

## **Knowledge of Primary School Students about H1N1 in Saudi Arabia**

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*Abstract.* Experience with pandemic (H1N1) 2009 in many countries has demonstrated the importance of schools in amplifying transmission of the virus, both within schools and in the wider community. To assess the knowledge of primary school students about H1N1 flu and to review school clinic records for detected cases of H1N1 and vaccination coverage. Female primary school students in Dammam and Khobar cities in Saudi Arabia were considered our target population (46,884 students). Our sample included 500 primary students selected by multi-stage, stratified random sampling with proportional allocation from private to public schools in Dammam and Khobar. Data was collected by a group interview questionnaire from primary students to assess their knowledge about H1N1 flu prevention and by reviewing of school clinic records. The present study revealed that the primary school students' knowledge about H1N1 was generally fair or good in about (62%) of the students. Although, there was a deficit in the primary school students' knowledge concerning the clinical manifestations of H1N1, the vaccination and the treatment of H1N1 and in the infection control. Low percentage of the recorded was suspected and confirmed; H1N1 cases (0.7% and 0.1%, respectively) and low vaccination coverage (2.4%) by H1N1 vaccine in the studied schools. About 62% of the primary school students had good or fair knowledge about H1N1.

*Keywords:* H1N1, Primary Schools, Knowledge, Students, Flu.

## **Introduction**

This study was conducted in the era of 2009 hemagglutinin Type 1 and neuraminidase Type 1 (H1N1) influenza strain, a new disease with unknown severity, along with the tragedy background of the Spanish flu and its high mortality rate in 1918. However, with this flu a new germ with unknown behavior was experienced. According to CDC, the rate of infection in USA has been highest among individuals aged 5 to 24 years<sup>[1]</sup>. According to the Saudi Ministry of Education, the most vulnerable group for infection are those under the age of 12, which means primary school age<sup>[2]</sup>.

Experience with pandemic H1N1 in 2009, many countries has demonstrated the importance of schools in amplifying transmission of the virus both within schools and the wider community. Infection within schools is considerable concern to parents as well as decision makers<sup>[3,4]</sup>.

Peculiar to Saudi Arabia is the challenge of Hajj and Umrah, expatriate movements, vaccine availability, disease surveillance system for early recognition, and detection of any suspected cases from influenza A (H1N1) infection. During the season of Hajj, there is great concern regarding H1N1 flu due to the overcrowding of Muslim people coming from all over the world. In addition to the high chance of flu transmission between pilgrims, and from them to their families and their communities

The aim of the present study was to assess the knowledge of primary school students about H1N1, and to review the school clinic records for detected cases of H1N1 and their vaccination coverage.

## **Material and Methods**

Female primary school students in Dammam and Khobar cities in Saudi Arabia were considered our target population (46,884 students). The study sample size was calculated by EpiInfo statistical package. It was found that at expected frequency of 50% of students having satisfactory knowledge, at worst acceptable frequency of +/- 5% and a confidence level of 95%, the minimum required sample size was 382. Ten schools were selected by multistage stratified random sampling technique from private to public female primary schools in Dammam and Khobar, with a proportional allocation. Two 6<sup>th</sup> grade classes were

selected for assessing their knowledge about H1N1 influenza from each school. Data was collected by a group interview questionnaire. The questionnaire was designed according to WHO, CDC and the Saudi Ministry of Education recommendations. It covers socio-demographic data, information about the seriousness of H1N1 flu, high risk groups, methods of prevention of H1N1 transmission, precautions in case of infection, precautions to avoid drug resistance to Tamiflu and indications to H1N1 vaccination<sup>[2,4,5]</sup>. Reliability of the knowledge questionnaire was found to be 0.780 by Chronbach's  $\alpha$ .

