

## Original Article

# Parental Attitudes and Anxiety towards COVID-19 Vaccination in Egypt

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## Abstract

**Background:** Multiple factors negatively affect parental attitudes towards vaccinating children against COVID-19, particularly anxiety. This represents a barrier to long-term control of the pandemic.

**Objective(s):** To study parental attitudes towards COVID-19 vaccination of children and adolescents and its association with anxiety.

**Methods:** A cross-sectional study using an online electronic survey collected from 361 caregivers of children and adolescents (5-17 years old) was conducted. The Arabic version of Parental Attitudes about Childhood Vaccines (PACV) Questionnaire for assessing vaccine hesitancy among parents and the Arabic version of Beck Anxiety Inventory (BAI-A) for assessing anxiety symptoms were used.

**Results:** 18% of the parents were hesitant towards vaccinating their children against COVID-19, 54.8% preferred that their children would develop natural immunity by acquiring the infection, 62.0%, 68.4%, and 41.8% were concerned that their children might have a serious side effect after the shot, they might not be safe or the vaccine might not prevent the disease respectively. Hesitance was higher among the unvaccinated and those who received the first and second dose with no intention to finish the booster one ( $p=0.004$  and  $0.001$  respectively). Higher hesitancy was found among parents with severe anxiety ( $p=0.017$ ).

**Conclusion:** A significantly higher hesitancy towards COVID-19 vaccination of children was found among parents having severe anxiety, young age, and higher education.

**Keywords:** Parental Attitude, Anxiety, COVID-19 Vaccines, Vaccine Hesitancy, Child Vaccination, SARS-COV-2

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## INTRODUCTION

The long-term safety and effectiveness of available COVID-19 vaccines are uncertain, raising greater fears of side effects or failure of prevention from COVID-19 or its upcoming variants.<sup>(1)</sup>

As for a vaccine to be effective in controlling the spread of COVID-19, it is estimated that 67% of the population will need to be vaccinated to reach herd immunity.<sup>(2)</sup> And given the number of people under the age of 18 in Egypt reached 38.9 million in 2018, making up 40.1 % of the total population, the inclusion of children and adolescents in the vaccination plans is imperative.<sup>(3)</sup>

A few months after the implementation of COVID-19 vaccine programs, it was found that about half of United States parents were hesitant about COVID-19 vaccinations for their children.<sup>(4)</sup> It has also been estimated that up to 30% of parents are hesitant to vaccinate their children in Western countries.<sup>(5)</sup>

Anxiety disorders are the sixth leading cause of disability worldwide and could worsen hesitancy and uncertainty.<sup>(6)</sup> Individuals suffering from anxiety experience higher COVID-19-related stress and anxiety.<sup>(6)</sup> Studies spotted the effect of higher Covid-19 anxiety among parents regarding their children.<sup>(7)</sup> However, parents' acceptance or refusal of COVID-19 vaccination has been influenced by multiple variables,

including cultural, social, emotional, spiritual, and political factors as much as cognitive factors. Revealing the factors underlying parental hesitancy towards the COVID-19 vaccines could help contain the infection spreading.<sup>(8)</sup>

Thus, it is crucial to understand the differences in parental attitudes towards COVID-19 vaccination of children and adolescents across varying communities and sociodemographic groups and their association with anxiety. With such knowledge, better vaccine communication and distribution strategies could be adopted. The aim of present study was to study parental attitudes towards COVID-19 vaccination of children and adolescents and its association with anxiety.

## METHODS

A cross-sectional study was conducted between September 2022 and November 2022 using an online electronic survey to explore the parental attitudes toward the COVID-19 vaccination of children and adolescents. Participants were invited to participate in the study through different social media platforms including Facebook, WhatsApp, and Messenger. All participants were included unless there was an exclusion cause.

The study population was adults parenting or acting as guardians of children or adolescents aged between 5 and 17 years. Parents/ guardians suffering from chronic diseases, psychological illness or those who have been recently infected with COVID-19 one week before the data collection were excluded from the study. Moreover, those with confirmed diagnoses of mental health problems have also been excluded.

**Study setting:** the study was conducted online in all Egyptian governorates.

**Study sample:** 380 parents filled out the questionnaire, 19 were excluded for not fulfilling the inclusion criteria, and 361 were illegible. The sample size was calculated using EPI-INFO 7.2. Based on the acceptance rate of administering COVID-19 vaccines to children of 12%<sup>(9)</sup> using a margin of error of 5%, level of confidence of 95%, design effect of 2, the minimum required sample size was 325.

### Data collection tools:

A predesigned self-administered questionnaire was developed and used to collect data regarding the following items:

- A. Socio-demographic data: age, sex, marital status, income, number of children, living with elderly.
- B. Occupational history: level of education,

occupation, type of work, professional level, years of experience.

