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DOI:

10.4103/jfcm.jfcm\_95\_22

# Hesitancy for influenza vaccine among healthcare workers and mothers of preschool children: A cross-sectional study in Zagazig, Egypt

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## Abstract:

**BACKGROUND:** Vaccine hesitancy is a worldwide issue. To intensify our efforts to find a solution to this problem, we need to comprehend its magnitude and underlying causes. This study aimed to determine the prevalence of influenza vaccine hesitancy and the reasons for it among healthcare workers (HCWs) and mothers of preschool children attending Zagazig Maternal and Child Healthcare (MCH) Center, Sharqia Governorate.

**MATERIALS AND METHODS:** A cross-sectional study was conducted in the Zagazig MCH Center involving 77 HCWs and 210 mothers of preschool children. Two validated questionnaires (one for HCWs and one for mothers of preschool children) were used to collect data on hesitancy to influenza vaccine. Data analysis performed using SPSS v 25.0. For quantitative variables, statistical significance was determined using *t*-test, whereas Chi-square test was employed for quantitative variables. Poisson regression model was used to determine the independent predictors of influenza vaccine hesitancy.  $P < 0.05$  was used as a level of statistical significance.

**RESULTS:** The prevalence of hesitancy to the influenza vaccine was 46.8% among HCWs and 54.3% among mothers of preschool children. Fear of side effects (42.9%) and doubt in the usefulness of the vaccine (42.1%) were the most frequent barriers. Hesitancy was significantly more prevalent in the negative-attitude HCWs (62.0%) than positive-attitude HCWs (18.5%). According to Poisson regression analysis, the age of the index child, the mothers' source of information, and the frequency of vaccination were the critical indicators of influenza vaccine hesitancy in the studied mothers.

**CONCLUSION:** Influenza vaccine hesitancy among the studied sample is high (46.8% among HCWs, and 54.3% among mothers of preschool children). Periodic health education campaigns to increase awareness and change the negative attitude about the influenza vaccine are recommended.

## Keywords:

Attitude, barriers, seasonal influenza, vaccine hesitancy

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Received: 02-03-2022

Revised: 29-03-2022

Accepted: 06-04-2022

Published: 13-05-2022

## Introduction

Seasonal influenza is a contagious viral infection that affects people of all ages globally. According to the World Health Organization (WHO) reports, each year, between 5% and 15% of the global population suffer from influenza virus

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infection, resulting in 3–5 million severe cases and 650,000 respiratory deaths.<sup>[1]</sup> In Egypt, 17.3% of hospitalized patients with acute respiratory infections included one or more types of influenza viruses.<sup>[2]</sup>

The importance of annual vaccination in preventing infection, serious illness, and influenza mortality cannot be overstated.<sup>[3]</sup> HCW vaccination is a vital strategy for the

**How to cite this article:** Hussein YH, Ibrahim MH, Badran SG, Eldeeb SM. Hesitancy for influenza vaccine among healthcare workers and mothers of preschool children: A cross-sectional study in Zagazig, Egypt. *J Fam Community Med* 2022;29:108-16.

reduction of influenza transmission to their service users.<sup>[4]</sup> According to the WHO recommendations, pregnant women, children aged 6 months to 5 years, people over 65, people with chronic medical conditions, and health workers should all get annual influenza vaccination.<sup>[5]</sup> The Centers for Disease Control and Prevention recommended a yearly influenza vaccine for all those above 6 months old.<sup>[6]</sup>

The Egyptian Government has advised people with chronic illnesses, immunological disorders, HIV infection, and extreme obesity to get the influenza vaccine; vaccination was also suggested for HCWs. However, the seasonal influenza vaccine is not part of Egypt's mandatory child immunization schedule.<sup>[7]</sup>

As COVID-19 rages on, seasonal influenza transmission leads to possible co-circulation of influenza and severe acute respiratory syndrome coronavirus 2, as well as an extra burden on at-risk populations and health systems.<sup>[8,9]</sup> The WHO re-evaluated the prioritization of influenza risk groups to achieve the best possible influenza control among high-risk groups of severe COVID-19 disease. For the highest-priority risk groups (HCWs and older people over 50 years old) and other risk groups (pregnant women, individuals with underlying health conditions, and children), influenza vaccination is a priority.<sup>[10]</sup>