Statistical analysis: All variables were coded and entered in SPSS program. Scoring of knowledge questions was carried as follows: each correct answer was given a score of 1 and each false answers a score of 0. The maximum knowledge score was 57. The total knowledge score was calculated by adding the scores given to each question. The knowledge score was divided into 3 categories; namely Good (> 75% of maximum score), Fair (50-75% of maximum score) and Poor (< 50% of maximum score). The questionnaire was divided into subscales to assess the knowledge about clinical manifestations, prevention, infection control, high risk groups and treatment. The appropriate statistical analytical techniques were performed. Frequency distribution tables were constructed. Data were presented in pie charts and box plots. Chi-square test was used for qualitative analysis, while Mann-Whitney non-parametric test was used for quantitative analysis.

## Results

Five hundred primary school students were included in the study, about 62% of them had fair to good knowledge about H1N1 (Fig. 1). The knowledge score was significantly better among Khobar than the Dammam students ( $p = 0.000$ ) (Table 1).

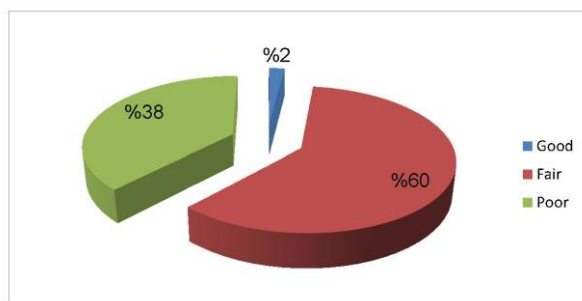
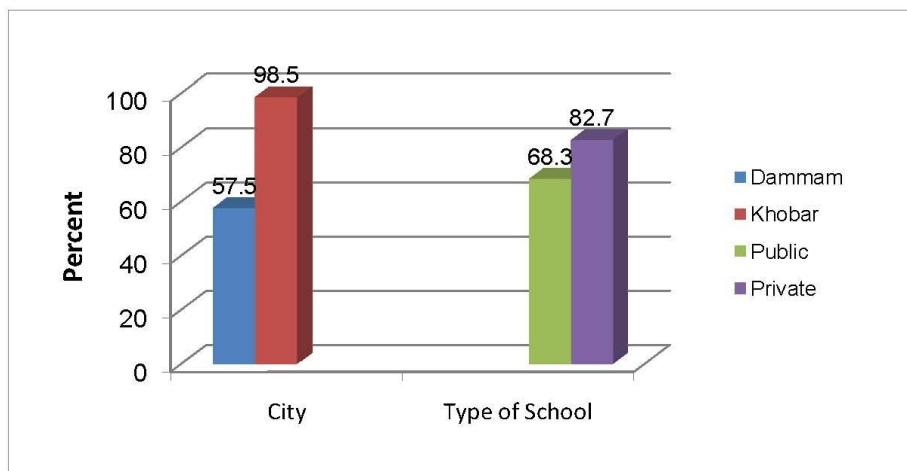


Fig. 1. Knowledge of primary school students about H1N1.

**Table 1. H1N1 knowledge score analysis by city and school type.**

Variable		Total Knowledge Score				Mann-Whitney P
		No.	(n=492) %	Median	Inter-quartile Range	
City	Dammam	293	60	30	9	0.008
	Khobar	199	40	31	9	
Type of school	Public	295	60	30	9	0.459
	Private	197	40	30	9	

The rate of attending school health education sessions was significantly higher in Khobar (99%) than in Dammam (58%), and in private (83%) than in public schools (68%) (Fig. 2).

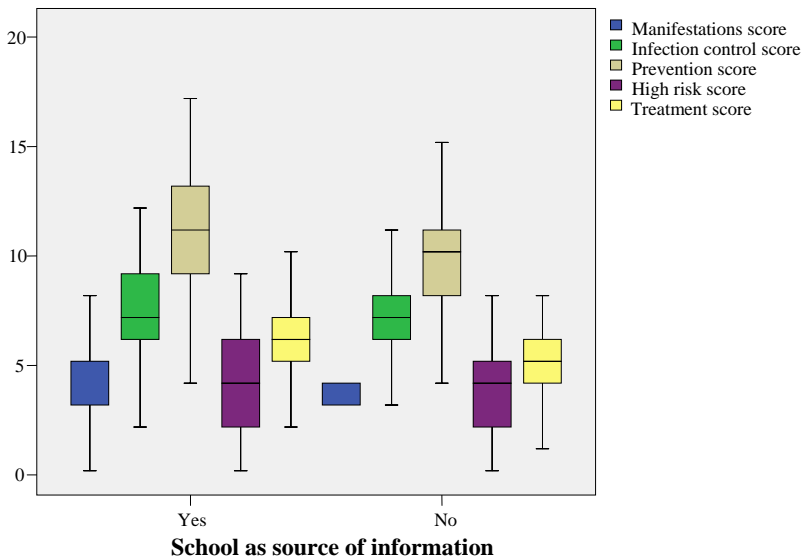
**Fig. 2. Attendance of health education sessions by school type and city.**

