

# Evaluating the Knowledge, Attitude, and Practices of Jordanian Society Towards Halal Pharmaceuticals



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## Abstract:

**Background:** Halal pharmaceuticals comply with Islamic dietary laws and ethical principles, addressing the needs of Muslim consumers. Understanding public awareness and attitudes towards these products is crucial for promoting informed healthcare decisions and religious adherence.

**Objectives:** Halal pharmaceuticals, adhering to Islamic principles, are essential in Muslim-majority countries. This study aimed to investigate the Knowledge, Attitudes, and Practices (KAP) of Jordanian society regarding halal pharmaceutical products.

**Methods and Materials:** A cross-sectional survey was conducted on 914 participants from diverse demographic backgrounds in Jordan. The survey assessed awareness, attitudes, and practices concerning halal pharmaceuticals. Data analysis was performed to identify key determinants of KAP scores.

**Results:** The study revealed moderate knowledge about halal pharmaceuticals among participants, with 60.4% and 64.2% unfamiliar with the terms "halal pharmaceuticals" and "non-halal pharmaceuticals," respectively. While 85.2% of participants recognized the prohibition of substances, such as derivatives of dead animals and alcohol, in pharmaceuticals, 66.2% lacked awareness of specific non-halal ingredients. When seeking information about halal medicines, 73.1% of participants relied on established institutions, while 68.4% used online resources. Pharmacists were identified as trusted sources by 61.7% of respondents. Gender, age, smoking status, education level, specialization, and job status significantly influenced KAP scores. Specifically, females exhibited higher knowledge and more favorable attitudes, with 64.1% of females reporting favorable knowledge, compared to 52.3% of males. Higher education levels also correlated with better KAP scores, with 74.5% of participants with a university education demonstrating more favorable practices compared to 55.7% of those without higher education.

**Conclusion:** The findings underscore the need for enhanced educational initiatives to bridge knowledge gaps and promote awareness about halal pharmaceuticals. Collaborative efforts between healthcare providers, pharmaceutical companies, and religious authorities are essential to ensure the availability and clear identification of halal pharmaceutical options, catering to the religious beliefs of patients and fostering informed healthcare decisions.

**Keywords:** Halal pharmaceuticals, Jordanian society, Knowledge, Attitudes, Practices.

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## 1. INTRODUCTION

The concept of halal pharmaceuticals, which refers to medications that comply with Islamic principles and guidelines, has gained notable attention in recent years, especially in Muslim-majority societies [1]. Within Islam, the Quran and Sunnah delineate a set of guidelines concerning permissible and forbidden foods, categorizing those fit for consumption as “Halal” and those prohibited as “Haram” [2, 3]. This distinction between halal and haram applies not only to food but also to a wide range of other products, such as cosmetics, dietary supplements, and pharmaceuticals [4-6].

Halal pharmaceuticals have become a significant aspect of Islamic jurisprudence, reflecting efforts to ensure healthcare practices align with religious principles. They are defined as medications that comply with Islamic dietary laws and ethical principles outlined in Islamic Jurisprudence. This focus reflects the desire of Muslim adherents to integrate their healthcare practices with religious tenets, such as dietary laws and ethical considerations. While the broader pharmaceutical industry caters to diverse cultural and religious demographics, the development and utilization of halal pharmaceuticals offer a specialized avenue for addressing the unique needs and preferences of Muslim consumers [7].

The pharmaceutical industry plays a crucial role in meeting the healthcare needs of populations worldwide, as it continuously innovates to develop drugs that address a myriad of health conditions. However, incorporating religious considerations introduces additional complexity to drug development, manufacturing, and consumption [8]. Halal pharmaceuticals, in particular, represent a convergence of religious principles and healthcare practices. These medications not only comply with Islamic dietary laws but also adhere to ethical principles outlined in Islamic jurisprudence. This adherence goes beyond ingredient verification; it covers each stage of the pharmaceutical supply chain, from sourcing raw materials to distributing the final product [7]. By upholding these principles, halal pharmaceuticals offer a holistic approach to healthcare that resonates with Muslim values. Patients can trust that these medications not only treat their physical ailments but also uphold their religious convictions, fostering a sense of confidence and well-being in their healthcare decisions [9, 10].

Jordan, a predominantly Muslim country with a rich

cultural heritage, serves as an intriguing case study for examining the intersection of religious beliefs and pharmaceutical practices. As a nation with a well-established healthcare system and a population deeply rooted in Islamic traditions, Jordan provides a fertile ground for investigating the adoption and acceptance of halal pharmaceuticals [11]. Although studies have explored the knowledge, attitudes, and practices toward halal pharmaceuticals in countries, such as Malaysia and Palestine [12, 13], limited research has been conducted on this topic in Jordan. Notably, existing literature does not adequately address how Jordanian society perceives and adopts halal pharmaceutical products, making it difficult to gauge the demand and understanding of such products in this context. This study, therefore, aims to fill this gap by assessing the knowledge, attitudes, and practices of Jordanian society toward halal pharmaceuticals. By conducting a comprehensive survey targeting diverse societal segments, this research aims to illuminate the intricacies of healthcare decision-making within the Jordanian context, shedding light on the factors shaping the demand for and utilization of halal pharmaceuticals. Through this study, we seek to contribute to the ongoing efforts surrounding culturally sensitive healthcare practices and the promotion of ethical, halal-compliant pharmaceutical options for Muslim communities worldwide.

## 2. METHODS AND MATERIALS

### 2.1. Study Design and Participants

This is an observational cross-sectional study conducted over a period of two months, from mid-January, 2023 to mid-March, 2023, to assess the knowledge, attitude, and practices of Jordanian society toward halal pharmaceutical products. Included in the study were 914 participants from the public in Jordanian society.

### 2.2. Inclusion / Exclusion Criteria

The inclusion criteria for this study involved individuals who were residents of Jordan, aged 18 years or older, proficient in reading and understanding Arabic, and willing to provide informed consent. Additionally, participants were required to have access to the Internet to complete the online survey. Exclusion criteria encompassed individuals who did not meet these requirements.

### 2.3. Sample Size

The sample size was determined by an online Raosoft sample size calculator [14]. Considering the population in Jordan to be around 10 million, the sample size was calculated by determining a margin of error of 5%, a confidence level of 95%, and a 50% response distribution. A sample size of 910 was found to be minimally required.

### 2.4. Procedure and Data Collection

Data was collected through a self-administered questionnaire filled out by the public in the Jordanian society. The questionnaire was written in Arabic and was distributed *via* social media platforms and WhatsApp groups. Participants were asked to complete the questionnaire anonymously. Participation was completely voluntary, and data collection was entirely anonymous. After they were instructed about the nature and purpose of the survey, all respondents provided informed consent and were given the option to withdraw at any time. The questionnaire's development was guided by the study's objectives and by a thorough literature review. To assess the suitability of the questionnaire employed in this cross-sectional study, a face validity assessment was conducted. This involved soliciting expert opinions from relevant professionals to evaluate whether the survey questions and response options appeared clear, relevant, and appropriate for measuring the intended constructs. By gathering feedback from experts (PhD and master's degree holders in Zarqa University's Department of Pharmaceutics and Clinical Pharmacy as well as a few members of the general public), any potential ambiguities or inconsistencies in the questionnaire were identified and addressed to ensure the accuracy and reliability of the data collected. Content validity was verified to guarantee the precision and applicability of the data gathered in this cross-sectional study. This required a panel of subject-matter experts to look through the study's research questionnaire in a thorough manner. The experts evaluated whether the questions used sufficiently covered all pertinent dimensions and measured the targeted constructs. The purpose of this content validity assessment was to improve the interpretability and credibility of the findings. A pilot sample of approximately 10% of the intended sample size was used. This preliminary study allowed for the refinement of data collection instruments, testing the clarity and relevance of questions, and identifying potential logistical challenges. Cronbach's alpha of internal consistency was calculated to assess the internal consistency and reliability of Likert-scale items (0.902).

The questionnaire comprised several sections and aimed at gathering comprehensive data regarding the knowledge, attitude, and practices of Jordanian society toward halal pharmaceutical products. It began by soliciting demographic information, including gender, nationality, age, marital status, smoking habits, religion, education level, field of study, employment status, chronic diseases, health insurance coverage, and medication use. Following this, participants were asked about their

knowledge of halal and non-halal pharmaceuticals, including their familiarity with these terms, awareness of non-halal components in medications, and sources they relied on for information about halal medications. Additionally, participants were prompted to discuss the healthcare providers they would consult for inquiries about non-halal pharmaceuticals. This section aimed to explore the participants' understanding of halal and non-halal pharmaceuticals, contributing to a comprehensive analysis of the subject matter. Regarding the scoring method, for knowledge statements, respondents were asked to choose "Yes" or "No" options. The correct answer (yes) was scored one (1), while the incorrect answer (no) was scored zero (0). Moreover, some questions used a 3-point Likert scale ranging from "I Don't Know" to "Excellent", where Excellent = 5, Very Good = 4, Good = 3, Weak = 2, and I Don't Know = 1.

