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Article

Willingness and influencing factors to be vaccinated against herpes zoster and pneumococcus of people aged 50 years and over in Xicheng District parks, Beijing

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ABSTRACT

To assess the willingness to receive herpes zoster vaccines (HZV) and 23-valent pneumococcal polysaccharide vaccines (PPSV23) among population aged ≥ 50 years in Xicheng District, Beijing, China. 36.59% and 40.98% of respondents ≥ 50 years of age were willing to receive HZV and PPSV23 with out-of-pocket expenses, and 54.63% of those were willing to receive PPSV23 for free of charge. Willingness to vaccinate against herpes zoster was associated with female sex and higher confidence in vaccine effectiveness, and willingness to vaccinate against PPSV23 was associated with younger age, higher confidence in vaccine effectiveness and having heard of PPSV23. The lower vaccination rate and willingness to vaccinate HZV and PPSV23 were found among individuals aged ≥ 50 years in Xicheng District, Beijing, China. We suggest the vaccination awareness among elderly should be improved. We conducted a cross-sectional survey of people ≥ 50 years of age in three parks of Xicheng District. Logistic regression analyses were performed to determine factors associated with willingness to be vaccinated.

KEYWORDS

elderly, herpes zoster vaccine, pneumococcal vaccine, willingness

1 Introduction

Varicella-zoster virus and *Streptococcus pneumoniae* (Spn) always colonize in the human body for a long period of time and cause illness that were associated with immunity decline [1, 2]. The prevalence and severity of infections are higher in elderly, compared to young adults. The estimated mortality rate for herpes zoster in population over 50 years of age worldwide is 10.9/1000 [1]. In 2017, there were an estimated 1,535,207 deaths from pneumococcal lower respiratory infections in the population aged 50 years and over worldwide [3]. China is currently experiencing an ageing population, with an estimated 365 million people over the age of 65 by 2050 [4]. As a result, the burden of infectious diseases such as herpes zoster and pneumococcal disease is expected to increase.

Vaccination against herpes zoster and pneumococcus for the elderly is an effective intervention for reducing mortality and hospitalization [5, 6]. The World Health Organization (WHO) has recommended people aged ≥ 50 years receive herpes zoster vaccines (HZV) and 23-valent pneumococcal polysaccharide vaccines (PPSV23) [3, 7]. In China, HZV and

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PPSV23 are not part of National Immunization Program and require out of pocket expenses. To alleviate such burden, free PPSV23 vaccination has been provided to local households for people aged ≥ 65 years since 2018 in Beijing, China [8]. HZV was licensed by the State Drug Administration in 2019.

This survey was conducted among people aged ≥ 50 years in Xicheng District Park, Beijing, China, to assess their willingness to receive the two vaccines.

2 Results

2.1 General characteristics

A total of 219 people were surveyed, of which 14 dropped out, and 205 valid questionnaires were collected, with a valid questionnaire response rate of 93.61%. The sociodemographic characteristic were shown in Table 1. The majority of participants were female accounting for 63.41%. There were 79 participants aged 50–64 years (38.54%), 111 participants aged 65–79 years (54.14%), and 15 participants aged over 80 (7.32%); the percentage of participants with junior high school and below, high school, and bachelor's degree and above is 33.7%, 34.1%, and 32.2%, respectively. The average monthly household income for most people ranges from 3000 to 6999 CNY. 56.6% of respondents rated their health condition as good, 36.6% as fair, and 6.8% as bad.

Table 1 Characteristics of participants aged 50 years and over

Variables	Number	Percentage
Gender		
Male	75	36.59%
Female	130	63.41%
Age (years)		
50–64	79	38.54%
65–79	111	54.14%
≥80	15	7.32%
Education background		
Junior high school or below	69	33.7%
High school	70	34.1%
University or above	66	32.2%
Family income (CNY/month/person)		
< 3000	26	12.68%
≥ 3000	75	36.59%
≥ 5000	67	32.68%
≥ 7000	37	18.05%
Physical condition		
Poor	116	56.6%
Fair	75	36.6%
Good	14	6.8%
Have you heard of HZV?		
Never	93	45.37%
Yes	112	54.63%
Can HZV effectively prevent disease?		
Yes	83	40.49%
No	122	59.51%
Is herpes zoster a severe illness?		
Yes	125	60.98%
No	80	39.02%
Have you heard of PPSV23?		
Never	87	42.44%
I've heard of PPV23	118	57.56%
Can PPSV23 effectively prevent disease?		
Yes	70	34.15%
No	135	65.85%

