

STUDY FOR USAGE OF MOBILE HEALTH TECHNOLOGY APPLICATION
FOR EARLY SCREENING AND DETECTION OF CANCER IN INDIA

Dissertation Submitted

to



The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree of

Master of Business Administration (MBA)

in

Hospital and Health Management

by

Prachee Shreekant Joshi

Under the Supervision and Guidance of

Dr Deepti Sharma

(Associate Professor)

2022

TITLE PAGE

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled - **STUDY FOR USAGE OF MOBILE HEALTH TECHNOLOGY APPLICATION FOR EARLY SCREENING AND DETECTION OF CANCER IN INDIA** is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.



Prachee Shreekanth Joshi

28th June 2022

Date: 13-Jun-2022

Internship Completion
Certificate

To Whom It May Concern

This is to certify that **Prachee Shreekant Joshi**, has worked as “**Intern**” with Karkinos Healthcare Private Limited and has successfully completed the internship under the guidance of Arup Ghosh.

Internship Duration: 4th April-2022 to 12th June-2022.

We wish all the best.

Karkinos Healthcare Pvt. Ltd.



Pooja Sharma
Vice President-HR

Karkinos Healthcare Private Limited

B 702, 7th Floor, Neelkanth Business Park, Kirol Village, Near Bus Depot, VidyaVihar West, Mumbai –
400086CIN: U93090MH2020PTC342527 | info@karkinos.in | www.karkinos.in

CERTIFICATE FROM FACULTY GUIDE AND DEAN

This is to certify that dissertation titled - **STUDY FOR USAGE OF MOBILE HEALTH TECHNOLOGY APPLICATION FOR EARLY SCREENING AND DETECTION OF CANCER IN INDIA** is a record of the research work undertaken by Prachee Shreekant Joshi in partial fulfilment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

Dr Deepti Sharma

Associate Professor

IIHMR university, Jaipur

Date

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Prachee Shreekant Joshi

MBA Healthcare Management

IIHMR University, Jaipur

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Abstract

Background

The shift in how health services are delivered internationally is being driven by improvements in mobile technologies and applications. Mobile phone use for healthcare services could reach more individuals in environments with limited resources than the traditional forms of healthcare delivery because mobile phone usage is rising exponentially in low- and middle-income nations. Post covid the mobile health technology usage has increased tremendously but still there are many people who are not aware of these healthcare apps. Hence it becomes important to generate awareness in the community. In the light of above context and to fill the gaps in mobile health technology, the present study attempted to assess the people in terms of knowledge for various aspects of mobile health usage and cancer screening through the app among the residents of India.

Methods

A cross sectional study was conducted using a pre-structured online questionnaire. The questionnaire aimed to assess the knowledge towards mobile health technology and cancer screening among the residence of India between the age group of 18-60 years. We are excluding all the non-residents of India and also who are below 18 years and above 60 years.

Results

A total of 82 responses we got for the questionnaire, out of which 2 were excluded following the exclusion criteria and analysis was performed on 80 respondents.

Conclusions

This study revealed an average of awareness and comprehensive knowledge about the mobile health technology but low uptake of cancer early detection through any healthcare app. Though the attitude was positive.

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Abbreviations

1. WHO- World health Organization
2. ICMR- Indian Council of Medical Research
3. LMIC- Lower middle-income countries
4. GBD- Global Burden of Disease
5. CBE- Clinical Breast Examination
6. BSE- Breast Self-Examination
7. m-health- Mobile Health
8. CHW- Community Health Worker
9. IHME-
10. SDI-
- 11.

Chapter 1

Background

A Greek physician named Hippocrates coined the term "cancer." When writing about tumours, Hippocrates used the Greek terms *carcinos* and *carcinoma*. Hippocrates thought the insides of tumours sounded like crabs, so these words were associated with the Greek word for "crab." He began using the term *Karkinos* to explain cancer. "Cancer is a broad range of illnesses that can start in virtually any organ or tissue of the body and spread to other organs when abnormal cells proliferate uncontrollably, infect nearby body regions, and/or transfer to other organs. The latter is known as metastasizing, and it is the main cause of death from cancer. Typically, neoplasm or a malignant tumour are used to describe cancer." The overwhelming majority of patients (75-80 percent) have advanced cancer (stages 3–4), indicating that cancer could be a global problem, not just in India (Divya Khanna et. al., 2020). "Primary prevention, which tries to minimise the incidence of cancer by modifying risk factors, is that the most cost-effective prevention approach." Tobacco is answerable for 50% of all malignancies in men, with anti-tobacco efforts preventing a significant portion of them. Women between the ages of 35 and 64 should routinely have their pap smears taken since cervical cytology (pap smear) screening programmes have been shown to be successful in lowering the risk of cervical cancer.

Global burden of cancer

The burden of cancer is rising globally, placing huge physical, psychological, and monetary strain on people, families, communities, and health systems. Numerous low- and middle-income countries' health systems are ill-equipped to handle this load, and many cancer patients worldwide lack prompt access to high-quality diagnosis and treatment. Thanks to early identification, high-quality therapy, and post-treatment care, the survival rates of many different forms of cancer are rising in nations with robust healthcare systems.

Because of changing lifestyles, higher life expectancies, and improved management of infectious diseases, noncommunicable diseases have become important health problems worldwide, particularly in developing countries.

India is expected to have 679,421 (94.1 per 100,000) male cancer patients in 2020 and 712,758 (103.6 per 100,000) female cancer patients. “One in 68 males will develop lung cancer, one in 29 women will develop breast cancer, and one in nine Indians will develop cancer (0-74 years of age).”

Cancer in India

Given the limitations of extensive population-based screening programmes, India should take genital hygiene and sexual behaviour promotion into consideration as a primary strategy for avoiding cervical cancer. Although mammographic screening for “the disease is currently not cost-effective in India, regular breast self-examination should be encouraged to detect breast cancer early. Breast self-examination can be promoted in a variety of contexts and by a variety of health care professionals, as well as through print and electronic media.”

By improving government health services including universal health coverage, health education, treatment compliance, and community-based early detection centres, the burden of cancer in the nation can be reduced.

Stronger cigarette and alcohol regulations, in addition to increased physical activity and vaccines for malignancies linked to viruses, like those of the liver and cervix, may be beneficial, according to scientists.

According to the IHME report, the coronavirus disease (COVID-19) pandemic had impeded advancements in cancer treatment. The main obstacles were probably delays and decreases in cancer screening, diagnosis, and treatment.

Low and low-middle SDI countries and regions have the highest rates of cancer diagnoses and fatalities. Researchers estimate that by 2040, low- and middle-income nations will account for more than two-thirds of all cancer cases worldwide.

According to forecasts from another study, India could have 1,392,179 cancer patients by 2020. According to studies, the breast, lung, mouth, cervix, uterus, and tongue were the five most common sites for the disease.

Statistics about cancer:

- In India, one woman passes away from cervical cancer every eight minutes.
- In India, one woman dies from breast cancer for every two women who receive a new diagnosis.

