SHORT REPORT

Influenza-like illness among Hong Kong Chinese pregnant women

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ABSTRACT

We assessed the self-reported prevalence of influenza-like illness (ILI) during pregnancy in two samples of 546 and 2,764 new mothers who were pregnant during the 2009 – 10 and 2010 – 11 peak influenza seasons. During pregnancy, 11% of participants experienced an ILI. Cough, sore throat and nasal congestion were the most common reported symptoms. Only 4.6% and 9% of participants in sample 1 and 2 had an underlying chronic illness respectively and 3.3% of mothers in both groups were smokers. Conducting regular surveillance on influenza prevalence during pregnancy is essential to evaluate the costs and benefits of influenza vaccination programmes.

INTRODUCTION

The latest position paper from the World Health Organization (WHO) on seasonal influenza vaccination states that the highest priority for vaccination should be pregnant women (1). The recommendation is based on the excess risk of influenza-related morbidity and mortality in this group, the safety of the influenza vaccine throughout the pregnancy, and the vaccine's effectiveness in reducing the risk of influenza and its complications among pregnant women and infants up to six month of age. However, existing evidence on the burden of seasonal influenza infection during pregnancy is largely based on studies from Western countries, and there is little evidence from other regions such as Asia. Pregnant women in various countries may have different susceptibility to influenza infection due to variation in the prevalence of risk factors in the population, such as underlying chronic illnesses, obesity, and smoking patterns. Therefore, assessing the prevalence of influenza and influenza-like-illness among pregnant women in different populations is important to evaluate the population level burden of influenza infection among pregnant women.

Moreover, community-based influenza surveillance focusing on pregnant women is essential to provide baseline information regarding influenza activity and in evaluating the potential benefits of influenza vaccination programmes. To our knowledge, only one previous study conducted in 2002 has actually reported the prevalence of influenza-like-illness among pregnant women (2). Therefore, the aims of this analysis were to assess the prevalence of influenza-like illness (ILI) among Chinese pregnant women and to examine its association with potential risk factors and adverse pregnancy outcomes.

METHODS

This paper included two large samples of postpartum women from the postnatal wards of public hospitals providing obstetric services in Hong Kong. Briefly, eligible participants were Hong Kong Chinese mothers, 18 years old or above, and had just given birth to a live newborn. The first sample of participants were recruited from February to June 2010 during the second wave of A/H1N1 influenza pandemic and included only those mothers with no serious medical and obstetric complications (i.e., infant admitted to the neonatal intensive care unit, congenital anomalies or birth defects, born at <37 weeks, or birth weight <2,500g). In this study, we recruited 549 participants from four study sites. Between April and June 2011, we further recruited 2,846 postpartum participants from the postnatal wards of all eight public hospitals. A detailed description of the study methods of both studies is available elsewhere (3-4). Participants in both samples were pregnant throughout the winter influenza season, which theoretically increases the sensitivity and specificity of the case definition. Data were collected using a self-completed questionnaire assessing socio-demographic characteristics, maternal influenza vaccination status, maternal and paternal smoking patterns, pre-existing chronic illnesses, medical conditions arising during pregnancy, and the occurrence of respiratory and febrile illnesses during pregnancy.

The primary outcomes were the prevalence of ILI during the 2009 – 2010 and 2010 – 2011 influenza seasons. ILI was defined based on the febrile acute respiratory illness definition for influenza surveillance from the WHO, which defines ILI as the presence of fever plus cough or sore throat (5). We also examined at potential risk factors for ILI (i.e., maternal and paternal smoking status, seasonal and H1N1 influenza vaccination status, and underlying chronic illnesses and adverse pregnancy outcomes, defined as emergency caesarean section

(yes/no), preterm birth (<37 weeks gestation) and low birth weight (<2500 grams). Due to the historical low prevalence rate of obesity in Hong Kong, we did not assess BMI among pregnant women in either sample (6,7). Since we only included mothers without pregnancy complications in the first sample, no data on preterm birth or low birth weight is available for this group.

Descriptive statistics were used to assess the prevalence of self-reported ILI and logistic regression was used to assess the unadjusted and fully adjusted associations between ILI and both background risk factors and adverse pregnancy outcomes. All data analysis was conducted using Stata 13 (Stata Corp, College Station, TX). Ethical approval was obtained from the Institutional Review Boards of all participating institutions and informed written consent was obtained from all participants.

