

Pharmacists' Awareness of E-Learning in Disseminating Pharmaceutical Knowledge Across the Arab World

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Abstract

This study aimed to assess the familiarity of pharmacy students and Arab pharmacists with e-learning as a means of transferring pharmaceutical information. It focused on their social media and internet usage, as well as the frequency of utilizing Web 2.0 tools in their everyday routines. The cross-sectional study surveyed 680 participants, predominantly aged 18-30 years, with a majority being females who had internet access. Most of the respondents (n = 491 (72.2%)) reported intermediate internet and computer skills, with most using the Internet for educational activities (n = 609 (89.6%)). Nearly all participants (n = 635 (93.4%)) accessed the internet every day, and over half (n = 360 (53.0%)) spent more than 2 hours daily using Web 2.0 tools and social media. However, more than half of the participants were unfamiliar with e-learning (n = 367 (54.0%)), and the majority had never participated in an online course (n = 484 (71.2%)). Despite this, nearly all participants expressed either high or intermediate confidence in e-learning (n = 669 (98.4%)), and the large majority felt confident in using Web 2.0 tools to aid interactive learning (n = 548 (80.6%) and n = 524 (77%), respectively). The findings of this study indicate strong potential for integrating web 2.0 tools and e-learning into pharmacy education.

Keywords: Arab world, EdTech, E-learning, Social media, Pharmacy education, Web 2.0

Introduction

Educational technologies (EdTech) are widely applied in medical education and pharmacy and around the world, facilitating interactive knowledge exchange between instructors and students. Numerous studies have demonstrated that e-learning plays a crucial role in

helping healthcare professionals remain informed about the latest advancements in healthcare [1-3]. Despite this, traditional teaching methods like in-person lectures and knowledge-based instruction continue to be prevalent in pharmacy education across many Arabic-speaking countries. However, innovative methods such as problem-based learning, computer-assisted learning, and self-directed learning are being implemented in nations such as Saudi Arabia, the United Arab Emirates, Kuwait, Jordan, Qatar, and Egypt [4-6]. In the West Bank, Palestine, telemedicine and videoconferencing have been successfully utilized among instructors and pharmacy students [7]. Regrettably, the adoption of e-learning and Web 2.0 tools in pharmacy education remains at an early

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stage in many ALSCs [8]. There is a gap in knowledge concerning internet access, usage patterns, and the level of familiarity among Arab pharmacy professionals and students with e-learning tools in both education and practice [9, 10]. The purpose of this study was to examine their awareness of these emerging technologies and assess how frequently they engage with social media and the internet, as well as their use of Web 2.0 tools in daily activities.

Materials and Methods

This research employed a cross-sectional design with a self-administered online survey. A convenience sampling approach was utilized to recruit participants via social media platforms. The inclusion criteria targeted undergraduate pharmacy students, recent pharmacy graduates, pharmacists working in hospitals and community pharmacies, as well as those employed in the pharmaceutical industry or holding administrative positions. Participants were either from Arab countries or residing outside ALSCs, with active engagement in social media and internet usage. Excluded from the study were other healthcare professionals, medical students, individuals not employed in the healthcare field, and those not actively participating in social media. An invitation letter, containing details of the study, was shared on the initial page of the survey before obtaining online informed consent via SurveyMonkey®. The invitation was distributed through Facebook®, Telegram®, WhatsApp®, Instagram®, Twitter®, and LinkedIn®. The preliminary questionnaire, developed in English based on a literature review, consisted of 18 questions addressing socio-demographics (5 items), Knowledge of e-learning (5 items), internet usage (6 items), and frequency of social media and internet use (2 items), as outlined in the study questionnaire section. The validity of the questionnaire was evaluated for content and face validity. Face validity was assessed by consulting three pharmacy education experts, while content validity was determined by 8 Arab pharmacy education professors. A self-administered online survey using Google Forms® was created to assess each question's relevance and representativeness. The scale-level content validity index (S-CVI/Ave) method was applied, with items scoring below a CVI value of 0.75 being removed. The overall content validity index of the instrument was excellent, at 0.873. The research received approval from the Department of Pharmacy Practice at

Kulliyyah of Pharmacy, International Islamic University Malaysia. Data analysis was performed using IBM SPSS version 22.0 (Chicago, IL), with both descriptive and inferential statistics. Categorical variables were reported as percentages and frequencies. The Kolmogorov-Smirnov test was used to assess data distribution for normality. Data from the Likert scale were analyzed as non-parametric data. We tested associations between groups using chi-square or Fisher's exact tests, considering a P-value < 0.05 statistically significant at a 95% confidence interval (95% CI). We conducted post-hoc tests to further explore significant differences between groups.

