

# The Acceptance of Seasonal Influenza Vaccination during Pregnancy in a Regional Public Hospital in Hong Kong

**Helen HM WOO** MBBS, MRCOG

**Chung-Nin LEE** FRCOG, FHKCOG, FHKAM (O&G)

**Anita PC YEUNG** FRCOG, FHKCOG, FHKAM (O&G)

Department of Obstetrics and Gynaecology, Pamela Youde Nethersole Eastern Hospital, Chai Wan, Hong Kong

**Objectives:** Pregnant women are at increased risk for complications from influenza. Despite the likely benefit from influenza vaccination, vaccination rates during pregnancy remain low. Our study aimed to define the current vaccination rate and to explore the acceptance of influenza vaccination by pregnant women.

**Methods:** All Hong Kong pregnant women attending for antenatal care at a regional obstetrics unit from 1 November 2009 to 31 March 2010 were recruited, by virtue of completing a questionnaire. Previous history of influenza vaccination, influenza vaccination in the current pregnancy, recommendations from doctors, and the attitudes towards influenza vaccine were examined. Hospital admissions for influenza and influenza-like illness during pregnancy were noted.

**Results:** 775 Questionnaires were considered valid for analysis, which amounted to a response rate of 91.9%. The vaccination rate for influenza during pregnancy was 4.4%. Only 8.9% of pregnant women considered influenza vaccine to be safe in pregnancy and only 20.8% had been recommended influenza vaccination by healthcare professionals. In all, 23 of these respondents were diagnosed to have influenza and / or an influenza-like illness. Previous influenza vaccination was associated with an uptake of influenza vaccination in pregnancy ( $p=0.001$ ). Respondents who thought that the influenza vaccine was safe in pregnancy (odds ratio [OR]=55.0; 95% confidence interval [CI], 21.7-139.1) and had been recommended to have it by doctors (OR=9.7; 95% CI, 3.9-24.0) were more likely to have the vaccination.

**Conclusion:** Influenza vaccination rates during pregnancy can be improved by implementing educational programmes for antenatal service providers and patients. Further studies exploring obstetricians' and patients' knowledge about influenza vaccine appear worthwhile.

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## Introduction

Pregnant women are at increased risk of complications and mortality from influenza. Excess mortality was noted among pregnant women in the 1918 and 1957 pandemics; in the 1918 pandemic, the mortality rate was 45% among pregnant women<sup>1</sup>. Studies showed that hospital admission rates for respiratory morbidities during the influenza seasons were higher among pregnant women, as compared with their non-pregnant counterparts<sup>2,3</sup>. It was therefore suggested that pregnant women were likely to benefit from influenza vaccination.

The Advisory Committee on Immunization Practices and American College of Obstetricians and Gynecologists Committee on Obstetric Practice have recommended vaccination of pregnant women with trivalent, inactivated vaccine during the influenza season. Vaccination can be administered at any trimester<sup>4,5</sup>. The World Health Organization (WHO) also considered inactivated influenza

to be safe in any trimester, and recommended all pregnant women receive it during the influenza season<sup>6,7</sup>. There was no evidence to indicate that inactivated influenza vaccine is teratogenic even if given during first trimester<sup>8,9</sup>.

In Hong Kong, the Scientific Committee on Vaccine Preventable Disease of the Centre for Health Protection (CHP) also recommends influenza vaccination in pregnant women. The recommendation is based on the fact that influenza vaccination can minimise the risk of potential severe influenza during pregnancy. It also protects the relevant infant from influenza during first few months of life<sup>10-12</sup>.

Hospital admissions for infants with influenza in the age-group of less than 6 months of age remain high.

*Correspondence to: Dr Helen HM Woo*

*Email: whm136@ha.org.hk*

However, the inactivated influenza vaccine is not currently licensed for this age-group. Immunisation of the pregnant women with influenza virus antigens results in production of antibodies that are transferred to the fetus and hence they protect the young infant from influenza.

However, vaccination rates during pregnancy remain low in most countries, despite the evidence of maternal and neonatal protection. In a review article, in Canada and United States<sup>13</sup> the vaccination rates in pregnant women for seasonal influenza varied from <0.1% to 12.8% during the period of 1974 to 2003. The influenza vaccination rate in Hong Kong pregnant women was similarly low. A study in Hong Kong revealed a self-reported vaccination rate of only 3.9% in the 2005-2006 influenza season<sup>14</sup>. Our study in a regional public hospital in Hong Kong aimed to (i) define the current vaccination rate, (ii) explore the attitudes of local pregnant women towards seasonal influenza vaccination, and (iii) determine the reasons for acceptance or refusal of influenza vaccination during pregnancy.

