# RESEARCH



# The attitude of the unvaccinated children's parents toward pediatric COVID-19 vaccination in Tabriz, Iran



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# Abstract

**Background** The COVID-19 vaccination has played a crucial role in combating the pandemic, yet vaccine hesitancy remains a significant barrier to achieving herd immunity. This challenge is particularly pronounced in specific cultural and geographic contexts. Understanding the reasons for parental reluctance to vaccinate their children is essential for developing effective public health strategies. This study aimed to assess the attitudes of parents with unvaccinated children aged 5–12 years toward COVID-19 vaccination and to explore their reasons for not vaccinating their children, despite having access to vaccination programs, in Tabriz, Iran.

**Method** This cross-sectional study, conducted between March and August 2022 in Tabriz. A random sample of 400 parents was selected from five healthcare centers using a cluster sampling method in conjunction with the Iranian SIB system. To gather data, a questionnaire was developed based on a comprehensive literature review and interviews with local parents. The questionnaire's content validity was established through expert review, and its internal consistency reliability was assessed, yielding a Cronbach's alpha of 0.85, indicating good reliability. Statistical analysis was performed using one-way ANOVA, chi-square, and Fisher's exact tests to explore associations between demographic factors and vaccine hesitancy. Multiple logistic regression was employed to identify significant predictors of parents' reluctance to vaccinate their children. Additionally, the reasons for unwillingness were reported for hesitant and unwilling parents and compared using the chi-square test.

**Result** Out of 400 parents of unvaccinated children, 263 parents (65.8%) were definitely unwilling, 21 (5.3%) were hesitant, and 116 (29.0%) were accepting to vaccinate their children against COVID-19. The analysis revealed that parents of children with underlying diseases were more hesitant or unwilling to vaccinate (OR = 1.77, (95% CI: (0.93, 3.42), *P*-value = 0.07). Additionally, mothers were more hesitant or unwilling than fathers (OR = 2.24, 95% CI: (1.42, 3.53), *P*-value = 0.001). The top three concerns among the unwilling and hesitant parents were the side effects of COVID-19 vaccination for children (reported by over 81.0%), the perception that vaccination could decrease the disease process (over 46.0%), and the lack of valid information about the side effects (above 42.9%). Furthermore, an important reason for unwillingness among unwilling parents was a lack of trust in the available vaccines (40.5%).

**Conclusion** Parents' willingness to vaccinate their children against COVID-19 in Tabriz was low, primarily due to concerns about the potential side effects of the vaccine. To address this issue, culturally sensitive public health

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campaigns should be designed that specifically target these concerns and involve trusted community figures. These initiatives could help reduce vaccine hesitancy, particularly among mothers and parents of children with underlying health conditions.

Keywords Child, COVID-19 vaccines, Vaccination hesitancy, Attitude

## Introduction

The World Health Organization (WHO) declared an end to the COVID-19 public health emergency on May 5, 2023; however, COVID-19 remains a global threat requiring ongoing management [1]. Between December 2019 and October 2021, children aged 5 to 14 accounted for 7% of global COVID-19 cases [2]. Notably, following the emergence of the Omicron variant in 2022, there was a significant increase in cases among children [2].

While the risk of severe illness from COVID-19 is generally lower in children than in adults [3], children represent over a quarter of the global population [4]. This demographic plays a crucial role in virus transmission, which can hinder the achievement of herd immunity [5].

Moreover, the emergence of new variants raises the risk of severe illness in unvaccinated children [6]. Complications such as long COVID-19 and Multisystem Inflammatory Syndrome in Children (MIS-C) have also become increasingly concerning [7, 8].

Vaccination has been recognized as a key strategy for managing the COVID-19 pandemic [8]. Vaccine hesitancy, defined as a delay in acceptance or refusal of vaccines despite availability, remains a challenge to achieving widespread COVID-19 vaccination. Global vaccination efforts have made progress, but pockets of resistance persist due to a range of cultural, socio-economic, and political factors.

Iran began its pediatric COVID-19 vaccination program for children aged 5–12 on February 8, 2022, using the Sinopharm and Soberana (PastoCoVac) vaccines. These vaccines were administered in two doses, with at least a 28-day interval between each dose. Despite these efforts, the vaccination rate for children aged 5–12 remains relatively low [9], with a maximum coverage of 10% as of April 2023 [10].

Since parents are the ones who make decisions on acceptance, rejection, or delay of their children's COVID-19 vaccinations, their knowledge and attitude take on added importance [11]. Understanding the factors that contribute to parental reluctance to vaccinate their children is crucial for developing effective public health strategies.

Trust in the safety and efficacy of COVID-19 vaccines [12], parents' history of COVID-19 vaccination [13, 14], fast development of the vaccine production [15], potential side effects of the vaccines [16], and demographic characteristics of parents and children [17] were

announced as the most contributary factors involved in the vaccination of their children or its delay [18].

