ATTITUDES ABOUT THE 2009 H1N1 INFLUENZA PANDEMIC AMONG PREGNANT JAPANESE WOMEN AND THE USE OF THE JAPANESE MUNICIPALITY AS A SOURCE OF INFORMATION

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Abstract. We conducted this study to determine the use of Japanese municipal information sources about the 2009 H1N1 influenza pandemic among 109 pregnant Japanese women during October and November 2009 and to determine their attitudes regarding the pandemic. During November 2009, the number of municipality information users increased significantly, however, the percentage of public magazine users remained under 40% and the percentage of municipality website users remained significantly lower than other website users. The accession of municipality information did not alleviate the anxiety of subjects caused by inaccurate information, such as mortality due to the virus infection and the safety of oseltamivir use. Those who obtained information about the pandemic from the municipality were more willing to receive the influenza vaccine than non-users. The results show the municipality information system needs to be improved to ameliorate anxiety and more effectively convey health information for future pandemics. Other Japanese public health service information systems shoud be assessed as well to determine their efficacy in delivering information regarding the 2009 H1N1 influenza pandemic.

Keywords: influenza, pandemics, pregnant woman, municipality, Japan

INTRODUCTION

During the 2009 H1N1 influenza pandemic, some of the press in Japan fostered anxiety by providing the public with inaccurate information about the pandemic. Confirmed cases were reported on in detail, and images of quarantine control facilities and staff in full personal protective equipment were repeatedly shown (Shigemura *et al*, 2009; Shimada *et al*, 2009). These press reports caused confusion and the belief that virulence of the virus could be enhanced by mutations during its propagation was treated sensationally (Watson, 2009). Beginning in the autumn of 2009, the Japanese press reports concentrated on reporting confirmed cases in which a patient had died and reported on the limited vaccine supply. However, when the pandemic was over, the Japanese government was left with

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too much vaccine. Information provided by the press suggested the pandemic was severe condition, and it is likely the press reports affected public perception regarding risk of infection.

Pregnant women who contract influenza infection are at higher risk of severe complications (Carlson *et al*, 2009; Statpathy *et al*, 2009). It is assumed vaccination and administration of oseltamivir have therapeutic benefits for pregnant women due to their safety and efficacy (Carlson *et al*, 2009; Statpathy *et al*, 2009; Tamma *et al*, 2009; Tanaka *et al*, 2009).

During the pandemic, the Japanese municipal authorities made an effort to transmit accurate information to the public and recommend appropriate behavior to prevent infection. To improve management during future pandemics, it is essential to comprehend how the public selects their information sources and responds to pandemic alerts. However, little information is available about the efficacy of the public health service information system during the 2009 H1N1 influenza pandemic. In this study, we examined the use of Japanese municipal information sources and the perceptions of pregnant Japanese women about the pandemic H1N1 during the pandemic.

MATERIALS AND METHODS

The subjects included in this study were participants of prenatal classes held in Kanagawa, Japan between October 7 and November 11, 2009. A total of 115 pregnant Japanese women attended the classes, 111 (96.5%) were enrolled in this study. Two subjects were excluded from this survey due to current disease (bronchial asthma) or family history (her husband had been infected with pandemic H1N1). Therefore, a total of 109 women (94.8%) were included in the final analysis. The main forms of media used by the municipality to supply information about the pandemic to the public were public magazines and a website. The public magazines were published twice a month and distributed mainly using the newspaper delivery system. This study complied with the principles of the Declaration of Helsinki and the ethical guidelines for epidemiological research laid down by Ministry of Education, Culture, Sports, Science and Technology and by Ministry of Health, Labor and Welfare. The objective of the study was explained to each subject and informed consent was obtained from all participants following the above guidelines prior to participation in the study.

A paper based closed format questionnaire was provided to each participant before the start of prenatal classes. A 5-point scale was used ranging from "strongly interested" to "completely uninterested" (Table 2). The degree of anxiety was measured on a 4-point scale, from "strongly concerned" to "not at all concerned". The degree of satisfactory with the amount of information supplied was measured on a 5-point scale, from "satisfied" to "unsatisfied". The subjects who showed some anxiety were asked about the reason for their anxiety. They were allowed to choose as many of the options listed in Table 3 as they wished. Both the information sources used and the prophylaxis interventions practiced were assessed, and the subjects were allowed to choose as many of the options listed in Tables 4 and 5 as they wished.

