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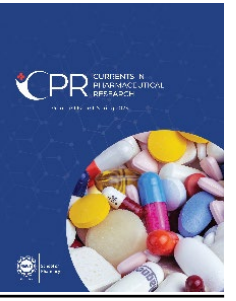

Title:	**Demographic Determinants of E-Pharmacy Utilization and Perceived Barriers Among Adults in Lahore, Pakistan: A Cross-Sectional Study**
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Demographic Determinants of E-Pharmacy Utilization and Perceived Barriers Among Adults in Lahore, Pakistan: A Cross-Sectional Study

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ABSTRACT

E-pharmacy facilities are growing at a very fast rate across Pakistan. However, much remains to be learned about how they are being utilized across the country. These connections are important to understand in order to make healthcare more accessible and to make effective policy decisions. This paper aimed at investigating the relationship between the demographics of individuals in Lahore, Pakistan and their use of online pharmacies, as well as the demographic predictors of hindrances that do not allow them to use these services. A sample of adults in Lahore participated in a cross-sectional study conducted between April 1, 2024 and September 30, 2024. The participants were selected through the convenience sampling method to ensure variability in their digital exposure, education levels, and socioeconomic background. Structured questionnaires were employed to gather data on demographics, perceived barriers, and e-pharmacy usage. The study found that the perception and usage of e-pharmacy services is strongly associated with the demographic characteristics of the individuals. Among the 450 respondents, the level of knowledge regarding e-pharmacy services was mostly high but only a moderate percentage of respondents used these services regularly. The use of e-pharmacy was found to be statistically significantly related to age group, level of education, socioeconomic status, and type of mobile phone used ($p < 0.05$). The participants who were younger, better educated, and from upper socioeconomic groups were more likely to use e-pharmacy services. Fear of getting counterfeit medicines, distrust of online platforms, low levels of digital literacy, high delivery fees, and poor awareness of the available services were the most common barriers among non-users. These results suggest that despite awareness, there still remain several structural and perceptual obstacles that prevent the popularization of e-pharmacies in the local context. The current study found that the barriers and willingness of people to use e-pharmacies in Lahore is strongly associated with their

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demographic background. These results indicate that there is a need to provide specific initiatives to address the problem of trust and digital literacy, particularly among less educated people.

Keywords: demographic correlates, e-pharmacy, perceived barriers, healthcare services, online-pharmacy, utilization patterns

1.INTRODUCTION

Online pharmacies are enterprises that offer prescription drugs and other pharmaceutical products to be sold online, so that a customer can order the products online and have them delivered through mail [1]. Online pharmacies operate on the internet, whereas they deliver orders to their customers through postal services or other shipping companies [2, 3]. They may broadly be classified into two groups, namely legitimate and illegitimate, based on their verification and adherence to national or international professional standards and regulations. There are legitimate online pharmacies that offer quality pharmacy services all over the world [4].

The digital health sector's ongoing growth has accelerated the growth of pharmaceutical e-commerce. Technology has increased the expansion and development of e-pharmacies [5]. There have been various technology breakthroughs that have altered healthcare via such pharmacies [6]. The rising use of smartphones and mobile apps has made e-pharmacy services more accessible and convenient to use while traveling. Mobile devices have made e-pharmacy platforms more accessible and integrated into the everyday life [7]. Indeed, mobile technology and artificial intelligence (AI) are essential for e-pharmacy. This is because AI improves inventory management, personalizes recommendations, and improves consumer experiences [8].

A revolutionary concept in e-communication and e-prescription, e-pharmacy has established a new business paradigm for pharmacies [9]. The digital evolution of pharmaceutical services offers enhanced convenience and improved accessibility to pharmaceutical products, as they become readily available in a variety of locations that are not freely reachable due to geographical or socioeconomic constraints, thereby challenging the traditional pharmacy model [10, 11].

Within the past few years, the use of online pharmacies has seen a surge around the world, especially after COVID-19. Indeed, it is one of the

increasingly used e-services in developed countries and even in major urban centers of developing countries [10, 12-14]. E-pharmacies have become the need of the hour for the smooth and effective provision of a conventional community pharmacy service [14, 15]. The uptake of these services, however, remains heterogeneous among demographic groups with a continued barrier to usage [16].

Lahore, the second-largest metropolis in Pakistan, provides a good case study to analyze the demographic differences in e-pharmacy adoption and usage patterns in an urban setting of a developing economy. It is critical to explain the demographic associations of e-pharmacy barriers and to inform specific interventions that may improve healthcare access for different urban communities. It offers essential information to policymakers and healthcare providers to overcome certain issues associated with various demographic groups [17]. In addition, it adds to the growing body of literature on e-health trends in developing countries, which allows drawing comparisons and understanding the situation worldwide.

Although e-pharmacy may have certain advantages, its adoption is associated with complex problems and may also lead to a variety of drawbacks, such as absence of meaningful interaction between pharmacists and patients, as well as improper use of drugs and privacy concerns, unless properly regulated [18, 19]. The primary obstacles include privacy and security, absence of customer service, and social interaction [20, 21]. Moreover, the intricate interaction of socio-cultural aspects, socioeconomic status, and technological maturity has a strong impact on the consumer behavior of adopting or rejecting e-pharmacy services [22, 23].

