

## HEALTHCARE WORKERS AND UNIVERSITY STUDENTS' ATTITUDES AND EXPERIENCES ABOUT PANDEMIC INFLUENZA A (H1N1) VACCINATION

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### Summary

The novel influenza A (H1N1), colloquially named “swine flu”, remained in the mainstream media as a major health problem for many countries for more than a year. The aim of our study was to investigate the attitudes and experiences of healthcare workers and university students about the pandemic influenza A (H1N1) vaccination programs. A cross-sectional, questionnaire based survey was conducted during March 2010. A total of 247 healthcare workers (125 physicians, 122 other workers) from Marmara University Hospital and 253 students (163 medical, 90 non-medical students) from Marmara University have accepted to fill in the questionnaire. Almost 44% of participants had been vaccinated, and the physicians had the highest vaccination rate (63.2%) whereas non-medical students had the lowest rate (15.6%) ( $p < 0.05$ ). The majority of the vaccine-takers (88.4%) had undergone immunization before experiencing any flu-like symptoms; nevertheless, 15.5% of them experienced influenza-like illness after the vaccination. One third of the participants (33.9%) reported adverse effects, of which fatigue, muscle ache, and fever were the most frequent. The percentage of people intending to accept a similar pandemic vaccine in the future was 31.9%, and this tendency to accept vaccination was significantly greater for physicians

(41.1%) and medical students (42.1%) than for the other healthcare workers (24.4%) and non-medical students (11.1%) ( $p < 0.05$ ). The healthcare workers' vaccination rates were higher than those for the other groups. Physicians and medical students showed greater tendency to accept future pandemic vaccination compared to other groups. Vaccination rates can be increased if erroneous knowledge can be corrected and concerns about safety and efficacy of vaccines can be relieved. All these findings should be taken into account when planning new pandemic vaccination programs in the future.

**Key words:** Influenza A (H1N1) vaccination, Health personnel, Students

### Introduction

The initial human infections of influenza A (H1N1) virus of swine origin were first identified in Mexico in April 2009 and later in the United States of America (USA). Due to its rapid global spread, its level of pandemic alert was raised to Phase VI by the World Health Organization (WHO) on 11 June 2009 [1-3]. Differently from seasonal influenza, 2009 pandemic influenza A (H1N1) primarily affected younger population and the vast majority of initial cases occurred among adolescents and young adults with a median age of 20-25 years [3-4]. More recent studies have noted that especially people with secondary medical conditions, pregnant women, children and adolescents were under risk of serious and fatal complications of influenza A (H1N1) [5-8]. In a fatality analysis by Vaillant *et al.*, the median age was reported to be 37, and 51% of the cases were 20 to 49 years of age [7].

Although antiviral drugs like oseltamivir and zanamivir were available for pandemic influenza A (H1N1) prophylaxis, vaccination was claimed to be the most effective modality to reduce the morbidity/mortality associated with the spread of the virus [5,8-10]. The Centre of Disease Prevention and Control (CDC) Advisory Committee recommended administration of the pandemic influenza vaccine to the following five target groups: healthcare workers (HCW) and emergency medical services personnel, pregnant women, persons who live with or provide care for infants aged  $< 6$ , persons aged 6 months-24 years, persons aged 25-64 years who have medical conditions that put them at higher risk for influenza-related complications [5]. HCW are under the risk of occupational exposure and act as a link in transmittance of the virus to patients in medical care settings; therefore, many countries started with their healthcare personnel having to take the pre-pandemic or pandemic influenza vaccination, and some programs mandated this [8,11,12]. In Turkey, the pandemic vaccination programs commenced in November 2009, and influenza vaccine target groups; HCW, infants aged  $< 2$ , children and adults aged 3-24 years and people with chronic diseases received priority for vaccination [13,14].

Studies on seasonal influenza vaccine acceptance are carried out to identify the factors that induce low immunization rates [15]. Moreover, previous studies reported that vaccination rates decreased in case of a reduction in the incidence of a vaccine-preventable disease or an increase in concerns about safety of vaccines [16,17]. Seasonal influenza vaccination rates are also reported to be fairly low among HCW [18,19]. Public discussions about H1N1 vaccine policy were raised in Turkey as well as all around the world in November 2009 when the vaccine became available [14,20-26]. Public discussions carry importance for providing public opinion about vaccination, specifically the influenza A (H1N1) vaccine, predicting the success of vaccination programs, and assessing the willingness of the public to accept future pandemic vaccines.

