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Essam Janahi, Maysoon Awadh, Shereen Awadh

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Correspondence concerning this article should be addressed to Dr. Essam Janahi, Department of Biology, College of Science, University of Bahrain, P.O. Box 32038, Sakhir, Kingdom of Bahrain / Email : emohammed@sci.uob.bh / Tel.:17437425

Public knowledge, risk perception, attitudes and practices in relation to the swine flu pandemic: A cross sectional questionnaire-based survey in Bahrain

Essam Janahi (1) [*], Maysoon Awadh (1), Shereen Awadh (2)

(1) Department of Biology, College of Science, University of Bahrain, Kingdom of Bahrain
(2) Department of Administrative and Technical Program, College of Applied Studies, University of Bahrain, Kingdom of Bahrain

* Corresponding author

ABSTRACT

Introduction/Objectives: On 10 August 2010 World Health Organization announced that H1N1 influenza virus had moved into the post-pandemic period and hence it is time for countries to evaluate their response to the pandemic. Many studies have been done about the public perception and behaviours toward H1N1 influenza in the western world; however none has been done so far in the Gulf countries. Therefore, this paper investigates the general public knowledge, risk perception, preventive behaviours and practices during the H1N1 pandemic in Kingdom of Bahrain, as a model for the Gulf countries.

Methods: The study was conducted using a cross-sectional questionnaire based survey on 771 Bahraini individuals.

Results: Despite that the public showed strong adherence to the personal protective hygiene measures, most of them underestimated the threat of H1N1 pandemic as evident in their knowledge of previous pandemics or in their susceptibility perception. Furthermore, misconceptions and wrong beliefs were common, which indicates a gap in the knowledge and practice of the public. For example, most of the public were against taking H1N1 Influenza vaccine and their negative intension was based on the alleged side effects of the vaccine.

Conclusion: This study provides a baseline for an ongoing surveillance programme to help the local authorities in improving their pandemic preparatory plans, especially the governmental educational and media campaign.

Keywords: *Epidemiology, Swine flu (H1N1 influenza A), Pandemic, Prevention and control, General Public, Kingdom of Bahrain*

Introduction

Pandemic influenza is a major public health problem, which is known historically to claim millions of life. It is estimated that 50-100 million people were killed by the 1918 flu pandemic (commonly referred to as the Spanish Flu).[1] In April 2009, World Health Organization (WHO) announced the emergence of a novel influenza A virus (H1N1), which was characterized by being highly contiguous and easily spread from a person to another, and from a country to another. Genetically, the virus is a mongrel, coming from three recognized sources (pigs, birds, and humans) which were combined in pigs.[2] On 11 June 2009, WHO have decided to raise the level of influenza pandemic alert from phase 5 to phase 6, declaring it as the first influenza pandemic in the new millennium.

The clinical symptoms of H1N1 influenza in most cases are similar to seasonal influenza, such as fever, cough, sore throat, rhinorrhoea, headache, muscle pain, and malaise. Patients may have some or all of these symptoms. The recovery time is about a week, even without medical treatment. However, some patients quickly develop very severe progressive pneumonia. Primary viral pneumonia is the most common finding in severe cases and a frequent cause of death. Secondary bacterial infections have been found in approximately 30% of fatal cases. The most common causes of death in severe cases are respiratory failure and refractory shock. In such cases, patients usually begin to deteriorate around 3 to 5 days after symptom onset. Deterioration is very rapid, as many patients progress to respiratory failure within 24 hours.[3] The average incubation period is 1.5-2 days, similar to seasonal flu, thus enables symptomless individuals to spread the disease through either close person-to-person contact or travel from one city to another city in the world.[3]

The World Health Organization latest report on 6 August 2010 indicates that 214 countries have reported laboratory confirmed cases of pandemic influenza H1N1 and the reported number of fatalities were at least 18449.[4] In Bahrain, the latest available number of laboratory confirmed cases was 1442 and the number of fatalities was 8 with a mortality rate of 0.5%.[5] Up to 17 January 2010, the world health organization had classified Bahrain as widespread geographical area for influenza activity.[6] Bahrain is one of the most densely populated countries in the world $(1461/km^2)$, and because of that there is a huge risk in case of community outbreak.