Based on the systematic review, parental vaccine hesitancy rates differ geographically. The highest hesitancy rates among parents were reported from the USA, Saudi Arabia, and Turkey with around 85% [18]. The lowest rates, on the other hand, were reported from South Africa and Switzerland with lower than 2% [18]. Furthermore, the reasons for vaccine hesitancy considerably vary with the cultural background [19], ethnicity [16, 20, 21], socioeconomic status [16, 19-21], and health policies of the countries [22]. These factors may greatly influence the vaccine acceptance depending on the context. Geographically different rates of the vaccine hesitancy and various cultural-related factors double the importance of studies in this area. These factors may greatly influence the vaccine acceptance depending on the context. Geographically different rates of the vaccine hesitancy and various cultural-related factors double the importance of studies in this area and the necessity for localized studies.

Tabriz, the capital of East Azerbaijan Province in Iran, presents a unique context for examining vaccine hesitancy due to its distinct cultural and ethnic composition, predominantly Azeri. The reluctance of parents in Tabriz to vaccinate their children against COVID-19 requires further exploration, especially as regional disparities in health behavior may impact overall public health efforts. So, this study aims to assess the rates of acceptance, hesitation and unwillingness regarding children's COVID-19 vaccination and to explore the reasons for vaccine hesitancy among parents of unvaccinated children aged 5–12 years in Tabriz, Iran.

# Material & methods

# Study design

This cross-sectional study was carried out to follow up a primary study conducted in Tabriz, Iran, from March 2022 to September 2022. The reports of the original study and the other secondary study with the aim of determining the prevalence of adverse events of COVID-19 vaccination among children and predictors of pediatric COVID-19 vaccination had been published elsewhere [10, 23]. During the primary study on vaccination adverse events in children, parents raised concerns regarding vaccination that were beyond that study's objectives. Consequently, we designed follow-up studies to address their concerns. The present study was specifically designed to explore the attitudes of unvaccinated children parents regarding COVID-19 vaccination. The primary aim was to determine the rates of acceptance, hesitation, and unwillingness in parents of unvaccinated children aged 5–12 years regarding the COVID-19 vaccination. Additionally, it sought to discover the most important reasons behind these parents' unwillingness to vaccinate their children against COVID-19. The reason for selecting the 5–12 age group is that in Iran, COVID-19 vaccination program is for children aged 5–12 years. So, this age group has access to the COVID-19 vaccination program, unlike younger children who are not eligible for this program. Therefore, focusing on this group allows for a better understanding of the factors influencing vaccine hesitancy among parents who have the option to vaccinate their children.

#### Sample size

In the primary study, 577 vaccinated and 366 un-vaccinated children were randomly selected from the general population of Tabriz, and their data were collected by telephone calls and interviews with the children's parents. For this follow up study, that assessed attitude of un-vaccinated children's parents regarding vaccination, due to the lack of previous information about the reasons for unwillingness, the sample size was calculated to estimate the proportion of "yes" responses for each of the items by considering P=0.5, which led to the largest sample size in the estimation. Therefore, the needed sample size with P = 0.5, 95% confidence, and marginal error of 0.05 was equal to 383. To account for potential non-responses and enhance the robustness of the findings, in this follow up study, an additional 34 un-vaccinated children's parents were invited, increasing the total sample size to 400.

# Sampling method

In the primary study, the sample was recruited using the cluster sampling method. Five health centers and one mass COVID-19 vaccination center were randomly selected from 20 healthcare facilities and three mass vaccination centers for COVID-19. In Iran, all children are registered with health centers, and their contact information is recorded in the SIB (Health Integrated System of Iran). This system, which records demographic details, diseases, vaccinations, medications, and laboratory results, supports the implementation of the referral system and provides the health system with access to health information for the covered population [24]. This system covers individuals from all socio-economic backgrounds. To ensure our sample was representative, we conducted random sampling from healthcare facilities serving different economic and social groups.

A list of vaccinated and unvaccinated children aged 5–12 from these centers was obtained through the SIB. A sample of eligible children was randomly selected from

this list, and their parents were invited to participate in the study via telephone interviews [10, 23].

However, unvaccinated children—whose parents' attitudes toward COVID-19 vaccination were also assessed and are reported in this study—were recruited from health centers, as the mass COVID-19 vaccination center only included vaccinated children.

Our inclusion criteria for unvaccinated children were children aged 5 to 12 who had not yet received any COVID-19 vaccine doses. Exclusion criteria included parents who could not be contacted or were unwilling to participate.

## Data collection

Children's demographic characteristics, including age, gender, height, and weight (categorical variables were constructed based on z-scores of body weight and height according to age and sex), underlying disease history (e.g., type 1 diabetes, asthma, hemoglobinopathy, convulsions, immune system deficiency, allergy, and other conditions), as well as their history of COVID-19 (based on the parents' statements and symptoms) were recorded. Additionally, information regarding the parents' education, occupation, and dwelling level was collected.

We categorized the "dwelling" variable into three levels based on the social and economic characteristics of participants' areas:

- 1. Low-level areas: Low household income, limited access to healthcare and education, and poor infrastructure.
- 2. Middle-level areas: Moderate income, average access to services, and decent infrastructure.
- 3. High-level areas: High household income, good access to healthcare and education, and advanced infrastructure.

A question was designed to assess parents' attitudes towards vaccination, asking them, "What is your attitude regarding vaccinating your child against COVID-19?" They were asked to choose one of the following three options: Definitely unwilling", "Hesitant", or "Accepting".