- Upwards of 3500 people die in India each day from tobacco-related causes, according to estimates.
- In 2018, tobacco use—including smoking and using smokeless tobacco—was responsible for 3,17,928 deaths in both men and women.
- About 2.25 million people are thought to be suffering from the illness.
 1. More than 11,57,294 lakhs new cancer patients register each year.
 2. Deaths from cancer: 7,84,821
 3. Risk of developing cancer before the age of 75 years

Male: 9.81%

Female: 9.42%

Early Detection and Screening

Breast cancer mortality is decreased with early detection of the disease through screening. The advantages of screening must be weighed against any drawbacks (e.g., false positives, overdiagnosis). Furthermore, the majority of screening programmes employ age to determine eligibility, despite the fact that the population's risk for breast cancer is widely diverse. MHealth interventions may significantly affect cancer screening attendance, particularly for breast cancer, cervical cancer, and CRC screening.

Research Gap

The majority of cancer research in LMICs, according to research findings, focuses on treatment, with little focus on prevention, education, early detection, and palliation. In order to better understand the practises of various breast cancer screening procedures like “Breast Self-Examination (BSE), Clinical Breast Examination (CBE), and mammography, a number of studies have been undertaken in India.” Research in this field is being done across the nation, and the outcomes range from poor to good understanding of breast cancer.

Research Question

How mobile health technology application is useful for early screening and detection of cancer in India and what is the perception of people for using mobile health technology?

Research Objectives

- To assess the burden of cancer in India

- To learn about the mobile health technology for early screening and detection of cancer in India
- To understand the knowledge and perception that people have for the mobile health technology for cancer and its early screening methods in the age group of 18-60 years.
- To learn the pattern of risk assessment for early screening and detection of cancer is taken via Karkinos Healthcare mobile application.

Chapter 2

Review of Literature

According to the analysis of the literature, global changes in the delivery of health services are being driven by improvements in mobile technologies and applications. Cancer prevention, public awareness, and early detection remain neglected priorities in India's healthcare system. Mobile phone use for healthcare services may be able to reach more individuals in settings with less resources than conventional healthcare delivery techniques due to the exponential growth of mobile phone penetration in low- and middle-income nations.

Table 1 Salient features gathered from literature review

S. No	Title of Study	Authors	Publication year	Study Type	Key Findings
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1.	“Mobile technology and cancer screening: Lessons from rural India”	“Shreya Bhatt, ¹ Rita Isaac, ² Madelon Finkel, ³ Jay Evans, ¹ Liz Grant, ⁴ Biswajit Paul, and David Weller ⁴ ”	Dec 2018	Cross-sectional study	1. The social status of the CHWs providing the interventions has improved as a result of using the mHealth prototype. 2. “Cancer screening can be aided by mobile health techniques in underdeveloped rural communities with poor levels of health literacy. However, they fall short of eliminating the numerous social, cultural, and financial barriers to screening and follow-up.” 3. Mobile health, often known as "mHealth," has recently been suggested as a solution to the inadequate infrastructure of health care information in many LMICs. 4. “Over 97 percent of people globally have access to a mobile

					device, compared to about 70 percent of Indians who have a cell phone subscription (with only minor variations between urban and rural areas)”
2.	“Oral cancer screening using mobile phone-based (m-health) approach versus conventional oral examination approach, protocol of a cluster randomized study with cost-effectiveness analysis”	“Krishnakumar Thankappan ^a PraveenBirur ^b ManuRaj ^c Sandjar Djalalov ^d Sujha Subramanian ^e SubramaniaIyer ^a MoniAbraham Kuriakose ^f ”	July 2020	Cluster-Randomized clinical trial	1. The study suggests an m-Health method based on mobile phones to help community health workers (CHWs) in rural areas detect and identify oral cancer at an early stage and to increase patient compliance with follow-up following oral cancer screening. 2. Precancer lesion detection can help patients receive better care by preventing the delay in mouth cancer diagnosis. The long-term advantages include enhanced access to specialised care, early diagnosis of oral cancer and precancer lesions by

					CHWs, increased awareness of oral cancer risk factors among rural residents, and lower costs for patients and the healthcare system.
3.	“Mobile phone apps for quality of life and well-being Assessment in breast and prostate cancer patients: Systematic review”	“Esther Rincon ¹ ; Francisco Monteiro-Guerra ² ; Octavio Rivera-Romero ³ ; Enrique Dorronzoro-Zubiete ³ ; Carlos Luis Sanchez-Bocanegra ⁴ ; Elia Gabarron ⁵ ”	Dec 2017	Systematic review	1. “The QoL and/or well-being assessment of patients with breast and/or prostate cancer has not been subjected to rigorous testing, despite the existence of hundreds of research employing cancer-focused mobile phone apps.” 2. Cancer patients should only be given apps that are easy to use and have received quality assurance. Cancer patients are typically receptive to treatments that might ameliorate their condition. 3 Mobile app developers and healthcare teams working in oncological settings should take

					extra prudence and patient-centered design principles when making apps that will be used and assessed by this population, most likely as a result of this.
4.	“mHealth Interventions for cancer care and support a systematic literature review”	“Samar Zuhair Alshawwa, Rasha Assad Assiri, Alriyadh, Riyadh, Samar Zuhair Alshawwa”	2020	Systematic Literature review	1. Several issues must be taken into consideration while creating mHealth interventions for cancer patients. For instance, privacy and security concerns were emphasised. 2. The complexity is another problem that has to be addressed because several patients found it difficult to use features like private messaging, decision aids, and login screens. Additionally, cancer survivors and parents were more motivated and likely to use an intervention that was appropriate for their situation.

5.	“Impact of Covid-19 Pandemic on cancer screening in India: Current situation, Challenges and way Forwards”	“Md. Abu Bashar, Nazia Begam”	Nov, 2021		1. The systemic upheaval and tragedy that COVID-19 has brought to patients, practitioners, and healthcare systems all across the world has opened a window of opportunity for innovative approaches to cancer screening and prevention. 2. We require both flexible long-term plans that take into consideration the unpredictable, expensive, and lethal nature of cancer as well as its intersection with other major health issues, such as viral diseases akin to the present epidemic.
6.	“Cervical Cancer: Formulation	“Ravi Mehrotra and Kavita Yadav”	Dec 2021	Literature Review	1. In order to provide effective cervical cancer screening

	and Implementa tion of Govt of India Guidelines for Screening and Managemen t”				programmes and community-level activities to increase community engagement and knowledge of cervical cancer and screening programmes, India must strengthen the capacity of its health system. This can only be accomplished by training a workforce of paramedical and health professionals who are informed about screening. 2. In addition to infrastructural obstacles, a recent study found that stigma, lack of awareness of the benefits of screening services, humiliation or anxiety associated to the screening process, and fear of being evaluated for lack of modesty were other common obstacles to screening uptake.
7.	“Investigati ng barriers to early	“Blair Burnett, Dr. Azim khan, Dr	2015	A Qualitati ve	1. There is a knowledge gap since proper health education is not readily

	cancer detection for rural Indian women: A qualitative analysis of cancer outreach in Dehradun, Uttarakhand ”	Rajeev Prasad Bijalwan”		analysis	available. 2. Obstacles to cancer identification in a neighbourhood that has not yet received outreach from a sizable tertiary centre that provides cancer care. 3. The majority of the women who were asked about the fundamentals of malignancies that specifically affect women did not know the risk factors, symptoms, or diagnostic procedures that are employed for early cancer detection.
8.	“Cancer awareness and attitude towards cancer screening in India A narrative review”	“Sahu, Dinesh Prasad, Subba, Sonu H., Giri, Prajna Paramita”	May 2020	A narrative review	1. As a crucial part of the cancer control programme, raising awareness of the disease requires careful assessment of the information source. 2. Given that there is less public awareness of cancer and less advertising, outdoor patients may represent an opportunity to raise awareness of the disease. Campaigns to

