Emerging Problems In Infectious Diseases

Pandemic Influenza A(H1N1) in Cote d'Ivoire: health-care providers' knowledge of influenza and attitudes towards vaccination

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Abstract
Introduction: During the 2009 influenza A(H1N1) pandemic (pH1N1), different methods were promoted to reduce the spread of influenza, including respiratory etiquette and vaccination. To identify knowledge gaps about influenza and to plan the vaccination campaign against the pandemic in Côte d'Ivoire, a survey was conducted among health-care providers (HCPs) to assess their knowledge about influenza and their willingness to be vaccinated.
Methodology: A cross-sectional survey was performed in the city of Abidjan on 16-18 February 2010, in the three university teaching hospitals, a randomly selected general hospital, and two randomly selected private clinics. In face-to-face interviews, 383 health-care professionals were asked questions about their knowledge of influenza, means of influenza prevention, and their willingness to be vaccinated. Data analysis, both univariate and multivariate, was performed using SPSS.
Results: Willingness to be vaccinated against pH1N1 was 80% (n = 284), and 83% of the HCPs would recommend the vaccine to others. The respiratory mode of transmission of influenza was known by 85% (n = 295) of the participants and 50% (n = 174) believed that seasonal influenza virus and pH1N1 virus were different. In a multivariate model, the factors significantly associated with willingness to receive pH1N1vaccine were fear of pH1N1 disease (OR = 2.1; IC = 1.02-4.35), having only a high school education (OR = 8.28; IC = 2.04-33.60), and feeling at risk to contract pH1N1 (OR = 11.43; IC = 4.77-27.38).
Conclusion: The willingness to be vaccinated against influenza A (H1N1) by health professionals is real.

Key words: health-care providers; influenza; pandemic vaccination

Introduction

In June 2009, the World Health Organization (WHO) declared a pandemic due to a new influenza A (H1N1) virus that was first confirmed in April 2009 in the United States and Mexico [1]

Following its first detection, the 2009 pandemic influenza A virus (pH1N1) circulated quickly around the globe and by June of the same year was detected for the first time in Abidjan, Côte d'Ivoire. Since then the Ivorian economic capital Abidjan, in the south of the country and with a population of 4,275,527 inhabitants in 2010, continued to record cases of pandemic influenza A (H1N1). As of 10 February 2010, the number of suspected cases of pandemic influenza reached 996 with 9 confirmed pH1N1 cases. In view of the pandemic spread, the WHO Strategic Advisory Group of Experts (SAGE) on Immunization

recommended vaccination against the virus, and to prioritize health-care providers (HCPs) to ensure a functional health-care system and to minimize nosocomial infections [2].

Since vaccine availability was limited and expensive, the WHO encouraged vaccine producers to donate vaccine doses to developing countries [3].

Côte d'Ivoire received two million doses of vaccines against pH1N1. This vaccine was intended to be used free of charge in a mass vaccination campaign to vaccinate health-care providers and other high-risk groups, such as pregnant women and people with chronic diseases [2]. At the time the vaccine became available, there were debates about both the severity of the pandemic and the effectiveness of the vaccine. In addition, the Ivorian health authorities had not released any specific information about the vaccine against

pandemic influenza A (H1N1) to health-care providers; this situation posed a real risk in implementing a successful vaccination campaign [4–7]. Reports questioning the efficacy and safety of the pandemic vaccine [8–12] led to low vaccination coverage in health-care providers in some countries [13–15]. In Sub-Saharan Africa, there was a general lack of data on influenza, including both epidemiological data as well as data on seasonal vaccination against influenza [16–18]. Influenza vaccination in health-care providers is poorly documented in Côte d'Ivoire, resulting in uncertainty about the willingness to be vaccinated against influenza among this group.

Prior to the vaccination campaign against the pandemic in Côte d'Ivoire, we conducted a survey among health-care professionals to determine their level of knowledge about the influenza pandemic and their willingness to be vaccinated.

Methodology

A cross-sectional survey was conducted in Abidjan from 16 to 18 February 2010, in the three university teaching hospitals, a randomly selected general hospital out of two, and two randomly selected private clinics out of five polyclinics. The study involved three major occupational groups: doctors, paramedical staff (nurses, midwives) and support staff in health services. Using the list of selected hospital staff, a simple random sampling in each group was performed. The subjects included in the study were previously informed about the objectives of the investigation by the management of the hospital. The sample size was estimated at 416 individuals using the software Epi-Table from Epi-Info (version 6) using a confidence level of 95%, an expected prevalence of 47.9% (13) for the willingness to be vaccinated by health-care providers, and assuming a likely non-response rate of 10%. Using a standard questionnaire, subjects participated in a face-to-face interview. The duration of an interview was about fifteen minutes. Information collected included socio-demographics, level of knowledge about both the pandemic and good practices to prevent the spread of respiratory diseases, and willingness to be vaccinated against pH1N1.