The most frequently mentioned source of information about H1N1 by the students was TV (69%), followed by family (63%), and school (62%). A significant difference in the knowledge score was detected between those who obtained their information from school, and education materials distributed by MOH and those who didn't (Table 2).

**Table 2. Total knowledge scores of students by source of information.**

Source of information	Total Knowledge Score					Mann-WhitneyP
	Answer	No.	%	Median	Interquartile Range	
TV	Yes	338	69	31	8	0.017
	No	154	31	29	9	
Family	Yes	309	63	31	9	0.013
	No	183	37	29	9	
School	Yes	305	62	32	9	0.000
	No	187	38	29	8	
Net	Yes	227	46	31	9	0.022
	No	265	54	29	9	
Friends	Yes	195	40	31	9	0.013
	No	297	60	30	8.5	
Newspaper	Yes	187	38	32	8	0.015
	No	305	62	29	8.5	
Educational material	Yes	181	37	32	9	0.002
	No	311	63	29	9	
Attendance of health education sessions	Yes	364	74	31	9	0.000
	No	127	26	28	7	

The median knowledge score about infection control, prevention and treatment was significantly higher among students who considered school as source of information than among all others (Mann-Whitney  $P < 0.05$ ) (Fig. 3).



**Fig. 3. Knowledge subscales by school as source of information.**

By reviewing the answers, it was found that students had misconceptions about H1N1 transmission as they considered eating pork, eating contaminated food, blood, using chlorinated pools and using contaminated toilet seats may transmit the disease. Also, they had misconceptions about severity of H1N1, its diagnosis, fatality and the high-risk groups. Also, misconceptions about H1N1 prevention were detected like cleaning surfaces by water, closing windows of isolation rooms, prophylactic Tamiflu, side effects of H1N1 vaccine, and the target group for vaccination.

By reviewing school clinic records, it was found a low rate of suspected and confirmed H1N1 cases (0.7% and 0.1% respectively), in spite of the low vaccination rate (2.4%) for H1N1 in the studied schools.

### **Discussion**

The present study revealed that 62% of female primary school students had fair or good knowledge about H1N1. This can be explained by the high percentage of health education sessions attended by the students in schools, which reached 74%. In addition to other sources of information about H1N1, which were associated with significant effects on their total knowledge score, like the school and educational materials distributed by MOH. The median knowledge score was significantly higher in Khobar schools than in Dammam. This can be explained by the difference in percentage of students attending health education sessions in Khobar primary schools (99%) compared to Dammam (58%). The median knowledge score of the students about H1N1 was significantly higher in private schools than in public schools. This can be explained by the higher rate of attending health education sessions in private (82.7%) compared to public schools (68.3%).

The median knowledge score about infection control, prevention and treatment was significantly higher among students who considered school as their source of information. This can be explained by the aim of primary schools, which was to concentrate on prevention, decreasing the rate of transmission, and vaccination since the infection rate and transmission is the highest among this group. Most of the students gave correct answers about fever, headache and malaise, vomiting and diarrhea as clinical manifestation of H1N1<sup>[6,7]</sup>. These are the most common clinical findings of the 2009 H1N1 influenza, but unfortunately

65% gave incorrect answers and considered arthritis as one of the manifestations of H1N1, which could be mistaken by arthralgia, which is a frequent finding in H1N1 influenza<sup>[6,8]</sup>.