In this study, we aimed to investigate the rate of influenza A (H1N1) vaccination, reasons for accepting or refusing influenza A (H1N1) vaccination and attitudes towards vaccination in case of a future pandemic among university students (US) and HCW. In addition, we also aimed to assess whether they experienced any adverse effects or any influenza-like illness or felt any regret after influenza A (H1N1) vaccination.

### **Method**

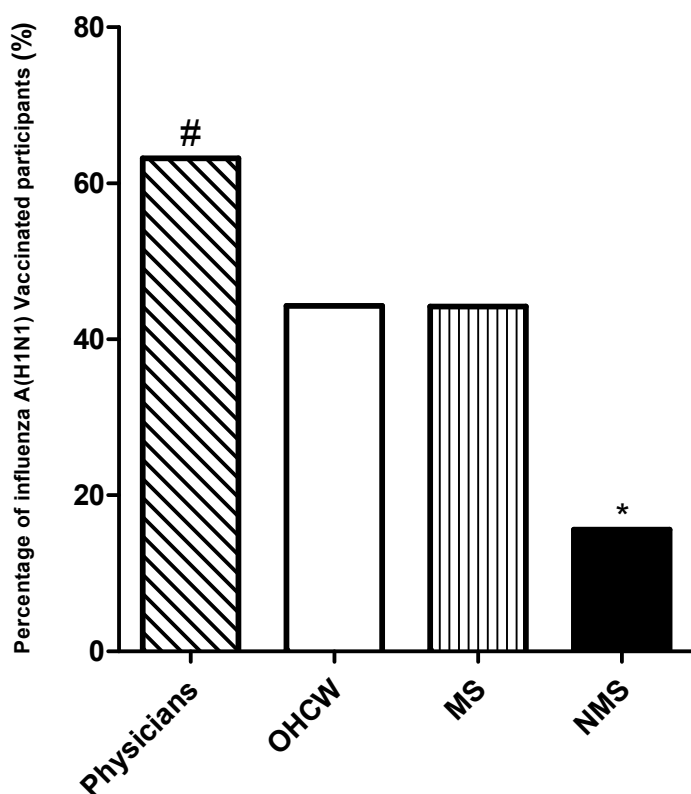
We conducted a cross-sectional, questionnaire based survey at Marmara University (MU) Hospital and the MU Haydarpasa Campus during March 2010. MU with approximately 60000- students is one of the biggest universities in Turkey and its hospital is the only university hospital on the Asian side of Istanbul. MU Hospital with a 400 bed capacity has been serving the community since 1986 [27]. There were 500 participants in the present study and they consisted of volunteers who accepted to fill in the questionnaire. It was aimed questionnaires to be distributed equally to US and HCW. Of the 500 participants, 253 were US (response rate 72.3%) and 247 were HCW (response rate 70.6%). One hundred and sixty-three participants (32.6%) were medical students (MS), 90 participants (18%) were students enrolled in other faculties, labelled as “non-medical students” (NMS). One hundred and twenty-five (25%) participants were physicians and 122 participants (24.4%) were healthcare personnel other than physicians, labelled as “other healthcare workers” (OHCW).

The face to face questionnaire consisting of 11 questions was used to assess some socio- demographic characteristics such as age, gender, occupation and also participants' attitudes and experiences towards the influenza A (H1N1) vaccination program. The participants were asked “whether they got vaccinated against influenza A (H1N1)”, “the time they got vaccinated”, “reasons for accepting influenza A (H1N1) vaccination”, “whether experienced any adverse effects after influenza A (H1N1) vaccination”, “whether experienced influenza A(H1N1) after they had been vaccinated”, “whether they felt any regret after vaccination”, “vaccine avoiders” were asked for “reasons for refusing influenza A (H1N1) vaccination”, participants were asked about their “attitudes towards vaccination in case of a future pandemic”.

All data analysis was conducted using the Statistical Package for the Social Sciences (SPSS version 11.5) and also the Chi-square test was used for the statistical analysis. The level of statistical significance was accepted as  $p < 0.05$ .