Surveys were conducted in October and November, 2009 about municipality information source usage and the data

from the two surveys were compared. Differences in the contribution of municipality information usage were evaluated in two ways: between users and nonusers and between combinations of information sources used. The program SPSS version 18 was used for analysis. To assess differences in mean values the Student's *t*-test was used. The Fisher's exact probability test was used to assess the demographic data of subjects. The Mann-Whitney *U* test and Kruskal-Wallis test were used to evaluate ordered categorical data. Odds ratios with 95% confidence intervals were calculated. A probability value less than 0.05 was considered significant.

RESULTS

Demographic data of subjects

All subjects were pregnant Japanese women who lived in Kanagawa, Japan. There were no significant differences in age, pregnancy length, pregnancy stage or primipara: multipara ratio between two groups surveyed in October and November, 2009. There were no significant differences in assessing municipality information between the two groups (Table 1).

Opinions about information provided during the pandemic

A slight change in degree of interest in the pandemic was observed between the two survey points (Table 2); all subjects in November had some level of interest in the pandemic. Subjects who accessed municipality information had a higher degree of interest in the pandemic. There was a significant difference between the different municipal information source groups (p=0.002).

Overall, the subjects who were "strongly concerned" or "concerned", about the pandemic comprised 96.3% of subjects. There was no significant difference in degree of anxiety about the pandemic between the two survey groups. The degree of anxiety was significantly different between the municipality information users and nonusers; however, there was no significant difference between the different municipal information source groups (p=0.097).

There was a significant difference in the degree of satisfaction with the amount of information available at the two survey points: in November, approximately half of the subjects felt there was too little information available. The degree of satisfaction did not change by the using of municipal information sources.

Reasons for anxiety about the pandemic

The reported reasons for anxiety included "pregnancy", "reports of H1N1-related deaths", and "not wanting to be treated with oseltamivir" (Table 3). Nearly all the subjects who suffered anxiety responded their pregnancy was the reason for anxiety. A significant increase in anxiety about "higher mortality" was detected in November. There were no differences in the frequencies of reasons given for anxiety between municipality information users and nonusers. However, the following significant differences were observed between the municipality information user group and nonuser group [odds ratio (95% confidence intervals)]: "reports of H1N1-related deaths" among municipality information website only user group [17.9 (2.1-154)]; "higher mortality" in the public magazine only user group [5.58 (1.23-25.4)] and "not wanting to be treated with oseltamivir" [3.52 (1.15-10.8)].

Sources used to obtain information about the pandemic

The number of information sources used was higher in November than in

Table 1
Characteristics of subjects.

	Survey point			Usage of municipality information sources						Total
				Users				Nonusers	*p*-value	
	October	November	*p*-value	All users	Both sources	Public magazine only	Website only			
Total (No., %)	55, 50.5	54, 49.5	-	33, 30.3	9, 8.3	16, 14.7	8, 7.3	76, 69.7	-	109
Age (mean ± SD)	31 ± 4	31 ± 5	0.796	32 ± 5	33 ± 3	31 ± 6	31 ± 3	30 ± 4	0.103	31 ± 4
Gestational age at time of survey (weeks, mean ± SD)	26 ± 4	26 ± 4	0.543	26 ± 4	24 ± 3	27 ± 4	27 ± 4	26 ± 4	0.674	26 ± 4
Second trimester (No., %)	43, 79.6	38, 70.4	0.374	22, 68.8	10, 62.5	4, 50.0	22, 68.8	59, 77.6	0.340	81, 75.0
Third trimester (No., %)	11, 20.4	16, 29.6		10, 31.2	6, 37.5	4, 50.0	10, 31.2	17, 22.4		27, 25.0
Primiparas (No., %)	52, 96.3	48, 88.9	0.270	30, 27.5	9, 100	14, 87.5	7, 87.5	70, 93.3	1.000	100, 92.6

A total of 109 pregnant women were analyzed between October and November 2009 in Japan.
p-values were calculated using the Student's *t*-test or Fisher's exact probability test for comparisons between the survey points and between municipality information source users and nonusers, respectively.
There were no significant differences among information user groups and nonusers.

