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Analysis of Students' Digital Literacy Skills and Attitude Towards Drug-Related Information Resources: A Study of Selected Pharmacy Institutes in India

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ABSTRACT

The research examined pharmacy students' digital literacy skills and attitudes toward drug-related information resources. A self-administered online questionnaire created with Google Forms was used to assess these aspects. The researchers used IBM SPSS to analyse the data. The study's findings indicated that students primarily relied on lectures and books but valued online resources despite concerns about reliability. While traditional resources were preferred, digital literacy skills proved crucial for accessing trustworthy online information. This underscored the importance of integrating responsible practices for online drug information resources in pharmacy education. The statistical analysis not only delves into how demographics influence student preferences but also offers valuable insights into how students accessed and perceived drug-related information sources. These findings had significant implications for the design of pharmacy education programs. The researchers suggested the need to promote digital literacy through targeted interventions and effective time management practices to better equip students for success in a digitalised healthcare landscape.

Keywords: Drug-Related information resources; Pharmacy students; Digital literacy; Online information resources

1. INTRODUCTION

In today's rapidly changing healthcare field, having reliable and easily accessible drug information is crucial for pharmacy students. With the increasing prevalence of online digital resources, students need a positive and thoughtful approach to these resources to enhance their learning and future professional practice. Access to updated and trustworthy drug information is essential for pharmacy students. As online drug information resources continue to gain popularity, cultivating a considerate attitude towards these resources becomes vital for the learning and future practice of pharmacy students. This study aims to examine pharmacy students' digital literacy skills and attitudes toward drug-related information resources, highlighting the need for a positive and thoughtful approach to these resources and providing valuable insights for the design of pharmacy education programs.

2. LITERATURE REVIEW

Alowais[1], *et al*. advocate for integrating technology skills into pharmacy education, echoing MacLure Stewart's[2] calls for user-centered design to bridge the digital divide. Similarly, Hallyburton[3] addresses the under-researched area of healthcare professionals' health literacy and highlights its direct influence on the quality of patient care. Beyond individual skills, concerns about digital literacy extend to broader issues of equity and access. Studies such as Campanozzi[4], *et al*. emphasise the critical role of bridging the digital divide in facilitating equal access to telemedicine. Safdari[5], *et al*. highlight the crucial role of effective communication and collaboration between medical librarians and researchers to optimise the librarian's role in supporting the research process. Galeshi[6],*et al*. shed light on the specific information-seeking behaviours of young millennials regarding health topics and emphasise the need for more accessible and inclusive health information resources to bridge the digital divide and ensure equitable access to health resources. Tahamtan[7], *et al*. bridge the gap between library services and researchers' needs through modernising capabilities. This aligns with the focus on identifying training programs as a potential solution for healthcare professionals who have difficulty accessing and managing medication information. Palumbo & Adinolfi[8] research emphasises the importance of digital health literacy, which equips patients to find, understand, and use online health information.

3. OBJECTIVES OF THE STUDY

- To identify pharmacy students' preferences for drug information resources, comparing traditional and digital mediums.

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- To evaluate the perceived reliability of various drug information resources among pharmacy students.
- To assess the digital literacy skills of pharmacy students and how these skills influence their information-seeking behaviors.
- To offer insights into optimising drug information resource usage among pharmacy students, facilitating better educational strategies and resource allocation.

4. HYPOTHESES FOR THE STUDY

- **H0:** Male and female pharmacy students have no significant difference in attitudes toward online drug information sources.
- **H0:** There is no significant difference in attitudes towards online drug information sources among pharmacy students from different nativity backgrounds.
- **H0:** There is no significant relationship between semester level and attitudes toward online drug information sources among pharmacy students.
- **H1:** There is an interaction effect between gender and nativity on attitudes towards online drug information sources among pharmacy students.

5. SCOPE AND LIMITATIONS OF THE STUDY

This study used a targeted Google Form survey to investigate the student's attitudes toward drug-related information resources among undergraduate pharmacy students at 25 pharmacy institutes from several Indian states, including Madhya Pradesh, Maharashtra, Karnataka, Uttarakhand, Andhra Pradesh, and Uttar Pradesh, providing a diverse representation of geography.

Using a quantitative questionnaire may miss nuanced insights into pharmacy students' digital literacy skills and attitudes toward drug-related information resources, which qualitative methods could uncover.

6. RESEARCH METHODOLOGY

A well-designed structured questionnaire using Google Forms collected 1460 responses. The research team reviewed all responses to ensure data quality and included 1430 in the final analysis. The online questionnaire was available to students from 12-30-2023 to 02-09-2024, allowing for a geographically diverse sample. Google Forms was used for easy access, secure data collection, and efficient management, while the questions were carefully designed to ensure data relevance to the study.