The data collected were used to estimate the number and frequency of information on the level of knowledge, attitudes and practices on pandemic influenza; to compare the proportion of participants who had a positive vaccine intention (pH1N1) to those who did not; to measure the association between the intention to vaccinate, the socio-demographic characteristics, knowledge, attitudes and practices of health-care providers; and finally to determine the frequencies of reasons for negative vaccine intention.

This study was approved by the Cote d'Ivoire Ministry of Health and all the participants gave their verbal consent.

Statistical analysis

The outcome variable was willingness to be vaccinated. Univariate analysis was used to estimate crude odds ratios (OR) and 95% confidence intervals of potential predictors. The Pearson Chi-square with a p-value $\leq$ 5% indicating a significant statistical difference or Fisher exact test and exact confidence intervals were used as appropriate. The choice of potential predictors (age, occupation, gender, marital status, education, access to news media, fear of disease, mode of transmission, perceived risk of contracting the disease, knowledge about cases in Côte d'Ivoire, fear of adverse effects of the vaccine) was made based on previously reported studies [19–21].

A multivariate logistic regression analysis was performed to determine the independent effects of factors influencing willingness to be vaccinated. In the multivariate analysis, the potential predictors were introduced as covariates using age above 40 and being a medical doctor as reference levels. The inclusion and exclusion criteria of an independent variable were respectively of $p \leq 0.05$ and $p \geq 0.10$. Logistic regression was performed with backwards model selection. Interactions between gender and educational level were tested, but found not to be significant.

The adequacy of the final model was tested with the Hosmer and Lemeshow test and residuals were examined for potential outliers. Analyses were performed using SPSS version 17.0.

Results

From the 416 persons who were asked to participate in the survey, 383 (92%) accepted. Among the participants (n = 383), 70% were 20 to 40 years of age, 57% were female, and 69% had a university degree (Table 1). Access to news media varied from 97% (n = 372) for television, to 50% (n = 188) for newspapers and 53% (n = 203) for internet (Table 1).

Questions on knowledge of influenza pH1N1 showed that the respiratory transmission mode of influenza was known by 85% (n = 295) of the participants, while only 50% believed that seasonal influenza virus and pH1N1 virus were different. Slightly more than half the participants, 57% (n = 200), knew about pH1N1 cases in Côte d'Ivoire and

Table 1. Characteristics of the health-care providers (HCPs) interviewed (n = 383)

Variables	Total HCPs	No (%)
Age (years)		
20 - 34	380	144 (37.9)
35 - 40	380	120 (31.6)
41and more	380	116 (30.5)
Gender		
Male	380	163 (42.9)
Female	380	217 (57.1)
Educational level		
High school equivalent	363	114 (31.4)
University degree	363	249 (68.6)
Profession		
Doctor	305	93 (30.5)
Paramedical staff	305	168 (55.1)
Auxiliary staff	305	44 (14.4)
Access to health information		
Have a television	382	372 (97.4)
Read newspapers	380	188 (49.5)
Have access to internet	382	203 (53.1)

only 66% (n = 228) were aware of the existence of a vaccine against it. Questions on attitudes and practices showed that 68% (n = 232) of the respondents feared becoming infected with the pH1N1, and 82% (n = 292) thought they were at risk for contracting it.

The willingness to be vaccinated was 80% (n = 284), and 83% (n = 295) would recommend it to others.

Fewer than half of the participants (41%) said they used disposable tissues when sneezing or coughing and 38% said they washed their hands with soap after sneezing and coughing (Table 2).

The univariate analysis showed that the willingness to be vaccinated was higher among persons with a high school education than among those with a university degree (OR = 2.14; IC = 1.09-4.21), persons fearing pandemic influenza (OR = 1.8; IC = 1.05-3.1), and persons feeling at risk to contract pH1N1 (OR = 5.33; IC=2.93-9.69) (Table 3). Gender, knowledge of pandemic cases in Côte d'Ivoire, and knowledge about adverse effects of the vaccine had no significant effect on the willingness to be vaccinated. In the multivariate model adjusting for age, the fear of

infection with pH1N1, and the perceptions of personal risk to contract pH1N1, those with only a high school level education were 8.3 times more likely to be willing to be vaccinated than those with a university degree (Table 4). Results of the multivariate analysis were similar to the results of the univariate analysis.

The main reasons cited for not being willing to be vaccinated among the 61 HCPs who were unwilling to be vaccinated, were lack of information about the vaccine (n = 30, 49%), doubts about vaccine efficacy (n = 16, 26%), and fear of adverse effects related to the vaccine (n = 14, 24%) (Table 5).