Furthermore, a researcher-made questionnaire was developed to collect data on parents' reasons for hesitancy or unwillingness to vaccinate their children against COVID-19. The potential reasons of unwilling and hesitant parents were identified based on a comprehensive literature review and qualitative interviews with 25 parents referring to health centers. Following these interviews, the questionnaire was refined and sent to an expert panel for content validity assessment, which provided qualitative feedback that was incorporated into the final version. The internal consistency reliability analysis yielded a Cronbach's alpha of  $\alpha = 0.83$ , indicating acceptable internal consistency across the 19 final items included in the questionnaire.

Reasons for parents' unwillingness were investigated based on the statements and "yes", "no", or "no idea" responses. The statements were used to assess the parents' knowledge and attitudes, trust in the vaccination, fear of potential vaccine complications, and perceived risks as well as other child-related factors (Table 1).

# **Operational definitions**

For consistency in interpretation, key terms were explicitly defined as follows:

"Acceptance": willingness to vaccinate their children against COVID-19.

"Hesitation": uncertainty or indecisiveness regarding vaccination.

"Unwillingness": refusal to vaccinate their children against COVID-19.

"Definitely unwilling parents": Parents who have definitively decided against vaccination.

"Hesitant parents": Parents who express uncertainty but are not fully opposed to vaccination.

Table 1 Reasons for parents' unwillingness statements

| Statement1  | We have not had a chance to refer yet.  |
|-------------|---|
| Statement2  | The child does not cooperate.   |
| Statement3  | We are worried about the side effects of vaccines in children.  |
| Statement4  | We do not believe in vaccines.<br>(All vaccination processes, including the Essential<br>Program on Immunization (EPI)) |
| Statement5  | The disease process has decreased.  |
| Statement6  | The pandemic is over and there is no need for a vaccine.  |
| Statement7  | Our desired vaccine (i.e., specific brand) is not admin-<br>istered to children.  |
| Statement8  | We are not worried about the child sickness.  |
| Statement9  | Children are mildly affected by Corona virus and there is no need to inject a vaccine.                                  |
| Statement10 | We did not know that children are also vaccinated.  |
| Statement11 | We have caught a cold or coronavirus and have not referred yet.   |
| Statement12 | The child has a special disease or is allergic to the components of the vaccine.  |
| Statement13 | The opinion of the child's physician was that no vac-<br>cine should be administered.                                   |
| Statement14 | Despite receiving the vaccine, I have been infected;<br>so, I have given up on injecting it to my child.                |
| Statement15 | Because other children have not been administered a vaccine, I have not taken any action either.                        |
| Statement16 | We have had a history of vaccine side effects in our-<br>selves or in our relatives.                                    |
| Statement17 | The effectiveness of the vaccine in children is low.  |
| Statement18 | Due to the lack of information about the side effects of the vaccine in children, we are hesitant to receive it.        |
| Statement19 | I do not trust the COVID-19 vaccines that are currently being administered  |

"Accepting parents": parents who are fully supportive of vaccinating their children.

#### **Statistics analysis**

Descriptive statistics for the study variables were reported using means (SD) for continuous variables and numbers (%) for categorical variables.

Based on the nature of the data and the research questions, statistical analyses were performed using one-way ANOVA, chi-square tests, and Fisher's exact tests to explore associations between continuous and categorical demographic factors and parents' attitudes toward COVID-19 vaccination, with two-tailed tests conducted at a significance level of 0.05. Multiple logistic regression with backward variable selection method was employed to identify significant predictors of parents' reluctance to vaccinate their children. Additionally, the reasons for unwillingness were reported for hesitant and unwilling parents and compared using the chi-square test.

The assumptions underlying the ANOVA test, such as normality and homogeneity of variance, were checked. For handling missing data, responses from participants who did not provide answers were excluded from the analysis, and this was accounted for in the sample size calculations. Data analysis was performed using SPSS version 26.

# **Ethical consideration**

The study received ethical approval from the ethics committee of Tabriz University of Medical Sciences (ethics code: IR.TBZMED.REC.1401.176). The objectives of the research were explained to the parents, and oral consent was obtained. Parents who were unwilling to participate were excluded. Data privacy and participant anonymity were ensured through secure data storage protocols, with access limited to the research team. Anonymized data were stored in Excel files, using unique identifiers to protect personal information.

#### Results

# Parental attitudes toward vaccination

Out of 400 parents of unvaccinated children, 263 parents (65.8%) reported being definitely unwilling to vaccinate their children against COVID-19, while 21 parents (5.3%) expressed hesitation. Conversely, 116 parents (29.0%) were accepting, indicated their willingness to vaccinate. The demographic characteristics of the parents and their unvaccinated children across different parental attitudes toward children's vaccination are shown in Table 2.