- C. Medical history: history of chronic diseases.
- D. Characteristics of the children: age, sex, medical history, and chronic diseases, receiving the compulsory childhood vaccination, the seasonal influenza vaccination (SIV) within the past 2 years
- E. History of COVID-19 infection: COVID-19 diagnosis.
- F. COVID-19 vaccination status: partially or fully vaccinated, receiving a booster dose, type of vaccine, date of last dose received, and causes of not completing the doses.
- G. History of COVID-19 infection among children: number of children infected.
- H. Beck Anxiety Inventory- Arabic version (BAI-A):<sup>(10)</sup> to assess anxiety symptoms. The Beck Anxiety Inventory is a 21-item multiple-choice self-report inventory that measures the severity of anxiety among adults and adolescents. The items describe the emotional, physiological, and cognitive symptoms of anxiety but not depression. Each symptom item has four possible answer choices: Responses range from; not at all = 0; mild = 1; moderate = 2; and severe = 3. The values for each item were summed for calculating the total score that ranged between 0 and 63 points. A total score of 0 - 7 was interpreted as a "Minimal" level of anxiety; 8 - 15 as "Mild"; 16 - 25 as "Moderate" and 26 - 63 as "Severe".
- I. The Parent Attitudes about Childhood Vaccines (PACV)-Arabic Version:<sup>(11)</sup> to assess vaccine hesitancy among parents. The PACV consisted of 15 items under 3 domains: behavior (questions 1–2), safety and efficacy (questions 7–10), and general attitude and trust (questions 3–6 and 11–15). The PACV questions were scored individually from 0-2, with 2 for hesitant response, 1 for a response of “don’t know or not sure,” and a score of 0 for questions answered with a non-hesitant response. The total PACV score ranged from 0 to 30, which was converted to percentage with a cutoff score of 50% (i.e. 15), where a non-hesitant parent was defined with a score <50% (below 15) and a hesitant with a value ≥50% (above 15).

A pilot study was initially performed through different social media platforms before the actual data collection phase to check the questionnaire’s feasibility, clarity, and applicability. Approval to fill and submit the online questionnaire was considered consent, as the questionnaire was self-administered with a clear statement mentioning that the questionnaire was a survey for research purposes.

**Statistical analysis:**

The data was analyzed using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA). Statistical significance was established at a p-value < 0.05. Descriptive statistical analysis was conducted. The differences between PACV and anxiety scale were assessed using a multivariate analysis. Correlation between PACV and anxiety scores was done using Pearson's coefficient.

**Ethical considerations**

The study was approved by the Ethics Committee of the Faculty of Medicine, Alexandria University, Egypt, and conducted in accordance with the 1964 Helsinki Declaration.

**RESULTS****Participants Characteristics**

The baseline and sociodemographic characteristics of the study participants are shown in (Table 1). Most participants were females (66.8%), over one-third (34.6%) of the participants were between 30-39 years old, 54.3% were mothers, 53.4% lived in metropolitan regions, and 51.0% held an academic degree. Additionally, 43.8% of the participants had only one child, 74.5% were working, 61.5% perceived their monthly income as enough, 35.7% had an extended family, 35.7% were healthcare workers, and 68.5% were health-insured.

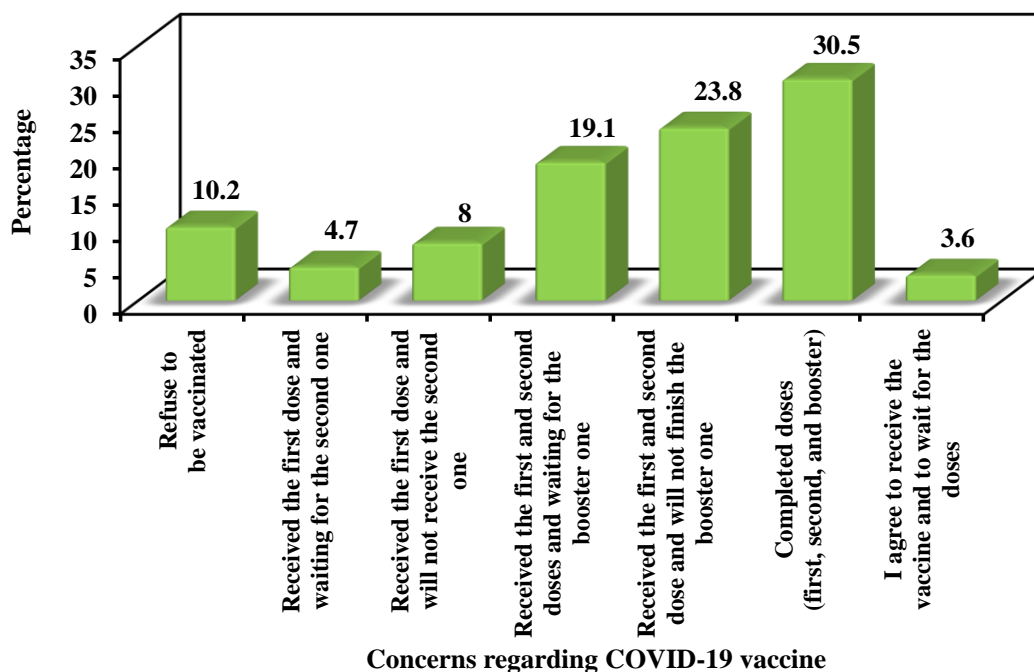
**Table (1): Socio-demographic characteristics of parents having children or teenagers**