The study was commenced during the winter period covering the traditional winter influenza season (January to March) in Hong Kong. During that period, the human swine influenza virus (influenza A H1N1 2009 virus) was increasingly diagnosed as the commonest causative agent of influenza locally. In Hong Kong, the first batch of human swine flu vaccine (as opposed to seasonal influenza vaccine) became available from 21 December 2009 and there were concerns about its safety profile. These concerns were linked to cases of intra-uterine death, miscarriage, and Guillain-Barré syndrome (GBS) reported after the launch of this vaccine. Tens of millions of doses of the pandemic, which are also called seasonal (H1N1) 2009 vaccine had been administered in September to December 2009 worldwide, and the first safety review by the WHO Global

Advisory Committee on Vaccine Safety published in mid-December 2009 revealed a reassuring safety profile<sup>15</sup>. However, there was ongoing surveillance for GBS<sup>15,16</sup>. It was expected that additional data about the latter would only be available in the first quarter of 2010<sup>15</sup>. Hence, the author decided to conduct a study on the acceptance of seasonal influenza vaccine in pregnancy, and to exclude human swine flu influenza vaccine to avoid potential bias.

## Methods

This was a cross-sectional study. Our study population was comprised of pregnant women who attended for antenatal care in the obstetrics department of a regional public hospital in Hong Kong during the period from 1 November 2009 to 31 March 2010. Eligible pregnant women were Hong Kong residents aged 18 years or more. They had to be able to read either English or Chinese and not to have had a miscarriage or termination of pregnancy at the time of the questionnaire. Eligible women were recruited by clinic nurses when they attended for oral glucose tolerance tests or morphology scans.

Participants were requested to complete a questionnaire consisting of 16 items (Appendixes 1 and 2). The questionnaire had been developed and pilot-tested. Standard written information concerning the objectives and details of the study was provided to the participants before completing the questionnaire. Verbal consent was obtained. The sample size was calculated based on the formula:

$$n = \frac{(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2 p(1-p)}{(p_0 - p)^2}$$

where  $\alpha$  is the significance level ( $\alpha=0.05$ );  $\beta=1$ -power; and assuming the power to be 80%.  $p$  is the prevalence rate which was set at 0.05 in our case.  $p_0$  was the population prevalence rate which was 0.08 according to

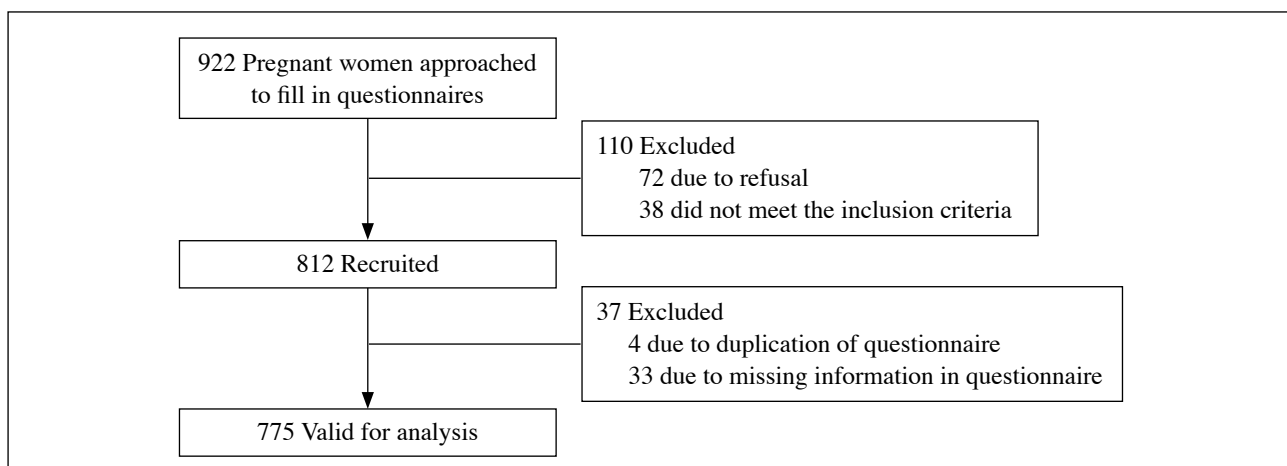


Figure. Flow chart on the recruitment of subjects in the study

previous studies on the prevalence of influenza vaccination in pregnancy<sup>13</sup>. Hence, sample size (n) was 415. Assuming the dropout rate was 20%, the final sample size was 518, which would be sufficient to identify the vaccination rate.

The questionnaire examined demographic data, any history of influenza vaccination when non-pregnant, any influenza vaccination in the current pregnancy, attitude towards influenza vaccination, recommendations from attending doctors, and any reasons for refusal. We estimated that it took 5 to 10 minutes to complete the questionnaire. Significant incomplete questionnaires and duplicate questionnaires were excluded from the analysis.

Data concerning hospital admissions to public hospital for influenza or related illness during pregnancy were retrieved from the electronic system of the hospital. Medical consultations for influenza or related conditions were also noted. This study was approved by the Institutional Review Board of the Hospital (ref: HKEC-2009-097).

### Statistical Analysis

Data analysis was performed by PASW Statistics 18.0 (SPSS Inc, Chicago, IL, US). Concerning categorical data, the Chi-square test and Fisher's exact test were used as appropriate. For continuous data with a highly skewed distribution, a non-parametric test (i.e. Mann-Whitney *U* test) was used. Statistically significant variables were adopted as potential predictors and analysed by logistic regression to look for significant predictors of influenza vaccine uptake. The critical level of statistical significance was set at 0.05. The multiple logistic regression analysis (stepwise) was performed to include variables found to be significant at the level of  $p < 0.2$  by univariate analysis, if considered to be an important demographic variable.

