

A Survey Analysis of Influenza Vaccination Status Among Children Aged 0–6 Years

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Abstract: *Objective:* This study aims to investigate the influenza vaccination status of children aged 0–6 years in Changzhi City and to analyze its influencing factors. *Methods:* A questionnaire was distributed to 228 randomly selected parents of children aged 0–6 in Changzhi City to investigate the children’s influenza vaccination status. *Results:* (1) A total of 217 valid questionnaires were collected in this survey, with a response rate of 95.2%. (2) The results showed that the main reasons affecting children’s influenza vaccination were, in order, worrying about the safety of the influenza vaccine, believing that influenza vaccination was not necessary, and not knowing the time of the vaccination. (3) Multivariate logistic regression analysis showed that compared with children aged 0–2 years old, those aged 2–4 years old (OR = 0.121, 95% CI = 0.032–0.301) and 4–6 years old (OR = 0.385, 95% CI = 0.228–0.530) had lower cumulative influenza vaccination rates. Compared to the group with parental awareness of flu vaccines, the moderate awareness group (OR = 2.319, 95% CI = 1.527–3.015) and the high awareness group (OR = 2.932, 95% CI = 1.598–4.966) exhibited higher cumulative influenza vaccination rates among children. Parents acquire knowledge about influenza and its vaccines through vaccination centers (OR = 1.396, 95% CI = 1.049–2.050) and doctors (OR = 1.763, 95% CI = 1.291–2.774), which serves as a facilitating factor for influenza vaccination among 0–6-year-old children in Changzhi urban area. *Conclusion:* The age of the child, parental knowledge of the influenza vaccine, and parental communication with the vaccination center and the physician at the visit were the main influencing factors for influenza vaccination.

Keywords: Children; Influenza vaccination; Vaccination status; Influencing factors

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1. Introduction

Influenza vaccination is recognized as a crucial public health intervention for preventing influenza and mitigating its associated severe illnesses and fatalities. Research shows that regular annual influenza vaccination has a significant effect on preventing and controlling influenza in children, and it is an economically effective strategy ^[1-6]. Furthermore, vaccinating children not only boosts their immunity but also provides indirect

protection for other groups, including the elderly, through herd immunity mechanisms ^[7]. According to the “Technical Guidelines for Influenza Vaccination in China (2023–2024 Edition),” all individuals aged 6 months and above who are willing to receive and have no contraindications should receive the influenza vaccine, especially children aged 6 months to 59 months, who are recommended as priority recipients for vaccination ^[8].

2. Subjects and methods

2.1. Subjects

Parents of children aged 0–6 years attending an outpatient clinic of a tertiary hospital in Changzhi City from January to March 2024 were surveyed by random sampling method. Inclusion criteria were: (1) children aged 0–6 years; (2) children without serious neurological diseases; (3) children and parents with normal cognitive and communication skills; (4) children and their guardians gave informed consent. Exclusion criteria: (1) allergic reaction to vaccine components; (2) patients with confirmed Guillain-Barre syndrome; (3) allergic individuals; (4) refusal to participate in the study. A total of 228 questionnaires were distributed and 217 questionnaires were collected, with a recovery rate of 95.2%.

2.2. Content of the survey

2.2.1. General information

The main content includes basic information about children and their families, age of children (0–2 years, 2–4 years, 4–6 years), gender (male, female), ethnicity (Han, non-Han), parity (first, second, third, and subsequent), age of parents (< 30 years, 30–34 years, 35–39 years, ≥ 40 years), education level (high school and below, college and undergraduate, master’s and above), and monthly average income of the family (< 4000, 4000–8000, ≥ 8000).

2.2.2. Parents’ knowledge of influenza vaccination

Parents’ knowledge of influenza and influenza vaccination was assessed, involving the level of knowledge of influenza and vaccination, channels for acquiring relevant knowledge, etc. Five questions were set for each cognitive level, with each correct answer scoring one point, and any non-answer or uncertainty scoring zero. The score ranged from 0–5 points, based on the scores, the level of parental cognition was categorized into low, medium, and high.

2.2.3. Influenza vaccination in the last five years

This section investigated the children’s record of influenza vaccination during 2018–2023 and the reasons for not being vaccinated.

2.2.4. Quality control

The children’s parents were instructed to complete the questionnaire. To ensure the reliability of the collected data, the screening of the research subjects strictly followed the inclusion and exclusion criteria. During the collection of the questionnaires, the researcher used consistent and standardized instructions. After collection, the questionnaires were carefully reviewed and refined to exclude those with omissions, missing key information, or abnormal responses.

2.3. Statistical methods

A database was established with EpiData3.1, data were entered, and statistical analysis was performed using SPSS27.0. The χ^2 test was employed to compare differences among various groups. The analysis of potential factors influencing influenza vaccination rates was performed using a multivariate logistic regression model. The study's significance level was set at $\alpha = 0.05$; if $P < 0.05$, the results were deemed statistically significant.