Successful disease control efforts depend on comprehending both the distribution and frequency of health behaviours and understanding associations with the different socio-demographic backgrounds. For example, the studies on avian influenza (H5N1) and SARS epidemics in different countries demonstrated the importance of understanding community responses and preparedness.[7-11] Therefore, this study aims to examine the Bahraini general population knowledge about the virus and the disease, their risk perception, their preventive behaviours and practices. Furthermore, it aims to determine the association between the preventive behaviours and the different socio-demographic backgrounds. Findings from this study would provide significant information on the level of preparedness among the public and government agencies, which will help in improving the Influenza prevention programmes in Kingdom of Bahrain. It will also help in the identification of high risk groups among the population.

Methods

Study population

The population of this study comprised of Bahraini adults who were 18-60 years old. Between 1 November -31 December 2009, questionnaires were randomly distributed on site in different regions of Kingdom of Bahrain with a request to return in 30 minutes. The participants were asked to complete the questionnaire without the use of additional information as to reduce the manipulation in data collection. In all, 793 out of 1500 distributed questionnaires were returned (return rate 52.9%) and 771 of them were valid (response rate 51.4%).

Instrument and key measures

This study adopted a questionnaire survey to collect data. The questions were developed by literatures review[12-14] and pilot group interviews with Bahraini adults of different demographic characteristics. The final version of the survey was pilot tested on a random sample of 50 participants in order to ensure the appropriate number of questions, clarity of scientific vocabulary and the possibility of adding or omitting questions based on their performance. The questionnaire was originally written in Arabic language, as the majority of the public would have difficulties in comprehending the English version. It consisted of three parts (see supplementary materials), the first part was general information describing the participants demographical and medical determinants which included gender, age, living situation, educational level, employment status, medical insurance and the presence of chronic illness.

Second part was related to the individual awareness of swine flu disease, this was assessed by 27 questions. Participants indicated on a three point scale the degree to which they were aware of swine flu disease (3=Yes, 2= No and 1=I don't know). This section was subdivided into 4 categories: General information about swine flu, modes of swine flu transmission, swine flu disease symptoms and people who are at higher risk due to swine flu virus.

The third part of the questionnaire consisted of 43 questions subdivided into three categories: Perceived efficacy of swine flu preventive measures, perceived threat of swine flu pandemic and perceptions about public organizations, health agencies and local government preventive measures. The participants indicated their answers for this part on a five point Likert scale (1= I don't know, 2= strongly disagree, 3= disagree, 4= agree and 5= strongly agree).

Internal consistency of instrument

Internal consistency of the research questionnaire was computed using Cronbach alpha coefficient. Results ranged from 0.72 to 0.83 with an average of 0.78. Cronbach alpha coefficients around 0.7 and above are scientifically acceptable.

Data analysis

Data analysis was considered by using descriptive statistics. Student t-test and one way ANOVA were applied to test the research hypotheses. SPSS version 17.0 was utilized for data analysis and P values of 0.05 or less were considered significant. This study was conducted to test the following null hypotheses:

1. There is no difference in Bahraini adults' general awareness about H1N1 influenza in terms of gender, age, educational level, marital status and employment status.

2. There is no difference in Bahraini adults' preventive behaviours and practices towards H1N1 influenza in terms of gender, age, educational level, marital status and employment status.

Results

Baseline Socio-Demographic characteristics of participants

The baseline socio-demographic characteristics of the participants are shown in Table 1. Mean age of the study population was 33.6 years (range: 18-60 years), and 53.8% of the study population were women, while 46.2% were men. There are no significant differences between the study population and the recent census data[15] in terms of age, gender and educational level. The five most common chronic diseases reported by participants were high blood pressure (n=105, 13.6%), diabetes (n=61, 7.9%), thyroid disorder (n=25, 3.2%), heart disease (n=5, 0.6%) and lung disease (n=5, 0.6%).