6.1 Sampling Method Used

The sampling method employed for this study was random sampling. This method is particularly advantageous in achieving a robust and statistically significant sample that accurately reflects the broader population.

6.2 Measure

The study employed a well-structured Google Forms online questionnaire to gather primary data on the chosen constructs. An "agree-disagree" Likert scale measured pharmacy students' digital literacy skills and attitudes toward drug-related information resources to deepen understanding.

6.3 Validity And Reliability

This is one of the data collection methods; it produces systematic, error-free, and valid information. Several attempts were made to ensure the validity of the scale constructed for this study, such as analysing several books and articles on self-directed learning to empower students and deepen understanding., informal discussions with teachers and experts, and informal meetings with library and information science professionals.

6.4 Expert Review

The expert review ensures questionnaire items accurately measure study constructs. Experts assess relevance, clarity, and comprehensiveness to validate the questionnaire's alignment with research objectives.

6.5 Questionnaire Design

The questionnaire was self-designed by the authors, incorporating relevant constructs and dimensions identified through a review of existing literature and expert input. This ensures that the questions in the survey accurately reflect the study's goals and effectively address the research questions. By combining theoretical knowledge and subject matter expertise, the questionnaire was carefully designed to capture the necessary data for the study.

6.6 Statistical Tools Used

The investigators used several statistical tools to analyse the collected data. These tools include the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test to assess the adequacy and suitability of the data for factor analysis. Structural Equation Modeling (SEM) is utilised to explore the relationships between different factors and attitudes toward drug information sources. In addition, multivariate analysis is used to examine the effects of gender, semester, and nativity on pharmacy students' digital literacy skills and attitudes toward drug-related information resources. Hypothesis testing is also conducted to explore differences in perceptions based on gender, nativity, and semester levels. These statistical methods collectively provide a comprehensive understanding of the analysis of students' digital literacy skills and attitudes toward drug-related information resources.

7. DATA ANALYSIS AND INTERPRETATION

7.1 Pharmacy Institutes Selected for the Study

Table 1 displays selected institutes and student responses across 25 pharmacy institutes, revealing exciting insights. Madhya Pradesh dominates with 15 institutes and a commanding 59.4 %. Uttarakhand follows with a notable 5.6 %, while Andhra Pradesh

Table 1. Pharmacy institutes selected for the study

S.No.	Name of the pharmacy institute	Number of students	Percent
1	B. R. Nahata College of Pharmacy. Mandsaur, Madhya Pradesh	67	4.7
2	Babulal Tarabai Institute of Pharma Science, Sironja, Madhya Pradesh	35	2.4
3	Department of Pharmaceutical Sciences Doctor Harisingh Gour Central University Sagar, Madhya Pradesh	135	9.4
4	Dr. L. H. Hiranandani College of Pharmacy, Ulhasnagar, Maharashtra	15	1.0
5	Dr. Satyendra Kumar Memorial College of Pharmacy, Bhopal, Madhya Pradesh	26	1.8
6	Institute of Pharmacy Amity University, Gwalior, Madhya Pradesh	62	4.3
7	Institute of Pharmacy Gyanveer University Sagar, Madhya Pradesh	4	.3
8	Institute of Pharmacy H.N.B. Garhwal University, Srinagar Dist. Garhwal, Uttarakhand	80	5.6
9	Institute of Pharmacy ITM University Gwalior, Madhya Pradesh	1	.1
10	Institute of Pharmacy Jiwaji University, Madhya Pradesh	77	5.4
11	Institute of Pharmacy People's University, Madhya Pradesh	157	11.0
12	Institute of Pharmacy RKDF University Bhopal, Madhya Pradesh	2	.1
13	Institute of Pharmacy Teerthanker Mahaveer University, Bagadpur, Uttar Pradesh	3	.2
14	Institute of Pharmacy Vikram University, Ujjain, Madhya Pradesh	48	3.4
15	KLE College of Pharmacy, Belagavi, a constituent unit of KLE Academy of Higher Education and Research, Belagavi, Karnataka	133	9.3
16	Mandsaur Institute of Pharmacy, Mandsaur University, Mandsaur, Madhya Pradesh	10	.7
17	Medical College of Pharmacy, Bhopal, Madhya Pradesh	50	3.5
18	Ravishankar College of Pharmacy in Bhopal, Madhya Pradesh	288	20.1
19	Smriti College of Pharmaceutical Education (SCOPE), Indore, Madhya Pradesh	47	3.3
20	Sri Satya Sai Institute of Pharmaceutical Sciences, Bhopal, Madhya Pradesh	1	.1
21	Truba Institute of Pharmacy, Bhopal, Madhya Pradesh	65	4.5
22	Vedic Institute of Pharmaceutical Education and Research, Sironja, Madhya Pradesh	6	.4
23	VJ's College of Pharmacy, Rajamahendravaram, Andhra Pradesh	65	4.5
24	VNS Institute of Pharmacy, Bhopal, Madhya Pradesh	13	.9
25	Yadavrao Tasgaonkar Institute of Pharmacy, Karjat, Dist – Raigad Maharashtra	40	2.8
	Total	**1430**	**100.0**

and Maharashtra each contribute 4.5 %. Karnataka adds 9.3 % to the tally. The remaining states -Uttar Pradesh, Rajasthan, and Andhra Pradesh have minimal representation, collectively accounting for less than 1 % of the student population. The sampling method employed for this study was random sampling.