	Socio-demographic characteristics	Parents (n=361)	
		No.	%
<b>Age</b>	<30	84	23.3
	30-	125	34.6
	40-	103	28.5
	≥50	49	13.6
<b>Sex</b>	Male	120	33.2
	Female	241	66.8
<b>Relation to child</b>	Mother	196	54.3
	Father	94	26.0
	Grandfather/mother	20	5.5
	Uncle/Aunt	25	7.0
	Other	26	7.2
<b>Living governorate</b>	Metropolitan*	193	53.4
	Lower Egypt	136	37.7
	Upper Egypt	32	8.9
<b>Number of children</b>	1	158	43.8
	2	136	37.7
	3	47	13.0
	4	20	5.5
<b>Level of education</b>	Illiterate	3	0.8
	Read & write	12	3.3
	Primary	13	3.6
	Preparatory	11	3.0
	Secondary	36	10.0
	University	184	51.0
	Postgraduate education	102	28.3
<b>Occupation</b>	Not working	92	25.5
	Governmental	155	42.9
	Private	114	31.6
<b>Work type</b>	Not working	92	25.5
	Work from home	18	5.0
	Part-time	63	17.5
	Full-time	188	52.0
<b>Health care workers</b>		129	35.7
<b>Having health insurance</b>	No	114	31.6
	Governmental	158	43.8
	Private	89	24.6
<b>Monthly income</b>	Not enough, borrow and cannot fulfill debit	23	6.4
	Not enough, burrow and can fulfill debit	78	21.6
	Enough	222	61.5
	Enough and spare	38	10.5
<b>Having parents/ elderly relatives in same house</b>		129	35.7
<b>People living in your house</b>	2 persons	33	9.1
	3 persons	72	20.0
	4 persons	98	27.1
	5 persons	98	27.1
	>5 persons	60	16.7

\*The metropolitan governorates are the four major cities of Cairo, Alexandria, Port-Said and Suez

Figure (1) shows the COVID-19 vaccine status of the studied parents. It revealed that about one-third of the study participants (30.5%) had Completed COVID-19 vaccine doses (first, second, and booster), whereas

(23.8%) received the first and second doses with no intention to finish the booster one. About one-half of the participants (51.5%) had reasons for not completing the vaccine doses.



**Figure (1): COVID-19 vaccine status of parents having children or teenagers**

History of COVID-19 infection and reasons for not completing the COVID-19 vaccination are reported in Table 2. Almost half of the parents (50.7%) confirmed previous COVID-19 infection.

More than one-quarter (27.7%) of the parents reported they will not complete the vaccination doses, while 9.1% stated that the vaccine was not available.

**Table (2): Medical status and concerns of parents having children or teenagers about COVID-19 vaccine**

History of COVID-19 infection and COVID-19 vaccine		Parents (n=361)	
		No.	%
History of COVID-19 infection	No	105	29.1
	Not sure	73	20.2
	Yes	183	50.7
Causes of not completing the doses of COVID-19 vaccine (n=186)	Vaccination is not available	33	9.1
	I will not complete the doses	100	27.7
	Time for the second dose of the vaccine is not yet determined	39	10.8
	Other	14	3.9

Table (3) describes the children’s characteristics and concerns of their parents regarding their vaccination. More than half of the children (53.1%) in this study were aged between 5 to <12 years and 43.0% were aged between 12 to<18 years. Male to female ratio was almost 1:1. Almost four fifths (79.7%) received the compulsory immunization, 63.0% received the

seasonal influenza vaccination (SIV) within the past 2 years and only 16.5% have been diagnosed with COVID-19 infection. Parents who refused to vaccinate their children constituted 43.5%, while 32.3% were willing to vaccinate them but the vaccine was unavailable, and 24.2% had already vaccinated their children.

