ABSTRACT

Background: Immunization has been one of the most successful public health measures ever undertaken. However, a degree of hesitancy about vaccine use still exists. Healthcare professionals are in a unique position to provide advice and education to the public and may influence the decision to undergo immunization. Objective: The aim of this study was to explore perceptions and beliefs regarding immunizations and immunization-preventable diseases. Methods: A descriptive cross-sectional study was undertaken at the Imam Abdulrahman bin Faisal University, located in Dammam, Saudi Arabia. In the Kingdom of Saudi Arabia, a survey of 564 Saudi undergraduate healthcare students was conducted. 77.8% of participants replied (439). Information was collected regarding perceptions of; severity of immunization-preventable diseases, contracting these diseases, immunization safety, and immunization beliefs. The statistical analysis was performed using the Statistical Package for the Social Sciences (IBM SPSS v25). Non-parametric analyses were utilized. Descriptive data were generated as appropriate, including frequencies, median, and inter-quartile range. Statistical relationships of demographic variables were explored using Kruskal Wallis H-Test and Spearman’s Rank-Order Correlation. A p-value < 0.05 was considered statistically significant. Results: Meningitis was perceived as the most severe disease and COVID-19 as having the highest likelihood of infection. Concern regarding vaccine side effects was most evident for the COVID-19 vaccine. Student year level and profession resulted in statistically significant differences for all three assessed perceptions. Substantial differences were also identified regarding views on immunization belief statements. Conclusion: This study identified considerable heterogeneity in Saudi healthcare students’ perceptions and beliefs regarding immunization-preventable diseases and vaccination. Further education is required to produce well-informed and confident healthcare professionals around these issues.

Keywords: Beliefs, Healthcare Students, Immunizations, Perceptions.
edge about vaccines (7). Also, there are reports that the populations of healthcare workers often display vaccine hesitancy and are under-immunized (8). Therefore, it provides the possibility of infection and transmission to others. In contrast, HCPs who regard vaccines as safe and beneficial are more likely to get vaccinated and recommend them to their patients (9).

The Health Belief Model (HBM) has been widely used to explore health-related behavior (10, 11). It has previously been used in vaccination studies to examine beliefs, perceptions, and behaviors related to disease and vaccination (12). Where the decision to vaccinate was considered a function of an individual’s perceptions of their disease susceptibility, disease severity, vaccine benefits, barriers to vaccine use, and environmental cues such as HCP information (13).

The present study was informed by the HBM and a recent study involving nursing students (14). This study will allow the research team to gain insight into students’ vaccination perceptions and beliefs, as well as inform future curriculum development in the field of immunization public health in Saudi Arabia.

2. OBJECTIVE

We aimed, in this study, to explore perceptions and beliefs regarding immunizations and immunization-preventable diseases. This study aims to address the following research questions: a) What are undergraduate healthcare students’ perceptions and beliefs about immunizations and immunization-preventable diseases? and b) How do perceptions and beliefs about immunizations and immunization-preventable diseases differ between healthcare students?

3. MATERIAL AND METHODS

Study design, setting and sample

A descriptive cross-sectional study was undertaken at the Imam Abdulrahman bin Faisal University, located in Dammam, Saudi Arabia. From October 2020 to April 2021, the study was carried out. For this study, a convenience sample of Saudi undergraduate healthcare students was conducted. The requirement for inclusion was that the undergraduate nursing, medicine, and paramedicine students enrolled in 2020.

Using a sample size calculation (Cohen, 1992). According to power = 0.80, alpha (α) = 0.05, and medium effect size = 0.25, 100 participants were needed. The use of oversampling was made to decrease the dropout rate 15.

Instruments

The questionnaire was written in English, the primary teaching language at the institution. The first section of the questionnaire gathered socio-demographic data, including the course year, gender, degree program, marital status, health rating, and diagnosis of chronic illness/disease. The second section focussed on 12 infectious diseases where participants were asked about their perceptions (i.e. what was their understanding) of immunization-preventable diseases by rating their level of agreement with the following: severity of immunization-preventable conditions [0 (not at all serious) to 10 (extremely serious)], likelihood of infection of immunization-preventable diseases [0 (not at all likely) to 10 (extremely likely)], and side effects of immunization-preventable diseases [0 (not at all worried) to 10 (extremely worried)]. The third section of the questionnaire gathered data regarding the participants’ beliefs (i.e., what they considered to be true) about immunization. Participants were asked to indicate their agreement level to 16 belief statements, using a 5-point Likert scale with higher scores indicating a higher level of agreement.

