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Article

Knowledge, perception, and practice of health professions students and academics regarding halal pharmaceuticals: A cross-sectional study

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Abstract: This cross-sectional study examines the knowledge, perception, and practice of health professions students and academics in Jordan concerning halal pharmaceuticals. Health professions students and academics from various universities in Jordan were surveyed using a structured questionnaire. Data analysis included descriptive statistics and inferential tests to identify factors affecting knowledge, perception, and practice. Participants had a high level of awareness regarding general halal and haram concepts, but there was relatively lower awareness of the term "halal pharmaceuticals" and detailed information about non-halal ingredients. Knowledge scores varied between students and academics, with academics scoring higher. Participants exhibited positive perceptions, acknowledging the importance of knowledge about halal pharmaceuticals and patients' rights to inquire about medication sources and ingredients. Concerns were raised about the potential controversy surrounding the topic. This research contributes to understanding the role of halal pharmaceuticals in healthcare, particularly in predominantly Muslim countries. The findings highlight the importance of integrating education on halal pharmaceuticals into healthcare curricula, emphasizing patient-centered care, and addressing cultural and religious sensitivity. There is a need for tailored educational approaches and sensitivity training to bridge the gap between knowledge and practice.

Keywords: halal pharmaceuticals; healthcare education; Islamic beliefs; cultural competence; patient care

1. Introduction

In recent years, the global pharmaceutical industry has seen a remarkable surge in the production and marketing of halal pharmaceuticals (Nor Norazmi and Lim, 2015). This growing field is closely tied to the requirements of Islamic principles and ethics, reflecting a growing awareness among both healthcare professionals and the general public of the significance of religiously compliant pharmaceuticals. The term "halal pharmaceuticals" refers to medications and healthcare products that adhere to the principles of Islamic halal dietary laws, ensuring that their composition and production processes align with the teachings of Islam (Annabi, 2017; Khattab, n.d.; Zunianto, 2023). These products are designed to cater to the needs of Muslim populations who seek medical treatments and products that are not only effective but also conform to their religious beliefs (Afifi, 2014; Attum et al., 2023). The Prophet

Mohammed said: "إِنَّ اللهَ أَنْزَلَ الدَّاءَ وَالدَّوَاءَ وَجَعَلَ لِكُلِّ دَاءٍ دَوَاءً فَتَدَاوَوْا وَلاَ تَدَاوَوْا بِحَرَامٍ" Allah has sent down both the disease and the cure, and He has appointed a cure for every disease, so treat yourselves medically, but use nothing unlawful (Dawud SA, n.d.) and he also said, "إِنَّ اَللَّهَ لَمْ يَجْعَلْ شِفَاءَكُمْ فِيمَا حَرَّمَ عَلَيْكُمْ" "Allah did not make your cure in what He [God] made Haram (unlawful) to you" (Hudud, n.d.).

Halal standards in pharmaceuticals are complex. They involve not only the ingredients but also Halal manufacturing and distribution practices in alignment with Islamic principles. Accordingly, Muslims with expertise in Islamic principles, pharmaceutical regulation, and their Halal financial background were prioritized.

The emergence of halal pharmaceuticals as a distinct sector in the healthcare industry has led to a surge in research and development activities globally. Statistics reveal a significant increase in the production and consumption of halal pharmaceuticals, reflecting the growing market for these products, especially in countries with predominantly Muslim populations (The Economist, 2020). In 2022, the global market for halal pharmaceuticals was estimated at $445.9 million, showcasing the substantial demand for these products. The market is expected to reach USD 913.7 million in 2028 (Business Research Insigts, 2023).

Halal pharmaceuticals, adhering to Islamic principles in their production and ingredients, offer several therapeutic benefits compared to conventional medicines (Herdiana et al., 2024). Foremost among these is their adherence to Islamic dietary laws, making them compliant with religious beliefs. For Muslims, this not only aligns with personal choice but also fulfills a religious obligation (Attum et al., 2024). Additionally, halal medications often boast greater ingredient transparency, ensuring labels accurately reflect contents and reducing concerns over controversial or objectionable ingredients. Rigorous quality control measures, characteristic of halal pharmaceuticals, enhance safety and purity, minimizing the risks of contamination or adulteration. Ethically, they are perceived as more conscientiously produced, especially regarding animal-derived ingredients, appealing to those prioritizing ethical consumption practices (Saha et al., 2019). Moreover, the psychological comfort derived from consuming medications in alignment with one's faith can positively impact well-being, potentially enhancing therapeutic effectiveness through a placebo effect or increased satisfaction with treatment (Rosmarin et al., 2013).

The field of halal pharmaceuticals is not without its challenges and controversies (Nor Norazmi and Lim, 2015). As the demand for these products increases, it is imperative to ensure that healthcare professionals and academics are well-prepared to address the unique ethical, religious, and practical considerations associated with them (Rahman et al., 2023; Sadeeqa et al., 2013a). Prior research in the area of halal pharmaceuticals has illuminated various aspects of this evolving field. Studies have explored the demand for such products among Muslim communities (Norazmi and Lim, 2015), investigated the development and regulation of halal pharmaceuticals (Majdina Nordin and Jasimah Wan Mohamed Radzi, 2021), and assessed the perception and knowledge of healthcare professionals and students regarding these products in diverse contexts (Butler et al., 2018; Eid et al., 2022; Sadeeqa et al., 2015).