Results and Discussion

Socio-demographics

A total of 680 participants responded to the online survey. The majority of respondents (n = 651 (95.73%)) resided in fifteen Arab countries, while a smaller proportion (n = 29 (4.3%)) lived in countries outside the Arab region. For this research, Arab countries were categorized into 3 geographical regions. Region A included five countries: Syria, Palestine, Lebanon, Jordan, and Iraq. Region B encompassed six countries: Saudi Arabia, Oman, Kuwait, Qatar, Yemen, and the United Arab Emirates. Region C covered Egypt, Libya, Algeria, and Sudan. The largest group of respondents came from Region A (n = 426 (62.65%)), followed by Region B (n = 122 (17.95%)) and Region C (n = 103 (15.15%)). Most participants were female (n = 434 (63.8%)), undergraduate students (n = 284 (41.8%)), and had internet access (n = 565 (83%)). Approximately one-third of respondents (n = 243 (35.7%)) were aged 21–25 years. Nearly half of the participants were pharmacy students (n = 325, 47.8%), while the other half were pharmacy practitioners (n = 355 (52.2%)), as presented in **Table 1**.

Table 1. Socio-demographic characteristics (n = 680)

Variables	Frequency (n)	Percentage (%)
Gender		
Male	246	36.2
Female	434	63.8
Age		
18–21 years	153	22.5
21–25 years	243	35.7

26–30 years	157	23.1
> 31 years	127	18.7
Job-status		
Undergraduate pharmacy students	284	41.8
Postgraduate pharmacy students	41	6.0
Community pharmacists	187	27.5
Hospital pharmacists	64	9.4
Working in academia	19	2.8
Working in pharmaceutical industries	17	2.5
Administrative pharmacists	21	3.0
Medical representatives	12	1.8
Pharmacy technicians	1	0.1
Unemployment of new graduate pharmacists	23	3.4
Unemployment pharmacists	11	1.6

The majority of pharmacy practitioners were employed in community pharmacies ($n = 187$ (52.7%)), followed by those working in hospitals ($n = 64$ (18%)). A significant association was found between gender and job status ($P < .001$). Over half of the community pharmacists were female ($n = 104$ (55.6%)), and approximately two-thirds of the undergraduate students were female ($n = 190$ (66.9%)). In contrast, Over half of the participants working in academic roles were male ($n = 10$ (52.6%)) (Table 2).

Table 2. Participants' countries of residence ($n = 680$)

Country	Frequency (n)	Percentage (%)
Syria	314	46.2
Jordan	51	7.5
Egypt	47	6.9
Saudi Arabia	41	6.0
Sudan	40	5.9
Yemen	39	5.7
UAE	33	4.9
Iraq	31	4.6
Palestine	25	3.7
Libya	12	1.8
Lebanon	5	0.7
Algeria	4	0.6
Oman	4	0.6
Qatar	3	0.4
Kuwait	2	0.3

Outside ALSCs	29	4.3
Total	680	100

Proficiency, utilization, and access to the internet

The results indicated that the majority of participants ($n = 491$ (72.2%)) had intermediate-level skills in both computer usage and internet navigation. A smaller proportion of respondents reported having either basic ($n = 95$ (14.0%)) or advanced ($n = 94$ (13.8%)) skills in these areas. A significant correlation was found between the level of internet and computer abilities and the year of graduation ($P = .02$). Over half of the pharmacy students ($n = 17$ (58.6%)) had intermediate skills, while a notable percentage of pharmacy practitioners, specifically those who graduated 10-15 years earlier, reported advanced skills ($n = 12$ (17.9%)).

Regarding internet usage, most participants ($n = 490$ (72.1%)) accessed the internet exclusively at home. In contrast, around one-fifth ($n = 140$ (20.6%)) used a variety of access points, such as home, internet cafés, and university campuses. A significant relationship was identified between internet access and location of use ($P < .001$). Those with internet access ($n = 404$ (71.7%)) primarily used it at home, followed by those who accessed the internet across multiple locations ($n = 128$ (22.7%)).

The majority of respondents ($n = 565$ (83.0%)) had a personal internet connection. A significant link was observed between owning an internet connection and using it for educational activities ($P = .029$), with 90.8% of those who used the internet for learning having their connection. Interestingly, even among those without personal Internet access, a substantial proportion ($n = 95$ (83.3%)) still used the Internet for educational activities.