General awareness of H1N1 influenza

1) General information about H1N1 influenza virus

The average general awareness among participants about H1N1 influenza was 76.7%

(range 64.8%- 92.6%). Overall, participants who are aged 40-49 years (P <0.001), with post-graduate education (P <0.05), married (P <0.001) and employed (P <0.001) were significantly more aware of swine flu general information (Table 2). There was no statistically significant difference between genders (Table2). The majority of the participants were aware about the nature of the epidemic (90.7%), origin of the virus (86.9%), subtype of the species (92.6%) and the mongrel nature of the virus (81.6%). Of all participants, 43.3% wrongly believed that swine flu is caused by bacteria, 35.2% didn't know the genus of the virus, 34.8% wrongly believed that swine flu virus has higher fatality than avian flu virus, 27.9% thought that the current Swine flu virus is one type of avian flu virus and 62.7% of the participants underestimated the fatalities caused by previous flu pandemics.

2) Modes of swine flu transmission

The prevalence of incorrect beliefs regarding the modes of transmission of the virus was as following: 11.8% believed that the virus is transmitted through long distance airborne aerosols, 18.5% believed that the virus is transmitted through eating well-cooked pork, 19.9% believed that the virus is transmitted via insect bites. A high percentage of the participants (70.3%) had at least one of the aforementioned misconceptions (with 25.5% with >= 2 misconceptions). On the other hand, the prevalence of the participants identifying the correct mode of transmission was as following: 96.4% 'via hand shake and embracing', 95% 'via contact with contaminated objects', and 84% 'via one meter distance airborne aerosols'. Overall, participants who are aged 40-49 years (P <0.001), with post-graduate education (P <0.01), married (P <0.001) and employed (P <0.001) were significantly more aware about

the modes of swine flu transmission (Table2). No significant difference between genders was determined (Table2).

3) *Swine flu disease symptoms*

Of all participants, 97% correctly identified the main swine flu symptoms and 86.4% were able to determine other subsidiary symptoms (diarrhoea, vomiting and neurological problems). The majority of participants (93.4%) correctly indicated that swine flu symptoms are similar to that of seasonal influenza. Overall, females participants (P <0.001) and those with post-graduate education (P <0.001) were significantly more aware about swine flu symptoms (Table 2).

4) *Individuals at higher risk due to swine flu disease*

Most of the participants correctly identified the individuals at higher risk of serious complications due to swine flu disease: individuals aged 65 and older (88.8%), children younger than 2 years old (84.1%), pregnant women (84.5%) and individuals with chronic diseases (diabetes, heart disease and lung disease) (83.1%). However, some participants erroneously believed that swine flu virus can infect people of different ages with the same severity (14.6%) and obese individuals are not at higher risk of serious complications due to the infection (33.9%). Married females (P <0.001) of the age group 50-60 years old (P <0.001) with post-graduate education (P <0.001) were shown to significantly have higher awareness regarding the groups at higher risk due to swine flu infection.

Attitudes, practices and risk perception in relation to H1N1 influenza

1) *Prevalence and perceived effectiveness of swine flu preventive measures*

The average adherence to the H1N1 influenza preventive measures among participants was 73.3% (range: 59.1% - 87%). In general, married and employed participants (P <0.001) in the age group 30-39 years (P <0.001) were shown to have significant positive behaviour toward swine flu preventive measures (Table 3). There was no statistically significant difference between genders (Table3).