### Results

The mean age was  $26.4 \pm 6.6$  (for students:  $21.8 \pm 2.1$ , for workers:  $31.2 \pm 6.3$ ) and 52.3% were female (for students 49.8%, for workers 54.7%). There were 219 participants (43.8%) who had accepted the vaccine against influenza A (H1N1). When compared among the groups, the highest coverage rate was seen among the physicians (n=79, 63.2%) and the lowest was seen in NMS (n=14, 15.6%). The percentages of vaccine-takers were the same for OHCW and MS (n=54, %44.3 and n=72, 44.2% respectively). Statistically significant differences were found among the groups, and these were related to the NMS group, which had the lowest vaccination rate vs. the other groups and also physicians which had the highest vaccination rate vs. the other groups ( $p < 0.05$ ) (Figure 1).



**Figure 1:** Comparison of influenza A (H1N1) vaccination rates among physicians, other healthcare workers (OHCW), medical students (MS) and non-medical students (NMS), (\*, NMS vs. other groups  $p < 0.05$  #, Physicians vs. other groups  $p < 0.05$ ).

Of the total of male participants, 42.9% were vaccinated and of the female participants, 44.8% were vaccinated. There was no statistical significant difference between genders for vaccination rates ( $p > 0.05$ ). The frequency of vaccination, before experiencing any flu-like

symptoms was 88.4%, after experiencing symptoms was 3.3% and after H1N1 diagnosis of someone among family/friends was 8.3%. Among the all groups, 97.2% of MS and 94.8% of physicians received vaccination before experiencing any flu-like symptoms, whereas only 70.3% of OHCW and 78.6% NMS did so. Physicians were similar to MS, and OHCW were also similar to NMS regarding the time of vaccination (Table 1).

**Table 1:** Distribution of influenza A (H1N1) vaccination times among different professional groups (*OHCW, other healthcare workers; MS, medical students; NMS, non-medical students*).

Time of Vaccination	Physicians		OHCW		MS		NMS	
	n	%	n	%	n	%	n	%
Before experiencing any flu-like symptoms	73	94.8	38	70.3	69	97.2	11	78.6
After experiencing flu-like symptoms	3	3.9	1	1.9	1	1.4	2	14.3
After an influenza A (H1N1) diagnosis for family/friends	1	1.3	15	27.8	1	1.4	1	7.1
<b>Total</b>	<b>77</b>	<b>100.0</b>	<b>54</b>	<b>100.0</b>	<b>71</b>	<b>100.0</b>	<b>14</b>	<b>100.0</b>

Among the reported reasons for accepting vaccination (in the questionnaire each participant was able to choose more than one reason), the most frequently reported reason was “fear of catching influenza A (H1N1)” (44.2%), (73.1% of the vaccinated chose this reason). This reason was followed by “recommendations by hospital/institution authorities” (21.3%), “recommendations by National Ministry of Health” (16.8%) and “influence of friends/colleagues” (11.9%), (these reasons were declared by 64.8%, 27.9% and 19.6% respectively of the vaccinated) (Table 2).

Among all the groups (physicians, OHCW, MS, and NMS) the reasons for accepting vaccination were similar and the main reason was “fear of catching influenza A (H1N1)” (46.5%, 51.1%, 38.5%, 34.9% respectively). The next most common reasons were “recommendations of National Ministry of Health” for physicians (21.3%), and “recommendations of hospital/institution authorities” for the other groups (18.9%, 28.7% and 21.7% respectively) (Table 3).

**Table 2:** Distribution of reasons for accepting influenza A (H1N1) vaccination.

(\*, among vaccine-takers) (n=219))

Reasons to get vaccinated	n	%	%*
Fear of experiencing influenza-like illness	160	44.2	73.1
Recommendation of hospital/institution authorities	77	21.3	64.8
Recommendation of National Ministry of Health	61	16.8	27.9
Recommendation of colleagues/friends	43	11.9	19.6
For the benefit of public health	8	2.2	3.7
Preventing transmission of infection to household	6	1.7	2.7
Working in risky environment	6	1.7	2.7
Personal opinions about this vaccination	1	0.2	0.4
<b>Total</b>	362	100.0	-

**Table 3:** Distribution of reasons for accepting influenza A (H1N1) vaccination among physicians, other healthcare workers (OHCW), medical students (MS) and non-medical students (NMS).

