Predictors of parental acceptability of COVID-19 vaccination for children, especially trust in primary health care: a cross-sectional online survey from Iran

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Additional Declarations: No competing interests reported.

Abstract

BACKGROUND

Children are the most susceptible to vaccination within the people, thus it's critical to evaluate parents' and guardians' willingness to vaccinate their children. This study aims to investigate the acceptance prevalence of COVID-19 vaccination among children under 18 in Iran and its relationship with trust in the Priamry Health Care (PHC) system.

METHOD

A cross-sectional online survey of 549 Iranian parents was conducted between January and March of 2023. After adjusting for background factors, multivariate logistic regression model was applied to investigate the relationships between COVID-19 vaccination related factors and trust in PHC with parental acceptability.

RESULTS

Of 549 parents with the age range was between 19 to 67 years (median = 38 years), 358 (65.2%) were female. The prevalence of vaccine acceptance and vaccine hesitancy among parents was 257 (46.8%), and 53.2%, respectively. After adjusting for background features, child's age (adjusted odds ratio [AOR] 0.81, 95% CI 0.71–0.91), child vaccination doses (1-dose: AOR 14.72, 95% CI 6.44–33.65, 2-dose: AOR 32.54, 95% CI 15.22–69.57), child's disease (AOR 5.31, 95% CI 2.19–12.85), and trust in PHC (AOR 1.01, 95% CI 1.00-1.02) were associated with greater parental acceptability of COVID-19 vaccination.

CONCLUSIONS

The findings of this study suggest that the child's age, vaccine doses received by the child, child's diseases, and trust in PHC are significant in parental acceptability of COVID-19 vaccination for children in Iran. The results of this can be used in service planning regarding children COVID-19 vaccination.

Introduction

COVID-19 vaccine for children is widely recognized by health authorities and the medical community as an effective method of reducing or even eliminating the burden of infectious diseases[1]; On April 26, 2020, the WHO reported seven Covid-19 vaccine candidates in clinical evaluation and 82 cases in preclinical evaluation[2]. Vaccination is crucial in protecting vulnerable individuals and reducing the mental, social, economic, and mortality burden of the crisis[3–6]. COVID-19 is a multi-organ response disease with different consequences[7, 8].

Large-scale vaccination programs are also necessary to achieve herd immunity. However, achieving this requires a sufficient proportion of the population to be willing to be vaccinated. The effectiveness of the vaccine is dependent on individual willingness to be vaccinated, which can be influenced by doubts and concerns about vaccine safety and suitability[9, 10]. Also, the willingness of individuals to participate in vaccination programs is heavily influenced by the concept of "trust"[3]. It can enhance the effectiveness and adherence to treatment [11].

Studies have shown that children are just as likely to be infected with the virus as adults, but they are less likely to show symptoms or experience severe symptoms[12, 13]. Optimizing the Covid-19 vaccination strategy for children and students is highly important and widely discussed[14]. Because of the introduction of several new forms of highly transmissible COVID-19 strains, scientists, and healthcare professionals recognize the significance of widespread immunization. [15]

The decision to vaccinate children is ultimately up to their parents, and their level of trust in vaccines and the primary health care system (PHC) directly impacts their decision to vaccinate [16].

According to a recent systematic assessment, acceptability prevalence of COVID-19 vaccination among the general people ranged from 23.6–97% across nations [17]. According to a global estimate, 57% of parents accept the COVID-19 immunization for their children[18].

Vaccination of children frequently necessitates the permission of their parents or guardians [35]. To make the COVID-19 vaccine more widely available to children, it is critical to understand parental acceptance of their children's COVID-19 vaccination, as well as the associated predictors. There is also no information on parents' attitudes toward vaccinating their children or their trust in the PHC system. Therefore, this study aims to investigate the acceptance prevalence of COVID-19 vaccination among parents of children and students under 18 in Iran and its relationship with trust in the PHC system.