In Jordan, the pharmaceutical industry is considered one of the largest sectors in the country, and Jordan is considered one of the most important pharmaceutical manufacturing countries in the MENA region (Al-Shaikh et al., 2011). In spite of the

importance and size of this industry, halal pharmaceuticals are still undiscovered and under-researched. Additionally, although Jordan is a predominantly Muslim country with an expanding healthcare sector and a notable educational network for health professionals, existing research has not provided a comprehensive overview of the current state of knowledge, perception, and practice in this field (Afifi, 2014; Saha et al., 2019).

The primary aim of this study is to assess the knowledge, perception, and practice of health professions students and academics in Jordan concerning halal pharmaceuticals. By better understanding the current state of knowledge, perception, and practice in this emerging field, we aspire to contribute to the ongoing discourse on the role of halal pharmaceuticals in healthcare, both in Jordan and beyond.

2. Materials and methods

2.1. Study design and setting

This study utilized a cross-sectional design using an electronic questionnaire to compare the levels of knowledge, perception, and practice (KPP) regarding halal pharmaceuticals among different health profession students and academics in Jordan.

2.2. Participants

The participants included students studying and academics working at various government and private universities in Jordan. The sample consisted of people from different healthcare fields, including medicine, dentistry, pharmacy, nursing, and allied medical sciences, who were selected through convenience sampling during the period from October to December 2019.

2.3. Inclusion-exclusion criteria

The inclusion and exclusion criteria are summarized in **Table 1**.

Table 1. Inclusion-Exclusion criteria.

Criteria	Inclusion	Exclusion
Status	Undergraduate students or faculty members or academic staff	Non-students or non-affiliated individuals
Field of study	Any health professions fields including medicine, dentistry, pharmacy, nursing, and allied medical sciences	Fields unrelated to health professions
Interest	Interest in halal pharmaceuticals	No interest in halal pharmaceuticals
Other	Willing participant with complete responses	Unwillingness to participate, or incomplete responses

2.4. Data collection methods, instruments used, and measurements assessed

Data collection was conducted using a structured, self-administered questionnaire developed specifically for this study. The questionnaire was divided into several sections, including demographic information (age, gender, professional role, years of experience, etc.) and items related to the knowledge, practice, and perception of health professions students and academics regarding halal pharmaceuticals. The

questionnaire was designed based on a comprehensive review of existing literature and expert consultation to ensure content validity. The valid questionnaire consisted of four sections: 1) socio-demographic section; 2) knowledge section; 3) perception section; and 4) practice section. All questions were closed-ended and answered by multiple choices or using a five-point Likert scale (strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree). The first section aimed to gather general demographic data, including age, gender, nationality, religion, level of education, and years of experience. The second section contains several questions that explore the participants knowledge level and understanding of halal general concepts and halal pharmaceuticals specifically. The third section aimed to assess participants' perceptions toward halal pharmaceuticals by exploring: 1) the importance of being aware of the halal pharmaceutical concept; 2) the importance of being aware of the most commonly used animal-derived drugs and their alternatives, which should be developed and included in the curriculum of pharmacy and medical education; and 3) the need for faculty members in health sciences to be well prepared to teach topics related to halal pharmaceuticals. The fourth section assessed the participants' practices toward halal pharmaceuticals. For students, we asked them if they took or attended any courses, lectures, conferences, or workshops covering the concept of halal pharmaceuticals through their studies at the university. While for academics, if they were usually educating the students regarding the concept of halal pharmaceuticals, they would explore the students' own beliefs and preferences regarding halal issues while using medicines, or they would teach their students to obtain future consent from the patient about non-halal drugs while looking into the prescriptions in their practice. The questionnaire was distributed to eligible participants through an online survey platform, and visits were made to a number of universities in Jordan, mainly Jordan University (JU), Jordan University of Science and Technology (JUST), and Zarqa University (ZU). Participants were instructed to complete the questionnaire during their free hours to ensure privacy and minimize response bias. The anonymity of the participants was ensured, and no identifying information was collected.

2.5. Ethical considerations

Ethical approval was sought under the reference number (1 January 2019–1 January 2020) from the institutional review board (IRB) committee of the Clinical Pharmacy Department and the Scientific Research Ethics Committee at Zarqa University. Participants gave their electronic informed consent and took part voluntarily. Prior to their participation, participants received a thorough explanation of the study's goals. To ensure complete participant anonymity, the study purposefully avoided gathering any individually identifiable data. Along with that, participants had the freedom to stop taking the survey at any time.

2.6. Statistical analysis

Statistical analyses of the collected data were performed using the Statistical Package for Social Sciences, version 27 (IBM SPSS® Statistics for Windows; IBM Corp., United States). Descriptive and inferential statistics were used for the data analyses. Frequencies and percentages were used to summarize the responses

generated. Data is presented as mean ± standard deviation (SD) or counts (%), as appropriate. The calculation of KPP scores was performed by aggregating responses for individual questionnaire items. These scores were then normalized by dividing them by the total number of items in each section and multiplying the result by 100. The *chi*-square test, independent *t*-test, ANOVA test, and Pearson's *r* test were utilized to determine any significant differences among the study groups. Group comparisons between pharmacy students and faculty members were presented in tables. A *p*-value of less than 0.05 indicates statistical significance. Data screening procedures were conducted to check for missing data and outliers. Missing data were handled using appropriate techniques such as mean imputation or multiple imputation, depending on the extent and pattern of missingness. Assumptions of statistical tests, including normality, homogeneity of variances, and independence, were examined and addressed as necessary.