					raise awareness may be a more effective strategy to inform the public. 3. The importance of cancer education in the community must be emphasised. Utilizing the internet and the media effectively can help spread awareness.
9.	“Social media and m-health Technology for cancer screening: systematic Review and Meta-analysis”	“Arlinda Ruco, Fahima dosso, Jill Tinmouth, Diego Llovet, Jenna Jacobson, Teruko Kishibe, Nancy Baxter”	July 2021	Systematic Review and Meta analysis	1. The use of mHealth interventions, notably for breast cancer, cervical cancer, and CRC screening, may have a considerable impact on cancer screening participation. 2. To boost screening participation, screening programmes should take into account the usage of mHealth interventions. As there was inadequate data available at the time of this evaluation, more research on social media interventions for cancer screening participation is required.
10.	“A novel	“Dr Praveen	Sep 2019		1.

	mobile-health approach to early diagnosis of oral cancer”	Birur N, Dr Sanjana Patrick, Dr Suchitra Bajaj, Dr Shubhasini Raghavan, Dr Amritha Suresh, Dr Sumsum P Sunny, Dr Radhika Chigurupati, Dr Petra Wilder Smith, Dr Keerthi Gurushanth, Dr Shubha Gurudath, Ms Pratima Rao, Dr Moni Abraham Kuriakose”			Early identification can help lower the high incidence of oral cancer in India. 2. Early detection of oral cancer can improve prognosis and treatment outcomes in terms of morbidity and death, with 82.8 percent of patients surviving 5 years after diagnosis. 3. The majority of oral malignancies are discovered after metastasis, when the 5-year survival rate is only 278.7%. 4. Due to the asymptomatic nature of oral cancer and its companion diseases, such as oral potentially malignant disorders (OPMDs), the majority of patients do not seek treatment until a late stage has been reached.
11.	“Preventing breast	“Subhojit Dey”	Aug 2014	Literature Review	1. In LMICs,

	cancer in LMICs via screening and/ or early detection: The real and the surreal”				policymakers are still not as aware of the benefits of early detection and BC screening as the "best buy" option to cut healthcare expenses. 2. Due to this, the majority of LMICs lose a significant number of women at a young age, which is unfair from the standpoint of human rights and also results in the creation of "cancer orphans," in addition to a lack of research regarding cost-effective screening/early detection methods and little community awareness about BC being a treatable disease.
12.	“mHealth in screening for	“A Suguna, A Surekha”	Oct 2019	Review	1. Mobile technology can enhance access to

	noncommunicable diseases: The untold tale”				information, as observed in other mHealth promotion examples from various disease areas — maternal and child health, for instance. This might be applied to NCD screening to raise awareness of the value of screening and the process for receiving the service. 2. A high-income nation trial that used information sent via SMS to note a 23 percent rise in female screening rates shown that this can be done successfully. 3. Mobile technology might be useful for NCD screening if it is well-designed and used.
13.	“Perceptions and knowledge	“Prasanna Mithra Parthaje, Bhas	Jan- Jun 2016	Cross-Sectional Study	1. The use of mobile phone technology will eliminate or lessen the

	towards mobile health among the college going students in Coastal South India”	karan Unnikrishnan, Rekha Thapar, Nithin Kumar, Elizabeth Josy Panikulam, Elina Geroge, Prajwal Pai, Vaman Kulkarni, Ramesh Holla, Bhagwan Bhagyamma Darshan, Avinash Kumar, Rohil Mehta, and Ratna Jay”			need for patients to physically visit the hospital in order to receive counselling or advice about medications, among other services. 2. Numerous studies have documented the different benefits of mHealth, but none have addressed young people's awareness, acceptance, or willingness to use the technology. 3. Planning and making policy decisions regarding boosting mHealth awareness among the younger generation and identifying the elements that make mHealth applicable depend on this. 4. Although there was a good degree of knowledge regarding mHealth and its different features in our study, there were disparities between the courses in terms of a
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					number of elements.
14.	“Barriers to the use of mobile health in improving health outcomes in developing countries: systematic review”	“Clemens Kruse, Jose Betancourt, Stephanie Ortiz, Susana Melissa Valdes Luna, Inderdeep Kaur Bamrah, Narce Segovia”	Oct 2019	Systematic review	1. Low-cost mobile technology can help poor nations with their health care demands. Short message service (SMS) text messaging, mobile apps, and phone conversations can all be utilised as a means of exchanging health information in order to improve health outcomes. This is known as mobile health (mHealth). Patients' health condition can be communicated, stored, retrieved, and reminded using a simple text. 2. It can also convey messages that encourage healthy habits and decisions. It is a low-cost technique that can lessen health disparities in underdeveloped nations.

Chapter 3

Methodology

We used a standardized, self-administered online questionnaire to perform a descriptive cross-sectional study with residents of any Indian city or state. The study had a 2-month period, and convenient sampling was chosen as the sample technique.

The instrument employed is a structured questionnaire with three sections:

- (a) Participants' demographic and socioeconomic background
- (b) Knowledge of health apps
- (c) Early detection and screening

The demographic and socioeconomic part concentrated on gathering data at the individual level, such as age, gender, and employment status. A structured questionnaire was utilized in the following parts to gauge people's knowledge of healthcare apps and early cancer diagnosis and screening. The study tool was distributed, and responses were collected via online mode using google forms at platforms like WhatsApp, LinkedIn.

Operational Definitions

- m-health Technology: “The World Health Organization defines mHealth as -the use of mobile and wireless technologies to aid in the achievement of health goals. mHealth is defined as - the use of mobile and wireless devices (cell phones, tablets, etc.) to improve health outcomes, health care services, and health research, by the National Institutes of Health (NIH). mHealth (or m-health) is an abbreviation for mobile health, which refers to the practice of medicine and health care via mobile devices such as smartphones, tablets, PDAs, and computers.”
- Cancer: “Cancer is a disease in which certain cells of the body grow uncontrollably and spread to other parts of the body. Cancer can develop almost anywhere in the human body, which contains trillions of cells. Human cells normally grow and multiply (a process known as cell division) to create new cells as needed by the body. Cells die when they age or become damaged, and new cells replace them. This orderly process occasionally breaks down, causing

abnormal or damaged cells to grow and multiply when they should not. Tumors, which are lumps of tissue, can form from these cells. Tumors can be cancerous or benign (benign).”

ETHICAL CONSIDERATION

Before responding to any of the questionnaire's questions, each participant will complete an informed consent form. The results of this study will help us understand how people in India feel about m-health technology and whether it is effective for early cancer diagnosis in that country. All ethical standards will be followed during the investigation.

IMPLICATIONS OF RESEARCH

The study will help us better understand how people's attitudes and understanding about cancer may be changed, which will enable us to expand early cancer screening in India.