3. Results

3.1. Univariate analysis of factors affecting cumulative influenza vaccination

In analyzing the multiple factors affecting influenza vaccination rates, we found that there was a significant correlation between the age of the child, the age of the mother, the average monthly income of the family, the parent's knowledge of the influenza vaccine, and knowledge of influenza and its vaccine-related aspects gained through vaccination facilities and healthcare providers, and the cumulative influenza vaccination rates, with a statistically significant ($P < 0.05$). The results are shown in **Table 1**.

Table 1. Univariate analysis of factors influencing influenza vaccination rates

Demographic of children	<i>n</i>	%	Influenza vaccination		χ^2	<i>P</i>	
			<i>n</i>	%			
Gender	Male	107	49.3	66	61.7	0.496	0.481
	Female	110	50.7	63	57.3		
Age	0–2	42	19.4	32	76.2	58.083	< 0.05*
	2–4	97	44.7	66	68.0		
	4–6	78	35.9	31	39.7		
Ethnicity	Han	213	98.2	128	60.1	0.863	0.149
	Non-Han	4	1.8	1	25.0		
Parity	1st pregnancy	130	59.9	83	63.8	3.693	0.158
	2nd pregnancy	79	36.4	41	51.9		
	3 or more births	8	3.7	5	62.5		
Age of mother	< 30	14	6.5	10	71.4	31.072	< 0.05*
	30–34	96	44.2	60	62.5		
	35–39	84	38.7	48	57.1		
	≥ 40	23	10.6	11	47.8		
Age of father	< 30	11	5.1	6	54.5	5.729	0.894
	30–34	70	32.3	42	60.0		
	35–39	99	45.6	63	63.6		
	≥ 40	37	17.0	18	48.6		
Mother's education level	High school or below	34	15.7	7	20.6	0.427	0.808
	Undergraduate college	160	73.7	111	69.4		
	Master's degree or above	23	10.6	11	47.8		

Table 1 (Continued)

Demographic of children		<i>n</i>	%	Influenza vaccination		χ^2	<i>P</i>	
				<i>n</i>	%			
Father's education level	High school and below	29	13.4	5	17.2	1.622	0.445	
	Undergraduate college	159	73.3	108	67.9			
	Master's degree or above	29	13.4	16	55.2			
Average monthly household income	Below 4000	25	11.5	10	40.0	6.179	< 0.01**	
	4000–8000	70	32.3	38	54.3			
	8000 and above	122	56.2	81	66.4			
Influenza awareness	Low	5	2.3	1	20.0	3.441	0.074	
	Medium	69	31.8	32	46.4			
	High	143	65.9	96	67.1			
Influenza vaccine awareness	Low	111	55.8	55	49.5	23.017	< 0.01**	
	Medium	87	40.1	58	66.7			
	High	20	7.4	16	80.0			
Access to influenza and influenza vaccine knowledge	Schools	Yes	122	79.3	81	66.4	2.765	0.098
		No	95	20.7	48	50.5		
	Relatives and friends	Yes	119	80.2	80	67.2	1.708	0.122
		No	98	19.8	49	50.0		
	Various media	Yes	111	51.2	73	65.8	1.177	0.245
		No	106	48.8	56	52.8		
	Vaccination centers	Yes	116	53.5	85	73.3	16.086	< 0.01**
		No	101	46.5	44	43.6		
	Doctors	Yes	125	57.6	88	70.4	27.178	< 0.01**
		No	92	42.4	41	44.6		

Note: **P* < 0.05; ***P* < 0.01

3.2. Reasons for not receiving the influenza vaccine from 2018 to 2023

Among the children surveyed, 88 had never received the influenza vaccine from 2018 to 2023. The three primary reasons why parents did not give their children the influenza vaccine were, in order, “worrying about the safety of the influenza vaccine,” “thinking that the influenza vaccine is unnecessary,” and “not knowing the specific vaccination schedule” (Table 2).

Table 2. Reasons for not receiving influenza vaccination (2018–2023)

Reasons for not getting the flu vaccine	<i>n</i>	%
Concerns about flu vaccine safety	79	89.7
Do not think the flu vaccine is necessary	57	64.7
Not knowing the exact timing of the flu shot	45	51.3

Table 2 (Continued)

Reasons for not getting the flu vaccine	<i>n</i>	%
The child is in good health and does not need to be vaccinated	36	40.9
The flu shot is too expensive	32	36.4
No imported flu vaccine	14	15.9
Ineffective flu vaccine	10	11.4

3.3. Multifactorial analysis of factors influencing cumulative influenza vaccination rates

Using whether one has received an influenza vaccine from 2018 to 2023 (No = 0, Yes = 1) as the dependent variable, logistic stepwise regression analysis was conducted on variables that showed a significant correlation with the cumulative vaccination rate of influenza vaccine in univariate analysis as independent variables. The results showed that compared with children aged 0–2 years, those aged 2–4 years (OR = 0.121, 95% CI = 0.032–0.301) and 4–6 years (OR = 0.385, 95% CI = 0.228–0.530) had lower cumulative vaccination rates of influenza vaccine. Compared with the low cognitive group of parents about influenza vaccines, the moderate cognitive group (OR = 2.319, 95% CI = 1.527–3.015) and the high cognitive group (OR = 2.932, 95% CI = 1.598–4.966) had a higher cumulative vaccination rate of influenza vaccines in children. Among the methods for parents to obtain knowledge about influenza and influenza vaccines, obtaining the knowledge through vaccination centers (OR = 1.396, 95% CI = 1.049–2.050) and doctors (OR = 1.763, 95% CI = 1.291–2.774) is a promoting factor for 0–6-year-old children in Changzhi City to receive influenza vaccines, as presented in **Table 3**.