**Table (3): Children characteristics and parental concerns regarding their vaccination**

Children characteristics	Children (n=635)		
	No.	%	
<b>Age</b>	<5	25	3.9
	5<12	337	53.1
	12<18	273	43.0
	min-max	0.2 – 17.0	
	mean $\pm$ SD	10.4 $\pm$ 4.0	
<b>Sex</b>	Male	305	48.0
	Female	330	52.0
<b>COVID-19 diagnosis</b>	No	420	66.2
	Not sure	110	17.3
	Yes	105	16.5
<b>Receiving the compulsory immunization</b>	No	114	18.0
	Not sure	15	2.3
	Yes	506	79.7
<b>Receiving the seasonal influenza vaccination (SIV) within the past 2 years</b>	No	400	63.0
	Not sure	48	7.6
	Yes	187	29.4
<b>Parents' opinion regarding their children COVID-19 vaccination</b>	Already vaccinated	154	24.2
	Agree to vaccinate but it is not available	205	32.3
	Refuse to vaccinate	276	43.5

Parent Attitudes about their Children's Vaccination measured by (PACV) among the studied parents are presented in table (4). The total PACV mean was  $10.04 \pm 4.78$ . About 20% reported that they never delayed their child getting a vaccine shot and 10.5% decided not to have their child get a vaccination for reasons other than illness or allergy. While 23.8% of the parents were sure that following the recommended shot schedule was good for their children, 32.4% adopted the opinion that getting more shots than the recommended will be good for their children. Notably, only 3.3% believed that vaccination shots prevent many severe illnesses. More than half of the hesitant parents (54.8%) thought that their children should develop natural immunity by getting sick than to get a shot, and 24.4% found it better for children to get fewer vaccines at the same time. About 62% of those parents were found concerned that their child might have a serious side effect from a shot, more than two-thirds (68.4%) were concerned that any one of the childhood shots might not be safe, and 41.8% had concerns that a shot might not prevent the disease. A percentage of 12.5% admitted that if they had another infant on that day, they would want him/her to get all the recommended shots. Overall, 23.8% recorded their hesitancy about childhood shots. Only 8.6% trusted the information they received about shots, 5.0% agreed that they were able to openly discuss their concerns about shots with their child's doctor, and as few as 4.7% confirmed that after all considerations, they trust their child's doctor.

Table (5) demonstrates the total of the PACV's 3 domains among the studied parents. Where the behavior concerning childhood vaccination among the non-hesitant was about 3 times (73.7%) that of the hesitant ones (26.3%), and the behavior domain's total mean score was  $0.71 \pm 1.23$ .

Regarding the general attitude towards childhood vaccinations, non-hesitant parents were much higher than the hesitant parents (88.4% and 11.6%, respectively), and the total mean score of the domain was  $4.68 \pm 2.87$ . Similarly, the score of the general attitude in PACV of the non-hesitant parents was more than four times that of the hesitant parents (82.0% and 18.0% respectively) with a total score of  $10.04 \pm 4.78$ . On the other hand, the Safety and efficacy concerns about childhood vaccination were much more among the hesitant than the non-hesitant parents (69.3% and 30.7% respectively) and the domain total mean score was  $4.65 \pm 2.47$ .

As illustrated in Table (6), the symptoms encountered the most among the parents of children and adolescents were being mildly bothered by the inability to relax and indigestion (about 46% in both). About 10% had no anxiety, while 21.1%, 23.5%, and 45.2% complained of mild, moderate, and severe anxiety, respectively, with a mean score of  $24.45 \pm 13.65$ .

Table (7) clarifies that there were no significant differences regarding the hesitancy of COVID-19 vaccine intake (by children and adolescents) between the different sociodemographic variables of parents. Table (8) demonstrates a significantly higher hesitancy towards childhood vaccination among those who refused to be vaccinated and those who received the first and second doses with no intention to finish the booster one among hesitant compared to the non-hesitant parents ( $p = 0.004$  and  $0.001$ , respectively). Also, a significantly higher hesitancy was reported among those with severe anxiety ( $p = 0.017$ ). On the other hand, there was a significantly lower hesitancy among those who completed the doses (first, second, and booster,  $p = 0.001$ ). Otherwise, no significant differences were detected between the categories.

**Table (4) Parental Attitudes about Childhood Vaccines (PACV) among parents having children or teenagers**

Parental Attitudes about Childhood Vaccines (PACV)		Not hesitant		Not sure		Hesitant	
		No.	%	No.	%	No.	%
Total (n=361)							
1.	Have you ever delayed having your child get a shot for reasons other than illness or allergy?	269	74.5	20	5.5	72	20.0
2.	Have you ever decided not to have your child get a shot for reasons other than illness or allergy?	308	85.3	15	4.2	38	10.5
3.	How sure are you that following the recommended shot schedule is a good idea for your child?	235	65.1	40	11.1	86	23.8
4.	Children get more shots than are good for them.	144	39.9	100	27.7	117	32.4
5.	I believe that many of the illnesses shots prevent are severe.	306	84.8	43	11.9	12	3.3
6.	It is better for my child to develop immunity by getting sick than to get a shot.	112	31.0	51	14.1	198	54.9
7.	It is better for children to get fewer vaccines at the same time.	153	42.4	120	33.2	88	24.4
8.	How concerned are you that your child might have a serious side effect from a shot?	87	24.1	51	14.1	223	61.8
9.	How concerned are you that any one of the childhood shots might not be safe?	114	31.6	0	0.0	247	68.4
10.	How concerned are you that a shot might not prevent the disease?	120	33.2	90	24.9	151	41.9
11.	If you had another infant today, would you want him/her to get all the recommended shots?	285	78.9	31	8.6	45	12.5
12.	Overall, how hesitant about childhood shots would you consider yourself to be?	238	65.9	37	10.3	86	23.8
13.	I trust the information I receive about shots.	242	67.0	88	24.4	31	8.6
14.	I am able to openly discuss my concerns about shots with my child's doctor.	312	86.4	31	8.6	18	5.0
15.	All things considered, how much do you trust your child's doctor?	294	81.4	50	13.9	17	4.7
	Mean $\pm$ SD	10.04 $\pm$ 4.78		Non-hesitant <50		296	82.0
	Min-max	0.0 – 26.0		Hesitant $\geq$ 50		65	18.0
	Median	10.0 (6.0–14.0)					