RESULTS

Complete data were available for 546 (99.5%) of the 549 recruited participants in the 2009 – 2010 sample and 2,764 (97.1%) of the 2,846 participants in the 2010 – 2011 sample. The demographic characteristics of the study participants are presented in Table 1. Overall, sample 1 and 63% in sample 2 were 25 to 34 years of age, 67% in sample 1 and 63% in sample 2 were born in Hong Kong, only 3% were current smokers in both groups. Five percent (n = 25) and 9% (n = 254) had underlying chronic illnesses respectively, of which 36% (n = 9) and 28% (n = 72) were chronic respiratory illnesses. Of all participants, 11% of participants in both groups reported having an ILI in pregnancy. Since the participants in sample 1 were pregnant during the second wave of 2009 A/H1N1 influenza pandemic, their

seasonal influenza vaccination rate was marginally higher than the second sample (5.0% vs 1.7%). Cough, sore throat and nasal congestion were the three most common respiratory symptoms reported. In the fully adjusted analysis, only paternal smoking status during pregnancy was significantly associated with the risk of ILI (Table 2) while there were no significant associations between ILI and pregnancy outcomes (Table 3).

DISCUSSION

To our knowledge, this is the first report on the population-based prevalence of ILI among Chinese pregnant women and only the second report on this topic in any population. Our results consistently show a low rate of ILI (11%) among Hong Kong women during pregnancy across two influenza seasons in 2009 – 10 and 2010 – 11. In comparison, Tuyishime reported that 64% of Canadian women experienced a febrile ILI during pregnancy (2), an almost six-fold difference. However, Tuyishime's study adopted a somewhat broader ILI definition (any combination of respiratory symptoms with fever). Upon reclassification of our data using Tuyishime's broader ILI definition, the prevalence remained unchanged at 11%. The substantial differences in the ILI rates between the two populations can possibly be explained by the presence of other risk factors such as pre-existing health conditions, obesity, and smoking rates among pregnant women. One US study found that 27% of pregnant women reported at least one chronic illness (7) compared with 5 to 9% in Hong Kong in our studies. In addition, the prevalence of obesity and maternal smoking in Asia are much lower than most Western countries. WHO data show that age-standardized obesity (BMI >30.0) estimates among adult women are 33% in the US, 25% in Australia and the United Kingdom, 24% in Canada, and 15% in France and Italy compared with 7% in China and Indonesia, 6% in Singapore, and only 4% in Japan. In addition, the age-standardized prevalence of smoking

among adult females was 32% in France, 22% in the UK, and 17% in the US, while Asia Pacific rates were substantially lower at 11% in Japan, 4% in Singapore, 2% in China and Thailand, and 1% in Malaysia and Vietnam (8).

Furthermore, while current evidence suggests that pregnant women are at higher risk of seasonal influenza-related morbidity, mortality, and adverse obstetric outcomes, it is not clear how much of this evidence is from studies conducted in Asia. During the 2009 A/H1N1 influenza pandemic, outcomes for infected pregnant women in Asia were much more favourable than in Western countries. In Hong Kong, up until May 2010, 87 pregnant women infected with 2009 A/H1N1 influenza were hospitalized, and only one required mechanical ventilation and none died (9). In Singapore, 211 A/H1N1 laboratory-confirmed pregnant women presented to a hospital between May and September, 2009; only two cases were complicated by pneumonia and both recovered uneventfully (10). In Japan, 181 pregnant women required hospitalization and none died (11) and only five Korean pregnant women were admitted to hospital and one died (12).

This study has several limitations. The data reported here was a secondary analysis of two studies designed to examine uptake and predictors of maternal influenza vaccination and was not designed specifically to measure the burden of influenza infection of ILI during pregnancy. Recall bias may also be an issue since the study outcome data was collected retrospectively through self-report in the first 24 to 48 hours after birth when participants may be less able to recall events that happened earlier in the pregnancy. Research has shown, however, that maternal recall of events during pregnancy is reliable and accurate (13) and this is especially likely to be true with regard to febrile illness during pregnancy. In addition, this

study did not assess laboratory-confirmed influenza and therefore, the true prevalence of influenza infection may actually be lower. Although our results show no association between ILI during pregnancy and adverse pregnancy outcomes, it is possible that mothers with preterm or low birth weight infants may have been less willing to participate in the study and thus were under sampled.

Determining the actual burden of influenza infection in high-risk populations is important to facilitate the planning of effective influenza vaccination programmes and other primary preventive interventions. WHO recommends that regional governments establish sustainable and effective surveillance systems to assess the epidemiology of influenza in high-risk groups, such as pregnant women and chronically ill individuals (1). In regions where the burden of influenza among pregnant women may be low, this type of surveillance is necessary so that resources are allocated to the groups with the highest needs. In the case of maternal vaccination programmes, it is also important to assess the burden of influenza infection in newborns under 6 months of age as the benefits of maternal vaccination for this group may provide a more substantial rationale for vaccination programmes.