7.2 KMO and Bartlett's Test

Table 2 provides information on the Kaiser-Meyer-Olkin (KMO) measure. The KMO measure, with a value of 0.935, indicates adequate sampling, meaning the variables can explain sufficient variance in the data. Bartlett's test, with a p-value less than 0.05, suggests significant correlations between the variables, supporting their suitability for factor analysis.

Table 2. KMO and bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.935
Bartlett's Test of Sphericity	Approx. Chi Square	7536.767
	df	45
	Sig.	.000

7.3 Distribution of Study Population According to Gender, Nativity, and Semester

Table 3 provides the study population according to gender, nativity, and semester. The study population consisted of 999 males (69.9 %) and 431 females (30.1 %). There was a notable gender imbalance across both nativity and semester. Males were more prevalent in all nativity groups, particularly in rural areas (77.3 %), and across all semesters. The test statistics provided indicate significant associations between gender distribution and both nativity and semester categories.

7.4 Sources Typically Used to Obtain Drug-Related Information

Table 4 highlights sources typically used to obtain drug-related information. Key Findings: Top Sources: Lectures (4.3 out of 5), Books and other publications (4.0), Drug information-related mobile apps (3.9), Social media platforms (3.9), Government websites (3.8), Lesser Used Sources: Online forums and discussion groups (3.6), Drug databases and directories (3.6), Scientific journals (3.6), Peer-reviewed articles (3.4), Hospital pharmacies (3.6), Decision Rule: The weighted average of 3.8 suggests an overall "High Perception" of using various sources for drug-related information but with variations in frequency.

7.5 Attitude Towards Online Drug Information Sources

Table 5 highlights the perception of online drug information sources. The weighted average of 4.1 suggests a positive inclination towards online drug information sources with a clear understanding of their limitations and the need for responsible use. Top perceived benefits: Valuable tool for learning about medications (4.3), Provides information about potential side effects and how to manage them (4.1), Provides general information about how to take medications (4.1), Helps make informed decisions about medication choices (4.1), Provides information about potential side effects and how to manage them, promoting safety and health while taking medications (4.0), Nuances in agreement: Statements emphasising privacy and regular updates received slightly lower deal (4.0). Verifying information and consulting healthcare providers was highlighted (4.0). Variability in reliability and the need for using reputable sources were acknowledged (4.1).

Table 6 shows the scores of preferences for drug information sources; the preference for traditional sources is significantly higher (mean=3.78) than for digital sources (mean=3.75), as the significance level of the t-test is less than 0.05.7.7

Table 3. Distribution of study population according to gender, nativity, and semester

S.No.	Nativity/ semester	Male	Female	Total	Male (%)	Female (%)	Test statistics
1.	Urban	390	220	610	63.9%	36.1%	chi-square statistic = 26.009, p<0.001 (significant association)
2.	Semi-urban	169	82	251	67.3%	32.7%	
3.	Rural	440	129	569	77.3%	22.7%	
4.	I Semester	292	136	428	68.2%	31.8%	chi-square statistic = 13.309, p<0.001 (significant association)
5.	III Semester	294	138	432	68.1%	31.9%	
6.	V Semester	250	71	321	77.9%	22.1%	
7.	VII Semester	163	86	249	65.5%%	34.5%	
Total		**999**	**431**	**1430**	**69.9%**	**30.1%**	

Table 4. Sources typically used to obtain drug-related information

S.No.	Sources	Mean	Std. Deviation	Rank	Decision
1.	Lectures	4.3	.95537	1	High Perception
2.	Books and other publications	4.0	1.05081	2	High Perception
3.	Drug information-related Mobile applications.	3.9	1.07234	3	High Perception
4.	Social media platforms (Facebook, YouTube, WhatsApp, Instagram, etc.)	3.9	1.10990	4	High Perception
5.	Government websites	3.8	1.12505	5	High Perception
6.	Drug Databases and Directories	3.6	1.16960	6	Low Perception
7.	Hospital Pharmacies	3.6	1.19843	7	Low Perception
8.	Online forums and discussion groups	3.6	1.17549	8	Low Perception
9.	Scientific journals	3.6	1.17224	9	Low Perception
10.	Peer-reviewed articles	3.4	1.18521	10	Low Perception

