Chapter 17
Growing Trends in Adoption of mHealth Apps and Users' Perception of Availing Healthcare Services: A Study in Mumbai City

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Abstract The advent of smart healthcare has facilitated the ease of providing convenient health services to people. mHealth apps are not much different from it. This paper aimed at understanding the growing trends among users to adopt mHealth apps for availing healthcare services. It studies the users' preference and perception toward mHealth apps provided free of cost by government and private companies on the Google Play Store.

In this study, mHealth apps offered by government and private companies were selected from the Google Play Store on the basis of their ratings and installs to study the trends in adoption. The survey-based questionnaire was used through purposive sampling to collect data from users in order to study their perception of mHealth apps.

The study revealed that the demographic variable education has an association with users' perception of mHealth apps. The study also witnessed that more awareness about mHealth apps resulted in more adoption of them with a correlation of 0.688 for mHealth apps offered by the government and 0.905 for mHealth apps offered by private companies.

There has been a considerable increase in mHealth app users specifically during COVID-19 where still the level of awareness among people is low. Even though healthcare apps are heightened to meet the growing needs of users, their adoption is still quite low, especially apps offered by private companies. There is a need to bring awareness among people so as to penetrate mHealth apps in the market and inducing its more adoption among people.

Keywords Smart healthcare · eHealth · mHealth

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17.1 Introduction

The term healthcare includes preventing, curing, and managing sickness, as well as the maintenance of mental and physical well-being, through the medical, nursing, and allied health professionals' services. Healthcare also encompasses the provision of services aimed at promoting emotional well-being. Medical services are provided by medical experts, organizations, and ancillary healthcare personnel. Healthcare has developed to be one of the greatest industries in India, both in terms of income and jobs. Hospitals, medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance, and medical equipment fall under the category of healthcare.

The Indian healthcare system is mounting rapidly as a result of expanding coverage, services, and increased investment by both the public and private sectors. Several aspects of our everyday lives have been impacted by new technological developments. Healthcare is different from it as today's healthcare system has realized the benefits of utilizing information and communication technology (ICT) to enhance the quality of treatment, transforming traditional healthcare into smart healthcare. Smart healthcare is a broad term that encompasses electronic and mobile health services, electronic data management, smart health services, and smart and linked medical devices. Smart healthcare essentially includes two main components, namely, eHealth and mHealth. eHealth is the use of electronic health systems to provide quick and efficient online healthcare services using information and communication technology (ICT). mHealth is a subset of eHealth, which includes the usage of mobile devices to provide healthcare facilities, thus improving medical outcomes.

As stated by the Global Observatory for eHealth (eHealth, 2005), "eHealth is broadly defined as the use of Information and Communication Technology (ICT) in health."

According to the World Health Organization (n.d.), "eHealth is the cost-effective and secure use of information and communication technologies (ICT) in support of health and health-related fields" whereas mHealth is defined as "a component of eHealth."

In its Second Global Survey Report on eHealth (eHealth, 2011), the Global Observatory for eHealth defined mHealth as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices."

17.2 Emergence and Adoption of mHealth

India needs newer and more inventive methods of providing treatment, such as mobile health, to make up for the lack of inadequate healthcare infrastructure. The country does not fulfill the minimal WHO criteria for the number of healthcare

workers and the number of beds available. A large segment of the population lives in rural regions, where the situation is far worse than in urban areas. The low-income population, in particular, has limited access to high-quality healthcare.

On the other hand, mobile technology is increasingly becoming part of Indians' daily life. As per the October 2021 data released by TRAI (Telecom Regulatory Authority of India, 2021), India has a wireless subscriber base of 1166.30 million. As more and more people are spending significant time on their smartphones, mobile technology and mHealth solutions in India are affecting every area of their lives, including their health. As people are becoming tech-savvy, there is an increase in demand for availing healthcare facilities in more convenient ways. Thus, mHealth technologies turn into a sought-after option in the Indian healthcare industry.

mHealth services are offered by both government as well as private companies in India, whereas, unlike private companies, the government offers mHealth apps aimed at providing public utility healthcare services at free or affordable rates to its citizens (Tables 17.1 and 17.2).