## Results

A total of 922 pregnant women were approached during the study period, but 38 were excluded because they were not Hong Kong residents. Of the remaining 884 pregnant women, 72 refused, and only 812 fulfilled our inclusion criteria and were recruited. Thus the response rate (defined as the number of completed questionnaires [n=812] divided by the number of eligible respondents [n=884]) was 91.9%. Thirty-seven questionnaires were excluded due to duplication or as they were incomplete. Hence, 775 questionnaires were available for analysis (Figure).

The majority of the respondents were Chinese women (93.8%); their median age was 32 years, and their

**Table 1. Background characteristics of the pregnant women studied (n=775)**

Characteristic	No. (%) of women*
Median (10th – 90th percentile) age in years	32 (27-37)
Median gestation (10th – 90th percentile) in weeks	28 (18-29)
Race	
Chinese	727 (93.8)
Non-Chinese	48 (6.2)
Indian	7 (0.9)
Pakistan	10 (1.3)
Filipino	20 (2.6)
Caucasian	5 (0.6)
Indonesian	4 (0.5)
Japanese	2 (0.3)
Educational level	
Primary school	27 (3.5)
Secondary school	365 (47.1)
Tertiary or above	371 (47.9)
Missing data	12 (1.5)
Marital status	
Single	13 (1.7)
Married	762 (98.3)
Work	
Sales / clerk / technician	321 (41.4)
Business / professional	214 (27.6)
Healthcare professionals / doctor	27 (3.5)
Housewife / student / unemployed	212 (27.4)
Missing data	1 (0.1)
Monthly household income (HK\$)	
<\$13,000	116 (15.0)
>\$13,000 to \$30,000	280 (36.1)
>\$30,000 to \$50,000	202 (26.1)
>\$50,000	119 (15.4)
Missing data	58 (7.5)
Receiving CSSA	
Yes	3 (0.4)
No	765 (98.7)
Missing data	7 (0.9)
Health status of pregnant woman	
With chronic disease	23 (3.0)
Autoimmune disease	2 (0.3)
Asthma	17 (2.2)
Heart disease	2 (0.3)
Renal disease	2 (0.3)
Good health	752 (97.0)
Trimester	
First trimester ( $\leq 12$ weeks)	6 (0.8)
Second trimester (13-27 weeks)	353 (45.5)
Third trimester (28-40 weeks)	416 (53.7)
Parity	
Primigravida	464 (59.9)
Multigravida	311 (40.1)
EDC at local influenza season	
Yes	262 (33.8)
No	513 (66.2)

Abbreviations: CSSA = Comprehensive Social Security Assistance; EDC = estimated date of confinement

\* Unless otherwise stated

median gestational age was 28 (range, 18-29) weeks; 769 (99.2%) were in either the second or third trimester. In all, 762 (98.3%) were married, 27 (3.5%) were doctors or healthcare workers, and 23 (3.0%) had chronic medical disease (Table 1).

In our study, 34 pregnant women received the influenza vaccination during their pregnancies, giving a second- and third-trimester vaccination rate of 34/775 or 4.4%. Most women (73.5%) received the influenza vaccination in the second trimester, and the gestational age for vaccination ranged from 7 to 28 weeks. Women who agreed to influenza vaccination during pregnancy were more likely to receive the vaccination ( $p < 0.001$ ), which was not surprising. Among the respondents who did not receive influenza vaccine, only 16.6% agreed with having vaccination during pregnancy (Table 3). Within our study cohort, 173 (22.3%) women had a history of influenza vaccination while they were not pregnant (Table 2). Of those who had a history of influenza vaccination, 16 (9.2%) out of 173 pregnant women received the vaccine during pregnancy. Among women without such a history, only 18 (3.0%) out of 602 pregnant women received influenza vaccination during pregnancy (Table 3).

Concerning the safety of influenza vaccination, only 69 (8.9%) of the women thought that influenza vaccine during pregnancy was safe; 282 (36.4%) believed that the influenza vaccine was not safe, and 423 (54.6%) answered that they were uncertain (Table 2). Pregnant women who thought that the influenza vaccine was safe were more likely to receive the influenza vaccination than those who stated they were uncertain (odds ratio [OR]=55.0; 95% confidence interval [CI], 21.7-139.1,  $p < 0.001$ ) [Table 4].

At the end of the study, three (0.4%) pregnant women had been diagnosed with influenza during pregnancy, 13 had experienced an influenza-like illness but subsequent testing for influenza was not positive, and seven were diagnosed with swine flu infection (H1N1 influenza virus) [Table 5]. Influenza-like illness was defined as clinical suspicion of influenza and either meeting the Centers for Disease Control and Prevention definition of influenza-like illness (fever of  $\geq 100.0^\circ\text{F}$ , cough, sore throat) or a positive influenza test<sup>17</sup>.