(Note: N=1430 5=Always 4=Often 3=Sometimes 2=Rarely1=Never Decision - weighted average 37.7/10 =3.8)

Table 5. Attitude towards online drug infomation sources

S.No.	Attitude	Mean	Std. deviation	Rank	Decision
1.	Online drug information sources are valuable tools for learning about medications.	4.3	.80975	1	High Perception
2.	It provides general information about how to take medications.	4.1	.86946	2	High Perception
3.	It provides information about potential side effects and how to manage them.	4.1	.83398	3	High Perception
4.	It is varied in reliability, so it is important to use reputable sources from government websites, medical journals, and academic institutions.	4.1	.91664	4	High Perception
5.	It provides information about different medications and their potential side effects, which can help make informed decisions about medication choices.	4.1	.90707	5	High Perception
6.	It is a valuable tool for supplementing the information received from healthcare providers, but it should not replace the need to talk to a healthcare provider.	4.0	.92186	6	Low Perception
7.	It provides accurate information about medications. However, verifying the information with other sources and talking to your healthcare provider if you have any questions is essential.	4.0	.92136	7	Low Perception
8.	It provides information about potential side effects and how to manage them, which can help patients stay safe and healthy while taking medications.	4.0	.91381	8	Low Perception
9.	It is often updated regularly, ensuring access to the most current medication information.	4.0	.91943	9	Low Perception
10.	It is a private and secure way to learn about medications, provided you take steps to protect your privacy online.	4.0	.92631	10	Low Perception

(Note: N=1430 5=Strongly agree 4=Agree 3=Not sure 2=Disagree1=Strongly Disagree Decision - weighted average 40.7/10 =4.1)

7.6 Score of Preferences For Drug Information Sources

Table 6 shows the scores of preferences for drug information sources; the preference for traditional sources is significantly higher (mean=3.78) than for digital sources (mean=3.75), as the significance level of the t-test is less than 0.05.

7.7 Attitude Score Towards Online Drug Information Sources by Nativity and Gender

Table 7 summarises how students view Drug-related information resources, considering gender (male/female) and where they live (urban/semi-urban/rural). While everyone finds these resources somewhat valuable (average ratings around four on a likely unspecified scale), some variations exist. Students agree that online resources provide information on side effects more than privacy or reliability. Those in rural areas tend to rate the resources slightly lower than people in more urban areas.

Table 6. Source of preferences for drug information sources

Medium	Source	Mean	S.D.	Mean	S.D.	Paired t-test	
						t	Sig.
Traditional mediums	Lectures	4.30	0.96	3.78	0.86	2.072	0.038
	Books and other publications	3.99	1.05				
	Scientific journals	3.55	1.17				
	Peer-reviewed articles	3.45	1.19				
	Hospital Pharmacies	3.60	1.20				
Digital mediums	Drug information-related Mobile applications.	3.92	1.07	3.75	0.88		
	Social media platforms	3.88	1.11				
	Online forums and discussion groups	3.56	1.18				
	Government websites	3.76	1.13				
	Drug Databases and Directories	3.62	1.17				

Table 7. Attitude score towards online drug information sources by nativity and gender of pharmacy students

Component	Gender	Nativity						Total	
		Urban		Semi-urban		Rural			
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1	Male	4.32	0.88	4.17	0.96	4.29	0.77	4.28	0.85
	Female	4.29	0.76	4.29	0.68	4.19	0.66	4.26	0.72
	Total	4.30	0.84	4.21	0.88	4.27	0.74	4.27	0.81
2	Male	4.10	0.88	4.11	0.88	4.09	0.85	4.10	0.87
	Female	4.14	0.81	4.16	0.76	4.01	0.64	4.10	0.76
	Total	4.11	0.86	4.12	0.84	4.07	0.81	4.10	0.83
3	Male	4.17	0.87	4.08	0.90	4.05	0.88	4.10	0.88
	Female	4.20	0.87	4.22	0.82	4.02	0.79	4.15	0.84
	Total	4.18	0.87	4.13	0.87	4.04	0.86	4.12	0.87
4	Male	4.06	0.93	4.12	0.87	4.08	0.92	4.08	0.91
	Female	4.02	0.92	4.00	0.87	3.95	0.84	4.00	0.89
	Total	4.05	0.92	4.08	0.87	4.05	0.91	4.05	0.91
5	Male	4.03	0.95	3.99	0.96	4.03	0.94	4.03	0.95
	Female	4.00	0.90	4.07	0.87	3.99	0.69	4.01	0.83
	Total	4.02	0.93	4.02	0.93	4.02	0.89	4.02	0.91
6	Male	3.98	0.98	3.95	0.94	3.99	0.93	3.98	0.95
	Female	4.01	0.94	3.91	0.85	3.95	0.78	3.97	0.88
	Total	3.99	0.96	3.94	0.91	3.98	0.90	3.98	0.93
7	Male	4.00	0.94	3.98	0.95	3.99	0.94	3.99	0.94
	Female	4.01	0.93	4.07	0.89	4.00	0.73	4.02	0.87
	Total	4.00	0.94	4.01	0.93	3.99	0.90	4.00	0.92
8	Male	4.03	0.94	3.98	0.94	4.01	0.96	4.01	0.95
	Female	4.08	0.94	4.06	0.88	4.02	0.67	4.06	0.86
	Total	4.04	0.94	4.00	0.92	4.01	0.90	4.03	0.92
9	Male	4.02	0.95	3.98	0.92	4.04	0.97	4.02	0.95
	Female	4.10	0.90	4.06	0.87	3.99	0.72	4.06	0.85
	Total	4.05	0.94	4.00	0.90	4.03	0.92	4.03	0.92
10	Male	4.14	0.93	3.97	1.04	4.03	0.94	4.06	0.96
	Female	4.09	0.87	4.01	0.87	4.09	0.68	4.07	0.82
	Total	4.12	0.91	3.98	0.98	4.05	0.89	4.07	0.92