2.2 Attitude towards HZV and PPSV23

Of the 205 respondents, 45.37% have heard of HZV, 40.49% believed that HZV vaccination could prevent shingles, 60.98% considered shingles to be a serious disease. 42.44% were aware of PPSV23, 34.15% believed that PPSV vaccination could prevent infection.

2.3 Willingness of HZV and PPSV23

Of the 205 participants, only 1 participant has vaccinated HZV, the share of HZV vaccination was 0.49%. 36.59% of people were willing to vaccinate HZV. PPSV23 vaccination rate was 7.80% (16/205) for those over 50 years of age. The rate was 9.91% (12/121) for those over 65 years of age. For self-pay vaccination, 40.98% (84/205) of people over 50 years of age were willing to receive PPSV23. For free vaccination, 54.63% (112/205) of those were willing to receive PPSV23.

2.4 Factors affecting willingness to receive vaccinations for HZV and PPSV23

The multiple logistic regression analysis showed that willingness of respondents to receive HZV was significantly associated with female and believing HZV vaccination can prevent from herpes zoster (Table 2). Table 3 showed a significant association between willingness to receive PPSV23 vaccination and respondents aged 50–64 years, having heard of PPSV23 and believing that PPSV23 can prevent pneumococcal diseases ($P < 0.05$).

2.5 Reasons for not vaccinating

Out of 130 people who were unwilling to receive the HZV vaccine, 44 (33.85%) believed that healthy individuals did not require vaccination, 39 (30.00%) were concerned about adverse events following immunization (AEFI), and 27 (20.77%) were not familiar with the HZV vaccine. Despite the policy of free vaccination, 93 people were hesitant to receive PPSV23. Of those, 32 (34.41%) were unaware of the pneumococcal vaccine, 22 (22.58%) of those believed that healthy individuals did not need to be vaccinated, and 14 of those (15.05%) believed the vaccine was ineffective. The percentage of individuals who believed the vaccine was unsafe

Table 2 Multifactorial logistic regression analysis of willingness to receive HZV in people over the age of 50 years

Variables	Total (*N*)	Willingness		OR (95%CI)
		N	Percentage	
Gender				
Male	75	19	25.33%	Reference group
Female	130	56	43.08%	2.44 [1.16, 5.16]
Age (years)				
50–64	84	40	47.62%	Reference group
65–79	106	33	31.13%	0.49 [0.24, 1.02]
≥ 80	15	2	13.33%	0.25 [0.05, 1.36]
Education background				
Junior high school or below	69	21	30.43%	Reference group
High school	70	19	27.14%	0.69 [0.29, 1.63]
University or above	66	35	53.03%	1.42 [0.53, 3.82]
Family income (CNY/month/person)				
< 3000	26	10	38.46%	Reference group
≥ 3000	75	25	33.33%	0.58 [0.2, 1.69]
≥ 5000	67	18	26.87%	0.41 [0.13, 1.28]
≥ 7000	37	22	59.46%	1.03 [0.26, 4.01]
Physical condition				
Poor	116	43	37.07%	Reference group
Fair	75	30	40%	1.41 [0.68, 2.96]
Good	14	2	14.29%	0.27 [0.05, 1.51]
Have you heard of HZV?				
Never	93	47	50.54%	Reference group
I've heard of HZV	112	28	25%	0.57 [0.26, 1.24]
Can HZV effectively prevent disease?				
Yes	83	45	54.22%	Reference group
No	122	30	24.59%	0.46 [0.22, 0.98]
Is herpes zoster a severe illness?				
Yes	125	54	43.2%	Reference group
No	80	21	26.25%	0.54 [0.26, 1.1]

Table 3 Multifactorial Logistic regression analysis of willingness to receive free PPV23 in people over 50 years of age

