | |
| Yes | 0.32 | .1–1.02 | .054 |
| Concern that their child could transmit the infection to family members, cohabitants, or acquaintances (1–10 points) | | | | |
| No (<10) | 1.00$^a$ | | | |
| Yes (10) | 1.37 | .91–2.07 | .131 |

Backward elimination

| Gender | At least one HCW parent | At least one parent with college degree | At least one relative who contracted COVID-19 | Children vaccinated against influenza | Belief that COVID-19 is a serious disease | Concern that their child may contract COVID-19 |
|--------|--------------------------|---------------------------------------|---------------------------------------------|--------------------------------------|--------------------------------------------|---------------------------------------------|
|        | Reference category.      | Reference category.                    | Reference category.                         | Reference category.                  | Reference category.                      | Reference category.                         |

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adolescents in the COVID-19 vaccination strategy would be crucial to reduce the spread of the infection within the populations. Therefore, the results of this study would add knowledge on a key issue since it investigated the willingness of parents to vaccinate their children and adolescents and eventual factors that facilitate or represent obstacles to the adherence to the COVID-19 vaccination strategy in these subjects.

One of the main findings of this study is that more than two-thirds of parents (68.5%) reported their willingness to vaccinate their children against COVID-19 with a higher willingness in parents of adolescents (74.5%) compared to those of younger children (65.5%). The values found in this study are within the results of previous similar investigations in parents, reporting willingness ranging from 36.3% in Turkey [33] to 80% in New Zealand [20]. It should be acknowledged, however, that most of the studies have been conducted before COVID-19 vaccines became available [18,19,29,34], whereas in the few studies [33,35] conducted after the introduction of the vaccination the willingness in parents tended to be lower. This finding is concerning, suggesting that the information on possible side effects related to the vaccines may have reduced the willingness of parents to have their children undergo COVID-19 vaccination. This result has already been reported in a meta-analysis of studies involving 13 countries, that revealed a decline in the willingness to accept COVID-19 vaccination in adult subjects as the pandemic has progressed [36], probably as a consequence of exposure to misinformation about COVID-19 and concerns about the safety of the vaccine. Indeed, several investigations have also shown that information on vaccines provided by Internet and social media was associated to low MMR vaccination coverage in Italy [37] and to parents' vaccine hesitancy in Israel [38], whereas trust in physicians and scientists, and physicians as source of information have been repeatedly found to be determinants of high vaccine acceptance [22,25]. Remarkable differences in the willingness to vaccinate children and adolescents have been encountered across countries during similar periods and this was also the case of the mentioned meta-analysis in the adult population [36], suggesting that context specific factors play a major role in the attitudes toward COVID-19 vaccination, highlighting the need for tailored and setting specific interventions to promote public acceptance of the vaccination. Indeed, the role of context variables is considered crucial in the development of hesitancy toward vaccinations, as reported in one of the seminal publications investigating this issue [39]. Furthermore, it should be noted that knowledge on modes of transmission of COVID-19 of the parents was very spread, while only half of the sample knew that the vaccine is an effective preventive measure. However, it should be acknowledged that at the beginning of the COVID-19 vaccination mass campaign the population was not yet aware of its effectiveness and impact.

The willingness reported in this study is, on average lower than that found in the adult population [9]. This is expected since parents are very concerned by safety issues related to the vaccination for their children, and indeed in this study, the most frequently reported reason for intending to refuse the COVID-19 vaccination was concern about the safety of the available vaccines. This is an interesting result since similar studies have reported lower rates of COVID-19 vaccine safety concerns [18,19], but they were conducted before the introduction of the COVID-19 vaccine in adults when no reports of side effects were known [18], and most concerns were addressed to the extremely rapid authorization process of the vaccine [34]. Several studies conducted about vaccination acceptance showed that safety and efficacy were the main parents' concerns for all vaccinations [40,41].

