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*Full Length Research Paper*

# An inquiry of knowledge, attitudes and practices against pandemic H1N1 influenza among Turkish health care workers: Experience of a single center in Southeast of Turkey

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**It is crucial to have a knowledge of pandemia. The aim of this study was to assess knowledge, attitude and behavioral responses of health care workers (HCWs) toward pandemic H1N1 influenza (PI). A cross-sectional study was performed in September 2009 in Diyarbakir, Turkey. All HCWs replied to a self-administered standardized, structured questionnaire. A total of 783 participated, with 31.55% having low knowledge and 22.98% having high level about PI. It was observed that HCWs sex was affecting knowledge level scores (p = 0.005). 26.44% had low knowledge about nosocomial preventive cautions, with 24.90% having high level of knowledge. The significant predictor for higher knowledge scores about preventive measures for nosocomial transmission was HCWs occupational status (p < 0.001). The study therefore reveals that, nosocomial transmission is a major problem during a pandemic and HCWs will be essential for effective working of the health system. Efforts should be targeted at educating HCWs to improve knowledge, attitude and behavioral responses in the current pandemia, as well as for future epidemics.**

**Key words:** Pandemic H1N1 influenza, health care worker, nosocomial transmission, hospital.

## INTRODUCTION

In April 2009, severe cases of pneumonia preceded by influenza-like illness were noted to occur in Mexico and then North America. A novel influenza A (H1N1) virus was identified as the cause and it rapidly evolved into a pandemic (Van et al., 2009). Evidence that this strain could pass from human to human led the World Health Organization to quickly raise its pandemic alert level to Phase 6 on 11 June, 2009 and soon appeared across the country (WHO, 2009). The state hospitals are an important source of transmission due to close contact between patients and health care workers (HCWs). During a pandemic or disease outbreak, the behaviors and actions of HCWs play a fundamental role in contagion and thus, it is crucial that they receive greater education and knowledge regarding preventive strategies.

So far most public health efforts have focused on identifying, treating, and isolating people who have the disease and educating the public about the steps that individuals can take to reduce the risk of transmission. These recommendations include using tissues when sneezing, washing hands regularly with soap and water, and setting up a network of “flu friends” to provide mutual assistance when someone becomes ill (Blendon et al., 2008). It is also suggested that HCWs be educated about sign and symptoms of pandemic influenza, ways of transmission, and preventive measures that should take place in hospital.

Learning more about the concerns, knowledge, attitudes, preventive measures, and behaviors of individuals working in state hospitals during an infectious disease outbreak is crucial for improving communication

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efforts between patients and HCWs and preventing the nosocomial spread of PI. The aim of this study is thus, to uncover the knowledge, attitudes, preventive measures, and behaviors of people working in state hospitals. To the best of our knowledge, this is the first study from Turkey that focuses on understanding the HCWs awareness of and attitudes toward a pandemic threat.

## MATERIALS AND METHODS

Adults working in state hospitals (both male and female) completed self-administered questionnaires during the month of September, 2009 in Diyarbakir, Turkey. The purpose of the study was explained to eligible participants. Although participants are required to provide written consent in most cases, we obtained oral informed consent before the performing questionnaire. Every HCWs replied to a standardized, structured questionnaire that was made up according to World Health Organization and Turkish Health Ministry guidance (Appendix - Additional files 1 and 2; to assess knowledge, attitudes and practices (KAPs) of pandemic H1N1 influenza (PI). The spread of 2009 H1N1 within the healthcare facility may be the result of lack of proper knowledge about nosocomial transmission. For that there is a different point value assigned to some questions to investigate knowledge level about infection control. The inclusion criterion was working in state hospital in Diyarbakir. The subjects were assessed using a questionnaire containing the following information:

1. Personal demographic characteristics (name, age, gender, educational qualification and working status).
2. General knowledge of PI (consisting of 26 questions) and general knowledge of PI for nosocomial transmission during hospitalization (consisting of 12 questions).