Table 2
The degrees of interest, anxiety, and satisfaction with information sources.

	Survey point No. (%)			Usage of municipality information sources No. (%)						Total No. (%)
				Users				Nonusers	*p*-value	
	October	November	*p*-value	All users	Both sources	Public magazine only	Website only			
Interest										
Strongly interested	23 (41.8)	31 (57.4)	0.067	24 (72.7)	9 (100)	9 (56.3)	6 (75.0)	30 (39.5)	0.001	54 (49.5)
Interested	29 (52.7)	23 (42.6)		9 (27.3)	0 (0)	7 (43.8)	2 (25.0)	43 (56.6)		52 (47.7)
Neither interested nor uninterested	2 (3.6)	0 (0)		0 (0)	0 (0)	0 (0)	0 (0)	2 (2.6)		2 (1.8)
Uninterested	1 (1.8)	0 (0)		0 (0)	0 (0)	0 (0)	0 (0)	1 (1.3)		1 (0.9)
Completely uninterested	0 (0)	0 (0)		0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)
Anxiety										
Strongly concerned	22 (40.7)	23 (42.6)	0.858	19 (57.6)	6 (66.7)	8 (50.0)	5 (62.5)	26 (34.7)	0.020	45 (41.7)
Concerned	30 (55.6)	29 (53.7)		14 (42.4)	3 (33.3)	8 (50.0)	3 (37.5)	45 (60.0)		59 (54.6)
Unconcerned	2 (3.7)	2 (3.7)		0 (0)	0 (0)	0 (0)	0 (0)	4 (5.3)		4 (3.7)
Not at all concerned	0 (0)	0 (0)		0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)
Satisfaction with information source										
Satisfied	1 (1.9)	0 (0)	0.025	1 (3.0)	0 (0)	1 (6.3)	0 (0)	0 (0)	0.286	1 (0.9)
Slightly satisfied	12 (22.2)	5 (9.4)		4 (12.1)	0 (0)	3 (18.8)	1 (12.5)	13 (17.6)		17 (15.9)
Neither satisfied nor dissatisfied	23 (42.6)	21 (39.6)		11 (33.3)	3 (33.3)	7 (43.8)	1 (12.5)	33 (44.6)		44 (41.1)
Slightly dissatisfied	15 (27.8)	22 (41.5)		14 (42.4)	6 (66.7)	4 (25.0)	4 (50.0)	23 (31.1)		37 (34.6)
Dissatisfied	3 (5.6)	5 (9.4)		3 (9.1)	0 (0)	1 (6.3)	2 (25.0)	5 (6.8)		8 (7.5)

P-values were calculated using Mann-Whitney *U* test or Kruskal-Wallis test for comparisons between survey points and between municipality information source users and nonusers, respectively.
Except for interest, there were no significant differences among information user groups and nonusers.

Table 3
Reasons for anxiety about H1N1 pandemic.

	Survey point No. (%)			Use of municipality information sources No. (%)						Total No. (%)
	October	November	Odds ratio[a]	Users				Nonusers	Odds ratio	
				All users	Both sources	Public magazine only	Website only			
Pregnancy	50 (96.2)	48 (92.3)	0.48 (0.08 - 2.74)	32 (97.0)	9 (100)	16 (100)	7 (87.5)	66 (93.0)	2.42 (0.27 - 21.6)	98 (94.2)
Reports of pandemic H1N1-related deaths	13 (25.0)	21 (40.4)	2.03 (0.88 - 4.69)	14 (42.4)	3 (33.3)	4 (25.0)	7 (87.5)	20 (28.2)	1.88 (0.79 - 4.45)	34 (32.7)
Higher mortality	1 (1.9)	9 (17.3)	10.7 (1.30 - 87.6)	6 (18.2)	1 (11.1)	4 (25.0)	1 (12.5)	4 (5.6)	3.72 (0.97 - 14.2)	10 (9.6)
Many patients	7 (13.5)	7 (13.5)	1.00 (0.32 - 3.08)	5 (15.2)	1 (11.1)	3 (18.8)	1 (12.5)	9 (12.7)	1.23 (0.38 - 4.01)	14 (13.5)
Not wanting to receive oseltamivir	18 (34.6)	13 (25.0)	0.63 (0.27 - 1.47)	12 (36.4)	1 (11.1)	9 (56.3)	2 (25.0)	19 (26.8)	1.56 (0.65 - 3.78)	31 (29.8)
Having chronic disease	1 (1.9)	1 (1.9)	1.00 (0.06 - 16.4)	1 (3.0)	1 (11.1)	0 (0)	0 (0)	1 (1.4)	2.19 (0.13 - 36.1)	2 (1.9)
Other	2 (3.8)	1 (1.9)	0.49 (0.04 - 5.58)	1 (3.0)	1 (11.1)	0 (0)	0 (0)	2 (2.8)	1.08 (0.09 - 12.3)	3 (2.9)

