Adra S, Taha F, Raza H, Bilalaga SJ, Al Moukdad AM, Mahfouz M, Zibdeh AB, Barqawi HJ, Gharbieh EA. Bridging the gap: understanding vaccination awareness and attitudes in healthcare students of the United Arab Emirates. Pharmacy Practice. 2024 Oct-Dec;22(4):3056. https://doi.org/10.18549/PharmPract.2024.4.3056

Original Research

Bridging the gap: understanding vaccination awareness and attitudes in healthcare students of the United Arab Emirates

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Received (first version): 08-Oct-2023 Accepted: 17-Nov-2023 Published online: 10-Jul-2024

Abstract

Background: Healthcare students (HCS) are at an elevated risk of infection and potential sources of infection for patients. This study focuses on HCSs in the United Arab Emirates (UAE) regarding their vaccination status, awareness, and attitudes. The lack of standardized vaccination policies among UAE medical universities and the recent global emphasis on HCSs' vaccination highlight the importance of this research. **Methods:** A cross-sectional, self-administered questionnaire, targeting current healthcare students in the UAE was conducted. A minimum sample size of 400 was calculated, and data were collected between March and May 2023. Statistical analysis including descriptive and inferential statistics were conducted. **Results:** Most of the participants received their childhood vaccination and some adult vaccines. Despite 97.3% claiming awareness of the importance of HCSs' vaccination, the average knowledge score was 8.5 ± 1.8 (score ranged from 0 to 13). Medical students had slightly lower knowledge scores compared to other healthcare majors. 75.9% received information on the required vaccinations before clinical training. There was a significant relationship between receiving information and awareness of the need for specific vaccinations ($p<0.001$). 56.0% checked their titres prior to clinical training, mainly due to training requirements (51.8%). Barriers to vaccination included vaccine availability and low perceived risk. **Conclusion:** This study underscores the gap between healthcare students' perceived and actual knowledge of the required vaccinations; highlighting the need for educational initiatives and clear vaccination information. Healthcare educational institutes play a crucial role in ensuring vaccination knowledge and practices of their students meet the recommended standards.

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INTRODUCTION

Healthcare professionals (HCPs) is an umbrella term that covers not only physicians, nurses, dentists, pharmacists, physiotherapists, and imaging/laboratory technicians, but also healthcare students (HCSs) partaking in clinical training. When compared to the general population, HCPs are at a higher risk of infection and are a possible source of infection for their patients.[1,2]and of transmitting these to their patients and colleagues. Medical students constitute an important, yet neglected, group within HCW because of their contact with patients in the course of compulsory or voluntary practical training courses at health care institutions. The aim of this study was to determine the current vaccination status of medical students at the Medical University of Vienna and assess their attitudes towards occupationally indicated mandatory vaccinations for doctors and other HCW. Nearly 80% of the students considered mandatory vaccinations for doctors an appropriate measure and 88% would recommend them in settings involving immunocompromised patients. The acceptance of mandatory immunisation differs very markedly for individual vaccinations; it ranges from 82.8% for hepatitis B to 40% for influenza. The self-reported vaccination status among medical students was 90.1%, 89.9%, 88.1% and 84.4% for hepatitis B, tetanus, polio and hepatitis A, respectively. Inadequately low rates of 78%, 70.5% and 70.5%, and 28.7% were reported for MMR, varicella, pertussis and influenza (2014/15 season Multiple studies reporting on hospital-acquired infections found that HCPs, as well as HCSs, were a key vector for a wide spectrum of infections ranging from the common flu to Tuberculosis.[1–3]and of transmitting these to their patients and colleagues. Medical students constitute an

www.pharmacypractice.org (eISSN: 1886-3655 ISSN: 1885-642X)

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The healthcare system in the United Arab Emirates (UAE) is overseen by three main health authorities: Dubai Health Authority (DHA) for Dubai, Department of Health (DOH) for Abu Dhabi, and Emirates Health Services (EHS) for Sharjah and the Northern Emirates. Each authority has their guidelines governing the vaccination status of HCPs. In addition, the healthcare sector includes both governmental and private hospitals/clinics which differ in their set standards. Furthermore, the lack of standardised student vaccination policy among UAE medical universities results in variation in students' vaccination status prior to their clinical training commencement. Due to the lack of literature in the UAE regarding the vaccination status amongst HCSs, this study is vital in shedding light on the vaccination status, perception, attitude, and awareness among HCSs.