The current study aims to examine the demographic predictors of e-pharmacy barriers and usage trends in Lahore, Pakistan. Although e-pharmacy services are increasingly available in all the major cities of Pakistan, their usage and acceptance among the population remains under-researched. Digital pharmaceutical services can enhance access to medicine in time, especially in a healthcare system where a lack of physical access is frequently caused by overcrowding, distance, and cost. Nonetheless, there is limited local data available describing the usage patterns, demographic factors, and obstacles that impede the adoption of such services. The majority of the current research in Pakistan remains centered on the traditional approach to pharmacy. Hence, there is a significant gap in the knowledge about digital pharmaceutical services. Thus, the current study

was carried out to determine the level of e-pharmacy usage and the significant demographic predictors and perceived barriers among adults in Lahore. By using a strict analysis of the variables age, education, income, and gender, the application of a cross-sectional study design, and the use of powerful statistical tests, this study attempts to present an in-depth analysis of the demographic situation that affects the adoption of e-pharmacy in Lahore, Pakistan. The results also offer practical implications towards enhancing e-pharmacy services in the country.

2.METHODOLOGY

2.1 Ethical Considerations

The research was approved by the Ethics and Research Committee of the University of Central Punjab (UCP), Lahore. The authors also obtained the approval of Ailaaj Online Pharmacy, Lahore (Meeting No: Ailaaj/GM/2024/3/2). Participant confidentiality was one of the priorities during the study. No personal identifiers were gathered and all data was stored securely. All the participants participated fully voluntarily and informed consent to include them in the study was taken.

2.2 Study Design

The study was a descriptive, cross-sectional study aimed at examining the use of e-pharmacies by adults in Lahore and the challenges they encounter. This method allowed the researchers to see the existing behaviors and attitudes at a particular point in time without any manipulation of variables.

2.3 Study Site

The data was collected at various places that represented varied social and educational environments using convenience sampling. These included Ailaaj Online Pharmacy, Lahore, the University of Central Punjab and its environs, the Allama Iqbal Campus of the University of the Punjab, and Bahria Town, Lahore. These places were selected strategically to include people with different degrees of digital access, education, and socioeconomic status.

2.4 Study Population and Eligibility Criteria

The participants were aged between 18 and 60 years and willing to give their informed consent to participate in this study. No limitations were put

on gender, level of education, occupation, or socioeconomic status, since the authors wanted to cover a broad range of adult population in the study.

2.5 Sample Size and Study Duration

The sample size was calculated by using the formula given by Yamani and settled on 450 respondents. This number was deemed sufficient to obtain credible estimates and make meaningful subgroup analyses. The research was conducted between April 1, 2024 and September 30, 2024.

2.6 Data Collection Instrument

The data was gathered by way of a self-designed questionnaire which was designed specifically to conduct this research. It included demographic information, past exposure to e-pharmacy platforms, and the obstacles encountered by those who have not used it yet. The questionnaire was carefully examined and reviewed by the experts to ensure that it was up to the mark, with a Scale Content Validity Index of 0.94 to demonstrate relevance (S-CVI R) and 0.89 to demonstrate clarity (S-CVI C).

2.7 Data Collection Procedure

The participants were recruited from the study sites using convenience sampling. The aim was to recruit people of different educational background, socioeconomic status, and digital exposure. Trained data collectors approached potential participants face to face at various times of the day to increase participant diversity. A short explanation of the study objectives and procedures was given to each person and participation was voluntary. Only participants who fulfilled the eligibility requirements and made informed consent were incorporated in the study. The process of recruitment went on until the necessary sample size was reached at every site. This method assisted in minimizing confusion and all the participants gave similar answers. The forms were then verified thoroughly to ensure that they were accurate and complete. Then, they were included in the dataset.

The recruitment of participants across different study locations minimized the selection bias. A validated questionnaire and standardized face-to-face data collection were used to minimize the information bias. In order to minimize the social desirability bias, the participants were promised anonymity and confidentiality. Likewise, correct data entry was done by cross-checking the data repeatedly before analysis.

2.8 Data Analysis

All the data were analyzed and processed using IBM SPSS (version 26). Descriptive statistics were employed to provide a clear image of the demographic characteristics of the participants. Appropriate inferential tests were used to examine the association between demographic variables, usage patterns, and the demographic predictors of the reported barriers. A significance level of $p < 0.05$ was used in all statistical analyses. The relationship between demographics and the use of e-pharmacy is possibly confounded by a number of factors, such as digital literacy, previous experience with online purchases, confidence in online healthcare services, access to the Internet, and personal health-seeking behavior. Similarly, social media and peer influence may also have been associated with the awareness and adoption of e-pharmacy without considering measured variables.

3.RESULTS

3.1 Demographic and Socioeconomic Characteristics

The current study was based on a sample size of 450 respondents. Among them 223 (50%) were male and 209 (46%) were female. The majority of the participants, that is, 374 (79%) fell in age group of 18-30 years, whereas the second major age group was 31-40 years with 61 (13%) participants. Graduation was completed by 114 (25%) participants, while 50 (11%) and 23 (5%) had either completed matriculation or were uneducated, respectively. The majority of the participants were single 280 (62%). A total of 205 (45%) participants reported themselves as lower middle class, 175 (39%) were recorded as upper middle class, while only 35 (8%) belonged to the elite class. The majority of the participants 396 (88%) used smartphones to access online pharmacy, followed by 34 (7%) and 16 (4%) through feature phones and basic phones, respectively. A total of 219 (49%) internet users used internet for more than two hours, while 77 (17%) of the participants used the internet for less than two hours. Table 1 summarizes the details of baseline characteristics of the studied sample.