In all, there were five pregnant women who received inpatient management for influenza or influenza-like illness, two of whom were later found to be suffering

**Table 2. Attitudes towards influenza vaccination (n=775)**

	No. (%) of women
Previous seasonal influenza vaccination	
Yes	173 (22.3)
No	602 (77.7)
Belief on safety of seasonal influenza vaccine in pregnancy	
Not safe	282 (36.4)
Safe	69 (8.9)
Do not know	423 (54.6)
Missing data	1 (0.1)
Vaccination in current pregnancy	
Vaccinated	34 (4.4)
Not vaccinated	741 (95.6)
Explained / recommended by doctor / healthcare professionals for influenza vaccination	
Explained by:	161 (20.8)
Public obstetrician	80 (10.3)
Private obstetrician	52 (6.7)
Family doctor or other healthcare professional	29 (3.7)
Not explained at all	613 (79.1)
Missing data	1 (0.1)
Agreed for seasonal influenza vaccine during pregnancy	
Agreed for vaccination	157 (20.3)
Not agreed for vaccination	618 (79.7)

**Table 3. Background of respondents who did or did not take up seasonal influenza vaccine in pregnancy**

Background	No. (%) of respondents		p Value*
	Uptake (n=34)	No uptake (n=741)	
Median (10th – 90th percentile) age in years	32 (26.5-36.5)	32 (27-37)	0.348
Median gestation (10th – 90th percentile) in weeks	28 (19.5-29.5)	28 (18-29)	0.629
Race			0.288‡
Chinese	32 (94.1)	695 (93.8)	
Indian	1 (2.9)	6 (0.8)	
Pakistan	0	10 (1.3)	
Filipino	0	20 (2.7)	
Caucasian	1 (2.9)	4 (0.5)	
Indonesian	0	4 (0.5)	
Japanese	0	2 (0.3)	
Educational level			0.007†
Primary school	0	27 (3.6)	
Secondary school	8 (23.5)	357 (48.2)	
Tertiary or above	26 (76.5)	345 (46.6)	
Missing data	0	12 (1.6)	
Marital status			1‡
Single	0	13 (1.8)	
Married	34 (100)	728 (98.2)	
Work			0.011†
Sales / clerk / technician	9 (26.5)	312 (42.1)	
Business / professional	14 (41.2)	200 (27.0)	
Healthcare worker / doctor	4 (11.8)	23 (3.1)	
Housewife / student / unemployed	7 (20.6)	205 (27.7)	
Missing data	0	1 (0.1)	
Monthly household income (HK\$)			0.001†
<\$13,000	4 (11.8)	112 (15.1)	
\$13,000 - \$30,000	4 (11.8)	276 (37.2)	
\$30,000 - \$50,000	11 (32.4)	191 (25.8)	
>\$50,000	15 (44.1)	104 (14.0)	
Missing data	0	58 (7.8)	
Receiving CSSA			1‡
Yes	0	3 (0.4)	
No	34 (100)	731 (98.7)	
Missing data	0	7 (0.9)	
Health status of pregnant woman			0.618‡
With chronic disease	0	23 (3.1)	
Good health	34 (100)	718 (96.9)	
Trimester			0.192†
First trimester (≤12 weeks)	0	6 (0.8)	
Second trimester (13-27 weeks)	11 (32.4)	342 (46.2)	
Third trimester (28-40 weeks)	23 (67.6)	393 (53.0)	

Abbreviations: CSSA = Comprehensive Social Security Assistance; EDC = estimated date of confinement

\* Continuous data are analysed by Mann-Whitney *U* test

† Categorical data are analysed by Chi-square test

‡ Categorical data are analysed by Fisher's exact test

(Table 3 cont'd on next page)

**Table 3. (cont'd)**

Background	No. (%) of respondents		p Value*
	Uptake (n=34)	No uptake (n=741)	
Parity			0.399†
Primigravida	18 (52.9)	446 (60.2)	
Multigravida	16 (47.1)	295 (39.8)	
EDC at local influenza season			0.359†
Yes	14 (41.2)	248 (33.5)	
No	20 (58.8)	493 (66.5)	
Diagnosed with influenza or influenza-like illness during pregnancy			0.649‡
No influenza diagnosed	33 (97.1)	719 (97.0)	
Diagnosed with influenza	0 (0)	3 (0.4)	
Influenza-like illness (no influenza confirmed)	1 (2.9)	12 (1.6)	
Diagnosed with swine flu	0 (0)	7 (0.9)	
Previous seasonal influenza vaccination			0.001†
Yes	16 (47.1)	157 (21.2)	
No	18 (52.9)	584 (78.8)	
Belief on safety of influenza vaccine in pregnancy			<0.001†
Not safe	1 (2.9)	281 (37.9)	
Safe	26 (76.5)	43 (5.8)	
Do not know	7 (20.6)	416 (56.1)	
Missing data	0	1 (0.1)	
Agreed for seasonal influenza vaccine during pregnancy			<0.001†
Agreed for vaccination	34 (100)	123 (16.6)	
Not agreed for vaccination	0	618 (83.4)	
Recommended by doctor for influenza vaccine			<0.001‡
Recommended by public obstetrician	3 (8.8)	77 (10.4)	
Recommended by private obstetrician	11 (32.4)	41 (5.5)	
Recommended by family doctor or other healthcare professional	9 (26.5)	20 (2.7)	
No recommendation by healthcare professionals	11 (32.4)	602 (81.2)	
Missing data	0	1 (0.1)	