Method
Study design

This cross-sectional study was conducted over a period Jan-Mar in 2023 across various provinces in Iran, with a focus on densely populated regions in the west, east, and center of the country. A questionnaire was shared on Google Forms and the links shared by universities of medical sciences, school associations, and student parents' groups on social networks of Telegram and Instagram and WhatsApp.

Study population

The study included parents or guardians of children under the age of 18 years old who were their child's vaccination condition. Participants residing outside of Iran and those who did not answer more than 50% of the questionnaire items were excluded from the study.

Trust in Primary Health Care (PHC) scale

Trust in PHC tool covers 30-statments developed and validated in Iran[19]. The answers of items have five options Likert scale as "very little = to "very much"= 4. By adding up the scores, the subscales and the total score of trust in PHC are calculated, so the higher score, higher trust is considered. Trust in PHC tool have two components, main Factor included 25 terms that accounted for 74. 1% of the variance and the Specific or Optimal task factor included 5 terms that accounted for 19.2% of the variance. Cronbach's alpha for the whole scale were 98.0. The test-retest reliability for the overall scale using the intra-class correlation coefficient (ICC) was 0.94[19].

In addition, a checklist of demographic information including age; gender, education, and place of referral to receive health and medical services (urban or rural) was also asked both in relation to the child and in relation to the parent (who completed the questionnaire). Child's disease such as asthma, Chronic kidney disease (CKD), congenital heart disease, respiratory tract infection, thalassemia, congenital anomalies, gastrointestinal infections, diabetes mellitus were evaluated based on parents reports.

Outcome

The acceptance of the COVID-19 vaccine among parents of children between 5 and 18 years old; as 'Have you succeeded in getting the Covid-19 vaccine for your children? (Yes/No) was questioned.

Sample size

To calculate the sample size, the following formula was used

$n = z^2p(1-p)/d^2$

where "n" is the number of samples, "p" is the prevalence[20] (considered to be 72%), "d" is precision (0.04) and, "Z" is the confidence level value equal to 1.96 for a confidence level of 95%[21]. Finally, the minimum sample size was 480.

Sampling method

On well-known social networks and groups like Instagram, Telegram, and WhatsApp, the "Google Forms" was disseminated. participants who volunteered to participate filled out the scale.

Statistical data analysis

The data was analyzed using SPSS version 25.0. Results were presented as frequencies (percentages), as well as medians and interquartile ranges due to the non-normal distribution of the data. Normality was assessed using skewness and kurtosis indices, Q-Q plots, and determined normal Q-Q plot. Statistical methods such as Chi-square tests, Student's t-tests, and logistic regression were used for data analysis. Graphs were generated using Graph Pad Prism version 6.0. A p-value of less than 0.05 was considered statistically significant.

Results

Descriptive analysis for parents

In this study, 549 parents participated were 358 (65.2%) female, with the age range of the parents was between 19 to 67 years (median = 38 years). Of those, 522 (95.1%) were married, 273 (49.7%) had two children, 407 (74.1%), had previous COVID-19, and 158 (28.8%) reported COVID-19 related deaths within their families. The education level of about 40% of the parents was bachelor's degree (Table 1). Most of the parents (43.4%) have received three doses of vaccine COVID-19 vaccine. The prevalence of vaccine acceptance among parents was 257 (46.8%), with 49.7% among fathers and 45.3% among mothers. The prevalence of vaccine hesitancy among parents in Iran was 53.2% in this study.

Table 1
Demographic characteristics of parents

Variables		Frequency (%)
Sex	Male	191 (34.8)
	Female	358 (65.2)
age		38 (42−33)*
Marital status	Married	522 (95.1)
	Divorced	27 (4.9)
Number of parents' children	1	222 (40.4)
	2	273 (49.7)
	3	54 (9.8)
Job status	Employed	421 (76.7)
	Unemployed	128 (23.3)
History of Parents' Covid-19 infection	Yes	407 (74.1)
	No	142 (25.9)
Death of relatives due to Covid-19	Yes	158 (28.8)
	No	391 (71.2)
	Rural Health Center	56 (10.2)
Referred vaccination center	Urban Health Center	236 (43)
	Public place	110 (20)
	Other places	147 (26.8)
	Illiterate	1 (0.2)
	elementary & guidance school	39 (7.1)
	Diploma	77 (14)
Education level	Associate Degree	73 (13.3)
	Bachelor's degree	223 (40.6)
	Master's degree	100 (18.2)
	clinical specialist	36 (6.6)
	0	26 (4.7)