The data seen in October or the nonuser group were used as controls to calculate the odds ratio, respectively. [a]Data in parentheses represents the 95% confidence interval.

Table 4
The total number and proportion of information sources used.

	Survey point No. (%)			Use of municipality information sources No. (%)						Total No. (%)
				Users				Nonusers		
	October	November	*p*-value Odds ratio[a]	All users	Both sources	Public magazine only	Website only		*p*-value Odds ratio	
No. of information sources used (mean± SD)	3.11 ± 1.41	3.98 ± 1.76	0.005	4.82 ± 1.40	5.89 ± 0.93	4.56 ± 1.59	4.13 ± 0.64	2.99 ± 1.43	<0.001	3.54 ± 1.65
Information sources										
Television	54 (98.2)	53 (98.1)	0.98 (0.06 - 16.1)	33 (100)	9 (100)	16 (100)	8 (100)	74 (97.4)	-	107 (98.2)
Radio	1 (1.8)	4 (7.4)	4.32 (0.47 - 40.0)	2 (6.1)	1 (11.1)	1 (6.3)	0 (0)	3 (3.9)	1.55 (0.25 - 9.73)	5 (4.6)
Newspaper	21 (38.2)	22 (40.7)	1.11 (0.52 - 2.40)	15 (45.5)	3 (33.3)	12 (75.0)	0 (0)	28 (36.8)	1.40 (0.61 - 3.21)	43 (39.4)
Commercially available magazine	1 (1.8)	3 (5.6)	3.18 (0.32 - 31.5)	2 (6.1)	0 (0)	2 (12.5)	0 (0)	2 (2.6)	2.35 (0.32 - 17.5)	4 (3.7)
Friends or family	20 (36.4)	20 (37.0)	1.03 (0.47 - 2.24)	13 (39.4)	4 (44.4)	7 (43.8)	2 (25.0)	27 (36.0)	1.16 (0.50 - 2.68)	40 (37.0)
Hospital or clinic	16 (29.1)	12 (22.2)	0.69 (0.29 - 1.66)	8 (24.2)	3 (33.3)	3 (18.8)	2 (25.0)	20 (26.3)	0.88 (0.34 - 2.27)	28 (25.7)
Website										
Any site	26 (47.3)	33 (61.1)	1.75 (0.82 - 3.75)	24 (72.7)	9 (100)	7 (43.8)	8 (100)	35 (46.1)	3.05 (1.25 - 7.42)	59 (54.1)
News site	22 (40.0)	26 (48.1)	1.39 (0.65 - 2.98)	16 (48.5)	5 (55.6)	6 (37.5)	5 (62.5)	32 (42.1)	1.26 (0.56 - 2.88)	48 (44.0)
Municipality site	4 (7.3)	13 (24.1)	4.04 (1.23 - 13.3)		-	-	-	-	-	17 (15.6)
Others	2 (3.6)	6 (11.1)	3.31 (0.64 - 17.2)	3 (9.1)	1 (11.1)	2 (12.5)	0 (0)	5 (6.6)	1.40 (0.31 - 6.24)	8 (7.3)
Municipality information										
Both sources	1 (1.8)	8 (14.8)	9.39 (1.13 - 77.9)	-	-	-	-	-	-	9 (8.3)
Public magazine only	3 (5.5)	13 (24.1)	5.50 (1.47 - 20.6)	-	-	-	-	-	-	16 (14.7)
Website only	3 (5.5)	5 (9.7)	1.77 (0.40 - 7.80)	-	-	-	-	-	-	8 (7.3)
None	48 (87.3)	28 (51.9)	0.16 (0.06 - 0.41)	-	-	-	-	-	-	76 (69.7)
Others	0 (0)	2 (3.7)	-	1 (3.0)	0 (0)	1 (6.3)	0 (0)	1 (1.3)	2.31 (0.14 - 38.1)	2 (1.8)