Table 1. Details of Baseline Characteristics of the Studied Samples (n=450)

Characteristics		f	%
Age	18-30 Years	374	79
	31-40 Years	61	13

Characteristics		*f*	%
	41-50 Years	17	4
	51-60 Years	18	4
Gender	Male	223	50
	Female	209	46
	Trans-male	9	2
	Trans-female	9	2
Educational Level	Uneducated	23	5
	Matriculation	50	11
	Bachelors	263	59
	Graduation or above	114	25
Marital Status	Single	280	62
	Married	137	30
	Separated	22	5
	Divorced	11	3
Socioeconomic Status	Lower Class	35	8
	Lower Middle Class	205	45
	Upper Middle Class	175	39
	Elite Class	35	8
Cellphone Type	Basic Phone	16	4
	Feature Phone	34	7
	Smart Phone	396	88
	None	4	1
Internet Usage	Less than 2 hours	77	17
	More than 2 hours	219	49
	Not Sure	121	27
	Not have Internet	33	7

3.2 Demographic Predictors for E-Pharmacy Barriers in Non-Users

Age and educational status of the participants were found as significant demographic factors that predicted website complexity as a barrier in using e-pharmacy services among non-users. Similarly, age, educational level, and type of cellphone used were found as significant demographic factors to predict the language of the website as a barrier in using e-pharmacy services. The socioeconomic status of the participants was also a significant demographic factor that predicted high delivery charges and no delivery at the desired address as barriers to using e-pharmacy. Likewise, the age and

type of cell phones used were significant factors that predicted strict prescription protocols as a barrier to using e-pharmacy. Similarly, age and educational status were significant factors to predict payment complications as a barrier to using e-pharmacy usage.

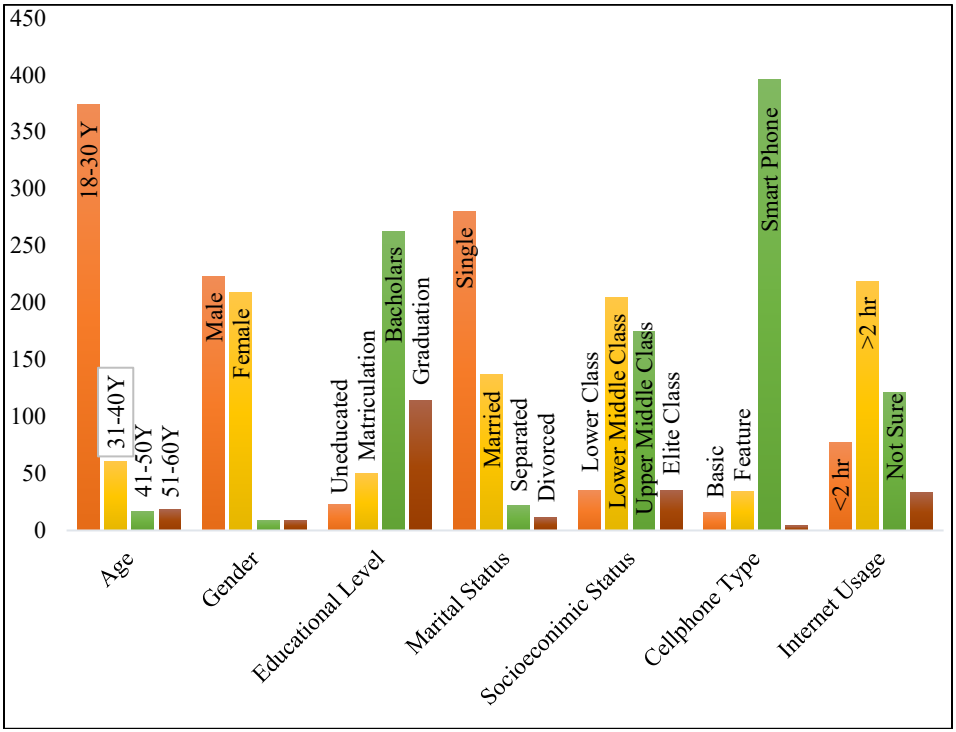

Figure 1. Demographic Characteristics of the Participants

Educational status was found to be a significant predictor which predicted the fear of losing personal data as a barrier. Similarly, educational status and socioeconomic status were significant factors to predict the unavailability of the required medicine as a barrier. Lastly, age, educational status, and type of cellphone used were found to be significant factors to predict the lack of website support at device as a barrier to using e-pharmacy services. Table 2 summarizes all the factors.

Table 2. Demographic Predictors for E-Pharmacy Barriers in Non-Users

Barriers in Non-Users	Demographics	*B*	*SE B*	β	*p*
Complexity of Website	Age	0.330	0.070	0.258	<0.001
	Gender	-0.021	0.068	-0.014	0.763
	Educational Status	-0.532	0.079	-0.396	<0.001