17.3   Growing Trends in mHealth Apps

mHealth apps can be seen as bringing revolutionary changes in traditional healthcare in the near future, and this can be perceived from these trends.

Connectivity: The frequency of doctor-patient meets can be increased with the help of mobile health apps. These apps provide features like finding, booking an appointment, and virtual meetings with doctors, thus facilitating frequent and timely connectivity between doctor-patients. Users even can easily book diagnostic tests with doorstep services at affordable prices.

Variety of mHealth apps: Google and Apple offer a variety of paid as well as free usage apps in the health category. Wellness management apps are becoming most popular among users due to the rising concerns about healthy lifestyles, especially among people with obesity, a sedentary lifestyle, and low or no physical exercise.

Self-monitoring: Online app store provides diversified health apps, which can be used to monitor health security like pulse rates, glucose levels, or oxygen. Fitness, exercise, dieting, and nutrition are some of the other apps that users prefer to maintain a good and healthy lifestyle. Users with chronic ailments like diabetes or heart disease can regularly monitor their health conditions with mHealth apps.

Pandemic: As per the reports of Fortune Business Insights, the 2020 mHealth app global market has witnessed a phenomenal growth of 65.7% (Fortune Business Insights, 2021). The main reason is the development of various COVID-19 apps offered by the government and other companies like the Aarogya Setu app in India or the Corona-Warn-App in Germany.

With the advent of technology and the increased number of smartphone users, mHealth is eventually paving its way as a convenient healthcare alternative for people.

Table 17.1 mHealth apps offered by government

No.	mHealth apps offered by government	Ratings (out of 5)	Installs	Offered by	Purpose	Services offered
1	TB Aarogya Sathi	4.1	>0.1 M	National TB Elimination Program (NTEP)	Empowering citizens about tuberculosis healthcare	1. Increasing awareness 2. Availability of free and quality drugs 3. Finding the nearest diagnostic center
2	Jan Aushadhi Sugam	3.9	>0.5 M	Bureau of Pharma PSUs of India (BPPI)	Generic medicines	Availability of generic medicines at affordable prices for all under Pradhan Mantri Bhartiya Janaushadhi Pariyojana
3	eSanjeevani OPD	3.9	>1 M	Health Informatics Group, CDAC – Ministry of Health and Family Welfare (MoHFW)	National teleconsultation service	1. Patient registration 2. Doctor consultation 3. ePrescription
4	Aarogya Setu	3.8	>100 M	National Informatics Centre, Ministry of Electronics & IT (MeitY)	Fight against COVID-19 by providing essential health services	Informing on Covid-19 related: Risks, best practices containment
5	Ayushman Bharat	3.8	>1 M	National Health Authority	Provide cashless treatment to poor and vulnerable families	1. Access information about treatment 2. Checking of eligibility 3. Find empaneled hospitals
6	NDHM Health Records (National Digital Health Mission)	3.5	>0.1 M	National Health Authority	Maintaining health records in one place	1. Creation of a unique Health ID; 2. Linkage of Health ID with healthcare facilities
7	Co-WIN Vaccinator App	2.7	>10 M	National Health Portal-Ministry of Health and Family Welfare (MoHFW)	Designed for vaccinator, supervisors, and surveyors	Registration for vaccination

Source: https://play.google.com

17.4   Literature Review

For the identification of past literature regarding mHealth apps, various studies have been undertaken, which helped in identifying the growing trends in the adoption of mHealth apps and users' perception of availing healthcare services. Some of the selected review of literature for the present study is as follows.

An exploratory study in the work (Palos-Sanchez et al., 2021) "Toward a Better Understanding of the Intention to Use mHealth Apps: Exploratory Study" with a sample of 310 app users in Spain to investigate primary healthcare apps through TAM, that is, technology acceptance model. They found that mHealth apps can be used to predict the users' behavior and concluded that gender plays a determining role in the utility of mHealth apps.

Alanzi (2021) has studied various mobile applications available during COVID-19 in selected countries including India. The mobile applications available on App Store and Google Play Store were screened, and 12 were finally selected. The study concluded that the majority of apps mainly focus on tracing rather than integrated functions like awareness, appointments, or bookings. It also suggested that apps should have built-in social media features.