Vaccination hesitancy is a motivational state in which a person is conflicted or unwilling to take the vaccine.<sup>[11]</sup> Parents hesitate to vaccinate their children for influenza because they consider it different from other childhood vaccines. It addresses a disease often dismissed as insignificant compared to other childhood illnesses.<sup>[12]</sup> Their children must be vaccinated every year since the vaccine's content and efficacy vary. Despite local initiatives in Egypt, as well as the distribution of the seasonal influenza vaccine by the Ministry of Health in healthcare directorates freely for HCWs,<sup>[13]</sup> the uptake of influenza vaccine by Egyptian HCWs remains suboptimal. The prevalence of seasonal influenza vaccine uptake in the last season was 30.7%, while the percentage of the "ever vaccinated" was 46.8%.<sup>[14]</sup> This study was designed to determine the prevalence of influenza vaccine hesitancy and the reasons for the hesitancy of HCWs and mothers of preschool children attending Zagazig Maternal and Child Healthcare (MCH) Center in Sharqia Governorate.

## Materials and Methods

A cross-sectional study was carried out from January 1, 2021, to the end of June 2021 in the Zagazig MCH Center. Zagazig, one of the Egypt's 191 cities, located on the eastern portion of the Nile delta is the capital

of the Sharqia Governorate.<sup>[15]</sup> Ethical approval was obtained from the Zagazig University Institutional Review Board (ZU-IRB) Vide Letter No. 6625 dated 27/12/2020, and informed written consent was taken from all participants.

A sample from mothers accompanying their preschool children (aged 1–5 years) to the outpatient clinics for routine medical follow-up or for other vaccinations was included in the study. All HCWs working at the Zagazig MCH Center in different departments were invited during the study period; HCWs from outside Sharqia Governorate and absent or on vacation were excluded from this study.

From the records, the total number of preschool children attending the Zagazig MCH Center in 12 months was 6720 children (560 per month). Based on a previous study in Saudi Arabia, the expected prevalence of influenza vaccine hesitancy of mothers was 17%,<sup>[16]</sup> with confidence limit of 5%. At the confidence level of 95%, the total sample size was 210 mothers. It was calculated by Epi Info 7 version 7.2.0.1.<sup>[17]</sup> All HCWs working at Zagazig MCH Center were included in the study.

Every third mother attending the MCH Center was regularly selected using a systematic random sample. Data were collected from participating mothers by face-to-face interviews using a self-administered questionnaire, developed, translated, and validated by Alabbad *et al.*<sup>[16]</sup> The questionnaire included data on demographic characteristics; willingness to take the vaccine; reasons for not getting vaccinated; knowledge about the vaccine and sources of this knowledge; and confidence in the information from the Ministry of Health and Population (MOHP), doctors, and social media (e.g., Facebook, Twitter, etc.) about the vaccine.

Data were collected from the HCWs using a validated self-administered questionnaire.<sup>[18]</sup> The questionnaire comprised the following areas: personal data, work characteristics, the presence of chronic diseases, questions evaluating knowledge regarding seasonal influenza, questions evaluating the knowledge and attitude toward the influenza vaccine (the attitude was considered negative if the person did not trust the effectiveness and necessity of vaccination), and the potential motivators as well as barriers to influenza vaccination.

The studied HCWs completed Google Forms-based questions and then sent them to the final database and downloaded as a Microsoft Excel file. According to Google's privacy policy, the participants' responses were anonymous and confidential.<sup>[19]</sup> The survey included an introductory page describing the background of

the survey, its goals, its survey ethics, and consent for participation. Participating HCWs were considered to have adequate knowledge of the vaccine and the disease if they correctly answered at least 60% of the questions in each set.