Barriers in Non-Users	Demographics	*B*	*SE B*	β	*p*
	Socioeconomic Status	-0.054	0.074	-0.039	0.464
	Type of Cellphone	-0.027	0.123	-0.013	0.829
Language of Website	Age	0.266	0.049	0.242	<0.001
	Gender	-0.029	0.048	-0.022	.549
	Educational Status	-0.552	0.056	-0.477	<0.001
	Socioeconomic Status	-0.013	0.052	-0.011	.804
	Type of Cellphone	-0.357	0.086	-0.202	<0.001
High Delivery Charges	Age	0.014	0.080	0.010	0.865
	Gender	-0.131	0.079	-0.085	0.097
	Educational Status	-0.145	0.092	-0.105	0.115
	Socioeconomic Status	-0.258	0.086	-0.179	0.003
	Type of Cellphone	-0.271	0.142	-.129	0.050
Long Delivery Time	Age	0.029	0.093	0.021	0.751
	Gender	-0.018	0.091	-0.011	0.844
	Educational Status	-0.045	0.106	-0.030	0.670
	Socioeconomic Status	-0.010	0.099	-0.006	0.918
	Type of Cellphone	-0.031	0.164	-0.014	0.848
No Delivery at Desired Address	Age	0.102	0.068	0.096	0.134
	Gender	0.069	0.067	0.055	0.303
	Educational Status	-0.040	0.077	-0.036	0.604
	Socioeconomic Status	-0.168	0.072	-0.143	0.021
	Type of Cellphone	0.084	0.120	0.049	0.486
Lack of Awareness and Advertisement	Age	0.121	0.083	0.092	0.150
	Gender	-0.104	0.082	-0.068	0.204
	Educational Status	-0.153	0.095	-0.111	0.110
	Socioeconomic Status	-0.131	0.089	-0.091	0.144
	Type of Cellphone	0.123	0.148	0.059	0.405
Strict Prescription Protocols	Age	0.178	0.081	0.142	0.028
	Gender	0.125	0.079	0.084	0.114
	Educational Status	-0.094	0.092	-0.071	0.304
	Socioeconomic Status	0.026	0.086	0.019	0.758
	Type of Cellphone	0.310	0.143	0.153	0.030
Payment Complications	Age	0.397	0.084	0.293	<0.001
	Gender	-0.113	0.082	-0.071	0.171
	Educational Status	-0.189	0.096	-0.133	0.049
	Socioeconomic Status	-0.026	0.090	-0.017	0.773

Barriers in Non-Users	Demographics	*B*	*SE B*	β	*p*
	Type of Cellphone	0.195	0.149	0.090	0.190
Fear of Losing Personal Data	Age	-0.036	0.086	-0.026	0.674
	Gender	-0.036	0.085	-0.022	0.672
	Educational Status	0.281	0.098	0.194	0.005
	Socioeconomic Status	0.023	0.092	0.015	0.800
	Type of Cellphone	0.143	0.153	0.064	0.352
Fear of Getting Fake Medicine	Age	0.000	0.087	0.000	0.997
	Gender	-0.072	0.085	-0.045	0.400
	Educational Status	0.007	0.099	0.005	0.947
	Socioeconomic Status	0.013	0.092	0.009	0.891
	Type of Cellphone	0.060	0.153	0.028	0.698
Unavailability of Required Medicine	Age	-0.083	0.084	-0.063	0.326
	Gender	-0.060	0.083	-0.039	0.465
	Educational Status	-0.201	0.096	-0.145	0.036
	Socioeconomic Status	.0241	0.090	0.166	0.007
	Type of Cellphone	-0.287	0.149	-0.136	0.054
Lack of Website Support at Device	Age	0.389	0.058	0.324	<0.001
	Gender	0.103	0.057	0.073	0.074
	Educational Status	-0.223	0.067	-0.177	0.001
	Socioeconomic Status	-0.107	0.062	-0.081	0.088
	Type of Cellphone	-0.507	0.104	-0.264	<0.001

Note. $p<0.05$ was considered statistically Significant for Linear Regression Analysis

3.3 Demographic Differences in the Use of E-Pharmacy

The analysis to check the differences in the use of e-pharmacy in participants based on their demographics was conducted. The analysis revealed counts (expected count) for age in 18-30 years, 31-40 years, 41-50 years, and 51-60 years as 56 (45.6), 2 (7.9), 0 (2.2), 0 (2.3) for Yes, 281 (291.9), 57 (50.3), 17 (14.0), 16 (14.8) for No, and 17 (16.5), 2 (2.8), 0 (0.8), 2 (0.8) for May be. The differences in usage were analyzed using Pearson chi square test. The results presented a very weak positive difference between the use of e-pharmacy services and age with the *p*-value of 0.014, $\chi 2$ of 15.926, and ϕ of 0.18. Counts (expected count) for gender, male, female, trans-male, and trans-female were 30(28.7), 28(26.9), 0(1.2), 0(1.2) for Yes, 184(183.9), 169(172.3), 9(7.4), 9(7.4) for No, and 9(10.4), 12(9.8),

0(4), 0(4) for May be. In the same manner, a very weak positive difference between the use of e-pharmacy and gender was exhibited with the *p*-value of 0.583, χ2 of 4.701, and ϕ of 0.10. Expected counts for the educational status for uneducated, matriculation, bachelors, and graduation or above were noted to be 0(3.0), 0(6.4), 15(33.9), 43(14.7) for Yes, 23(19.0), 47(41.2), 239(216.8), 62(94.0) for No, 0(1.1), 3(2.3), 9(12.3), and 9(5.3) for May be. A strong positive difference was found related to educational status with the *p*-value of <0.001, χ2 of 93.982, and ϕ of 0.45. The results showed counts (expected count) for socioeconomic status for lower class, lower-middle class, upper-middle class, and elite class as 0(4.5), 0(26.4), 40(22.6), and 18(4.5) as Yes, 35(28.9), 198(169.0), 128(144.3), and 10(28.9) as No, 0(1.6), 7(9.6), 7(8.2), and 7(1.6) as May be. In the same way, a strong positive difference with socioeconomic status was seen with the *p*-value of <0.001, χ2 of 125.319, and ϕ of 0.52. Whereas, the expected count for the type of cell phone for basic phone, feature phone, smart phone, or none were noted as 0(2.1), 2(4.4), 56(51.0), and 0(0.5) as Yes, 16(13.2), 32(28.0), 321(326.5), and 2(3.3) as No, 0(0.7), 0(1.6), 19(18.5), and 2(0.2) as May be. These values revealed a weak positive difference between the use of e-pharmacy and the type of cellphone presented with the *p*-value of <0.001, χ2 of 26.081, and ϕ of 0.24. Table 3 provides detailed count analysis and differences in the use of e-pharmacy services in participants based on their demographics.