These questionnaires comprised mode of transmission, signs and symptoms, infectiousness time of illness, duration of infection control measures, urgent medical attention condition time and KAPs associated with PI in the first part of the questionnaire. The second part of the questionnaire comprised prevention methods, order of removing contact precaution materials, the method of following patients, time required for transmission of influenza after travel, hospitalization indication of patients, method of cleaning the patient's laundry, method for cleaning dirty dishes, separation of medical equipments, a person who ordered antiviral treatment and knowledge, attitudes and practices (KAPs) associated with PI.

Most questions were closed-ended: participants were allowed to choose correct answers (Yes/No). To each question, 1 point was assigned if the answer was ''yes'', 0 points for ''no'' and 1 point was assigned for correct answer of multiple choice-questions.

Questionnaire 1 was assessed to determine whether the participants were aware of the mode of transmission (2 points), signs and symptoms of PI infections (16 points), how to estimate infectiousness/time of illness (1 point), duration of infection control measures (1 point), urgent medical attention condition time (4 points) and whether they believed that PI is spread by pools and drinking water (1 point). Participants were grouped into three categories according to their level of knowledge: low (≤7 points), average (8 - 14), and high (15 or more points). A person who scored 8 to 14 points was defined as concerned about PI.

Questionnaire 2 of HCWs was based on assessment of nosocomial transmission during hospitalization of PI. Concerns related to PI were assessed via twelve questions. We asked for prevention methods (4 points), the order of removing contact precaution materials (1 point), hospitalization indication of patients (1 point), time required for transmission of influenza after travel (1 point), method of following patients (1 point), method of cleaning patient's laundry (1 point), method for cleaning dirty dishes (1 point), separation of medical equipment (1 point), and a person who ordered antiviral treatment (1 point). The total preventive score ranged from 0 to 12 points. A high level was considered to be more than 9 points, average level was 5 - 8 points, and a poor level was 4 points or less. A person who scored 5 to 8 points was defined as concerned about nosocomial transmission of PI.

For convenience, age was divided into four groups as follows: up to 30 years; 31 to 40 years; 41 to 50 years; and ≥ 60 years. Similarly, educational status was divided into two groups: high school education and university graduation. Because all HCWs at least completed a high school education.

### Statistical analysis

For the purpose of analysis, the individual scores were summed up to yield a total score. The data were analyzed using the statistical package for social sciences (SPSS) (version 10.0). Student's t-test was used to find the significant difference in the means of knowledge, attitude and behavior for gender and working status at p value < 0.05. One-way ANOVA was used to find the association of knowledge, attitude and behavior in relation to different age groups and different literacy rate levels. Pearson's correlation test was used to find the correlation between knowledge, attitude and behavior.

## RESULTS

A total of 883 HCWs were contacted, of whom only 783 agreed to participate. The demographic profile of the participants is shown in Table 1.

### Knowledge assessment

The majority of the participants (65.0%) were aware that the disease was transmitted to a person by touching and 57.9% of them felt that droplets after coughing and sneezing was the other way of spread, however 7.2% of them stated that PI was not contagious. Although most correctly known signs and symptoms were fever, cough myalgia and fatigue, the least correctly known signs and symptoms were nose bleed, conjunctivitis, convulsion and mental confusion. A large number of participants (74.7%) mistakenly believed that PI was spread by pools and drinking water. The period of communicability was known by most (58.6%) however the majority of participants were not knowledgeable about infection control period during PI when a person was sick (22.1%). More than one-half of participants thought that the difficult breathing and shortness of breath (71.5%), mental confusion (50.8%), and frequent and prolonged vomiting (52.0%) were worthy of an emergency intervention for hospitalization. All participants agreed that the wishes of the patient were not important to adjudicate emergency situation (Table 2). Also according to Table 5, HCWs sex were affecting knowledge level score ($p = 0.005$). There was no difference between age, educational level, and occupational status about knowledge level scores ($p > 0.005$). In the present study, 31.55% of participants had