In Saudi Arabia by the evaluation of 153 hospitalized patients with H1N1, the most common symptoms in order of frequency were; fever (143 patients), cough (126 patients), sore throat (70 patients), headache (18 patients), shortness of breath (17 patients), myalgia (11 patients), diarrhea (9 patients), and vomiting (7 patients). Average duration of symptoms before admission was 3.55 days, and the average time of hospitalization was 4.8 days. Full recovery was obtained in 150 patients. Death occurred in 3 patients<sup>[9]</sup>.

Less than 15% gave correct answers about diagnosis. It was considered that most cases of H1N1 require diagnostic testing, while according to CDC and the Saudi Ministry of Health recommendations, most patients with clinical illness, consistent with uncomplicated influenza who resides in an area where influenza viruses are circulating, do not require diagnostic influenza testing for clinical management. Patients who should be considered for influenza diagnostic testing include: Hospitalized patients with suspected influenza, patients for whom a diagnosis of influenza will inform decisions regarding clinical care, infection control, or management of close contacts<sup>[10]</sup>.

More than 88% of students considered H1N1 a serious fatal disease. Whereas, H1N1 flu case fatality rate is 0.01-0.03%, which is considered low compared to previous pandemics. Most of the cases are mild, not requiring treatment or hospitalization, as the hospitalization rate among H1N1 confirmed cases was 0.3% in the United States<sup>[11]</sup>. In a study about the characteristics of pandemic influenza A (H1N1) infection among 116 patients presenting to a university hospital in Riyadh, who were confirmed positive by using the PCR test. Most cases, (73%) were diagnosed in the outpatient clinic and sent home with specific medical advice. About one-third (31 cases) were admitted as in-patients, out of whom 22 recovered after receiving a treatment. All patients were subsequently discharged. Twelve cases of those admitted suffered from co-morbidities (2 with pulmonary disease; 1 with cardiac disease; 2 with chronic renal/liver diseases; 1 with diabetes; 1 was overweight as determined by BMI; and 5 were suffering from other diseases). Additionally, there was one pregnant woman and a lactating mother with

a reported decreased milk volume. As of September 12, 2009 there were two reported deaths; west Riyadh residents attributed to the 2009 pandemic influenza A (H1N1) virus infection; one had chronic pulmonary disease and the other, from outside the KKAU, had unknown contributory diseases<sup>[12]</sup>.

About 54% considered Bronchial Asthma (BA) a risk factor for H1N1 complications, inspite of being a prevalent disease in Saudi Arabia among children from 6 to 16 years of age. It has a regional diversity, being highest in Jazan (24%), 14% in Hofuf, 12% in Dammam and the lowest in Riyadh 10%<sup>[13]</sup>.

Only 36% considered *diabetes mellitus* (DM) a risk factor for H1N1 flu complications. DM is common in KSA, its prevalence reaches 23.7% in adults<sup>[14]</sup>. The prevalence of type 1 DM in Saudi Arabian children and adolescents is 1.1 per 1000<sup>[15]</sup>.

Only 35% gave correct answers about the risk of Sickle Cell Anemia on H1N1 flu complications, while SCA is a common hereditary blood disease in Saudi Arabia with a prevalence of 2.4 per 1000 in children and adolescents; and the regional distribution revealed dominance in the Eastern Region with a prevalence of 14.5 per 1000<sup>[16]</sup>.

Only 27% gave correct answers about the risk of obesity on H1N1 flu complications, while scientific findings to date support the conclusion that people who are morbidly obese are at increased risk from complications of 2009 H1N1<sup>[17]</sup>. Obesity is very common in Saudi Arabia with prevalence of 35.6% in both genders. Females are significantly more obese with a prevalence of 44% than males 26.4% ( $p < 0.0001$ )<sup>[18]</sup>. The prevalence of obesity among children in Saudi Arabia aged 1-18 years is 6% in boys and 6.7% in girls<sup>[19]</sup>.

