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Pharmacist's Knowledge and Attitudes toward Digital Health Tools

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Digital health solutions have seen a remarkable increase in recent years as they enhance the efficiency and effectiveness of healthcare system. Digital health tools have transformed how patients interact with healthcare. Digital health tools help in diagnosis, measuring of vitals on daily and regular basis, and in prevention of diseases. Studies show a gap between the design of these tools and the needs of the patients they serve. The study aimed to identify areas where improvements are needed for digital health skills.
Objective: The objective of this study was to assess community pharmacist's knowledge and attitudes toward integration of digital health tools (e.g. mobile apps, telehealth) into their practice. To observe association between participants demographics/professional variables and knowledge concerning digital health tools.

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Methods: A cross-sectional survey-based study was conducted by research students of a private medical college in Lahore a city of Punjab, Pakistan. Data was collected on data collection form after getting consent from the participants. All those community pharmacists who gave consent and have work experience of more than one year were included in study and those who have work experience less than one year were excluded from study. Validated questionnaire was used for data collection. Data was collected from August 30,2024 to September 6, 2024. After inclusion & exclusion criteria sample size was remained to 70. For analysis of collected data SPSS 26th version was used. For the purpose of summarizing the data standard deviation and mean were employed. Evaluation of categorical data was carried out either by using chi-square test or Fisher's exact test. For measuring of effect size Cramer's V or Phi (φ) was used. Less than 0.05 of P-value was considered significant.

Results: 51.4% of participants were females but males have more adequate knowledge than females. The mean age of all participants calculated was 27.41±4.03. 62.6% participants were from urban areas. 85.7% of participants have done post-graduation. 70% of participants have work experience of less than 2 years and only 12.9% have participated in courses related to digital health tools. Only 30%of participants were from chain pharmacies while rest of them were from independent pharmacies. A statistically non-significant was observed between participants knowledge and their qualification as p-value was 1. Additionally, non-significance was observed between all demographics and knowledge of participants as none have p-value less than 0.05. Regarding attitude of variables, no statistically significant difference was observed between score of males which is 32.794±5.156 and females 32.69±5. 538 in present study with p-value of 0.938. Similarly, no significant difference was found between score of chain and independent community pharmacists which is 33.30 and 32.59 respectively with p-value 0.692.

Conclusion: The current study concluded that there was no significant association between participants demographics/professional variables and knowledge concerning digital health tools. However, male pharmacists and those pharmacists working in chain pharmacies have more knowledge but this impact was not justified by p-values. Similarly, those participants who have done some certifications 55.6% out of them has adequate knowledge but still association was non-significant as p-value was 0.116. Regarding attitude of participants, no statistically significant difference was observed between score of attitude variables and none of them have significant p-value as well.

Keywords: Digital health tools; digital health; eHealth services; digital health in community pharmacy.

1. INTRODUCTION

Digital health solutions have seen a remarkable increase in recent years, offering promising prospects for enhancing the efficiency and effectiveness of healthcare tools [1]. To ensure the continued relevance and effectiveness of pharmacy practice, the profession must embrace the rapid advancements in digital healthcare, The International Pharmaceutical Federation (FIP) conducted a global study to evaluate how well pharmacy education programs are preparing pharmacists for the digital age. The study aimed to identify areas where improvements are needed for digital health skills [2].

The widespread adoption of digital health technology in the past two decades has raised important safety and ethical concerns. Despite these challenges digital health tools are increasingly used by patients, healthcare providers, and organizations to enhance healthcare outcomes and improve care delivery. These tools offer personalized treatment recommendations, aid in diagnosis, streamline workflows, empower self-care, and facilitate access to complex health data. Additionally, digital health technology plays a crucial role in wellness, chronic disease prevention, and health promotion [3].

Digital health technologies can significantly improve the quality, reach, and efficiency of healthcare services [4]. The adoption of digital health in healthcare is still limited in many countries, to drive its successful application and integration, it is essential for healthcare professionals, including those in training, to adopt digital technology [5].

Digital health tools have transformed how patients interact with healthcare. Studies show a gap between the design of these tools and the

needs of the patients they serve. By integrating artificial intelligence, these technologies have been used to guide public health policies, modernize healthcare systems, increase efficiency, and streamline processes. These technologies aim to empower patients and increase their involvement in their healthcare decisions. Most digital technologies have been created primarily with the technical focus, neglecting the importance of user-centered design. Patient portals, mobile applications, and wearable technologies provide a more accessible way for patients to manage their health. They simplify access to medical records and expert advice while making data collection less intrusive [6].