The second section of the questionnaire delved into participants' attitudes toward halal and non-halal pharmaceutical products. These statements covered a range of topics, including patients' rights to request information about ingredient sources, the preference for clear labeling of halal pharmaceuticals, and the consideration of religious beliefs by healthcare providers in pharmaceutical choices. This section aimed to gauge participants' perspectives on the importance of halal certification, the influence of pricing on purchasing decisions, and the role of community awareness and religious authorities in regulating halal pharmaceuticals. Regarding the scoring method, for attitude statements, a 3-point Likert scale was used ranging from "Strongly Agree/Agree" to "Disagree/Strongly Disagree", where Strongly Agree/Agree = 5, Neutral = 3, and Disagree/Strongly Disagree = 1.

Moving on to the third section, participants were asked to reflect on their actual practices concerning halal and non-halal pharmaceutical products. Participants indicated the frequency of their behaviors in various scenarios. These scenarios included being fully aware of the concept of halal pharmaceuticals, preferring to purchase halal products, and inquiring about non-halal ingredients from specialist doctors and pharmacists. Additionally, participants shared their level of reassurance when provided with halal alternatives and their proactive efforts in seeking information about ingredient sources. This section aimed to provide insights into participants' real-world behaviors regarding halal pharmaceutical products, shedding light on their purchasing habits, information-seeking behaviors, and preferences for halal certification. Regarding the scoring method, for practice statements, a 3-point Likert scale was used ranging from "Never" to "Always", where Always/Mostly = 5, Sometimes = 3, and Rarely/Never = 1.

### 2.5. Ethical Considerations

Ethical approval was obtained (under reference number: 1/1/2019-2020) from both the Research Ethics Committee and the Clinical Pharmacy Department at Zarqa University. Participants provided electronic

**Table 1. Socio-demographic characteristics of participants (N = 914) #.**

Variable	N (%)
<b>Gender</b>	
• Male	268 (29.3)
• Female	646 (70.7)
<b>Nationality</b>	
Jordanian	825 (90.8)
• Non-Jordanian	81 (9.2)
<b>Age group</b>	
• 18-30	477 (52.2)
• 31-60	437 (47.8)
<b>Marital status</b>	
• Single	490 (53.6)
• Married	424 (46.4)
<b>Smoking status</b>	
• Smoker	212 (23.2)
• Non-smoker	702 (76.8)
<b>Religion</b>	
• Muslim	908 (99.3)
• Non-Muslim	6 (0.7)
<b>Educational level</b>	
• Bachelors	573 (62.7)
• Master	141 (15.4)
• Diploma	85 (9.3)
• High school or less	73 (8.0)
• PhD	42 (4.6)
<b>Specialization</b>	
• Medical specialist	255 (28.0)
• Islamic law	118 (13.0)
• Art	94 (10.3)
• Science	73 (8.0)
• Engineering	70 (7.7)
• Computer science	37 (4.1)
• Otherwise	264 (28.9)
<b>What exactly is your medical specialty?</b>	
• Pharmacist or Pharm D	142 (57)
• Nursing	39 (15.7)
• Allied medical science	38 (15.3)
• Other	30 (12.0)
<b>Job status</b>	
Student	259 (28.4)
• An employee in a non-medical sector	195 (21.4)
• Non-working	180 (19.7)
• Medical sector	113 (12.4)
• Freelance	67 (7.3)
• University academic	56 (6.1)
• Retired	43 (4.7)
<b>Chronic disease</b>	
• No	742 (81.2)
• Cardiovascular disease	47 (5.1)
• Respiratory disease	27 (3.0)
• Diabetes mellitus	15 (1.6)
• Other	83 (9.1)
<b>Health insurance</b>	
Yes, government	499 (54.7)
• Yes, private	130 (14.2)
• No	284 (31.1)
<b>Do you take medications chronically?</b>	
• No	719 (78.7)
• Yes, less than 3	132 (14.4)
• Yes, 3 or more	63 (6.9)

**Note:** # There were some missing data.

informed consent and participated voluntarily. Prior to their participation, participants received a thorough explanation of the study's objectives. Before their involvement, participants received a comprehensive explanation of the study's objectives. To maintain

complete participant anonymity, the study deliberately refrained from collecting individually identifiable data. Additionally, participants had the freedom to discontinue the survey at any point.

## 2.6. Statistical Analysis

Descriptive statistics, including frequencies and percentages, were used to summarize the demographic characteristics of the participants. The levels of Knowledge, Attitudes, and Practices (KAP) were assessed using mean scores and standard deviations. To compare KAP levels across different participants, both analysis of variance (ANOVA) and independent sample t-tests were performed. A *p*-value of less than 0.05 was considered statistically significant. Data analysis was performed using SPSS v27 (Statistical Package for Social Sciences) software. Data screening procedures were conducted to check for missing data and outliers. Missing data were managed using appropriate techniques, such as mean imputation, based on the extent and pattern of missingness. Assumptions underlying the statistical tests, including normality and independence, were examined and addressed as necessary.

## 3. RESULTS

The socio-demographic characteristics of the participants are presented in Table 1. The study encompassed a total of 914 participants. In terms of demographic distribution, women constituted a substantial majority at 70.7%. A large proportion (90.8%) of the participants were Jordanians. Age-wise, the participants were fairly evenly distributed across two age groups: 18-30 (52.2%) and 31-60 (47.8%). Marital status exhibited a comparable split, with 53.6% single and 46.4% married. The majority of participants were non-smokers (76.8%), and an overwhelming 99.3% identified as Muslim. Educational levels varied, with a majority holding Bachelor's degrees (62.7%), followed by those with Master's degrees (15.4%). The participants' specialties were diverse, notably featuring a significant representation of medical specialists (28.0%), predominantly Pharmacist and Pharm-D professionals (57%). Job-status further diversified the sample, encompassing students (28.4%), non-medical sector employees (21.4%), and medical sector professionals (12.4%). Additionally, a considerable portion (75.3%) of the participants reported being healthy without any chronic diseases.

The participants' knowledge regarding halal pharmaceuticals is presented in Table 2. The findings revealed varying degrees of awareness and understanding concerning both halal and non-halal pharmaceuticals and their constituents. The average knowledge score was calculated to be  $49.8 \pm 19.4$ , indicating a moderate level of understanding. In terms of familiarity with the term "halal pharmaceuticals," two-thirds of respondents, 549 (60.4%), expressed that they were not familiar with it. Likewise, a similar trend was observed for the term "non-halal pharmaceuticals," with two-thirds, 575 (64.2%), indicating unfamiliarity with it. More than two-thirds of

the participants, 600 (66.2%), exhibited varying levels of awareness, ranging from a lack of knowledge to weak understanding, regarding the presence of non-halal ingredients that may be present in certain pharmaceutical formulations. Conversely, over half of the participants, 491 (53.9%), were aware that Muslims forbid the use of derivatives from deceased animals, pigs, blood, and other impurities in pharmaceutical preparations, except when deemed necessary. Additionally, nearly half of the participants, 452 (49.8%), were aware that alcohol is forbidden as a basic ingredient in pharmaceutical preparations. Interestingly, over fifty percent of the participants, 492 (54.7%), were unaware of the availability of halal alternatives to non-halal pharmaceuticals. Moreover, more than two-thirds of the participants, 621 (68.9%), either lack knowledge or possess a weak understanding regarding the fact that gelatin used in making capsules may originate from non-halal animal sources. Additionally, almost 710 (80%) of the participants lacked knowledge or possessed a weak understanding

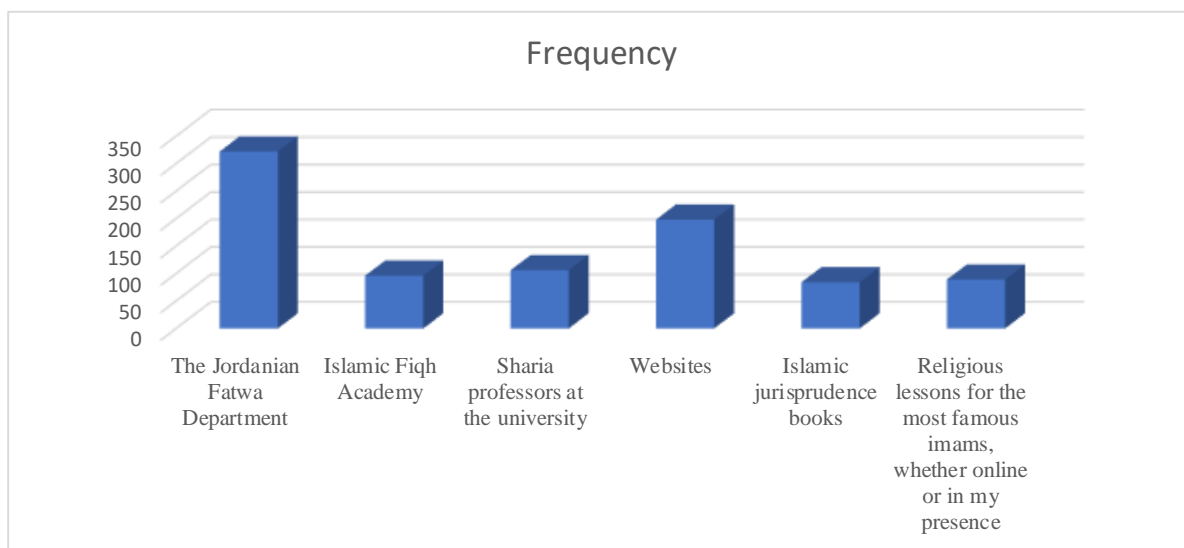
regarding the high alcohol content in elixirs. Finally, two-thirds of the participants (514, 60.3%) were not aware of the Jordanian Iftaa Department's statement on the impermissibility of using pharmaceuticals with forbidden ingredients when halal alternatives are available.