3. Results

3.1. Demographic characteristics

A total of 874 health professions students and 118 academics (total 992) participated in the study. The demographic characteristics of students and faculty members participating in the study are presented in **Table 2**. The majority of participants were students at the faculty of medicine (*N* = 362, 41.4%), followed by pharmacy (*N* = 320, 36.6%) then nursing (*N* = 102, 11.7%). While the majority of academics were working at the Faculty of Pharmacy (*N* = 56, 47.5%). Most participants were Jordanians (*N* = 852, 85.9%), females (*N* = 690, 69.6%), Muslim (*N* = 965, 97.3%) and non-smokers (*N* = 895, 90.2%). In terms of age distribution, the highest proportion of students fell within the 18–25 age group (*N* = 863, 98.7%) and of academics aged more than 31 years (*N* = 91, 77.1%). Of the 874 students who responded to the survey, the majority of students attended governmental universities (*N* = 814, 93.1%), are currently in their third-year or more (*N* = 558, 63.8%) and from medicine specialty (*N* = 362, 41.4%). More than half of faculty members were Ph.D. degree holders (*N* = 62, 52.5%) had five years of work experience or more (*N* = 63, 53.4%), clinical pharmacy & therapeutics as their exact specialty (*N* = 37, 21.4%) and from medicine specialty (*N* = 40, 33.9%).

Table 2. Socio-demographic characteristics of students and faculty members (*N* = 992) *.

Parameter	Students, *N* = 874 (%)	Faculty Members, *N* = 118 (%)
Gender		
Male	263 (30.1)	39 (33.1)
Female	611 (69.9)	79 (66.9)
Age distribution		
18–25	863 (98.7)	12 (10.2)
26–30	11 (1.2)	15 (12.7)
31–40	0 (0.0)	51 (43.2)
More than 40	0 (0.0)	40 (33.9)

Table 2. (*Continued*).

Parameter	Students *N* = 874 (%)	Faculty Members *N* = 118 (%)
Nationality		
Jordan	740 (84.7)	112 (94.9)
Non-Jordanian	134 (15.3)	6 (5.1)
Marital status		
Single	851 (97.4)	30 (25.4)
Married	23 (2.5)	88 (74.6)
Smoking status		
Smoker	84 (9.6)	13 (11.0)
Non smoker	790 (90.4)	105 (89.0)
University		
Governmental (JU)	814 (93.1)	101 (85.5)
Private (ZU)	60 (6.9)	17 (14.5)
Education level		
First and second year	316 (36.2)	-
Third and fourth year	352 (40.2)	-
Fifth year or more	206 (23.5)	-
Highest education level		
BSc	-	22 (18.6)
Master	-	34 (28.8)
Doctoral	-	62 (52.5)
Having insurance		
Yes	770 (88.1)	108 (91.5)
No	104 (11.9)	10 (8.5)
Insurance type		
M.O.H	229 (26.2)	34 (28.8)
JUH	358 (41.0)	62 (52.5)
R.M.S	108 (12.4)	3 (2.5)
Private	75 (8.6)	9 (7.6)
Specialty		
Medicine	362 (41.4)	20 (16.9)
Dentistry	48 (5.5)	20 (16.9)
Pharmacy	320 (36.6)	56 (47.5)
Nursing	102 (11.7)	10 (8.5)
Allied Medical Sciences	42 (4.8)	12 (10.2)
Years of work experience		
No experience	818 (93.6)	23 (19.5)
1–4 years	43 (4.9)	32 (27.1)
5–9 years	2 (0.2)	30 (25.4)
More than 10 years	10 (1.1)	33 (27.9)

*: There were some missing data.

3.2. Sources of information about halal and non-halal pharmaceuticals

The results revealed various sources of information that individuals rely on to obtain knowledge about halal and non-halal pharmaceuticals. **Figure 1** presents the distribution of participants and the corresponding percentages for each information source. The majority of participants (N = 817, 82.4%) indicated that they rely on religious sources such as Fiqh Fatwas, which are religious legal opinions, as a source of information on this topic. Half of participants (N = 500, 50.4%) requested consultation from different healthcare providers, mainly physicians and pharmacists, as a source of information. Around one-third of participants (N = 297, 29.9%) rely on different media platforms such as the internet, social media, television, or others as a source of information, suggesting a relatively noticeable impact of such media platforms.

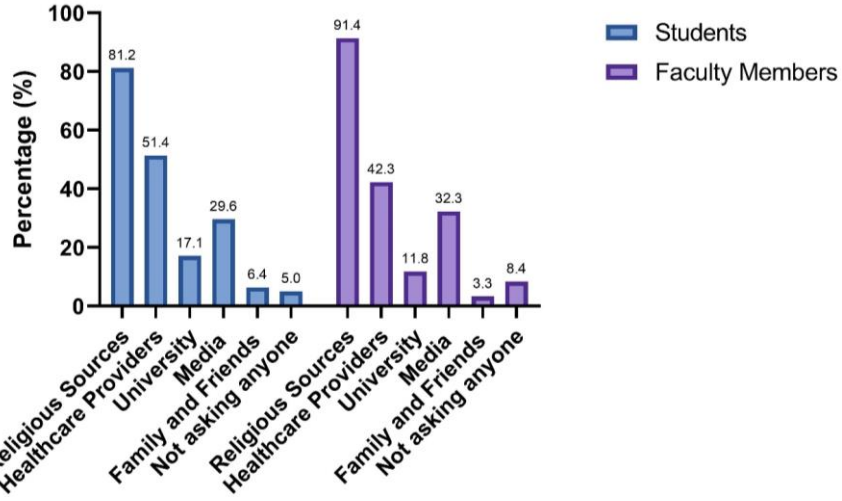

Figure 1. Most frequently used reference of information related to Halal and Non-Halal Pharmaceuticals (N = 992) [#].