Most participants showed strong adherence to the personal protective hygiene measures such as 'using disposable tissues when coughing and sneezing' (84.3%), 'washing hands frequently' (83.3%), 'avoiding touching nose, eyes and mouth without sterilizing hands' (79.45%) and 'carrying a sanitizer when going out of home' (76.8%). Of the participants, 68.1% were avoiding visiting crowded places, 67.3% postponed travelling to other countries, 69.4% postponed pilgrim to Mecca and 76.2% avoided visiting hospitals unnecessarily. Avoiding such places is seen by the participants as efficient means of preventing the transmission of the H1N1 virus (70.5%). Most of the participants would consult a doctor immediately if they develop flu symptoms (87%) and comply with quarantine procedures in case if they become infected (85.7%). However, a high percentage (63.7%) thought that taking antibiotics would help with swine flu disease. From nutritional point of view, 74.6% of participants have increased their intake of vegetables, whole grain and fruits to boost their immune system. Of the participant, 68.2% thought that using traditional herbal drinks would help to protect them from infection.

Overall, 65.5% of the participants reported regularly wearing facemasks in crowded places to prevent contracting and spreading H1N1 virus, and 63.4% reported that they would force their children to wear facemasks when attending schools and colleges. Of the participants, who originally stated that they don't wear facemasks, 67.7% said that the increase in the number of local confirmed cases and the increase in death toll would change their mind regarding the use of facemasks regularly.

The negative intention toward swine flu vaccination was quite high, as 59.1% of the participants indicated that they neither will get vaccinated nor will vaccinate their children. The majority of them (77.7%) indicated that their negative intention is due to the alleged side effects they have been hearing about it. Of the participants aged <30, 22.4% (n=173) had a negative intention towards swine flu vaccine compared to 12.1% (n=93) aged 30-39, 8.2% (n=63) aged 40-49, 4.4% (n=34) aged 50-60.

2) *Perceived threat of swine flu pandemic*

About 57-59% of the participants thought there will be a sharp increase in the number of swine flu cases in Kingdom of Bahrain and other neighbouring countries in the next six months. Less than 50% of the participants believed that there is a very high chance for themselves (42.2%) and for their family members (42.7%) to be infected in the next six months. Furthermore, 69.5% of the participants suspected that a new influenza pandemic will occur in the next five years. About 47.6% of the participants felt distressed and panicked regarding the cases of swine flu infection in Bahrain. On the other hand, 74.9% of the participants indicated that swine flu pandemic had no impact on their daily life activities and 76.3% thought that there is

unnecessary panic due to swine flu pandemic. A large proportion of the participants (44.9%) thought that the swine flu pandemic will have no effect on Bahrain's economy and 64.4% believed in the conspiracy theory that international pharmaceutical companies are responsible for the swine flu pandemic. Participants aged 30-39 years (P <0.001) were significantly feeling higher threat of swine flu pandemic compared to other age groups.

3) *Perceptions about public organizations and agencies preventive measures*

Most of the participants (71.3%) thought positively about the performance of the local health authorities in terms of the preventive measures applied to control swine flu infection, for example 75.1% of the participants supported the suspension of schools and universities at the beginning of the academic year to prevent further spread of the virus. However, the local media campaign has received a negative perception as 75.4 % of the participants believed that they have not received sufficient and accurate information from Bahrain TV and Bahraini newspapers. The analysis of the major sources of information about swine flu was as following: 14% 'local newspapers', 10.6% 'Bahrain TV', 20% 'Arabic and foreign satellite channels', 35.9% 'Arabic websites and emails' and 19.5% 'Foreign language websites'. Overall, participants who are aged 30-39 years (P <0.01), employed (P <0.05) and married (P <0.05) had significantly more positive perception towards the performance of the governmental and public organizations regarding swine flu pandemic (Table 3).

Discussion

Researchers have shown that disease prevention and health promotion depend critically on understanding both prevalence of health behaviours and associations among such behaviours.[16-18] With proper diseases preventive policies, these individual preventive behaviours can be the basis for establishing an effective population-level prevention efforts.[19,20] As the first epidemiological study on H1N1 Influenza to be carried out in Kingdom of Bahrain and as far as we know the first in all gulf countries, this study may contribute positively to the refinement of the H1N1 preparedness plans and programmes. The importance of this study is reinforced by the strategic location of Bahrain as an international transit hub for aviation, which increases the significance of controlling H1N1 outbreaks in this country. This study has revealed important gaps in the general Bahraini population knowledge about the virus and the disease, as well as revealing some of the malpractices and behaviours in relation to H1N1 pandemic.