The reliability of the questionnaires was tested through Cronbach's alpha measurement. Mothers' questionnaire demonstrated an acceptable level of reliability (Cronbach's alpha = 0.79). HCWs' questionnaire revealed a good level of reliability (Cronbach's alpha = 0.83).<sup>[20]</sup> A pilot study was done 1 month before the start of this project to discover any data-collecting challenges, test the questionnaire validity and reliability, and estimate the time required for data collection and the predicted frequency. The pilot sample was included in the primary selection since no adjustments were made. We defined hesitant participants, as defined by the WHO, as those who said that they had never taken the influenza vaccine and would not do so in the future, despite its availability.<sup>[10]</sup>

The Statistical Package for the Social Sciences (SPSS) version 25 (SPSS Inc. Chicago, IL, USA)<sup>[21]</sup> was used to analyze the data collected. The primary outcome variable was influenza vaccine hesitancy. Major independent variables included demographic variables of the study participants, attitude, knowledge, and source of information about seasonal influenza. A comparison between participants with vaccine hesitancy and those without vaccine hesitancy was made using the appropriate tests of significance. Quantitative variables were analyzed using the Student's *t*-test. Qualitative variables were analyzed using Pearson's Chi-squared test and Chi-square for linear trend as appropriate. In the studied mothers, all the factors significantly associated with vaccine hesitancy were run in a Poisson regression model to determine the independent predictors of influenza vaccine hesitancy.  $P < 0.05$  was used as a level of statistical significance.

## Results

The mean age of the studied HCWs was 34.6 years old, 84.4% of whom were females, 89.6% were married, and 53.2% were physicians. The mean years of experience of the studied HCWs was 10.6. Regarding their health conditions, 18.2% had chronic diseases, but only 2.6% were smokers. While most HCWs (97.4%) had adequate knowledge of the influenza disease and 70.1% had adequate knowledge about the influenza vaccine, more than half had never taken the influenza vaccine, and only 36.4% got the influenza vaccine 2021. Nearly two-thirds of HCWs (64.9%) had a negative attitude toward the vaccine. The majority of HCWs trust MOHP (85.7%)

**Table 1: Characteristics of the healthcare workers working at Zagazig MCH Center, Zagazig, Egypt (n=77)**

Variables	N (%)
Age (years)	
Mean±SD	34.6±4.2
Range	26.0-50.0
Sex	
Male	12 (15.6)
Female	65 (84.4)
Marital status	
Married	69 (89.6)
Unmarried	8 (10.4)
Occupation	
Physician	41 (53.2)
Pharmacist	13 (16.9)
Nurse	13 (16.9)
Dentist	10 (13.0)
Experience years	
Mean±SD	10.6±4.4
Range	2.0-27.0
Chronic diseases	14 (18.2)
Smoking	2 (2.6)
Knowledge about influenza disease	
Adequate	75 (97.4)
Inadequate	2 (2.6)
Knowledge about influenza vaccine	
Adequate	54 (70.1)
Inadequate	23 (29.9)
Attitude toward influenza vaccine	
Positive	27 (35.1)
Negative	50 (64.9)
Do you trust MOHP information on the influenza vaccine?	
Yes	66 (85.7)
No	11 (14.3)
Do you trust social media information on the influenza vaccine?	
Yes	41 (53.2)
No	36 (46.8)
Have you ever received influenza vaccine?	
Yes	33 (42.9)
No	44 (57.1)
Have you received influenza vaccine 2021?	
Yes	28 (36.4)
No	49 (63.6)
Motivators for receiving influenza vaccine (n=28)	
High risk of infection during work	14 (50.0)
Instructions of infection control unit	8 (28.6)
To prevent transmission of influenza to family members	8 (28.6)
The vaccine is free and available	6 (21.4)
Presence of chronic disease	4 (14.3)
To prevent transmission of influenza to patients	3 (10.7)
Satisfactory experience	2 (7.1)
COVID-19 pandemic	1 (3.6)

Contd...