About 86% of the students considered hypertension a risk factor for H1N1 complications. According to CDC all cardiovascular diseases, except isolated hypertension increased the risk for H1N1 flu complications<sup>[20]</sup>.

Less than one third of the students gave correct answers about protectiveness and side effects of H1N1 vaccine, which may reflect the low percentage of parents accepting to vaccinate their children (2.4%). In addition to the extensive mass media propaganda about side effects of the vaccine, and what was reported through the Vaccine Adverse Event



Reporting System like Guillain Barre Syndrome (GBS). Approximately 80% of GBS patients have a complete recovery within a few months to a year; about 5-10% recover with severe disability and death rate among this disorder is about 2-3% even in the best intensive care units. On the other hand, getting infected by the flu increases the risk of developing GBS to a much higher level (approx. 10 times higher by recent estimates) and, all in all, the flu vaccination contributes protection against the risk of GBS<sup>[21,22]</sup>.

While CDC guidance was to encourage all children and staff to receive the 2009 H1N1 flu vaccination against the flu. The best way to protect against the flu – seasonal and 2009 H1N1 – is to get vaccinated. The five primary target groups for vaccination against 2009 H1N1 flu include pregnant women, people who live with or care for children younger than 6 months of age, healthcare and emergency medical services personnel, people age 6 months through 24 years, and people age 25 through 64 years who have underlying medical conditions that put them at higher risk for flu complications. Due to the increased vaccine availability, everyone, including those over age 65 years, can be vaccinated<sup>[23]</sup>. The vaccine against the 2009 H1N1 virus is made using the same processes, and facilities that are used to make the currently licensed seasonal influenza vaccine<sup>[24]</sup>. The Saudi MOH provided the Pandemrix vaccine on 10<sup>th</sup> of January 2010 for vaccination of school children against H1N1. Pandemrix is a multidose vaccine including thiomersal preservative and includes adjuvant, while in USA they used single non-adjuvantated vaccine<sup>[25]</sup>.

The present study revealed that primary schools students had fair or good knowledge about H1N1 in Dammam and Khobar, which resulted in low percentage of suspected and confirmed cases (0.7% and 0.1% respectively), in spite of low vaccination coverage.

### **Conclusion**

About 74% of the students attended health education sessions on H1N1 in their primary schools. Accordingly, 62% of the primary school students had good or fair knowledge about H1N1, with better knowledge score in Khobar than in Dammam schools. This was reflected on the low percentage of suspected and confirmed H1N1 cases (0.7% and 0.1%

respectively), despite the low vaccination coverage (2.4%) by H1N1 vaccine in the studied schools.

## Recommendations

### *In Case of a New Flu Epidemic:*

- To increase Health Education sessions in schools concentrating on the students misconceptions
- To focus on vaccination of High Risk students only (DM, BA, Morbid Obesity, Cardiac patients and SCA) in order to reduce side effects of the vaccine and minimize its cost, as other preventive measures appear to be adequate for healthy students.