The World Health Organization (WHO) recently published a report that recommends vaccination against COVID-19, varicella zoster, influenza, hepatitis B, measles, mumps, and rubella, tetanus, diphtheria, pertussis for HCPs and HCSs alike.[4] The meningococcal vaccine is especially vital for HCPs at an elevated risk of exposure, particularly those working in the intensive care unit, or lab workers testing for Neisseria meningitidis. The WHO recognizes that HCSs must be included when implementing vaccination protocols for healthcare facilities; hence, if the UAE adopts this practice, it would be for the beneficial for the healthcare community. The Centers for Disease Control and Prevention (CDC) on Immunization of Health-Care Personnel emphasized that clinical-year students should be prioritized, and thus required to meet the same vaccination standards as other HCPs before their training begin.[5] Additionally, the Australian Immunisation Handbook mandates that all healthcare staff including students in direct contact with patients should receive all the recommended vaccines.[6]

In the UAE, each health authority has specific vaccination recommendation for HCPs; these regulations should also apply in equal measure to medical student. The objectives of this study are to determine the knowledge, and awareness of HCSs in the UAE on the ramifications of being unvaccinated and attitudes towards vaccination.

METHODOLOGY

Study design and target population

A cross-sectional study was conducted to assess the knowledge of HCSs in the UAE regarding their vaccination status as well as their attitudes, and practices towards vaccination. The inclusion criteria for this study were current students in a UAE university, enrolled in a healthcare major college, and currently undergoing clinical training. The healthcare majors involved in the study include Medicine, Dental Medicine, Nursing, Pharmacy/PharmD, and Health Sciences (which include Medical Diagnostic Imaging, Nutrition, Physiotherapy and Healthcare Management). Those who did not speak English or are not currently in the clinical phase of their respective education were excluded from the study. A random sampling technique was utilised to recruit healthcare students from the eight major universities between March and May 2023.

Questionnaire development

A self-administered questionnaire was created after reviewing the literature and multiple international studies[7–10]which leads to a number of vaccines being routinely recommended for health care staff. Medical students are also prone to such hazards. This study accesses undergraduate medicine students' compliance to recommended health-staff vaccination, and their reasons for noncompliance.\nMethod\nAn online questionnaire was sent to all undergraduates in a major public medical school in Brazil, asking about vaccination status to Hepatitis B, Measle-mumps-rubella, Varicella, Pertussis and Influenza, and reasons in case of noncompliance\nResults\n146 students answered the questionnaire, (response rate 14,6%. The questionnaire was developed in English and consisted of 23 questions divided into four sections dealing with: demographics (10 questions), knowledge (5 questions), attitudes (3 questions) and practices (5 questions). These sections used a combination of different question designs such as 5-item Likert scales and multiple-choice. Before proceeding with data collection, standardisation sessions were held, through which the researchers agreed on a consistent and uniform method of data collection.

Prior to the commencement of the survey, a pilot of the questionnaire was conducted on 18 randomly selected HCSs. This served the purpose of cognitive testing of the questionnaire, to enhance the clarity of the questions by identifying any vague or confusing phrases and wordings. Furthermore, the questionnaire underwent scrutiny by a panel

of experts to ensure its content, reliability, and face validity. Subsequent to receiving feedback from both the pilot study and the experts, the questionnaire was modified and edited by the authors to minimize ambiguity. Importantly, the data gathered from the pilot study was not included in the data analysis. The study was approved by the Research Ethics Committee of the University of Sharjah (REC-22-12-22).

Data collection and sample size

During data collection, participants were given a brief introduction of the aims and objectives of the study in the information sheet and the questionnaire was completed online using a link that was shared through various social media methods such as WhatsApp and Email.

A minimum sample size of 400 was calculated using the following formula: where n = sample size, p = expected prevalence (50%), and SE = sampling error (5%). However, the minimum sample size was increased by 20% to take into consideration possible missing/corrupted data and to increase the power of the study. A total of 1036 questionnaires were collected, out of which 126 were discarded as they did not meet the inclusion criteria. In total, 910 questionnaires were completed and analysed. Participants' confidentiality and anonymity were ensured throughout the research process, by not collecting any identifying personal information, such as name, and contact details.

Statistical Analysis

The data was exported from Google Forms and imported into Microsoft Excel for data cleaning and pre-processing. Data was then imported into IBM SPSS Statistics for Windows, Version 26.0 (IBMCorp., Armonk, NY, USA) and checked for any errors or duplicates.

A knowledge score was then calculated by awarding a point for every correct answer; no points were awarded for incorrect or missing answers. All the points were added to calculate the knowledge score.