Abbreviations: CSSA = Comprehensive Social Security Assistance; EDC = estimated date of confinement

\* Continuous data are analysed by Mann-Whitney U test

† Categorical data are analysed by Chi-square test

‡ Categorical data are analysed by Fisher's exact test

**Table 4. Respondents who did or did not take up seasonal influenza vaccination**

Variable	OR (95% CI)	p Value
Safety of seasonal influenza vaccine	55.0 (21.7-139.1)	<0.001
'Vaccination is safe' group vs. 'Do not know' group		
Recommended by doctor / healthcare professionals to have uptake of vaccine	9.7 (3.9-24.0)	<0.001
(Reference group: not received recommendation for vaccination)		

Abbreviations: OR = odds ratio; CI = confidence interval

from swine flu infection (at 7 and 27 weeks of gestation). After excluding the latter patients, the rate of admission for seasonal flu during our study period was 0.4%. The

duration of these admissions varied from 2 to 4 days, two of the women having been admitted at the peak of the influenza season. There were two other respondents



who were admitted with upper respiratory tract symptoms and high fever at 28 weeks' and 30 weeks' gestation respectively, but for whom subsequent testing for influenza was negative. The remaining pregnant woman who was admitted was diagnosed to have influenza B infection (at 29 weeks' gestation). She had a known history of asthma and the influenza infection precipitated an asthmatic attack, which was treated with bronchodilators and intravenous hydrocortisone. During this study period, no pregnant woman was admitted to the intensive care unit or died in relation to influenza.

Table 6 illustrates the reasons given for refusing influenza vaccination during pregnancy. The most common reasons were "fear of teratogenicity" (51.5%), and "fear of adverse effect to myself" (40.6%). Other reasons included:

"do not have uptake of influenza vaccination usually" (35.0%), "no recommendation from a doctor" (17.0%), "do not know the benefit of influenza vaccination" (15.2%), and "do not know the safety of the influenza vaccination" (6.0%).

In all, 161 (20.8%) women were recommended by doctors or healthcare professionals to have influenza vaccination during their pregnancy. These latter women were more likely to have received influenza vaccination than those who received no such recommendation (OR=9.7; 95% CI, 3.9-24.0, p<0.001) [Table 4]. The preferred modes of communication for receiving information on influenza vaccination were similar in those who received influenza vaccine and those who did not. The preferred mode was via consultation with a doctor (Table 7).

**Table 5. Subjects diagnosed with influenza or influenza-like illness during pregnancy (n=775)**

Influenza or influenza-like illness during pregnancy	No. (%) of women
Not diagnosed (no admission or consultation for disease)	752 (97.0)
Diagnosis of seasonal influenza	3 (0.4)
Influenza-like illness, no influenza confirmed	13 (1.7)
Diagnosed with swine flu	7 (0.9)

**Table 6. Reasons for refusing seasonal influenza vaccination in pregnancy**

Reason for refusal	No. (%) of women
Teratogenicity	318 (51.5)
Adverse effect to myself	251 (40.6)
Do not have uptake of influenza vaccination usually	216 (35.0)
No recommendation from a doctor	105 (17.0)
Do not know the benefit of influenza vaccination	94 (15.2)
Do not know the safety of influenza vaccination	37 (6.0)
Worry about miscarriage after influenza vaccination	24 (3.9)
Worry about the local side-effects	17 (2.8)
Expensive	7 (1.1)
Do not know how / where to have influenza vaccination	4 (0.6)

**Table 7. Preferred mode of communication for receiving information on influenza vaccination**

Mode of communication	No. (%) of respondents*	
	Uptake group (n=34)	No uptake group (n=704)†
Consultation with a doctor	16 (47.1)	253 (35.9)
Antenatal talk	7 (20.6)	141 (20.0)
Pamphlet	7 (20.6)	157 (22.3)
Internet / email	10 (29.4)	180 (25.6)
Television	7 (20.6)	194 (27.6)
Not interested	0	17 (2.4)

\* More than 1 mode could be chosen

† Missing data in 37

## Discussion

In our study, the influenza vaccination rate in pregnancy was 4.4%, which was similar to the 3.9% rate reported in a previous study in Hong Kong<sup>14</sup>. This rate was significantly lower than that in non-pregnant adults in our local population that was reported to be 17.9% to 27%, depending on the study<sup>18,19</sup>. Notably, 23 pregnant respondents who had a chronic medical disease did not receive the influenza vaccine. According to recommendations from WHO and CHP, the seasonal influenza vaccines for 2009/2010 entailed A/Brisbane/59/2007 (H1N1)-like virus, and A/Brisbane/10/2007 (H3N2)-like virus and B/Brisbane/60/2008-like virus. The vaccination rate for seasonal influenza vaccine might have been affected by the increasing prevalence of swine flu (influenza A H1N1 2009 virus) in Hong Kong and the mass media's overwhelming coverage of adverse effects after its launch in December 2009. There were three cases of intra-uterine death and a number of miscarriages reported after the use of swine flu vaccine and few cases of suspected GBS. All the latter events overlapped with our study period, such that our respondents might have been negatively impacted by the reported adverse effects. Subsequently (in January 2010), the CHP indicated that there was no medical evidence to suggest that the stillbirths and miscarriage were related to swine flu vaccination. The report also noted the local background rate for stillbirths is 0.2 to 0.4% and the miscarriage rate was up to 20%<sup>20</sup>. The CHP also stated that it was not possible to differentiate with reasonable certainty whether the relationship between swine flu vaccination and the symptoms suggestive of GBS were causal or coincidental<sup>21</sup>. At that point, the public's concern for the safety of swine flu vaccine and even seasonal influenza vaccine could have affected the vaccination rate. Furthermore, as ours was a cross-sectional study, the vaccination rate could be underestimated. It is of interest, however, that according to CHP web data, from 21 December 2009 till 1 March 2010, 1430 pregnant women (3.5% of eligible pregnant women) received swine flu vaccine.