## References

- [1] **United States Centers for Disease Control and Prevention.** Novel H1N1 flu facts and figures. 5 April 2009. <<http://www.cdc.gov/h1n1flu/surveillanceqa.htm>>
- [2] Saudi Ministry of Education. *AH1N1* خطة وزارة التربية والتعليم للتوعية بوباء *AH1N1* للعام الدراسي 1430 / 1431 هـ، 5 Jun 2009. [http://www.moe.gov.sa/h1n1\\_2/](http://www.moe.gov.sa/h1n1_2/) [Arabic]
- [3] **WHO.** Weekly epidemiological record, No. 34, 21 Aug. 2009. <<http://www.who.int/wer/2009/wer8434.pdf>>
- [4] **WHO.** Reducing transmission of pandemic (H1N1) 2009 in school settings. A framework for national and local planning and response. 1 Sep. 2009. <[http://www.who.int/entity/csr/resources/publications/reducing\\_transmission\\_H1N1\\_2009.pdf](http://www.who.int/entity/csr/resources/publications/reducing_transmission_H1N1_2009.pdf)>
- [5] **United States Centers for Disease Control and Prevention.** Preparing for the Flu: A Communication Toolkit for Schools (Grades K-12). 5 Dec. 2009. <<http://www.cdc.gov/h1n1flu/schools/toolkit/pdf/schoolflutoolkit.pdf>>
- [6] **United States Centers for Disease Control and Prevention.** Interim guidance on antiviral recommendations for patients with novel influenza A (H1N1) virus infection and their close contacts. 7 May 2009. <<http://www.cdc.gov/h1n1flu/recommendations.htm>>
- [7] **United States Centers for Disease Control and Prevention.** Interim guidance for clinicians on identifying and caring for patients with swine-origin influenza A (H1N1) virus infection. 5 May 2009. <<http://www.cdc.gov/swineflu/identifyingpatients.htm>>
- [8] **United States Centers for Disease Control and Prevention.** Interim guidance for clinicians on the prevention and treatment of swine-origin influenza virus infection in young children. 29 April 2009. <<http://www.cdc.gov/swineflu/childrentreatment.htm>>
- [9] **Al-Khuwaitir TS, Al-Abdulkarim AS, Abba AA, Yousef AM, El-Din MA, Rahman KT, Ali MA, Mohamed ME, Arnous NE.** H1N1 influenza A. Preliminary evaluation in hospitalized patients in a secondary care facility in Saudi Arabia. *Saudi Med J* 2009; **30**(12): 1532-1536.
- [10] **United States Centers for Disease Control and Prevention.** H1N1 diagnostic test. 5 Aug 2009. <[http://www.cdc.gov/h1n1flu/guidance/diagnostic\\_tests.htm](http://www.cdc.gov/h1n1flu/guidance/diagnostic_tests.htm)>

- [11] **WHO.** Human infection with pandemic A (H1N1) 2009 influenza virus: clinical observations in hospitalized patients, Americas. *Weekly Epidemiological Record* 1 July 2009. <<http://www.who.int/wer/2009/wer8430/en/index.html>. Accessed August 11, 2009>
- [12] **BinSaeed, AA.** Characteristics of pandemic influenza A (H1N1) infection in patients presenting to a university hospital in Riyadh, Saudi Arabia. *Ann Saudi Med* 2010; **30**(1): 59-62.
- [13] **Al-Frayh AR, Hasnain SM.** Prevalence of bronchial asthma in children in Saudi Arabia. *WAO J* 2007; S167-S168.
- [14] **Al-Nozha MM, Al-Maatouq MA, Al-Mazrou YY, Al-Harathi SS, Arafah MR, Khalil MZ, Khan NB, Al-Khadra A, Al-Marzouki K, Nouh MS, Abdullah M, Attas O, Al-Shahid MS, Al-Mobeireek A.** *Diabetes mellitus* in Saudi Arabia. *Saudi Med J* 2004; **25**(11): 1603-1610.
- [15] **Al-Mendalawi MD, Al-Herbish A.** Prevalence of type 1 *diabetes mellitus* in Saudi Arabian children and adolescents. *Saudi Med J* 2009; **30**(2): 310
- [16] **Al-Mendalawi MD.** The prevalence of sickle cell disease in Saudi children and adolescents. A community-based survey. *Saudi Med J* 2009; **30**(3): 452.
- [17] **United States Centers for Disease Control and Prevention.** Morbid Obesity as a Risk Factor for Hospitalization and Death due to 2009 H1N1. <[http://www.cdc.gov/h1n1flu/in\\_the\\_news/obesity\\_qa.htm](http://www.cdc.gov/h1n1flu/in_the_news/obesity_qa.htm)>
- [18] **Al-Nozha MM, Al-Mazrou YY, Al-Maatouq MA, Arafah MR, Khalil MZ, Khan NB, Al-Marzouki K, Abdullah MA, Al-Khadra AH, Al-Harathi SS, Al-Shahid MS, Al-Mobeireek A, Nouh MS.** Obesity in Saudi Arabia. *Saudi Med J* 2005; **26**(5): 824-829.
- [19] **El-Hazmi MA, Warsy AS.** The prevalence of obesity and overweight in 1-18-year-old Saudi children. *Ann Saudi Med* 2002; **22**(5-6): 303-307.
- [20] **United States Centers for Disease Control and Prevention.** Deaths Related to 2009 Pandemic Influenza A (H1N1) Among American Indian/Alaska Natives---12 States, 2009. 10 June 2010. <<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5848a1.htm>>.
- [21] **Stowe J, Andrews N, Wise L, Miller E.** Investigation of the temporal association of Guillain-Barré syndrome with influenza vaccine and influenza-like illness using the United Kingdom General Practice Research Database. *Am J Epidemiol* 2009; **169**(3): 382-388.
- [22] **Sivadon-Tardy V, Orlikowski D, Porcher R, Sharshar T, Durand MC, Enouf V, Rozenberg F, Caudie C, Annane D, van der Werf S, Lebon P, Raphaël JC, Gaillard JL, Gault E.** Guillain-Barré syndrome and influenza virus infection. *Clin Infect Dis* 2009; **48**(1): 48-56.
- [23] **United States Centers for Disease Control and Prevention.** H1N1 flu vaccine. 10 Jun 2010. <<http://www.cdc.gov/h1n1flu/vaccination>>.
- [24] **United States Centers for Disease Control and Prevention.** Vaccines for the 2009-2010 Influenza Season vaccines. 10 Jun 2009. <[http://www.cdc.gov/h1n1flu/vaccination/public/vaccination\\_qa\\_pub.htm](http://www.cdc.gov/h1n1flu/vaccination/public/vaccination_qa_pub.htm)>
- [25] **Saudi Ministry of Health.** H1N1 vaccine in Saudi Arabia. 12 Jun 2010. <<http://www.moh.gov.sa/swineflue/index.php>>.