**Table 1.** Demographic characteristics of the participants (n = 783).

| Characteristics | Number | Percentage |
|---|---|---|
| **Sex** | | |
| Male | 457 | 58.4 |
| Female | 326 | 41.6 |
| **Age groups (years)** | | |
| ≤30 | 292 | 37.3 |
| 31 - 40 | 386 | 49.3 |
| 41 - 50 | 88 | 11.2 |
| ≥51 | 17 | 2.2 |
| **Educational level** | | |
| High school | 729 | 93.1 |
| University graduated | 54 | 6.9 |
| **Occupational status** | | |
| Nurse | 218 | 27.8 |
| Doctor | 54 | 6.9 |
| Cleaning staff | 134 | 17.1 |
| Computing staff | 152 | 19.4 |
| Security staff | 49 | 6.3 |
| Food preparing staff | 79 | 10.1 |
| Other workers | 97 | 12.4 |

**Table 2.** General knowledge about pandemic H1N1 influenza (n = 783).

| | True | answer | False | answer |
|---|---|---|---|---|
| | n | % | n | % |
| **Sign and symptoms** | | | | |
| Fever | 657 | 83.9 | 126 | 16.1 |
| Cough | 448 | 57.2 | 335 | 42.8 |
| Sore throat | 383 | 48.9 | 400 | 51.1 |
| Myalgia | 482 | 61.6 | 301 | 38.4 |
| Headcahe | 362 | 46.2 | 421 | 53.8 |
| Chill | 380 | 48.5 | 403 | 51.5 |
| Fatigue | 405 | 51.7 | 378 | 48.3 |
| Diarrhea | 218 | 27.8 | 565 | 72.2 |
| Vomitting | 238 | 30.4 | 545 | 69.6 |
| Rhinitis | 269 | 34.4 | 514 | 65.6 |
| Conjuntivitis | 168 | 21.5 | 615 | 78.5 |
| Nausea | 250 | 31.9 | 533 | 68.1 |
| Convulsion | 165 | 21.1 | 618 | 78.9 |
| Arthralgia | 301 | 38.4 | 482 | 61.6 |
| Mental confusion | 82 | 10.5 | 701 | 89.5 |
| Nose bleed | 67 | 8.6 | 716 | 91.4 |
| **Mode of transmission** | | | | |
| Person to person by touching | 453 | 57.9 | 330 | 42.1 |
| Via droplets after coughing and sneezing | 509 | 65.0 | 274 | 35.0 |
| Not contagious | 56 | 7.2 | 727 | 92.8 |
| Spread via pools and drinking water | 198 | 25.3 | 585 | 74.7 |

**Table 2.** Cont.

| | | | | |
|---|---|---|---|---|
| İnfectious from one day before start of symptoms to seven days after start of symptoms | 459 | 58.6 | 324 | 41.4 |
| Duration of infection control measures | | | | |
| Seven days | 173 | 22.1 | 610 | 77.9 |
| **Emergency situations** | | | | |
| Difficult breating and shortness of breath | 560 | 71.5 | 223 | 28.5 |
| Mental confusion | 398 | 50.8 | 385 | 49.2 |
| Frequent and prolonged vomitting | 407 | 52.0 | 376 | 48.0 |
| The wishes of the patient | 0 | 0.0 | 783 | 100.0 |

**Table 3.** General knowledge about pandemic H1N1 influenza during hospitalization.

| | True answer | | False answer | |
|---|---|---|---|---|
| | n | % | n | % |
| **Prevention methods for infectiousness** | | | | |
| Frequent hand washing | 516 | 65.9 | 267 | 34.1 |
| Usage of mask | 508 | 64.9 | 275 | 35.1 |
| Not shaking hands | 370 | 47.3 | 413 | 52.7 |
| Do not touch surfaces that are contaminated | 449 | 57.3 | 334 | 42.7 |
| Correct order of removing contact precaution materials | 308 | 39.3 | 475 | 60.7 |
| Correct hospitalized patient count in one room | 553 | 70.6 | 230 | 29.4 |
| Correct duration after travel for catching PI | 335 | 42.8 | 448 | 57.2 |
| All patient with PI must be hospitalized | 163 | 20.8 | 620 | 79.2 |
| Patient's laundries must be washed separately | 91 | 11.6 | 692 | 88.4 |
| Patient's dirty washes must be cleaned with water and detergent with rubber gloves | 462 | 59.0 | 321 | 41.0 |
| Patient's medical equipment must be separated from other patient's equipment | 584 | 74.6 | 199 | 25.4 |
| All antiviral treatment must be ordered by doctor | 508 | 64.9 | 275 | 35.1 |

low knowledge, with 22.98% having high level of knowledge about pandemic H1N1 influenza. Low knowledge about PI was evident with regard to duration of infection control measures (22.1%) and spread of virus via pools and drinking water (25.3%) are seen in Table 4.