[#]: There were some missing data. Note: participant can select more than one choice.

3.3. Knowledge regarding halal pharmaceuticals

Participants' knowledge regarding halal pharmaceuticals was assessed through a series of questions. The mean score for knowledge was (75.0 ± 20.3 and 85.6 ± 18.2) for students and academics, respectively, which indicating a high level of knowledge among participants. There were significant differences in knowledge scores between students and academics (p < 0.001).

Table 3 presents the knowledge questions and scores of students and academics regarding halal pharmaceuticals. The majority of participants demonstrated a high level of awareness regarding the terms "Halal" (N = 972, 97.9%) and "Haram" (N = 876, 88.3%). However, a smaller percentage of participants were aware of the term "Halal Pharmaceuticals" (N = 728, 73.4%). When asking more detailed questions about the capsules' gelatin from non-halal origin or their awareness of the high level of alcohol in the elixir's dosage form, the level of awareness became less.

Table 3. Students and faculty members' knowledge regarding halal pharmaceuticals (N = 992) [#].

Parameter, N (%)	Students N = 874	Faculty members N = 118
Are you aware of the term / word "Halal"?		
Yes	854 (97.7)	118 (100.0)
No	17 (1.9)	0 (0.0)
Are you aware of the term / word "Haram"?		
Yes	769 (88.0)	107 (90.7)
No	102 (11.7)	11 (9.3)
Are you aware of the term / word "halal pharmaceuticals"?		
Yes	624 (71.4)	104 (88.1)
No	247 (28.3)	14 (11.9)
Did you know that dead animals, blood, pork, and alcohol are forbidden for Muslims to use in any form except when necessary?		
Yes	710 (81.2)	106 (89.8)
No	161 (18.4)	12 (10.2)
Did you know that resources are available to offer halal alternatives to pharmaceuticals that contain non-halal ingredients?		
Yes	507 (58.0)	96 (81.4)
No	363 (41.5)	22 (18.6)
Did you know that capsules are made of gelatin that can be obtained from non-halal animal sources?		
Yes	567 (64.9)	102 (86.4)
No	302 (34.6)	16 (13.5)
Did you know that liquids such as elixirs contain a high percentage of alcohol?		
Yes	610 (69.8)	92 (78.0)
No	260 (29.7)	26 (22.0)
Did you know that the alcohol content in medicines, if it exceeds a certain percentage, is considered forbidden?		
Yes	570 (65.2)	79 (66.9)
No	295 (33.8)	39 (33.0)
Total knowledge score (mean ± SD)	75.0 ± 20.3	85.6 ± 18.2

[#]: There were some missing data.

3.4. Perception towards halal pharmaceuticals

The participants' perceptions of halal pharmaceuticals were assessed using a Likert scale, as summarized in **Table 4**. The mean perception scores were 72.3 ± 10.9 for students and 73.3 ± 12.1 for academics, indicating a positive and comparable overall perception towards halal pharmaceuticals. The majority of participants believed that knowledge about halal pharmaceuticals is important (N = 759, 76.5%) and should be included in the curriculum (N = 710, 71.5%), and the patient has a right to ask for information about the sources and ingredients of medicine (N = 800, 80.5%). On the other hand, a noticeable percent of participants disagreed that teaching about halal issues should be left solely to the parents or community religious institutions (N

= 562, 56.7%) and that teaching about halal pharmaceuticals is too controversial and should be avoided (*N* = 384, 38.7%).

Table 4. Students' and faculty members' perception regarding halal pharmaceuticals.

Parameter	Strongly Agree/Agree (N, %)	Neutral (N, %)	Strongly disagree/disagree (N, %)
Knowledge about halal pharmaceuticals is important to me as a faculty member/student.	759 (76.5)	157 (15.8)	68 (6.8)
I think that knowledge of halal pharmaceuticals and their sources should be included in the curriculum.	710 (71.5)	193 (19.5)	80 (8.0)
I think that a list of the most commonly used animal-derived drugs and their alternatives should be developed and included in the curriculum of student education.	761 (76.7)	143 (14.4)	77 (7.7)
The faculty members in health sciences need to be well prepared to teach topics related to halal pharmaceuticals.	541 (54.5)	194 (19.6)	246 (24.8)
Teaching about halal issues should be left solely to the parents/guardians, and/or religious institutions within the community.	182 (18.4)	236 (23.8)	562 (56.7)
Teaching about halal pharmaceuticals is too controversial and should be avoided.	358 (36.1)	235 (23.7)	384 (38.7)
Perhaps if resources and training were made available to faculty members in medical schools, topics of halal medicine could be more easily incorporated into the curriculum.	726 (73.2)	185 (18.6)	69 (6.9)
The patient has a right to ask for information about the sources and ingredients of medicine.	800 (80.6)	137 (13.8)	43 (4.3)