The frequency of responses regarding reliable sources for issuing fatwas and inquiring about halal medicines is presented in Fig. (1). The majority of respondents (N=514, 60.3%), with a frequency of over 300, indicated "The Jordanian Fatwa Department" as a trusted source. Following this, websites received a moderate frequency of responses. In contrast, responses regarding "Sharia professors at the university" and "Islamic Fiqh Academy" were notably lower. "Islamic jurisprudence books" and "religious lessons of the most famous imams, whether online or in my presence" received the least frequency of responses. Overall, the figure highlights the preference for established institutions, such as "The Jordanian Fatwa Academy" and the "Websites" when seeking guidance on halal medicines and fatwas.

**Table 2. Participants' knowledge regarding halal pharmaceuticals (N = 914) #.**

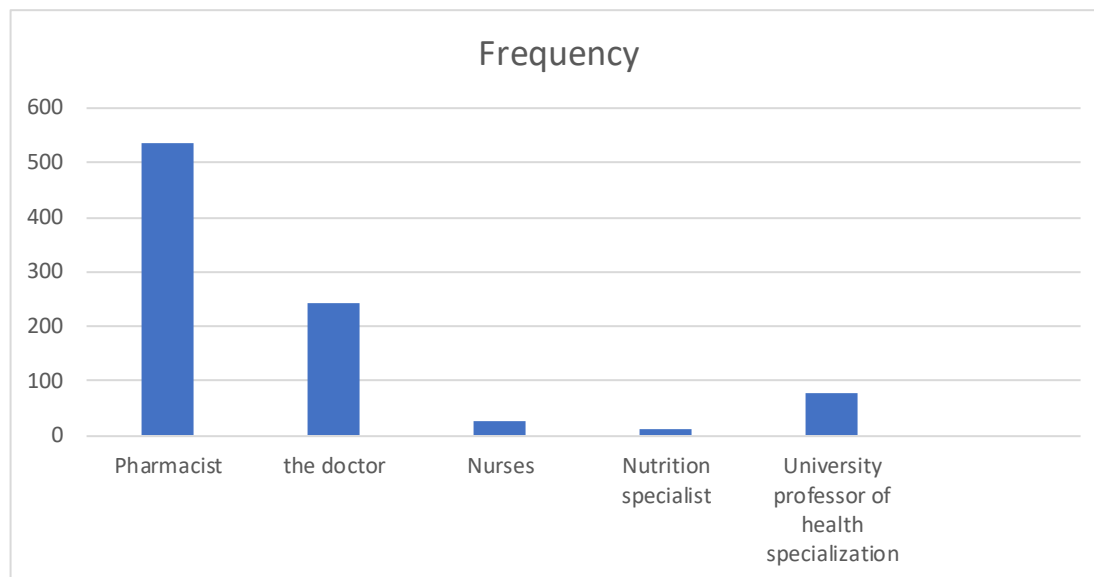
Parameter	I don't know	Weak	Good	Very Good	Excellent
To what degree do you know that there are non-halal ingredients that may be included in the composition of some pharmaceutical preparations?	331 (36.5)	269 (29.7)	212 (23.4)	67 (7.4)	27 (3.0)
To what degree do you know that derivatives of dead animals, pigs, blood, and various impurities are forbidden to be used by Muslims in pharmaceutical preparations except when necessary?	171 (18.8)	97 (10.6)	153 (16.8)	174 (19.1)	317 (34.8)
To what extent do you know that alcohol is forbidden to be used as a basic ingredient in pharmaceutical preparations?	194 (21.4)	90 (9.9)	172 (18.9)	166 (18.3)	286 (31.5)
How well do you know that there are halal alternatives to non-halal pharmaceuticals?	324 (36.0)	168 (18.7)	190 (21.1)	116 (12.9)	101 (11.2)
How well do you know that the gelatin that goes into making the capsules may be from a non-halal animal source?	466 (51.7)	155 (17.2)	110 (12.2)	75 (8.3)	95 (10.5)
How much do you know that the elixir has a high alcohol content?	620 (68.0)	90 (9.9)	81 (8.9)	58 (6.4)	63 (6.9)

**Note:** # There were some missing data.



**Fig. (1).** What are the reliable sources that you may go to for the purposes of issuing fatwas and inquiring about halal medicines? (N = 914).





**Fig. (2).** Who is the healthcare provider to turn to if you have a question about non-halal pharmaceuticals? (N = 914).

The frequency of responses regarding the healthcare provider to consult when individuals have questions about non-halal pharmaceuticals is presented in Fig. (2). Results showed that the majority of respondents (N=537, 58.7%), with a frequency above 500, indicated “pharmacists” as the preferred healthcare provider. Following this, “the doctor” received a moderate frequency of responses (N=244, 26.7%). Responses regarding “nurse,” “nutrition specialist,” and “university professor of health specialization” were notably lower. Overall, the figure emphasizes the significant role of pharmacists as trusted healthcare providers when seeking information about non-halal pharmaceuticals.

The attitudes regarding halal pharmaceuticals among Sharia practitioners are presented in Table 3. The mean attitudes score stood at  $94.71 \pm 9.4$ , signifying a notably high level of favorability. The overwhelming majority of participants (N=848, 93.0%) agreed that patients have the right to request information about pharmaceutical ingredients and expressed a strong preference for halal pharmaceuticals to be clearly labeled with a distinctive logo (N=862, 94.6%). Moreover, there was widespread agreement among participants that healthcare providers should take into account patients' religious beliefs when prescribing pharmaceuticals (N=818, 90%), coupled with a significant consensus on the necessity for community awareness regarding halal products (N=858, 94.8%). Interestingly, a high percentage (N=693, 76.5%) of participants agreed that the price of a halal pharmaceutical product does not affect the patient's decision to purchase it. The data further indicated that more than 90% of participants agreed that the patient has

the right to request information about the sources of the ingredients of the pharmaceutical preparation, underscoring a significant call for the involvement of the Fatwa Department in educating the community about halal pharmaceuticals (N=840, 93.6%). Lastly, more than 90% of participants exhibited a strong agreement for the pharmaceutical industry to offer halal alternatives and emphasize the importance of companies disclosing the animal sources used in their products.

The scores of practice regarding halal pharmaceuticals among participants are presented in Table 4. With a mean score of  $77.1 \pm 14.2$  for practices, the overall practice was notably positive. Approximately 90% of participants expressed a preference for purchasing halal pharmaceuticals. This inclination is further highlighted by the fact that more than half of respondents were fully aware of the concept of halal pharmaceuticals. Regarding consultations with healthcare professionals, less than half of the participants rarely inquired from the specialist doctor about non-halal ingredients before using the prescription, and two-thirds rarely checked with the pharmacist about non-halal ingredients before buying a prescription. The majority of respondents (N=692, 75.8%) always felt reassured if a pharmacist offered a halal pharmaceutical alternative. The results also highlighted that nearly half of the participants always seek information on the sources of ingredients for the pharmaceuticals they use. Furthermore, more than 80% of respondents were willing to purchase halal pharmaceuticals regardless of their cost. Finally, more than 90% liked and preferred to check the “halal” logo clearly on the pharmaceutical product that they would like to buy and would be more reassured when using a halal pharmaceutical compared to a non-halal one.

**Table 3. Participants' attitudes regarding halal pharmaceuticals. (N = 914) #.**

Variable	N (%)		
	Strongly Disagree/Disagree	Neutral	Agree/Strongly agree
The patient has the right to request information about the sources of the ingredients of the pharmaceutical preparation	17 (1.9)	47 (5.2)	848 (93.0)
It is preferable to distinguish halal pharmaceutical preparations with a special and clear logo	7 (0.7)	42 (4.6)	862 (94.6)
The patient's religious beliefs should be taken into account by healthcare providers in selecting a pharmaceutical preparation	24 (2.7)	67 (7.4)	818 (90.0)
The price of a halal pharmaceutical product does not affect the patient's decision to purchase it	81 (9.08)	132 (14.6)	693 (76.5)
It is preferable to raise the awareness of the local community about the presence of halal pharmaceutical products	10 (1.1)	37 (4.1)	858 (94.8)
It is preferable for healthcare providers to inform patients about non-halal ingredients in a pharmaceutical product based on the patients' religious beliefs	9 (1.0)	59 (6.5)	835 (92.4)
It is preferable to activate the role of the Fatwa Department in educating the local community about the existence of fatwas related to halal and non-halal pharmaceutical preparations.	12 (1.3)	45 (5.0)	840 (93.6)
It is preferable to intensify the efforts of the pharmaceutical industry to supply the pharmaceutical market with halal alternatives	7 (0.7)	50 (5.6)	838 (93.6)
It is preferable for pharmaceutical companies to provide healthcare providers with a list showing the animal source used in their products	8 (0.9)	49 (5.5)	839 (93.6)

Note: # There were some missing data.