**Table 1: Contd...**

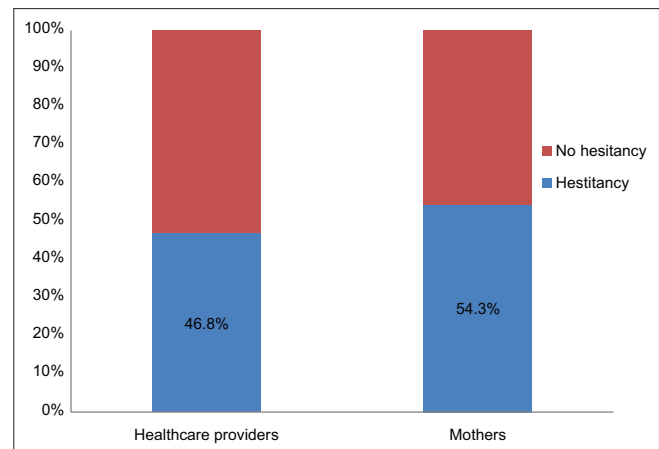
Variables	N (%)
Barriers for receiving influenza vaccine (n=49)	
Side effects of the vaccine	21 (42.9)
Lack of effectiveness of vaccine	12 (24.5)
Fear of injection	5 (10.2)
Cost of vaccine	4 (8.2)
Lack of interest	4 (8.2)
Not needed	2 (4.1)
Unsatisfactory experience	2 (4.1)
Lack of availability	1 (2.0)
Influenza vaccine hesitancy	
No hesitancy	41 (53.2)
Hesitancy	36 (46.8)

MOHP=Ministry of Health and Population, SD=Standard deviation

and social media (53.2%) as the most usual sources of information on the influenza vaccine. Of those who had received the vaccine, the most frequent motivators were the high risk of infection at work (50%), infection control unit instructions (28.6%), and the prevention of the transmission of influenza to family members (28.6%). The most frequent barriers were side effects of the vaccine (42.9%) and the perceived lack of effectiveness of the vaccine (24.5%) [Table 1].

The demographic characteristics of the participating mothers are presented in Table 2. Their mean age was 32.6 years; more than half the participants had high education (51%) and worked (54.8%). Regarding the education of children’s fathers, 61% had high education. More than half of the index children were ≥3 years old, 54.8% were males, 11.4% had chronic diseases, and their childhood routine vaccination coverage was 97.6%. Most of the studied mothers trusted information provided by doctors, and 50.0% had information about the influenza vaccine from HCWs. More than half of the studied mothers (54.8%) trusted the information supplied by MOHP. In addition, 25.5% of the studied mothers depended on the social media for their information. Almost two-thirds of index children (37.6%) had never been vaccinated against influenza. Of the previously vaccinated children, 51.9% took the vaccine regularly every year. Influenza vaccine coverage during the COVID-19 pandemic was 29.5%. The most frequent causes of hesitancy were the doubt in the usefulness of the vaccine (42.1%) and the fear of severe side effects (41.2%).

The prevalence of influenza vaccine hesitancy was 46.8% among HCWs, and 54.3% among mothers of preschool children [Figure 1]. Influenza vaccine hesitancy was significantly more prevalent in HCWs with a negative attitude (62.0%) than in the HCWs with a positive attitude (18.5%). In addition, there



**Figure 1:** Influenza vaccine hesitancy among the study participants

were no significant differences regarding other demographic characteristics in HCWs who had never been vaccinated (68.2%) [Table 3].

Hesitancy about influenza vaccine was significantly more prevalent among mothers of young children <3 years old 80.6%, those with a lower level of education (71.4% for mothers and 75% for fathers) than those with higher education. In addition, the lack of knowledge about the vaccine was associated with a high hesitancy. Most mothers who had never heard about the influenza vaccine (83.3%) were hesitant; 67.2% of the mothers who had never vaccinated their children against influenza were hesitant to take the vaccine. However, chronic health conditions in the index child were associated with less vaccine hesitancy. Only one-third of the mothers whose children had chronic diseases were hesitant about the influenza vaccine. In addition, mothers who got their information from HCWs were less hesitant (38.5%) than those whose information came from other sources. Most mothers who had their children vaccinated against influenza regularly every year (85.4%) had no hesitancy about the vaccine [Table 4].