Although the general information of the public was satisfactory, there were many misconceptions about the H1N1 virus and its modes of transmission. For example, despite being able to recognize the subtype of the causative agent, many participants surprisingly thought it was a bacterium. This misconception is supported by the belief of many participants that antibiotics can treat swine flu disease. Many also mixed up between the swine flu virus and avian flu virus, which might led to misconception about swine flu fatalities. More than two thirds of the participants mistakenly believed that the H1N1 virus is transmitted via long distance airborne aerosols, eating well-cooked pork, and via insect bites and many of them had more than one of these misconceptions.

Furthermore, some participants have underestimated the fatalities caused by previous flu pandemics, which explains why a high percentage of them thought that swine flu pandemic has no effect on their daily life and they believed that the media and health authorities has exaggerated its danger. In general, higher education and older age have positively correlated with an increase in the general knowledge about the virus and the disease. In case of an outbreak of H1N1, these misconceptions may lead to unnecessary panic, which highlights the significance of the role of governmental agencies and organizations in providing the public with the correct information and assessing their methods of delivering such information.

Prevention is very important in controlling the global spread of H1N1 influenza virus. The Bahraini health authorities have conducted several prevention and intervention measures against further spread of the disease. They have launched a public health education programmes about the disease through the local media, issued preventive health guidelines to health care workers and the general public, suspension of classes for schools and universities at the beginning of the academic year, prompt isolation of infected individuals at quarantine facilities especially at the beginning of the pandemic. The public were very supportive to the governmental policies and procedures such as the quarantine and closure of schools at the beginning of the pandemic. However, they thought they haven't received accurate and sufficient information from local media. This is a very important finding of this study, as it reveals a big gap in providing the public with the necessary information about H1N1 pandemic. The Bahraini authorities need to revise their health education and awareness campaign through the local media and ministry of education and find better methods to deliver the necessary information.

The public shown considerable behavioural changes in response to H1N1 pandemic, for example 'using disposable tissues when coughing and sneezing', 'washing hands frequently', 'avoiding touching nose, eyes and mouth without sterilizing hands' and 'avoiding visiting crowded places'. Furthermore, a large portion of the public have postponed pilgrim to Mecca in 2009. This high adherence to personal hygiene practices and behaviours might be directly related to the increase in the number of fatalities of H1N1, 7 have been reported dead at the time of the dissemination of the questionnaire. However, the emotional distress and panic was moderate, as about half of the participants expressed that they felt distressed and panicked due to the increase in the number of cases in Bahrain.

During SARS epidemic, the use of facemasks regularly in public venues have been shown to be an effective means of controlling the spread of SARS.[21] However during H1N1 pandemics, some European countries such as UK advised the public against using facemasks.[22] Although the Bahraini health authorities didn't not recommend using facemasks, about two thirds of the study population reported regular use of facemasks in crowded places and public transport to prevent contracting and spreading H1N1 virus. This again emphasizes the importance of the educational and awareness campaign to provide the public with the correct information and prevent unnecessary panic and stress. The majority of the public said that the main source for information about swine flu is Arabic websites and emails, which are not scientifically refereed so they might be responsible for the many misconceptions and wrong beliefs seen in this study.

There are a lot of publications documenting the significance of associations between individuals' demographic characteristics and their practice of preventive behaviours.[16,23-26] Most of the studies have shown that women, individuals with a college education, and the 18-24 and 65+ age groups were more likely to practice preventive behaviours than men, individuals with less or no education, and the 25-44 age group.[26] In our study, women and men were equally practicing preventive behaviours, and the age group 30-39 shown most adherence to preventive measures. With respect to age, previous studies have shown that young people's health behaviours are easily influenced by peer pressure[27] and this might explain why this group didn't show high adherence to preventive behaviours. Whereas family and spouse support became more important than peer influences for older groups[28] and that's why married and employed individuals were more strict in practicing preventive behaviours in our study.