Variables	Total (*N*)	Willingness		OR (95%CI)
		N	Percentage	
Gender				
Male	75	33	44%	Reference group
Female	130	79	60.77%	1.68 [0.81, 3.46]
Age (years)				
50–64	84	57	67.86%	Reference group
65–79	106	50	47.17%	0.3 [0.14, 0.67]
≥ 80	15	5	33.33%	0.22 [0.05, 0.89]
Education background				
Junior high school or below	69	33	47.83%	Reference group
High school	70	34	48.57%	0.61 [0.27, 1.39]
University or above	66	45	68.18%	0.66 [0.24, 1.84]
Family income (CNY/month/person)				
< 3000	26	16	61.54%	Reference group
≥ 3000	75	38	50.67%	0.43 [0.14, 1.27]
≥ 5000	67	28	41.79%	0.45 [0.15, 1.36]
≥ 7000	37	30	81.08%	1.64 [0.37, 7.28]
Physical condition				
Poor	116	63	54.31	Reference group
Fair	75	43	57.33	1.47 [0.68, 3.19]
Good	14	6	42.86	0.62 [0.17, 2.24]
Have you heard of PPV23?				
Never	87	66	75.86	Reference group
I've heard of PPV23	118	46	38.98	0.22 [0.1, 0.47]
Can PPSV23 effectively prevent disease?				
Yes	70	56	80	Reference group
No	135	56	41.48	0.22 [0.1, 0.48]

and those who reported chronic illnesses preventing vaccination were both 8.6% (8/93). Other reasons are detailed in Table 4.

3 Discussion

In the survey, low willingness to vaccinate against HZV was found among Chinese adults. The result is similar to that of an online survey that showed 43.02% of Chinese people were willing to be vaccinated against HZV [9]. We found that willingness to be vaccinated against PPSV23 by self-payment was similar to that for HZV, but willingness to be vaccinated against PPSV23 was improved by free vaccination. Although there is a significant price difference between HZV and PPSV23, the willingness to pay for vaccination was found to be similar.

This survey revealed three key barriers to improving vaccination willingness. First, even though the PPSV23 policy was in Beijing for five years, less people had heard of these two vaccines. Secondly, some were too complacent to want to be vaccinated, believing they were healthy and did not need to be vaccinated. Thirdly, concerns about the efficacy and safety of

Table 4 Reasons for unwillingness to vaccinate HZV and PPSV23

Reasons for unwillingness to vaccinate HZV	*N*	Percentage	Reasons for unwillingness to vaccinate PPSV23	*N*	Percentage
Healthy people are not required to be vaccinated.	44	33.85%	Lack of awareness regarding the pneumococcal vaccine.	32	34.41%
Concerning about AEFI	39	30%	Concerning about AEFI	26	27.96%
I never heard of HZV	27	20.77%	Healthy people are not required to be vaccinated.	21	22.58%
Already had herpes zoster.	21	16.15%	PPSV23 cannot prevent pneumococcal diseases.	14	15.05%
HZV cannot prevent herpes zoster.	20	15.38%	No risk of infection	12	12.9%
HZV is expensive	17	13.08%	I never heard of PPSV23 free vaccination policy	6	6.45%
Have vaccination contraindications	12	9.23%			
Herpes zoster is not a severe illness.	7	5.38%			

vaccines are one of major obstacle to vaccination. The above evidence indicated that there is a lack of awareness among the elderly regarding vaccination. The studies showed that vaccine education for older people significantly improved attitudes towards vaccine confidence, and vaccination rates were significantly higher than in the control group [10, 11]. Therefore, it is necessary to provide education for the elderly to improve their understanding of vaccines. It has been found that a multimodal intervention of health education and vaccination reminders for older adults in developed areas during physical examinations, outpatient clinics, inpatient vaccination protocols, and health screening checklists can increase vaccination rates [12]. The vaccination behaviour of older people can be influenced by their family members. Older people who receive advice on vaccination from their family members were more likely to get vaccinated [13].