**Table 4. Participants' practice regarding halal pharmaceuticals. (N = 914) #.**

Variable	N (%)		
	Never/rarely	Sometimes	Always/Mostly
I am fully aware of the concept of halal pharmaceuticals	234 (25.7)	194 (21.3)	484 (53.1)
I prefer to buy halal pharmaceuticals	39 (4.3)	59 (6.5)	815 (89.2)
I inquire from the specialist doctor about non-halal ingredients before using the prescription	444 (48.8)	183 (20.2)	280 (30.9)
I check with my pharmacist about non-halal ingredients before buying a prescription	451 (63.7)	167 (18.4)	291 (32.0)
I am reassured if the pharmacist changes the prescription to give me a halal pharmaceutical alternative	117 (12.9)	99 (10.9)	692 (75.8)
I am looking for information on the sources of ingredients for the pharmaceuticals I use	297 (33.0)	186 (20.6)	418 (46.4)
I will buy a halal pharmaceutical when it is available, regardless of its cost	60 (6.7)	106 (11.8)	735 (81.5)
I like and prefer to see the "halal" logo clearly on the pharmaceutical product that I would like to buy	29 (3.3)	44 (4.9)	824 (91.9)
I will be more reassured when using a halal pharmaceutical compared to a non-halal one	19 (2.1)	47 (5.2)	832 (92.6)

Note: # There were some missing data.

**Table 5. Factors affecting KAP score regarding halal pharmaceuticals. (N = 914) #.**

Variable	Knowledge Score		Practice Score		Attitude Score	
	Mean ± SD	p-value	-	p-value	-	p-value
<b>Gender</b>		-		-		-
Male	47.36 ±18.73	<b>0.012*</b>	74.89±13.60	<b>0.013*</b>	90.75±10.30	<b>&lt;0.001*</b>
Female	50.91±20.24		77.65±15.00		95.33±11.10	
<b>Nationality</b>		-		-		-
Jordanian	49.14± 19.77	<b>&lt;0.001*</b>	76.73±14.49	0.253*	93.97±10.48	0.739*
Non-Jordanian	57.65± 19.40		78.68±13.30		94.38± 8.99	
<b>Age group (years)</b>		-		-		-
18-30	50.79±19.66	0.155*	77.56±13.98	0.126*	94.87±8.20	<b>0.011*</b>
31 or more	48.89±20.08		76.06±14.94		93.07±12.23	
<b>Smoking status</b>		-		-		-
Smoker	44.46±18.36	<b>&lt;0.001*</b>	74.40±15.10	<b>&lt;0.001*</b>	91.45±12.93	<b>&lt;0.001*</b>
Non-smoker	51.50±20.03		77.58±14.19		94.77±9.33	

(Table 5) contd.....

Variable	Knowledge Score		Practice Score		Attitude Score	
	Mean ± SD	p-value	-	p-value	-	p-value
<b>Education level</b>						
Bachelors	49.79 ±19.43	<b>&lt;0.001\$</b>	77.14±14.23	<b>0.002\$</b>	94.71±9.4	<b>&lt;0.001\$</b>
Master	50.07±20.30		76.18±15.23		94.07±9.61	
Diploma	50.05±21.79		79.24±13.52		93.49±12.55	
High school or less	43.08±16.08		70.88±15.75		88.50±14.98	
PhD	61.25±21.51		76.86±14.46		94.49±7.85	
<b>Specialization</b>						
Medical specialist	59.56± 20.59	<b>&lt;0.001\$</b>	79.26±13.84	<b>&lt;0.001\$</b>	92.74±10.64	<b>&lt;0.001\$</b>
Otherwise	44.20± 18.77		73.91±15.96		92.75±12.46	
Islamic law	53.90±15.67		80.84±12.21		97.64±4.55	
Art	46.80±17.36		77.11±13.34		95.20±7.06	
Science	46.32±18.99		76.72±14.16		95.67±8.23	
Engineering	41.31±15.79		73.82±13.24		94.05±11.80	
Computer sciences	39.73±19.75		72.90±14.46		93.39±10.91	
<b>Job status</b>						
Student	52.22±19.21	<b>&lt;0.001\$</b>	77.58±13.33	0.112\$	95.62±6.88	<b>0.004\$</b>
An employee in a non-medical sector	44.47±18.28		74.62±15.52		94.13±10.97	
Non-working	48.10±18.29		77.29±13.91		94.09±10.55	
Health employee	56.53±21.88		79.04±13.71		91.60±11.58	
Freelance	48.76±21.67		74.27±16.10		92.29±12.10	
University academic	52.43±20.54		77.97±12.79		95.31±8.72	
Retired	48.06±21.27		77.26±18.48		90.74±16.44	

Note: # There were some missing data.

\* p-values were calculated using an independent sample t-test.

\$ p-values were calculated using the ANOVA test.

**Table 6. Correlations of knowledge, attitudes and practice with total KAP score. (N = 914).**

Variable	Total N= 914	Pearson Correlation Coefficient (r)	p-value*
Average Knowledge Score (100%)	49.8 ± 19.4	0.870	<0.001
Average Attitude Score (100%)	94.71 ± 9.4	0.527	<0.001
Average Practice Score (100%)	77.1±14.2	0.678	<0.001

Note: \* A p-value of less than 0.05 indicates statistical significance, calculated by Pearson Correlation Coefficient (r).

Factors influencing knowledge, attitudes, and practices and overall KAP scores among participants are presented in Table 5. Females exhibited a significantly higher mean knowledge score compared to males (p-value=0.012). There was also a significant influence of education level on the mean knowledge score (p-value of < 0.001), where PhD holders obtained the highest knowledge score among other education levels. Participants from medical sectors obtained the highest score significantly, followed by Islamic law (Sharia) specialists (p < 0.001). Participants' attitudes towards halal pharmaceuticals were notably influenced by gender, with females demonstrating a significantly more positive attitude compared to males (p < 0.001). The age group played a significant role in attitudes, where those in the younger age group had higher mean attitude scores compared with older ones. The education level was found to play a significant role in shaping attitudes, with Bachelor's degree holders exhibiting the highest mean attitude score among all education levels (p < 0.001).

These findings emphasize the importance of gender, age group, education level, smoking status, specialization, and job status in influencing participants' attitudes toward halal pharmaceuticals. The practices related to halal pharmaceuticals were significantly influenced by various factors. Gender played a crucial role, with females exhibiting higher mean practice scores compared to males (p = 0.013). Additionally, education level also had a significant impact, with participants holding a diploma degree showing the highest mean practice score among all education levels (p < 0.001). Furthermore, participants from Islamic law reported the highest mean practice score among all specializations (p < 0.001). These results underscore the multifaceted influences of gender, smoking status, education level, and specialization on participants' practices concerning halal pharmaceuticals.

Correlations of knowledge, attitudes, and practice with total KAP scores are presented in Table 6. The findings underscore strong positive correlations between



knowledge, attitudes, and practices with KAP scores, revealing significant associations that shed light on the participants' overall engagement with the subject matter. Notably, the total KAP score demonstrated a robust correlation of 0.870 ( $p < 0.001$ ) with knowledge. Attitude scores also displayed a noteworthy correlation of 0.527 ( $p < 0.001$ ) with the total KAP score. Furthermore, the practice score exhibited a correlation of 0.678 ( $p < 0.001$ ) with the overall KAP score.

#### 4. DISCUSSION

Halal pharmaceuticals, rooted in Islamic principles, hold significant importance within Muslim communities worldwide, aligning with religious beliefs and influencing attitudes and practices concerning healthcare. In this study, we aimed to evaluate the knowledge, attitude, and practices of Jordanian society towards halal pharmaceutical products through an observational cross-sectional survey involving 914 participants.

The study encompassed a wide variety of demographic segments, reflective of the public in Jordan, shedding light on the relevance of halal pharmaceuticals in this setting. The predominance of Jordanian participants is an important aspect, spotlighting the local nuances and underlining the cultural and religious importance of halal pharmaceuticals in Jordan [14]. The notable majority of non-smokers in the study might suggest a correlation with adherence to halal standards, which typically discourage smoking and other harmful practices [15]. Moreover, the substantial number of Muslim participants underscores the role of halal pharmaceuticals in Islamic culture, pointing to the strong interplay between faith-based practices and the adoption of such products [16]. In terms of specialization backgrounds, the highest specialization participants were from the pharmacy field, which directly aligned with the research's emphasis on pharmaceuticals [17].