Variables		Frequency (%)
	1	27 (4.9)
Number of vaccine doses	2	174 (31.7)
	3	238 (43.4)
	4	84 (15.3)
Acceptance of vaccine by parents	Yes	257 (46.8)
	No	292 (53.2)
* Median (Interquartile)		

Descriptive analysis for children

The data indicated that of the children surveyed (Table 2), 332 (60.5%) were boys and 39.5% were girls. The age range of the children was between **5** to 18 years, with a mean age of 9 years. The mean age for girls was 8.87 ± 3.98 years, while the mean age for boys was 9.92 ± 3.91 years. Of the children surveyed, 53% had not received any doses of the vaccine, 11.1% had received one dose, and 35% had received two doses. Additionally, 43 (7.8%) children had a pre-existing medical condition.

Table 2
Demographic profile of children

Variables		Frequency (%)
Sex	Girl	217 (39.5)
	Boy	332 (60.5)
Age		9 (6−13)*
Residence	City	496 (90.3)
	Village	53 (9.7)
Vaccination doses	0	296 (53.9)
	1	61 (11.1)
	2	192 (35)
Education level	Kindergarten	137 (25)
	Elementary 1	190 (34.6)
	Elementary 2	137 (25)
	High school	85 (15.5)
Disease	Yes	43 (7.8)
	No	506 (92.2)

Univariate analysis

No statistically significant difference was observed in parent's vaccine acceptance rates between fathers and mothers (P = 0.316). Moreover, Bivariate analysis indicated that parents who were vaccinated in rural centers had the highest likelihood of accepting vaccines compared to other vaccination locations. Parents of children who had received one dose of the vaccine were more likely to accept vaccines than parents of unvaccinated children, and parents of children who had received two doses were even more likely to accept vaccines.

The relationship between trust in PHC and parent's vaccine acceptance

The degree of trust in the primary healthcare system is correlated with the acceptance of vaccinations by parents. A higher score on this questionnaire signifies greater trust in the primary healthcare system. In this study, the mean score obtained from the valid PHC questionnaire was 60.69 ± 28.76, with a minimum score of 0 and a maximum score of 120. The proportion of parents accepting vaccines was 33.3% among those with low trust in the primary healthcare system, 48.4% among those with moderate trust, and 56.7% among those with high trust. In addition, the Chi-square test revealed a significant association

between the level of trust in PHC and vaccine acceptance among parents. As shown in Fig. 1, as trust in PHC increased, so did the rate of vaccine acceptance (P < 0.0001). Furthermore, the most vaccine hesitancy was seen in lowest trust in primary health centers category. As shown in Table 3. A significant correlation was found between trust in the PHC and vaccine acceptance among parents.

Multivariable models between demographic factors and Trust in the PHC and COVID-19 vaccines acceptance among parents

Multivariate analysis revealed that the child's age (adjusted odds ratio [AOR] 0.81, 95% CI 0.71–0.91), child vaccination doses (1-dose: AOR 14.72, 95% CI 6.44–33.65, 2-dose: AOR 32.54, 95% CI 15.22–69.57), child's disease (AOR 5.31, 95% CI 2.19–12.85), and trust in PHC (AOR 1.01, 95% CI 1.00-1.02) were all significant predictors of vaccine acceptance among parents after controlling for parents (age, sex, marital status, number of children, job status, history of Covid-19, death due to Covid-19 in relatives, referred vaccination center) and child's (sex, residence, Covid-19 infection, education level). After controlling for other variables in the model, an increase in trust in PHC was associated with an increase in vaccine acceptance by parents. Additionally, an increase in the child's age was found to negatively impact vaccine acceptance among parents. The number of vaccine doses received by the child was found to be a significant predictor of vaccine acceptance among parents. Additionally, having a pre-existing medical condition increased the likelihood of vaccine acceptance among parents by 5.31 times compared to parents of children without pre-existing conditions. The education level and the number of COVID vaccine doses received by parents were not found to be significant predictors and were therefore removed from the model.