#### **Demographic influences**

The percentage of parents of children with underlying disease who were unaccepting (hesitant or unwilling) to vaccinate their children was 80.30%, while this

# Table 2 Demographic characteristics of parents and children totally and by the state of parents' attitude

| Children & Family Characteristics                               |                           | Total<br>400 (100.0%) | Accepting<br>vaccination<br>116 (29.0%) | Definitely<br>unwilling<br>263 (65.8%) | Hesitant<br>21 (5.3%) | <b><i>P</i>-value</b> * |  |
|---|---------------------------|-----------------------|---|--|-----------------------|-------------------------|--|
|   |                           | 8.32 (2.10)           | 8.22 (2.07)                             | 8.41 (2.11)                            | 7.76 (2.06)           |                         |  |
| z-score of child's  | z-score<-2                | 0 (0)                 | 0 (0)                                   | 0 (0)                                  | 0 (0)                 | 0.794 <sup>†</sup>      |  |
| body weight for<br>their age and sex,<br>n(%)                   | $-2 \le z$ -score $\le 2$ | 315 (78.8)            | 82 (26.03)                              | 216 (68.57)                            | 17 (5.39)             |                         |  |
|   | z-score>2                 | 14 (3.5)              | 3 (21.42)                               | 10(71.42)                              | 1(7.14)               |                         |  |
|   | Missing                   | 71 (17.8)             | 31 (43.66)                              | 37 (52.11)                             | 3 (4.22)              |                         |  |
| z-score of child's<br>height for their age<br>and sex, n(%)     | z-score <-2               | 7 (1.8)               | 2 (2.4)                                 | 5 (2.2)                                | 0 (0)                 | 0.752 <sup>†</sup>      |  |
|   | $-2 \le z$ -score $\le 2$ | 316 (79.0)            | 80 (69.0)                               | 218 (82.9)                             | 18 (85.5)             |                         |  |
|   | z-score > 2               | 6(1.5)                | 3 (2.6)                                 | 3 (1.1)                                | 0 (0)                 |                         |  |
|   | Missing                   | 71 (17.8)             | 31 (26.7)                               | 37 (14.1)                              | 3 (14.3)              |                         |  |
| Child Gender, n(%)  | Male                      | 198 (49.5)            | 60 (51.7)                               | 130 (49.4)                             | 13 (61.9)             | 0.516 <sup>†</sup>      |  |
|   | Female                    | 202 (50.5)            | 56 (48.3)                               | 133 (50.6)                             | 8 (38.1)              |                         |  |
| Having previous<br>COVID-19 infection<br>in child, <i>n</i> (%) | Yes                       | 82 (20.5)             | 32 (27.6)                               | 46 (17.5)                              | 4 (19.0)              | 0.080 <sup>†</sup>      |  |
| Child Underlying  | Nothing                   | 334 (83.5)            | 103 (88.8)                              | 215 (81.7)                             | 16 (76.2)             | 0.046 <sup>¥</sup>      |  |
| Diseases, n(%)  | Asthma                    | 13 (3.3)              | 1 (0.9)                                 | 12 (4.6)                               | 0 (0.0)               |                         |  |
|   | Hemoglobinopathies        | 18 (4.5)              | 1 (0.9)                                 | 15 (5.7)                               | 2 (9.5)               |                         |  |
|   | Convulsion                | 5 (1.3)               | 0 (0.0)                                 | 4 (1.5)                                | 1 (4.8)               |                         |  |
|   | Allergy                   | 17 (4.3)              | 7 (6.0)                                 | 10 (3.8)                               | 0 (0.0)               |                         |  |
|   | type 1 diabetes           | 0 (0.0)               | 0 (0.0)                                 | 0 (0.0)                                | 0 (0.0)               |                         |  |
|   | immune system deficiency  | 0 (0.0)               | 0 (0.0)                                 | 0 (0.0)                                | 0 (0.0)               |                         |  |
|   | Other diseases            | 13 (3.3)              | 4 (3.4)                                 | 7 (2.7)                                | 2 (9.5)               |                         |  |
| Who was inter-<br>viewed? n(%)                                  | Father                    | 122 (30.5)            | 50 (43.1)                               | 64 (24.3)                              | 8 (38.1)              | 0.001 <sup>+</sup>      |  |
|   | Mother                    | 276 (69.0)            | 65 (56.0)                               | 198 (75.3)                             | 13 (61.9)             |                         |  |
|   | Missing                   | 2 (0.5)               | 1 (0.9)                                 | 1 (0.4)                                | 0 (0.0)               |                         |  |
| Dwelling, n(%)  | High Level                | 141 (35.3)            | 37 (31.9)                               | 95 (36.1)                              | 9 (42.9)              | 0.545 <sup>†</sup>      |  |
| (based on the so-   | Middle Level              | 16 (4.0)              | 7 (6.0)                                 | 9 (3.4)                                | 0 (0.0)               |                         |  |
| cial and economic   | Low Level                 | 242 (60.5)            | 71 (61.2)                               | 159 (60.5)                             | 12 (57.1)             |                         |  |
| characteristics of<br>participants' areas)                      | Missing                   | 1 (0.2)               | 1 (0.9)                                 | 0 (0.0)                                | 0 (0.0)               |                         |  |
| Father Education,   | High school and lower     | 148 (37.0)            | 49 (42.2)                               | 92 (35.0)                              | 7 (33.3)              | 0.460 <sup>†</sup>      |  |
| n(%)  | Undergraduate             | 193 (48.3)            | 51 (44.0)                               | 133 (50.6)                             | 9 (42.9)              |                         |  |
|   | Graduate (Masters, PhD)   | 43 (10.8)             | 11 (9.5)                                | 28 (10.6)                              | 4 (19.0)              |                         |  |
|   | Missing                   | 16 (4.0)              | 5 (4.3)                                 | 10 (3.8)                               | 1 (4.8)               |                         |  |
| Mother Education,<br>n(%)                                       | High school and lower     | 154 (38.5)            | 52 (44.8)                               | 95 (36.1)                              | 7 (33.3)              | 0.555 <b>†</b>          |  |
|   | Undergraduate             | 202 (50.5)            | 53 (45.7)                               | 138 (52.5)                             | 11 (52.4)             |                         |  |
|   | Graduate (Masters, PhD)   | 30 (7.5)              | 7 (6.0)                                 | 21 (8.0)                               | 2 (9.5)               |                         |  |
|   | Missing                   | 14 (3.5)              | 4 (3.4)                                 | 9 (3.4)                                | 1 (4.8)               |                         |  |
| Father job, <i>n</i> (%)  | Managers and specialists  | 13 (3.3)              | 3 (2.6)                                 | 9 (3.4)                                | 1 (4.8)               | 0.924 <sup>†</sup>      |  |
|   | Employees and technicians | 73 (18.3)             | 23 (19.8)                               | 46 (17.5)                              | 4 (19.0)              |                         |  |
|   | Craftsmen and sellers     | 203 (50.7)            | 55 (47.4)                               | 136 (51.7)                             | 12 (57.1)             |                         |  |
|   | Workers                   | 92 (23.0)             | 29 (25.0)                               | 60 (22.8)                              | 3 (14.3)              |                         |  |
|   | Missing                   | 19 (4.8)              | 6 (5.2)                                 | 12 (4.6)                               | 1 (4.8)               |                         |  |
| Mother job, n(%)  | Managers and specialists  | 4 (1.0)               | 0 (0.0)                                 | 3 (1.1)                                | 1 (4.8)               | 0.225 <sup>†</sup>      |  |
|   | Employees and technicians | 35 (8.8)              | 14 (12.1)                               | 19 (7.2)                               | 2 (9.5)               |                         |  |
|   | Craftswomen and sellers   | 18 (4.5)              | 5 (4.3)                                 | 11 (4.2)                               | 2 (9.5)               |                         |  |
|   | Housewife                 | 330 (82.5)            | 93 (80.2)                               | 222 (84.4)                             | 15 (71.4)             |                         |  |
|   | Missing                   | 13 (3.3)              | 4 (3.4)                                 | 8 (3.0)                                | 4. (4.8)              |                         |  |