Chapter 4

Results

Our online survey received responses from 83 individuals in total. The analysis was conducted on 81 Indian homes. The information helps us understand the patterns for each age group and gender in detail. Which social media platform do today's young use? Instagram and WhatsApp are the finest options if we want to raise awareness among the populace. Considering that many of the responders utilise it. People are occasionally unaware of the mobile healthcare app's great value to them and their health since they are a little hesitant to use it. Many of them aren't even aware that there are any such apps.

Sociodemographic characteristics

The majority of the 81 respondents were between the ages of 18 and 30, followed by 50 to 60. The majority of responders (51 percent) were full-time workers, followed by students (26 percent). Ten percent or so of workers are independent contractors. Either

the information/software sector or the healthcare sector employs the majority of the respondents. 51 percent of the 81 respondents work in the healthcare industry, and 19 percent work in the IT/software industry.

All responders use social media quite effectively. Among all responders, the most popular social media apps were Instagram, WhatsApp, Facebook, and LinkedIn. They use Instagram 67 percent of the time and WhatsApp 80 percent of the time. Many of the responders also use Facebook and LinkedIn. 28 percent of them use Facebook, and 38% use LinkedIn. The statistics showed us that the respondents were more likely to be in the 18-to-30-year age range, and as a result, those young people use Instagram and WhatsApp more frequently than they do Facebook. But compared to Instagram and WhatsApp, LinkedIn is much less popular.

Table 2: Participant sociodemographic characteristics (n=81)

<i>socio-demographic characteristic</i>	<i>Number of respondents</i>	<i>Valid Percentage</i>
Gender		
Male	40	49
Female	41	51
Others	0	0
Age		
18-30	58	72
30-40	6	7
40-50	7	9
50-60	9	11
Employment status		
Employed full time	41	51
Employed part time	4	5
Freelance/contract employee	8	10
Self-employed	5	6
Unemployed	1	1
Student	21	26
Retired	3	4
Working Industry		
Healthcare Industry	41	51
Technology/software	15	19
Consulting	6	7
Services	5	6
Educational Department	7	9
Others	9	11
Social Media		
Instagram	54	67
WhatsApp	65	80

Facebook	23	28
LinkedIn	31	38
Others	1	1

Awareness of various healthcare apps

The study shows that people are aware of various healthcare apps, and they are also using them. According to the study 61.7% of the respondents used the healthcare apps so far. And only 30% are those who have not used any of the healthcare app.

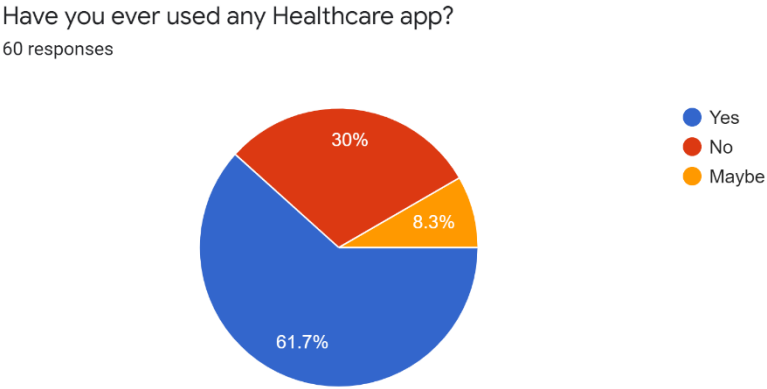


Fig 1: Ever used healthcare apps

The main purpose of using any healthcare apps is ordering medicines followed by video-consultation and information gathering. 77.8% respondents gave a response that they are using the healthcare apps to order the medicines, and 24.4 % are saying that they have booked teleconsultation through the app. Easy to use and discounts and offers are the ones that makes the user-friendly experience. Many of the respondents gets attracted towards these app because they feel like the app is easy to use and also provides many offers which is an economical choice for many of them.

If no, Why have you not used any healthcare app?
22 responses



Fig 2: Reason for not using healthcare apps

As shown in the figure, there are many reasons for not using the healthcare apps. Respondents (45.5%) of overall thinks that they don't need any healthcare apps. And 18.2% are those people who are not at all aware about the healthcare apps. So, it shows that there is lack of awareness among the individuals for the healthcare apps and its usefulness.

Early screening and detection of cancer through apps

There are few apps those are providing the features needed for cancer care. According to the study we can easily understand that many of the respondents are unaware of any such healthcare app that provides cancer care through app. 80 % of the respondents gave a response that they are not aware of any of the early detection of cancer care through apps. Only 11.7% of them are aware of early screening and detection of cancer through apps.

Are you aware of any mobile health App for early detection of cancer care?
60 responses

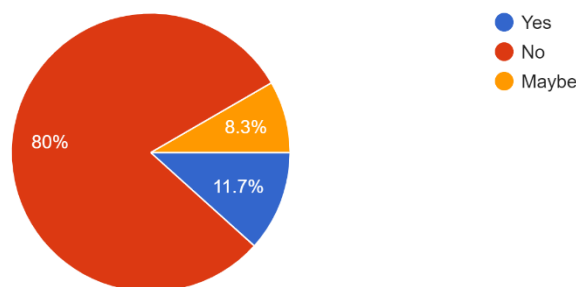


Fig 3: Awareness of mobile health app for early detection of cancer

As the awareness for early screening and detection is less, similarly the respondents are not aware of the self-test through various apps available. Self-test here means based on symptoms when you take a basic test through apps for your health. Sometimes known as risk assessment in some apps it is self-test. Minor symptoms detected early can save lots of time, money, and energy of an individual. They have mentioned that they are not aware of any such app from where they can take self-test and be sure that they are disease free. It is much needed to spread the awareness among the individuals about the early screening and detection of cancer through apps can happen and also they can easily self-examine themselves for the initial stage through these mHealth apps

Have you ever taken the self-test through any of the healthcare app for any symptoms you are facing?

60 responses

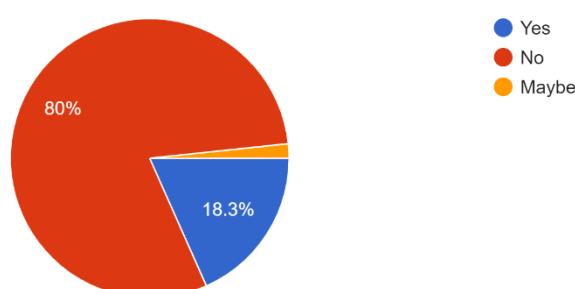


Fig 4: Ever taken the self-test through any mHealth apps

According to the respondents, if the cancer is detected at an early stage, then it gives better chances to survive, becomes easier to treat, and also reduces the cost of treatment. 78.3 % respondents thinks that it increases the chances of survival if detected at an early stage. And 75% thinks that it becomes easier to treat a patient at an early stage rather than at the advance stage. If the person ignores the minor symptoms also it becomes extremely critical to treat that at an advance stage.

Chapter 5

Discussion

This study aimed to identify usage of mobile health technology for early screening and detection of cancer in India. “Cancer is a condition when a subset of the body's cells grows out of control and spreads to other body regions.” In neglected nations, mHealth concentrates on gathering information as quickly as possible in order to diagnose illnesses, track diseases, and give the public up-to-date information. “In rural locations where doctors and nurses might not always be available to give care, mobile health (mHealth) is especially crucial.” In neglected nations, mHealth concentrates on gathering information as quickly as possible in order to diagnose illnesses, track diseases, and give the public up-to-date information. “In rural locations where doctors and nurses might not always be available to give care, mobile health (mHealth) is especially crucial.” The likelihood of successfully treating cancer is considerably increased by early identification. The two elements of early cancer detection are screening and early diagnosis (or downstaging). While screening consists of evaluating healthy individuals to find those who have cancer before any symptoms occur, early diagnosis focuses on identifying symptomatic patients as early as feasible.

