Acceptability of A/H1N1 vaccination during pandemic phase of influenza A/H1N1 in Hong Kong: population based cross sectional survey

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ABSTRACT

Objective To investigate the intention of the Hong Kong general population to take up vaccination against influenza A/H1N1.

Setting Cross sectional population based anonymous survey.

Participants Random sample of 301 adults interviewed by telephone (response rate 80%).

Main outcome measure Intention to take up vaccination against influenza A/H1N1 under five hypothetical scenarios: vaccination is free; vaccination per dosage costs less than \$HK100 (£8; €9; \$13), \$HK101-200, or more than \$HK200; and no data are available on the efficacy and safety of the vaccine.

Results 45% (n=135) of the participants reported that they would be highly likely take up vaccination if it was free. When vaccination incurred a cost, however, the prevalence of uptake decreased: 36% (n=108) would take up vaccination if it cost less than \$HK100, 24% (n=72) if it cost \$HK101-200, and 15% (n=45) if it cost more than \$HK200; and in absence of proved efficacy and safety decreased to 5% (n=14). Moreover, 32% (n=95) considered universal A/H1N1 vaccination unnecessary. Overall, 39% (n=117) of participants believed that A/H1N1 vaccination would prevent the virus being contracted; 63% (n=189) erroneously believed that efficacy of the vaccine had been confirmed by clinical trials, and 16% (n=49) believed that it is necessary for everyone in Hong Kong to take up vaccination against influenza A/H1N1.

Conclusions The uptake of vaccination against influenza A/H1N1 by the general population of Hong Kong is unlikely to be high and would be sensitive to personal cost. Evidence about safety and efficacy is critical in determining the prevalence of uptake of vaccination.

INTRODUCTION

The earliest confirmed case of influenza A/H1N1 (swine flu) in 2009 was reported in Mexico on 23 April,¹ and the World Health Organization declared the disease to be a pandemic on 11 June.² As of 13 September 2009 the virus has spread to over 170

countries, territories, and areas, and is estimated to have caused over 3486 deaths.³ The mortality from A/H1N1 appears moderate, although the virus does seem to be more infectious than seasonal influenza⁴ and children are particularly susceptible.⁵ On 20 September, 22054 cases of influenza A/H1N1 and 15 associated deaths were confirmed in Hong Kong.⁶ The government has now suspended the testing of suspected cases. The development of A/H1N1 vaccines would be one of the most effective ways to control the pandemic.⁷ Many governments have announced large scale plans for vaccination against influenza A/H1N1. On 19 June 2009 the government of Hong Kong passed legislation to purchase five million doses of influenza A/H1N1 vaccine and indicated that a large scale vaccination campaign would be launched at the end of the year,^{8,9} with an acknowledgement that the vaccine might not have gone through complete clinical trials. The government announced that the vaccine would be provided to a high risk group of two million people, including healthcare workers, people aged more than 65, children aged 6 months to 6 years, and those with particular health conditions, along with 500 000 people who would voluntarily pay for the service.¹⁰ The tender was unsuccessful and a new round of bidding was initiated. The cost of vaccination has not yet been agreed. The market price for seasonal influenza vaccination in Hong Kong is around US\$20-25 (£13-16; €14-17).

A recent study reported that 48% of healthcare workers in Hong Kong were willing to accept vaccination at the prepandemic phase of the influenza A/H1N1 epidemic and that the perceived risk of contracting the virus and history of vaccination against seasonal influenza were associated with the willingness to take up vaccination, whereas fear of side effects and doubts about vaccine efficacy were major reasons for unwillingness.¹¹

The uptake of seasonal influenza vaccination in Hong Kong during September 2006 to April 2007 among community dwelling older people aged 65 or more was 35% and it was lower among pregnant

Table 1 Characteristics of participants and intention to take up vaccination against influenza A/H1N1 according to five hypothetical scenarios