## معلومات طالبات المدارس الابتدائية عن جائحة إنفلونزا الخنازير بالمملكة العربية السعودية

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الدمام - المملكة العربية السعودية

المستخلص. أظهرت المعاناة التي واجهتها كثير من الدول نتيجة جائحة إنفلونزا الخنازير للعام ٢٠٠٩م أهمية دور المدارس في زيادة انتقال العدوى داخل المدرسة، ومن المدرسة إلى المجتمع. الهدف من الدراسة تقييم معلومات طالبات المرحلة الابتدائية عن إنفلونزا الخنازير واستعراض سجلات العيادة المدرسية لرصد الحالات المشتبهة والمؤكدة لإنفلونزا الخنازير، ونسبة التغطية بالتحصين. الفئة المستهدفة هم طالبات المرحلة الابتدائية في مدارس مدينتي الدمام والخبر (٤٦,٨٨٤ طالبة). العينة المأخوذة ٥٠٠ طالبة مرحلة ابتدائية، واختيرت العينة عن طريق عينات عشوائية طبقية متعددة المراحل مع مراعاة النسبة والتناسب في أخذ العينة من المدارس الابتدائية الخاصة والحكومية في الدمام والخبر لتقييم معلوماتهم عن إنفلونزا الخنازير ومراجعة سجلات العيادة المدرسية. أظهرت نتائج الدراسة أن معلومات طالبات المرحلة الابتدائية عن إنفلونزا الخنازير كانت بشكل عام جيدة عند ٦٢٪ من الطالبات. على أنه هناك بعض العجز في المعلومات التي تخص أعراض الإنفلونزا، التطعيم الخاص بإنفلونزا الخنازير، العلاج وطرق الوقاية من الإصابة بإنفلونزا الخنازير. نسبة حالات إنفلونزا الخنازير المشتبهة والمؤكدة والمسجلة في سجلات العيادة المدرسية كانت منخفضة (٠,٧ و ٠,١ ٪ على

التوالي) و نسبة التغطية بتحصين إنفلونزا الخنازير وجدت أيضًا منخفضة (4.2%) في المدارس تحت الدراسة.

الخلاصة: حوالي 62% من طالبات المدارس الابتدائية كانت معلوماتهم جيدة عن إنفلونزا الخنازير.