Five-item Likert scales were awarded points as follows:

- 2 points were awarded to those who strongly agreed with a correct statement or strongly disagreed with an incorrect statement.
- 1 point was awarded to those who agreed with a correct statement or disagreed with an incorrect statement.
- 0 points were awarded to those who were neutral.
- -1 point was awarded to those who agreed with an incorrect statement or disagreed with a correct statement.
- -2 points were awarded to those who strongly agreed with an incorrect statement or strongly disagreed with a correct statement.
- A total attitudes score was then calculated for each participant.

In the univariate analysis, the normality of the continuous outcomes was assessed using both Q–Q plots and the Kolmogorov–Smirnov test. All reported percentages were calculated by excluding missing values (valid percentages). Various factors such as demographic variables, perceived knowledge, and source of information were assessed as potential predictors for the outcomes. Bivariate analyses were performed to identify significant predictors. For non-continuous outcomes, the Chi-square test was utilised, while for continuous outcomes, as the parametric assumptions were met, analysis of variance and Student t-test were employed. The threshold for significance was set at a P-value < 0.05.

RESULTS

Females made up most of the participants (70.7%, n=554), 57.9% (n=454) were Arabs, and more than half were University of Sharjah students (55.9%, n=438). The mean age of participants was 22.6 ± 1.5 years. As for the field of study, 58.2% (n=456) were medical students. Further demographic details are shown in Table 1.

Table 1. Demographics of the study's participants

Variable	Frequency (n)	Percentage (%)
Gender		
Female	230	29.3
Male	554	70.7
Age		
<25 years	84	20.1
25-35 years	151	36.2
36-45 years	87	20.9
>45 years	95	22.8
Nationality		
UAE national	172	21.9
Arab Expat	454	57.9
Non-Arab	158	20.2
University		
UOS	438	55.9
RAK	60	7.7
DMC	64	8.2
MBRU	53	6.8
Ajman Uni	59	7.5
UAEU	23	2.9
GMU	84	10.7
DPC	3	0.4
Major		
Medicine	456	58.2
Dentistry	158	20.2
Nursing	55	7
Health Sciences	68	8.7
Pharmacy	47	6

Current Year of Study		
Year 1	3	0.4
Year 2	16	2
Year 3	39	5
Year 4	279	35.6
Year 5	205	26.1
Year 6	93	11.9
Intern	149	19

Only 1.8% (n=14) have not received their childhood vaccination. When asked where the participants received their childhood vaccination, 62.4% (n=489) identified the UAE, while 78.3% (n=614) claimed to have a record of those vaccines. On the other hand, 3.8% (n=30) did not received any adult vaccination, 91.1% (n=714) received their adult vaccinations in the UAE, and 82.4% (n=646) have a record of it.

Additionally, 75.9% (n=595) of participants received information from their university/hospital regarding the required vaccination prior to the commencement of clinical training. The most common method of relaying this information was via emails (24.1%, n=189) and lectures (26.9%, n=211). While the majority (97.3%, n=763) indicated that they are aware of the importance of HCPs' vaccination, the mean knowledge score was 8.5 ± 1.8 (score ranged from 0 to 13). Interestingly, the knowledge score of medical students was 8.22 ± 1.6, while other students scored 8.96 ± 1.9 (p<0.001). Of the participants, 93.9% (n=736) correctly identified that students should take the COVID-19 vaccine prior to clinical training, and only 64.0% (n=502) indicated that influenza vaccine should also be taken. There was a significant association (p=0.005) between receiving information prior to clinical training and knowing that influenza vaccination is mandatory before clinical training. Similarly, a significant relationship was found (p<0.001) between receiving information and awareness of the need for vaccinations against DPT, Polio, MMR, and Varicella Zoster. Students who received information were 4.77 (95% CI: 2.82-8.06) times more likely to know the necessity of the Hepatitis B vaccine.

Regarding vaccine uptake being mandatory requirement for hospital training, a significant difference was found across different majors (p<0.001). Medical students were more likely to adhere to the recommended vaccinations compared to students from other majors. The study also revealed a significant relationship (p=0.015) between the major studied and the reason for receiving vaccination, particularly wanting to protect the community. Medical students were 1.42 (95% CI: 1.07-1.89) times more likely to take vaccines to protect those around them.

Additionally, a significant difference between medical students and other majors concerning vaccination against influenza, meningococcal, PCV, DPT, OPV/IPV, Haemophilus influenza type A, MMR, rotavirus, HPV, and TB (p<0.001 for most). Females were 2.41 times more likely to be vaccinated against HPV compared to males (95% CI: 1.65-3.52). Further details are highlighted in Table 2.