Table 3. Detailed Count Analysis and Differences in the Use of E-Pharmacy Services in Participants Based on their Demographics

Demographics		Yes (*N*=58)	No (*N*=371)	May be (*N*=21)	$\chi^2(6)$	Φ	*p*
		f (Expected *f*)	*f* (Expected *f*)	*f* (Expected *f*)			
Age	18-30 Years	56 (45.6)	281 (291.9)	17 (16.5)	15.926	0.18	0.014
	31-40 Years	2 (7.9)	56 (50.3)	3 (2.8)			
	41-50 Years	0 (2.2)	17 (14.0)	0 (0.8)			
	51-60 Years	0 (2.3)	16 (14.8)	2 (0.8)			
Gender	Male	30 (28.7)	184 (183.9)	9 (10.4)	4.701	0.10	0.583
	Female	28 (26.9)	169 (172.3)	12 (9.8)			
	Trans-male	0 (1.2)	9 (7.4)	0 (4)			
	Trans-female	0 (1.2)	9 (7.4)	0 (4)			
Educational Status	Uneducated	0 (3.0)	23 (19.0)	0 (1.1)	93.982	0.45	<0.001
	Matriculation	0 (6.4)	47 (41.2)	3 (2.3)			
	Bachelors	15 (33.9)	239 (216.8)	9 (12.3)			
	Graduation or above	43 (14.7)	62 (94.0)	9 (5.3)			

Demographics		Yes (*N*=58)	No (*N*=371)	May be (*N*=21)	$\chi^2(6)$	Φ	*p*
		f (Expected *f*)	*f* (Expected *f*)	*f* (Expected *f*)			
Socioeconomic Status	Lower	0 (4.5)	35 (28.9)	0 (1.6)	125.319	0.52	<0.001
	Lower Middle	0 (26.4)	198 (169.0)	7 (9.6)			
	Upper Middle	40 (22.6)	128 (144.3)	7 (8.2)			
	Elite	18 (4.5)	10 (28.9)	7 (1.6)			
Type of Cellphone	Basic Phone	0 (2.1)	16 (13.2)	0 (0.7)	26.081	0.24	<0.001
	Feature Phone	2 (4.4)	32 (28.0)	0 (1.6)			
	Smart Phone	56 (51.0)	321 (326.5)	19 (18.5)			
	None	0 (0.5)	2 (3.3)	2 (0.2)			

Note. $p<0.05$ was considered statistically Significant for Pearson's Chi-Square Test

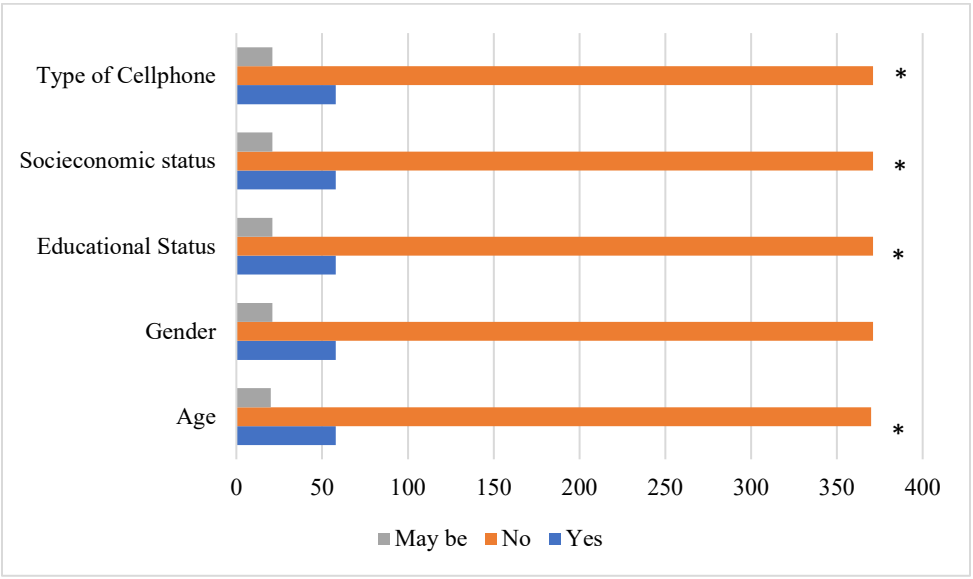

Figure 2. Significant Demographics for Differences in the Use of E-Pharmacy Services in Participants

4. DISCUSSION

Data analysis showed that out of 450 participants, most were between 18-30 years of age. In other words, most adult participants belonged to the same age group. These results are consistent with the results of a previous study [24] which showed that the majority of the participants using e-pharmacies belonged to the same age group. Most of the participants were men (50%) as compared to women (which were 46%). This makes this

study comparable to a previous study as well [24]. The results showed that most of the participants using e-pharmacy services were educated, with the majority having a bachelor's degree. These results are similar to the results of other previous studies [25, 26] which showed that most of the customers had a bachelor's degree.