The research work on the awareness and usage of mHealth apps among teaching and nonteaching staff at Nnamdi Azikiwe University, Nigeria (Adum & Mozie, 2020), collected data from a sample respondent of 360 people. The study showed that people are not very aware of mHealth apps and their benefits. The main reasons for low penetration lie in lack of awareness, high internet cost, and preference to avail face-to-face medical services. This can be improved through government measures for creating awareness and usage in the healthcare system.

A study (Peprah et al., 2019) among university students in Ghana was conducted to understand their knowledge, attitude, and use regarding mHealth apps. A total of 963 sample data was collected from on-campus and off-campus students. The findings showed that male students were more aware of the usage of mHealth apps than female students. It suggested that as the overall awareness is low among students, there is a high need for awareness and promotion of mHealth apps.

"Awareness and Use of mHealth Apps: A Study from England" (Kayyali et al., 2017) highlights the research on the awareness and usage of mHealth apps among 95 community pharmacists along with 154 public in London. The study has particularly focused on awareness about mHealth apps among pharmacists and their recommendations to the general public, particularly diabetic people. It highlighted that people are not much aware of mHealth apps, even the pharmacists, which in turn leads to low or no recommendations by them among the general public.

A methodological study on "Mobile Health: A Review of the Current State in 2015" (Bruno et al., 2015) highlights the growth of health telematics for improvement in healthcare especially due to the availability of 3G and 4G technology. The authors suggested a study can be conducted to see the influence of mHealth apps on the daily routine of patients. They also believed that mHealth apps have already

Table 17.2 mHealth apps offered by private companies

Sr. No.	mHealth apps offered by private companies	Ratings (Out of 5)	Installs	Offered by	Purpose	Services offered
1	PharmEasy	4.6	>10 M	Axelia Solutions Private Limited	Online pharmacy	1. Buying health products and medical equipment 2. Book diagnostic tests
2	TATA 1 mg	4.5	>10 M	Tata 1MG Healthcare Solutions Private Limited	Online pharmacy and healthcare	1. Buying medicines 2. Book diagnostic tests 3. Online doctor consultation 4. Health tips and information
3	Practo	4.5	>5 M	Practo Technologies Private Limited	Telemedicine solutions	1. Video consultation with the doctor 2. Book diagnostic tests 3. Buying medicines 4. Health articles and tips
4	Apollo 24|7	4.4	>5 M	Apollo Hospitals Enterprise Limited	Healthcare	1. Video consultation with a doctor 2. Book diagnostic tests 3. Digitized health records 4. Symptom tracker 5. Health articles and news
5	Tata Health	4.4	>0.5 M	Tata Health	Doctor consultation	1. Find and book appointments with general or specialist doctors 2. Video consultation with the doctor

Table 17.2 (continued)

Sr. No.	mHealth apps offered by private companies	Ratings (Out of 5)	Installs	Offered by	Purpose	Services offered
6	NetMeds	4.2	>10 M	Netmeds Marketplace Limited	Healthcare	1. Buying medicines 2. Book diagnostic tests 3. Online doctor consultation
7	Medlife	4.2	>10 M	Axelia Solutions Private Limited	Online pharmacy	1. Buying health products and medical equipment 2. Book diagnostic tests

Source: https://play.google.com

started reorganizing old healthcare systems, which can be more penetrated to improve patients' life.

In the article "Apps as Artefacts: Towards a Critical Perspective on Mobile Health and Medical Apps" (Lupton, 2014), how with the advent of technology, mHealth apps lately emerged in the healthcare sector has been discussed. It also highlighted the top 10 ranked mHealth apps available on the Apple App Store. Through these apps, the author analyzed the social, cultural, and political factors involved in mHealth apps. For instance, how the internet security and privacy issue encompassing the political dimension discourages people from using apps.

17.5   Research Methodology

Several research objectives have been established:

1. To examine the trends in the adoption of mHealth apps.
2. To know the level of awareness among people about mHealth apps.
3. To study the perception of users toward mHealth apps.
4. To do a comparative analysis of mHealth apps offered by government and private companies.