7.8 Multivariate Test Results of Variation of Attitude Towards Online Drug Information Sources by Nativity and Gender of Pharmacy Students

Table 8 shows how gender, location (urban/rural, etc.), and their interaction influence attitudes toward online medication resources. This table reveals minimal independent effects of gender or location. Location or gender might weakly influence perceptions of privacy, keeping information updated, and reliability, but these factors seem to have little overall impact.

7.9 Student Attitude Over Semester

Table 9 shows the students' attitudes over the semester. Students seem to view online medication resources favorably (average scores around 4), with a possible slight increase in finding them valuable over time. However, the changes across statements and semesters are small. While the specific scale and student population are unknown, this table suggests a generally positive and stable student perception.

Table 8. Multivariate test results

Component	ANOVA			MANOVA		
	Gender	Native	Gender * Native	Gender	Native	Gender * Native
	F (Sig.)	F (Sig.)	F (Sig.)	F (Sig.)	F (Sig.)	F (Sig.)
1	0.002 (0.962)	0.863 (0.422)	1.321 (0.267)			
2	0.000 (0.985)	1.000 (0.368)	0.762 (0.467)			
3	0.618 (0.432)	3.674 (0.026)	0.710 (0.492)			
4	3.043 (0.081)	0.256 (0.774)	0.344 (0.709)			
5	0.001 (0.982)	0.038 (0.963)	0.363 (0.696)	1.288 (0.232)	1.236 (0.213)	0.787 (0.733)
6	0.061 (0.806)	0.368 (0.692)	0.220 (0.803)			
7	0.406 (0.524)	0.067 (0.936)	0.215 (0.806)			
8	0.636 (0.425)	0.219 (0.803)	0.161 (0.851)			
9	0.391 (0.532)	0.305 (0.737)	0.605 (0.546)			
10	0.088 (0.766)	1.385 (0.251)	0.466 (0.628)			

Table 9. Student attitude over semester

Component	1 semester		3 Semester		5 Semester		7 Semester	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1	4.21	0.83	4.30	0.78	4.20	0.91	4.44	0.65
2	4.03	0.91	4.13	0.76	4.05	0.90	4.23	0.70
3	4.07	0.89	4.15	0.82	4.03	0.95	4.25	0.79
4	4.01	0.95	4.08	0.82	3.98	0.98	4.17	0.88
5	3.99	0.97	4.08	0.80	3.88	1.04	4.17	0.80
6	3.96	0.96	3.99	0.85	3.87	1.02	4.11	0.83
7	3.96	0.92	4.06	0.86	3.89	1.03	4.12	0.86
8	3.96	0.93	4.05	0.86	3.93	1.04	4.22	0.82
9	3.98	0.93	4.04	0.86	4.00	1.00	4.16	0.90
10	4.04	0.93	4.06	0.85	3.98	1.03	4.22	0.83

7.10 ANOVA/MANOVA Results

Table 10 shows the ANOVA/MANOVA Results. Pharmacy students' attitudes towards online drug information sources differed significantly based on their semester level. Two findings showed this. First, scores for each question about online drug information sources varied across semesters (ANOVA p-value < 0.05). For instance, 7th-semester students had the highest average score on the first statement, while 5th-semester students had the lowest. Second, when all questions were analysed together (MANOVA), a significant difference (p-value < 0.05) was again observed between semesters. This confirms a relationship between students' semesters in the program and their views on online drug information resources.