The current study revealed that most of the patients had a low socioeconomic status, as lower-middle class patients were greater in number. Poverty affects the quality of living standards, since using e-pharmacy services requires a cell phone and an internet connection to buy medicines, which comes with good money. Consumers who have a high income may have better accessibility to e-pharmacy services as compared to low income ones [25, 27]. Another important point was the type of cell phone used. In this regard, most of the participants used a smart phone to order or purchase medication through e-pharmacy services. One of the basic reasons to use these phones is to gain easy accessibility to e-pharmacy application which could be difficult with feature or basic phones. In this regard, the current study is comparable with a previous study which showed people using smart phones to purchase medicines online [28].

Demographic predictors of the barriers to e-pharmacy services in non-users were compared with the results of previous studies. In this regard, age and educational status were found to be significant predictors of website complexity. This is because senior citizens found it tough to use online applications or sites due to visual complexities, while people with less educational background found it tough to operate e-pharmacy sites [29, 30]. These results are comparable with the results of a previous study which showed that middle-aged and senior citizens found it difficult to use online applications and less educated people also found it hard to operate such applications [31]. The results determined age, educational status, and type of cellphone used as significant predictors of the language of the website as a barrier. These results are consistent with the results of previous studies [32]. The results also showed socioeconomic status as a significant predictor of high delivery charges as a barrier. This result is also comparable to the results of previous studies [33]. According to the current study, individuals from the lower class and the lower-middle class are highly likely to not use e-pharmacies due to their income limitations. They tend not to buy medication along with an additional delivery fee [33].

The results also indicated socioeconomic status as a significant

predictor of no delivery at the desired address as a barrier. The result is consistent with a previous study [34]. Further, the results showed that there was no significant demographic factor to predict differences in the lack of awareness and advertisement as a barrier. These results are in line with a previous study [35]. The findings revealed age and type of cellphone used as significant predictors of strict prescription protocols as barriers. These results were comparable to the results of previous studies [33]. The findings also showed a significant difference in payment complications with age and educational status, with results comparable to a previous study [32]. Age and educational status were found to be significant predictors of the fear of losing personal data or information as a barrier to e-pharmacy usage. These findings are in line with those of an earlier study that found that peoples fear of disclosing personal information was the main deterrent to utilizing online pharmacies [34].

As per the findings, educational status and socioeconomic status are significant factors to predict the unavailability of the required medicines as barriers, in line with the results of a previously published study [35]. The results showed that age, educational status, and type of cellphone used are significant factors to predict the lack of website support at device as a barrier. These results are in line with the results of a previous study which showed that at a particular age, the customer wants easy access which could be difficult with certain devices or types of cell phones used. This is because basic phones lack feasibility and show less support to the main online purchasing sites for medications [36].

The results revealed that there is a significant association in the use of e-pharmacy and age. In this regard, the results are comparable to a previous study which showed that people of a particular age, such as adults of 18-30 years, are more likely to use online pharmacy sites to purchase medications [17]. The results also expressed a significant association in the usage of e-pharmacy and educational status. The reason is that well-educated people can easily understand how to use e-pharmacy sites and purchase an order. Mostly, people that are bachelors tend to buy medications online. This result is comparable to the results of another study [37]. According to the study, educated people are well aware and use e-pharmacy sites to purchase medicines online.

The results also revealed that there is a significant association in the use of e-pharmacy and the socioeconomic status of people. The reason is that it

requires money to have a smart phone or feature phone through which online pharmacy sites can be accessed. Lower-middle and upper-middle classes are more likely to buy medicines online. The results are comparable to the results of a previous study which showed that middle class and upper middle class individuals purchase medication online [38]. The results also revealed that there is a significant association in the use of e-pharmacy and the type of cellphone used. People with smart phones and feature phones have an easy accessibility to online pharmacy sites. The results are comparable to results of a previous study which showed that the major difference in having basic phones and smart phones correlates with accessibility [39].

4.1. Strengths and Limitations

Besides the most important findings, this research has a number of methodological strengths which contribute to the credibility of the findings. The data is more representative because a rather large and heterogeneous urban sample, recruited from various educational, commercial, and residential locations, was used. In addition, the consistency and reliability of responses was achieved through the use of a validated data collection instrument. Moreover, this study offers a better insight into digital pharmacy adoption in the local setting, where empirical evidence still remains scarce, by examining both e-pharmacy use and the perceived barriers to its usage simultaneously.

Although the results showed that demographic characteristics have a significant influence on how people perceived and dealt with e-pharmacy services, this study has several limitations as well. Its cross-sectional design restricted the ability to infer causal relationships. Further, the sample was drawn mainly from the digitally active urban areas of Lahore. Hence, it may not fully represent individuals with limited internet access or those from peri-urban areas. Moreover, reliance on self-reported data introduces the possibility of recall and social desirability biases. While, the overrepresentation of younger and more educated participants may be associated with the observed patterns of e-pharmacy usage and perceived barriers. In addition, the research was mainly based on demographic variables, excluding other variables such as trust in digital health services and quality of service issues, which may also influence the behavior of the users. Nevertheless, despite the limitations reported above, positive findings in the use of e-pharmacy services and barriers to their usage can be used as

foundations on which future research can build.