There was also a significant association between familiarity with e-learning and having an internet connection ($P = .01$). Nearly half of the participants with internet access ($n = 291$ (51.5%)) were aware of e-learning, while a larger proportion of those without an internet connection ($n = 76$ (66.1%)) were not aware of it. Furthermore, a significant relationship was found between having internet access and attending online courses ($P = .022$). While most of those without internet access ($n = 90$ (81.8%)) had not participated in any online courses, more than two-thirds of those with internet

access ($n = 394$ (69.1%)) had not participated in any online learning sessions, as illustrated in **Table 3**.

Table 3. Responses regarding participation in an online course based on having an internet connection ($n = 680$)

Participation in an online course	Having an internet connection		Total (n)	P-value
	Yes n (%)	No n (%)		
No	394 (69.1%)	90 (81.8%)	484	.02*
Yes, one time only	104 (18.3%)	12 (10.9%)	116	
Yes, ≥ 2 times	72 (12.6%)	8 (7.3%)	80	
Total	570 (100%)	110 (100%)	680	

*Chi-square test was applied to assess significance, with $P < .05$ indicating statistical significance

Approximately 63% of participants ($n = 428$) reported having reliable internet service with easy access, while a small portion ($n = 68$ (10%)) indicated they had poor internet service. Over a third of respondents ($n = 184$ (27%)) described their internet access as fair. A statistically significant association was found between internet access ease and country of residence ($P < .001$). Most participants from Jordan reported very good or good internet access ($n = 42$ (82.4%)), followed by respondents from the UAE, Saudi Arabia, Lebanon, and Palestine ($n = 27$ (81.8%), $n = 33$ (80.5%), $n = 4$ (80.0%), and $n = 18$ (72.0%), respectively). Conversely, about a third of respondents from Libya ($n = 4$ (33.3%)) reported poor or very poor internet access, followed by participants from Algeria, Syria, Sudan, and Yemen ($n = 1$ (25.0%), $n = 6$ (15.0%), $n = 43$ (13.7%), and $n = 3$ (7.7%), respectively).

Regarding internet speed, nearly half of respondents ($n = 352$ (51.7%)) had a high-speed connection, while 38.9% ($n = 264$) had a moderate-speed connection, and 9.4% ($n = 63$) had a slow connection. An important relationship between country of residency and internet speed was observed ($P < .001$). All respondents from Oman reported having a high or very high-speed internet connection ($n = 4$ (100%)), followed by those in Palestine, countries outside ALSCs, Saudi Arabia, Algeria, UAE, Jordan, and Lebanon ($n = 19$ (76%), $n = 22$ (75.9%), $n = 31$ (75.6%), $n = 3$ (75.0%), $n = 23$ (69.7%), $n = 3$ (60.0%), and $n = 30$ (58.8%), respectively). On the other hand, one-third of respondents from Libya ($n = 4$ (33.0%)) reported having a very slow or slow connection, followed by participants

from Algeria, Iraq, Yemen, and Syria ($n = 1$ (25.0%), $n = 5$ (12.1%), $n = 3$ (9.7%), and $n = 30$ (9.5%), respectively).

Frequency of using web 2.0 tools internet

The majority of participants ($n = 635$ (93.4%)) reported using the internet daily, with a smaller number using it weekly ($n = 43$ (6.3%)) or monthly ($n = 2$ (0.3%)). Just over half of the respondents ($n = 360$ (53.0%)) indicated that they spent more than 2 hours per day on social media platforms like Facebook® and other Web 2.0 tools. In comparison, about one-third of the participants ($n = 233$ (34.3%)) used these tools for less than 2 hours every day, as presented in **Table 4**. No significant correlation was found between current employment status and the frequency of internet usage ($P = .28$). Similarly, no significant relationship was observed between the frequency of using Web 2.0 tools and social media websites, the year of graduation, and current job status ($P = .06$ and $P = .32$, respectively).

Table 4. Usage patterns of social media platforms and Web 2.0 tools among study participants ($n = 680$)

Frequency of use	Frequency (n)	Percentage (%)
> 2 Hours every day	360	53.0
< 2 Hours every day	233	34.3
≥ 3 times every week	52	7.7
1 – 2 times every week	21	3.0
No frequent use	14	2.0
Total	680	100.0

Awareness of e-learning

A significant proportion of participants reported utilizing the Internet for educational activities ($n = 609$ (89.6%)). Nonetheless, over half of the individuals ($n = 367$ (54.0%)) indicated a lack of familiarity with e-learning, and the majority had never participated in an online course ($n = 484$ (71.2%)). In contrast, less than one-third of participants ($n = 196$ (28.8%)) had completed at least 1 online course. There was a significantly important correlation between internet usage for educational activities and familiarity with e-learning ($P < .001$). Roughly half of those who were acquainted with e-learning ($n = 297$ (48.8%)) utilized the Internet for educational activities. Conversely, the majority of individuals unfamiliar with e-learning ($n = 55$ (78.6%))

reported not using the Internet for educational activities (Table 5).