Table 3
Regression coefficients and odds ratios for acceptance of vaccination by children's parent's predictors
derived from logistic regression analysis

Variables		β Coefficient	P-value	OR	95% CI	
					Lower	Upper
age		0.021	0.068	1.021	0.999	1.044
Sex(Ref = Male)	Female	0.180	0.484	1.197	0.723	1.983
Marital status (Ref = Married)	Divorced	0.278	0.622	1.320	0.438	3.979
Number of parents children(Ref = 1)	2	-0.064	0.814	0.938	0.549	1.601
	3	-0.023	0.957	0.978	0.432	2.215
Job status (Ref = Employed)	Unemployed	0.001	0.997	1.001	0.572	1.753
History of Parents' Covid-19 infection		-0.0532	0.073	0.588	0.329	1.050
Death of relatives due to Covid-19		0.170	0.198	1.185	0.725	1.936
Referred vaccination center(ref = RHC)	CHC	0.706	0.155	2.027	0.766	5.362
	Public place	0.502	0.336	1.653	0.594	4.600
	Nowhere	-0.762	0.165	0.467	0.159	1.368
Child's sex (Ref = Girl)	Boy	-0.075	0.765	0.927	0.566	1.521
Child's age		-0.211	**0.001**	0.810	0.719	0.913
Child's residence (Ref = City)	Village	-0.346	0.508	0.708	0.254	1.970
Child Covid-19 infection		0.217	0.405	1.243	0.745	2.073
Child vaccination doses(Ref = 0)	1	2.690	**< 0.001**	14.728	6.445	33.657
	2	3.483	**< 0.001**	32.546	15.225	69.572
Child's education level(Ref = Kindergarten)	Elementary 1	-0.525	0.199	0.591	0.265	1.319
	Elementary 2	-0.604	0.285	0.547	0.181	1.653
	High school	-0.440	0.512	0.644	0.173	2.402
Child's disease* (Ref = no)		1.670	**< 0.001**	5.313	2.196	12.856
Trust in PHC*		0.013	**0.002**	1.013	1.005	1.021

Variables	β Coefficient	P-value	OR	95% CI	
				Lower	Upper

* PHC: Primary Health Care system, OR: Odds Ratio, CI: Confidence Interval, Child's disease: asthma, Chronic kidney disease(CKD), congenital heart disease, respiratory tract infection, thalassemia, congenital anomalies, gastrointestinal infections, diabetes mellitus, respectively.

Discussion

This study aims to investigate the parental acceptability of COVID-19 vaccination for children under the age of 18 years in Iran and its relationship with trust in the PHC system. The current study found that the child's age, the number of vaccine doses received by the child, child's diseases, and trust in PHC are all significant predictors of parental acceptance of COVID-19 vaccine for their children. After controlling for other variables in the model, an increase in trust in PHC was associated with an increase in vaccine acceptance by parents. Additionally, the greatest vaccine hesitancy was seen in lowest trust in PHC category.

Parents' knowledge of the COVID-19 vaccine, their confidence in the COVID-19 vaccine, and vaccination enablers (such as affordable costs, easy access to vaccines, and incentives) were factors for higher willingness to vaccinate, whereas mental health issues (such as worrying and experiencing psychological distress) were significant factors for lower willingness to vaccinate [18].

According to a global estimate of parental acceptance of the COVID-19 vaccination for their children was reported 57% [18]. In a study in China, the prevalence of parents' acceptance of COVID-19 vaccination for them under the age of 18 years' children was 72.6% [20]. What is surprising is that the prevalence of vaccine acceptance among parents in Iran is lower than the global average.