3.5. Practice towards halal pharmaceuticals

Participants' practices towards halal pharmaceuticals were examined through items related to availability, accessibility, and information dissemination, which are presented in **Table 5**. The mean practice scores were 55.9 ± 19.4 for students and 45.7 ± 19.5 for academics, indicating a neutral-moderate overall practice towards halal pharmaceuticals. Nearly one-third of students never took courses that took into account the explanation of halal pharmaceutical concepts in their studies (*N* = 360, 41.2%). Almost half of students never participated in any workshop or conference that discussed the use of halal pharmaceuticals inside and outside the university (*N* = 413, 47.2%). Remarkably, a good percent of students will request the inclusion of courses that explain halal pharmaceutical concepts in their curriculum. Regarding the practice of faculty members towards halal pharmaceuticals, the majority of them never regularly teach their students about different faiths regarding medicine intake (*N* = 82, 69.5%) nor used to explore their students' own beliefs and preferences regarding halal pharmaceuticals issues (*N* = 85, 72.0%). Noticeably, half of academics regularly teach their students that it is their moral obligation to disclose the sources of non-halal ingredients to the patients in their practice (*N* = 60, 50.8%) and to take consent from the patient about non-halal drugs while looking into the prescriptions in their practice (*N* = 59, 50.0%). Both students (*N* = 338, 38.7%) and academics (*N* = 59, 50.0%) believed that they needed proper training on halal and non-halal pharmaceuticals and their alternatives.

Table 5. Students' and faculty members' practice regarding halal pharmaceuticals.

Parameter	Always/mostly (N, %)	Sometimes (N, %)	Never/rarely (N, %)
Students' practice			
I take courses that take into account the explanation of the halal pharmaceutical concept.	279 (31.9)	188 (21.5)	360 (41.2)
I request the inclusion of courses that explain halal pharmaceutical concepts in the curriculum.	328 (37.6)	199 (22.8)	300 (34.4)
I participate in any workshop or conference that discusses the use of halal pharmaceuticals inside and outside the university.	220 (25.2)	195 (22.3)	413 (47.2)
As a student, I try to explain halal alternatives to non-halal pharmaceuticals when I participate in university medical days.	276 (31.6)	183 (20.9)	368 (42.5)
If I am asked to do an assignment or activity for a specific course, I will educate students about halal pharmaceuticals.	326 (37.3)	244 (27.9)	257 (29.4)
I create an educational brochure and distribute it to my colleagues that explains in a simplified manner the concept of halal pharmaceuticals.	286 (32.8)	213 (24.4)	330 (37.8)
I argue with my colleagues that it is our ethical duty to disclose the sources of non-halal ingredients to patients when practicing in the future.	309 (35.3)	191 (21.9)	327 (37.4)
Faculty members' practice			
I educate my students regarding halal pharmaceuticals.	14 (11.9)	16 (13.6)	70 (59.3)
I educate the students about the sources of medication ingredients.	25 (21.2)	16 (13.6)	59 (50)
I teach my students about different faiths regarding medicine intake.	10 (8.4)	7 (5.9)	82 (69.5)
I used to explore students' own beliefs and preferences regarding halal pharmaceutical issues.	7 (5.9)	8 (6.8)	85 (72)
I teach my students that, in the future, they should consider patients' religious beliefs when designing a treatment regimen.	25 (21.2)	20 (16.9)	55 (46.7)
I teach my students that it is their moral obligation to disclose the sources of non-halal ingredients to the patients in their practice.	25 (21.2)	15 (12.7)	60 (50.8)
I teach my students to get consent from the patient about non-halal drugs while looking into the prescriptions in their practice.	30 (25.4)	11 (9.3)	59 (50)
I will include topics about halal pharmaceuticals if I have to develop a medical curriculum.	29 (24.6)	22 (18.6)	49 (41.5)

3.6. Factors affecting student's halal pharmaceuticals knowledge, perception and practice scores

The study also investigated the factors affecting knowledge, practice, and perception scores among recruited students. **Table 6** presents the mean values and standard deviations of the scores, along with the corresponding p-values for various factors. Significant differences were observed in the students' knowledge scores among different university types ($p = 0.004$), gender ($p = 0.013$), specialty ($p < 0.001$), and level of education ($p = 0.001$). Female pharmacy students from private university at the third and fourth levels of education scored the highest knowledge score. Significant differences were found in the perception scores among students of different nationalities ($p = 0.028$), gender ($p = 0.001$), religion ($p = 0.001$), and specialties ($p = 0.001$). Medical, non-Jordanian, and non-Muslim male students scored the lowest perception score. However, no significant differences were found in the practice score based on gender, nationality, or religion ($p > 0.05$).

Table 6. Factors affecting students' halal pharmaceuticals knowledge, perception and practice (N = 847).