## Preventive measures for nosocomial transmission

The participants reported that frequent hand washing (65.9%), usage of masks (64.9%), no shaking hands (47.3%), and avoiding contaminated touching surfaces (57.3%) were important preventive measures for transmission of PI from human to human. Only 39.3% of the participants knew the correct order of removing contact precaution materials. The majority of participants agreed that patients should be isolated in a single room (70.6%). 42.8% of the participants believed that until seven days a patient was capable of catching PI after travel. 20.8% of respondents were not knowledgeable about hospitalization indication of PI. 11.6% of them do not have information about the method of cleaning the patient's laundry and 59.0% of the participants were knowledgeable about the method for cleaning dirty dishes. Of the respondents, 74.6% reported that separation of patient's medical equipment was correct option and 64.9% believed that antiviral therapy should be given by a physician (Table 3). Also according to Table 6 HCWs occupational status affected the preventive level score ($p = 0.000$). There was no difference between age, educational level and sex about preventive level scores ($p > 0.005$). In our study, we assessed our knowledge about nosocomial preventive cautions. 26.44% of participants had low knowledge, with 24.90% having high level of knowledge about preventive cautions of nosocomial transmission of PI. Low knowledge was evident with regard to the method of cleaning the patient's laundry (11.6%) as shown in Table 6.

## DISCUSSION

The results of the present survey depict a range of knowledge, attitudes and self reported behavioral

**Table 4.** Knowledge about pandemic H1N1 (n = 783).

| Knowledge level | Know 1 | Know 2 |
|---|---|---|
| Low | 247 (31.55%) | 207 (26.44%) |
| Average | 356 (45.47%) | 381 (48.66%) |
| High | 180 (22.98%) | 195 (24.90%) |

**Table 5.** Association of demographic characteristics of participants with knowledge, attitude and behaviour using one-way ANOVA (n = 783; Know 1).

| | Mean | Standard deviation | 95% confidence interval | P |
|---|---|---|---|---|
| Age groups | 1.7829 | 0.7250 | 1.7320 - 1.8337 | 0.355 |
| Sex | 1.4163 | 0.4933 | 1.3817 - 1.4510 | 0.005 |
| Occupational level | 3.4917 | 2.0690 | 3.3466 - 3.6368 | 0.115 |
| Educational status | 1.0690 | 0.2536 | 1.0512 - 1.0868 | 0.297 |

**Table 6.** Association of demographic characteristics of participants with preventive measures about nosocomial transmission of PI (n = 783; Know 2).

| | Mean | Standard deviation | 95% confidence interval | P |
|---|---|---|---|---|
| Age groups | 1.7829 | 0.7250 | 1.7320 - 1.8337 | 0.677 |
| Sex | 1.4163 | 0.4933 | 1.3817 - 1.4510 | 0.717 |
| Occupational level | 3.4917 | 2.0690 | 3.3466 - 3.6368 | 0.000 |
| Educational status | 1.0690 | 0.2536 | 1.0512 - 1.0868 | 0.493 |

patterns concerning PI among a sample of an adult population in one region of Turkey. This study investigated the levels of knowledge, attitudes and practices regarding these risk factors and should provide scientific support to assist hospital administration in developing strategies and health education campaigns to prevent transmission of PI. Guidelines and recommendations have been developed to prevent and control the spread of PI during pandemic threat (WHO, 2009). Successful containment or control of pandemic influenza will rely on early recognition of sustained human-to-human transmission which requires a system for outbreak detection, rapid data collection, analysis, assessment and timely reporting. The main recommended measures which need to be used in concert, are: 1) isolation and quarantine measures used; 2) contact tracing and management, including the number of contacts under observation, their clinical status, and the date of the last known contact; 3) infection control measures implemented in health care facilities; 4) extent of animal culling, if any; 5) use of antivirals for treatment or prophylaxis; 6) border controls and travel restrictions, if any; 7) risk communication activities; 8) estimates or indicators of effectiveness of containment; 9) lessons learned (WHO, 2009).