**Table (5): Parental Attitudes about Childhood Vaccines (PACV)**

PACV domains	Non-hesitant (<50)	Hesitant ( $\geq$ 50)	Total Score
	No. (%)	No. (%)	Mean $\pm$ SD.
Behavior (0 – 4)	266 (73.7%)	95 (26.3%)	0.71 $\pm$ 1.23
General attitudes (0 – 18)	319 (88.4%)	42 (11.6%)	4.68 $\pm$ 2.87
Safety and efficacy (0 – 8)	111 (30.7%)	250 (69.3%)	4.65 $\pm$ 2.47
Total (0 –30)	296 (82.0%)	65 (18.0%)	10.04 $\pm$ 4.78

As shown in Table (9), there was a significant positive correlation between the (general attitudes, safety and efficacy, and total PACV) and the total anxiety score ( $p= 0.008$ ,  $<0.001$  and  $<0.001$ , respectively).

Table (10) shows the stepwise logistic regression analysis results of significant variables related to hesitancy towards childhood vaccination. Based on the findings of the univariate analysis, 11 variables were introduced for the stepwise multiple logistic regression. Results showed that in univariate analysis, the age of the caregiver (being less than

30), level of education (university and post-graduate levels), and severity of anxiety symptoms (severe anxiety) had a significant effect on hesitancy, with OR = 2.11 [1.18 – 3.77], 2.47 [1.07 – 5.66] and 1.92 [1.12 – 3.32], respectively).

While in multivariate analysis, only the age of the caregiver (being less than 30) proved to be a significant independent predictor of hesitancy (OR=2.19 [1.26 – 3.98]). Higher educational levels and severe anxiety were evident but not reaching significance (OR= 2.23 [0.95 – 5.24] and 1.7 [0.98 – 3.02], respectively).

**Table (6): Anxiety Symptoms among the parents having children or teenagers on Beck's Anxiety Inventory (BAI) and its mean score value**

Anxiety	Not at all bothered		Mildly, but it didn't bother me much		Moderately - it wasn't pleasant at times		Severely - it bothered me a lot	
	No.	%	No.	%	No.	%	No.	%
<b>Total (n=361)</b>								
1. Numbness or tingling	115	31.9	155	42.9	75	20.8	16	4.4
2. Feeling hot	106	29.3	136	37.7	87	24.1	32	8.9
3. Wobbliness in legs	128	35.4	136	37.7	65	18.0	32	8.9
4. <b>Unable to relax</b>	72	20.0	165	45.7	82	22.7	42	11.6
5. Fear of worst happening	75	20.8	135	37.4	101	27.9	50	13.9
6. Dizzy or lightheaded	115	31.9	115	31.9	87	24.1	44	12.1
7. Heart pounding / racing	103	28.5	108	29.9	96	26.6	54	15.0
8. Unsteady	100	27.7	131	36.3	78	21.6	52	14.4
9. Terrified or afraid	110	30.5	142	39.3	69	19.1	40	11.1
10. Nervous	72	20.0	139	38.5	105	29.0	45	12.5
11. Feeling of choking	113	31.3	104	28.8	64	17.7	80	22.2
12. Hands trembling	122	33.8	132	36.6	69	19.1	38	10.5
13. Shaky / unsteady	136	37.7	115	31.9	73	20.2	37	10.2
14. Fear of losing control	91	25.2	147	40.7	78	21.6	45	12.5
15. Difficulty in breathing	110	30.5	99	27.3	63	17.5	89	24.7
16. Fear of dying	95	26.3	127	35.3	106	29.3	33	9.1
17. <b>Scared</b>	110	30.5	135	37.4	79	21.9	37	10.2
18. Indigestion	77	21.4	166	46.0	94	26.0	24	6.6
19. Faint / lightheaded	156	43.2	89	24.7	52	14.4	64	17.7
20. Face flushed	136	37.7	126	34.9	64	17.7	35	9.7
21. Hot / cold sweats	125	34.6	130	36.0	65	18.0	41	11.4
<b>Level of anxiety</b>	<b>Total (n=361)</b>				<b>No.</b>		<b>%</b>	
<b>No anxiety</b>	0-7				<b>37</b>		10.2	
<b>Mild</b>	8-15				<b>76</b>		21.1	
<b>Moderate</b>	16-25				<b>85</b>		23.5	
<b>Severe</b>	26-63				<b>163</b>		45.2	
<b>Mean score ± SD</b>					10.04 ± 4.78			
<b>Median</b>					10.0 (6.0-14.0)			
<b>Min. – Max.</b>					0 - 63			