Digital health software is rapidly expanding, offering new opportunities for patients, healthcare systems, and other stakeholders to enhance patient-centered care using innovative apps, sensors, algorithms, and data visualization techniques [7]. The healthcare system is under pressure due to increasing population and with that there is an increased need for healthcare services by the patients, to overcome this imbalance organizations are working on advanced technologies such as digital health tools i.e. smart and portable appliances [8].

These tools are useful in various ways such in diagnosis of the disease and also helps in making preventions and managing various diseases [9]. Different health apps are used by the cancer patients to track their treatment for the disease and to keep a check on their side effects [10]. Digital health tools are also used in managing depression by tracking the changes in mood as well as the behavior of a patient [11].

The developing area of digital health tools provides its services in managing various diseases which are chronic in nature and also promotes health, mobile health (mHealth) is useful in managing diabetes mellitus as it aids in controlling blood sugar level and provides guidance in managing the diabetes [12]. Electronic health records provide history of patient health, and the data provides information about the medicines that are dispensed to the patient and demographic data of the patient and lab findings, etc [13].

Digital health tools (HealthKit®, Fitbit™ health and fitness products, etc) provide a lot of advantages to patients in monitoring their treatments as a result of which their diseases have been managed well, many devices have unique features such as diet plans, reminders related to medicines and guide to various exercises [14]. Healthcare tools can have various positive outcomes on health of people such as it play an important role in proper diagnoses and treatment plans, increase adherence to medication and increase patient monitoring, these outcomes can significantly reduce the health care costs of patients [15].

Moreover, use of health care tools can be challenging in medical practice in order to maintain the privacy of patients and training of staff to have proper access of technology [16]. In future Artificial intelligence and other advancement in technologies can enhance the functions and uses of digital health care tools and can improve digital diagnosis and tailored regimens according to genomics of patients [17]. Digital health tools usage is increasing worldwide as these are being implemented in many countries but the quality of implementation and the productiveness varies with different types of digital health tools [18].

The objective of this study is to assess community pharmacist's knowledge and attitudes toward integration of digital health tools (e.g. mobile apps, telehealth) into their practice, identify training needs and potential barriers to adoption of digital health tools. To observe association between participants demographics/professional variables and knowledge concerning digital health tools.

2. METHODOLOGY

A cross-sectional survey-based study was conducted by research students of a private medical college in Lahore to evaluate the attitude and knowledge about digital tools in community pharmacy practice. Quantitative research methodology was carried out that involved validated questionnaires and research tools were utilized to evaluate the knowledge, attitude and perception of pharmacists about digital tools in clinical settings.

The data for this research was collected from pharmacists working in community pharmacies in Lahore Punjab Pakistan. Study settings were purely based in Lahore Punjab Pakistan and its purpose was only to study the pharmacist attitude and knowledge regarding digital tools, to accomplish this goal different areas community pharmacies were visited and data was collected from August 30,2024 to September 6, 2024.

Inclusion criteria: Those community pharmacists who gave consent, were willing to participate and have work experience more than one year. Data was collected from them and were included in the study.

Exclusion criteria: All those participants whose work experience was less than 1 year were excluded from the study.

Stratified convenient sampling technique was used for data collection, more than 100 community pharmacies were visited, data was collected from willing participants and after the application of inclusion and exclusion criteria's sample size was remained to 70 participants. For data collection, a self-developed validated questionnaire was used. Questionnaire was consisted of 7 demographics related and 22 questions regarding knowledge and attitude of participants. Data was collected after consent to participate. The questionnaire consisted of three parts, first part was related to demographic data which included age, gender, residential areas like urban or rural, year of experience, and qualification of participants. The second part dealt with attitude for this purpose, the following questions were asked, do pharmacists are familiar with digital tools, do these tools help them solve or handle different situations, do all of them use these tools, do these tools provide them with better opportunities for betterment of patients, is it challenging to use digital tools, do they believe in participating in online webinars or engaging in peer-to-peer learning would be useful for implementing digital health tools.

Third part of questionnaire consists of knowledge questions about digital health tools for community pharmacists. Questions included in this part were as: common types of digital health tools used, chief purpose on patient's end to use digital health tools, benefits of telepharmacy, any issues while using artificial intelligence (AI), how pharmacists assist or educate patients in utilizing these tools, and cost of adoption these tools. Participants who gave 60 percent answers right their knowledge was considered adequate.