Understanding determinants influencing parents in the decision process to vaccinate their children is critical to assure the success of the vaccination campaign, and the findings of this study have revealed that predictors of parents' willingness were related to children and parenthood characteristics, attitudes toward COVID-19 vaccination, the practice of previous vaccinations, and contacts with physicians/pediatricians. In particular, it should be noted that the strongest predictor of the parents' willingness was the belief that the COVID-19 vaccine is very useful, and this attitude has been found to be a determinant of acceptance also in previous investigations [42]. Furthermore, the finding that parents of adolescents are more willing to vaccinate has been reported [35], and it has been linked to considering younger children more prone to the side effects of the vaccination. Moreover, being concerned about the seriousness of COVID-19, as well as being confident on the effectiveness of the COVID-19 vaccine, were predictors of parents' willingness also in the study by Skjelle et al. [34], whereas the previous experience of influenza and COVID-19 vaccination were found to be determinants of parents' intention to vaccinate in the survey by Goldman et al. [18]. Finally, since having their child being visited by a primary care pediatrician/physician may be considered a proxy for having had contact with a physician, this finding highlights the relevance of information received by HCW on vaccinations, which has been reported as a predictor of willingness to vaccinate their children with COVID-19 vaccine in several studies conducted on parents [35], as well as in other investigations on recommended childhood vaccinations [29,33,35]. The role of these determinants is confirmed by reasons reported by parents for intention, as well as for refusing to vaccinate their children. Indeed, an overall favorable attitude toward vaccinations was the most frequently reported reason for willingness to vaccinate, along with specific trust in the efficacy of COVID-19 vaccine, belief in the seriousness of risk for their children to contract COVID-19, and intent to protect fragile family members, with no significant differences between parents of adolescents and those of younger children.

All of these findings, coupled with the reported motivations for not willing to vaccinate their children, including lack of recommendations by primary care pediatrician/physician, demonstrate the attitudinal nature of both promoting factors and barriers to willingness to vaccinate children against COVID-19, also highlighting the crucial role of HCWs as a trusted source in the decision process to accept to undergo vaccinations. These results add knowledge on the targets of interventions designed to improve acceptance of COVID-19 vaccination in children. Transparent and clear communication on benefits and risks of COVID-19 vaccines, preferably provided by HCWs, should be the core of interventions, which should be addressed to predisposing factors, mainly focused to the mitigation of concerns and the development of positive attitudes toward the COVID-19 vaccination. This was not foregone, since it has been demonstrated that interventions to promote adherence to vaccination in other contexts and populations would have benefited from the involvement of enabling factors, rather than predisposing factors, such as the case of HCWs' willingness to undertake influenza vaccination in the context of COVID-19 pandemic [45] or all other HCWs recommended vaccinations [46].
Limitations

There are some potential limitations in the study that need to be dealt with before interpreting the results. First, the analyses were based on cross-sectional data, and therefore, the nature of the associations limited us from drawing definitive causal conclusions about the observed relationships between determinants and willingness. Second, in this study, parents were asked to respond to a hypothetical situation since, at the time of the survey, children and adolescents were not yet involved in the vaccination campaign, and the indication that they would accept a COVID-19 vaccine might not correspond to true uptake rates; moreover, vaccine acceptance levels might change over the course of time, especially as vaccine trials and vaccine education campaigns evolve. Third, as with many surveys, when one parent is involved, there was an overestimation of the responses from mothers, which were the great majority of the recruited sample. Although it was not the case of this study, previous investigations have revealed that mothers tend to be significantly less likely to be willing to vaccinate their children against COVID-19 [21]; therefore, our findings may have underestimated the overall intention of parents; however, since in our context mothers are more frequently responsible of their children’s health as compared to fathers, we believe that our estimate is adequate to measure overall willingness in our area. Indeed, this study was carried out in Southern Italy, and our sample might not be completely representative of the Italian parents, but at least of those in Southern Italy. Forth, it was not possible to collect information on parents who refused to participate in the study, which may have different characteristics than the study participants. However, our response rate was sufficiently high to suggest that no substantial differences in the estimates would have been introduced by the results on non-responders. Fifth, only parents who had an e-mail account were included, but this bias was negligible since, in Italy, all communications from schools to parents are made through e-mail, and from the beginning of COVID-19 related school distance learning, at least one parent was required to have an e-mail account. Finally, parents expressed their attitude during a period of lay-off school, and their willingness to vaccinate their own children against COVID-19 might change when regular activities are re-established.

In conclusion, a relevant proportion of parents are willing to vaccinate with a higher willingness in parents of adolescents compared to those of younger children. However, there is still room for reducing hesitancy and refusal of the COVID-19 vaccine in this strategic population group. The findings of this study suggest that, in our context, interventions should be targeted to remove attitudinal barriers by promoting communication aimed at the mitigation of concerns and the promotion of positive attitudes toward COVID-19 vaccine in children and adolescents.