\*Color coding: *p*-value > 0.05: transparent, *p*-value < 0.01: blue, and 0.01 < *p*-value < 0.05: Green

<sup>£</sup>*P*-value was calculated by one way ANOVA

<sup>†</sup>*P*-value was calculated by Chi- square test

 ${}^{\mathrm{F}}\!P\text{-}\mathsf{value}$  was calculated by Fisher exact test

percentage in parents of children without underlying disease was 69.16%. According to the results of multiple logistic regression, a borderline significant relationship was observed between children's underlying health status and parental attitudes toward vaccination. the odds ratio comparing the vaccination unacceptance between parents of children with underlying disease to children without underlying disease was approximately 1.77 (95% CI: (0.93, 3.42), *P*-value = 0.07) indicating that parents of children with underlying disease exhibited more unaccepting attitudes toward vaccination.

Gender differences were also apparent in parental attitudes. The percentage of mothers who were unaccepting (unwilling or hesitant) to vaccinate their children was 76.44%, while this percentage in fathers was 59.01%. Consequently, the percentages of accepting attitude was 23.55% for mothers and 40.98% for fathers indicating that mothers significantly, exhibited more hesitant or unwilling attitudes toward vaccination. The odds ratio from multiple logistic regression comparing the vaccination unacceptance between mothers to fathers was approximately OR = 2.24 (95% CI: (1.42, 3.53), *P*-value = 0.001).

#### **Reasons for hesitancy**

Both groups of the parents who were unwilling to vaccinate their children and those who were hesitant had somehow similar reasons for their unwillingness to vaccinate their children.

Three top concerns of the parents about vaccination were:

- 1. The side effects of COVID-19 vaccination for their children (90.5% in unwilling and 81.0% in hesitant parents; *P*-value = 0.24),
- 2. Decreased disease process (46.0% in unwilling and 47.6% in hesitant parents, *P*-value = 0.18).
- 3. Lack of valid information about vaccine side effects statement (answer "yes": 45.0% in unwilling parents and 42.9% in hesitant parents, answer "no": 32.3% in unwilling parents, 4.8% in hesitant parents, answer "no idea": 22.4% in unwilling parents and 52.4% in hesitant parents; *P*-value = 0.003).

Also, one of the noticeable reasons was likely the lack of trust in available vaccines among parents who were unwilling to vaccinate their children (40.5%). This percentage was 19% in hesitant parents that significantly differs from the unwilling group (p-value = 0.017). Furthermore, the frequency distribution of these reasons: "We do not believe in vaccines", "The effectiveness of the vaccine in children is low", and "The pandemic is over and there is no need for a vaccine" were significantly different between two groups (p-value = 0.03, p-value < 0.001, and p-value = 0.019, respectively).

The frequency distribution of the reasons of the unwilling or hesitant parents for unacceptance the COVID-19 vaccination for their children according to attitude status are reported in Tables 3 and 4.