This survey found that a gap between willingness and behavior in the vaccination among elderly. A very low vaccination rates for HZV and PPSV23 were found among people aged ≥ 50 years in Xicheng District, Beijing. A survey of the elderly in nine cities showed that the HZV vaccination rate among people aged ≥ 50 years in China was extremely low, at only 1.70% and the main reason for non-vaccination was a lack of understanding of HZV [14]. PPSV23 was licensed in China in 1996, much earlier than HZV [15]. This study found that the coverage of PPSV23 remained below 10% even after the implementation of a free vaccination policy for the population aged ≥ 65 years. The result is higher than the national coverage of individuals aged ≥ 65 years reported in a meta-analysis (5.5%) [16], but lower than the coverage of individuals aged ≥ 60 years in Shanghai in 2023 (27.4%) [17]. In other countries, the elderly are regarded as priority population for vaccination and receive for attention and support from governments. The Advisory Committee on Immunization Practices (ACIP) recommends that individuals aged ≥ 50 years receive HZV, while those aged ≥ 65 years receive PPSV23 in USA [18, 19]. In 2021, PPSV23 coverage among adults aged ≥ 65 years was 65.8%, HZV coverage among adults aged ≥ 50 years was 32.6% [20]. There is a gap of elderly vaccination rate between China and other countries. It is necessary to consider how willingness can be transferred to behaviours.

It should be noted that this survey was subject to certain limitations. Convenience sampling was used in this survey, and parks were used as survey venues. The respondents might have greater health awareness and better physical condition, so the survey results may have a certain selection bias and not fully reflect the actual level.

In conclusion, the lower vaccination rate and willingness to vaccinate HZV and PPSV23 were found among individuals aged 50 years and older in Xicheng District, Beijing, China. Willingness to vaccinate against HZV was associated with female sex and having higher confidence of PPSV23 effectiveness, and willingness to vaccinate PPSV23 was associated with younger age, higher vaccine confidence of effectiveness and having heard of PPSV23. It is recommended that vaccine education for the elderly be improved.

4 Methods

In this study, respondents were selected as people ≥ 50 years old who engaged in outdoor activities in parks in Xicheng District, Beijing, and who had Beijing local household, excluding unconscious and noncommunicative people. The target sample size was 115 subjects based on $N = \frac{Z^2_{1-\alpha/2}(1-p)}{\varepsilon^2 p} \times diff$, $\alpha = 0.05$, $Z^2_{1-\alpha/2} = 1.96$, $\varepsilon = 0.10$, $p = 87\%$ referring to the rate of willingness to receive pneumococcal vaccination for people aged ≥ 65 years in Chaoyang District, Beijing [21].

A convenience sampling method was used for this survey. We selected three parks in Xicheng District to conduct it. To enhance accessibility for Beijing's elderly population, the selected parks are accessible to Beijing elderly citizens free of charge with their Beijing Elderly Citizen Card. The survey was conducted on April 18–20, 2023. We searched the park for middle-aged and elderly people. If people were eligible by age and household status, a face-to-face survey was conducted after signing an informed consent form. The questionnaire included general characteristics (age, gender, ethnicity, education background, income, and health status), attitudes towards PPSV23 and HZV, vaccination willingness and reasons for unwillingness to be vaccinated.

Descriptive statistics were conducted using frequency for general characteristics, vaccination rates, willingness, and reasons for unwillingness to vaccinate. Two multiple logistic regression models were applied with HZV vaccination willingness (1 for intention to vaccinate or have been vaccinated, 0 for no intention to vaccinate) and PPSV23 vaccination willingness for free as dependent variables. Independent variables included demographic characteristics and attitude towards vaccines. Data analyses were performed using SPSS 23.0. All statistical tests with p-values less than 0.05 were considered statistically significant, and *p*-values were two-sided.

Author contributions

Concept and design: Zhaonan Zhang, Chao Wang, Junqing Song, Chong Teng, and Lirong Wang; data collection and analysis: Junqing Song, Zhaonan Zhang, Xia Chen, Chong Teng, Lirong Wang, Chao Wang, Yifan Song, and lunguang Liu; drafting of the article: Junqing Song and Zhaonan Zhang; critical revision of the article for important intellectual content: Yingxin Pei, Jichuan Shen, and lunguang Liu; study supervision: Yingxin Pei. All the authors approved the final article.

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Conflict of interests

The authors report there are no competing interests to declare.

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