Discussion

The level of knowledge about pH1N1 among health professionals in this study is variable.

The transmission routes of the disease are known by 80% of the participants, which is likely higher than knowledge in the general population, as found elsewhere [19]. However, knowledge of the virus's characteristics and the safety of the vaccine are insufficient because only 50% of participants knew that pandemic influenza is different from seasonal

Table 2. Knowledge, attitudes, and practices of health-care providers towards pH1N1 (n = 383)

Knowledge about pH1N1	Positive answers /total answers	%
Informed of pH1N1cases in Côte d'Ivoire	200/352	56.8
pH1N1 may be acquired by contact with a person ill with pH1N1	310/332	93.4
The pandemic influenza virus (pH1N1) is different from the seasonal influenza virus (sH1N1)	174/348	50,0
Influenza may be transmitted by respiratory droplets	295/347	85.0
Using disposable handkerchiefs when coughing and sneezing reduces the transmission of influenza	283/333	85.0
Existence of a vaccine against pH1N1	228/344	66.3
pH1N1 vaccine may have side effects	37/304	12.2
Wearing a face mask helps to reduce the transmission of influenza	233/321	72.6

Attitudes and practices towards pH1N1 (persons answering with yes)

Fear of becoming infected with pH1N1	232/343	67.6
Feel at risk of contracting pH1N1	292/355	82.3
Fear of becoming influenza infected at the hospital	83/377	22.0
Willing to receive pH1N1 vaccination	284/354	80.2
Would advise someone else to receive pH1N1vaccine	295/356	82.9
Use disposable handkerchiefs for sneezing and coughing	154/380	40.5
Wash hands after sneezing and coughing	144/379	38.0
Instruct patients about hand hygiene after sneezing and coughing	284/378	75.1

influenza virus and 12.2% knew that the vaccine against pandemic influenza has adverse effects. The survey was conducted after the detection of the first pandemic case in Côte d'Ivoire, and eight months after the declaration of the pandemic by the WHO [1]. It was expected that the combined efforts of national and international health authorities in training health-care providers and informing and educating the general population would have led to a better understanding of pH1N1. One of the reasons for the relative lack of knowledge could be the rather low rate of internet access (53%) which to the authors' knowledge is one of the best channels to get timely information.

The study showed that the majority of the respondents knew that wearing a face mask or using disposable tissues helps to reduce influenza transmission; however, a rather small proportion of participants reported actually using respiratory hygiene measures such as the use of disposable tissues when sneezing or coughing (40.5%) or hand washing with soap after sneezing or coughing (38%). These simple measures are among the best means of preventing influenza transmission [22–25]. These results indicate a low compliance with prevention measures, illustrating that more needs to be done to promote behavioral changes in hospital and clinic settings to prevent influenza transmission [26,27]. The analysis also illustrates that the change in behavior is not necessarily related to knowledge. Indeed, despite the knowledge of prevention of disease through the use of protective masks and disposable tissues when coughing and sneezing, practices thereto (washing hands with soap, wearing masks) are in low proportions. Moreover, these practices are recommended to patients. These data provide information on adherence by HCPs to these methods and also the need for health authorities to promote the implementation of these practices by bringing resources and raising awareness of HCPs to implement these measures in hospitals.

Table 3. Factors associated with willingness to be vaccinated against pH1N1 among health-care providers: univariate analysis

Variables	N (%)	OR*	95% CI**	P-value[#]
Age (years)				
20 - 34	111 (84.7)	1.47	0.75 - 2.87	0.256
35 - 40	88 (76.5)	0.86	0.46 - 1.63	0.653
41 and more	83 (79.0)	1		
Gender				0.645
Male	125 (81.2)	1		
Female	156 (79.2)	0.88	0.52 - 1.50	
Educational level				0.024
High school equivalent	85 (87.6)	2.14	1.09 - 4.21	
University degree	185 (76.8)	1		
Profession				
Doctor	66 (72.5)	1		
Paramedical staff	131 (81.4)	1.65	0.90 - 3.04	0.103
Auxiliary staff	28 (80.0)	1.52	0.59 - 3.91	0.388
Access to television: yes vs. no	276 (80.2)	1.16	0.12 - 6.27	1.000£
Reading newspapers: yes vs. no	147 (83.5)	1.55	0.91 - 2.64	0.103
Access to internet: yes vs. no	152 (77.2)	0.65	0.38 - 1.11	0.111
Existence of pandemic cases in Ivory Coast: yes vs. no	161 (80.9)	1.15	0.68 - 1.94	0.605
Transmission of influenza via respiratory droplets: yes vs. no	234 (80.1)	1.08	0.52 - 2.24	0.830
Existence of adverse effects for the vaccine against pandemic influenza A(H1N1) : Yes vs. No	26 (70.3)	0.56	0.26 - 1.21	0.139
Fear of infection with pH1N1: yes vs. no	190 (83.0)	1.8	1.05 - 3.1	0.032
Feeling at risk to contract influenza: yes vs. no	250 (86.2)	5.33	2.93 - 9.69	<0.001