# Discussion

#### Key findings

According to our results, only 29% of parents were willing to vaccinate their children against COVID-19. Over 5% were hesitant, while approximately 66% refused to vaccinate

 Table 3
 Frequency distribution of parents' situational reasons for unwillingness or hesitation to vaccinate their children against

 COVID-19 by attitude status

| Reason statement  | Definitely unwilling (n=263) |            |             |            | Hesitant (n = 21) |              |            | <i>p</i> -value <sup>*</sup> |
|---|------------------------------|------------|-------------|------------|-------------------|--------------|------------|------------------------------|
|   | Yes                          | No         | No<br>idea  | Missing    | Yes               | No           | No<br>idea |                              |
| We have not had a chance to refer yet   | 17 (6.5)                     | 242 (92.0) | 4 (1.5)     | 0<br>(0.0) | 3 (14.3)          | 17<br>(81.0) | 1 (4.8)    | 0.211                        |
| The child does not cooperate  | 33<br>(12.5)                 | 224 (85.2) | 5 (1.9)     | 1<br>(0.4) | 1 (4.8)           | 19<br>(90.5) | 1 (4.8)    | 0.407                        |
| Our desired vaccine (specific brand) is not administered to children                          | 29<br>(11.0)                 | 211 (80.2) | 22<br>(8.4) | 1<br>(0.4) | 3 (14.3)          | 17<br>(81.0) | 1 (4.8)    | 0.781                        |
| We did not know that children are also vaccinated   | 11 (4.2)                     | 247 (93.9) | 5 (1.9)     | 0<br>(0.0) | 3 (14.3)          | 17<br>(81.0) | 1 (4.8)    | 0.077                        |
| We have caught a cold or coronavirus and have not referred yet                                | 11 (4.2)                     | 247 (93.9) | 5 (1.9)     | 0<br>(0.0) | 0 (0.0)           | 20<br>(95.2) | 1 (4.8)    | 0.441                        |
| The child has a special disease or is allergic to the components of the vaccine               | 5 (1.9)                      | 254 (96.6) | 4 (1.5)     | 0<br>(0.0) | 0 (0.0)           | 20<br>(95.2) | 1 (4.8)    | 0.458                        |
| The opinion of the child's physician was that no vaccine should be administered               | 17 (6.5)                     | 239 (90.9) | 7 (2.7)     | 0<br>(0.0) | 3 (14.3)          | 18<br>(85.7) | 0 (0.0)    | 0.316                        |
| Because other children have not been administered vaccine, I have not taken any action either | 60<br>(22.8)                 | 178 (67.7) | 24<br>(9.1) | 1<br>(0.4) | 4 (19.0)          | 16<br>(76.2) | 1 (4.8)    | 0.688                        |

\* Color coding: p-value > 0.05: transparent, p-value < 0.01: blue, and 0.01 < p-value < 0.05: Green. All P-values are calculated by Chi<sup>2</sup> test

**Table 4**Frequency distribution of parents' beliefs and concerns for unwillingness or hesitation to vaccinate their children againstCOVID-19 by attitude status

| Reason statement  | Definitely not (n = 263) |               |           |            | Hesitant  | Hesitant (n=21) |           |         |
|---|--------------------------|---------------|-----------|------------|-----------|-----------------|-----------|---------|
|   | Yes                      | No            | No idea   | Missing    | Yes       | No              | No idea   |         |
| We are worried about the side effects of vaccines in children   | 238 (90.5)               | 22 (8.4)      | 3 (1.1)   | 0<br>(0.0) | 17 (81.0) | 3 (14.3)        | 1 (4.8)   | 0.249   |
| We do not believe in vaccines   | 48 (18.3)                | 202<br>(76.8) | 13 (4.9)  | 0<br>(0.0) | 0 (0.0)   | 18<br>(85.7)    | 3 (14.3)  | 0.030   |
| The disease process has decreased   | 121 (46.0)               | 121<br>(46.0) | 21 (8.0)  | 0<br>(0.0) | 10 (47.6) | 7 (33.3)        | 4 (19.0)  | 0.182   |
| The pandemic is over and there is no need for a vaccine   | 114 (43.3)               | 124<br>(47.1) | 25 (9.5)  | 0<br>(0.0) | 9 (42.9)  | 6 (28.6)        | 6 (28.6)  | 0.019   |
| We are not worried about the child getting sick   | 44 (16.7)                | 204<br>(77.6) | 15 (5.7)  | 0<br>(0.0) | 8 (38.1)  | 12<br>(57.1)    | 1 (4.8)   | 0.051   |
| Children are mildly affected by Corona virus and there is no need to inject a vaccine                           | 53 (20.2)                | 189<br>(71.9) | 21 (8.0)  | 0<br>(0.0) | 7 (33.3)  | 13<br>(61.9)    | 1 (4.8)   | 0.345   |
| Despite receiving the vaccine, I have been infected, so I have given up on injecting it to my child             | 32 (12.2)                | 225<br>(85.6) | 6 (2.3)   | 0<br>(0.0) | 1 (4.8)   | 19<br>(95.5)    | 1 (4.8)   | 0.482   |
| We have had a history of vaccine side effects in ourselves or in our relatives                                  | 96 (36.5)                | 160<br>(60.8) | 7 (2.7)   | 0<br>(0.0) | 6 (28.6)  | 14<br>(66.7)    | 1 (4.8)   | 0.686   |
| The effectiveness of the vaccine in children is low   | 15 (5.7)                 | 156<br>(59.3) | 91 (34.6) | 1<br>(0.4) | 0 (0.0)   | 4 (19.0)        | 17 (81.0) | < 0.001 |
| Due to the lack of information about the side effects of the vaccine in children, we are hesitant to receive it | 118 (44.9)               | 85 (32.3)     | 59 (22.4) | 1<br>(0.4) | 9 (42.9)  | 1 (4.8)         | 11 (52.4) | 0.003   |
| I do not trust the vaccines that are currently being administered   | 106 (40.3)               | 108<br>(41.1) | 48 (18.3) | 1<br>(0.4) | 4 (19.0)  | 8 (38.1)        | 9 (42.9)  | 0.017   |