4.2. Conclusion

Although e-pharmacy services are growing at a very high rate, there is a lack of knowledge concerning the demographic factors that affect their usage. The current paper underlines the importance of demographic characteristics towards the utilization of e-pharmacy services, as well as the barriers in their usage, by people in Lahore, Pakistan. The findings indicate that the experience of people regarding e-pharmacy services depends greatly on a specific set of criteria, including age, gender, socioeconomic status, and educational level. The research concludes that although the elderly population faces important barriers in terms of digital literacy, highly educated people with a high socioeconomic status are more inclined to use e-pharmacy services. There are also socioeconomic influences including the cost of delivery and product selection that can scare away the potential customers. To enhance the adoption of e-pharmacy services, it is necessary to overcome these challenges. The projects in the future should focus on improving digital literacy, building trust by taking legal measures, and tailoring outreach efforts to the specific needs of different demographic groups. National language can be used on e-pharmacy platforms to improve the knowledge and confidence of the population. The use of Urdu is thus important in expanding access to digital pharmacy services. In this way, the stakeholders would be able to create an increased access to e-pharmacy services, which would eventually enhance the delivery and outcome of healthcare in urban areas, such as Lahore, Pakistan.

Author Contribution

Muhammad Faheem: conceptualization, data curation, formal analysis, writing-original draft, writing-review and editing. **Waqas Akram:** supervision, methodology, validation, visualization. **Ali Akhtar:** formal analysis, visualization, writing-review and editing. **Mahtab Ahmad Khan:** project administration, supervision. **Zuha Shahid:** writing original draft, writing-review and editing.

Conflict of Interest

The authors of the manuscript have no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

Data Availability Statement

Data supporting the findings of this study will be made available by the corresponding author upon request.

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REFERENCES

1. Al-Worafi Y. *A Guide to Online Pharmacy Education: Teaching Strategies and Assessment Methods.* CRC Press; 2022.
2. Roshini A, Pavithra G. e-Pharmacy—a boon or bane. *Int J Pharm Res.* 2021;13(2):123-134.
3. Yang H, Li Z, Liu J, et al. Balancing online pharmacy services for patient adherence: a stimulus-organism-response perspective. *Internet Res.* 2021;31(6):2000-2032.
4. Santos SC, Silva V, Lopes S, et al. Perception of community pharmacists about the work process of drug dispensing: a cross-sectional survey study. *BMC Health Serv Res.* 2022;22(1):e161. https://doi.org/10.1186/s12913-022-07500-3
5. Thusi P. Exploring senior citizens perceptions of e -pharmacy usefulness and trust. Paper presented at: Proceedings of the 2022 International Business Conference; 2022; Pretoria.
6. Fairfax J, Sørensen A. Integrating telemedicine and pharmacists in chronic gastrointestinal diseases: a critical role during the COVID-19 pandemic. *Glob J Med Terminol Res Inf.* 2024;2(4):23-29. https://doi.org/10.5176/2765-0849
7. Alwhaibi M, Alqahtani S, Sani I, et al. Evaluating the frequency, consumers motivation, and perception of online medicinal, herbal, and health products purchase safety in Saudi Arabia. *Saudi Pharm J.* 2021;29(2):166-172. https://doi.org/10.1016/j.jsps.2020.11.004
8. Khan O, Patel J, Raina M, et al. The future of pharmacy: how AI is revolutionizing the industry. *Intell Pharm.* 2023;1(1):32-40. https://doi.org/10.1016/j.iphar.2023.01.001
9. Singh K, Rana P, Sandhu R. *E-Pharmacy* [dissertation]. Himachal Pradesh: Jaypee University of Information Technology Waknaghat; 2022.
10. Eab-Aggrey N, Khan S. Prospects and challenges of online pharmacy in the post-COVID world: a qualitative study of pharmacists experiences in Ghana. *Explor Res Clin Social Pharm.* 2024;13:e100395.

https://doi.org/10.1016/j.ercp.2024.100395

11. Lostakova H, Curdova M, Janouch V. Purchase behavior of online pharmacy clients. *Econ Manag.* 2012;17(3):1098-1107.
12. Raut S, Shinde A, Patil V, et al. Design and usage of a digital e-pharmacy application framework. In: Thakkar HK, Dehury CK, Sahoo PK, Veeravalli B, eds. *Predictive Analytics in Cloud, Fog, and Edge Computing: Perspectives and Practices of Blockchain, IoT, and 5G.* Springer; 2022:91-105.
13. Long CS, Farah N, Tan Y, et al. Online pharmacies selling prescription drugs: a systematic review. *Pharmacy.* 2022;10(2):e42. https://doi.org/10.3390/pharmacy10020042
14. Almeman A. The digital transformation in pharmacy: embracing online platforms and the cosmeceutical paradigm shift. *J Health Popul Nutr.* 2024;43(1):60-68. https://doi.org/10.3329/jhpn.v43i1.12345
15. Patak M, Milanovic I, Kovar P. The e-pharmacy customer segmentation based on the perceived importance of the retention support tools. *Procedia-Soc Behav Sci.* 2014;150:552-562.
16. Ashames A, Bassi M, Cheema M. Public perception toward e-commerce of medicines and comparative pharmaceutical quality assessment study of two different products of furosemide tablets from community and illicit online pharmacies. *J Pharm Bioallied Sci.* 2019;11(3):284-291. https://doi.org/10.4103/jpbs.JPBS_170_19
17. Srivastava M, Raina M. Consumers' usage and adoption of e-pharmacy in India. *Int J Pharm Healthc Mark.* 2021;15(2):235-250. https://doi.org/10.1108/IJPHM-04-2021-0008
18. Savant PB, Kareppa MS. A review: e-pharmacy vs conventional pharmacy. *Asian J Pharm Technol.* 2022;12(1):84-88.
19. Yadav AK, Agrawal R, Sharma S, et al. Knowledge and attitude toward e-pharmacy among the physicians of South Rajasthan, India: a pilot survey. *Asian J Pharm Clin Res.* 2020;13(9):157-160.
20. Shawaqfeh MS, Ibrahim M, Nasser F, et al. Pharmacy students perceptions of their distance online learning experience during the COVID-19 pandemic: a cross-sectional survey study. *J Med Educ Curric Dev.* 2020;7:1-9. https://doi.org/10.1177/2382120520963039