The findings of this study offer valuable insights into the knowledge levels and awareness of Jordanian society regarding halal pharmaceuticals. The average knowledge score indicates a moderate understanding of halal pharmaceutical concepts among the Jordanian public, which directly relates to our study objective of assessing the general awareness of halal pharmaceuticals. A significant proportion of respondents, 60.4% and 64.2%, were unfamiliar with the terms "halal pharmaceuticals" and "non-halal pharmaceuticals," respectively, indicating a clear lack of awareness among the surveyed population. This lack of awareness underscores the need for better education and information about halal pharmaceuticals. Our findings contrast with the findings from a study conducted by Jaber *et al.*, which assessed the knowledge, attitude, and perception of healthcare providers regarding halal pharmaceuticals. Their study revealed that the majority of participants exhibited a very good level of awareness regarding the term "halal pharmaceuticals" (66.6%) [18]. This difference in results can be attributed to the different study populations, *i.e.*, our study focused on the general public, while the study by Jaber *et al.* was

conducted on healthcare providers.

Furthermore, in this study, the prevalent uncertainty (66.2%) regarding the presence of non-halal ingredients in pharmaceutical compositions highlights the need for enhanced education and awareness campaigns. This directly links to the study objective of evaluating the knowledge of Jordanian society about halal pharmaceuticals, as the uncertainty reflects gaps in public understanding. Interestingly, while a considerable proportion (53.9%) recognized the prohibition of certain substances like derivatives of dead animals and alcohol in pharmaceuticals, there remains a lack of understanding regarding specific non-halal ingredients (66.2%). This discrepancy highlights a potential gap between general knowledge and specific pharmaceutical-related awareness [4]. Moreover, the findings regarding gelatin source awareness (68.9%) and the understanding of alcohol content in elixirs (80%) revealed significant misconceptions that could impact healthcare decision-making [19]. These results highlight a critical link between knowledge gaps and potential consequences for healthcare choices, which ties back to our study's broader objective of assessing how knowledge affects practices and decision-making in relation to halal pharmaceuticals. In contrast to our results, SADEEQA *et al.* reported that 94.2% of their study participants, who were doctors working in hospitals, had the knowledge that dead animals, blood, pork, and alcohol are prohibited for Muslims to use in any form (food, medication, *etc.*) [20]. This emphasizes the need for targeted educational efforts to address misconceptions and promote informed decision-making among the general public. Additionally, the lack of awareness (60%) regarding the Jordanian Iftaa Department's stance on permissible pharmaceutical ingredients [21] further underscores the need for clearer communication channels between religious authorities and healthcare practitioners. This finding highlights the objective of understanding how religious guidelines influence public knowledge and practices related to halal pharmaceuticals and indicates the importance of improving communication between religious bodies and the healthcare system.

The frequency of responses regarding reliable sources for issuing fatwas and inquiries about halal medicines highlights a preference for established institutions, notably "The Jordanian Fatwa Academy," and online resources, such as "Websites." This preference for authoritative bodies and digital platforms aligns with findings from studies by Alahmad *et al.* and Rahman *et al.*, which emphasize the importance of reputable sources for religious guidance and information dissemination within Muslim communities [22, 23]. Moreover, the preference for online platforms and trusted websites highlights the increasing influence of digital resources in disseminating information and shaping consumer behavior, particularly among the younger demographic [24]. This trend emphasizes the need for accessible, reliable online resources [25] tailored to address inquiries about halal pharmaceuticals, catering to the changing information-

seeking behaviors of the population.

Furthermore, the emphasis on consulting pharmacists when individuals have questions about non-halal pharmaceuticals underscores the key role of pharmacists as trusted healthcare providers. This finding resonates with some research studies that highlight the pharmacist's role as a key source of healthcare information and guidance [13, 26, 27]. Pharmacists, being readily available in community pharmacies and often serving as the first point of contact for individuals seeking healthcare advice, naturally emerge as trusted sources of information regarding pharmaceutical products. Their specialized training allows them to address a wide range of medication-related concerns, including queries about the halal status of pharmaceuticals. Overall, these insights shed light on the importance of established institutions and healthcare professionals in facilitating informed decision-making regarding halal and non-halal pharmaceuticals within Jordanian society. Conversely, while responses indicating consultation with doctors garnered a moderate frequency, they were notably surpassed by those favoring pharmacists. This discrepancy underscores our study's focus on the perceived roles of healthcare providers, specifically pointing to the difference in expertise between doctors and pharmacists regarding medication-related issues. Unlike pharmacists, who specialize in medication management and have comprehensive knowledge of pharmaceutical products, doctors may be seen as focusing more on diagnosis and treatment, which could explain the preference for consulting pharmacists for medication-related concerns [28, 29]. Moreover, the relatively lower frequencies of responses indicating consultation with nurses, nutrition specialists, and university professors of health specialization highlight a clear hierarchy in the perceived authority and relevance of healthcare providers in the domain of pharmaceutical inquiries. While nurses and nutrition specialists undoubtedly contribute valuable insights within their respective fields, their roles may not be as directly associated with medication-related inquiries, thus resulting in diminished consultation frequencies in this context [30-32].

The attitudes revealed by this study regarding halal pharmaceuticals offer crucial insights into the intersection of religious beliefs, healthcare practices, and consumer preferences. Firstly, the overwhelming agreement (>90%) on the patient's right to request information about the sources of pharmaceutical ingredients highlights the importance of transparency and informed decision-making in healthcare. This result aligns with the principles of autonomy and patient-centered care, which were central to our study's objective of evaluating attitudes towards halal pharmaceuticals and emphasizes the necessity of respecting patients' rights to make choices that align with their religious beliefs [33-35]. Similarly, the strong consensus (>90%) in favor of distinguishing halal pharmaceutical preparations with a clear logo reflects a proactive approach toward facilitating consumer choices and promoting halal-certified products in the market [36].

This supports the study's broader aim of exploring consumer preferences, emphasizing the demand for visible indicators of halal authenticity, which can bolster consumer trust in pharmaceutical products [37]. Moreover, the emphasis on considering patients' religious beliefs in selecting pharmaceutical preparations (90%) further emphasizes the importance of cultural competence and sensitivity in healthcare delivery [38]. These insights shed light on the critical role of healthcare professionals in fostering trust and improving patient satisfaction by acknowledging and accommodating religious perspectives, which aligns with the broader objective of understanding the knowledge and practices surrounding halal pharmaceuticals. By acknowledging and accommodating patients' religious perspectives, healthcare providers can foster trust and rapport with their patients, ultimately improving patient satisfaction and adherence to treatment regimens [39].

The notable finding that the price of halal pharmaceutical products does not significantly influence patients' purchasing decisions (76.5%) highlights a strong willingness among consumers to prioritize religious adherence over cost considerations. This emphasizes the perceived value and importance of halal-certified products within the Jordanian context, reflecting a deep commitment to religious principles in healthcare decision-making. Such insights are aligned with the broader aim of understanding how religious beliefs influence consumer choices in the realm of healthcare. Our results contrast with those reported in the study by Sadeeqa *et al.* on the general public in Malaysia, where 60.4% agreed that if people are provided with relatively more expensive halal pharmaceutical alternatives, the majority will be reluctant to use the halal ones [13].

Furthermore, the overwhelming agreement (>90%) on the importance of raising awareness in the local community about the availability of halal pharmaceutical products emphasizes the need for comprehensive educational initiatives targeting both healthcare providers and the wider community. By empowering pharmacists to serve as educators through conferences, lectures, campaigns, trusted websites [25], and informative materials, stakeholders can enhance public awareness and understanding of halal pharmaceuticals, thereby fostering informed consumer choices and promoting health equity [14].

Our findings also highlight the crucial role of the Jordanian Fatwa Department in disseminating guidance and education on matters related to halal and non-halal pharmaceutical preparations (93.6%). The call for increased involvement of the Jordanian Fatwa Department reflects the demand for authoritative religious guidance and the need to bridge the gap between religious rulings and healthcare practices [40]. Efforts to enhance collaboration between healthcare providers and religious authorities can facilitate the dissemination of accurate information and promote compliance with religious principles in healthcare settings. Additionally, the overwhelming support (>90%) for intensifying efforts to

supply the pharmaceutical market with halal alternatives underscores the growing demand for halal-certified products and the need for industry responsiveness to consumer preferences. These findings further demonstrate the study's aim of assessing consumer attitudes towards halal pharmaceuticals, revealing a clear demand for halal alternatives in the market. By prioritizing the development and availability of halal alternatives, pharmaceutical companies can meet the needs of diverse consumer segments and contribute to greater inclusivity in healthcare delivery [41]. Thus, moving forward, efforts to promote transparency, enhance consumer education, and foster collaboration between healthcare providers and religious authorities can further advance the accessibility and uptake of halal pharmaceutical products, ultimately contributing to improved health outcomes and patient satisfaction within the Jordanian context.