The online questionnaire was based on a tool recently utilised with a cohort of nursing students which reported good levels of reliability for the immunization perception components, with Cronbach α of 0.87 (total scale), 0.94 (likelihood of infection), 0.90 (perceived severity), and 0.96 (perceived side effects). Reliability for the immunization beliefs component was lower with a Cronbach α of 0.41 14. The addition of COVID-19 to the list of immunizations/diseases was made for this study to reflect the contemporary health situation. The questionnaire link was sent to representatives from each of the three university programs who then provided the students with either a QR code to the study in person during class or sent them an electronic link to the questionnaire. Questionnaire completion required approximately 10-15 minutes.

Ethical considerations, data collection, and data analysis

Ethical approval was obtained from the Imam Abdulrahman Bin Faisal University Institutional Review Board (IRB-2020-03-398). Written informed consent was obtained from all students after explaining the purpose of the study, that their participation was voluntary and non-participation would not affect their academic achievements, that they had the right to withdraw from the study at any time without obligation, and that all information would remain confidential.

Once the student commenced the questionnaire, the system obliged that all questions were answered, with only fully completed questionnaires accepted. Responses were uploaded into a Google Sheet for data analysis. Data were coded, tabulated, and statistical analysis was performed using the Statistical Package for the Social Sciences (IBM SPSS v25). The research team took a conservative approach to the analysis due to unequal sample sizes. Thus, non-parametric analyses were utilized. Descriptive data were generated as appropriate, including frequencies, median, and inter-quartile range. Statistical relationships of demographic variables were explored using Kruskal Wallis H-Test and Spearman’s Rank-Order Correlation. A p-value < 0.05 was considered statistically significant.

4. RESULTS

General and demographic results

The questionnaire was completed by 439 students (response rate 77.8%). The majority of participants were medicine students, single, had not been diagnosed with a chronic illness, and rated their health as good or very
good (219 (49.9%), 375 (85.4%), 373 (85%), and 410 (93.4%)) respectively, as shown in Table 1.

Reliability statistics for the instrument used in this study, as measured by Cronbach's Alpha, were: 0.96 (total scale); and for the subscales, 0.97 (likelihood of infection), 0.96 (disease severity), 0.97 (immunization side effects), and 0.88 (beliefs).

Students' perceptions of immunizations and immunization-preventable diseases

The median (Mdn) reported perceived severity of the included diseases ranged from 5 (influenza) to 8 (hepatitis B, HPV, meningitis, pneumonia, COVID-19). The lowest median perceived likelihood of infection was 5 for 75% of the included diseases (polio, Hib, hepatitis B, pertussis, measles, varicella, hepatitis A, HPV, meningitis) with the highest level (Mdn=7) reported for COVID-19. Students also indicated they were least concerned about the side effects of the influenza and hepatitis A vaccines (Mdn=3) and most concerned about COVID-19 vaccine side effects (Mdn=6).

The year level in which a student was enrolled resulted in statistically significant differences in perceptions about perceived severity of the following diseases: polio, Haemophilus influenzae type B, pertussis, measles, varicella, influenza, hepatitis A, and meningitis. When considering the perceived likelihood of infection, the health professions being studied produced significantly different results with regards to measles, varicella and hepatitis A. Results for perceived concerns about vaccine side effects were significantly different with regards to year level and health profession for hepatitis A. Gender had no statistically significant effect on any of the three perception measures (see Table 2 for further details).

Overall, medical students had the lowest mean rank scores across the severity, likelihood and side effects measures. Statistical differences overwhelmingly occurred in Year 5 cohort.

Students' beliefs about immunizations

The two statements with the highest level of agreement were: "Immunization requirements protect children from getting diseases from unimmunized children", and "Immunizations strengthen the immune system". Conversely, the two statements demonstrating most disagreement were: “Health care workers should be allowed to work even if unimmunized”, and "Parents should be allowed to send children to school even if unimmunized".