An important finding of our study is that a large proportion of the study population was against taking H1N1 vaccine. The Ministry of Health in Bahrain has ordered 130000 doses of H1N1 vaccine; however only 7.6 % of this quantity has been used.[5] Despite, the efforts of Ministry of Health to assure the public about the safety of the vaccine, the majority of study population indicated that their negative intention is due to the alleged side effects they have been hearing about the vaccine. This finding further supports the importance of revising the educational and awareness campaign. Another important finding of this study was the low perceived susceptibility, as only about half of the study population thought that they are susceptible for contracting H1N1 infection in the next six months and they also underestimated the chances of an outbreak in the community. This kind of relaxed attitude would become a problem in case of a community outbreak.

This study has several limitations. First, the response rate was not high; however it was comparable to similar published studies.[9,13,29,30] Furthermore, because there were no significant differences between the study population and the recent census data[15], the study population is a good representative of the entire Bahraini population. Second, the study was a descriptive one as it aimed at describing the Bahraini general population knowledge, risk perception, preventive behaviours and practices in relation to H1N1 pandemic. Third, the study was based on self-reported questionnaire, which is subject to social desirability bias. However, the questionnaire was anonymous and the return-time was restricted to 30 minutes, which will significantly reduce such bias.

This study concluded that the public underestimated the threat of H1N1 pandemic as evident in their knowledge of previous pandemics or in their susceptibility perception. This low perception of the pandemic threat might create a problem in case of large community outbreak. Misconceptions and wrong beliefs were common, which needs to be addressed. Although the public was not distressed or panicked at the time of questionnaire dissemination, it is anticipated that the distress level would rise in case of community outbreak. Therefore, psychological preparedness should become part of the governmental preparatory plan. The main recommendation of this study is to revise the governmental educational and media campaign, as it is evident from our data there is a gap in the knowledge and practice of the public. Many lessons can be learnt from the SARS and avian influenza epidemics and how other countries have dealt with it. The government can make use of the health and media experts across the country to formulate new plans for the educational and media campaign. Data from surveillance studies can be used to monitor the public perception and responses, and these studies should become an integral part of the governmental preparatory plan.

Conflicts of Interest: None

References

1. Taubenberger J, Morens D. (1918) Influenza: the mother of all pandemics. Emerg Infect Dis.2006; 12:15-22.

2. Garten R, Davis C, Russell C, et al. Antigenic and genetic characteristics of swine-origin (2009) A(H1N1) influenza viruses circulating in humans. Science. 2009; 325:197-201.

3. World Health Organization (W.H.O). Clinical features of severe cases of pandemic influenza. 2009.

4. World Health Organization (W.H.O). Pandemic (H1N1) (2009) - update 85, Global Alert and Response(GAR)(http://www.who.int/csr/don/2010_01_29/en/index.html). Accessed. 29 June 2010.

5. Public Health Directorate (P.H.D), Ministry of Health, Kingdom of Bahrain. H1N1 statistics in Bahrain. 2010.

6. World Health Organization (W.H.O). Geographical spread of H1N1 Influenza activity (http://gamapserver.who.int/h1n1/qualitative_indicators/atlas.html?indicator= i0&date=Week 01 (04-Jan-2010: 10-Jan-2010). Accessed 22 August 2010.

7. Lau J, Yang X, Tsui H, et al. Monitoring community responses to the SARS epidemic in Hong Kong: from day 10 to day 62. J Epidemiol Community Health. 2003; 57:864-870.