Variables	No (%) of participants (n=301)
Men	136 (45)
Women	165 (55)
Age (years):	
<30	76 (25)
30-39	64 (21)
40-49	86 (29)
50-60	75 (25)
Education level*:	
Form 3 or below	58 (19)
Form 4—matriculation	130 (44)
College or above	111 (37)
Marital status:	
Single	105 (35)
Married or cohabiting	189 (63)
Divorced or widowed	5 (2)
Full time employment:	
No	123 (41)
Yes	177 (59)
Ever had influenza vaccination:	
No	240 (80)
Yes	61 (20)
Hypothetical scenarios for influenza A/H1N1 vaccination	
Vaccination is free:	
Unlikely or unsure†	166 (55)
Highly likely‡	135 (45)
Vaccination costs <\$HK100:	
Unlikely or unsure†	193 (64)
Highly likely‡	108 (36)
Vaccination costs \$HK101-200:	
Unlikely or unsure†	229 (76)
Highly likely‡	72 (24)
Vaccination costs >\$HK200:	
Unlikely or unsure†	256 (85)
Highly likely‡	45 (15)
Vaccine efficacy and safety have not been confirmed by clinical trials:	
Unlikely or unsure†	287 (95)
Highly likely‡	14 (5)

Based on census data to end of 2008 from Census and Statistics Department Hong Kong, 2009. 46% of men and 54% of women were aged 18-60; 25% of participants were aged <30, 24% were aged 30-39, 27% were aged 40-49, and 24% were aged 50-60.

*Form 3 is equivalent to ninth year of formal education and form 4 to 10th year. On completion of 11 years of formal education, students are required to take the two year matriculation programme to enter universities.

women (4%), children aged 6-23 months (9%), those with chronic diseases (23%), and adults in the general population (15%).¹² We investigated the intention of taking up vaccination against influenza A/H1N1 under five hypothetical scenarios including cost and availability of clinical evidence on the vaccine.

METHODS

The target population was Chinese adults aged between 18 and 60 who lived in Hong Kong. The study was carried out during 2-8 July 2009, after influenza A/H1N1 had been declared a pandemic (11

June),² the first community infected case had been reported (10 June),¹³ and before the first reported death associated with the virus in Hong Kong (27 July).¹⁴

We carried out telephone surveys by using a structured questionnaire. Study methods were similar to those used in local studies related to severe acute respiratory syndrome,¹⁵⁻¹⁹ avian flu,²⁰⁻²² and influenza A/H1N1.²³ Telephone numbers were randomly selected from current telephone directories; over 95% of households in Hong Kong have a telephone line installed.^{24,25} Interviews were done from 6 30 pm to 10 pm to avoid over-representation of people not working. An eligible member was selected from each of the contacted households. If more than one household member was eligible, we invited the one whose birthday was closest to the survey date to join the study. Verbal consent was obtained from the participants and the interview took about 20 minutes. At least three telephone calls were made at different hours and weekdays before we considered the number to be invalid. A total of 378 eligible participants were identified and 301 completed the interview; the response rate was 80% (301/378).

Outcome measures and data analysis

The questionnaire items were modified from those that had been used in some of the studies on avian flu^{21,26,27} and a study on influenza A/H1N1.²³ Participants were asked sequentially about intentions to take up vaccination against influenza A/H1N1 under five hypothetical scenarios: vaccination is free; vaccination per dosage costs less than \$HK100, \$HK101-200, or more than \$HK200; and clinical data are lacking on vaccine efficacy and safety. Response categories included unlikely (certainly not, mostly not), unsure, and highly likely (mostly and definitely). As a reference, the median family income in Hong Kong in 2006 was around \$HK 17 250.²⁸

Participants were asked whether clinical evidence on the safety and efficacy of the influenza A/H1N1 vaccine was currently available. Other questions were related to knowledge about different modes of transmissions of the virus and perceptions related to the virus and its vaccine.

We tabulated the distributions of several variables. Analyses were carried out in SPSS version 16.0.

RESULTS

Of the 301 participants, 55% (n=165) were women, 47% (n=140) were aged less than 40, 37% (n=111) had received some education after secondary school, and 63% (n=189) were married or cohabiting. Twenty per cent of the participants (n=61) self reported ever receiving vaccination against seasonal influenza (table 1).