There are several reasons why the parents hesitant to accept covid-19 vaccines for their children. These are: safety[22], effectiveness[22], lack of long-term data[23], risk-benefit analysis[24], trust in the healthcare system[25], fear of unknown consequences[26], personal beliefs and values[27].

To increase parents' acceptance of COVID-19 vaccines for their children, several strategies can be employed. These may be accurate health information, targeted education campaigns[28], building trust in the care system[29], engage trusted messengers [30], address specific concerns[31], share success stories and experience[32], offer vaccine clinics in convenient locations[33], support for decision-making [32], peer influence[34], incentives[18], health promoting services[35], and continuously monitor.

Our findings provided understandings to advise vaccination. More consideration must be specified to parents with younger children and persons with lesser number of vaccine doses received, child's diseases status and trust in PHC as they reported significant predictors of parental acceptability of COVID-19 vaccination.

Given that the parental acceptance of COVID-19 vaccination for children was relatively low (46.8%%) and does not reach the condition of herd immunity (i.e., 70%), government and healthcare providers should work to increase parents' related knowledge, and trust in primary health care centers.

Limitations

Finally, a number of important limitations need to be considered. One significant limitation in this study was that parents without access to the internet were not included, which reduced the sample's representativeness. We were unable to obtain information regarding people who refused to participate in the study. Parents who refused to participate in the study may have different features than study participants. There could be selection bias. The generalization needs to be done with caution.

Conclusion

The child's age, the number of vaccine doses received by the child, child's diseases, and trust in PHC are all significant predictors of vaccine the parental acceptability of COVID-19 vaccination for children under the age of 18 years in Iran. The results of this can be used in service planning regarding children COVID-19 vaccination.

Declarations

Authors' contributions

"ES, NM, MP, AM, HA and HS wrote the main manuscript text and HS, MP, ES and RM undertook the major parts of the study design and performed the statistical analysis. All authors reviewed the manuscript."

Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Consent to publish: The data presented in the manuscript and its supplemental files do not contain any details relevant to any individual patient and thus, no consent for publication was required.

Acknowledgements

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Figures
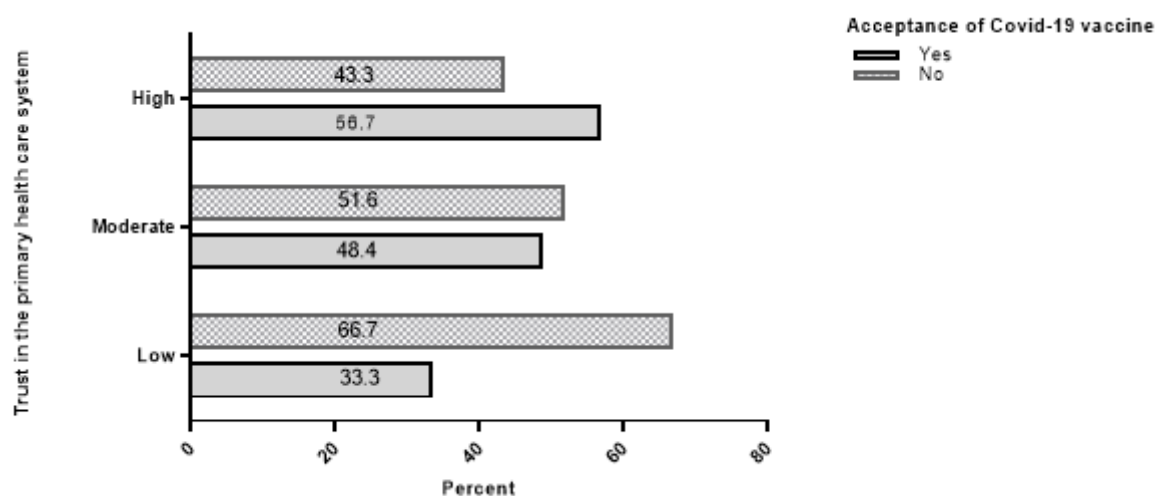
Figure 1

The correlation between trust in the primary healthcare system and the willingness of parents to accept vaccinations