Poisson regression analysis was done for influenza vaccine hesitancy with significantly related independent variables among the studied mothers [Table 5]. The regression model showed that the age of the index child, source of information, and frequency of vaccination were the significant predictors of influenza vaccine hesitancy. Mothers of younger children (<3 years old) were more prone to influenza vaccine hesitancy. In addition, obtaining information from healthcare providers and getting annual vaccination regularly were protective factors against the influenza vaccine hesitancy. Surprisingly, parents’ level of education and chronic diseases in the child were not significant predictors.

**Table 2: Characteristics of the mothers of children attending Zagazig MCH Center, Zagazig, Egypt (n=210)**

Variables	N (%)
Age of index child (years)	
<3	93 (44.3)
≥3	117 (55.7)
Sex of index child	
Male	115 (54.8)
Female	95 (45.2)
Age of mother (years)	
Mean±SD	32.6±5.4
Range	20.0-48.0
Education of mother	
Primary, preparatory, or secondary	21 (10.0)
High education	107 (51.0)
Postgraduate education	82 (39.0)
Education of father	
Primary, preparatory, or secondary	24 (11.4)
High education	128 (61.0)
Postgraduate education	58 (27.6)
Occupation of mother	
Working	122 (58.1)
Not working	88 (41.9)
Chronic diseases in the child	24 (11.4)
Routine vaccination coverage	205 (97.6)
Do you trust in information provided by MOHP?	
Yes	115 (54.8)
No	95 (45.2)
Do you trust in information provided by doctors?	
Yes	207 (98.6)
No	3 (1.4)
Have you ever heard about influenza vaccine?	
Yes	192 (91.4)
No	18 (8.6)
Knowledge about effectiveness duration of influenza vaccine (n=192)	
Correct answer (1 year)	108 (56.2)
Incorrect answer	84 (43.8)
Source of information about influenza vaccine (n=192)	
Healthcare providers	96 (50.0)
Social media	49 (25.5)
Family or friends	43 (22.4)
Other	4 (2.1)
Have you ever vaccinated your child against influenza?	
Yes	79 (37.6)
No	131 (62.4)
Frequency of vaccination (n=79)	
Regularly every year	41 (51.9)
Irregularly in some years	38 (48.1)
Influenza vaccine coverage after COVID-19 pandemic	62 (29.5)
Influenza vaccine hesitancy	
No hesitancy	96 (45.7)
Hesitancy	114 (54.3)
Causes of hesitancy (n=114)	
The vaccine is not useful	48 (42.1)

Contd...

**Table 2: Contd...**

Variables	N (%)
The vaccine has serious side effects	47 (41.2)
My child is in good health and does not need the vaccine	18 (15.8)
The vaccine is not recommended by doctors	17 (14.9)
I have never heard about the vaccine	13 (11.4)
The vaccine is painful	6 (5.3)

SD=Standard deviation, MOHP=Ministry of Health and Population

## Discussion

This study was conducted to determine the prevalence of influenza vaccine hesitancy and the reasons for it among HCWs and mothers of preschool children. In this study, most HCWs seemed to trust MOHP (85.7%), and social media (53.2%) as the most well-known source of information on the influenza vaccine. This was consistent with a Saudi Arabian study that reported that 93% of HCWs trusted MOHP instruction.<sup>[18]</sup> A study based in Italy showed that most sources of information about the influenza vaccine were scientific journals (56.5%), mass media (41.4%), the Internet (25.3%), and colleagues (20.4%).<sup>[22]</sup>

The present study showed that influenza vaccine hesitancy of HCWs was 46.8%, the most frequent barriers being side effects (42.9%) and lack of vaccine effectiveness (24.5%). This was higher than the report from Saudi Arabia, which stated that HCWs hesitancy was 17%, and the reported causes were the lack of effectiveness of the vaccine (21%), feeling healthy (17%), and vaccine side effects (13%).<sup>[16]</sup> This may be because the health authorities have made vaccination mandatory and free for HCWs.