8. Leung G, Quah S, Hedley A, et al. A tale of two cities: community psychobehavioral surveillance and related impact on outbreak control in Hong Kong and Singapore during the severe acute respiratory syndrome epidemic. Infect Control Hosp Epidemiol. 2004; 25:1033-1041.

9. Lau J, Kim J, Tsui H, et al. Perceptions related to human avian influenza and their associations with anticipated psychological and behavioral responses at the onset of outbreak in the Hong Kong Chinese general population. Am J Infect Control. 2007; 35: 38-49.

10. Lau J, Kim J, Tsui H, et al. Anticipated and current preventive behaviors in response to an anticipated human-to-human H5N1 epidemic in the Hong Kong Chinese general population. BMC Infect Dis. 2007; 7:18-28.

11. Lau J, Tsui H, Kim J, et al. Perceptions about status and modes of H5N1 transmission and associations with immediate behavioral responses in the Hong Kong general population. Prev Med. 2006; 43: 406-410.

12. Tang C, Wong C. Factors influencing the wearing of facemasks to prevent the severe acute respiratory syndrome among adult Chinese in Hong Kong. Prev Med. 2004; 39:1187-1193.

13. Lau J, Griffiths S, Choi K, et al. Widespread public misconception in the early phase of the H1N1 influenza epidemic. J Infect. 2009; 59: 122-127.

14. Zijtregtop E, Wilschut J, Koelma N, et al. Which factors are important in adults' uptake of a (pre)pandemic influenza vaccine? Vaccine. 2009; 28: 207-227.

15. Ministry of Cabinet Affairs, Kingdom of Bahrain. Basic Results Population, Housing, buildings and Establishment Census. 2008.

16. Berrigan D, Dodd K, Troiano R, et al. Patterns of health behavior in U.S. adults. Prev Med. 2003; 36: 615-623.

17. Johansson S, Sundquist J. Change in lifestyle factors and their influence on health status and all-cause mortality. Int J Epidemiol. 1999; 28: 1073-1080.

18. Physical activity and cardiovascular health. NIH Consensus Development Panel on Physical Activity and Cardiovascular Health. JAMA. 1996; 276: 241-246.

19. McKinlay J, Marceau L. A tale of 3 tails. Am J Public Health. 1999; 89: 295-298.

20. Stokols D. Translating social ecological theory into guidelines for community health promotion. Am J Health Promot. 1996; 10: 282-298.

21. Lau J, Tsui H, Lau M. X. SARS transmission, risk factors, and prevention in Hong Kong. Emerg Infect Dis. 2004; 10: 587-592.

22. National Health Service (UK). Swine Flu Q & A (http://www.nhs.uk/conditions/ Pandemic-flu/Pages/QA#Whofacemask.aspx). Accessed 19 January 2010.

23. Boutelle K, Murray D, Jeffery R, et al. Hennrikus, D.J., & Lando, H.A. Associations between exercise and health behaviors in a community sample of working adults. Prev Med. 2000; 30: 217-224.

24. Liang W, Shediac-Rizkallah M, Celentano D, et al. A population-based study of age and gender differences in patterns of health-related behaviors. Am J Prev Med. 1999; 17: 8-17.

25. Pappas G. Elucidating the relationships between race, socioeconomic status, and health. Am J Public Health. 1994; 84: 892-893.

26. Shi L. Sociodemographic characteristics and individual health behaviors. South Med J. 1998; 91: 933-941.

27. Lau R, Quadrel M, Hartman K. Development and change of young adults' preventive health beliefs and behavior influence from parents and peers. J Health Soc Behav. 1990; 31: 240-259.

28. Umberson D. Gender, marital status and the social control of health behavior. Soc Sci Med. 1992; 34: 907-917.

29. Lau J, Yang X, Pang E, et al. SARS-related perceptions in Hong Kong. Emerg Infect Dis. 2005; 11: 417-424.

30. Tang C, Wong C. An outbreak of the severe acute respiratory syndrome: predictors of health behaviors and effect of community prevention measures in Hong Kong, China. Am J Public Health. 2003; 93: 1887-1888.