Barriers may prevent patients from receiving prompt diagnosis and treatment at any stage. “Poor cancer awareness among the general public; deficient understanding of cancer symptoms and/or adequate diagnosis follow-up at the primary health care level; poor accessibility; low affordability and/or quality of diagnosis and treatment services (waiting lists, errors in diagnosis, administrative red tape, confusing referral pathways, etc.); and the various logistical, financial, and psychosocial barriers preventing patients from receiving services quickly.”

In low- and middle-income nations, early screening and detection are crucial for stabilizing the economy and cutting healthcare costs. Therefore, it is important to raise public awareness about cancer, its symptoms, and the care and treatment that are available. Several mHealth apps are available and actively developing for this in numerous nations. They are primarily focused on introducing novel and crucial characteristics for the early identification and treatment of cancer. We may anticipate an increase in the incidence of cancer in the coming years, so we must take action to manage unexpected circumstances in order to prevent an uncontrollable scenario.

Chapter 6

Conclusion

The smartphone app is a tailored, interactive health education tool with the potential to increase cancer awareness. The most effective technique to educate the public about healthcare and how useful mHealth apps can simplify their lives is through social media. The necessity of the hour is for mHealth technology to provide efficient healthcare. to place a prescription for medication, schedule a video consultation, or schedule a lab test. Any feature can be accessed in mHealth apps, and many of them also provide lots of information about a person's health. If you frequently use these educational apps and take free risk assessments through different apps for the minor symptoms that you are experiencing, you may be able to detect health problems early.

Chapter 7

Recommendations

There is need to conduct studies for the usage of mHealth technology with some quantitative data, as there are so many literature reviews and narrative reviews are available, but the data is needed to understand about various perspectives of the population.

1. Study population should be more for further studies to get fair understanding of the perspectives.
2. Learn about the knowledge the study population have about the mHealth technology.
3. User friendly healthcare apps can work on the feature that the users need, and which are economical for the users.
4. The mHealth apps should be user friendly and easy to use.

References

1. Osei, E., & Masahamba-Thompson, T. (2021). *Mobile health applications for disease screening and treatment support in low and middle income countries- A narrative review*. Retrieved 16 April 2022, from <https://www.sciencedirect.com/science/article/pii/S2405844021007428>.
2. Griffen, L., Lee, D., Jaisle, A., Carek, P., George, T., & Laber, E. et al. (2019). *Creating an mHealth App for Colorectal Cancer Screening: User-Centered Design Approach*. Retrieved 16 April 2022, from <https://humanfactors.jmir.org/2019/2/e12700/>.
3. Varghese, C. *Cancer Prevention and Control in India*. Retrieved 16 April 2022, from <https://main.mohfw.gov.in/sites/default/files/Cancer%20Prevention%20And%20Control%20In%20India.pdf>.
4. Janda, M., & Soyer, H. P. (2020). Using Mobile Health Technology and Social Media for the Prevention and Early Detection of Skin Cancer. *Dermatology (Basel, Switzerland)*, 236(2), 72–74. <https://doi.org/10.1159/000505150>
5. Ruco, A., Dossa, F., Tinmouth, J., Llovet, D., Kishibe, T., & Baxter, N. N., MD PhD (2020). Social media and mobile health technology for cancer screening: a systematic review and meta-analysis protocol. *BMJ open*, 10(2), e035411. <https://doi.org/10.1136/bmjopen-2019-035411>
6. Rossen, S., Kayser, L., Vibe-Petersen, J., Christensen, J. F., & Ried-Larsen, M. (2020). Cancer Survivors' Receptiveness to Digital Technology-Supported Physical Rehabilitation and the Implications for Design: Qualitative Study. *Journal of medical Internet research*, 22(8), e15335. <https://doi.org/10.2196/15335>
7. Parthaje, P. M., Unnikrishnan, B., Thapar, R., Kumar, N., Panikulam, E. J., Geroge, E., Pai, P., Kulkarni, V., Holla, R., Darshan, B. B., Kumar, A., Mehta, R., & Jay, R. (2016). *Perceptions and knowledge toward mobile-health among the college going students in coastal South India*. *Journal of natural science, biology, and medicine*. Retrieved June 10, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4780173/>
8. Bhatt, S., Isaac, R., Finkel, M., Evans, J., Grant, L., Paul, B., & Weller, D. (2018, December). *Mobile Technology and Cancer Screening: Lessons From Rural India*. *Journal of global health*. Retrieved June 10, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6304168/>
9. Thankappan, K., Birur, P., Raj, M., Djalalov, S., Subramanian, S., Iyer, S., & Kuriakose, M. A. (2020, July 15). *Oral cancer screening using mobile phone-based(mhealth) approach versus conventional oral examination approach, protocol of a cluster randomized study with cost-effectiveness analysis*.

- International Journal of Surgery Protocols. Retrieved June 15, 2022, from <https://www.sciencedirect.com/science/article/pii/S2468357420300218>
10. Rincon1*, E., Monteiro-Guerra2*, F., Rivera-Romero3, O., Dorronzoro-Zubiete3, E., Sanchez-Bocanegra4, C. L., Gabarron5, E., Pedagogy, 1D. of P. and, & Rincon, C. A. E. (n.d.). *Mobile phone apps for quality of life and well-being assessment in breast and prostate cancer patients: Systematic review*. JMIR mHealth and uHealth. Retrieved June 15, 2022, from <https://mhealth.jmir.org/2017/12/e187/>
 11. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.bibliomed.org/mnsfulltext/196/196-1603562719.pdf?1655858883
 12. Bashar, M. D. A., & Begam, N. (n.d.). *Impact of covid-19 pandemic on cancer screening in India: Current situation, challenges and way forwards*. Asian Pacific Journal of Cancer Care. Retrieved June 20, 2022, from <http://waocp.com/journal/index.php/apjcc/article/view/729>
 13. Mehrotra, R., & Yadav, K. (2021, December 27). *Cervical cancer: Formulation and implementation of Govt of India Guidelines for screening and Management - Indian Journal of Gynecologic Oncology*. SpringerLink. Retrieved June 20, 2022, from <https://link.springer.com/article/10.1007/s40944-021-00602-z>
 14. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://digitalcollections.sit.edu/cgi/viewcontent.cgi?article=3100&context=isp_collection
 15. 1Department of Community Medicine and Family Medicine. (n.d.). *Cancer awareness and attitude towards cancer screening in... : Journal of Family Medicine and Primary Care*. LWW. Retrieved June 20, 2022, from https://journals.lww.com/jfmpc/Fulltext/2020/09050/Cancer_awareness_and_attitude_towards_cancer.14.aspx
 16. Ruco1, A., Dossa3, F., Tinmouth1, J., Llovet1, D., Jacobson1, J., Kishibe7, T., Baxter1, N., Policy, 1I. of H., & Baxter, C. A. N. (n.d.). *Social Media and mHealth Technology for cancer screening: Systematic Review and meta-analysis*. Journal of Medical Internet Research. Retrieved June 20, 2022, from <https://www.jmir.org/2021/7/e26759/>
 17. Birur, N. P., Patrick, S., Bajaj, S., Raghavan, S., Suresh, A., Sunny, S. P., Chigurupati, R., Wilder-Smith, P., Gurushanth, K., Gurudath, S., Rao, P., & Kuriakose, M. A. (2018, September 1). *A novel mobile health approach to early diagnosis of oral cancer*. The journal of contemporary dental practice. Retrieved June 20, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6455929/>
 18. Dey, S. (2014, August 10). *Preventing breast cancer in Imics via screening and/or early detection: The real and the surreal*. World journal of clinical oncology. Retrieved June 25, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4127620/>
 19. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://ijpm.mui.ac.ir/index.php/ijpm/article/viewFile/2172/717717968
 20. Parthaje, P. M., Unnikrishnan, B., Thapar, R., Kumar, N., Panikulam, E. J., Geroge, E., Pai, P., Kulkarni, V., Holla, R., Darshan, B. B., Kumar, A., Mehta, R., & Jay, R. (2016). *Perceptions and knowledge toward mobile-health among the college going students in coastal South India*. Journal of natural science,