Table 2. Students' knowledge regarding vaccines to be taken prior to clinical training across different demographics

	Gender			**Nationality**				**Received information regarding vaccinations prior to clinical training?**			**Major**						
	Male	Female	p-value	Emirati	Arab	Non-Arab	p-value	Yes	No	p-value	Medicine	Dentistry	Nursing	Health Sciences	Pharmacy	p-value
COVID-19	214	522	0.530	166	420	150	0.145	558	178	0.842	430	144	54	61	47	0.059
Hepatitis A	151	340	0.259	105	278	108	0.250	364	127	0.136	297	97	32	38	27	0.455
Hepatitis B	212	508	0.824	156	421	143	0.561	567	153	**<0.001**	417	152	51	56	44	**0.014**
Influenza	132	370	**0.013**	121	276	105	0.066	365	137	**0.005**	328	58	45	38	33	**<0.001**
Meningococcal	151	376	0.547	119	314	94	0.069	396	131	0.482	258	135	40	56	38	**<0.001**
Pneumococcal	144	338	0.676	104	289	89	0.252	355	127	0.064	244	122	36	50	30	**<0.001**
Polio	122	297	0.885	82	270	67	**<0.001**	289	130	**<0.001**	257	81	30	37	14	**0.014**
DPT	150	341	0.334	118	251	122	**<0.001**	401	90	**<0.001**	287	93	35	35	41	**0.002**
MMR	145	350	0.972	115	268	112	**0.015**	411	84	**<0.001**	270	103	39	42	41	**0.002**
Varicella Zoster	142	337	0.812	112	256	111	**0.004**	392	87	**<0.001**	261	98	36	42	42	**0.001**
Rotavirus	137	346	0.449	81	300	102	**<0.001**	340	143	**<0.001**	272	108	36	53	14	**<0.001**
HPV	168	389	0.427	123	320	114	0.913	418	139	0.385	321	110	41	52	33	0.815
BCG	156	372	0.854	124	281	123	**<0.001**	432	96	**<0.001**	308	98	43	39	40	**0.005**

Interestingly, only 56.0% (n=439) checked their titres prior to commencing clinical training. The most common reason for checking the titres, as indicated by the participants, was it being a requirement prior to clinical training (51.8%, n=406), followed by checking the level for their own safety (9.3%, n=73).

Furthermore, the most identified barrier to vaccination were the availability of the vaccine (6.6%, n=52) and thinking that they are not at risk (5.5%, n=43). The mean attitudes score was 8.3 ± 4.1 (score ranged from -16 to 16). In our study there was a significant difference in the attitudes of the participants per their nationality (p=0.027), the mean attitudes score of Emirati, Arabs, and non-Arabs were 8.7 ± 3.9, 8.0 ± 4.0, 8.9 ± 4.3, respectively. Post Hoc analysis showed that non-Arabs had on average 0.88 points more than Arabs (p=0.047). Finally, when comparing the attitudes of the participants across the different majors, a significant difference was found (p<0.001). Post Hoc analysis showed that Health Sciences participants had worse attitudes than those studying in other colleges. Surprisingly, there was no significant difference in the attitudes of between the attitudes of medical students and those in dental medicine, nursing and pharmacy.

DISCUSSION

To our knowledge this is the first study in the UAE that evaluates HCSs' knowledge and perceptions regarding vaccination. Despite only less than two percent of the participants not receiving their childhood vaccine, about a quarter did not have a record of their prior vaccinations. This contrasts with a Mexican study where about ten percent of the participants knew their vaccination status and had a record of it.[11]824 medical students responded the survey. One thousand ninety (59.8% Additionally, the relatively high childhood vaccination rate of students in the UAE is partially due to the mandated proof of vaccination on admission to school and universities. A study at a medical school in Brazil concluded that 74.7% of the medical students had incomplete vaccination.[7]which leads to a number of vaccines being routinely recommended for health care staff. Medical students are also prone to such hazards. This study accesses undergraduate medicine students' compliance to recommended health-staff vaccination, and their reasons for noncompliance.\nMethod\nAn online questionnaire was sent to all undergraduates in a major public medical school in Brazil, asking about vaccination status to Hepatitis B, Measle-mumps-rubella, Varicella, Pertussis and Influenza, and reasons in case of noncompliance\nResults\n146 students answered the questionnaire, (response rate 14,6% Similarly, a French study conducted among HCSs found that only 53.9% were completely vaccinated after excluding the Human Papillomavirus (HPV) vaccine.[12]attitudes and beliefs is necessary to provide an adequate vaccination education to better equip them to promote vaccination in their future careers. The aim of this study was to assess vaccination perception (VP These studies highlight a subpar reinforcement of vaccination policies towards healthcare students.