Table 10. ANOVA/MANOVA results

Component	ANOVA		MANOVA	
	F	Sig.	F	Sig.
1	10062.3	0.000	214.312	0.000
2	8688.5	0.000		
3	8063.4	0.000		
4	7169.0	0.000		
5	6996.4	0.000		
6	6618.9	0.000		
7	6814.7	0.000		
8	6894.3	0.000		
9	6860.9	0.000		
10	7073.6	0.000		

7.11 Hypothesis Table

Table 11 shows the hypothesis table. This study delved into how pharmacy students across various institutes perceive online drug information sources. Surprisingly, neither gender nor native background significantly influenced their attitudes.

Table 11. Hypothesis table

S.No.	Hypothesis description	Test used	Result
1.	Difference in attitudes towards online drug information sources between genders	ANOVA MANOVA	No significant difference
2.	The difference in attitudes towards online drug information sources among different nativity	ANOVA MANOVA	No significant difference
3.	Relationship between semester level and attitudes toward online drug information sources	ANOVA MANOVA	The significant difference
4.	Interaction Effect between gender and nativity on attitudes towards online drug information sources	ANOVA MANOVA	There is no significant interaction; individual effects are inconclusive

7.12 Total Variance Explained by Source

Table 12 shows the variance explained by each extracted component. The table suggests that the first component has the potential to explain approximately 55 % of the total variance explained by all the variables related to "Sources typically used to obtain drug-related information." Understanding this primary factor would provide crucial insights into the overall structure of preferences for drug information sources.

Table 12. Total variance explained by source

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.477	54.772	54.772	5.477	54.772	54.772
2	.965	9.652	64.423			
3	.811	8.114	72.537			
4	.511	5.111	77.649			
5	.501	5.007	82.656			
6	.427	4.270	86.925			
7	.388	3.879	90.805			
8	.376	3.760	94.564			
9	.281	2.811	97.375			
10	.263	2.625	100.000			

Extraction method: Principal component analysis.

7.13 Total Variance Explained by Factor

Table 13 provides details of the proportion of variance explained by each component. The first component, attitude toward inline drug information sources, can explain approximately 65 % of the variance explained by mentality. This suggests a robust and central dimension shaping these preferences and attitudes.

Table 14 shows the correlation between the first extracted components of sources used to obtain drug-related information and sources that assess attitudes toward online drug information. The strength of the correlation is moderate, suggesting a relationship but not a perfect overlap. Students who rely on specific sources for drug information tend to have similar attitudes toward online drug information sources.

7.15 Logistic Regression Analysis

Table 15 Provides the logistic regression analysis report. The result suggests that concerning the female, the male group has 1.16 times higher utility for obtaining drug-related information, which is found significant with a p-value of less than 5 %. Whereas attitude towards the online drug-related details, both the groups had approximately equal odds ratio for the male group was 0.933 compared with the female group.

Table 13. Total variance explained by factor

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.516	65.164	65.164	6.516	65.164	65.164
2	.646	6.462	71.626			
3	.513	5.130	76.755			
4	.405	4.048	80.803			
5	.393	3.928	84.731			
6	.359	3.587	88.318			
7	.336	3.359	91.678			
8	.325	3.245	94.923			
9	.274	2.739	97.662			
10	.234	2.338	100.000			

Extraction method: Principal component analysis

Table 14. Correlation between the extracted components

Statement	Correlations	Source typically used to obtain drug-related information.
Attitude towards online drug information sources	Pearson Correlation	.425**
	Sig. (2-tailed)	.000
	N	1430

****. Correlation is significant at the 0.01 level (2-tailed)**

Table 15. Logistic regression analysis

S.No.	Statement	Gender	Odds ratio	p-value	95% C.I. for odds ratio	
					Lower	Upper
1.	Source use to obtain drug-related information	Male	**1.161**	**.018**	**1.026**	**1.314**
2.	Attitude toward drug information	Male	.933	.280	.822	1.058

Table 16. Multinomial Regression

S.No.	Nativity	Sources	Odds ratio	p-value	95% Confidence interval for OR	
					Lower bound	Upper bound
1.		Lectures	.967	.705	.814	1.149
2.		Drug information-related Mobile applications.	.948	.560	.792	1.134
3.		Social media	1.041	.617	.889	1.220
4.		Online forums and discussion groups	.971	.759	.808	1.169
5.	Semi-urban	Government websites	.958	.667	.788	1.165
6.		Drug Databases and Directories	1.007	.947	.816	1.244
7.		Scientific journals	.994	.953	.805	1.227
8.		Peer-reviewed articles	.983	.866	.801	1.206
9.		Hospital Pharmacies	1.041	.667	.868	1.248
10.		Books and other publications	.936	.481	.777	1.126
1.		Lectures	1.135	.075	.987	1.306
2.		Drug information-related Mobile applications.	.939	.383	.814	1.082
3.		Social media platforms	1.059	.370	.934	1.200
4.		Online forums and discussion groups	.982	.803	.848	1.136
5.	Rural	Government websites	.926	.335	.793	1.082
6.		Drug Databases and Directories	1.120	.180	.949	1.323
7.		Scientific journals	.985	.859	.834	1.163
8.		Peer-reviewed articles	.927	.357	.790	1.089
9.		**Hospital Pharmacies**	**1.155**	**.050**	**1.000**	**1.333**
10.		**Books and other publications**	**.828**	**.011**	**.715**	**.958**