Statistical analysis: To statistically analyze the collected data 26th version of SPSS was used. Following tests kurtosis and skewness were applied to find out whether data followed normal distribution or not. For the purpose of summarizing the data standard deviation and mean were employed. Evaluation of categorical data was carried out either by using chi-square test or Fisher's exact test. For measuring effect size of those variables whose p-value was found statistically significant Cramer's V or Phi (φ) was used. Less than 0.05 of P-value was considered significant. One-way ANOVA or independent t-test was applied for the testing of null hypothesis for continuous variables (numerical data).

3. RESULTS

Out of sample size of 70 participants, 51.4% of them were female participants. The mean age of all participants calculated was 27.41±4.03. Only 30%of participants were from chain pharmacies while rest of them were from independent pharmacies. Additionally, 70% of participants have experience of less than 2 years. 62.6% participants were from urban areas. 85.7% of participants have done post-graduation. Further demographic information of participants is provided in Table 1.

Table 1. Represents demographics of participants (N=70)

Variables	N(%)
Age	
Age	27.41±4.03
Gender	
Male	34 (48.6)
Female	36 (51.4)
Area	
Urban	44(62.7)
Rural	26 (37.3)
Qualification	
Pre-graduation	10 (14.3)
Post-graduation	60 (85.7)
Name if any courses you have done	
Yes	9 (12.9)
No	61 (87.1)
Pharmacy	
Chain	21 (30.0)
Independent	49 (70.0)
Years of experience	
Less than 2 years	49 (70)
2-5 years	9 (12.9)
More than 5 years	12 (17.1)

Among 70 participants, for various variables a post-hoc pairwise comparison of chi-square test with knowledge was conducted to evaluate any kind of association between them. Analysis of collected data revealed that qualification of participants don't have any significant association (P-value=1) with their level of knowledge. Further details on association of various variables with knowledge of participants is provided in Table 2.

Table 2. Represent knowledge of participants (N=70)

Variables	Patient knowledge N (%)			
	Adequate knowledge	Inadequate knowledge	*P*-value*	Effect size#
Gender				
Male	12 (35.3)	22 (64.7)	0.437	-
Female	9 (25)	27 (75)		
Area				
urban	15 (34.1)	29 (65.9)	0.422	-
rural	6 (23.1)	20 (76.9)		
Qualification				
Pre graduation	3 (30.0)	7 (70)	1.0	-
Post graduation	18 (30.0)	42 (70)		
Name if any courses you have done				
No	16 (26.2)	45 (73.8)	0.116	-
Yes	5 (55.6)	4 (44.4)		
Pharmacy				
Chain	10 (50.0)	10 (50.0)	0.062	-
Independent	11 (24.4)	38 (77.6)		
Years of experience				
Less than 2 years	13 (26.5)	36 (73.5)	0.538	-
2-5 years	4 (44.4)	5 (55.6)		
Greater than 5 years	4 (33.3)	8 (66.7)		

Table 3. Represent Attitudes of community pharmacists (N=70)

Outcome	Mean (SD)	95% Confidence Interval (C.I)		t- statistic (df)	p-value	Effect size (η^2)
Variables		Lower bounds	Upper bounds			
Gender						
Male	32.794±5.156	31.129	34.48	0.006	0.938	-
Female	32.69±5. 538	31.0	34.48			
Area						
Urban	33.18±4.97	31.64	34.64	0.805	0.373	-
Rural	32.00±5.88	29.88	34.61			
Qualification						
Pre graduation	35.70±5.73	32.55	39.11	0.85	0.373	-
Post graduation	32.25±5.13	31.01	33.55			
Courses						
No	32.50±5 21	31.29	33.82	0.923	0.340	-
Yes	34.33±6.06	30.66	33.33			
Pharmacy						
Chain	33.30±6.78	30.53	36.15	0.370	0.692	-
Independent	32.591±4.69	31.29	33.92			
Years of experience						
Less than 2 years	33.06±5.33	31.58	34.599	0.966	0.386	-
2-5 years	33.55±7.24	28.833	38.28			
More than 5 years	30.88±3.15	29.06	32.812			

By using chi-square test P-value was calculated. As Phi-coefficient measures the strength of association so effect size was determined by using Phi-coefficient.

Regarding attitude of variables, no statistically significant difference was observed between score of males which is 32.794±5.156 and females 32.69±5. 538 in present study with p-value of 0.938. Similarly, no significant difference was found between score of chain and independent community pharmacists which is 33.30 and 32.59 respectively with p-value 0.692. Further detailed information on attitude of participants provided in Table 3.

4. DISCUSSION

In current study, it was observed that male community pharmacists have more adequate knowledge than female community pharmacists. However, there is no significant association found between knowledge and gender of participants as the P-value was 0.437 which was non-significant. While analyzing data there was no significant association observed between the area of community pharmacy and knowledge of pharmacists related to digital health tools and P-value was 0.422. Similar kind of study conducted which stated that across majority of studies no difference between genders of participants were observed [19].

