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Willingness to accept a future influenza A(H7N9) vaccine in Beijing, China

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ABSTRACT

Background: The present study aimed to estimate residents' willingness to accept a future H7N9 vaccine and its determinants in the general adult population in Beijing, China.
Methods: We conducted a multi-stage sampling, cross-sectional survey using self-administered anonymous questionnaires from May to June, in 2014. The main outcome variable was residents' willingness to accept a future H7N9 vaccine. Logistic regression was used to identify the predictors of vaccination willingness.
Results: Of the 7264 eligible participants, 14.5% of Beijing residents reported that they had not heard of H7N9. Among those who had heard of H7N9, 59.5% of the general adult population would be willing to accept a future H7N9 vaccine, and approximately half of them reported 'I am afraid of being infected by H7N9' and 'H7N9 vaccine can prevent infections', and 28.1% reported 'my daily life is affected by H7N9'. The variables that were significantly associated with a higher likelihood of reporting willingness were being younger adults (aged 18–29 years: OR = 1.52, 95% CI: 1.17–1.97; aged 30–39 years: OR = 1.39, 95% CI: 1.08–1.78), being farmers (OR = 1.61; 95% CI: 1.32–1.96), being unemployed people (OR = 1.36; 95% CI: 1.04–1.78), living in suburban areas (OR = 2.18; 95% CI: 1.89–2.51), having ≥2 children in the family (OR = 1.41; 95% CI: 1.03–1.92), perceived risk in China (OR = 1.30; 95% CI: 1.15–1.48), perceived susceptibility to disease (OR = 3.13; 95% CI: 2.73–3.58), perceived negative effect on daily life (OR = 1.32; 95% CI: 1.13–1.55), perceived effectiveness of vaccination (OR = 2.34; 95% CI: 2.07–2.64), and recent uptake of influenza vaccine (OR = 2.26; 95% CI: 1.92–2.66).
Conclusions: A great number of Beijing residents had doubts about the vaccine's effectiveness and were not concerned about disease risk, which were the factors affecting willingness to be vaccinated. Targeted education programs on disease risk as well as vaccine's effectiveness are needed to improve the willingness of vaccination for potential H7N9 pandemic preparedness.

1. Introduction

Avian influenza A (H7N9) virus was first identified as a novel virus in Eastern China in March 2013 [1]. Global attention was soon focused on the situation because of the increasing number of new cases and the high rate of death associated with the infections [2]. As of February 23, 2017, a total of 1220 human infections with the virus, including 494 deaths, have been reported from mainland

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China during the former four epidemics [3]. Current evidence suggests that this virus has not acquired the ability of sustained transmission among humans, but small clusters of infected cases involving healthcare workers have been observed previously [4]. Phylogenetic analyses have suggested there is a possible pandemic threat from new reassortment of influenza A (H7N9) virus, emphasizing the importance of continuous surveillance and protective measures against epidemic spread [5].

Vaccination remains one of the most effective strategies in controlling epidemics, but promoting the vaccination uptake can be a difficult challenge for local governments [6]. WHO has recommended several candidate vaccine viruses for the development of H7N9 vaccines for the purpose of pandemic preparedness [7]. Although up to now (as of August 2017), no H7N9 vaccines are commercially available [8], a phase I/II trial suggests that the H7N9 influenza vaccine was immunogenic and safe in adults [9]. Therefore, vaccination is a critical part of H7N9 pandemic preparedness.

Beijing had a heavy burden of Severe Acute Respiratory Syndromes (SARS) in 2003 and pandemic influenza A (H1N1) in 2009 [10]. During the 2009 H1N1 pandemic, pandemic influenza vaccination was first provided to priority populations (e.g., older adults, public servants in key positions, students, teachers and people with chronic diseases) and then other persons in Beijing, and it was proven to be an effective strategy in controlling epidemics [11]. Our previous study showed the vaccination coverage rate was relatively low within the general adult population of Beijing, and the perceptions of not expecting to contract influenza was the predominant barrier to influenza vaccination [12]. Although Beijing has only reported 37 laboratory-confirmed cases of influenza A (H7N9) and 11 deaths as of August 2017, a potential threat of H7N9 pandemic has always been in Beijing. Therefore, preventive measures, including pandemic vaccination policy, should be prepared for possible H7N9 pandemic. Understanding the willingness to accept a future H7N9 vaccine and its main related factors may enable policy makers to take measures for future vaccination coverage improvement. Although several surveys have been conducted in Southern China [13–15], only one of these studied a general population while the other two focused on food producers or live poultry traders. Considering the diverse epidemic strength [16], income levels and healthcare access across China, public willingness to accept a future H7N9 vaccine may vary by region. In the present study, we conducted a large population-based cross-sectional survey to estimate residents' willingness to accept a future H7N9 vaccine and to identify its associated possible factors in the general adult population of Beijing at the end of the second epidemic wave.