Table 5. Awareness of e-learning based on Internet usage for educational activities (n = 680)

Awareness of E-learning	Internet usage for educational activities		Total (n)	P-value
	Yes n (%)	No n (%)		
Yes	297 (48.8%)	15 (21.4%)	312	.001** √
No	313 (51.2%)	55 (78.6%)	368	
Total	609 (100%)	70 (100%)	680	

**The chi-square test was applied to assess significance, with a threshold set at $P < .05$

No significant relationship was found between using the Internet for educational activities and either graduation year or current job status ($P = .36$ and $P = .62$, respectively). However, a significant correlation was observed between familiarity with e-learning and graduation year ($P = .01$). Over one-third of participants who were acquainted with e-learning ($n = 124$ (39.6%)) were pharmacy practitioners who graduated fifteen years before the study, followed by those who graduated 5 years earlier ($n = 114$ (36.4%)). No significant association was found between familiarity with e-learning and current job status ($P = .07$). On the other hand, a significant relationship was found between respondents' job status and participation in online courses ($P = .004$). Less than half of those who had participated in at least 2 online courses were undergraduate pharmacy students ($n = 33$ (41.3%)), followed by community pharmacists ($n = 13$ (16.3%)) and hospital pharmacists ($n = 7$ (8.8%)).

A statistically significant correlation was found between respondents' country of residence and familiarity with e-learning ($P < .001$). Most of the participants from Libya were not acquainted with e-learning ($n = 9$, 75%), followed by those from Syria and Yemen ($n = 213$ (67.8%) and $n = 26$ (66.7%), respectively). All participants residing in Oman were acquainted with e-learning ($n = 4$ (100%)), with the majority of those in Lebanon, Egypt, Palestine, and Saudi Arabia also familiar with it ($n = 4$ (80%), $n = 20$ (80%), $n = 34$ (72.4%), and $n = 29$ (70.8%), respectively).

A significant relationship was also observed between country of residence and participation in online courses ($P < .001$). Most respondents in Syria and Yemen had

never attended an online course ($n = 250$ (79.6%) and $n = 39$ (79.5%), respectively), followed by those from Sudan, Iraq, Jordan, and Libya ($n = 26$ (65.0%), $n = 33$ (64.7%), $n = 20$ (64.5%), and $n = 7$ (58.3%), respectively). Conversely, all participants in Oman ($n = 4$ (100%)) had attended at least one online course, followed by those from Lebanon, Egypt, Algeria, and Saudi Arabia ($n = 3$ (60%), $n = 2$ (50%), $n = 23$ (49%), and $n = 17$ (41.5%), respectively). Participants from Libya, Syria, and Yemen were less likely to have attended online courses ($n = 2$ (16.7%), $n = 67$ (21.4%), and $n = 9$ (23%), respectively).

Regarding confidence in online learning, nearly all participants expressed either intermediate or high levels of confidence in online learning ($n = 669$ (98.4%)). A large majority also reported being confident in using Web 2.0 tools for interactive learning ($n = 548$ (80.6%) and $n = 524$ (77%)). However, a limited number of participants were neither comfortable in using these tools ($n = 28$ (4.1%)) nor inclined to use them for learning ($n = 26$ (3.8%)). About 10% of participants stated that these tools reduced their enthusiasm to learn ($n = 63$ (9.3%)).

The study revealed no important relationship between confidence in using Web 2.0 tools for learning and job status ($P = .88$ and $P = .11$, respectively). On the other hand, significant relationships were found between using the Internet for educational activities and both confidence ($P < .001$) and motivation ($P < .001$) to learn using Web 2.0 tools. Among those who used the internet for educational activities, the majority were comfortable in learning with Web 2.0 tools ($n = 446$, 78.9%) and highly motivated ($n = 489$, 93.3%). No significant relationship was found between job status and increased motivation to use Web 2.0 tools for learning ($P = .99$). About one-quarter of those who did not use the Internet for educational activities ($n = 17$, 23.6%) reported that Web 2.0 tools reduced their enthusiasm to learn.