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Supplementary Data

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References

[1] European Medicines Agency. EMA recommends first COVID-19 vaccine for authorisation in the EU. Available at: https://www.ema.europa.eu/en/news/ema-recommends-first-covid-19-vaccine-authorisation-eu. Accessed December 27, 2021.
[2] Food and Drug Administration. COVID-19 vaccines authorized for emergency use. Available at: https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/covid-vaccines. Accessed December 27, 2021.
[3] Food and Drug Administration. Pfizer-BioNTech COVID-19 vaccine. Available at: https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/pfizer-biontech-covid-19-vaccine. Accessed December 27, 2021.
[4] Delahoy MJ, Ujamaa D, Whitaker M, et al. Hospitalizations associated with COVID-19 among children and adolescents - COVID-NET, 14 States, March 1, 2020-August 14, 2021. MMWR Morb Mortal Wkly Rep 2021;70:1255–61.
[5] Duarte-Salles T, Vizcaya D, Pistillo A, et al. Thirty-day outcomes of children and adolescents with COVID-19: An international experience. Pediatrics 2021;148. e2020042929.
[6] Jakubowicz D, Mallon A, Harris DG, et al. Assessment of knowledge, attitudes, and practices towards new Coronavirus (SARS-CoV-2) of health care professionals in Greece before the outbreak period. Int J Environ Res Public Health 2020;17:4925.
[7] Di Giuseppe G, Pelullo CP, Della Polla G, et al. Surveying willingness toward SARS-CoV-2 vaccination of healthcare workers in Italy. Expert Rev Vaccin 2021;25:1–9.
[8] Kreps S, Praus S, Brownstein JS, et al. Factors associated with US adults’ likelihood of accepting COVID-19 vaccination. JAMA Netw Open 2020;3: e2025594.
[9] Di Giuseppe G, Pelullo CP, Della Polla G, et al. Exploring the willingness to accept SARS-CoV-2 vaccine in a university population in Southern Italy. September to November 2020. Vaccines (Basel) 2021;9:275.
[10] Maguire L, Gariel AJ, Rasmussen S, et al. Towards intervention development to increase the uptake of COVID-19 vaccination among those at high risk: Outlining evidence-based and theoretically informed future intervention content. Br J Health Psychol 2020;25:1039–54.
[11] Sperone MR, Piascik AM, Strick LR, et al. Willingness to receive a COVID-19 vaccination among incarcerated or detained persons in correctional and detention facilities - four states, September-December 2020. MMWR Morb Mortal Wkly Rep 2021;70:473–7.
[12] Di Giuseppe G, Pelullo CP, Lanzano R, Napolitano F, Pavia M. Knowledge, attitudes, and behavior of incarcerated people regarding COVID-19 and related vaccination: a survey in Italy. Sci Rep 2022;19:960.
[13] Ehde DM, Roberts MK, Herring TE, Alschuler KN. Willingness to obtain COVID-19 vaccination among adults with multiple sclerosis in the United States. Mult Scler Relat Disord 2021;49:102788.
[14] Food and Drug Administration. FDA Decision Memorandum - emergency use authorization (EUA) amendment for an unapproved product review memorandum. Available at: https://www.fda.gov/media/148542/download. Accessed December 27, 2021.
[15] European Medicines Agency. CHMP post-authorisation summary of positive opinion for Comirnaty. Available at: https://www.ema.europa.eu/en/documents/smop/chmp-post-authorisation-summary-positive-opinion-comirnaty-ii-30_en.pdf. Accessed December 27, 2021.
[16] Agenzia Italiana del Farmaco. Determina n. 73/2021 - Estensione indicazione per Comirnaty. Available at: https://www.aifa.gov.it/portale/documentazione/p6_2_8_3_1.jsp?lingua¼italiano&id¼39. Accessed December 27, 2021.
[17]Bell S, Clarke R, Mounier-Jack S, et al. Parents’ and guardians’ views on the acceptability of a future COVID-19 vaccine: A multi-methods study in England. Vaccine 2020;38:7789–98.
[18] Goldman RD, Yan TD, Seiler M, et al. Caregiver willingness to vaccinate their children against COVID-19: Cross sectional survey. Vaccine 2020;38: 7668–73.
[19] Zhang KC, Fang Y, Cao H, et al. Parental acceptability of COVID-19 vaccination among children and adolescents - COVID-NET, 14 States, March 1, 2020-August 14, 2021. MMWR Morb Mortal Wkly Rep 2021;70:1255–61.
[20] Jeffs E, Lucas N, Walls T. CoVID-19: Parent and caregiver concerns about school distance learning, at least one parent was required to have an e-mail account. Finally, parents expressed their attitude during a period of lay-off school, and their willingness to vaccinate their own children against COVID-19 might change when regular activities are re-established.