2. Materials and methods

2.1. Study area

Beijing is the capital of China and the largest city in Northern China. It is divided into 16 districts, which are classified as urban and suburban districts according to the population density and local economic level. As of the 2010 census, the city had a population of nearly 20 million [17].

2.2. Participants and survey design

The target population was Chinese adults living in Beijing. The participants were classified into ten subgroups according to residence (urban or suburban) and different age groups (18–29, 30–39, 40–49, 50–59 and ≥60 years). The formula $n = \mu_{\alpha}^2 \times \pi \times (1-\pi)/\delta^2 \times deff$ was used to estimate the sample size per subgroup, based on an α error of 5%, the rate of residents' willingness to accept a future H7N9 vaccine in the general population of Beijing (π) = 50%, maximum permissible error (δ) = 0.1π, and the design effect of complex sampling (deff) = 1.5 [18,19]. We estimated a sample size of 576 participants per subgroup. Regarding 10 subgroups, a no-answer rate of 15% and a rate of 10% participants who had not heard of H7N9, the optimal sample size for the present study was 7286 (576 participants per subgroup × 10 subgroups × 1.15 × 1.1).

In this study, participants were recruited by a multistage stratified sampling approach [18–20]. Initially, three urban districts and three suburban districts were randomly selected to be sampled. From each selected district, five towns or streets were randomly selected. And then five communities or villages were randomly selected in each of these towns or streets. In total, 150 committees or villages were confirmed as the survey locations. To meet the sample size requirement, about 48 participants (about 10 participants in each age group) needed to be selected from each survey location.

2.3. Data collection

We conducted the survey from May to June, in 2014, at the end of the second epidemic wave of H7N9. Within each survey location, all the households were randomly numbered according to the address numbers. Well-trained interviewers from local Centers for Disease Prevention and Control visited the households individually according to the random numbers, and interviewed each adult within the households until a total of 48 residents and about 10 participants per age group were investigated in each survey location. Because the family size of Beijing residents was ranged from 2 to 3, approximately 16 to 24 households were randomly selected for interview. Before visiting a household, they made an appointment with the family. If all the residents in a household were not available for the first visit, re-visits would be made to the household. During the interviews, participants were asked to complete the questionnaire by themselves or with the help of interviewers if they had difficulty with reading or writing.

The survey was carried out using a self-administered, anonymous questionnaire, which consisted of four sections: (1) Demographics information (gender, age, educational level, employment status, living area and number of children within the family); (2) Have you ever heard of avian influenza A (H7N9)? The response options were 'yes' and 'no'. If the response was 'no', the following questions from Sections 3 and 4 were not required to answer. (3) Residents' willingness to accept a future H7N9 vaccine if it is available with the response options of 'yes' and 'no'; and (4) Residents' perceptions regarding H7N9 listed as follows: 'H7N9 will remain in China'; 'H7N9 is a serious disease'; 'I am afraid of being infected by H7N9'; 'My daily life is affected by H7N9'; 'H7N9 vaccine can prevent infections' and 'I have accepted the seasonal influenza vaccine in the past year'. The six questions were close-ended, and the response options were 'yes' and 'no'. All the questions were based on evidence in the existing literature [21].

2.4. Ethics statement

The study approval was obtained from the Institutional Review Board and Human Research Ethics Committee of Beijing Center for Disease Prevention and Control (approval number: 2013-11, approval date: December 10, 2013). Anonymity of the participants was guaranteed to participants, and agreement and informed consent from participants was required during the surveys.

2.5. Statistical analysis

The main outcome variable was residents' willingness to accept a future H7N9 vaccine. Weighted analysis was conducted to

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