P-values were calculated using the Student's *t*-test for comparisons between survey points and between municipality information source users and nonusers, respectively. The data seen in October or the nonuser group were used as controls to calculate the odds ratio, respectively. [a]Data in parentheses represent the 95% confidence interval.

Table 5
Preventive practices used by sources of information sought by study subjects.

	Survey point No. (%)			Use of municipality information sources No. (%)						Total No. (%)
				Users				Nonusers	Odds ratio	
	October	November	Odds ratio[a]	All users	Both sources	Public magazine only	Website only			
Hand washing	52 (94.5)	52 (96.3)	1.50 (0.24 - 9.35)	30 (90.9)	8 (88.9)	15 (93.8)	7 (87.5)	74 (97.4)	0.27 (0.04 - 1.70)	104 (95.4)
	2 (3.6)	2 (3.7)	1.02 (0.14 - 7.51)	3 (9.1)	1 (11.1)	1 (6.3)	1 (12.5)	1 (1.3)	7.50 (0.75 - 75.0)	4 (3.7)
Gargling	44 (80.0)	49 (90.7)	2.45 (0.79 - 7.61)	30 (90.9)	8 (88.9)	15 (93.8)	7 (87.5)	63 (82.9)	2.06 (0.55 - 7.79)	93 (85.3)
	5 (9.1)	2 (3.7)	0.38 (0.07 - 2.07)	2 (6.1)	1 (11.1)	0 (0)	1 (12.5)	5 (6.6)	0.92 (0.17 - 4.98)	7 (6.4)
Mask wearing	21 (38.2)	26 (48.1)	1.50 (0.70 - 3.22)	16 (48.5)	3 (33.3)	7 (43.8)	6 (75.0)	31 (40.8)	1.37 (0.60 - 3.11)	47 (43.1)
	23 (41.8)	15 (27.8)	0.54 (0.24 - 1.19)	14 (42.4)	6 (66.7)	6 (37.5)	2 (25.0)	24 (31.6)	1.60 (0.69 - 3.71)	38 (34.9)
Vaccination	16 (29.1)	15(27.8)	0.94 (0.41 - 2.16)	10 (30.3)	3 (33.3)	3 (33.3)	4 (50.0)	21 (27.6)	1.14 (0.46 - 2.79)	31 (28.4)
	9 (16.4)	12 (22.2)	1.46 (0.56 - 3.81)	11 (33.3)	4 (44.4)	4 (25.0)	3 (37.5)	10 (13.2)	3.30 (1.23 - 8.82)	21 (19.3)
Information-gathering	9 (16.4)	9 (16.4)	1.02 (0.37 - 2.81)	7 (21.2)	2 (22.2)	4 (25.0)	1 (12.5)	11 (14.5)	1.59 (0.56 - 4.55)	18 (16.5)
	17 (30.9)	13 (24.1)	0.71 (0.30 - 1.65)	11 (33.3)	4 (44.4)	3 (18.8)	4 (50.0)	19 (25.0)	1.50 (0.62 - 3.66)	30 (27.5)
Humidity control	14 (25.5)	11 (20.4)	0.75 (0.31 - 1.84)	13 (39.4)	2 (22.2)	6 (37.5)	5 (62.5)	12 (15.8)	3.47 (1.37 - 8.80)	25 (22.9)
	5 (9.1)	4 (7.4)	0.80 (0.20 - 3.15)	2 (6.1)	1 (11.1)	1 (6.3)	0 (0)	7 (9.2)	0.64 (0.12 - 3.24)	9 (8.3)
Adequate rest	18 (32.7)	19 (35.2)	1.12 (0.50 - 2.47)	11 (33.3)	2 (22.2)	6 (37.5)	3 (37.5)	26 (34.2)	0.96 (0.40 - 2.28)	37 (33.9)
	13 (23.6)	7 (13.0)	0.48 (0.18 - 1.32)	6 (18.2)	2 (22.2)	2 (12.5)	2 (25.0)	14 (18.4)	0.98 (0.34 - 2.83)	20 (18.3)
Stocking up on prophylaxis	10 (18.2)	15 (27.8)	1.73 (0.70 - 4.29)	12 (36.4)	2 (22.2)	6 (37.5)	4 (50.0)	13 (17.1)	2.77 (1.10 - 7.00)	25 (22.9)
materials	20 (36.4)	14 (25.9)	0.62 (0.27 - 1.39)	11 (33.3)	4 (44.4)	3 (18.8)	4 (50.0)	23 (30.3)	1.15 (0.48 - 2.76)	34 (31.2)
Leaving home	9 (16.4)	10 (18.5)	1.16 (0.43 - 3.13)	6 (18.2)	1 (11.1)	4 (25.0)	1 (12.5)	13 (17.1)	1.08 (0.37 - 3.13)	19 (17.4)
	14 (25.5)	9 (16.7)	0.59 (0.23 - 1.50)	9 (27.3)	4 (44.4)	3 (18.8)	2 (25.0)	14 (18.4)	1.66 (0.64 - 4.34)	23 (21.1)