The main motivator for studied HCWs to be vaccinated against influenza was 'the protection of themselves and their families'. Similar findings have been reported by studies conducted in Saudi Arabia.<sup>[23]</sup> The survey carried out in three Middle East countries<sup>[24]</sup> reported that HCWs' desire to protect themselves was the most common factor that influenced their decision to get the vaccine (United Arab Emirates 56.6%, Kuwait 54.5%, and Oman 64.7%). Another study in Oman reported that the most cited reasons for vaccine acceptance by HCWs were protection for self and the community.<sup>[25]</sup>

The main barriers in the studied HCWs were side effects and the perceived lack of vaccine effectiveness. This is consistent with Alshammari *et al.*,<sup>[26]</sup> who reported that the main barrier was vaccine safety concern (58%). Unlike this study, many studies have indicated that unavailability is one of the main factors of low vaccination coverage.<sup>[27-29]</sup>

The current study showed that hesitancy was more common in HCWs with a negative attitude (62.0%) and those who

**Table 3: Association between characteristics of the healthcare workers and influenza vaccine hesitancy**

Variables	Influenza vaccine hesitancy		P-value
	Yes N (%)	No N (%)	
Age (years)			
Mean±SD	34.2±4.3	34.9±4.0	0.5
Sex			
Male (n=12)	4 (33.3)	8 (66.7)	0.3
Female (n=65)	32 (49.2)	33 (50.8)	
Marital status			
Married (n=69)	32 (46.4)	37 (53.6)	0.8
Unmarried (n=8)	4 (50.0)	4 (50.0)	
Occupation			
Physician (n=41)	17 (41.4)	24 (58.6)	0.3
Pharmacist (n=13)	9 (69.2)	4 (30.8)	
Nurse (n=13)	6 (46.2)	7 (53.8)	
Dentist (n=10)	4 (40.0)	6 (60.0)	
Experience years			
Mean±SD	10.2±4.7	10.9±4.2	0.5
Chronic diseases (n=14)	6 (42.9)	8 (57.1)	0.7
Smoking (n=2)	0	2 (100)	0.5
Knowledge about influenza disease			
Adequate (n=75)	36 (48.0)	39 (52.0)	0.5
Inadequate (n=2)	0	2 (100)	
Knowledge about influenza vaccine			
Adequate (n=54)	23 (42.6)	31 (57.4)	0.3
Inadequate (n=23)	13 (56.5)	10 (43.5)	
Attitude toward influenza vaccine			
Positive (n=27)	5 (18.5)	22 (81.5)	<0.001*
Negative (n=50)	31 (62.0)	19 (38.0)	
Do you trust MOHP information about influenza vaccine?			
Yes (n=66)	29 (43.9)	37 (56.1)	0.2
No (n=11)	7 (63.6)	4 (36.4)	
Do you trust social media information about influenza vaccine?			
Yes (n=41)	17 (41.5)	24 (58.5)	0.3
No (n=36)	19 (52.8)	17 (47.2)	
Have you ever received influenza vaccine?			
Yes (n=33)	6 (18.2)	27 (81.8)	<0.001*
No (n=44)	30 (68.2)	14 (31.8)	

\*Statistically significant. MOHP=Ministry of Health and Population, SD=Standard deviation

had never been vaccinated (68.2%). This is consistent with a study in Slovenia that found that 88.0% of health professionals had not been immunized in season 2014/15. The reported barriers were that health professionals did not believe vaccination was necessary (37.7%) and had a negative attitude toward vaccination (37.3%).<sup>[30]</sup>

The current study found that almost two-thirds of index children had never been vaccinated against influenza. Among previously vaccinated children, 51.9% had the vaccine regularly every year. Influenza vaccine coverage during the COVID-19 pandemic was 29.5%.