21. Sampene AK, Li C, Wiredu J. Unraveling the shift: exploring consumers' adoption or resistance to E-Pharmacy through behavioral reasoning theory. *BMC Public Health.* 2024;24(1):e2789. https://doi.org/10.1186/s12889-024-17221-1

22. Pal S, Gupta R, Dey A, et al. Attitude of patients and customers regarding purchasing drugs online. *Farmacia.* 2015;63(1):93–98.

23. Orizio G, Schulz P, Pizzuti R. Quality of online pharmacies and websites selling prescription drugs: a systematic review. *J Med Internet Res.* 2011;13(3):e1795. https://doi.org/10.2196/jmir.1795

24. Bowman C, Lee K, Cao H, et al. Consumer internet purchasing of medicines using a population sample: a mixed methodology approach. *Res Social Adm Pharm.* 2020;16(6):819-827. https://doi.org/10.1016/j.sapharm.2020.01.010

25. Brown J, Li Z. Characteristics of online pharmacy users in a nationally representative sample. *J Am Pharm Assoc.* 2014;54(3):289-294. https://doi.org/10.1331/JAPhA.2014.13114

26. Chen H, Liu Z, Zhang J, et al. Consumers' perceptions about pharmaceutical care provided by community pharmacists in China in relation to over-the-counter drugs: a qualitative study. *Inquiry.* 2018;55:1-8. https://doi.org/10.1177/0046958018793292

27. Miller R, Dufresne A, Lang M, et al. When technology precedes regulation: the challenges and opportunities of e-pharmacy in low-income and middle-income countries. *BMJ Glob Health.* 2021;6(5):e005405. https://doi.org/10.1136/bmjgh-2021-005405

28. Aiyegbajeje FO, Ajayi DD. Determinants of mobile telephone usage for healthcare service utilization. *J Health Technol.* 2022;23(1):59-67.

29. Baughan A, August T, Yamashita N, Reinecke K. Keep it simple: how visual complexity and preferences impact search efficiency on websites. Paper presented at: CHI Conference on Human Factors in Computing Systems; April 25-30, 2020; Honolulu, HI, USA. https://doi.org/10.1145/3313831.3376440

30. Baker L, Cohen R, Ziegler M, et al. Use of the Internet and e-mail for health care information: results from a national survey. *JAMA.* 2003;289(18):2400-2406. https://doi.org/10.1001/jama.289.18.2400

31. Aghazadeh H, Leung T, Salazar P. Use of mobile health (mHealth) technologies in ophthalmology patients in Alberta. *Can J Ophthalmol.* 2019;54(2):164-170. https://doi.org/10.1016/j.jcjo.2019.01.004

32. Apte A, Ahuja M, Bansal P, et al. Implementation of e-pharmacy in India—facilitators, barriers, and its potential impact on cost, quality, and access to medicines: a scoping review. *J Health Technol.* 2023;12(3):45-57.

33. Ma L. Understanding non-adopters' intention to use internet pharmacy: Revisiting the roles of trustworthiness, perceived risk and consumer traits. *J Eng Technol Manag*. 2021;59:e101613. https://doi.org/10.1016/j.jengtecman.2021.101613

34. Amankwaa NA. Factors influencing the adoption of e-pharmacy services in the Ashanti Region of Ghana: perspectives of consumers. *J Public Health Pharm Sci.* 2024;5(1):24–36. https://doi.org/10.1016/j.jphs.2024.01.002

35. Bhatia A, Grover MB, Mittal P. Post-COVID evolution of Indian healthcare: the impact of e-pharmacy on supply chain management. *Front Health Inf.* 2024;13(3):231-240. https://doi.org/10.3389/fhinf.2024.00009

36. Lakho A, Joyo AS, Siddiqui HA. Impact of perceived usefulness, ease of use, value, risk, and trust on online purchase intention of medicines: role of consumer engagement. *J Consumer Behav.* 2024;23(1):45-56. https://doi.org/10.1002/cb.1986

37. Adebo AI, Aladelusi K, Mohammed M. Determinants of e-pharmacy adoption and the mediating role of social influence among young users. *J Hum Appl Soc Sci.* 2025;7(1):3-17. https://doi.org/10.1108/JHASS-10-2024-0007

38. Littlejohn C, Williams K, Roberts T, et al. Internet pharmacies and online prescription drug sales: a cross-sectional study. *J Med Internet Res.* 2005;12(1):75-80. https://doi.org/10.2196/jmir.12.1.e75

39. Thinnukool O, Khuwuthyakorn P, Wientong P. Pharmacy assistant mobile application (PAMA): development and reviews. *Int J Inf Manage Technol.* 2017;11(3):145-150. https://doi.org/10.1016/j.ijimt.2017.07.002