(\*, among vaccine-takers. Physicians (n=79), OHCW (n=54), MS (n=72), NMS (n=14))

Reasons to get vaccinated	Physician			OHCW			MS			NMS		
	n	%	%*	n	%	%*	n	%	%*	n	%	%*
Fear of experiencing influenza-like illness	59	46.5	74.4	46	51.1	85.1	47	38.5	65.3	8	34.9	57.1
Recommendation of hospital/institution authorities	20	15.7	25.3	17	18.9	31.5	35	28.7	48.6	5	21.7	35.7
Recommendation of National Ministry of Health	27	21.3	34.1	11	12.2	20.4	18	14.8	25.0	5	21.7	35.7
Recommendation of colleagues/friends	10	7.9	12.7	12	13.3	22.2	16	13.1	22.2	5	21.7	35.7
Other	11	8.6	13.9	4	4.5	7.4	6	4.9	8.3	-	-	-
<b>Total</b>	127	100.0	-	90	100.0	-	122	100.0	-	23	100.0	-

The most frequently reported reason for refusing vaccination (in the questionnaire, each participant was able to choose more than one reason not to get vaccinated) was “fear of being used as an experimental subject in a vaccine clinical trial” (19.4%) and this was followed by “fear of vaccine’s adverse effects” (17.9%), “thinking that influenza A (H1N1) is not as dangerous as mentioned” (17.1%) and “being affected by the public discussions about the safety of vaccine” (15.3%). Among the vaccine-avoiders, the frequency of first reason was 42.1%, second reason was 38.9% and third reason was 37.1% (Table 4).

When the reasons for refusing vaccination were specifically analyzed among all the groups (Table 5), the resemblance between OHCW and NMS was detected in their answer “fear of being used as an experimental subject in a vaccine clinical trial” (23.6% and 20.0% respectively). Furthermore, “fear of vaccine’s adverse effects” (24.5%) among physicians and “thinking that influenza A (H1N1) is not as dangerous as mentioned” (24.6%) among MS were found as the most frequent reasons for refusing vaccination.

**Table 4:** Distribution of reasons for refusing influenza A (H1N1) vaccination.

(\*; among vaccine-avoiders (n=281))

<b>Reasons for refusing vaccination</b>	<b>n</b>	<b>%</b>	<b>%*</b>
<b>Fear of being used as an experimental subject in a vaccine clinical trial</b>	118	19.4	42.1
<b>Fear of vaccine’s adverse effects</b>	109	17.9	38.9
<b>Thinking that influenza A (H1N1) is not dangerous</b>	104	17.1	37.1
<b>Being affected by the public discussions about the vaccine’s safety</b>	93	15.3	33.2
<b>Thinking that the vaccine will not work</b>	56	9.2	19.9
<b>Thinking that his/her immune system can fight influenza A (H1N1)</b>	49	8.1	17.5
<b>Thinking that he/she will not get infected by influenza A (H1N1)</b>	29	4.8	10.4
<b>Being against vaccination in general</b>	16	2.6	5.7
<b>Not needing the vaccine due to past infection</b>	11	1.8	3.9
<b>Not needing the vaccine because of a supposed previous infection with influenza A (H1N1)</b>	6	1	2.1
<b>Lack of time</b>	7	1.1	2.5
<b>Other</b>	10	1.7	3.6
<b>Total</b>	608	100.0	-

**Table 5:** Distribution of reasons for refusing influenza A (H1N1) vaccination among physicians, other healthcare workers (OHCW), medical students (MS) and non-medical students (NMS).

(\*, among vaccine-avoiders. Physicians (n=46), OHCW (n=68), MS (n=91), NMS (n=76))

Reasons for not getting vaccinated	Physicians			OHCW			MS			NMS		
	n	%	%*	n	%	%*	n	%	%*	n	%	%*
Fear of being used as an experimental subject in a vaccine clinical trial	21	21.4	45.7	37	23.6	63.8	26	14.2	28.6	34	20.0	44.7
Fear of adverse effects of the vaccine	24	24.5	52.2	35	22.3	51.5	25	13.7	27.5	25	14.7	32.9
Thinking that influenza A (H1N1) is not as dangerous as mentioned	15	15.3	32.6	13	8.3	22.1	45	24.6	49.5	31	18.2	40.8
Being affected by the public discussions about the vaccine's safety	8	8.2	17.4	29	18.5	42.6	27	14.8	29.7	29	17.1	38.2
Thinking that the vaccine will not work	8	8.2	17.4	17	10.8	25.0	11	6.0	12.1	20	11.8	26.3
Other	22	22.4	47.8	26	16.6	38.2	49	26.8	53.8	31	18.2	40.8
<b>Total</b>	98	100.0	-	157	100.0	-	183	100.0	-	170	100.0	-