The goal of this study was to examine the patterns of frequency of using the internet, accessibility, and internet usage, along with Web 2.0 tools. Additionally, it sought to investigate the level of familiarity with e-learning for transferring pharmaceutical knowledge among pharmacists and pharmacy students in the Arab world. The majority of the participants were millennials at the time of the study. In most ALSCs, pharmacy programs typically have more female students than male students [6]. Our findings also indicated that female students

outnumbered male students, which aligns with previous research [11-13]. Interestingly, Arab pharmacists who had graduated 15 years before the study were more inclined to participate in online courses compared to pharmacy students. This finding is consistent with Conte's (2012) research, which indicated that older individuals were more likely to engage in online continuing education [14]. In our research, a majority of respondents expressed confidence and motivation when learning through Web 2.0 tools, with both pharmacists and pharmacy students showing similar levels of engagement. This suggests promising prospects for the integration of these tools in pharmacy education and ongoing professional development programs. Notably, pharmacy students were more inclined than pharmacists to agree that instructors should utilize emerging online tools for delivering educational content.

The findings of our study align with another investigation that demonstrated millennial pharmacy students are open to using modern technologies in educational settings [13]. Our research also revealed a favorable inclination toward utilizing social media and other Web 2.0 tools for academic purposes. However, this finding contrasts with a study by Hall *et al.* which indicated that nearly all participants used social media primarily for personal rather than educational reasons [12]. Regarding internet access locations, our study found that respondents preferred to have the internet solely from home. This result was consistent with another research showing that home was the most common place for online lectures, while campus views were minimal [15]. Furthermore, our research showed that internet speed and accessibility were strongly correlated with the respondent's country of residence. Participants with high-speed internet connections were mostly from Gulf countries. This is understandable since Gulf nations have either met or exceeded international ICT infrastructure standards. The UAE, alongside several other Gulf countries, stands out as a statistical anomaly in the broader Arab world internet access landscape [16]. On the other hand, respondents from countries like Libya, Syria, Yemen, Iraq, and Sudan were more likely to have slower or unreliable internet connections due to political instability and conflict during the research period. Similarly, there was a significant correlation between the country of residency and familiarity with e-learning. Participants from Libya, Syria, Yemen, and Sudan were found to have lower levels of familiarity with e-learning compared to those

from other regions. In contrast, individuals from Gulf countries, Lebanon, Palestine, Egypt, and areas outside ALSCs were more knowledgeable about e-learning and engaged in more online classes. Our findings indicated that those with limited familiarity with e-learning either participated in fewer online classes or did not take part in any at all. However, some respondents from Palestine, the UAE, and areas outside ALSCs, despite being more acquainted with e-learning, did not participate in any online courses. This may be attributed to negative perceptions and attitudes toward e-learning in pharmacy education, issues with accessibility, or lower internet, and computer skills. The majority of respondents in our study had intermediate levels of internet and computer skills. This highlights the need to enhance ICT and online learning capabilities among Arab pharmacy students and pharmacists to ensure the successful integration of e-learning. Barriers such as limited computer anxiety, informational skills, and insufficient computer proficiency are common obstacles to e-learning in health sciences [17].

Limitations

The participants for the online survey were chosen conveniently through the Internet, which led to under-coverage bias due to restricted Internet access in certain Arab countries. However, under-coverage bias may become less of a concern in the future, particularly with the increasing use of social networking sites and the growing number of individuals accessing the internet daily [18, 19].

Study questionnaire

Item No. | Statement

Socio-demographics

- What is your gender?
- How old are you?
- In which country do you reside?
- What is your employment status?
- When is your graduation year?
- Do you have internet access?
- Where do you typically have internet?
- How would you rate the ease of accessing internet service?
- What is your level of computer and internet proficiency?
- What is the speed of your internet connection?

- Do you use the internet for learning purposes?
- How often do you use the internet?
- How often do you use social media and web 2.0 tools?
- Do you have experience with e-learning?
- Have you participated in any online courses?
- How confident are you in using online educational materials?
- Are you comfortable using Web 2.0 tools as learning aids?
- Does using web 2.0 tools for learning motivate you to learn more?

Conclusion

This research is the first of its kind conducted in ALSCs and highlights the potential for utilizing Web 2.0 tools and integrating e-learning in the transfer of pharmaceutical knowledge. However, various challenges and obstacles hinder the successful adoption of e-learning in ALSCs. On a positive note, the majority of pharmacy students and pharmacists in the Arab world were already familiar with e-learning. It is recommended that policymakers in ALSCs encourage the integration of e-learning into pharmacy education and support faculty members in enhancing their computer and internet skills to create more engaging and relevant content for millennial pharmacy students. Moreover, Arab policymakers in ALSCs outside of the Gulf countries are urged to focus on improving ICT infrastructure and internet services to reduce the digital divide between ALSCs and more developed nations. Scholars in both developed countries and ALSCs should further explore the impact and effectiveness of using online education tools in pharmacy practice and education.

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