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DECLARATION OF INTERESTS

The authors report no declarations of interest.

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Table 1 Characteristics of participants

Variable	Sample 1		Sample 2	
	N	wt %	N	wt %
Total	**546**	**100.0**	**2,764**	**100.0**
Age				
18 - 24 years	41	7.5	263	9.5
25 - 29 years	131	24.0	716	25.9
30 - 34 years	247	45.2	1,027	37.2
≥ 35 years	127	23.3	758	27.4
Education				
Compulsory secondary	276	50.6	1,649	59.7
Upper secondary	107	19.6	488	17.7
University degree or above	163	29.9	627	22.7
Place of birth				
Hong Kong	367	67.2	1,735	62.8
Mainland China	167	30.6	968	35.0
Other	12	2.2	61	2.2
Smoking status during pregnancy				
No	528	96.7	2,674	96.7
Yes	18	3.3	90	3.3
Partner's smoking status during pregnancy				
No	374	68.5	1,855	67.1
Yes	172	31.5	909	32.9
Seasonal influenza vaccination status during pregnancy				
No	519	95.1	2,716	98.3
Yes	27	5.0	48	1.7
H1N1 influenza vaccination status during pregnancy				
No	512	93.8	NA	NA
Yes	34	6.2	NA	NA
Pre-existing chronic illness				
No	521	95.4	2,510	90.8
Yes	25	4.6	254	9.1
Types: (some participants have more than one illness)				
Respiratory/ pulmonary disease	9	36.0	72	28.4
Thyroid disease	4	16.0	42	16.5
Hepatitis B	7	28.0	38	15.0
Others	6	24.0	120	47.2
Emergency caesarian section				
No	498	91.2	2,412	87.3
Yes	48	8.8	352	12.7
Preterm birth (<37 weeks gestation)				
No	NA	NA	2,550	92.3
Yes	NA	NA	214	7.7
Low birth weight infant (<2500 gms)				
No	NA	NA	2,548	92.2
Yes	NA	NA	216	7.8

NA=not available

Table 2 Unadjusted and adjusted odds ratios for risk of ILI with regards to potential risk factors

	Sample 1						Sample 2					
	Unadjusted ILI			Adjusted ILI[1]			Unadjusted ILI			Adjusted ILI[1]		
Variable	**OR**	**95% CI**	**Sig.**	**AOR**	**95% CI**	**Sig.**	**OR**	**95% CI**	**Sig.**	**AOR**	**95%CI**	**Sig.**
Smoking status during pregnancy												
No	1			1			1			1		
Yes	0.99	0.22, 4.43	0.99	0.95	0.21, 4.39	0.95	1.33	0.73, 2.42	0.36	1.15	0.62, 2.16	0.66
Partner's smoking status during pregnancy												
No	1			1			1			1		
Yes	0.82	0.46, 1.49	0.52	0.85	0.45, 1.60	0.61	1.11	0.87, 1.42	0.42	**1.36**	**1.04, 1.79**	**0.03**
Seasonal influenza vaccine status in pregnancy												
No	1			1			1			1		
Yes	0.99	0.29, 3.40	0.99	0.65	0.16, 2.56	0.54	0.70	0.25, 1.97	0.50	0.62	0.22, 1.75	0.36
H1N1 influenza vaccine status in pregnancy												
No	1			1								
Yes	2.20	0.91, 5.29	0.08	2.20	0.82, 5.92	0.12	NA	NA	NA	NA	NA	NA
Pre-existing chronic illness												
No	1			1			1			1		
Yes	1.09	0.32, 3.75	0.89	1.00	0.28, 3.57	1.00	1.05	0.70, 1.56	0.83	1.06	0.71, 1.59	0.78

[1]Adjusted for age group, educational level, place of birth, and the remaining variables in the table
NA=not available

Table 3 Unadjusted and adjusted ORs for the risk of selected maternal and neonatal outcomes with regard to ILI in sample 2

	Emergency caesarian section			Preterm			Low birth weight		
Variable	**OR**	**95% CI**	**Sig.**	**OR**	**95% CI**	**Sig.**	**OR**	**95% CI**	**Sig.**
Unadjusted ILI									
No	1			1			1		
Yes	1.03	0.73, 1.46	0.87	1.24	0.82, 1.87	0.30	1.23	0.81, 1.85	0.33
Adjusted ILI[1]									
No	1			1			1		
Yes	0.99	0.70, 1.42	0.93	1.23	0.81, 1.87	0.33	1.14	0.75, 1.73	0.55

[1] Adjusted for age group, educational level, place of birth, family income, maternal smoking status, seasonal influenza vaccination status, pre-existing chronic illness, and medical conditions arise during pregnancy

NA = not available