During our study period, three pregnant patients were diagnosed to have influenza, whilst 20 were diagnosed to have an influenza-like illness or swine flu. Notably, 82% of these 23 patients had attended the accident and emergency department for fever and upper respiratory tract symptoms, and more than 91% had contracted the illness in second and third trimesters. As pregnancy is associated with immunological and physiological changes that become most pronounced in the third trimester, pregnant women are more prone to influenza and infection-related complications at late gestation. A 13-year population-

based cohort study showed higher hospital admission rates during the influenza season even in women without co-morbidities, and in women with co-morbidities the rate was highest in the third trimester<sup>2</sup>. In a randomised, controlled prospective study in Bangladesh, influenza immunisation of pregnant women was associated with a reduction in febrile influenza-like illnesses of more than 30%, in both the mothers and their young infants<sup>11</sup>.

In our series, although the numbers of influenza infections and admission were small, they could be underestimated due to patients not being picked up if they consulted private doctors. In a serological study that evaluated 1500 pregnant women for influenza antibody during a 3-year period, the seasonal influenza infection rate ranged from 2 to 22%<sup>22</sup>. In our study, among the three patients with influenza diagnosed, the one with underlying asthma was admitted to hospital at 29 weeks of gestation to control her exacerbation of asthma. This was consistent with patients having existing respiratory illness being at increased risk of this complication and hospitalisation from influenza. It is therefore beneficial to promote seasonal influenza vaccination during pregnancies.

A significant number of pregnant women in our study (n=618) refused influenza vaccination in pregnancy. The commonest reasons for refusal included: "fear of teratogenicity", "fear of adverse effect to myself", "do not have uptake of influenza vaccination usually", and "no recommendation from a doctor". Only 8.9% of respondents believed that influenza vaccination in pregnancy was safe, whereas 36.4% believed it not safe, and 54.6% did not know. Although there are adverse effects associated with influenza vaccination, most are local reactions in the form of pain or swelling that affect 15 to 20% of the subjects; systemic effects (fever, malaise, and myalgia) ensue in 1 to 10%<sup>23</sup>. Severe adverse effects attributed to vaccination are rare, and include GBS (1 to 2 per 1 million vaccines), meningitis or encephalopathy (1 in 3 million doses distributed), and anaphylaxis (9 in 10 million doses distributed). In another statement published by the WHO in 2011, it was reported that a well-established causal association for GBS was only found for the 1976 vaccine that contained an H1N1 swine-influenza-like virus<sup>24</sup>. From this perspective, it is appropriate to promote the effectiveness and safety of current influenza vaccination and consider providing written information to counter misconceptions that might be impairing its uptake during pregnancy.

In our study, only 20.8% of respondents reported having recommendation or discussion about influenza



vaccination involving their attending doctors, obstetricians or healthcare professionals. The sparseness of such encounters could be a barrier to receiving influenza vaccine in pregnancy. A Canadian study noted that medical providers with high levels of knowledge about maternal vaccination (OR=2.64; 95% CI, 1.56-4.46), and positive attitudes towards influenza vaccination (OR=2.29; 95% CI, 1.43-3.68) were associated with recommending influenza vaccine to pregnant women<sup>25</sup>. In the same study, obstetricians were less likely than family physicians to indicate it was their responsibility to recommend or provide influenza vaccination in pregnancy.<sup>25</sup>

The exploration of healthcare workers' own uptake of seasonal influenza vaccine might reflect their own judgement and acceptance of such practices. In a review that included 32 studies performed between 1985 and 2002 in the US, Canada, Europe, Australia and Israel, vaccination rates for seasonal influenza among healthcare workers were reported to vary from 2.1 to 82%<sup>26</sup>. In 17 studies, "fear of adverse effect" was a major pressure dissuading healthcare workers from vaccination. Moreover, in 10 to 45% of them, there was a misconception that "vaccination can cause influenza". This review included studies with physician and other healthcare workers, and was therefore heterogeneous with respect to ease of access and free vaccination. It was concluded that education campaigns for healthcare workers should include factual information about possible reactions and their frequency<sup>26</sup>. If doctors and healthcare professionals are inadequately informed about seasonal influenza vaccine and have a low acceptance rate themselves, it is not surprising that they may not recommend vaccination effectively. In another prospective study including 242 postpartum women and 113 physicians, there was a significant discrepancy found between the patient's impression (22%) and physician's impression (74%) of any discussion of influenza vaccination during the index pregnancies<sup>27</sup>. Besides knowledge and opportunity for recommendations, in our locality another factor to consider is the cost of influenza vaccine. Only pregnant women who are on Comprehensive Social Security Assistance can receive the seasonal influenza vaccine free under the Government Vaccination Scheme. Other pregnant women have to pay for the vaccination and receive the vaccination either by their private obstetricians or general practitioners.