Seventy four vaccine takers (33.9%) reported 134 adverse effects which were related to the influenza A/H1N1 vaccine. Among each groups this ratio was found 57.1% in NMS, 37.0% in OHCW, 34.2% in physicians and 26.4% in MS. Out of the 134 adverse effects, 32.1% were fatigue (reported by 19.6% of the vaccinated participants), 22.4% were muscle ache (reported by 13.7% of the vaccinated participants), 18.7% were fever (reported by 11.4% of the vaccinated participants), 15.7% were headache (reported by 9.6% of the vaccinated participants), 5.2% were redness (reported by 3.2% of the vaccinated participants), 3.7% were nausea (reported by 2.2% of the vaccinated participants), 1.5% were allergy (reported by 0.9% of the vaccinated participants) and 0.8% were shivering (reported by 0.4% of the vaccinated participants). Among each group the most common reported adverse effect was fatigue in physicians, in MS and in OHCW whereas muscle ache was in NMS. Frequencies of the self reported adverse effects among each group were also demonstrated in Table 6.



**Table 6:** Distribution of self-reported adverse effects of influenza A (H1N1) among physicians, other healthcare workers (OHCW), medical students (MS) and non-medical students (NMS).

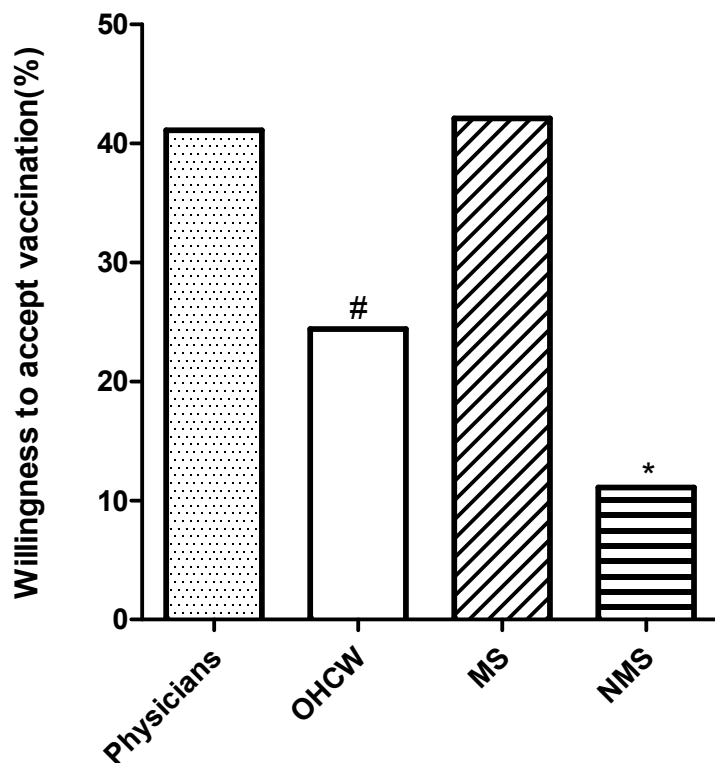
(\*, among vaccine-takers)

Adverse effects	Physicians			OHCW			MS			NMS			Total		
	n	%	n*= 79	n	%	n*= 54	n	%	n*= 72	n	%	n*= 14	n	%	n*= 219
			%			%			%			%			
<b>Fatigue</b>	15	33.3	19.0	15	34.9	27.8	12	40.0	16.7	1	6.3	7.1	43	32.1	19.6
<b>Muscle ache</b>	8	17.8	10.1	8	18.6	14.8	7	23.3	9.7	7	43.8	50.0	30	22.4	13.7
<b>Fever</b>	8	17.8	10.1	10	23.3	18.5	6	20.0	8.3	1	6.3	7.1	25	18.7	11.4
<b>Headache</b>	7	15.6	8.9	7	16.3	13.0	4	13.3	5.6	3	18.8	21.4	21	15.7	9.6
<b>Redness</b>	3	6.7	3.8	2	4.7	3.7	1	3.3	1.4	1	6.3	7.1	7	5.2	3.2
<b>Nausea</b>	2	4.4	2.5	1	2.3	-	-	-	-	2	12.5	14.2	5	3.7	2.2
<b>Allergy</b>	1	2.2	1.3	-	-	-	-	-	-	1	6.3	7.1	2	1.5	0.9
<b>Shivering</b>	1	2.2	1.3	-	-	-	-	-	-	-	-	-	1	0.8	0.4
<b>Total</b>	45	100.0	-	43	100.0	-	30	100.0	-	16	100.0	-	134	100.0	-

Thirty four participants (15.5%) have reported experiencing influenza-like illness after they had been vaccinated. Among the groups this was most frequently reported by MS (n=15, 20.8%) and followed by OHCW (n=10, 18.5%), NMS (n=2, 14.3%) and physicians (n=7, 8.9%) respectively.