* = odds ratio unadjusted; ** = confidence interval; # = Pearson Chi-Square Test; £ = Fisher's Exact Test

Among the HCPs we surveyed, the willingness to be vaccinated against pH1N1was high. Similar acceptance rates for vaccination have been reported in other studies among the general population (Mexico 80% [28], Canada 69% [29] and 75% [30]**,** and 89% in Kenya [31]**)**. However, our results are markedly different from those in other studies that have reported a low willingness to be vaccinated in HCPs [13–15, 32–35]. This difference could be explained by the period at which certain studies were conducted, especially under the influence of the evolution of the

pandemic. The moderate pace of the pandemic has not negatively impacted vaccine uptake intention by participants in our study because 80% of the participants expressed a desire to be vaccinated.

The main factors associated with the willingness to be vaccinated against the pandemic virus from this study are similar to those found in other studies. In fact, the perception of disease severity and the risk of contracting pH1N1 are the main predictors for vaccination [19–21]. Previous vaccination against seasonal influenza was not found in this study to be a

Table 4. Results of the logistic regression analysis, showing the adjusted OR for the association of covariates with the willingness to be vaccinated against pH1N1 (n = 230; yes =180)

Variables	Adjusted OR*	95 %CI**	P-value $
Age (years)			
20 - 34	1.81	0.68 - 4.85	0.083
35 – 40	0.67	0.27 - 1.64	
41 and more	1		
Educational level			
High school equivalent	8.28	2.04 - 33.60	0.003
University degree	1		
Fear of becoming infected with the pH1N1: yes vs. no	2.1	1.02 - 4.35	0.045
Feeling at risk to contract influenza: yes vs. no	11.43	4.77 - 27.38	<0,001

* = adjusted odds ratio ; ** = confidence interval; $ = Wald's test

Table 5. Reasons for unwillingness to be vaccinated among health care providers (HCPs), Cote d'Ivoire, February 2010 (n = 70

Variables	Total HCPs	No. (%)
No information about the vaccine	61	30 (49)
No confidence in the vaccine	61	16 (26)
Fearing adverse effects	58	14 (24)
Not a dangerous disease	61	3 (5)

positive predictor for the willingness to be vaccinated with the pandemic vaccine, although this has been found in a series of other studies [36–39]. In sub-Saharan Africa and in Côte d'Ivoire in particular, vaccination against seasonal influenza is not common among health-care providers, although quality data on vaccination coverage for seasonal influenza are very limited. In developed countries, vaccination against seasonal influenza is mandatory for health-care providers to reduce morbidity from the disease in health facilities [40,41]**;** however, in Côte d'Ivoire, there is no similar vaccination policy.

Although the 80% willingness to be vaccinated against the pandemic virus is high, the rate of 20% not willing to be vaccinated is still considerable, taking into account that vaccination is the primary means to prevent the transmission of influenza [40,42]. It is therefore essential to work towards a reduction in refusals to lower than 10% through further education

and awareness campaigns. The main reasons given for refusal were the lack of information about the vaccine, doubts about efficacy, and fear of adverse effects, which are also factors mentioned in other publications [8–11]. These attitudes can easily be targeted by making available the data on tolerance and efficacy of the vaccine against pH1N1, which should reassure the skeptics and increase the interest for vaccination [2,43].

This study has some limitations. It was performed only in the city of Abidjan, the economic capital of Côte d'Ivoire, where information is more readily accessible compared with more remote parts of the country. The selection design favours larger hospitals where access to information might again be better. The timing of the actual interviews vis-á-vis current media coverage could also have influenced the outcome of the study. Other limitations are inherent in the method of cross-sectional study and data collection by

interview (response induced by the investigator, unsuitable time for the interview, etc.) including the use of dual-choice questions (yes/no) that does not necessarily mean better understanding of all the answers of the respondents.

Conclusion

In Abidjan, Côte d'Ivoire, the willingness to be vaccinated against influenza A (H1N1) by health professionals is real. Factors influencing favorably for vaccination are perceived risk of acquiring pH1N1 as well as the fear of the disease. Improving the attitude of HCPs for vaccination against pH1N1 requires making information available at their level. It appears necessary for the Ivorian health authorities to educate health professionals on the importance of influenza vaccination in hospital settings to increase the intention of vaccine uptake in the 20% of HCPs not willing to be vaccinated.

Disclaimer
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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