The study includes the use of both primary and secondary data. The primary data was collected with a survey method from 124 respondents, which were selected through purposive sampling. Purposive sampling was used to intentionally select the small group of respondents who are mHealth app users so as to collect their personal experience with apps. A structured questionnaire was formed to understand the level of awareness, reasons for adoption, and preferences among mHealth apps offered by government and private companies. Secondary data was collected

through various sources available on public domains like the National Health Portal, Ministry of Health and Family Welfare, World Health Organization, reports, journals, etc.

The following hypotheses were formulated for the present study:

- H_{01}: There is no association between the users' perception of government apps and the age of respondents.
- H_{02}: There exists no gender difference in the users' perception of government apps.
- H_{03}: There exists no significant association between the users' perception of government apps and their educational qualifications.
- H_{04}: There is no association between the users' perception of private apps and the age of respondents.
- H_{05}: There exist no gender differences in the users' perceptions toward private apps.
- H_{06}: There exists no significant association between the users' perception of private apps and their educational qualifications.
- H_{07}: There is no correlation between the awareness level and the users' positive perception of government apps.
- H_{08}: There is no correlation between the awareness level and the users' positive perception of private apps.

17.6 Results

17.6.1 Descriptive Statistics: Demographic Variables—Age, Gender, Educational Qualification, Occupation, Residential Location, and Income (Table 17.3)

The descriptive statistics of the variable age from the total number of 124 responses collected mean statistics = 1.26, standard deviation = 0.596, and skewness statistic is 2.182, which shows right skewness of data, and kurtosis statistic is 3.416 indicating thick peaked tail as the respondents are majorly from less than 30 years of age group. From overall 124 respondents, 49.2% ($n = 61$) were females, and 50.8% ($n = 63$) were males with a mean statistic of 1.50, a standard deviation of 0.502, skewness = 0.000 indicating symmetrical data, and kurtosis = −2.033. The mean statistic for the educational qualification of users is 1.99, the standard deviation is 0.906, skewness is 0.416, and kurtosis is −0.869 indicating flatter distribution. In the case of occupation, the mean statistic is 1.59, the standard deviation is 0.805, the skewness is 0.423, and the kurtosis is −0.536. Residential location is having a mean statistic of 2.19, standard deviation of 1.530, skewness of 0.759, and kurtosis of −1.101 showing left skewed. The mean statistic for monthly income is 1.49, standard deviation = 0.801, skewness = 1.183, and kurtosis −0.382 (Table 17.4).

Table 17.3 Descriptive statistics

	N	Minimum	Maximum	Mean	Std. deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. error	Statistic	Std. error
1. Age	124	1	3	1.26	0.596	2.182	0.217	3.416	0.431
2. Gender	124	1	2	1.50	0.502	0.000	0.217	−2.033	0.431
3. Educational qualification	124	1	4	1.99	0.906	0.416	0.217	−0.869	0.431
4. Occupation	124	1	4	1.59	0.805	0.423	0.217	−0.536	0.431
5. Residential location	124	1	5	2.19	1.530	0.759	0.221	−1.101	0.438
6. Monthly income	124	1	3	1.49	0.801	1.183	0.217	−0.382	0.431

Source: Authors' compilation

Table 17.4 Reliability statistics

Cronbach's Alpha	N of items
0.878	14

Source: Authors' compilation

To measure internal consistency, Cronbach's Alpha coefficient was calculated. Cronbach's Alpha was evaluated where >0.9 is excellent, >0.8 is good, >0.7 is acceptable, >0.6 is questionable, >0.5 is poor, and ≤ 0.5 is unacceptable. In this study, the value of $\alpha = 0.878$, which shows that there exists good internal consistency between different variables.

17.6.2 Testing of Hypothesis

H_{01}: There is no association between users' perception of government apps and respondents' age (Table 17.5).

The significance value is 0.879 (>0.05), which shows that there is no association between users' perception of government apps and the age of respondents. Thus, it fails to reject the null hypothesis, that is, age of users is indifferent toward their perception of government mHealth apps.

H_{02}: There exist no gender differences in users' perceptions of government apps (Table 17.6).