- biology, and medicine. Retrieved June 25, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4780173/>
21. Kruse, C., Betancourt, J., Ortiz, S., Luna, S. M. V., Bamrah, I. K., Segovia, N., Administration, S. of H., & Kruse, C. A. C. (n.d.). *Barriers to the use of mobile health in improving health outcomes in developing countries: Systematic Review*. Journal of Medical Internet Research. Retrieved June 25, 2022, from <https://www.jmir.org/2019/10/e13263/>

Annexures

Annexure A: Questionnaire

Consent: Your participation in this research is entirely voluntary. You have the right to withdraw at any time and for any reason. All of your information will be kept private and used solely for research purposes.

- a) Yes
- b) No

Table 3: Questionnaire

Ques no.	Question	Options	Mandatory/ Non mandatory
1.	What is your good name?	_____	Non-Mandatory
2.	Are you a	a) Male b) Female c) Others	Mandatory
3.	What is your age?	a) 18-30 b) 30-40 c) 40-50 d) 50-60	Mandatory

		e) 60+	
4.	How would you describe your employment status?	a) Employed full time b) Employed part time c) Freelance/contract employee d) Self-employed e) Unemployed f) Student g) Retired	Mandatory
5.	How would you classify your industry?	a) Healthcare Industry b) Technology/ Software c) Consulting d) Services (Banking, Defense/ Army, etc.) e) Educational Department f) Others	Mandatory
6.	Which social media you use mostly?	a) Instagram b) WhatsApp c) Facebook d) LinkedIn e) Others	Mandatory
7.	Have you ever used any healthcare app?	a) Yes b) No c) Maybe	Mandatory
8.	If yes, Which app have you used?	a) PharmEasy b) Tata 1mg c) Apollo 247 d) Practo e) Pristyn care f) Others	Non-Mandatory
9.	What is the purpose for using that app?	a) Teleconsultation/ Video consultation	Non-Mandatory

		b) Ordering Medicines c) Booking Lab Tests d) Gathering healthcare information	
10	What do you like most in that App?	a) Good healthcare services through the app b) Discounts / Offers c) Information provided on the app d) Easy to use e) Easy to contact the customer care f) Others	Non-Mandatory
11	If no, why have you not used any healthcare app?	a) I am not aware of any such app b) I don't trust such apps c) I am not satisfied with my previous experience d) These apps are costly e) I don't need any healthcare apps f) Others	Non-Mandatory
12	Are you aware of any mobile health app for early detection of cancer care?	a) Yes b) No c) Maybe	Mandatory
13	Can you name any mobile healthcare app for early detection of cancer care?	_____	Mandatory
14	Have you ever taken the self-test through any of the healthcare app for any	a) Yes b) No c) Maybe	Mandatory

	symptom you are facing?		
15	If no, why have you not taken any self-test?	a) Not aware of the app b) Don't know how it works c) I don't want to take any risk assessment d) Other	Non-Mandatory
16	If you get any app that gives you all the information about cancer, would you like to use it?	a) Yes b) No c) Maybe	Mandatory
17	In your views what are the benefits of early screening and detection of cancer?	a) Easier to treat b) Better chances of survival c) Less treatment and less time spent recovering d) Reduce the cost of treatment e) Other	Mandatory
18	What would you like to have in that app?	a) Information on Cancer care b) Risk assessment test c) Teleconsultation/ Video consultation d) Track the medical records e) Track your regular activities f) Other	Mandatory

Thank you for your valuable time and support :)

Annexure B: Responses

Consent: Your participation in this research is entirely voluntary. You have the right to withdraw at any time and for any reason. All of your informatio...ept private and used solely for research purposes.

60 responses

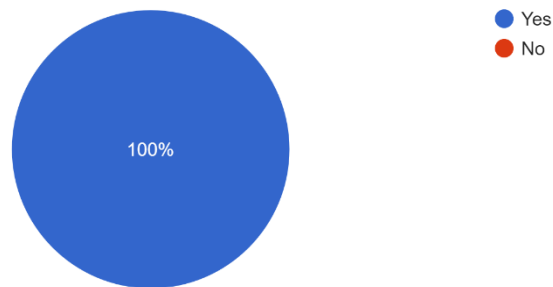


Fig 5: Consent by the Respondents

Are you a

60 responses

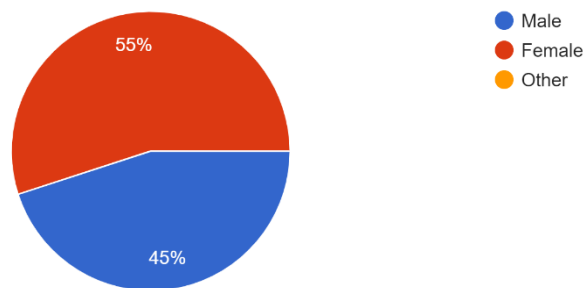


Fig 6: Respondents Gender

What is your age?