Perceptions towards vaccination against influenza A/H1N1
Intentions—When the participants were asked about their intention to take up free vaccination against influenza A/H1N1, 45% (n=135) thought it highly likely

Table 2 | Participants' knowledge and perceptions of influenza A/H1N1 and its vaccine

Variables	No (%) of participants (n=301)
Knowledge on modes of transmission	
Correct knowledge about modes of transmission:	
Could be transmitted via droplets (for example, sneezing)	291 (97)
Could be transmitted via touching body of infected person	203 (67)
Could be transmitted via touching contaminated objects	196 (65)
All above items are correct:	
No	148 (49)
Yes	153 (51)
Perceptions related to severity of influenza A/H1N1	
Fatality rate for adults:	
<1%	181 (60)
1-5%	67 (22)
>5%	23 (8)
Don't know	30 (10)
Would cause severe and irreversible damage to body of adults:	
Disagree	232 (77)
Agree	41 (14)
Don't know	28 (9)
No of deaths in Hong Kong in coming year:	
None	87 (30)
1-10	162 (57)
11-50	32 (11)
>50	5 (2)
No of hidden cases in community:	
Very few	56 (19)
A few	121 (41)
Quite a lot or many	118 (40)
Chance of having large scale local outbreak of influenza A/H1N1 in coming year:	
Unlikely, most unlikely, certainly not, unsure	218 (72)
Certainly, most likely, likely	83 (28)
Risk perception	
High or very high chance of contracting influenza A/H1N1 in coming year:	
Participant	31 (10)
Family members	30 (10)
General public	35 (12)
Comparisons of influenza A/H1N1 to seasonal influenza	
Fatality rate:	
Much lower, a little lower, or same	190 (64)
A bit higher or much higher	108 (36)
Transmission rate:	
Much lower, a little lower, same	173 (58)
A bit higher or much higher	126 (42)
Severity of damage to body:	
Much lower, a little lower, same	196 (67)
A bit higher or much higher	95 (33)
Perceptions related to influenza A/H1N1 vaccine	
Vaccination is inconvenient:	
Disagree, strongly disagree, unsure	219 (73)
Agree or strongly agree	81 (27)
Vaccine is effective for prevention of influenza A/H1N1:	
Disagree, strongly disagree, or unsure	183 (61)
Agree or strongly agree	117 (39)
Efficacy of present A/H1N1 vaccine has been confirmed by clinical trials:	
No	44 (15)
Yes	189 (63)

(that is, mostly or certainly) and 55% (n=166) thought it unlikely or were unsure (mostly not, certainly not, or unsure). The prevalence of intention (highly likely to take up the vaccine), however, decreased with increasing cost in the hypothetical scenarios where a charge was levied for vaccination: 36% (n=108) were highly likely to take up vaccination for less than \$HK100, 24% (n=72) for \$HK101-200, and 15% (n=45) for more than \$HK200. In the absence of data on efficacy and safety the prevalence decreased to 5% (n=14; table 1).

Positive and negative attitudes—39% (n=117) of participants believed that vaccination would be effective at preventing influenza A/H1N1, 63% (n=189) erroneously believed that efficacy of influenza A/H1N1 vaccine had been confirmed by clinical trials, and 16% (n=49) believed that it is necessary for everyone in Hong Kong to take up vaccination against influenza A/H1N1 (49%, n=146, not quite necessary and 32%, n=95, completely unnecessary; table 2). Overall, 27% (n=81) of the participants believed vaccination against influenza A/H1N1 would be inconvenient and 16% (n=49) believed that it would cause quite a lot of side effects or that side effects would be very severe (table 2).

Knowledge and perceptions about influenza A/H1N1

Knowledge—51% (n=153) of the participants gave correct responses to all three questions on modes of transmission through droplets, bodily contact with infected people, and touching objects contaminated with the A/H1N1 virus (table 2).