Table 3. Multifactorial analysis of factors influencing cumulative influenza vaccination rates

Factors	Groups	Reference group	β	Standard error	Wald	<i>P</i>	OR	95% CI
Age of the child	2–4	0–2	-2.148	0.689	9.808	< 0.001	0.121	0.032–0.301
	4–6		-1.096	0.364	12.679	< 0.001	0.385	0.228–0.530
Influenza vaccine awareness	Medium	Low	0.836	0.281	10.482	< 0.001	2.319	1.527–3.015
	High		1.273	0.376	7.205	< 0.001	2.932	1.598–4.966
Access to influenza vaccine-related knowledge through vaccination centers	Yes	No	0.341	0.277	3.648	0.0022	1.396	1.049–2.050
Learning about the flu vaccine by visiting the doctor	Yes	No	0.589	0.293	6.039	0.001	1.763	1.291–2.774

4. Discussion

4.1. Analysis of reasons for not receiving influenza vaccine

The primary concern for parents lies in the safety of vaccines, a sentiment that aligns with the findings of Wang^[9]. Vaccine safety incidents have occurred frequently in China in the past ten years. From 2013 to 2023, there

were more than ten incidents^[10], including the hepatitis B vaccine incident in Shenzhen Kangtai in 2013, the illegal vaccine series case in Shandong in 2016, the Changchun Changsheng vaccine incident in 2018, and the expired vaccine incident in Jinhu County, Jiangsu in 2019. Extensive research studies^[11-13] have consistently demonstrated that these occurrences significantly undermine parental confidence in vaccines, leading to decreased willingness to vaccinate and lower vaccination rates. Moreover, short-term recovery from such setbacks is slow^[14]. Consequently, it becomes imperative to enhance both vaccine safety management and public awareness regarding influenza vaccine safety.

Following influenza vaccination, the immune system takes approximately 2 to 4 weeks to produce sufficient antibodies to provide immune protection. However, antibody levels gradually decrease within 6 to 8 months after vaccination, so vaccination is recommended before the influenza season to maintain an effective immune barrier^[8]. Influenza epidemics in Changzhi City occur from November to March^[15], so the optimal time for influenza vaccination in Changzhi City is in mid-October, which is in line with the recommended vaccination time in the Technical Guidelines for Influenza Vaccination in China (2023–2024)^[8]. To increase influenza vaccination rates, it is recommended that vaccination centers, communities, and kindergartens use a variety of promotional methods in the fall of each year, from September to October, to ensure that parents are aware of the importance of influenza vaccination and related information promptly. These include showing influenza vaccine information on LED screens, posting information on WeChat, and sending SMS reminders. Some studies have shown that SMS reminders can significantly increase the proportion of children receiving influenza vaccination^[16,17].

4.2. Analysis of factors influencing influenza vaccination rates

Data analysis showed that the proportion of children receiving influenza vaccine decreased as they grew older. This phenomenon may be related to the following two reasons. First, as children grow older, the types of vaccines they need to be vaccinated gradually decrease, leading to a decrease in the frequency of parental visits to the vaccination unit, and the importance that parents attach to vaccination may also decrease^[18]. Second, as children's immune systems mature and resistance improves, they are less likely to contract influenza, which may lead to a reduced sense of urgency among parents regarding influenza prevention. Given this, there is a need to strengthen influenza education for parents to increase their awareness of the dangers of influenza and to enhance their awareness of influenza prevention. In a survey of 1,030 primary healthcare professionals in Weifang City, Shandong Province, 96.56% of them recommended influenza vaccination to their patients in the winter and spring of 2020–2021^[19]. In addition, recommendation by healthcare professionals is an important driver of public vaccination. In this survey, 79.4% of parents indicated that they would be willing to vaccinate their children against influenza if recommended by a healthcare professional. The provision of specialized training for healthcare professionals, particularly pediatricians and medical personnel stationed at vaccination sites, is imperative in order to enhance their knowledge regarding influenza vaccination and motivate them to disseminate accurate information about influenza and its vaccines to the public while also recommending immunization.

5. Conclusion

Children's age, parents' knowledge of influenza vaccine, and parents' knowledge of influenza and influenza vaccine through vaccination centers and doctors at medical appointments are the main factors affecting

influenza vaccination; based on these factors, the popularization and education of influenza and vaccination should be strengthened at multiple levels to enhance the awareness and acceptance of influenza and its preventive measures among different groups.

Disclosure statement

The authors declare no conflict of interest.

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