<sup>\*</sup>Color coding: *p*-value > 0.05: transparent, *p*-value < 0.01: blue, and 0.01 < *p*-value < 0.05: Green

All P-values are calculated by Chi<sup>2</sup> test

their children. Our study found that children's underlying health conditions were a borderline significant factor influencing parental attitudes; parents of children with underlying diseases being more hesitant or unwilling to vaccinate. Additionally, there was a notable difference in vaccination decisions based on parents' gender, and mothers exhibited greater hesitation or unwillingness compared to fathers.

In our study, the reasons behind unwillingness to vaccinate the children against COVID-19 were almost similar for hesitant parents and unwilling parents. The most important reason was parents' concern about the vaccine's potential side effects. The end of the pandemic and the needlessness to vaccinate the children was another barrier. Also lack of sufficient information about the side effects of the vaccine was other important reason behind the parental unwillingness. COVID-19 vaccine efficacy and side effects were recognized as the key elements in hesitant parents.

Morever, the comparison between the responses of unwilling and hesitant parents regarding the trust in vaccin, belief in vaccine, effectiveness of vaccine, the end of the pandemic, and lack of valid information about vaccine side effects reveals significant differences in their attitudes.

#### Comparison with other studies and implications

In our study, parental willingness to vaccinate their children against COVID-19 was low compared to other Asian countries like India (over 85%) and Saudi Arabia (about 44%) [18]. However, globally, parental hesitation has been reported in a wide range from 25% to over 80% [25, 26], which is very different from our findings (almost 5%). In the United States, parental refusal of COVID-19 vaccination for children was reported 20% [27], indicating that parental reluctance among our participants in Tabriz was noticeable.

In our study, we observed a high rate of vaccination reluctance among parents of children with underlying health conditions. It seems that concerns regarding potential worsening of their child's condition or adverse effects from the vaccine may play a significant role. This hypothesis is supported by findings from similar studies, which indicate that parents often fear the implications of vaccination on their child's existing health issues [28] and may believe that, due to their child's health problems, the risks of vaccination could outweigh the benefits [29].

To mitigate these fears, it is crucial to develop targeted public health messaging that provides clear, evidence-based information regarding vaccine safety and efficacy for children with underlying conditions. This approach could help alleviate parental concerns and promote higher vaccination rates among this vulnerable population.

Also, a significant difference based on parents' gender in the decision to vaccinate children was observed in our study. This indicates that mothers were more likely to be hesitant or unwilling about vaccinating their children compared to fathers.

Consistent with our study, several studies have shown that mothers tend to have more doubts about vaccinating their children compared to fathers [25, 26, 30-32].

The higher reluctance among mothers may stem from greater concerns about vaccine safety or risks, possibly due to their caregiving role.

Public health campaigns should focus on addressing mothers' specific concerns and fears while reinforcing positive attitudes toward vaccination among fathers to boost overall vaccination rates.

Regarding the key reasons for unwillingness identified in our study, these factors have also been highlighted in other studies on parental reluctance, including concerns about the vaccine's potential side effects [14, 16, 25, 33], the belief that the pandemic is over and vaccination is unnecessary [34], also lack of adequate information about the side effects of the vaccine [35]. Notably, the efficacy and side effects of the COVID-19 vaccine have been consistently identified as the main factors influencing parental hesitancy [14, 18, 25, 26, 36, 37].

More specifically, Mollaie et al. conducted a similar study in Shiraz, Iran using questions relatively similar to those in our study [38]. According to their study results, majority of the participants argued that COVID-19 vaccines had side effects for their children and exerted unfavorable effects on their children's growth and fertility [38]. Furthermore, some studies demonstrated that the parents' perceived financial well-being was associated with the parental attitudes about vaccines [39].

New vaccines, rapid production of vaccines, and unknown adverse effects have been recognized as the factors affecting the vaccination refusal or hesitancy [25, 32, 36]. Furthermore, misinformation, the predomination of anti-vaccine groups, and the lack of reliable information sources have been suggested as significant reasons for hesitancy [14, 36]. Although our data collection was performed after the Omicron prevalent period, which increased transmission among all age groups, including children and young people [40], parents speculated that the disease process was slowed down. Parents are not willing to accept vaccination for uncommon diseases [41]. Parents may be encouraged to vaccinate their children if the statistics on infected children and adverse effects after vaccination is constantly updated [36] and the reliable information sources are provided [14].