In our study, the preferred method of communication about influenza vaccination in pregnancy was during consultations with doctors, less often via televised promotion, and rarely via the internet or email. Hence,

doctors' and obstetricians' attitude towards promoting the vaccination in pregnancy could be critical. It is therefore important to have educational programmes for obstetricians and to define their role in promoting influenza vaccination. In a prospective study, the vaccination rate increased from 19% to 31%<sup>28</sup> after employing education programmes to promote influenza vaccination targeted at both patients and physicians.

It might also be helpful to explore other logistic factors such as the limited time spent on consultations in public hospitals and the limited resources for providing influenza vaccination in the same clinic setting. These issues were not addressed in the present study. In a Canadian study, during a 2-week period a clinic nurse was assigned to approach pregnant women about influenza vaccination and achieved a 42% uptake rate among eligible subjects<sup>29</sup>. This illustrates that having dedicated personnel to recommend and implement such vaccinations might be a pragmatic approach to augmenting uptake in public obstetric clinics in which the time spent in consultation with doctors was limited.

Regarding limitation of our study, the influenza infection rate during pregnancy might be an underestimate, due to the short duration of our study and because patients attending private health providers for influenza were not traced. As our study was based on results from a single centre and the vaccination rate for seasonal influenza vaccine was affected by the negative news associated with swine flu vaccine, the findings cannot be reliably generalised. Nor did the questionnaire explore patient or physician knowledge about influenza and the influenza vaccination, which might be another important factor affecting patient acceptance of influenza vaccination. However, our study revealed that reasons for refusal of influenza vaccination included "fear of teratogenicity", which reflects misconceptions among many of our subjects. In a 2006 Canadian cross-sectional survey of postpartum women, only half of the subjects thought that the vaccine was safe during pregnancy and breastfeeding, and 80% incorrectly believed that it could cause birth defects<sup>30</sup>. Hence, there is substantial room for improvement in promoting and offering influenza vaccination during pregnancy in our local healthcare setting.

## Conclusion

There is evidence that pregnant women and their infants could benefit from influenza vaccine during pregnancy and the safety of the vaccine is well-established<sup>8-13,31-33</sup>. Since regular antenatal services are available both in the public and private healthcare sectors

locally, promotion of influenza vaccination in this target group could be easily accomplished. However, there seems to be doctor-related, patient-related, and facility-related factors that hinder the uptake of such vaccinations. Implementing an educational programme about influenza vaccine for obstetricians, antenatal service providers, and patients is one approach to improving the vaccination rate. Further studies to explore obstetricians' and patients'

knowledge about influenza vaccination during pregnancy and its effects are needed.

## Appendices

Additional material related to this article can be found on the HKJGOM website. Please go to <<http://www.hkjgom.org>>, search for the appropriate article, and click on Full Text (PDF).

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## Appendix 1.

**Patient's Gum Label**

**Questionnaire: Acceptance of influenza vaccination in pregnant women in Hong Kong**

- 1) What is your gestational age? \_\_\_\_\_ weeks
- 2) What is your expected date of delivery? Date:
- 3) Did you have any delivery in the past ? a)  Yes b )  No

**Concerning Seasonal Influenza Vaccine : ( Not Swine Flu Vaccine )**

- 4) Have you had seasonal influenza vaccination in the past? ( Before pregnancy )  
a)  Yes b )  No
  - 5) Do you think seasonal influenza vaccine is safe in pregnancy ?  
a)  Yes b )  No c)  I don't know
  - 6) Did you have seasonal influenza vaccination during present pregnancy ?  
a)  Yes ; received at gestation : \_\_\_\_\_ b )  No
  - 7) Did your antenatal care provider ( including public or private doctor ) ever mention or give information on influenza vaccination ? a)  Yes, b)  No  
if yes, please circle the following:  
(i) public obstetrician, (ii) private obstetrician, (iii) general practitioner, (iv) other healthcare professionals/ nurses
  - 8) The **Centre for Health Protection** (CHP) of the Department of Health recommends you to receive the seasonal influenza to protect yourself from infection and its complications. Vaccination is effective and safe to both yourself and your baby according to their recommendation.  
Do you accept influenza vaccination **in pregnancy** ? a)  Yes b )  No
  - \*9) If the answer is "No" to question 8, what is your reason for not accepting influenza vaccination in pregnancy?\*
- More than one answer is allowed in question 9*
- a)  I am worried about teratogenic effects to my fetus
  - b)  I am worried about adverse effects to myself
  - c)  I do not know about the benefits of vaccination
  - d)  No doctor has recommended influenza vaccination to me
  - e)  I am fear of injection pain or local swelling or local skin reaction
  - f)  I am worried that it might be too expensive
  - g)  I don't get vaccination usually even when I am not pregnant
  - h)  I do not know where to get vaccinated
  - i)  Other reasons: please state \_\_\_\_\_
- 10) Have you been diagnosed with influenza infection during your current pregnancy ?  
a)  Yes , at \_\_\_\_\_ weeks of gestation b )  No