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2022.01.003.
[24] Della Polla G, Pelullo CP, Napolitano F, Angelillo IF. HPV vaccine hesitancy among parents in Italy: A cross-sectional study. Hum Vaccin Immunother 2020;16:2744–51.

[25] Tabacchi G, Costantino C, Napoli G, et al. Determinants of European parents’ decision on the vaccination of their children against measles, mumps and rubella: A systematic review and meta-analysis. Hum Vaccin Immunother 2016;12:1909–23.

[26] Napolitano F, Ali Adou A, Vastola A, et al. Rotavirus infection and vaccination: Knowledge, beliefs, and behaviors among parents in Italy. Int J Environ Res Public Health 2019;16:1807.

[27] Broniatsowski DA, Jamison AM, Qi S, et al. Weaponized health communication: Twitter bots and Russian trolls amplify the vaccine debate. Am J Public Health 2018;108:1378–84.

[28] Chou WS, Budenz A. Considering emotion in COVID-19 vaccine communication: Addressing vaccine hesitancy and fostering vaccine confidence. Health Commun 2020;35:1718–22.

[29] Brandstetter S, Böhmer MM, Pawellek M, et al. Parents’ intention to get vaccinated and to have their child vaccinated against COVID-19: Cross-sectional analyses using data from the KUNO-Kids health study. Eur J Pediatr 2021;1–6.

[30] Hetherington E, Edwards SA, MacDonald SE, et al. SARS-CoV-2 vaccination intentions among mothers of children aged 9 to 12 years: A survey of the all our families cohort. CMAJ Open 2021;9:E548–55.

[31] Hosmer DW, Lemeshow S. Applied logistic regression. 2nd edition. New York, NY: Wiley; 2000.

[32] Stata Corporation. Stata Reference manual Release 15.1. College Station: TX: Stata Corporation; 2017.

[33] Yilmaz M, Sahin MK. Parents’ willingness and attitudes concerning the COVID-19 vaccine: A cross-sectional study. Int J Clin Pract 2021;75:e14364.

[34] Ashlenazi S, Livni G, Klein A, et al. The relationship between parental source of information and knowledge about measles/measles vaccine and vaccine hesitancy. Vaccine 2020;38:7292–8.

[35] Ashkenazi S, Livni G, Klein A, et al. The relationship between parental source of information and knowledge about measles/measles vaccine and vaccine hesitancy. Vaccine 2020;38:7292–8.

[36] Robinson E, Jones A, Lesser I, Daly M. International estimates of intended uptake and refusal of COVID-19 vaccines: A rapid systematic review and meta-analysis of large nationally representative samples. Vaccine 2021;39:2024–34.

[37] Aquino F, Donzelli G, De Franco E, et al. The web and public confidence in MMR vaccination in Italy. Vaccine 2017;35:4494–8.

[38] MacDonald NE. SAGE working group on vaccine hesitancy Vaccine hesitancy: Definition, scope and determinants. Vaccine 2015;33:4161–4.

[39] Dyda A, King C, Dey A, et al. A systematic review of studies that measure parental vaccine attitudes and beliefs in childhood vaccination. BMC Public Health 2020;20:1253.

[40] Czcerotti M, Girardi P, Rubalbetti E, et al. Associations of COVID-19 risk perception with vaccine hesitancy over time for Italian residents. Soc Sci Med 2021;272:113688.

[41] Verger P, Sconias D, Dauby N, et al. Attitudes of healthcare workers towards COVID-19 vaccination: A survey in France and French-speaking parts of Belgium and Canada, 2020. Euro Surveill 2021;26:2002047.

[42] Pelullo CP, Marino S, Valdes Abudili AJ, et al. Is it reasonable to abandon obligatory vaccinations in Italy? A 2013 survey. Euro Surveill 2014;19:20089.

[43] Bertoldo G, Pesce A, Pepe A, et al. Seasonal influenza: Knowledge, attitude and vaccine uptake among adults with chronic conditions in Italy. PloS One 2019;14:e0215978.

[44] Di Giuseppe G, Pelullo CP, Paolantonio A, et al. Healthcare workers’ willingness to receive influenza vaccination in the context of the COVID-19 pandemic: A survey in Southern Italy. Vaccines (Basel) 2021;9:766.

[45] De Sarro C, Papadopoli R, Cautela V, et al. Vaccination coverage among health-care workers: Pre–post intervention study to assess impact of an on-site vaccination-dedicated clinic. Expert Rev Vaccines 2021;20:753–9.