Perceived severity—30% (n=90) of the participants erroneously believed that the fatality associated with A/H1N1 among adults exceeded 1%; 14% (n=41) believed that A/H1N1 results in severe and irreversible damage to the body among adults; 13% (n=37) believed that more than 10 deaths related to A/H1N1 infection would occur in Hong Kong, and 40% (n=118) believed that there are quite a lot or many hidden H1N1 cases of influenza A/H1N1 in the local community (table 2). Compared with seasonal flu, less than half of the participants believed that A/H1N1 would result in a higher fatality rate (36%, n=108), higher infectivity (42%, n=126), and more severe bodily damage (33%, n=95; table 2).

Risk perception—Around 10% of the participants considered themselves (10%, n=31), their family members (10%, n=30), or the general public (12%, n=35) to have a high or very high chance of contracting A/H1N1 in the next year, and 28% perceived a high (high, very high, or certain) chance of having a large scale outbreak of influenza A/H1N1 in the coming year (table 2).

DISCUSSION

A vaccine against influenza A/H1N1 will become available in the near future. Over 30 governments placed orders for vaccines by June 2009²⁹: the United Kingdom ordered enough to cover its entire population,³⁰ Japan intended to provide enough for

Variables	No (%) of participants (n=301)
Don't know	67 (22)
Perceived side effects:	
None or a few	162 (54)
Quite a lot or severe	49 (16)
Don't know	88 (29)
Vaccination against influenza A/H1N1 should be universal in Hong Kong:	
Completely not necessary	95 (32)
Not quite necessary	146 (49)
Quite necessary or highly necessary	49 (16)
Don't know or unsure	11 (4)

half its population,³¹ and Australia ordered enough for half its population.³² It is uncertain whether the early production of vaccine could meet the demands of different countries.³¹ Many governments therefore intend to provide A/H1N1 vaccine to a substantial proportion of the general population. A few countries are more conservative—the US government will confirm the proportion of citizens who need to be vaccinated after the completion of clinical trials,⁷ whereas mainland China plans to provide vaccines for 5% of its population.³¹ Most of the governments have not announced the pricing schemes.

Our results are comparable to those of a study in health workers,¹¹ with a similar prevalence for intention to take up A/H1N1 vaccination when it was free (48% *v* 45%). Lack of data on safety and efficacy was the reason for health workers' unwillingness to take up vaccination. No trials have studied the responsiveness of the general population. Our results show that intention to take up A/H1N1 vaccination would be highly sensitive to cost as well as to the availability of scientific evidence on its efficacy and safety. As the population of Hong Kong is seven million, the Hong Kong government plans to purchase five million doses of the A/H1N1 vaccine. The actual demand would depend on the cost and, more importantly, the availability of clinical evidence on efficacy and safety. Without such an assurance the prevalence of uptake of vaccination in the general population would be lower than 5%. It is not known whether the prevalence for high risk groups would be different but previous data showed that, except for elderly people, the prevalence of vaccination against seasonal influenza for other risk groups in Hong Kong tended to be low.¹² There are reasons to speculate that in the absence of scientific evidence, the prevalence of uptake of A/H1N1 vaccination in these high risk groups would remain low.

The intention to take up free vaccination might, however, be an over-estimation as most of the participants (63%) erroneously believed that at the time of the survey clinical evidence on the efficacy and safety of A/H1N1 vaccine was available. Many of these participants may change their mind if clinical evidence remains unavailable when the vaccination campaign is launched. The publicity that less than half of the local healthcare workers were willing to take up A/

H1N1 vaccination¹¹ might also undermine the public's confidence in being vaccinated. The relatively low levels of positive intention to take up A/H1N1 vaccination in the general population may be partially explained by the confusion between different types of influenza related vaccination. A previous study showed that a high proportion (39%) of the general public were under the misconception that seasonal influenza vaccination is effective at preventing influenza A/H1N1.²³ Without clarifying such a misconception, people may resort to seasonal influenza vaccination, which has passed clinical trials on efficacy and safety, rather than receiving a new vaccine, especially if it has not been fully tested. Although about one third of participants believed that A/H1N1 has a fatality of more than 1%, that A/H1N1 is more severe than seasonal flu, and that many hidden cases of A/H1N1 exist in the community, over half of the participants believed otherwise. Perceived susceptibility was also relatively low (around 10% perceived susceptibility as high). Therefore in the context of the study influenza A/H1N1 was seen by the participants as a relatively mild disease and that it might not be worth the risk to be vaccinated against A/H1N1 as it has not been thoroughly tested for safety and efficacy.