**Table (7): Relation between Parental Attitudes about Childhood Vaccines (PACV) and socio-demographic characteristics**

	PACV		$\chi^2$	p
	Non-hesitant (n = 296)	Hesitant (n = 65)		
	No. (%)	No. (%)		
<b>Age</b>				
<30	61 (72.6%)	23 (27.4%)	6.794	0.079
30-	105 (84.0%)	20 (16.0%)		
40-	89 (86.4%)	14 (13.6%)		
≥50	41 (83.7%)	8 (16.3%)		
<b>Sex</b>				
Male	97 (80.8%)	23 (19.2%)	0.164	0.685
Female	199 (82.6%)	42 (17.4%)		
<b>Relation to child</b>				
Mother	166 (84.7%)	30 (15.3%)	3.675	MC p=0.452
Father	76 (80.9%)	18 (19.1%)		
Grandfather/mother	16 (80.0%)	4 (20.0%)		
Uncle/Aunt	18 (72.0%)	7 (28.0%)		
Other	20 (76.9%)	6 (23.1%)		
<b>Governorate</b>				
Metropolitan	156 (80.8%)	37 (19.2%)	3.287	0.193
Lower Egypt	110 (80.9%)	26 (19.1%)		
Upper Egypt	30 (93.8%)	2 (6.2%)		
<b>Number of children</b>				
1	123 (77.8%)	35 (22.2%)	4.250	0.236
2	117 (86.0%)	19 (14.0%)		
3	38 (80.9%)	9 (19.1%)		
4	18 (90.0%)	2 (10.0%)		
<b>Level of education</b>				
Illiterate	3 (100.0%)	0 (0.0%)	4.776	MC p=0.546
Read & Write	11 (91.7%)	1 (8.3%)		
Primary	12 (92.3%)	1 (7.7%)		
Preparatory	10 (90.9%)	1 (9.1%)		
Secondary	32 (88.9%)	4 (11.1%)		
University	143 (77.7%)	41 (22.3%)		
Postgraduate education	85 (83.3%)	17 (16.7%)		
<b>Occupation</b>				
Not working	70 (76.1%)	22 (23.9%)	3.428	0.180
Governmental	128 (82.6%)	27 (17.4%)		
Private	98 (86.0%)	16 (14.0%)		
<b>Work Type</b>				
Not working	70 (76.1%)	22 (23.9%)	6.141	0.105
Work from home	17 (94.4%)	1 (5.6%)		
Part-time	56 (88.9%)	7 (11.1%)		
Full-time	153 (81.4%)	35 (18.6%)		
<b>Health care workers</b>	106 (82.2%)	23 (17.8%)	0.004	0.948
<b>Having health insurance</b>				
No	99 (86.8%)	15 (13.2%)	2.767	0.251
Governmental	127 (80.4%)	31 (19.6%)		
Private	70 (78.7%)	19 (21.3%)		
<b>Monthly income</b>				
Not enough, borrow and cannot fulfill debit	18 (78.3%)	5 (21.7%)	4.130	0.237
Not enough, burrow and can fulfill debit	64 (82.1%)	14 (17.9%)		
Enough	187 (84.2%)	35 (15.8%)		
Enough and spare	27 (71.1%)	11 (28.9%)		
<b>Having parents/elderly relatives in the same house</b>	106 (82.2%)	23 (17.8%)	0.004	0.948

 $\chi^2$ : Chi square test

MC: Monte Carlo

\*: Statistically significant at  $p \leq 0.05$ 

No.: Number



**Table (8): Relation between Parental Attitudes about Childhood Vaccines (PACV) and History and concerns about COVID-19 vaccine**