	Knowledge score %		Perception score %		Practice score %	
Items	**Mean + SD**	***p*-value**	**Mean + SD**	***p*-value**	**Mean + SD**	***p*-value**
Gender						
Male	72.4 ± 20.4	0.013*	74.1 ± 14.0	0.001*	54.7 ± 18.6	0.255*
Female	76.1 ± 19.8		78.7 ± 11.4		56.4 ± 19.7	
Nationality						
Jordan	74.7 ± 20.2	0.448*	78.1 ± 11.6	0.028*	55.9 ± 19.4	0.863*
Non-Jordanian	76.2 ± 20.3		74.7 ± 15.3		55.6 ± 19.5	
Smoking status						
Smoker	74.5 ± 20.5	0.829*	71.3 ± 17.5	0.009*	51.7 ± 19.7	0.045*
Non smoker	75.1 ± 20.2		78.2 ± 11.3		56.3 ± 19.3	
Religion						
Muslim	75.0 ± 20.0	0.922*	77.9 ± 11.8	0.001*	55.8 ± 19.3	0.908*
Non-Muslim	75.5 ± 26.1		68.3 ± 19.2		56.3 ± 19.9	
University						
Governmental (JU)	74.4 ± 20.3	0.004*	77.5 ± 12.3	0.746*	55.4 ± 19.4	0.010*
Private (ZU)	82.5 ± 26.1		78.1 ± 11.8		62.5 ± 17.5	
Specialty						
Medicine	69.2 ± 20.4		76.4 ± 12.1		51.8 ± 18.2	
Dentistry	75.4 ± 15.1		79.0 ± 10.2		54.2 ± 21.7	
Pharmacy	83.3 ± 18.2	<0.001$	78.1 ± 12.1	0.001$	59.7 ± 19.2	<0.001$
Nursing	75.6 ± 17.5		75.5 ± 13.1		59.4 ± 19.5	
Allied Medical Sciences	72.1 ± 16.3		84.2 ± 7.2		58.6 ± 20.5	
Education level						
First and second year	79.2 ± 20.8		81.1 ± 13.0		56.5 ± 19.0	
Third and fourth year	84.1 ± 16.3	0.001$	81.9 ± 12.0	0.512$	54.6 ± 18.1	0.003$
Fifth year or more	81.3 ± 21.1		78.6 ± 18.3		57.6 ± 18.5	
Have medical insurance?						
Yes	74.5 ± 20.0	0.057*	77.3 ± 12.1	0.221*	55.3 ± 19.2	0.021*
No	78.6 ± 21.3		79.0 ± 12.7		60.2 ± 20.2	

* *p*-values were calculated using independent sample *t*-test., $*p*-values were calculated using ANOVA test.

3.7. Factors affecting faculty members' halal pharmaceuticals knowledge, perception and practice scores

The study also investigated the factors affecting knowledge, practice, perception, and total KPP scores among recruited academics. **Table 7** presents the mean values and standard deviations of the scores, along with the corresponding *p*-values for various factors. Significant differences were observed in the academics' knowledge score among different university types (p = 0.0274) and specialties (p = 0.002). Faculty members teaching pharmacy students at a private university scored the highest

knowledge score. A significant difference was found in the perception scores between females and males (p = 0.019), with females scoring a higher perception score. Nevertheless, no significant differences were found in the practice score based on gender, marital status, religion, or university type (p > 0.05).

Table 7. Factors affecting faculty members' halal pharmaceuticals knowledge, perception and practice (N = 118).

	Knowledge Score %		**Perception Score %**		**Practice Score %**	
Items	**Mean + SD**	***p*-value**	**Mean + SD**	***p*-value**	**Mean + SD**	***p*-value**
Gender						
Male	82.2 ± 19.4	0.170*	73.5 ± 17.1	0.019*	42.5 ± 18.9	0.231*
Female	87.2 ± 17.4		80.8 ± 9.2		47.2 ± 19.7	
Marital status						
Single	88.2 ± 14.4	0.212*	81.1 ± 7.8	0.095*	49.9 ± 17.0	0.190*
Married	84.3 ± 19.1		77.5 ± 13.9		44.3 ± 20.2	
Smoking status						
Smoker	83.6 ± 21.3	0.699*	66.2 ± 22.5	<0.001*	42.4 ± 17.6	0.545*
Non smoker	85.8 ± 17.8		79.8 ± 10.3		46.1 ± 19.8	
Years of experience						
No experience	89.1 ± 18.8		80.8 ± 7.3		55.1 ± 18.6	
1-4 years	89.6 ± 15.3	0.138$	80.4 ± 10.7	0.489$	49.3 ± 23.5	0.005$
5-9 years	79.5 ± 22.8		75.5 ± 16.6		37.4 ± 16.1	
More than 10 years	85.6 ± 15.9		78.4 ± 12.7		42.6 ± 14.8	
University						
Governmental (JU)	83.7 ± 19.2	0.027*	78.3 ± 13.3	0.826*	45.4 ± 19.4	0.714*
Private (ZU)	96.1 ± 6.0		79.3 ± 11.1		49.6 ± 21.0	
Specialty						
Medicine	81.5 ± 18.8		76.5 ± 15.8		44.1 ± 18.9	
Dentistry	70.8 ± 24.0		76.4 ± 12.7		44.6 ± 15.1	
Pharmacy	92.1 ± 14.4	0.002$	78.1 ± 12.1	0.530$	48.9 ± 21.2	<0.009$
Nursing	83.7 ± 16.7		84.4 ± 7.4		53.9 ± 16.4	
Allied medical sciences	78.1 ± 20.0		80.2 ± 14.7		26.4 ± 8.2	
Highest certification						
Bachelor degree	88.2 ± 15.8		81.6 ± 7.2		55.9 ± 21.6	
Master degree	84.3 ± 16.8	0.550$	80.5 ± 10.2	0.179$	45.2 ± 20.1	0.036$
Doctoral degree	85.3 ± 20.2		76.6 ± 14.9		42.8 ± 17.8	
Have medical insurance?						
Yes	85.3 ± 17.7	0.564*	78.1 ± 13.2	0.560*	44.8 ± 18.8	0.138*
No	88.7 ± 23.1		80.7 ± 7.5		54.9 ± 25.2	

* p-values were calculated using independent sample t-test., $ p-values were calculated using ANOVA test.

4. Discussion

In predominantly Muslim countries like Jordan, where adherence to Islamic principles is deeply ingrained in society, the use of halal pharmaceuticals has the potential to play a significant role in shaping healthcare practices and choices. This cross-sectional study aimed to evaluate the knowledge, perception, and practice of health professions students and academics in Jordan regarding halal pharmaceuticals. The findings of this research reflect the current state of knowledge, perception, and practice in this emerging field and lay the foundation for informed discussions and decisions.