60 responses

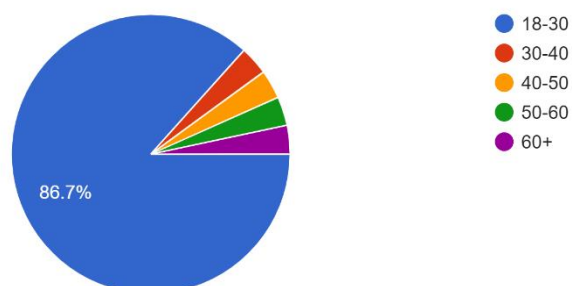


Fig 7: Age group of the respondents

How would you describe your employment status?
60 responses

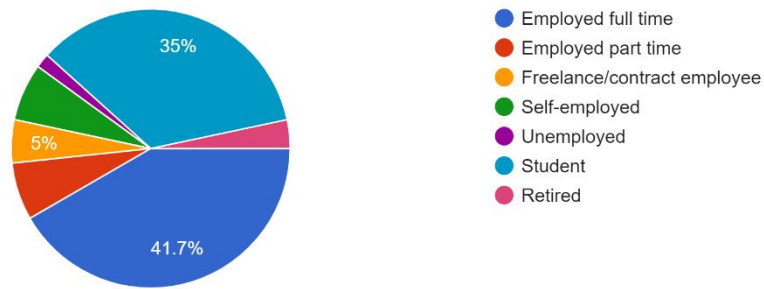


Fig 8: Employment status of individuals

How would you classify your industry?
60 responses

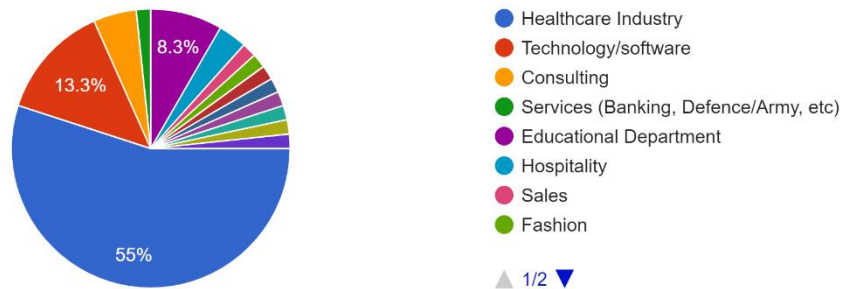


Fig 9: Working Industry Classification

Which social media you use mostly?
60 responses

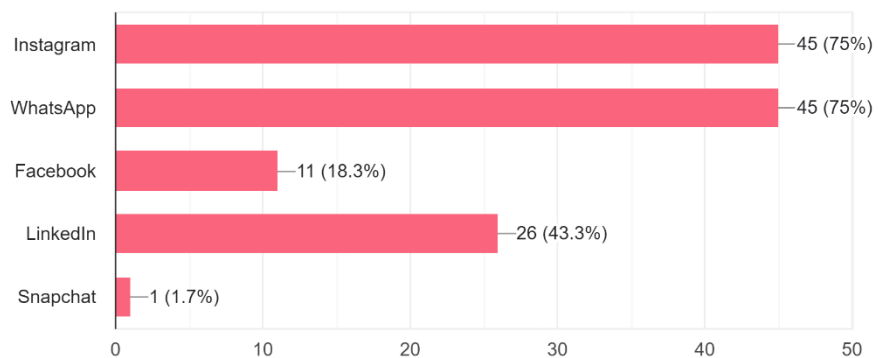


Fig 10: Most Frequently used social media

Have you ever used any Healthcare app?
60 responses

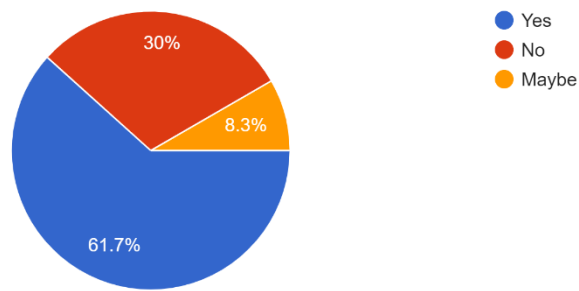


Fig 11: Ever used healthcare apps

If yes, Which app have you used?
44 responses

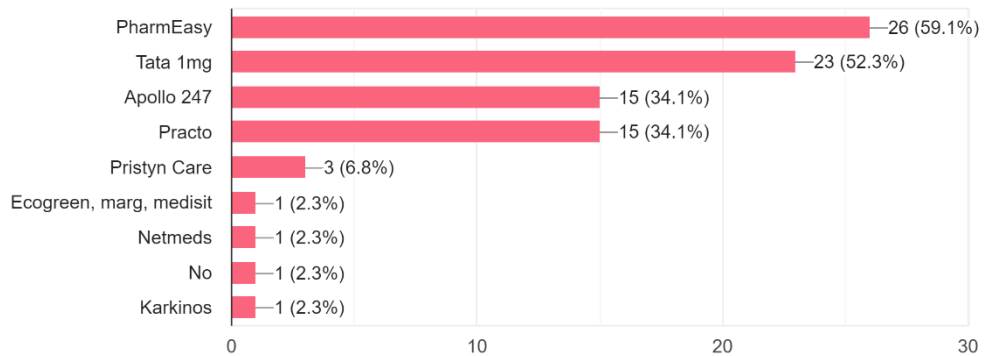


Fig 12: App used by respondents

What is the purpose for using that app?
45 responses

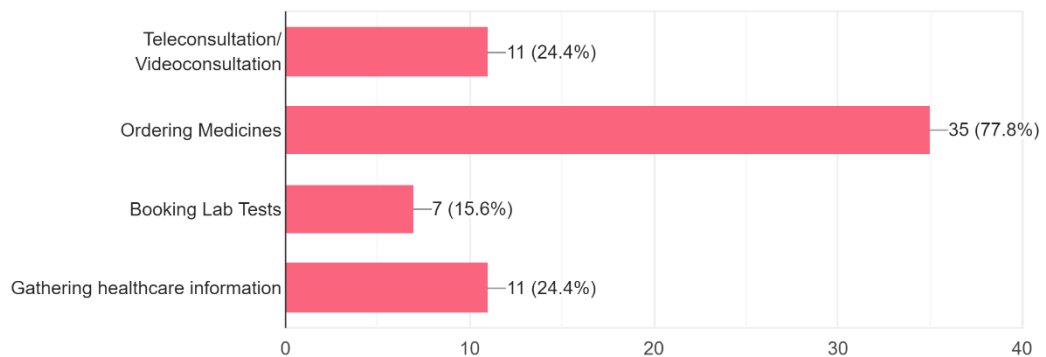


Fig 13: Purpose for using the app

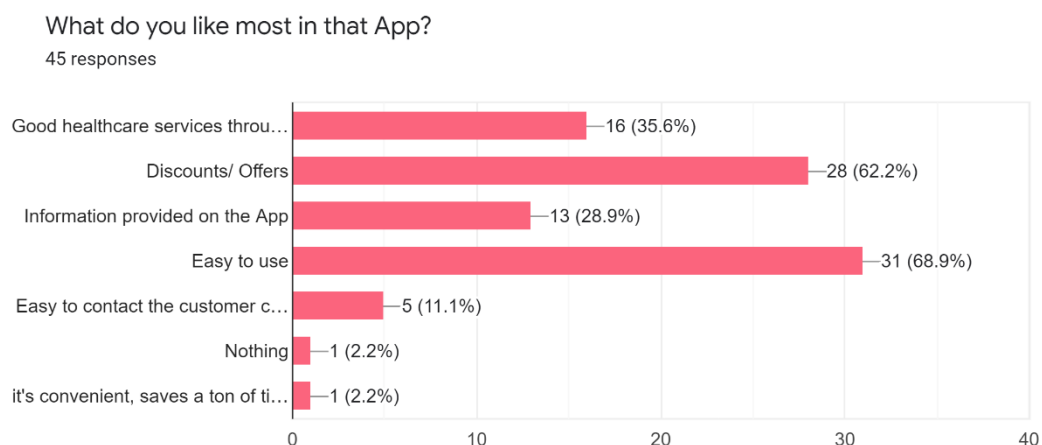


Fig 14: Feature mostly used or liked by respondents

If no, Why have you not used any healthcare app?