The results showed that 8.2% of vaccine-takers regretted getting immunized against the influenza A (H1N1) whereas 15.1% of them were undecided. The participants who reported regret were mostly NMS (28.6%) followed by OHCW (11.1%), MS (5.6%) and physicians (5.1%). To the question, "Would you get vaccinated in case of a pandemic similar to 2009 influenza A (H1N1) in the future?" 31.9% of participants answered "yes", 25.0% "no", 40% "I don't know" and 3% of them answered "maybe if I am convinced". The distribution of participants who reported willingness to accept pandemic vaccination without

a condition, indicated that physicians (41.1%) and MS (42.1%) demonstrated a greater tendency to accept future pandemic vaccination compared to OHCW and NMS (24.4% and 11.1% respectively), and the difference among the groups was statistically significant ( $p < 0.05$ ), (Figure 2).



**Figure 2:** The comparison of willingness to accept vaccination in case of a pandemic similar to that of influenza A (H1N1) among physicians, other healthcare workers (OHCW), medical students (MS) and non-medical students (NMS). (\*, NMS vs. other groups  $p < 0.05$  #, OHCW vs. other groups  $p < 0.05$ ).

## Discussion

Vaccines play a key role in the protection from infections and the prevention of their spread. However, several reasons, such as unwillingness or inability to get the vaccine, make it difficult to reach targeted rates of vaccination. These problems can be even more critical for pandemic vaccination [9,10,16-18,21-24,28-33]. It should be highlighted that these problems were encountered for the vaccine developed against influenza A (H1N1) 2009 strain [14,20-26,34].

Although vaccination is claimed to be the most effective way to control the spread of influenza A (H1N1) and reduce the morbidity/mortality, many studies from different countries reported that influenza A (H1N1) vaccination rate remained much lower than

expected levels. For instance, a study based on phone-calls in the USA in February 2010 calculated that 24% (72 million) of the population received vaccination against influenza A (H1N1), and the vaccination rate for people above 18 years old was estimated to be 20.1% [35]. In our study, the overall influenza A (H1N1) vaccination rate was 43.8%, and it was striking to see that our rates are almost twice those obtained for the population aged 18 years and older in the USA. It should be noted that our study was conducted a month after the study in the USA, therefore the rates in the USA would have partially increased in the meanwhile as well. However, considering the remission of the infection in that period, it can be assumed that this time interval would not have affected the vaccination rates greatly. On the other hand, the influenza A (H1N1) vaccine acceptability rates before actual vaccination were 80% for Mexico and in two different studies 45% and 47.9% for Hong Kong [24,36,37]. Although the rates in the Hong Kong studies were relatively close to our rates, it is clear that these rates are higher than ours. This circumstance may be due to a misrepresentation of the pre-pandemic vaccination attitudes' relative to the actual behavior; as in France, where general practitioners reported a 61.7% vaccine acceptability rate, but after the vaccines had been administered, the actual coverage stayed below 10% [23], starting point of the phenomenon, mortality rates of each specific region or "emotional epidemiology" of different countries as described by Ofri [34]. It is possible that the occurrence of the initial influenza A (H1N1) cases with a dramatic disease progression caused an emotional turmoil in Mexico or the fact that Hong Kong had previously faced a pandemic like SARS affected their pre-pandemic vaccination acceptance rates.

In our study, physicians (63.2%) displayed the highest vaccination rates, whereas NMS showed the lowest vaccination rates (15.6%). The vaccination rates were 44% for OHCW and MS, and a statistically significant difference was present between these groups. ( $p < 0.05$ ; Figure 1). Compared to the other groups and the existing literature, physicians in our study displayed a very high vaccination rate. A study from the USA suggested that physicians and nurses had similar influenza A (H1N1) vaccination rates (44.7% and 44.5% respectively), whereas in Spain the two groups were very different (48.9% and 3.9% respectively) [35,12]. In our study, the OHCW and MS showed vaccination rates parallel with nurses in the USA but much higher than nurses in Spain. Another significant finding in our study was that the groups giving or studying medical care (physicians, OHCW, MS) had remarkably high vaccination rates compared to NMS. Although all the groups in our study were in vaccine target groups [3-7], these findings might be evidence of superior knowledge and readiness, higher awareness and increased sensitivity towards this issue of all the current and future medical professionals, from physicians to MS, compared to the NMS. These findings in general support the theory that differences between countries and groups exist on the subject of influenza A (H1N1) pandemic vaccination rates. These points should be taken into consideration when planning pandemic vaccination programs in the future.