Data gathered showed that a high number of respondents had detailed understanding of most known sign and symptoms of PI which were fever, cough, myalgia and fatigue. Specifically, the least correctly known signs and symptoms were nose bleed, conjunctivitis, convulsion and mental confusion. Especially there was no detailed understanding of the vehicles of transmission such as spreading the virus via pools and drinking water.

A high number of respondents had detailed knowledge about the period of communicability, and emergency intervention for hospitalization. However, it was disturbing to note that detailed questioning revealed gaps in knowledge about infection control period during PI.

Many reports have examined the various levels of knowledge about infectious agents and public behavior in relation to these infections; such studies have primarily focused on the SARS and avian influenza outbreaks (Tang and Wong, 2003; de Zwart et al., 2007). Other studies have been recently published specifically on behavioral and attitudinal responses to pandemic (H1N1) 2009 influenza (Rubin et al., 2009; Goodwin et al., 2009).

Hospitals with greater capacity will be expected to assess and give information to their personnel regarding important pandemic related issues. If HCWs are to respond appropriately during an outbreak of infectious disease, nosocomial transmission of disease between people could be prevented. Many reports have highlighted various levels of knowledge towards infectious agents and the public behavior towards these infections, especially after avian influenza outbreaks (Balkhy et al., 2010).

In the present study, 31.55% of participants had low

knowledge, with 22.98% having high level of knowledge about pandemic H1N1 influenza. Low knowledge about PI was evident with regard to duration of infection control measures (22.1%) and spread of virus via pools and drinking water (25.3%) as can be seen in Table 4. Influenza viruses are highly contagious (WHO, 2009). The working environment may be crucial to pandemic preparedness planning (Blake et al., 2010). For that the health care system needs to be aware of the safety of their HCWs because they are at significant risk. HCWs are at risk of occupational exposure to influenza and may transmit the infection to their patients and co-workers (Wicker et al., 2010).

The influenza attack rate among unprotected HCWs might be approximately 60% higher than that of the general population, which would result in substantial absenteeism and morbidity (Wicker et al., 2010; Cooley et al., 2010). Occupational health and infection prevention and control should follow the precautionary principle and the recommendations or findings presented in the scientific literature to ensure staff safety during an influenza pandemic.

A comprehensive approach to staff safety should be considered when planning for such an event. Even though all preventive cautions are taken, patients will be best cared for when HCWs are convinced that everything possible is being done to protect their own health as well (Chironna et al., 2010). For these reasons, HCWs should be educated before any type of pandemia. In our study we assessed our knowledge about nosocomial preventive cautions. 26.44% of participants had low knowledge, with 24.90% having high level of knowledge about preventive cautions of nosocomial transmission of PI. Low knowledge was evident with regard to washing condition of the patient's laundries (11.6%) as shown in Table 4.

Our study for PI should be useful for educating HCWs and preventing nosocomial transmission. Increased efforts should be made by hospital administration to build up adaptive behavioral changes among HCWs and encouraging them during early stages of any outbreak of pandemic.

## Conclusion

Knowledge is a significant influence on attitudes and practices in a pandemic. HCWs have been identified as the priority group whose preparedness is a critical element in the response to the pandemic. Nosocomial transmission is a major problem during a pandemic and information about the preventive measures that could be taken to reduce risk of transmission and infection is crucial. For that efforts should be targeted at educating HCWs to improve knowledge, attitude and behavioral responses in the current pandemia, as well as for future. Moreover, we can evaluate program effectiveness by using pre and post questionnaires to provide scientific support to assist hospital administration in developing strategies and health education campaigns to prevent transmission of PI in state hospitals.