	PACV (n = 361)		$\chi^2$	p
	Non-hesitant (n = 296) No. (%)	Hesitant (n = 65) No. (%)		
<b>History of COVID-19 infection</b>				
No	88 (83.8%)	17 (16.2%)		
Yes	148 (80.9%)	35 (19.1%)	0.392	0.822
Not sure	60 (82.2%)	13 (17.8%)		
<b>Concerns regarding COVID-19 vaccine</b>				
Refuse to be vaccinated	24 (64.9%)	13 (35.1%)	8.193*	0.004*
Received the 1st dose, waiting for the 2 <sup>nd</sup>	13 (76.5%)	4 (23.5%)	0.369	<sup>FE</sup> p=0.522
Received the 1st dose, will not receive the 2nd	26 (89.7%)	3 (10.3%)	1.253	0.263
Received the 1st and 2nd doses, waiting for the booster	60 (87.0%)	9 (13.0%)	1.423	0.233
Received the 1st and 2nd dose, will not finish the booster	60 (69.8%)	26 (30.2%)	11.432*	0.001*
Completed doses (1 <sup>st</sup> , 2 <sup>nd</sup> , and booster)	101 (91.8%)	9 (8.2%)	10.342*	0.001*
I agree to receive the vaccine and to wait for the doses	12 (92.3%)	1 (7.7%)	0.972	<sup>FE</sup> p=0.477
<b>Causes of not completing the doses of COVID-19 vaccine</b>				
NA	148 (84.6%)	27 (15.4%)		
Applicable	148 (79.6%)	38 (20.4%)	1.528	0.216
<b>Total anxiety score</b>				
No anxiety	31 (83.8%)	6 (16.2%)	0.089	0.765
Mild	66 (86.8%)	10 (13.2%)	1.532	0.216
Moderate	74 (87.1%)	11 (12.9%)	1.931	0.165
Severe	125 (76.7%)	38 (23.3%)	5.670*	0.017*

 $\chi^2$ : Chi square test\*: Statistically significant at  $p \leq 0.05$ **Table (9): Correlation between anxiety and PACV<sup>#</sup> (n = 361)**

Total Score PACV	Total Score Anxiety	
	r	p
Behavior	-0.034	0.515
General attitudes	0.140*	0.008*
Safety and efficacy	0.309*	<0.001*
Total	0.235*	<0.001*

<sup>#</sup>PACV: Parent Attitudes about Childhood Vaccines r: Pearson coefficient \*: Statistically significant at  $p \leq 0.05$ **Table (10): Univariate and multivariate logistic regression analysis for the parameters affecting PACV**

	Univariate		<sup>#</sup> Multivariate	
	p <sup>`</sup>	OR (LL – UL 95% C.I)	p	OR (LL – UL 95% C.I)
Age <30	0.012*	2.110 (1.180 – 3.773)	0.009*	2.198 (1.215 – 3.975)
<b>Relation to child</b>				
Mother	0.147	0.671 (0.392 – 1.151)		
Grandfather/mother	0.811	1.148 (0.371 – 3.553)		
Upper Egypt	0.088	0.281 (0.066 – 1.209)		
>= 2 children	0.072	0.609 (0.355 – 1.045)		
High Level of education (University or Postgraduate)	0.033*	2.471 (1.078 – 5.665)	0.065	2.234 (0.951 – 5.245)
Not working	0.090	1.652 (0.925 – 2.949)		
Governmental or Private health insurance	0.106	1.675 (0.896 – 3.131)		
Not enough Monthly income	0.804	1.078 (0.596 – 1.949)		
< 4 persons living in your house	0.126	1.554 (0.883 – 2.733)		
Severe anxiety	0.018*	1.925 (1.117 – 3.319)	0.059	1.720 (0.980 – 3.018)

OR: Odd's ratio C.I: Confidence interval LL: Lower limit UL: Upper Limit #: All variables with  $p < 0.05$  was included in the multivariate\*: Statistically significant at  $p \leq 0.05$

## DISCUSSION

COVID-19 vaccines developed rapidly without enough long-term research, leaving space for high uncertainty and doubts, especially among parents toward vaccinating their children.<sup>(1)</sup> The current study aimed to investigate the parental attitudes towards COVID-19 vaccination of children and adolescents, as well as the association of anxiety and other factors with hesitancy.

In the present work, parents who were found hesitant towards vaccination contributed to less than 20% of the

**parents having children or teenagers (5-17 years old)**, indicating high acceptance, which was almost consistent with the high parental acceptance reported by Lee et al (2022) in Korea and Yang et al (2021) in China (72.2% and 70.8%, respectively).<sup>(12, 13)</sup> Yet more hesitancy was recorded by Bell et al (2020) in England (40.9%), which could be attributed to the earlier time of their study when uncertainty was more prevalent.<sup>(14)</sup> Unlike our findings, Saied et al 2022 in Egypt reported that 64% of mothers were hesitant to vaccinate their children. However, their study was carried out at outpatient pediatric clinics in Tanta and only on mothers who could have been worried about their sick children, and the methodology is overall different.<sup>(15)</sup>

Hesitant parents were more encountered among unvaccinated and partially vaccinated who only received the first and second doses with no intention to finish the booster. On the other hand, there was a significantly lower hesitancy among those who completed the doses (first, second, and booster). That was concordant with the findings of Galanis et al (2022), who concluded that increased fear of COVID-19, besides higher trust in its vaccines, especially after receiving the first COVID-19 vaccine dose, decreased worry about a booster dose, however after receiving a second booster dose, people might think there was no need for another booster.<sup>(16)</sup>