A study done in Spain notes that the inclination to get vaccine was twice as high in men (27.8%) than women (12.9%) [12], yet in our study gender was not a determining factor (42.9% of men and 44.8% of women got vaccinated) in behaviour about vaccination ( $p > 0.05$ ).

Other behavioural factors also play a role in determining vaccination behaviour. For example, getting vaccinated without first experiencing any flu-like symptoms related to influenza A (H1N1), in other words without a compelling factor, was an act equally likely for MS and physicians (97.2% and 94.8% respectively), as well as NMS and OHCW (78.6% and 70.3% respectively) (Table 1). This finding reflects more willingness to approve vaccination by physicians and MS.

“Fear of catching influenza A (H1N1)” (73.1%) was the most frequent reason for accepting vaccination. This reason mainly reveals the participants’ motivation for self-protection. Similar to overall rates, 79 physicians (74.4%) gave this reason as the main one for accepting vaccination. A study that reflects the HCW’ reasons for being vaccinated also points out “self-protection” (33.3%) as the most important reason [12]. In a review of 25 studies, it was also deduced that most of the HCW get influenza vaccination to “protect themselves” [18]. Another study on influenza vaccination behaviour of HCW also indicates the “desire for self-protection” to be the prime reason for encouraging vaccination [38]. In general, “desire for self-protection” was the primary reason to get vaccinated. Moreover, “recommendations of hospital/institution authorities” (64.8%) was encountered as the second most common reason in our study, whereas it was the primary reason (64.6%) for getting vaccinated in a study from Mexico [24]. In our study most of the reasons correlate well with the other studies’ findings in the literature.

The main reason for influenza A (H1N1) vaccine refusal was “fear of being used as an experimental subject in a vaccine clinical trial” (42.1%). In a Canadian study conducted about the knowledge and attitudes of 1330 adults, 42.6 percent of the participants agreed or strongly agreed with the item “the idea of taking a newly developed vaccine, even if it has been carefully safety tested, makes me very anxious” [15]. In another study carried out in the Netherlands, 34% of participants displayed a negative attitude about getting pre-pandemic vaccine and 5% about the pandemic vaccine [22]. Due to the emergency of the pandemic, influenza A (H1N1) vaccine was rapidly licensed, under the “strain change” supplemental mechanism by the US Food and Drug Administration (FDA). This regulatory mechanism is used annually to approve changes to the seasonal influenza vaccines. It was proposed that without the strain change mechanism, licensure could only follow completion of large clinical trials, the results of which would delay the production and delivery of vaccines [39]. Therefore, many people have been concerned with “being used as an experimental subject” in the process by getting the vaccine [40]. This reason was especially high among OHCW and NMS in our study. This issue was intensely discussed by the mass media in Turkey, so these discussions may have intensified such doubts of the public. As a matter of fact, this theory is supported by one of our findings that one third of vaccine-avoiders (33.2%) in our study reported refusing the vaccine because of “being influenced by the public discussions about vaccine’s safety”. The fears and doubts about the safety of vaccines may have stemmed from the vaccine’s association with Guillan-Barre Syndrome [31] and the unexpected complications that occurred for past pandemic influenza vaccines against H1N1, especially the one in 1976 in the USA [41,42]. Therefore, it is possible that people might have had apprehensions about the “repetition of the adverse effects of the past influenza A (H1N1) vaccines”. Our findings include this fear as one of the most important reasons for refusing vaccination and therefore demonstrate the importance of the discussions raised about the vaccine’s safety in affecting the public’s opinion to a very high degree.

The second frequently given reason for refusing vaccination was “fear of vaccine’s adverse effects” (17.9%). A study from the USA suggested that one of the most frequent reasons for vaccine-avoidance were fear of facing any adverse effects and thoughts that they did not need a vaccine [21]. These findings correlate with our findings about adverse effect fear. In another study conducted in Spain, the primary reason for refusing vaccination was doubts about the efficacy of the vaccine (38.1%) and the second most frequent reason was fear of adverse effects (19.4%) [12]. Other reasons for refusing the vaccination as pointed out by other studies were “lack of time, inconveniency of vaccine location, doubts about the efficacy of vaccine, perception of not being at risk for acquiring the disease, medical contraindications, avoiding medical treatment and favouring alternative medicine or fear of needles” [19,38].