Despite Hong Kong being a fairly affluent city with a high degree of vigilance for A/H1N1,²³ acceptability of the A/H1N1 vaccine was still highly sensitive to cost. It is expected that such sensitivity would be even higher in developing countries and in those countries where people may feel less anxious about influenza A/H1N1. Moreover, since the A/H1N1 vaccine is new, people worldwide are curious about its effectiveness and safety. In developed countries such as the United Kingdom and the United States, the strength of governmental measures to control influenza A/H1N1 has been much weaker than in Hong Kong—Hong Kong had exercised quarantine measures and still recommends closure of schools with the rate of sick leave reaching or exceeding 10%.³³ The results also suggest that as the scientific evidence is not available, expected uptake of A/H1N1 vaccination in the general populations of different countries would be low.

The results provide some insights into different international settings, with important implications. Governments want to promote A/H1N1 vaccination in the general population and need to understand barriers and facilitators for its acceptability before implementing vaccination on a full scale. From our results it seems that free or low cost vaccination needs to be provided to achieve a high rate of vaccination against A/H1N1. More importantly, the general public has to be convinced about the vaccine's efficacy and safety as misconceptions may exist about what the scientific data show. Good communication between health workers and the public is therefore a prerequisite for a successful A/H1N1 vaccination programme targeting the general population. Acceptability studies and real time monitoring are crucial for the success of such programmes.

What is already known on this topic

In Hong Kong the uptake of vaccination against seasonal influenza by the general population and high risk groups is low

Over half of the healthcare workers in Hong Kong were unwilling to be vaccinated against influenza A/H1N1

A history of seasonal influenza vaccination and the perceived efficacy of the vaccine were significant factors associated with willingness of uptake

What this study adds

The uptake of vaccination seems to be sensitive to personal cost and would be low in the absence of data on efficacy and safety

This study has some limitations. Firstly, the response rate was lower than 80%, although comparable to those of other relevant published studies.^{17 27 34 35} The sex and age distributions of the sample were comparable to those of the census data.³⁶ In this sample, 45% of the participants were men (census data 46%), 25% were aged less than 30 years (census data 25%), 21% aged 30-39 (census data 24%), 29% aged 40-49 (census data 27%), and 25% aged 50-60 (census data 24%). Secondly, Hong Kong went through a unique experience with the outbreak of severe acute respiratory syndrome, the results of the current study may not be applicable to the situations in other countries. Some observations about A/H1N1 vaccination may, however, be shared among countries. Thirdly, this study could only document the willingness of people to accept vaccination against influenza A/H1N1, which may not necessarily reflect their actual behaviour. Fourthly, we did not record participants' chronic disease status; those with chronic disease may have different intentions from the rest of the general population.

Conclusions

Participants did not consider universal vaccination against A/H1N1 to be necessary. Efficacy and safety data are needed to enhance uptake. Cost is important although our study suggests that most of the population would not take up vaccination against A/H1N1. As the A/H1N1 vaccine is new and major plans regarding the vaccine have been made in many countries, further research is warranted. Further studies should also monitor the level and factors predicting intentions towards A/H1N1 vaccination longitudinally in different risk groups as well as in the general population. International comparisons are also warranted. Such studies would improve the understanding of vaccination against different types of influenza related diseases.

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Contributors: JTF designed and supervised the study, finalised the analysis, interpreted the findings, and wrote the drafts of the manuscript. He is guarantor. NCYY commented on and helped revise drafts of the manuscript and carried out a literature review. KCC analysed the data. MYMC and HYT carried out a literature review and assisted in designing the questionnaire. SG made suggestions to improve the manuscript and revised later drafts.

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