The data seen in October or the nonuser group were used as controls to calculate the odds ratio, respectively. [a]The data in parentheses represent the 95% confidence interval.

October. Users of municipality information reported using many more information sources than the nonuser group. The major information sources used were: television, internet-based news, and newspapers, in descending order of use (Table 4). Nearly all subjects used television as an information source. Fewer than 30% of subjects obtained information about the pandemic from a hospital or clinic even though the subjects had been seen by a doctor regularly. No significant differences in the use of non-municipal sources of information were observed between the two survey points.

The number of municipality information users increased from Octorber to November. The number of public magazine users increased to nearly the same level as the number of newspapers users (38.9% and 40.7%, respectively).

Municipality information users used websites to obtain information about the pandemic more often than nonusers. However, the number of municipality website users was significantly lower than the total number of web users [odds ratio = 0.20 (0.08 - 0.46)].

Preventive practices used

Pandemic influenza prevention practices used by the pregnant women are shown in Table 5. The major precautions taken were wearing a mask, stocking up on prophylaxis materials, and information gathering. More subjects practiced nutritional care in November than in October. Municipality information users sought vaccination more frequently than nonusers.

The most commonly used non-pharmaceutical precautions were hand washing, gargling, and wearing a mask in descending order of use. Municipality information users more frequently practiced humidity control and stocking up on prophylaxis materials than nonusers, and more frequently sought vaccination than nonusers.

DISCUSSION

We studied use of municipality information sources and the responses to the H1N1 influenza pandemic among pregnant Japanese women during the pandemic. During the pandemic, there was a marked increase in media reports about confirmed cases of H1N1 infection in which a patient died as well as inadequate vaccine supply in Japan. The municipality increased the amount of information about vaccine supply, including for pregnant women, beginning in November 2009.

Compared to October, the subjects in November felt too little information was available about the pandemic. This perceived information deficit was also reported from other Asian nation (Kamate *et al*, 2010). The use of municipality information sources increased in November. It seems reasonable to suppose the increased amount of information available in November was responsible for the increase in utilization. In support of this hypothesis, more users of municipality information received a vaccination than nonusers.

Users of municipality information sources had a high interest in the pandemic and used more information sources than nonusers. This suggests they utilized the municipality to obtain more information, rather than in substitute for other sources. However, the number of municipality website users was significantly lower than the total number of web users during this survey. There were similar numbers of public magazine and newspaper users, probably because their delivery

systems overlapped, but newspaper users comprised less than half of all subjects. These observations demonstrate the need to improve accessibility to municipality information.