The study encompassed a diverse demographic group. These demographics mirror the composition of the healthcare workforce in Jordan and reflect the context in which halal pharmaceuticals are relevant. The fact that most participants are Jordanians is particularly important, as it reflects the local context and underscores the cultural and religious relevance of halal pharmaceuticals in Jordan (Alhashimi et al., 2018). Moreover, the preponderance of female participants might indicate a heightened interest or engagement in the topic, potentially influencing how pharmaceuticals are perceived and utilized in the country (Firdous et al., 2020; Marcus, 2016). The large number of non-smokers in the study is noteworthy, as it could be related to the compatibility of pharmaceuticals with halal practices, which typically discourage smoking and other harmful behaviors (Ghouri et al., 2006). The prevalence of Muslim participants emphasizes the importance of halal pharmaceuticals in Islamic culture, as there is a strong connection between religious beliefs and practices and the consumption of products like pharmaceuticals (Al-Kwifi, 2018). Regarding academic affiliation, participants mainly come from the faculties of medicine and pharmacy, which are directly relevant to the study's focus on pharmaceuticals. The high proportion of faculty members holding Ph.D. degrees among the academics implies a high level of education and expertise, potentially impacting their understanding of and advocacy for halal pharmaceuticals and how this knowledge is conveyed to future healthcare professionals (Sadeeqa et al., 2013). The implications of these demographics are far-reaching. The study results may suggest a need for healthcare practices that are culturally and religiously sensitive, given the predominantly Muslim participant base. Additionally, the educational implications are significant, as the high number of Ph.D. holders among academic participants highlights their potential role in educating the future healthcare workforce about halal pharmaceuticals.

Regarding sources of information, the participants drew knowledge from diverse outlets, with a significant reliance on religious sources, particularly Fiqh Fatwas, and healthcare providers, including physicians and pharmacists. This underscores the pivotal roles of religious scholars and healthcare professionals in shaping attitudes and knowledge related to halal pharmaceuticals (Tayeb et al., 2023). The reliance on media platforms, such as the internet and social media, highlights the influence of digital channels in disseminating information on this topic (Kukreja et al., 2011; Malone, 2012).

Regarding knowledge about halal pharmaceuticals, the high level of awareness among participants about the terms "Halal" and "Haram" is noteworthy, with nearly all respondents demonstrating familiarity with these concepts. However, awareness of

the term "Halal Pharmaceuticals" was relatively lower." Furthermore, awareness diminished when participants were queried about specific details, such as whether resources are available to offer halal alternatives to pharmaceuticals that contain non-halal ingredients, the origin of gelatin in capsules, or the presence of high alcohol levels in elixirs. These findings underscore the importance of introducing and emphasizing the finer nuances of halal pharmaceuticals in educational and awareness programs. Moreover, the mean score for knowledge for students and academics indicated a high level of knowledge among participants. There were significant differences in knowledge scores between students and academics, with academics scoring higher, and this can be attributed to several key factors. First and foremost, academics typically possess a wealth of educational and professional experience, having spent more years in the field. This extended exposure to the subject matter allows them to accumulate in-depth knowledge, including a deep understanding of topics like halal pharmaceuticals (Darling-Hammond et al., 2020). Additionally, academics often enjoy better access to a wide range of academic resources. They can easily tap into research journals, libraries, and extensive academic networks, ensuring they stay abreast of the latest developments in the field. Moreover, academics sometimes contribute to curriculum development in medical schools. This involvement enables them to include topics related to halal pharmaceuticals and other specialized areas, which, in turn, deepens their understanding (de Wit-de Vries et al., 2019). Last but not least, engaging in research projects related to halal pharmaceuticals is another way in which academics expand their knowledge (Fecher et al., 2015). This is contrary to what was reported in a study carried out by Alserhan et al. to explore the level of awareness towards halal pharmaceuticals among healthcare professionals in Jordan. Their findings revealed that awareness of halal pharmaceuticals, medicines, and cosmetics is lacking at all four different relevant levels: patients, pharmacists, doctors, and legislators (Alserhan, 2020). These results may be peculiar to Arab Muslim markets where halal is part of the Islamic identity. Similarly, in a study carried out by Butler et al., where they assessed pharmacists' knowledge of halal medications to support the health beliefs of patients, it was reported that over half of the participants were unaware of halal pharmaceuticals, haram ingredients, resources to utilize, or medications to use as an alternative. This supports the belief that it is necessary for a resource to be available for quick access and information to ensure that patients receive optimal care and are adherent to their treatment (Butler et al., 2018).

Participants' perceptions toward halal pharmaceuticals were generally positive, aligning with previous studies emphasizing patient-centered care and the importance of respecting patients' religious and cultural beliefs in healthcare provision (Eid et al., 2022; Sadeeqa et al., 2015; Sadeeqa et al., 2013b). A significant proportion agreed that knowledge about halal pharmaceuticals is essential and should be integrated into the curriculum. They also acknowledged patients' rights to inquire about the sources and ingredients of their medication. Nonetheless, a notable portion disagreed with the notion of exclusively teaching halal issues in parents' or community religious institutions and found teaching about halal pharmaceuticals to be too controversial and thus best avoided. Overall, these results suggest that there is a willingness among the participants to consider the importance of halal pharmaceuticals and cater to the needs of patients who require them. However, there are concerns about the approach to

education and potential controversy. These findings highlight the need for a balanced and evidence-based approach to teaching and integrating halal pharmaceutical considerations into the medical curriculum. It is essential to strike a balance between respecting religious and cultural beliefs and maintaining the integrity of medical education and practice. This could involve developing guidelines, ethics, and standards for the incorporation of halal pharmaceuticals into the medical field while respecting diverse perspectives and addressing potential controversies.