The findings suggest that the qualification of participants and their knowledge concerning digital health tools have no significant relation with each other as the observed P-value was 1. The qualification variable reveals the impact of pre-education and post-education background which exhibited the same distribution, with 30% being qualified and 70% being unqualified. The p-value was 1.0 which was statistically nonsignificant implying that qualification has no impact on the outcome of knowledge. Similar kind of study was conducted in china on patients which showed a positive relationship on digital tool use as their p-value for master's degree program and above was <0.001 [20].

The analysis for variable of participation in courses reveals that 55.6 % have more adequate knowledge in comparison to those who have not participated in courses. These findings suggest that courses play a major role in the knowledge of community pharmacists for digital health tools. However, the p-value was 0.1116 which was non-significant so there was no association between participation in courses and knowledge related to digital health tools. Similar kind of pilot study reported that 60% of participants who have trained with digital skills apply and transfer it to their professional practice [21].

The study indicates that community pharmacists from independent pharmacies have lower positive outcomes of knowledge which is 24.4% in comparison to community pharmacists of chain pharmacies. But there is no association observed because p-value is 0.062 which is statistically non-significant. Similarly, the study also indicates that community pharmacists having work experience of 2 to 5 years have more positive outcomes toward knowledge which is 44.4% than those having experience of less than 2 years (26.5). These findings show that work experience has a positive result on knowledge. However, in that case we don't find any significant association as p-value is 0.538 which is statistically non-significant. Study reported that pharmacists with higher level of education and longer tenure or work experience exhibit positive agreement towards digital health literacy among their patients [22].

It was observed that the attitude of male community pharmacists is little or no different from that of female pharmacists regarding knowledge of digital healthcare tools. The mean (SD) score of the males is 32.79, slightly higher than that of the females, which is 32.69 making no difference at all. The findings of this variable align with the cross-sectional study conducted in Shanghai where there was no difference at all among male and female community pharmacists regarding the knowledge of digital healthcare tools [23].

The p-value is 0.938 which is non-significant. It was noted that community pharmacists residing in urban areas have a higher attitude toward knowledge of digital healthcare tools with a mean (SD) score of 33.18 compared to pharmacists from rural areas with a mean score of 32.00. The findings of our study align with the survey conducted in the Lalitpur district of Nepal in 2017 where community pharmacist from urban areas has more attitude and knowledge [24].

Community pharmacists who have done courses have a better attitude toward digital healthcare tools with a mean score (SD) of 34.33 emphasizing the importance of courses for better knowledge and attitude of pharmacists. The p-value is 0.340 which is non-significant. This finding of our study is novel as previously there

were no findings on this variable reported. It was observed that community pharmacists with 2 to 5 years of work experience have more approach towards attitude and knowledge of digital health tools with a mean score of (SD) of 33.55 compared to those with less than two years of work experience inferring the importance of work experience. The mean score (SD) of community pharmacists with pre-graduation is 35.70 which is higher than the mean score (SD) of community pharmacists with post-graduation. The p-value is 0.373 which is statistically non-significant. The result of our study resembles the KAP study conducted in South Africa in 2023 [25].

It was observed that community pharmacists from chain pharmacies have more approach of attitude towards digital health tools in comparison to community pharmacists from independent pharmacies with a mean (SD) score of 33.30. The p-value is 0.692 which is statistically non-significant. The findings of this variable are parallel to an online cross-sectional study conducted in Saudia Arabia in 2023 [26].

5. CONCLUSION

The current study concluded that there was no significant association between participants demographics/professional variables (age, gender, area of practice, types of pharmacy, and work experience) and knowledge concerning digital health tools. As observed p-value of different demographics with knowledge as follows: for association between knowledge and gender it was 0.437, for qualification p-value was 1.0 and similarly for years of experience it was 0.538. However, those participants who have done some certifications have some positive influence on knowledge. Regarding attitude of participants, no statistically significant difference was observed between score of attitude variables and none of them have significant p-value as well.

6. LIMITATIONS

The current study, focused only on community pharmacist's knowledge and attitude toward digital health tools. Several research gaps that were identified for future studies, these gaps are outlined under recommendation heading.

7. RECOMMENDATION

For future researchers, current study recommends to address research gap that were left and not studied. These gaps include identify training needs and potential barriers to adoption of digital health tools.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

ETHICAL APPROVAL

Ethical approval from Institutional Ethical Review Board (IRB) and Bio-Ethical Committee (BEC) of LMDC was attained.

CONSENT

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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