Many subjects were anxious about the H1N1 pandemic because of reports of H1N1-related deaths, the high mortality rate of the virus, and the side effects of oseltamivir. Although preliminary studies of the outbreak in Mexico showed a high fatality rate, the epidemiological characteristics of the Japanese who contracted the infection showed the severity of H1N1 pandemic was similar to that of seasonal influenza (Fraser *et al*, 2009; Shimada *et al*, 2009). Oseltamivir has been shown to be safe and effective in pregnant women (Statpathy *et al*, 2009; Tanaka *et al*, 2009). A major reason for anxiety during the pandemic was a lack of accurate information. These results are similar to other studies of the H1N1 pandemic and SARS (Lau *et al*, 2003, 2009; Kamate *et al*, 2010). When the public is confronted with a new threatening situation it results in increased anxiety, which predisposes them to misperceptions and overreaction (Lau *et al*, 2006; Sandman, 2009). Accurate information supported by scientific evidence is limited at the beginning of a pandemic (Leppin and Aro, 2009). The limited amount of accurate information causes the general public to copy the behavior of others, which leads to the propagation of misperceptions (Johal, 2009). Since the public reassesses the risk of and best strategy to prevent contracting an infection, the transmission of adequate information can be effective reducing public anxiety (Leung *et al*, 2004). In this study we found insufficient and inaccurate knowledge and anxiety about the pandemic were not eliminated by the information supplied by the municipality. Although the anxiety was enhanced by the perceived increased risk due to their pregnancy, our findings show there is a need to improve the accuracy and adequacy of information provided by the municipality. It has been previously pointed out there is a need for coherent accessible information to be provided to the public by public health specialists during health emergencies (Brahmbhatt and Dutta, 2008). However, the municipality's information system included little advice from public health physicians. The information focused exclusively on vaccine supplies schedule and did not adequately eliminate misconceptions and anxiety about the H1N1 pandemic.

In this study nearly all subjects practiced hand washing. Public behavior reflects various factors, including demographic, cultural and psychological factors (Catherine and Wong, 2003; Tang and Wong, 2004). Researchers in other regions found such factors affected public behavior regarding the H1N1 pandemic (Goodwin *et al*, 2009; Rubin *et al*, 2009; Kamate *et al*, 2010). Asians adhered strongly to hygiene measures (Syed *et al*, 2003). Females and highly anxious individuals were more likely to adopt recommended behavioral changes, including nonpharmaceutical interventions, such as hand washing and mask wearing (Fischhoff *et al*, 2004; Tang and Wong, 2004). It has been demonstrated both hand washing and mask wearing are effective in preventing respiratory infections (Cowling *et al*, 2009; Maclntyre *et al*, 2009; Aiello *et al*, 2010; Jefferson *et al*, 2010). Early in pandemics, shortages of treatment drugs and delays in production of vaccines will occur (Booy *et al*, 2006). In view of this, nonpharmaceutical interventions are important for controlling pandemic infections.

The public has limited knowledge about what action to take during crises, including infectious disease pandemics (Wray *et al*, 2008). Many Japanese were confused by the large amount of inaccurate information about the H1N1 pandemic provided by the media (Shigemura *et al*, 2009). In this study, 44.0% of subjects sought information about influenza. Taken together, if the municipality information system provides accessible and accurate information, this confusion may be avoided.

Care must be taken when applying our results to other populations since our study was conducted among pregnant women attending prenatal classes, therefore, selection bias is possible. Self-reporting bias may also have affected our results. Therefore, a large prospective study is needed to estimate the relationship between information provision and behavior.

Good judgment and the provision of appropriate information are required to take appropriate measures against infectious disease. We examined the contribution of one municipality information system on the response to the H1N1 pandemic among pregnant women. We conclude: 1) improvement of the municipality information system is necessary to ensure it provides usable information, 2) nearly all subjects practiced hand washing and other nonpharmacological interventions and 3) half of subjects sought information about influenza. Our findings suggested the need to create a more usable information system for future pandemics. We encourage assessment of other health service information systems regarding their response to the 2009 H1N1 influenza pandemic.

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