22 responses

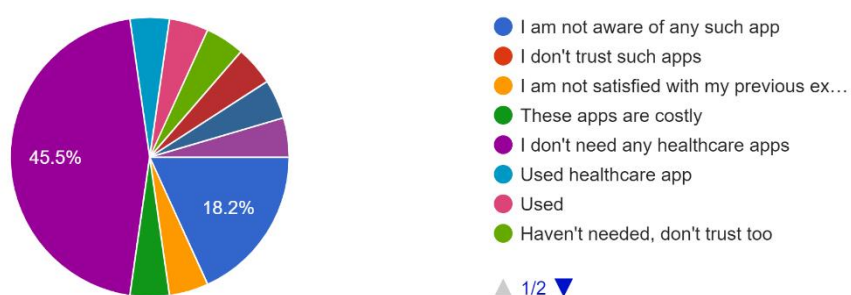


Fig 15: Reason for not using healthcare apps

Are you aware of any mobile health App for early detection of cancer care?

60 responses

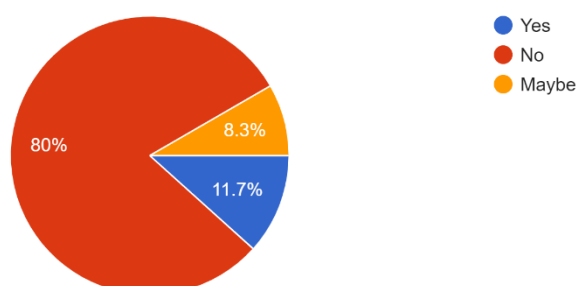


Fig 16: Awareness of mobile health app for early detection of cancer

Can you name any mobile health App for early detection of cancer care?

20 responses

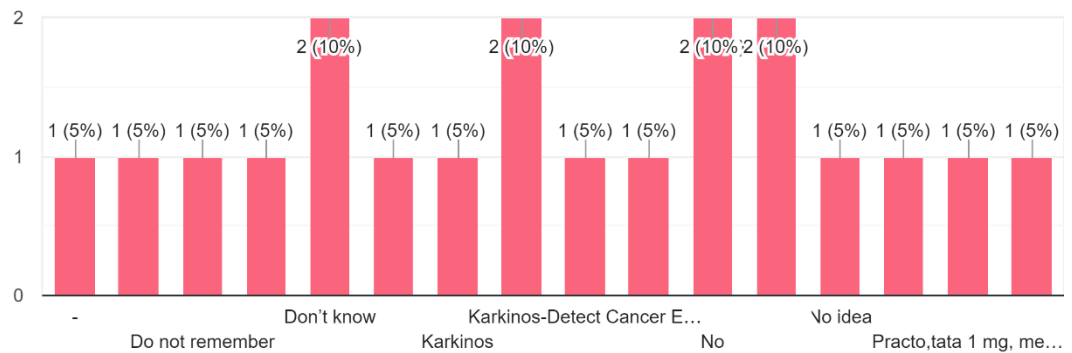


Fig 17: Few mHealth apps for early detection of cancer known to respondents

Have you ever taken the self-test through any of the healthcare app for any symptoms you are facing?

60 responses

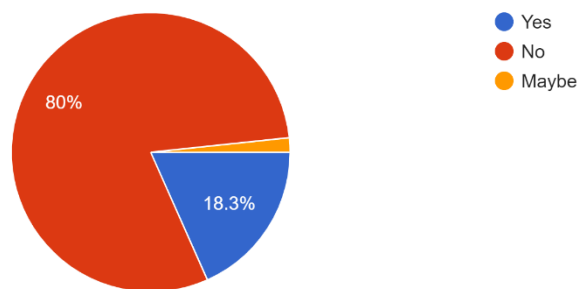


Fig 18: Ever taken the self-test through any mHealth apps

If no, Why have you not taken any self-test?

47 responses



Fig 19: Reason for not taking self-test

If you get any app that gives you all the information about cancer, would you like to use it?
60 responses

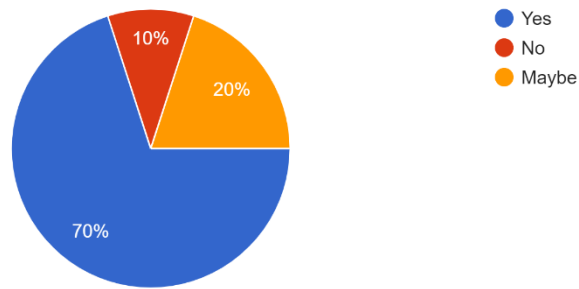


Fig 20: If cancer care apps are provided, respondents will use that or not

In your views what are the benefits of early screening and detection of cancer?
60 responses

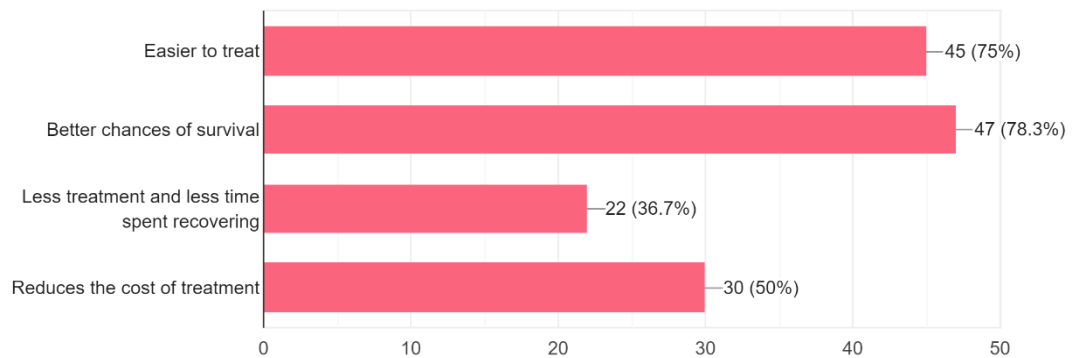


Fig 21: Benefits of early detection on the basis of respondent's viewpoint

What would you like to have in that app?
60 responses

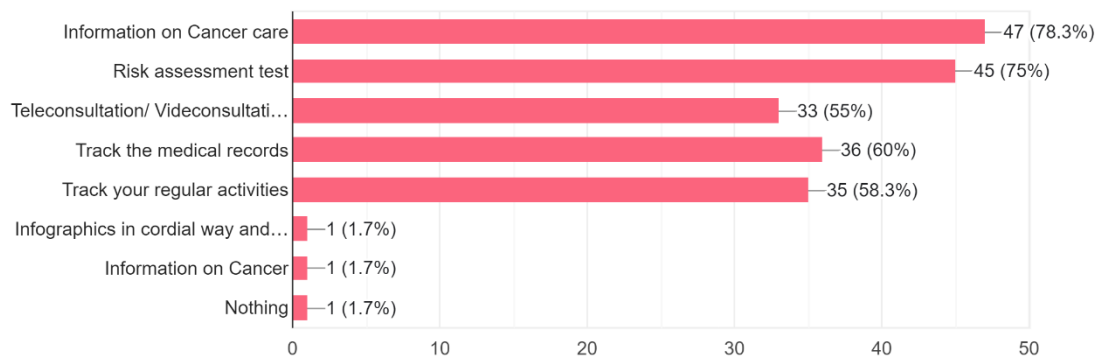


Fig 22: Feature the respondents want