Pal et al (2021) assumed that refusal to receive the first COVID-19 vaccine dose would predict a further rejection for additional booster doses, which differed from our results. That could be explained by the difference in structure and approach of the questionnaire as well as variation of the methodology, cultures, and the earlier time of the study, which carries more uncertainty and doubt. However, in partial agreement with our findings, they found that equal proportions accepted and refused booster vaccinations after their initial vaccine dose, where some feared the actual side effects, they already experienced, while the others were further concerned that the vaccine doses they received might not be effective against the upcoming strains and hence other booster/s is/are needed.<sup>(17)</sup>

Interestingly, supporting our results, Ma et al (2022) and Qin et al (2022) reported that parents who were more accepting of the first dose of the vaccine were also favoring booster doses and their children's vaccination and boosters.<sup>(18, 19)</sup>

Concerning the hesitancy, our current work showed that most of the participating parents did not trust the information they received about the children's vaccine, more than two-thirds were concerned about the vaccine safety, less than two-thirds were worried about the side effects and less than half of the hesitant parents favored their children receive natural immunity through actual infection rather than being vaccinated. That matched with Yigit et al (2021),<sup>(20)</sup> Yang et al (2022),<sup>(13)</sup> Lee et al (2022)<sup>(12)</sup>, McNeil and Purdon (2022),<sup>(1)</sup> and Gomaa et al (2023)<sup>(21)</sup> in Egypt, Mansoura. They all agreed that the perception of safety and efficacy, as well as the fear of side effects, played the most critical role in vaccine hesitancy.<sup>(1)</sup> Somehow different results were concluded by Du et al (2021), who mentioned that parental hesitancy was associated with the lower perceived children's susceptibility and benefits to them as well as the higher perceived barriers.<sup>(22)</sup>

Regarding anxiety, a significantly higher hesitancy was reported in our study among those with severe anxiety symptoms, while significance was not encountered among other anxiety levels. Furthermore, a significant positive correlation was found between the general attitude, safety and efficacy, as well as the total PACV to the total anxiety score. That could be explained by the poor tolerance to uncertainty and high perception of threat that anxious people generally have.<sup>(1)</sup> In addition, anxiety could further increase COVID-19 and its vaccine-related information-seeking, which directly correlates with higher vaccine hesitancy.<sup>(23)</sup>

Close results were mentioned by Gomaa and Abdu (2023), who reported that moderate and severe anxiety significantly correlated with higher vaccine refusal among Egyptian Parents.<sup>(21)</sup> In partial concordance with our findings, Bedau et al (2021) , and Bas and Bas (2022) found a significant positive correlation between general anxiety and parental hesitancy toward children's vaccination.<sup>(24, 25)</sup> McNeil and Purdon further argued that anxiety disorders could increase COVID-19 vaccine hesitancy, but their study proved no difference between anxious and non-anxious in vaccine hesitancy.<sup>(1)</sup>

On the other hand, Yigit et al (2020) argued that higher anxiety levels significantly predicted higher parenteral acceptability/intention to COVID-19 vaccination of their children, which might occur due to overweighing fears by vaccine benefits.<sup>(20)</sup> But their study did not include levels of anxiety, unlike this work, where the relationship was evident with severe anxiety levels.<sup>(6)</sup>

Unsurprisingly, we found that the top significant predictors of hesitancy were age under 30 years, higher educational level, and severe anxiety. Yet the only significant independent predictor was age being under 30 years. These findings were in total concordance with Saied et al 2022 and Gomaa et al 2023 in Egypt regarding age,<sup>(15, 21)</sup> educational level, and anxiety, in addition to Galanis et al 2022.<sup>(16)</sup> They were in partial concordance with Lee et al 2022, agreeing with the age but not the education related to hesitancy.<sup>(12)</sup> Nevertheless, Bell et al 2020 found no association between age and hesitancy. The discrepancy could be due to the difference in cultures and methodologies, as well as the age groups of children and adolescents involved in the studies.<sup>(14)</sup>

## CONCLUSION AND RECOMMENDATIONS

There was a significant hesitancy towards COVID-19 vaccination of children among unvaccinated parents and hesitant parents who received the first and second doses with no intention to finish the booster one. Also, there was a significantly high hesitancy among those with severe anxiety, younger parental age, and higher education. The total anxiety score significantly and positively correlated to the general attitude as well as the perception of the safety and efficacy of the children's COVID-19 vaccine.

### Recommendation

Accordingly, the following recommendations are suggested:

- Awareness of the public about the exact nature of the COVID-19 virus and its variants by healthcare workers.
- Provision of accurate information by the vaccine companies and the government about the available vaccines, the age ranges they safely cover, and the expected immunity.
- More research studies covering the physical and mental health effects of the COVID-19 virus, its variants, and vaccines, including possible long-term adverse effects on children and adults. More research on the effect of anxiety, depression, obsessive compulsive disorders, and other psychological problems on the willingness of adults to receive and administrate the COVID-19 vaccines to their children.

### CONFLICT OF INTEREST

All authors declare no conflict of interest.

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