**Table 4: Association between characteristics of the mothers and influenza vaccine hesitancy after COVID-19 pandemic**

Variables	Influenza vaccine hesitancy		P-value
	Yes N (%)	No N (%)	
Age of index child (years)			
<3 (n=93)	75 (80.6)	18 (19.4)	<0.001*
≥3 (n=117)	39 (33.3)	78 (66.7)	
Sex of index child			
Male (n=115)	59 (51.3)	56 (48.7)	0.3
Female (n=95)	55 (57.9)	40 (42.1)	
Age of mother (years)			
Mean±SD	32.2±4.8	33.0±5.9	0.3
Education of mother			
Primary, preparatory, or secondary (n=21)	15 (71.4)	6 (28.6)	0.02*
High education (n=107)	48 (44.9)	59 (55.1)	
Postgraduate education (n=82)	51 (62.2)	31 (37.8)	
Education of father			
Primary, preparatory, or secondary (n=24)	18 (75.0)	6 (25.0)	0.02*
High education (n=128)	60 (46.9)	68 (53.1)	
Postgraduate education (n=58)	36 (62.1)	22 (37.9)	
Occupation of mother			
Working (n=122)	64 (52.5)	58 (47.5)	0.5
Not working (n=88)	50 (56.8)	38 (43.2)	
Chronic diseases in the child (n=24)	8 (33.3)	16 (66.7)	0.03*
Routine vaccinations coverage (n=205)	112 (54.6)	93 (45.4)	0.5
Do you trust in information provided by MOHP?			
Yes (n=115)	68 (59.1)	47 (40.9)	0.1
No (n=95)	46 (48.4)	49 (51.6)	
Do you trust in information provided by doctors?			
Yes (n=207)	114 (55.1)	93 (44.9)	0.09
No (n=3)	0	3 (100)	
Have you ever heard about influenza vaccine?			
Yes (n=192)	99 (51.6)	93 (48.4)	0.01*
No (n=18)	15 (83.3)	3 (16.7)	
Knowledge about effectiveness duration of influenza vaccine			
Correct answer (n=108)	54 (50.0)	54 (50.0)	0.2
Incorrect answer (n=84)	60 (58.8)	42 (41.2)	
Source of information about influenza vaccine			
Healthcare providers (n=96)	37 (38.5)	59 (61.5)	<0.001*
Social media (n=49)	38 (77.6)	11 (22.4)	
Family or friends (n=43)	36 (83.7)	7 (16.3)	
Other (n=4)	3 (75.0)	1 (25.0)	
Have you ever vaccinated your child against influenza?			
Yes (n=79)	26 (32.9)	53 (67.1)	<0.001*
No (n=131)	88 (67.2)	43 (32.8)	
Frequency of vaccination			
Regularly every year (n=41)	6 (14.6)	35 (85.4)	<0.001*
Irregularly in some years (n=38)	20 (52.6)	18 (47.4)	

\*Statistically significant. MOHP=Ministry of Health and Population, SD=Standard deviation

**Table 5: Poisson regression analysis results: Association between influenza vaccine hesitancy and various characteristics of the mothers of children attending Zagazig MCH Center, Zagazig, Egypt**

Variables	B	SE	Wald	P-value	OR	95% CI
Age of index child (<3 years)	0.67	0.21	10.7	0.001*	1.99	1.3-2.9
Education level of mother	0.06	0.17	0.11	0.7	1.1	0.75-1.5
Education level of father	0.10	0.17	0.31	0.6	1.1	0.78-1.6
Chronic diseases in the child	-0.11	0.40	0.07	0.8	0.90	0.41-2.0
Ever heard of the influenza vaccine	-0.43	0.34	1.6	0.2	0.65	0.33-1.3
Source of information on influenza vaccine (healthcare providers)	-0.87	0.36	5.9	0.02*	0.42	0.21-0.85
Having the child previously vaccinated against influenza	-0.18	0.26	0.49	0.5	0.83	0.50-1.4
Regular influenza vaccination every year	-1.2	0.47	7.0	0.01*	0.29	0.12-0.73

\*Statistically significant. B=Beta coefficient, SE=Standard error, CI=Confidence interval, OR=Odds ratio

This low vaccination coverage of children could be explained by lack of compulsion, cost, unavailability, and misconceptions about the vaccine.