The investigation of participants' practices regarding halal pharmaceuticals revealed a high preference (>90%) for purchasing halal pharmaceuticals among participants, which directly links to our study's objective of assessing consumer behaviors and their alignment with religious beliefs. This finding is consistent with previous responses, where 76.5% of participants indicated they were willing to pay for halal alternatives. This further emphasizes the perceived value and importance attached to religious compliance in pharmaceutical choices. This willingness to invest in halal-certified products signifies the depth of commitment to religious principles among consumers, transcending mere cost considerations. However, the finding that 48% of participants rarely inquired from specialist doctors about non-halal ingredients before using a prescription suggests a potential gap in patient-provider communication and awareness regarding the composition of pharmaceutical products. These insights reflect our objective of exploring the practices and behaviors of consumers, showing a need for improved information-seeking behaviors and communication with healthcare professionals. Similarly, the observation that two-thirds of participants rarely checked with pharmacists about non-halal ingredients before purchasing prescriptions highlights a need for greater proactive engagement and information-seeking behavior among consumers. On the other hand, Sadeeqa *et al.* reported that 30.9% disagreed with talking to the doctor about the sources of ingredients of medicine before accepting the prescription [13].

The significant proportion (almost 75%) of participants expressing reassurance when pharmacists offer halal alternatives further reinforces the previous responses from our participants regarding the role of pharmacists as trusted advisors capable of guiding patients toward halal-certified options. This, in turn, enhances patient satisfaction and adherence to religious principles. On the other hand, the strong inclination (>90%) towards seeing a clear "Halal" logo on pharmaceutical products reflects a desire for transparency and authenticity in product labeling, facilitating informed decision-making and consumer choice [36]. A comparison with international trends, such as those observed in South Korea, where a

study found high levels of consumer awareness and comprehension of product labeling, including food products, underscores the global importance of clear labeling in enhancing consumer trust. The Korean study also highlighted how labeling influences purchasing decisions and consumer behavior, providing insight into how different cultural contexts approach product labeling and awareness [42]. This also confirms the earlier strong agreement from our participants on their preference for distinguishing halal pharmaceutical preparations with a special and clear logo.

The comprehensive analysis of factors influencing participants' knowledge, attitudes, and practices regarding halal pharmaceuticals revealed intriguing insights into the complex interplay of demographic variables, professional backgrounds, and lifestyle factors on KAP scores.

Starting with knowledge scores, the observed gender disparity, with females exhibiting significantly higher mean K scores compared to males, highlights the influence of gender on knowledge acquisition and retention regarding halal pharmaceuticals. This finding resonates with previous research highlighting variations in health-related knowledge across gender lines, suggesting the need for targeted educational interventions tailored to specific demographic groups to address knowledge gaps effectively [43-45]. Furthermore, the significant impact of education level on knowledge scores, with PhD holders obtaining the highest mean K score among all education levels, underscores the positive association between higher educational attainment and knowledge acquisition in healthcare domains. This finding aligns with the broader literature emphasizing the role of education as a determinant of health literacy and underscores the importance of promoting educational opportunities for healthcare professionals and the general populace alike [46-48]. Similarly, the effect of specialization and job status on knowledge scores highlights the nuanced influences of professional background and expertise on participants' understanding of halal pharmaceuticals. Participants from medical sectors and Islamic law specialties and health exhibited notably higher mean knowledge scores, underlining the importance of disciplinary knowledge and expertise in shaping perceptions and practices related to healthcare products within specific professional domains. A similar result was reported by Sadeeqa *et al.* in their study evaluating the knowledge, attitude, and perception regarding halal pharmaceuticals among general medical practitioners in Malaysia [49].

Turning to attitudes towards halal pharmaceuticals, the observed gender differences, with females demonstrating significantly more positive attitudes compared to males, suggest the presence of gender-specific beliefs and preferences influencing consumer perceptions of halal-certified products [50, 51]. Additionally, the significant influence of age group on attitudes, with younger participants exhibiting more favorable attitudes compared to older individuals, reflects



generational differences in healthcare preferences and perceptions [52, 53]. This draws attention to the importance of tailoring healthcare interventions and messaging to address the unique needs and preferences of different gender and age cohorts within the target population. The impact of education level and specialization on attitudes further underscores the role of professional background and expertise in shaping perceptions and attitudes toward halal pharmaceuticals. Participants with higher educational attainment and those specializing in Islamic law demonstrated more favorable attitudes, underscoring the importance of disciplinary knowledge and religious orientation in shaping consumer preferences and beliefs regarding healthcare products [12, 48].

Finally, regarding practices related to halal pharmaceuticals, the observed gender disparity, with females exhibiting higher mean practice scores compared to males, suggests variations in adherence to halal practices across genders. This signifies the importance of understanding gender-specific barriers and facilitators to adopting halal pharmaceutical practices and developing targeted interventions to promote adherence among both male and female populations. Similarly, the significant influence of smoking status, education level, and specialization on practices highlights the multifaceted determinants of behavior change and adherence to halal pharmaceutical practices. Non-smokers, participants holding diploma degrees, and those who specialized in Islamic law demonstrated better adherence to halal practices, highlighting the importance of addressing lifestyle factors and educational barriers in promoting behavior change within the target population [12, 46, 54].

By identifying key determinants of KAP scores, valuable insights can be obtained for healthcare policymakers and practitioners seeking to develop targeted interventions to promote the acceptance and adoption of halal-certified products within diverse communities.

The analysis of correlations between knowledge, attitudes, practices (KAP), and total KAP score unveils significant associations that offer valuable insights into participants' overall engagement and understanding of halal pharmaceuticals. Beginning with the strong positive correlation between knowledge and total KAP score (0.870,  $p < 0.001$ ), the findings underscore the key role of knowledge acquisition and understanding in shaping participants' overall engagement with halal pharmaceuticals. This association suggests that individuals with higher levels of knowledge regarding halal pharmaceuticals are more likely to exhibit positive attitudes and practices towards these products, highlighting the importance of educational interventions and knowledge dissemination initiatives in promoting informed decision-making and behavior change among consumers [55]. Similarly, the noteworthy correlation between attitude scores and total KAP score (0.527,  $p < 0.001$ ) accentuates the influence of attitudes and perceptions on participants' overall engagement with halal

pharmaceuticals. This finding suggests that individuals with more favorable attitudes towards halal-certified products are more likely to demonstrate higher levels of knowledge and engage in practices aligned with halal principles, emphasizing the interconnectedness of cognitive, affective, and behavioral dimensions in shaping consumer behavior and healthcare outcomes [4]. Finally, the strong correlation between practice scores and total KAP scores (0.678,  $p < 0.001$ ) highlights the importance of translating knowledge and attitudes into tangible behaviors and actions in healthcare decision-making. Individuals who exhibit higher levels of knowledge and positive attitudes towards halal pharmaceuticals are more likely to engage in practices that reflect religious adherence and dietary preferences, highlighting the importance of addressing both cognitive and behavioral factors in promoting health-related practices within diverse communities [4].

Overall, the correlations of knowledge, attitudes, and practice with total KAP scores in our study highlight the multidimensional nature of participants' engagement with halal pharmaceuticals, highlighting the interconnectedness of knowledge, attitudes, and practices in shaping healthcare behaviors and outcomes. By elucidating the relationships between these variables, our study provides valuable insights for healthcare policymakers and practitioners seeking to develop targeted interventions and educational programs aimed at promoting informed decision-making, fostering positive attitudes, and encouraging adherence to halal practices among consumers.

## 5. STRENGTHS AND LIMITATIONS

This study exhibits several strengths, including a large sample size of 914 participants, which enhances its reliability and representativeness of the broader Jordanian society. The inclusion criteria were designed to capture a diverse demographic, providing a comprehensive understanding of the population's perspectives. The questionnaire was developed through a rigorous process involving a literature review and content validity testing, ensuring its effectiveness in capturing relevant data on knowledge, attitudes, and practices regarding halal pharmaceuticals. The study's anonymity and voluntary participation likely encouraged honest responses. However, there are notable limitations. The use of social media and WhatsApp for participant recruitment may have introduced selection bias, as those who chose to participate might have had a particular interest in halal pharmaceuticals. Additionally, the self-reported nature of the data collection raises concerns about social desirability bias, which could distort the findings. The reliance on online surveys also limited participation to individuals with internet access, excluding groups, such as older or lower socio-economic individuals, which further restricts the generalizability of the findings. While the cross-sectional design provides valuable data on the prevalence and correlations within the population, it limits the ability to establish causality or track changes over

time. The focus on Jordanian society also limits the applicability of the findings to other cultural or regional contexts. Future studies could address these limitations by using more diverse sampling methods, such as face-to-face interviews, and exploring mixed-methods designs to reduce biases and increase the depth of understanding.