In our study less than four percent of participants have not received any adult vaccination; the high rate of adult vaccination is in part due to the COVID-19 vaccination campaigns which served not only to vaccinate the UAE community against COVID-19 but also reinvigorate the need for adult vaccinations and their beneficence. This trend of renewed and increased interest in adult vaccination was also observed in multiple countries across a wide geographical area. Both the UK and Australia reported a rise in the demand for the flu vaccine in the wake of the COVID-19 pandemic.[13,14]

Our study uncovers profound disparity between the expected and observed knowledge among the participants. Despite most of the participants claiming to be aware of the importance of HCP vaccination, the low mean knowledge score is reflective of a falsely elevated knowledge perception. Additionally, medical students had a lower mean knowledge score when compared to those from other health-related colleges. This gap in the knowledge of the participants is exemplified in their relative lack of awareness for the need to take the influenza vaccine prior to clinical training, when compared to the COVID-19 vaccine. As such, it is important to educate the students regarding the importance of vaccination and the CDC's vaccination recommendations for HCS vaccination. This knowledge gap should be addressed at multiple levels (college, university, health authority levels) to ensure a greater adherence to the recommendations and address possible underlying vaccination hesitancy. This is further highlighted in our study by the significant association between receiving information regarding vaccination prior to clinical training and the participants awareness of the recommendation of multiple vaccines (i.e., influenza, DPT, and Varicella Zoster); highlighting the importance of raising awareness among the students and the effectiveness of those campaigns.

One of the pivotal aspects of this study was to explore the students' attitudes toward vaccination; a crucial driver for vaccination and one that can significantly impact public health outcomes. Interestingly, there was a significant variation in the participants' attitudes based on nationality and major. Arab students and those from the Health Science colleges exhibited fewer positive attitudes toward vaccination compared to other participants. Highlighting this disparity is essential to steer focused educational efforts and awareness campaigns that emphasize the significance of vaccination and precautions before commencing clinical training. Additionally, the significantly worse attitudes displayed by the Health Sciences' participants could be due to lack of awareness of the current guidelines and unfamiliarity with the importance of HCS vaccination. Boosting the level of knowledge of HCS regarding vaccination would not only increase their adherence, but also rise the public's vaccination rate. Likewise, nonadherence to vaccination guidelines among HCS would mean a lesser chance of counselling the patients they see during their clinical training vaccination uptake.

Moreover, the substantial impact of the participants' attitudes toward vaccination was evident in the gender-based variation in vaccine uptake, with females being notably more likely to receive the HPV vaccine. This discrepancy could be attributed to differing perceptions of the vaccine's relevance and necessity.

Unpacking these gender-related factors could inform targeted interventions to enhance vaccine uptake among specific demographic groups.

Limitations

Convenience sampling was used to acquire participants for this study, potentially introducing bias and impacting the generalizability of the results. Furthermore, there was no stratification for the different universities in the UAE or the colleges in each university. Approximately half of the participants were from the University of Sharjah, which might further affect generalizability. Exploring the differences in students' knowledge across the various universities they attend is an interesting area to be explored in future research. Additionally, the study did not investigate the socio-economic status or health insurance status of the participants; factors that may influence their perceptions regarding the importance of adult vaccines and the significance of checking their antibody titres prior to clinical training.

CONCLUSION

This study explores vaccination knowledge, attitudes, and practices among UAE healthcare students, revealing a notable gap between their perceived and actual understanding of the required vaccination. Educational initiatives are crucial to bridge this knowledge gap and underscore the importance of recommended vaccines. Disparities in attitudes across demographics emphasize the need for tailored interventions to dispel misconceptions and enhance public health responsibility. Educational institutions play a pivotal role in providing clear vaccination information before clinical training, ensuring best practices and safety.

ETHICS STATEMENT

The study was approved by the Research Ethics Committee of the University of Sharjah (REC-22-12-22). Information sheet was provided to the participants that stated that completion of the questionnaire indicates agreement to join the study. No names or signatures were collected to ensure the anonymity of the participants.

FUNDING

This research was conducted without any external funding.

CONFLICTS OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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www.pharmacypractice.org (eISSN: 1886-3655 ISSN: 1885-642X)