The reference category is Urban; p-value<0.05 will be considered significant

7.16 Multinomial Regression

Table 16 shows the results of multinomial regression. The analysis suggests that, concerning the urban group, the rural group has an odds ratio of 1.155 times higher for hospital pharmacies and a lower odds ratio of 0.828. Overall, rural students favor traditional and readily available sources, highlighting potential disparities in accessing newer information channels between urban and rural areas.

7.17 Results of Multinomial Regression

Table 17 shows the results of multinomial regression. The analysis suggests that concerning the first-semester group, the third-semester group has an odds ratio of 0.801 times less for scientific journals, 1.221 times higher for peer-reviewed articles, and 1.058 times higher for hospital pharmacies. For the 5th-semester group, mobile applications, online forums, discussion groups, and peer-reviewed articles had higher odds of 1.283, 1.237, and 1.255, respectively, and lower odds of 0.831 for books and publications. Meanwhile, for the 7th semester, drug databases and directories have a lower odds ratio of 0.787 and a higher odds ratio of 1.266 for peer-reviewed articles.

Figure 1 shows the structural equation model; it demonstrates intricate relationships among attitudes, preferences, and semesters. The semester significantly influences attitude (0.014) and preferences (0.032). Attitudes significantly predict preferences (0.726).

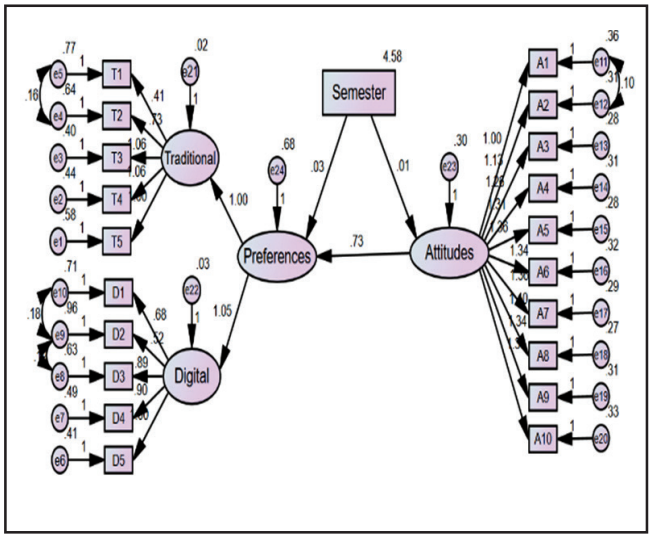

Figure 1. Structural equation model.

Table 17. Results of multinomial regression

S.No.	Semester	Sources	Odds ratio	p-value	95% Confidence interval for OR	
					Lower bound	Upper bound
1	3 Semester	Lectures	1.032	.703	.879	1.211
2		Drug information-related Mobile applications.	1.053	.534	.895	1.239
3		Social media platforms	1.014	.847	.878	1.172
4		Online forums and discussion groups	1.057	.522	.893	1.251
5		Government websites	1.007	.941	.843	1.202
6		Drug Databases and Directories	.957	.652	.792	1.157
7		Scientific journals	.801	.024	.661	.971
8		Peer-reviewed articles	1.221	.035	1.014	1.470
9		Hospital Pharmacies	1.058	.500	.897	1.249
10		Books and other publications	.915	.295	.774	1.081
1	5 Semester	Lectures	.894	.203	.752	1.062
2		Drug information-related Mobile applications.	1.283	.007	1.069	1.540
3		Social media platforms	.882	.124	.752	1.035
4		Online forums and discussion groups	1.237	.025	1.027	1.489
5		Government websites	1.090	.397	.893	1.329
6		Drug Databases and Directories	.843	.116	.681	1.043
7		Scientific journals	.978	.841	.791	1.211
8		Peer-reviewed articles	1.255	.031	1.021	1.543
9		Hospital Pharmacies	.902	.270	.752	1.083
10		Books and other publications	.831	.051	.690	1.001
1	7 Semester	Lectures	.973	.782	.799	1.184
2		Drug information-related Mobile applications.	1.179	.104	.967	1.437
3		Social media platforms	.931	.416	.783	1.106
4		Online forums and discussion groups	1.116	.285	.912	1.366
5		Government websites	1.142	.232	.919	1.419
6		Drug Databases and Directories	.787	.044	.624	.994
7		Scientific journals	.996	.972	.791	1.254
8		Peer-reviewed articles	1.266	.038	1.013	1.582
9		Hospital Pharmacies	1.039	.703	.853	1.267
10		Books and other publications	.965	.736	.786	1.185

The reference category is 1 semester; a p-value<0.05 will be considered significant.