The significance value is 0.246 (>0.05), which shows that there exist no gender differences in users' perception toward government apps. Thus, it fails to reject the

Table 17.5 ANOVA test: government apps and age

	Sum of squares	Df	Mean square	F	Sig.
Between groups	4.485	19	0.236	0.625	0.879
Within groups	39.257	104	0.377		
Total	43.742	123			

Source: Authors' compilation

Table 17.6 ANOVA test: government apps and gender

	Sum of squares	Df	Mean square	F	Sig.
Between groups	5.699	19	0.300	1.233	0.246
Within groups	25.301	104	0.243		
Total	31.000	123			

Source: Authors' compilation

null hypothesis, that is, the gender of the users does not create any significant difference in their perception of government mHealth apps.

H_{03}: There exists no significant association between users' perception of government apps and their educational qualifications (Table 17.7)**.**

The significance value is 0.027 (<0.05), which shows that there is an association between users' perception of government apps and their educational qualifications. Thus, the null hypothesis is rejected, and an alternate hypothesis is found to be true, that is, educational qualifications influence the users' perception of government mHealth apps.

H_{04}: There is no association between users' perception of private apps and the age of the respondents (Table 17.8)**.**

The significance value is 0.439 (>0.05), which shows that there is no association between users' perception toward private apps and the age of respondents. Thus, it fails to reject the null hypothesis, that is, age of users' is indifferent toward their perception of private mHealth apps.

H_{05}: There exist no gender differences in users' perceptions of private apps (Table 17.9)**.**

The significance value is 0.511 (>0.05), which shows that there exist no gender differences in users' perception toward private apps. Thus, it fails to reject the null hypothesis, that is, the gender of the users does not create any significant difference in their perception of private mHealth apps.

H_{06}: There exists no significant association between the users' perception of private apps and their educational qualifications (Table 17.10)**.**

The significance value is 0.041 (<0.05), which shows that there is an association between the users' perception of private apps and their educational qualifications. Thus, the null hypothesis is rejected, and an alternate hypothesis is found to be true,

Table 17.7 ANOVA test: government apps and educational qualifications

	Sum of squares	Df	Mean square	F	Sig.
Between groups	3.428	19	0.180	0.868	0.027
Within groups	41.131	104	0.395		
Total	44.559	123			

Source: Authors' compilation

Table 17.8 ANOVA test: private apps and age

	Sum of squares	Df	Mean square	F	Sig.
Between groups	6.904	19	0.363	1.026	0.439
Within groups	36.838	104	0.354		
Total	43.742	123			

Source: Authors' compilation

Table 17.9 ANOVA private apps and gender

	Sum of squares	Df	Mean square	F	Sig.
Between groups	4.633	19	0.244	0.962	0.511
Within groups	26.367	104	0.254		
Total	31.000	123			

Source: Authors' compilation

Table 17.10 ANOVA test: private apps and educational qualifications

	Sum of Squares	Df	Mean Square	F	Sig.
Between groups	4.361	19	0.230	0.769	0.041
Within groups	40.198	104	0.387		
Total	44.559	123			

Source: Authors' compilation

that is, educational qualifications influence the users' perception of private mHealth apps.

H_{07}: There is no correlation between the awareness level and the users' positive perceptions of government apps (Table 17.11)**.**

The significance value is 0.000 (<0.05), which shows that there exists a correlation between awareness level and users' positive perception toward government apps. Thus, the null hypothesis is rejected, that is, the more awareness, the more the adoption of mHealth apps offered by the government among the users.

H_{08}: There is no correlation between the awareness level and the users' positive perception of private apps (Table 17.12)**.**

The significance value is 0.000 (<0.05), which shows that there exists a correlation between awareness level and users' positive perception toward private apps.

Table 17.11 Correlations: awareness level and users' positive perceptions of government apps

			Level of awareness (for government apps)	Users' perception average about govt apps
Spearman's rho	Level of awareness (for government apps)	Correlation coefficient	1.000	.688**
		Sig. (two-tailed)	.	.000
		N	124	124
	Users' perception average about government apps	Correlation coefficient	.688**	1.000
		Sig. (two-tailed)	.000	.
		N	124	124

Source: Authors' compilation
**Correlation is significant at the 0.01 level (two-tailed)

Table 17.12 Correlations: awareness level and users' positive perceptions of private apps

|			Level of awareness (for private apps)	Users' perception average of private apps
Spearman's rho	Level of awareness (for private apps)	Correlation coefficient	1.000	.905**
		Sig. (2-tailed)	.	.000
		N	124	124
	Users' perception average of private apps	Correlation coefficient	.905**	1.000
		Sig. (two-tailed)	.000	.
		N	124	124

Source: Authors' compilation
**Correlation is significant at the 0.01 level (2-tailed)

Thus, the null hypothesis is rejected, that is, the higher the awareness, the more the adoption of mHealth apps offered by private companies among the users.