## Appendix 1. (cont'd)

- 11) What is your education level ?  
a)  Primary school level   b)  Secondary school level   c)  Tertiary level
- 12) Your occupation is:  
a)  Sales/clerk/service worker  
b)  Skilled/non-skilled worker  
c)  Employer/business  
d)  Professional/manager/administrator/teacher  
e)  Doctor/nurse/healthcare worker  
f)  Housewife  
g)  Others (e.g. student/retired/unemployed)
- 13) What is your estimated **monthly family** income? ( In Hong Kong Dollars )  
a)  <13,000  
b)  >13,000-30,000  
c)  >30,000-50,000  
d)  >50,000
- 14) Are you on Comprehensive Social Security Assistance ( CSSA ) ?  
a)  Yes   b)  No
- 15) Do you have any of the following medical disease ?  
a)  Autoimmune disease                                      d)  Renal disease  
b)  Asthma    e)  Pre-existing diabetes mellitus (not gestational diabetes)  
c)  Cardiac disease    f)  **None** of the above
- \*16) In what ways do you prefer to receive information about influenza vaccination?  
\* *More than one answer is allowed in question 16.*  
a)  Doctor discussion during consultation    d)  Internet/ email  
b)  Antenatal talks    e)  Others: please state \_\_\_\_\_  
c)  Pamphlets/ letters

## Appendix 2.

## Patient's Gum Label

**Acceptance of influenza vaccination in pregnant women in Hong Kong****問卷: 香港孕婦對流行性感疫苗之接納程度**

- 1) 你現在是懷孕多少週: \_\_\_\_\_ 週
- 2) 你的預產期是: \_\_\_\_\_
- 3) 你以前有曾經分娩過嗎? a)  有 b)  沒有

**關於季節性流感疫苗 (而不是豬流感疫苗):**

- 4) 你過去有否接種季節性流感疫苗? (在未懷孕以前)
  - a)  有 b)  沒有
- 5) 你認為在懷孕時接種季節性流感疫苗安全嗎?
  - a)  安全 b)  不安全 c)  我不知道
- 6) 在這次懷孕, 你有沒有接種季節性流感疫苗?
  - a)  有, 在第: \_\_\_\_\_ 週 b)  沒有
- 7) 在你的產前檢查, 你的醫生 (公立醫院醫生或私家醫生) 或其他醫護人員有沒有向你講解季節性流感疫苗的資料?
  - a)  有, 請圈以下:
    - (i) 公立醫院婦產科, (ii) 私家婦產科, (iii) 家庭醫生, (iv) 其他醫護人員/護士
  - b)  沒有
- 8) 根據衛生署衛生防護中心的建議: 孕婦接種季節性流感疫苗是可以保障你及胎兒預防季節性流感及其併發症, 疫苗效果是可靠的, 對孕婦和胎兒也是安全的。  
你會否同意及接受在懷孕時接種流感疫苗? a)  同意 b)  不同意
- \*9) 若你不同意第8條問題, (即不同意在懷孕時接種季節性流感疫苗) 你的原因是甚麼?  
\*可以有過一個答案
  - a)  我擔心會引致畸胎
  - b)  我擔心會對自己有不良影響
  - c)  我不知道接種流感疫苗的好處和益處
  - d)  沒有醫生向我建議需要接種流感疫苗
  - e)  我擔心注射部位疼痛, 發紅, 腫脹
  - f)  我擔心會很昂貴
  - g)  我平常也不會接種流感疫苗 (在沒有懷孕時)
  - h)  我不知道在哪裏可以接種流感疫苗
  - i)  其他原因, 請說明: \_\_\_\_\_

## Appendix 2. (cont'd)

- 10) 你在這次懷孕中，你有沒有感染流行性感冒？  
a)  有，在第 \_\_\_\_ 週 b)  沒有
- 11) 你的教育程度是：  
a)  小學教育  
b)  中學教育  
c)  大學教育/高等教育
- 12) 你的工作類別是：  
a)  售貨/文職/服務  
b)  技術/非技術工人  
c)  僱主/做生意  
d)  專業人士/行政人員/管理/老師  
e)  醫生/護士/其他醫護人員  
f)  家庭主婦  
g)  其他（學生/退休/待業）
- 13) 你的家庭每月收入有多少？（港幣）  
a)  <13,000  
b)  >13,000-30,000  
c)  >30,000-50,000  
d)  >50,000
- 14) 你有否接受綜合社會保障援助計劃（綜援）CSSA？  
a)  有 b)  沒有
- 15) 你有沒有以下的疾病？  
a)  免疫體系疾病 d)  腎臟的疾病  
b)  哮喘 e)  糖尿病？（非妊娠期糖尿病）  
c)  心臟病 f)  我沒有以上的疾病
- \*16) 你想以甚麼方法知道關於接種季節性流感疫苗的資料？\*可以有過一個答案  
a)  醫生講解 d)  互聯網/電子郵件  
b)  產前講座 e)  電視  
c)  小冊子/書信 f)  其他，請說明：\_\_\_\_\_