When comparing responses of the three healthcare professional student groups, the statements that produced statistically significant differences were: "Immunizations strengthen the immune system", "Immunizations are getting better & safer all the time, as a result of medical research", "As a student, I have learned enough about immunizations to teach my clients", "Children and adults should only be immunized against serious disease", "I am opposed to immunization requirements because they go against my freedom of choice", "I am opposed to immunization requirements because I know what is best for my family and/or clients", and "I am concerned too many immunizations weaken my clients' immune system". Medicine students were most likely to believe all these statements, except for the latter three, whereas paramedicine students were most likely to accept these as true. Overall, nursing students had the lowest rank scores in the belief measures (See Table 3 for further information).
5. DISCUSSION

This study aimed to examine the perceptions and beliefs of Saudi nursing, medicine, paramedicine students concerning immunization and immunization-preventable diseases, and whether these were associated with the students’ demographics or profession. The healthcare students in this study demonstrated heterogeneity in their perceptions of severity and likelihood of infection of a range of communicable diseases as well as in their concerns about immunization side effects. This diversity was also apparent in their reported beliefs about immunizations. A proportion of these differences were associated with year level and profession. Due to the unequal year-level sample sizes, specifically a small Year 5 sample, we have not made any objective hypotheses on the differences in results between year levels. Additional research will be required to further examine these variations. Overall, our study demonstrated that medical students had the lowest mean rank scores across measures of severity, likelihood and side effects. That is, they reported lower levels of perceived concerns about these factors when compared to nursing and paramedicine. One may speculate that the medical students may have a higher level of infectious disease and immunization knowledge as a consequence of more comprehensive education in this field, leading to lower levels of concern. This is supported by a recent study that demonstrated that medical students received more education and had increased knowledge of immunization-related issues compared with other healthcare students (16). However, additional research would be needed to explore this issue in more detail.

Comparing our results to a study of American nursing students (Wilson et al., 2020) which utilized the same assessment tool (without the inclusion of COVID-19), both studies found the students perceived influenza to be the least severe of the included diseases (14). In addition, the perceived likelihood of infection was lowest for polio in both studies, which is likely to reflect that this disease is no longer endemic in either country involved (17). The present study indicates that the disease which demonstrated the highest perceived level of concern across all three areas (severity and likelihood of infection, immunization side effects) was COVID-19. This is unsurprising considering the study took place during the COVID-19 pandemic in 2020, and when the vaccine was still under development. Previous studies have reported a high perception of risk from COVID-19,
as well as possible side effects of this vaccine (18, 19). Factors that may contribute to this apprehension may involve it being a novel disease with a new vaccine, the expedited development of the vaccine (19, 20).

The least concern for immunization side effects was for influenza and hepatitis A (Mdn 3). The reasons for this lower level of apprehension is unclear but contributing factors may be the long history of the influenza vaccine and, the low level of knowledge of hepatitis A and its vaccine (21, 22). In comparison, a study of American nursing students (Wilson et al., 2020) reported that HPV was the disease with the highest perceived likelihood of infection and the highest concern of side effects of its associated vaccine (14). Although the HPV vaccine was introduced in 2006 in the US, there continues to be a substantial hesitancy to its use, with reasons proposed such as vaccine cost and the perception that it is solely for the prevention of sexually transmitted disease and not additionally associated with cancer prevention (23, 24). Two of the most highly ranked beliefs in the present study "Immunization requirements protect children from getting diseases from unimmunized children", "Immunizations strengthen the immune system", mirrored the top two beliefs in a previous similar study. Additionally, the four beliefs demonstrating most disagreement in the present study also exhibited high levels of disagreement in the previous study (14). These similarities suggest that immunization beliefs may not be country-dependent, however, further research would be required to explore this notion.

Using the framework of the HBM, the perceived threat of a disease and/or its vaccine impacts a healthcare professionals’ decision to seek immunization for themselves or to advise immunization for their patients. Supported by prior studies demonstrating low immunization-related knowledge of healthcare students, many students felt they had not learnt enough about immunization to effectively educate their patients once graduated (16, 25). As a considerable component of the decision to seek immunization is related to advice from a trusted source such as doctors, nurses, or paramedics, healthcare students must be provided with sufficient education to provide factual information to their patients and enable meaningful discussion of any concerns.

Limitations of the study

A possible source of bias in this study is that self-reported data has the potential for social desirability bias. In addition, due to the voluntary nature of participation, the respondents may not have been representative of the entire student population. Also, sampling students from one university may limit the generalizability to other settings.

6. CONCLUSION

The exploration of healthcare students’ perceptions and beliefs regarding immunizations and immunization-preventable diseases suggests that further education is required to produce well-informed and confident healthcare professionals. It is hoped that this study may inform future healthcare curricula on requirements to assist in the development of knowledgeable and competent healthcare professionals in this important public health area.

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- **Ethical approval:** This study was approved by the Institutional Review Board (IRB) of Imam Abdulrahman Bin Faisal University (IRB: 2020-03-398).
- **Author contributions:** TAS conceived and designed the study, conducted research, and provided research materials. RAA analyzed and interpreted data. SAH wrote initial and final draft of article and provide logistic support. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.
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