## CONCLUSION

In conclusion, the study results revealed a moderate level of understanding among participants regarding halal and non-halal pharmaceuticals. While a considerable portion lacked familiarity with halal pharmaceutical terminology, awareness regarding non-halal components in medications was notable. Preferences for halal pharmaceuticals were evident, with participants expressing a strong inclination towards purchasing them despite cost considerations. Additionally, the study highlighted the significant role of pharmacists as trusted sources of information on non-halal pharmaceuticals. Factors, such as gender, age group, smoking status, education level, specialization, and job status, were found to influence participants' knowledge, attitudes, and practices concerning halal pharmaceuticals. These findings highlighted the critical need for enhanced educational initiatives to bridge these gaps, ensuring that healthcare professionals and the public are well-informed about halal pharmaceuticals. Emphasizing the cultural and religious importance of halal certification, the research advocates for stronger collaboration between healthcare providers, pharmaceutical companies, and religious authorities to facilitate the availability and identification of halal pharmaceutical options. It is recommended that public health campaigns be launched to raise awareness about halal pharmaceuticals, incorporating both general public education and professional training programs for healthcare workers. Such campaigns could be implemented through media channels, community outreach, and integration into school curricula. Furthermore, healthcare providers should collaborate more closely with religious authorities to ensure that halal certification processes are clear and accessible, enhancing consumer confidence in the products. Ultimately, this collaborative effort aims to respect and cater to the religious beliefs of patients, promoting informed healthcare decisions and fostering a more inclusive healthcare environment.

## AUTHORS' CONTRIBUTION

D.J. and A.Z.A.: Conceptualization; D.J. and N.S.: Methodology; N.S.: Software; D.J., N.S., and S.A.: Validation; D.J. and N.S.: Formal analysis; D.J., N.S., A.Z.A., and S.A.: Investigation; N.S. and S.A.: Resources; N.S.: Data curation; D.J., N.S., A.E., and A.Q.: Writing the original draft preparation; D.J., N.S., S.A., A.E., and A.Q.: Writing the review and editing; D.J.: Visualization; D.J. and A.Z.A.: Supervision; D.J. and N.S.: Project administration; D.J. and A.Z.A.: Funding acquisition. All authors have read and agreed to the published version of the manuscript.

## LIST OF ABBREVIATIONS

KAP = Knowledge, Attitude, and Practices  
ANOVA = Analysis of Variance  
SPSS = Statistical Package for Social Sciences

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The approval was obtained under reference number 1/1/2019-2020 from both the Research Ethics Committee and the Clinical Pharmacy Department at Zarqa University, Jordan.

## HUMAN AND ANIMAL RIGHTS

All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

## CONSENT FOR PUBLICATION

Informed consent was obtained from all individual participants included in the study.

## STANDARDS OF REPORTING

STROBE guidelines were followed.

## AVAILABILITY OF DATA AND MATERIALS

This data is available from: [https://zenodo.org/records/14619732?preview=1&token=eyJhbGciOiJIUzUxMiJ9.eyJpZCI6IjBhOGMxN2QzLTE4ODItNGU4Mi1iOGZlLTRlOWI1MjdkNDc2NiIsImRhdGEiOiJ9LjYw5kb20iOiJjZTQ3MTQxNzgyYzNiOGI3YWWE3NjJiZjU3ZWZmZmI5NyJ9.WOp8o\\_OuBMzDBITzwTVTvhfy7vkqRmqp72OTp2YbZ2TMpVA77QoazZC6qFA5R9Yb34bJ-O2jybbm-e2jN3sTbg](https://zenodo.org/records/14619732?preview=1&token=eyJhbGciOiJIUzUxMiJ9.eyJpZCI6IjBhOGMxN2QzLTE4ODItNGU4Mi1iOGZlLTRlOWI1MjdkNDc2NiIsImRhdGEiOiJ9LjYw5kb20iOiJjZTQ3MTQxNzgyYzNiOGI3YWWE3NjJiZjU3ZWZmZmI5NyJ9.WOp8o_OuBMzDBITzwTVTvhfy7vkqRmqp72OTp2YbZ2TMpVA77QoazZC6qFA5R9Yb34bJ-O2jybbm-e2jN3sTbg).

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## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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## REFERENCES

- [1] Saha T, R.T., Shimanto S. Prospects of halal pharmaceuticals. *Asian J Ethnopharmacol Medi Foods* 2019; 5(2): 17-23.
- [2] The Noble Quran Karim 2024. Available from: <https://alqurankarim.net/>
- [3] Sahih al-Bukhari. 2024. Available from: <https://sunnah.com/bukhari>
- [4] Herdiana Y, Sofian FF, Shamsuddin S, Rusdiana T. Towards halal pharmaceutical: Exploring alternatives to animal-based ingredients. *Heliyon* 2024; 10(1): e23624. <http://dx.doi.org/10.1016/j.heliyon.2023.e23624> PMID: 38187251
- [5] Izhar Ariff Mohd Kashim M, Abdul Haris AA, Abd Mutalib S, Anuar N, Shahimi S. Scientific and Islamic perspectives in relation to the Halal status of cultured meat. *Saudi J Biol Sci* 2023; 30(1): 103501. <http://dx.doi.org/10.1016/j.sjbs.2022.103501> PMID: 36466219
- [6] Sugibayashi K, Yusuf E, Todo H, *et al.* Halal cosmetics: A review on ingredients, production, and testing methods. *Cosmetics* 2019; 6(3): 37. <http://dx.doi.org/10.3390/cosmetics6030037>
- [7] Norazmi MN, Lim LS. Halal pharmaceutical industry:



- Opportunities and challenges. *Trends Pharmacol Sci* 2015; 36(8): 496-7.  
<http://dx.doi.org/10.1016/j.tips.2015.06.006> PMID: 26187623
- [8] Urias E. The Contribution of the Pharmaceutical Industry to the Health Status of the Developing World. *International Business & Management*. Emerald Publishing Limited 2017; pp. 41-67.  
<http://dx.doi.org/10.1108/S1876-066X20170000033003>
- [9] Attum B, HS, Malik A, et al. Cultural competence in the care of muslim patients and their families. *StatPearls*. Treasure Island (FL): StatPearls Publishing 2023.  
 PMID: 29763108
- [10] Alzeer J. Halalopathy: Integrating Halal Pharmaceuticals for Holistic Healing. *International Halal Science Conference 2023*. Malaysia, 2023, pp. 1-6.
- [11] Robbins M, Rubin L. The rise of official islam in Jordan. *Polit Reli Ideol* 2013; 14(1): 59-74.  
<http://dx.doi.org/10.1080/21567689.2012.752359>
- [12] Eid AM, Zaid AN, Kielani JZ. Knowledge, perceptions and attitudes among sharia practitioners in palestine regarding halal pharmaceuticals: an exploratory study. *J Relig Health* 2022; 63(6): 4342-53.  
<http://dx.doi.org/10.1007/s10943-022-01604-7> PMID: 35752727
- [13] Sadeeqa S, A.S., Masood I, Saleem F, Atif M. Knowledge, attitude and perception regrading halal pharmaceuticals among general public in Malaysia. *Int J Publ Heal Sci* 2013; 2(4): 143-50.
- [14] Alserhan BA, Bayirli M, Zakzouk F. Awareness towards Halal pharmaceuticals: An analysis of pharmacists' views. *Int J Islam Mark Brand* 2020; 5(1): 43-57.  
<http://dx.doi.org/10.1504/IJIMB.2020.109065>
- [15] American Halal Foundation AHF Halal Standards 2024. Available from: <https://halalfoundation.org/ahf-halal-standards/>
- [16] Al-Kwif OS, Abu Farha A, Ahmed ZU. Dynamics of Muslim consumers' behavior toward Halal products. *Int J Emerg Mark* 2019; 14(4): 689-708.  
<http://dx.doi.org/10.1108/IJOEM-11-2017-0486>
- [17] Hepler CD. Clinical pharmacy, pharmaceutical care, and the quality of drug therapy. *Pharmacotherapy* 2004; 24(11): 1491-8.  
<http://dx.doi.org/10.1592/phco.24.16.1491.50950> PMID: 15537552
- [18] Jaber D, H.H., Alkaderi A, Alkilani A, El-Sharif A. Assessment of the knowledge, attitude, and perception of healthcare providers regarding halal pharmaceuticals. *Open Public Health J* 2024; 1: 17.
- [19] Labrude P. The elixir of doctor Garrus. Drug or liquor? Original formula or imitation?. *Bull Cercle Benelux Hist Pharm* 2010; (118): 14-31.  
 PMID: 20527158
- [20] Sadeeqa S, Sarriff A, Masood I, Atif M, Farooqui M. Kap among doctors working in hospitals, regarding halal pharmaceuticals; a cross sectional assessment. *Acta Pol Pharm* 2015; 72(3): 615-24.  
 PMID: 26642670
- [21] Jordanian General Fatwa Department. 2024. Available from: <https://www.aliftaa.jo/SearchEn.aspx>
- [22] Alahmad G, Dierickx K. What do Islamic institutional fatwas say about medical and research confidentiality and breach of confidentiality? *Developing World Bioeth* 2012; 12(2): 104-12.  
<http://dx.doi.org/10.1111/j.1471-8847.2012.00329.x> PMID: 22702346
- [23] Rahman S. Religion and animal welfare: an islamic perspective. *Animals* 2017; 7(2): 11.  
<http://dx.doi.org/10.3390/ani7020011> PMID: 28218670
- [24] Evans WD, Abroms LC, Broniatowski D, et al. Digital media for behavior change: review of an emerging field of study. *Int J Environ Res Public Health* 2022; 19(15): 9129.  
<http://dx.doi.org/10.3390/ijerph19159129> PMID: 35897494
- [25] Pharma H. Halal Pharmaceuticals 2024. Available from: <http://halalpharma.rf.gd/>
- [26] Chiba T, Kobayashi E, Nishijima C, Sato Y. Consulting pharmacists who have advisory staff license regarding the use of medicines and health foods. *Yakugaku Zasshi* 2020; 140(5): 723-8.  
<http://dx.doi.org/10.1248/yakushi.19-00256> PMID: 32378676
- [27] Wahab MSA, Jalani MM, Goh KW, Ming LC, Faller EM. Why did i consult my pharmacist about herbal and dietary supplements? an online survey amid the covid-19 pandemic in Malaysia. *Int J Environ Res Public Health* 2022; 19(17): 10994.  
<http://dx.doi.org/10.3390/ijerph191710994> PMID: 36078707
- [28] Kelly DV, Young S, Phillips L, Clark D. Patient attitudes regarding the role of the pharmacist and interest in expanded pharmacist services. *Can Pharm J* 2014; 147(4): 239-47.  
<http://dx.doi.org/10.1177/1715163514535731> PMID: 25360150
- [29] Mamiya KT, Hirata K. Physicians' and nurses' perceptions of pharmacists' competencies, and their needs of pharmacists during COVID-19. *Pharmacy* 2022; 10(3): 64.  
<http://dx.doi.org/10.3390/pharmacy10030064> PMID: 35736779
- [30] Kennedy BM, Rehman M, Johnson WD, Magee MB, Leonard R, Katzmarzyk PT. Healthcare providers versus patients' understanding of health beliefs and values. *Patient Exp J* 2017; 4(3): 29-37.  
<http://dx.doi.org/10.35680/2372-0247.1237> PMID: 29308429
- [31] Nilsen P, Seing I, Ericsson C, Birken SA, Schildmeijer K. Characteristics of successful changes in health care organizations: An interview study with physicians, registered nurses and assistant nurses. *BMC Health Serv Res* 2020; 20(1): 147.  
<http://dx.doi.org/10.1186/s12913-020-4999-8> PMID: 32106847
- [32] Pitsillidou M, Roupa Z, Farmakas A, Noula M. Factors affecting the application and implementation of evidence-based practice in nursing. *Acta Inform Med* 2021; 29(4): 281-7.  
<http://dx.doi.org/10.5455/aim.2021.29.281-287> PMID: 35197664
- [33] Cook T, Mavroudis CD, Jacobs JP, Mavroudis C. Respect for patient autonomy as a medical virtue. *Cardiol Young* 2015; 25(8): 1615-20.  
<http://dx.doi.org/10.1017/S1047951115002097> PMID: 26675613
- [34] Entwistle VA, Carter SM, Cribb A, McCaffery K. Supporting patient autonomy: The importance of clinician-patient relationships. *J Gen Intern Med* 2010; 25(7): 741-5.  
<http://dx.doi.org/10.1007/s11606-010-1292-2> PMID: 20213206
- [35] Varkey B. Principles of clinical ethics and their application to practice. *Med Princ Pract* 2021; 30(1): 17-28.  
<http://dx.doi.org/10.1159/000509119> PMID: 32498071
- [36] Caraele AJB, Raopan M R D. The influence of halal logo on the purchasing behavior of muslim filipinos: a structural equation modelling. *Adv Int J Busi Entrepreneur SMEs* 2024; 6(19): 01-13.  
<http://dx.doi.org/10.35631/AIJBES.619001>
- [37] Isa RM, Man S, Rahman NNA, Aziz A. Determinants of consumer adoption of halal cosmetics: A systematic literature review. *J Cosmet Dermatol* 2023; 22(3): 752-62.  
<http://dx.doi.org/10.1111/jocd.15486> PMID: 36700377
- [38] Swihart DL, Yarrarapu SNS, Martin RL. Cultural Religious Competence in Clinical Practice. *StatPearls*. Treasure Island (FL): StatPearls Publishing 2023. Treasure Island (FL): StatPearls Publishing 2024.  
 PMID: 29630268
- [39] Benjamins MR. Religious influences on trust in physicians and the health care system. *Int J Psychiatry Med* 2006; 36(1): 69-83.  
<http://dx.doi.org/10.2190/EKJ2-BCCT-8LT4-K01W> PMID: 16927579
- [40] Deuraseh N, Raffi RM, Roslan A, Tektona RI. The pattern and trend of fatwa related to halal consumption law in negara brunei darussalam: analyzing historical data of previous fatwas issued. *Diponegoro Law Review* 2022; 7(1): 121-37.  
<http://dx.doi.org/10.14710/dilrev.7.1.2022.121-137>
- [41] Nasihah Naimat MSAM, Mahat IR. Challenges and opportunities in the halal pharmaceutical industry in malaysia. *Inform Manag Busi Rev* 2023; 15(4): 73-8.
- [42] Choi Y, Kim HJ, Park J, et al. National prevalence and trends in food labeling awareness, comprehension, usage, and COVID-19 pandemic-related factors in South Korea, 2014-2022. *Sci Rep* 2024; 14(1): 2617.  
<http://dx.doi.org/10.1038/s41598-024-51948-1> PMID: 38297021

- [43] Bidmon S, Terlutter R. Gender differences in searching for health information on the internet and the virtual patient-physician relationship in Germany: exploratory results on how men and women differ and why. *J Med Internet Res* 2015; 17(6): e156. <http://dx.doi.org/10.2196/jmir.4127> PMID: 26099325
- [44] Fagerli RA, Wandel M. Gender differences in opinions and practices with regard to a "healthy diet". *Appetite* 1999; 32(2): 171-90. <http://dx.doi.org/10.1006/appe.1998.0188> PMID: 10097024
- [45] Rehman R, Zafar A, Mohib A, Baig M. A gender-based comparison in health behaviors and state of happiness among university students. *Cureus* 2018; 10(3): e2342. <http://dx.doi.org/10.7759/cureus.2342> PMID: 29796354
- [46] Diaz-Quijano FA, Martínez-Vega RA, Rodríguez-Morales AJ, Rojas-Calero RA, Luna-González ML, Díaz-Quijano RG. Association between the level of education and knowledge, attitudes and practices regarding dengue in the Caribbean region of Colombia. *BMC Public Health* 2018; 18(1): 143. <http://dx.doi.org/10.1186/s12889-018-5055-z> PMID: 29338712
- [47] Noé A, Ribeiro RM, Anselmo R, *et al.* Knowledge, attitudes and practices regarding tuberculosis care among health workers in Southern Mozambique. *BMC Pulm Med* 2017; 17(1): 2. <http://dx.doi.org/10.1186/s12890-016-0344-8> PMID: 28056943
- [48] Simanjuntak MaD, Mardi Muhammad. The effects of knowledge, religiosity, value, and attitude on halal label reading behavior of undergraduate students. *Asean Marke J* 2021; 6(2): 65-76.
- [49] Saleha Sadeeqa AS, Masood I, Farooqi M, Atif M. Evaluation of knowledge, attitude, and perception regarding Halal pharmaceuticals, among general medical practitioners in Malaysia. *Arch Pharm Pract* 2013; 4(4): 139-46.
- [50] Shafariah H, Gofur A. Halal product awareness and trust from students perspectives: The role of gender. *Jurnal Manajemen Strategi dan Aplikasi Bisnis* 2024; 7(1): 1-12. <http://dx.doi.org/10.36407/jmsab.v7i1.1190>
- [51] Yusriyah Alfie Syarifah EBPP. Factors related to consumer preferences of halal certified restaurants (case study in fast food restaurant X). *J Halal Res, Poli Indus* 2022; 1(1): 1-7.
- [52] Bonilla K, Gaitan B, Sanders J, Khenglawt N, Martin-Hammond A. Comparing older and younger adults perceptions of voice and text-based search for consumer health information tasks. *AMIA Annu Symp Proc* 2022; 2021: 227-36. PMID: 35309005
- [53] Dougal S, Hargreaves SS, Viner RM. Do young and older adults have different health care priorities? evidence from a national survey of English inpatients. *J Adolesc Health* 2012; 51(5): 528-32. <http://dx.doi.org/10.1016/j.jadohealth.2012.05.016> PMID: 23084177
- [54] Hameed A, Jalil MA, Noreen R, Mughal I, Rauf S. Role of Islam in prevention of smoking. *J Ayub Med Coll Abbottabad* 2002; 14(1): 23-5. PMID: 12043328
- [55] Deema Jaber SAAT, Elsalem Lina, Alkilani Ahlam Zaid, *et al.* Knowledge, perception, and practice of health professions students and academics regarding halal pharmaceuticals: A cross-sectional study. *J Infrastruc Pol Develop* 2024; 8(7): 4296. <http://dx.doi.org/10.24294/jipd.v8i7.4296>