The significant difference in the percentage of unwilling parents (40.5%) compared to hesitant parents (19%) in terms of their trust in vaccines suggests that these two groups should be addressed with different strategies.

Specifically, unwilling parents are likely to have deeper concerns that may stem from misinformation or negative past experiences. Therefore, rebuilding trust among parents through transparent and factual information about vaccine safety and efficacy, as well as collaboration with trusted community figures, could significantly impact changing their attitudes.

Moreover, the differentiation in reasons for refusal shows that there are varying beliefs within each group. These findings emphasize the need for public health campaigns designed to address the specific concerns of each group and effectively provide the necessary information. This approach could help improve vaccination rates and reduce parental reluctance to vaccinate their children. For instance, parents who do not believe in vaccines or who think the pandemic is over may require tailored arguments that directly address their perceptions.

Regarding the significant difference between the responses of unwilling and hesitant parents about the lack of valid information on vaccine side effects, this stark contrast highlights that unwilling parents are more likely to perceive themselves as having adequate information compared to hesitant parents. The fact that a larger percentage of unwilling parents claim to have valid information suggests that their reluctance to vaccinate may be driven by factors such as personal beliefs or fears, rather than a lack of information alone. In contrast, the very low percentage of hesitant parents who report having valid information indicates that they might be struggling with uncertainty or confusion regarding vaccine safety. This distinction is crucial for understanding the motivations behind parental attitudes toward vaccination.

Recognizing these differences can inform public health strategies. For unwilling parents, interventions might focus on addressing specific concerns and misconceptions. For hesitant parents, providing clear and reliable information could help reduce uncertainty and increase their willingness to vaccinate.

Furthermore, a significant number of the hesitant parents had no idea about the following items: (1) the effectiveness of the vaccine in children (81.0%), (2) the pandemic and necessity of the vaccine for children (28.6%), (3) the lack of information about the side effects of the vaccine in children (52.4%), and (4) trust in vaccines (42.9%). However, majority of the parents who were unwilling to vaccinate their children had positive or negative responses toward the items. Therefore, it was recommended that the health system should take necessary measures to raise the awareness of hesitant parents and disseminate correct information to other target groups.

#### **Future directions**

Our suggestions for future studies that can guide future research to improve vaccination programs and reduce hesitancy, are as follows:

- 1. Investigate the role of media, culture, and medical information on parents' attitude toward vaccination.
- 2. Analyze differences in attitudes and outcomes between parents of vaccinated and unvaccinated children.
- 3. Examine parental attitudes across different regions and cultures.
- 4. Assess the impact of public health campaigns on changing parental attitudes towards vaccination.
- 5. Analyze the influence of healthcare professionals' advice on parents' vaccination decisions.

## Limitations

The current study faced few limitations. First, due to time constraints and the rapidly changing situation of Covid-19, especially in children, telephone interviews were conducted. So, the accuracy of the answers may have been affected by the data collection method relying on the telephone calls. Furthermore, low response rates and incomplete population coverage may occur with the telephone interview method. So, the use of various interview methods, such as face-to-face interview in addition to telephone interviews, can help cover the target population, reduce the low response rate associated with telephone interviews, and compensate for the defects. Second, the responses to study questions may have been affected by the self-reported nature of the study on the underlying diseases and the history of COVID-19 in children. This can be partially addressed by having doctors examine children and conducting prospective studies to carefully investigate the disease. Additionally, parents' information relied upon for background questions about the children. Also, Due to the cross-sectional nature of the study, causal conclusions cannot be made. Although the SIB system covers the general population of Iran and we selected a random sample from its list, potential selection biases such as non-response bias may still arise when using this system for sampling. Finally, due to the specific context of Tabriz, generalizability of the findings beyond the study population should be done with caution.

# Conclusion

The study reveals a significant reluctance among parents to vaccinate their children against COVID-19, with 65.8% unwilling and 5.3% hesitant. Key reasons for this hesitancy include concerns about potential side effects, the belief that the pandemic is over, doubts about the necessity of vaccination, insufficient information about vaccine side effects, and a lack of trust in available vaccines. Additionally, children's underlying health conditions and parents' gender were found to significantly influence attitudes towards vaccination. These findings underscore the importance of targeted educational initiatives to alleviate concerns about vaccine safety, particularly among mothers and parents of children with underlying health conditions. Policymakers and health professionals should prioritize clear communication strategies and reliable information dissemination to foster vaccine acceptance. Future actions may include regular updates on vaccination benefits, statistics on adverse effects, and community engagement to build trust in the health system.

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#### Author contributions

PS initiated the project. PS, NJ, HA designed the project. NJ and AM led the knowledge elicitation, data collection, as well as data analysis and interpretation. PS and NJ wrote the manuscript. All authors reviewed and approved the final manuscript.

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#### Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

#### Declarations

#### Ethics approval and consent to participate

All methods were implemented in accordance with the relevant guidelines and regulations. This study was approved by the research ethics committee of Tabriz University of Medical Sciences with the code of ethics IR.TBZMED. REC.1401.176. Informed consent was obtained from all participants in the study or their legal guardians.

#### **Consent for publication**

Not applicable.

#### **Competing interests**

The authors declare that they have no competing interests.

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