17.6.3 Comparison Between Government and Private mHealth Apps with Respect to Users' Preference

A total of 124 users gave their preference in terms of ranking mHealth apps offered by government and private companies. As noted in Fig. 17.1, 75 (60%) respondents preferred government-offered mHealth apps, whereas 49 (40%) users opted for apps offered by private companies. This clearly shows that more users prefer mHealth apps offered by the government rather than by private companies.

Fig. 17.1 Users' preference between government and private mHealth apps. (Source: Authors' compilation)
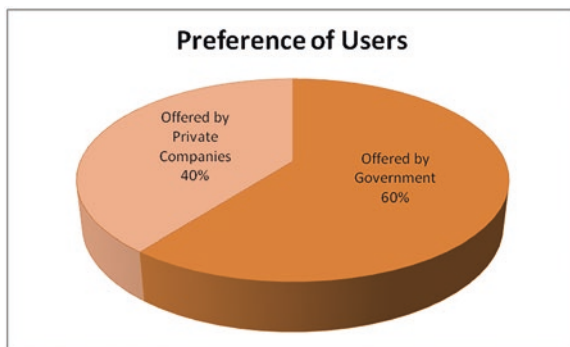
17.7 Discussion

This study has focused on the level of awareness and adoption of mHealth apps among users. All the respondents selected were mHealth app users, that is, either they were using mHealth apps offered by the government or by private companies. Overall, 98 respondents were aware of the mHealth apps offered by the government, Aarogya Setu and Jan Aushadi Sugam being the leading ones. With respect to mHealth apps offered by private companies, out of 68, most of the respondents were aware of PharmEasy and Tata 1 mg. The variables like age, gender, and educational qualifications were examined to find out the impact on the awareness and perception of users regarding mHealth apps. The test results of hypotheses H_{01}, H_{02}, H_{04}, and H_{05} have confirmed that the age and gender of users do not create any significant difference in their level of awareness, perception, and adoption of mHealth apps offered by government and private companies. However, the educational qualifications of the respondents do create a significant impact on users' perceptions. The respondents were questioned about the factors that influence the use of mHealth apps on the basis of convenience, ease of use, cost-effectiveness, operational efficiency, flexibility, schemes, discounts, and offers.

It was observed that the users adopt more of mHealth apps offered by the government due to cost-effectiveness, whereas private apps were found to be more efficient in providing services. Due to this, overall 60% of users preferred government-offered mHealth apps over private companies' apps. It was also witnessed that there exists a positive correlation between the level of awareness and adoption of mHealth apps among users. Thereby, it shows that the mHealth apps market can be flourished by creating more awareness among people.

17.8 Conclusions and Recommendations

The present work studies the variables like awareness, growth, and reasons for the adoption of mHealth apps. It highlights the preference of people from the city of Mumbai toward mHealth apps offered by government and private companies. The

study outlines the reasons contributing to the adoption of government mHealth apps over private and vice versa among users. This study can be used to identify the gaps to develop user-friendly mHealth apps, thereby delivering a satisfactory experience to its users. Moreover, the analysis shows the lack of awareness, adoption, and retention of mHealth apps among users, which can be increased through improved measures by government and companies. Future research can be extended by taking new variables or dimensions related to mHealth. Additionally, this work has considered samples from a specific geographical location, which can be further studied by taking into account other areas and segments.

There has been a considerable increase in mHealth app users due to its various significance and benefits like convenience, ease of use, free availability, cost-effectiveness, offers, and discounts. Even though smartphone and internet penetration has increased in India, awareness and adoption are not at pace. The following suggestions can be taken into consideration, which were observed during the study about the mHealth apps offered by the government. Schemes and benefits should be timely informed, and the information provided must be appropriate, easy to understand, and accurate. Further, medicines should have a longer expiry period so that unnecessary wastage can be stopped and must be a user-friendly app with multilingual options.