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## APPENDIX

**Additional file 1:**

Health care worker ID:

***Part 1: Demographic information***

1. Gender:

a. Male
b. Female

2. How old are you? Or birth date: / / /(y/m/d)
3. What is your highest education level?

a. Illiterate
b. Primary school
c. Middle school
d. High school
e. College and above

4. What is your occupation?
a. Nurse
b. Doctor
c. Food preparing staff
d. Security personnel
e. Other personnel working in hospital

**Questionnaire 1**

***Part 2: General knowledge about pandemic H1N1 influenza***

Questionnaire 1 is assessed to determine whether the participants were aware of the mode of transmission, signs and symptoms of PI infections, how to estimate infectiousness/time of illness, the duration of infection control measures, urgent medical attention condition time and whether they believed that PI is spread by pools and drinking water and knowledge, attitudes and practices (KAPs) associated with PI in Diyarbakir, Turkey. This structured questionnaire is used in our study to collect information about KAPs associated with PI in Diyarbakır, Turkey.

A. What are the signs and symptoms of pandemic H1N1 influenza? (please answer each questions with yes or no option by using Y and N symbols)

1. Fever
2. Cough
3. Sore throat
4. Myalgia
5. Headache
6. Chill
7. Fatigue
8. Diarrhea
9. Vomiting
10. Rhinitis
11. Conjuntivitis
12. Nausea
13. Convulsion
14. Arthralgia
15. Mental confusion
16. Nose bleed

B. What is the mode fo transmission? (please answer each questions with yes or no option by using Y and N symbols)

1. Person to person by touching
2. Via droplets after coughing and sneezing
3. Not contagious

C. Can pandemic H1N1 influenza be spread by pools and drinking water?

1. Yes
2. No

D. When do cloud pandemic H1N1 influenza become infectious?

1. Until sign and symptoms is starting
2. Not infectious
3. one day before start of symptoms to seven days after start of symptoms

E. How long should infection control measures be continued?

1. seven days
2. It does not matter
3. as long as symptoms continue

F. What are the situations that require urgent intervention?

1. Difficult breathing and shortness of breath
2. Mental confusion
3. Frequent and prolonged vomitting
4. A wish of the patient.

**Additional file 2**

***Questionnaire 2***

Questionnaire 2 of HCWs based assessment of nosocomial transmission during hospitalization of PI. We asked for prevention methods, the order of removing contact precaution materials, hospitalization indication of patients, time required for transmission of influenza after travel, the method of following patients, the method of

cleaning patient's laundry, the method for cleaning dirty dishes, the separation of medical equipment, a person who ordered antiviral treatment and knowledge, attitudes and practices (KAPs) associated with pandemic H1N1 influenza in Diyarbakır, Turkey. This structured questionnaire had been used in our study to collect information about knowledge, attitudes and practices (KAPs) associated with pandemic H1N1 influenza in Diyarbakır, Turkey.

***Part 3: General knowledge about pandemic H1N1 influenza during hospitalization***

A. What are disease prevention methods for infectiousness? (please answer each questions with yes or no option by using Y and N symbols)

1. Frequent hand washing
2. Usage of mask
3. Not shaking hands
4. Do not touch surfaces that are contaminated

B. What is the order of removing contact precaution materials? Choose the correct ranking?

1. Gloves removed firstly, later lab coat is removed
2. Hands are washed or rubbed with hand disinfectant
3. Glasses are removed
4. Mask is removed
5. Hands are washed once again or rubbed with hand disinfectant

a) 5,4,3,1,2 b) 2,1,3,4,5 c) 1,2,3,4,5
d) 3,4,2,1,5

C. If possible, how many people must have been hospitalized in one room?

1. One patient
2. Three patients
3. More than three patients
4. It does not matter

D. How many days should be required for catching pandemic H1N1 influenza before being presented in a place where pandemic H1N1 influenza is existing?

1. seven days
2. one month
3. fifteen days
4. It does not matter

E. All patient with pandemic H1N1 influenza must have been hospitalized. Choose the correct option?

1. Yes
2. No

F. The patient's laundries must have been washed separately. Choose the correct option?

1. Yes
2. No

G. The patient's dirty dishes must have been cleaned with water and detergent with rubber gloves. Choose the correct option?

1. Yes
2. No

H. The patient's medical equipment must have been separated from other patient's medical equipment. Choose the correct option?

1. Yes
2. No

I. All antiviral treatment must be ordered by a medical doctor. Choose the correct option?

1. Yes
2. No