7.18 Model Fit

Table 18 shows the analysis employed a linear regression model that fits the data (RMSEA=0.048, NFI=0.957, IFI=0.966, CFI=0.966). This suggests positive attitudes, higher semesters, and specific factors related to preferred learning methods (traditional/digital) all influence overall preference for learning methods. Interestingly, there's a slight preference for digital sources, and the influence of attitudes on preference appears to strengthen as students progress through their studies.

Table 18. Model fit

RMSEA	NFI	IF	CFI
0.048	0.957	0.966	0.966

7.19 Regression Weights

Table 19 shows the regression analysis, which explored how attitudes, semesters, and learning method preferences (traditional/digital and additional factors) influence overall learning method preference. Positive

attitudes and higher semesters were associated with stronger preferences. Interestingly, there was a slight but significant preference for digital methods. The analysis also revealed that specific factors related to traditional or digital methods play a role, and the influence of attitudes on preference appears to strengthen as students progress through their semesters.

8. DISCUSSION OF FINDINGS

The research examined pharmacy students' digital literacy skills and attitudes toward drug-related information resources. The Kaiser-Meyer-Olkin measure and Bartlett's test confirmed the adequacy and suitability of the data for factor analysis. Gender and semester-wise distribution indicated significant associations with attitudes toward

Table 19. Regression weights

			Estimate	S.E.	C.R.	P
Attitudes	<---	Semester	0.014	0.007	2.068	0.039
Preferences	<---	Attitudes	0.726	0.052	13.860	***
Preferences	<---	Semester	0.032	0.011	2.917	0.004
Traditional	<---	Preferences	1.000			
Digital	<---	Preferences	1.049	0.048	22.018	***
T5	<---	Traditional	1.000			
T4	<---	Traditional	1.061	0.032	33.528	***
T3	<---	Traditional	1.063	0.031	34.054	***
T2	<---	Traditional	0.733	0.029	25.017	***
T1	<---	Traditional	0.411	0.028	14.759	***
D5	<---	Digital	1.000			
D4	<---	Digital	0.899	0.026	34.421	***
D3	<---	Digital	0.887	0.028	31.715	***
D2	<---	Digital	0.516	0.030	17.458	***
D1	<---	Digital	0.679	0.027	25.145	***
A1	<---	Attitudes	1.000			
A2	<---	Attitudes	1.130	0.037	30.692	***
A3	<---	Attitudes	1.262	0.046	27.201	***
A4	<---	Attitudes	1.307	0.048	27.024	***
A5	<---	Attitudes	1.359	0.049	27.781	***
A6	<---	Attitudes	1.344	0.049	27.190	***
A7	<---	Attitudes	1.362	0.049	27.696	***
A8	<---	Attitudes	1.399	0.049	28.293	***
A9	<---	Attitudes	1.344	0.049	27.311	***
A10	<---	Attitudes	1.303	0.049	26.706	***

drug information sources. Overall, attitudes toward online resources were favorable, although preferences varied between traditional and digital sources, with traditional mediums being rated slightly higher. Multivariate analysis revealed minimal independent effects of gender or location on attitudes, while differences at the semester level significantly impacted perceptions. Hypothesis testing indicated no significant differences based on gender or nativity, but it did reveal a notable relationship between semester levels and attitudes. The study emphasised the high value placed on online resources, although variations in perceptions and preferences suggested opportunities for targeted improvements.

9. DISCUSSION AND CONCLUSION

The paper highlights the need to revamp pharmacy curriculums to include digital literacy and information verification skills. Although factors like semester level and gender did not impact students' attitudes toward drug-related resources, it underscores the need for training. Despite concerns about online reliability, it finds a positive attitude towards various resources, including lectures, books, mobile apps, and even social media. Statistical analysis explores how demographics influence student preferences, providing valuable insights into how students access and view drug information. Pharmacy education is changing as digital drug information resources become indispensable. Teaching students how to verify information and develop digital literacy skills is crucial. Including these skills in the curriculum prepares future pharmacists for modern healthcare. The study suggests incorporating digital skills into the curriculum, partnering with reliable online resources, and monitoring student usage patterns.

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