It was observed that mHealth apps offered by private companies are not economical at times. Being able to meet the needs of the diverse population, cost-effectiveness is the need of the hour, and also the provision of generic medicines can be an alternate means to it. Utmost transparency in the billing procedure must be adopted. There must be a dedicated page or app for the traditional system of medicines. Too frequent and unwanted in-app ads must be removed.

The present study has its own limitations in terms of sample size, the area of sample study, and the techniques used for analysis. The samples were collected only from the city of Mumbai in Maharashtra state of India. The low response rate may not lead to generalization of data. Techniques used in the study are limited to descriptive statistics, ANOVA and Correlation.

As per the data of World Population Review (2022), the population of Mumbai is over 20 million, whereas the installs of mHealth apps on the Google Play Store are very few million. The awareness of mHealth apps is very low among people even after having access to smartphones and the internet. Around 54% and 79% of respondents were aware of the mHealth apps offered by the private companies and the government, respectively. Awareness, adoption, and retention need to be induced in the market among people about various mHealth categories like treatment, diagnosis, consultation, e-pharmacy, healthy lifestyles, regular monitoring, and care. The study shows that people are not much aware of the benefits of mHealth apps, and thus, adoption is very low. The adoption of mHealth apps was influenced by various factors like transparency, ease of use, and cost-effectiveness. The preference for government-offered apps was 60% whereas for apps offered by private companies was only 40%. The existing users are not very satisfied with the prevailing facilities of mHealth apps, which in the long run may affect the retention rate of such users. There is a need to explore and flourish the mHealth market as it is very

convenient, economical, and available round the clock to common people. Through the joint efforts of government and private stakeholders the awareness about mHealth apps can be increased and eventually its adoption as well.

References

Adum, A. N., & Mozie, C. E. (2020). Awareness and utilization of Mobile health applications among teaching and non-teaching staff of Nnamdi Azikiwe university Awka, Anambra state. *International Journal of Innovative Science and Research Technology, 5*(2), 827–839.

Alanzi, T. (2021). A review of Mobile applications available in the app and Google play stores used during the COVID-19 outbreak. *Journal of Multidisciplinary Healthcare, 14*(2021), 45–57.

Bruno, M. S., et al. (2015). Mobile health: A review of the current state in 2015. *Journal of Biomedical Informatics, 56*(2015), 265–272.

eHealth. (2005). *Global Observatory for eHealth* [Online]. Available at: https://www.who.int/observatories/global-observatory-for-ehealth. Accessed 1 Mar 2022.

eHealth. (2011). *mHealth: New horizons for health through mobile technologies: a second global survey on eHealth* [Online]. Available at: https://apps.who.int/iris/handle/10665/44607. Accessed 1 Mar 2022.

Fortune Business Insights. (2021). *mHealth Apps Market* [Online]. Available at: https://www.fortunebusinessinsights.com/mhealth-apps-market-102020. Accessed 1 Mar 2022.

Kayyali, R., et al. (2017). Awareness and use of mHealth apps: A study from England. *Pharmacy, 5*(2), 33.

Lupton, D. (2014). Apps as artefacts: Towards a critical perspective on mobile health and medical apps. *Societies, 4*(4), 606–622.

Palos-Sanchez, P. R., Saura, J. R., Martin, M. Á. R., & Aguayo-Camacho, M. (2021). Toward a better understanding of the intention to use mHealth apps: An exploratory study. *JMIR Publications, 9*(2021), 9.

Peprah, P., et al. (2019). Knowledge, attitude, and use of mHealth technology among students in Ghana: A university-based survey. *BMC Medical Informatics and Decision Making, 19*(2019), 1–11.

Telecom Regulatory Authority of India. (2021). *Telecom subscription data* [Online]. Available at: https://www.trai.gov.in/sites/default/files/PR_No.59of2021_0.pdf. Accessed 1 Mar 2022.

WHO. (n.d.). *Using e-health and information technology to improve health* [Online]. Available at: https://www.who.int/westernpacific/activities/using-e-health-and-information-technology-to-improve-health. Accessed 1 Mar 2022.

World Population Review. (2022). *Mumbai population 2023* [Online]. Available at: https://world-populationreview.com/world-cities/mumbai-population. Accessed 4 Jan 2023.