This study showed that influenza vaccine hesitancy was high (54.3%) among mothers of preschool children. The most frequent causes of hesitancy were doubt in the usefulness of the vaccine (42.1%) and the fear of severe side effects (41.2%). This agrees with a study in Hong Kong.<sup>[31]</sup> Furthermore, these findings are in line with previous research in both developed and developing Asian countries.<sup>[27-29]</sup>

Another survey conducted in the United States of America (USA) found that the prevalence of hesitancy for influenza vaccine was 25.8%.<sup>[12]</sup> Concerns about the safety and effectiveness of the vaccine were the main factors of parents' hesitancy. Another study in China reported that 22% of mothers vaccinated their children for influenza in 2012.<sup>[9]</sup>

A study in Saudi Arabia<sup>[16]</sup> showed that mothers expressed their confidence in the Ministry of Health's and their own doctors' information (95% and 99%, respectively), which is consistent with the findings of this study. A study in Korea<sup>[32]</sup> also showed these as the most potent motivators for vaccination. In contrast, the cost of vaccination was the most substantial factor for not vaccinating children. A study in the USA<sup>[33]</sup> reported that a physician's recommendation for immunization was one of the positive predictors of vaccination. In a survey in Michigan,<sup>[34]</sup> parents cited doctor's recommendations (53%) as well as

the reduction of risk (95%) as significant reasons for vaccinating their children. Finally, a study in Singapore<sup>[35]</sup> found that factors associated with child influenza vaccination included a child's doctor recommendation for influenza vaccine and receiving influenza vaccine information. In line with this study, one conducted in South Australia indicated that the mothers' primary motivators of vaccination were the general practitioner's recommendation (63.8%), access at no cost to all children (37.6%), more awareness through social media campaigns (34.1%), and emphasis on the health benefits of the vaccine (32.4%).<sup>[36]</sup>

The current study reported that hesitancy was significantly higher among mothers and fathers with little education, parents with index children aged <3 years with chronic disease, never having vaccinated their child for influenza, or irregularly had the vaccine. Similar findings were found in a systematic review study, which found that the main predictors of hesitancy were age, education, and the lack of recommendations from medical personnel.<sup>[37]</sup> Furthermore, according to a study of parental hesitancy about routine childhood and influenza vaccinations in the USA, parents with less than a bachelor's degree and with household incomes below 400% of the federal poverty level were more likely to be hesitant about routine childhood and influenza vaccinations.<sup>[12]</sup>

The Poisson regression analysis indicated that the age of the index child, the mothers' source of information, and the frequency of vaccination were the critical indicators of influenza vaccine hesitancy among the studied mothers. Mothers of younger children (<3 years old), also known as prekindergarten age, were more prone to be hesitant for influenza vaccine. Since the child is in home most time and does not mix with other people outside the family, mothers feel that vaccination is not necessary until the child is in kindergarten. In a study conducted in Thailand, similar observations were reported.<sup>[38]</sup>

According to this study, having information from healthcare providers and keeping regular annual vaccination were protective factors against the influenza vaccine hesitancy.

High-risk groups expressed trust in their doctors whose advice, in many studies, strongly influenced the uptake of influenza immunization.<sup>[39,40]</sup>

Finally, there are some limitations in the study's methodology. The first limitation is the reliance on self-reporting, which could be influenced by social desirability and associated with recall bias. Second, it did not discuss the effect of social class or income on vaccine hesitancy. Furthermore, the cross-sectional design does

not provide conclusive evidence of a cause-and-effect relationship.

## Conclusion

Influenza vaccine hesitancy among the studied sample is high (46.8% among HCWs, and 54.3% among mothers of preschool children). The leading causes of the hesitancy of HCWs were the side effects of the vaccine and the doubts about vaccine effectiveness. Concerning children's mothers, the main roadblocks were doubts about the vaccine's efficacy and concerns about serious side effects. As a result, an institutional framework that regularly monitors HCWs for vaccine-negative attitudes and addresses any potential barriers to the yearly influenza vaccination program's integrity is still required. Periodic health education campaigns to raise awareness and change negative attitudes toward the influenza vaccine, and keep healthcare providers as the primary source of information, are especially important for mothers with children under the age of three, who were found to be more prone to influenza vaccine hesitancy.

## Acknowledgment

The authors would like to thank the study's HCWs and mothers for their enthusiastic support and assistance with data collection.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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