Table 1: Demographic characteristic of the 771 participants

Variables	Number	Percent
Gender		
Male	356	46.2
Female	415	53.8
Age		
<30	366	74.5
30-39	171	22.2
40-49	148	19.2
50-60	86	11.2
Educational level		
Secondary school	300	38.9
Diploma	148	19.2
Bachelor	241	31.3
Postgraduate	82	10.6
Martial status		
Single	253	32.8
Married	490	63.6
Divorced/widowed	28	3.6
Employment status		
Employed	554	71.9
Unemployed	69	8.9
Student	148	19.2
Living situation†		
One	136	17.6
Two	137	17.8
Three	158	20.5
Four	171	22.2
Nil	169	21.9
Health insurance		
Yes	92	11.9
No	679	88.1
Chronic disease		
None	615	79.8
High blood pressure	105	13.6
Heart disease	5	0.6
Lung disease	5	0.6
Diabetes	61	7.9
Thyroid disorder	25	3.2

†Number of individuals under 18 years old living in household.

Table 2: Socio-demographic factors associated with participants' general awareness about H1N1 influenza

	Mean†	SD	95% CI
Sex			
Male	2.44	0.30	2.42-2.46
Female	2.49	0.32	2.47-2.51
P††	**0.022**		
Age			
<30	2.43	0.30	2.41-2.45
30-39	2.44	0.31	2.42-2.46
40-49	2.57	0.27	2.55-2.59
50-60	2.54	0.39	2.51-2.57
Total	2.47	0.31	2.45-2.49
P	**0.000**		
Educational level			
Secondary school	2.49	0.32	2.47-2.51
Diploma	2.43	0.25	2.41-2.45
Bachelor	2.43	0.35	2.41-2.45
Postgraduate	2.58	0.20	2.58-2.60
Total	2.47	0.31	2.45-2.49
p	**0.000**		
Martial status			
Single	2.41	0.34	2.39-2.43
Married	2.52	0.26	2.50-2.54
Divorced/widowed	2.20	0.45	2.17-2.23
Total	2.47	0.31	2.45-2.49
p	**0.000**		
Employment status			
Employed	2.50	0.29	2.48-2.52
Unemployed	2.47	0.30	2.45-2.49
Student	2.36	0.35	2.34-2.38
Total	2.47	0.31	2.45-2.49
p	**0.000**		

† Data are expressed as weighted mean.
†† p values of 0.05 or less are considered significant.

Table 3: Socio-demographic factors associated with participants' attitudes, practices and risk perception in relation to H1N1 influenza

	Mean†	SD	95% CI
Sex			
Male	3.44	0.51	3.40-3.48
Female	3.51	0.58	3.47-3.55
P††	**0.11**		
Age			
<30	3.40	0.61	3.36-3.44
30-39	3.64	0.45	3.62-3.68
40-49	3.47	0.52	3.43-3.51
50-60	3.49	0.45	3.46-3.52
Total	3.48	0.55	3.44-3.52
P	**0.000**		
Educational level			
Secondary school	3.60	0.57	3.56-3.64
Diploma	3.40	0.63	3.36-3.44
Bachelor	3.36	0.51	3.32-3.40
Postgraduate	3.51	0.32	3.49-3.53
Total	3.48	0.55	3.44-3.52
p	**0.000**		
Martial status			
Single	3.37	0.64	3.32-3.42
Married	3.53	0.49	3.50-3.56
Divorced/widowed	3.53	0.62	3.49-3.57
Total	3.48	0.55	3.44-3.52
p	**0.001**		
Employment status			
Employed	3.53	0.50	3.49-3.57
Unemployed	3.32	0.52	3.28-3.36
Student	3.35	0.70	3.30-3.40
Total	3.48	0.55	3.44-3.52
p	**0.001**		

† Data are expressed as weighted mean.
†† p values of 0.05 or less are considered significant.