In our study, 33.9% of vaccine-takers declared that they suffered from adverse effects. Although differences among groups exist, we could not make any concrete arguments about this difference based on our current data. Out of 134 adverse effects, fatigue (32.1% of all adverse effects, seen in 19.6% of vaccine-takers) was the most common, followed by muscle ache (22.4%), fever (18.7%), headache (15.7%) (13.7%, 11.4%, and 9.6% of all vaccine-takers respectively) (Table 6). Fatigue, muscle ache, and headache were very frequently encountered adverse effects (in more than 10%) in accordance with what was written in the vaccine’s leaflet [43]. According to this leaflet, fever was an adverse effect expected to be seen 1-10% of the population; however, 11.4% of our participants declared experiencing fever [43]. In a study performed on 95 subjects by Dinh *et al.*, fever was seen in 6.3% of the participants, in other words half of our study’s result and in accordance with the vaccine’s leaflet [44]. Shivering which was expected to be very frequent (more than 10%) according to the vaccine’s leaflet, was discovered to be very low (0.4%) in our study. These differences may be due to different biological responses in the society that we studied, underlying medical conditions of our responders and/or the limited representation of the studied group. Additionally, the certain time frame between the act of vaccination and filling in the questionnaires should be taken into account to consider possibilities such as forgetting or neglecting the experienced adverse effects. Therefore, the detected differences could not be assigned to concrete reasons. In addition, these differences may also be due to our sample which contained an educated layer of society such as US or HCW. The fact that our sample represents certain groups of the population and the data was gathered via oral responses and not direct testing can be considered as the primary limitation of our study.

Thirty four participants (15.5%) reported experiencing influenza-like illness after getting immunized. Moreover, in a dosage response study from Australia, 3 out of 240 people also had flu-like symptoms on the 8<sup>th</sup> day of influenza A (H1N1) vaccination, and one of them was tested positive for 2009 H1N1 [45]. Nevertheless, the fact that this finding is based on the participants’ self-report should not be dismissed. Therefore, this high rate of re-infections with influenza A (H1N1) may also be associated with invalid self-diagnosis of the participants.

In the USA, 62.8% of the HCW were satisfied with accepting the vaccination [35]. In our study, surprisingly, 8.2% of vaccine-takers regretted getting the influenza A (H1N1) vaccine and the OHCW and NMS groups had significantly higher regret rates compared to the other groups. This may be associated with easier affectability of these groups by the safety discussions in the mass media compared to the physicians and MS. Furthermore this may be associated with questioning the benefits of the vaccine due to over time apprehension that influenza A (H1N1) was not as deadly as feared.

To the question, “Would you get vaccinated in case of a similar pandemic in the future?”, 31.9% answered directly “yes” and the significant greater tendency of physicians (41.1%) and MS (42.1%) to accept vaccination compared to the OHCW and NMS (24.4% and 11.1% respectively) attracts attention ( $p < 0.05$ ), (Figure 2). When 63.2% of physicians and 15.6% of NMS got vaccinated in the 2009 pandemic, the drop of these rates to 41% and 11.1% respectively in a future pandemic is extremely alarming. This situation may also be evidence for decreased belief in vaccination and/or vaccines provided by health authorities. In order to raise the immunization levels, health authorities need to utilize better interventional techniques for reaching the people and providing better education about the vaccines. As a matter of fact, a study from Singapore reported that a 25% increase in influenza A (H1N1) vaccination rates among HCW followed an informative seminar by infectious diseases specialists [46].

### Conclusion

This is the first study that reveals both the HCW’ and US’ attitudes and experiences towards the influenza A (H1N1) vaccination programme from Turkey. Higher vaccination rates were recorded in our study compared to other programs conducted in other countries. Physicians’ greater tendency towards vaccination and MS’ not far behind was also notable. The main reason for getting vaccinated was self-protection, whereas the main reason to refuse vaccination was fear of being used as an experimental subject in a vaccine clinical trial. Another remarkable finding was that fever had been found unexpectedly high reported. We conclude that the vaccination rates can be increased if erroneous knowledge can be corrected and concerns about safety and efficacy of vaccines can be relieved. Therefore, our findings should be taken into consideration along with providing improved risk communication when planning locally or globally new vaccine campaigns to tackle future public health crises.

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