The findings related to participants' practices concerning halal pharmaceuticals indicate a need for improvement. There is potential for enhancing educational programs and raising awareness among students to bridge the gap between knowledge and practice. Among academics, a notable proportion did not regularly teach their students about different faiths regarding medicine intake or explore their students' beliefs and preferences regarding halal pharmaceuticals. However, there is a positive inclination among academics to teach students about their moral obligation to disclose the sources of non-halal ingredients to patients and obtain consent regarding non-halal drugs. The findings have several implications for the healthcare field in Jordan. There is a clear need for improved educational programs to bridge the gap between knowledge and practice among health professions students and academics. While the participants displayed a positive perception of halal pharmaceuticals, practical skills and awareness in this area require enhancement. To address this, educational institutions should consider implementing awareness and sensitivity training focused on halal pharmaceuticals. Such training can help students and academics understand the religious and cultural dimensions of healthcare and the importance of respecting patients' beliefs. Moreover, faculty development programs should be established to enhance the knowledge and teaching skills of academics in the realm of halal pharmaceuticals and related ethical considerations. Collaboration with religious and cultural experts or advisors is another valuable step that medical institutions in Jordan could consider. These experts can provide insights into the specific beliefs and practices related to halal pharmaceuticals, ensuring that the curriculum and training are culturally sensitive and accurate. Emphasizing patient-centered care, which includes respecting patients' cultural and religious beliefs, should be a fundamental aspect of healthcare education. Encouraging students to actively engage with patients to understand their preferences and concerns regarding medication is essential for building trust and delivering quality care. Other results regarding practices concerning halal pharmaceuticals were reported in the literature. Sadeeqa et al. concluded that better knowledge of halal pharmaceuticals is associated with a positive attitude towards the use of halal pharmaceutical products. However, it still remains unknown how this positive attitude influences the prescribing practices of general practitioners (Sadeeqa, 2013a).

The study also explored factors affecting knowledge, perception, and practice scores among students and academics. Several significant differences emerged in knowledge and perception scores based on university type, gender, nationality, religion, specialty, and level of education. These findings highlight the need for tailored educational approaches and training programs that consider these influencing factors to enhance knowledge, perception, and practice regarding halal pharmaceuticals. Other studies were carried out to explore the factors related to halal

concepts and halal products. Halal awareness as a concept was found to impact health care providers and customers' behavior toward the purchase of halal products, as well as other factors such as certifications and components (Awan, 2015, Basheer et al., 2021, Jaber et al., 2024). A similar study was conducted by Kurniawati *et al*. and discussed how certifications, logos, and religious beliefs were among the most influential factors in halal awareness (Kurniawati, 2019,). In another study, halal awareness was found to influence non-Muslims (mostly Christians) purchasing intentions, which reflects the level of knowledge non-Muslim customers hold on halal concepts and halal regulations (Bashir, 2019).

This study can be evaluated in light of its strengths and limitations. Strengths include the high relevance of our study, as the concept of halal pharmaceuticals is of increasing significance, particularly in regions with a significant Muslim population like Jordan. We have also included a diverse sample, encompassing various health professions and both students and academics, which adds depth to the study and offers a more comprehensive view of KPP within the healthcare education and practice community. Moreover, our data collection instrument, a structured questionnaire, is a strength. It was developed through a comprehensive literature review and expert consultation, ensuring content validity. The questionnaire's utilization of a Likert scale for responses allows for quantitative analysis. Ensuring the anonymity and privacy of participants during questionnaire completion helps minimize response bias and safeguards their privacy. Our study's reliance on convenience sampling, while having limitations, is an efficient way to gather data, especially in cases with practical constraints in reaching diverse participants. Nonetheless, there are several limitations to consider. Convenience sampling may introduce bias, as participants who volunteer may be more interested in or knowledgeable about the subject, affecting the generalizability of findings. Additionally, despite measures to ensure privacy and anonymity, response bias remains a concern, particularly for sensitive topics like religious beliefs and practices. The cross-sectional design provides only a snapshot in time and does not allow for assessing changes over time, necessitating longitudinal studies to understand the evolution of KPP. The geographical limitation of our study, conducted in Jordan, means the findings may not be generalizable to regions or countries with different cultural and religious backgrounds. Lastly, the survey delivery method, using online surveys and university visits, may miss individuals without internet access or those not present during the visits.

5. Conclusion

In summary, this study contributes valuable insights into the knowledge, perception, and practice of health professions students and academics in Jordan regarding halal pharmaceuticals. The positive perception and recognition of the importance of halal pharmaceuticals among participants highlight the potential for integrating education on this topic into healthcare curricula. However, the observed gap between knowledge and practice underscores the need for targeted education and training initiatives to bridge this divide. The findings suggest that incorporating halal pharmaceuticals into healthcare education and emphasizing patient-centered care may positively influence healthcare practices in Jordan and potentially in other regions with

significant Muslim populations. Future research could explore the long-term impacts of such interventions, conduct cross-cultural comparisons, and delve into the qualitative aspects of participants' perceptions and practices, offering further insights into this evolving field.

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