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Designing HepCare App for Promoting Hepatitis Prevention and Awareness in Bangladesh Utilizing User-Centered Design Methodology

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Attestation

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Abstract

Hepatitis remains a major public health concern in Bangladesh due to a lack of awareness, inadequate access to healthcare, and low vaccination rates. With an estimated 4–7% of the population infected with hepatitis B and 1% with hepatitis C, hepatitis B and C continue to pose serious public health challenges in Bangladesh. In response to these challenges, the ‘HepCare’ app has been designed, aiming to promote hepatitis prevention and awareness across Bangladesh. The app is expected to play a crucial role in reducing the country’s high rates of viral hepatitis.

The User-Centered Design (UCD) methodology involved detailed scientific papers that were used for the literature review used in this study to create a mobile health (mHealth) application (app) ‘HepCare’ that is tailored specifically for Bangladeshi people. The ‘HepCare’ app seeks to offer comprehensive information on any type of hepatitis, including prevention techniques, and modes of transmission. The 23 questions in the need-finding survey helped to collect user requirements and shape the features of the app. Beginning with hand-drawn sketches to create a low-fidelity prototype. The process advanced to a high-fidelity prototype which was created using Figma.

Key functionalities of the ‘HepCare’ app include “About the Types of Hepatitis”, “Prevention Guidelines From Online Resources”, “People at Risk”, “Chatbox”, “Guidelines for Living With Hepatitis”, “Symptoms Tracker”, “Medication Reminder”, “Doctor’s Appointment Reminder”, “Pregnancy and Hepatitis”, and “Advertisement and Awareness”. Interactive elements, like “Chatbox”, encourage participation and lessen stigma.

Moreover, 91.2% of survey participants expressed willingness to use and recommend the ‘HepCare’ app during a user study. The user-friendly design of the high-fidelity prototype ensures intuitive interaction, becoming a vital resource in the fight against hepatitis in Bangladesh, empowering individuals with the information and resources.

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1 Introduction

1.1 Background And Motivation

1.1.1 Liver Hepatitis

Liver hepatitis refers to inflammation of the liver, an essential organ responsible for detoxification, nutrient metabolism, and digestion. The liver's vital functions are hampered by this inflammation, which leads to symptoms like exhaustion, jaundice (yellowing of the skin and eyes), discomfort in the abdomen, and extreme situations, liver failure [1, 2]. There are five primary types of hepatitis (i.e., A, B, C, D, and E) each caused by different viruses but sharing liver inflammation as a common outcome. Viral infections like hepatitis A, B, and C are among the most common culprits, but alcohol, certain medications, and autoimmune disorders can also inflame the liver. Each type of hepatitis spreads differently, hepatitis A is usually transmitted through contaminated food or water, while hepatitis B and C are mainly spread through infected blood or bodily fluids [3]. Hepatitis D spreads through infected blood, bodily fluids, and shared needles, but it only infects people who already have hepatitis B [4]. On the other hand, hepatitis E is usually caught by drinking contaminated water or eating undercooked meat, especially in places with poor sanitation [5]. Among them, chronic hepatitis B and C are especially concerning because they can silently damage the liver for years, eventually leading to life-threatening conditions like cirrhosis or liver cancer [1].

1.1.2 Mobile Health (mHealth)

Mobile Health (mHealth) is all about using mobile devices like smartphones, tablets, and wearables to make healthcare more accessible and effective. It includes things like apps that help people track their health, reminders to take medication, virtual doctor visits, and tools for collecting health data. mHealth makes it easier for people to take care of themselves, stay informed, and connect with healthcare professionals no matter where they are. It is especially helpful in areas where access to medical services is limited, and it plays a big role in keeping track of health trends and improving public health overall [6].

Mobile phones have quickly grown into powerful tools for communication and connectivity. Back in 2010, there were around 5.3 billion mobile subscriptions worldwide, and over 85% of people had access to a wireless signal [7]. Since then, that number has continued to rise, reaching about 8.9 billion subscriptions by 2023 up from 8.6 billion the year before. In fact, global subscriptions first crossed the 8 billion mark in 2019 [8]. With this rapid growth, mHealth has played a key role in making healthcare more efficient, more accessible, and more affordable for many people [9]. At the same time, 179.9 million cellular connections in Bangladesh [10], which is more than its population of 172.1 million [10], mHealth is becoming more practical and widely used as technology becomes more

affordable and easier to access. According to a report estimates that by 2025, about 62% of people in Bangladesh will own a smartphone [11], making it easier for more people to benefit from digital health services. This growing access to mobile technology is also changing the way public health workers do their jobs, giving them new responsibilities and helping shift roles and decision-making in the healthcare system.

1.1.3 Human-Computer Interaction (HCI)

Human-Computer Interaction (HCI) is all about how people interact with computers. At its core, HCI focuses on designing, building, and testing user interfaces (UI) that make those interactions smoother, easier, and more enjoyable. It is a field that brings together knowledge from different areas like computer science, design, engineering, and even philosophy to improve the way we use technology in our everyday lives. Two important ideas in HCI are functionality and usability [12]. Functionality is what a system can do with the features and services it offers. Usability, on the other hand, is about how easy and effective it is for people to use those features to get things done. Good HCI makes technology feel more human and less like a machine, so people do not get frustrated or overwhelmed when using it. The goal is to create experiences that feel natural, personal, and responsive to what users actually need. It is also about closing the gap between how people think and how computers work.

HCI is not just about making websites or apps look good it has real-world applications in many areas, including healthcare. For example, it is used to design easy-to-use medical devices and telemedicine tools. It also plays a big role in creating wearable tech like smartwatches and fitness trackers that monitor health data. HCI even helps improve electronic health record (EHR) systems, which has led to better workflow for doctors and fewer medical errors by up to 55% [13]. In education, HCI helps make digital learning platforms more engaging. Studies have shown that when HCI principles are applied, students tend to retain 27% more of what they learn [14]. Similarly, in the realm of smart home technology, HCI contributes to the development of intuitive control systems, leading to improved energy efficiency and user comfort. Reports suggest that such systems can reduce energy consumption by up to 30% [15]. As technology continues to evolve, HCI is playing an even bigger role in making our interactions with devices more natural, efficient, and inclusive [16]. It is all about making technology work better for people.

1.1.4 User-Centered Design(UCD)

User-Centered Design (UCD) is an iterative design methodology that emphasizes a thorough understanding of users and their needs at every stage of the design process. Rather than making design decisions based on assumptions, UCD encourages a deep understanding of how people think, feel, and behave when using a product or system [17]. The process is typically broken down into four main phases [17]. It starts by exploring the context in which users will interact with the system. Next, designers gather and define user requirements based on that context. Then comes the design phase, where potential solutions are created. Finally, in the evaluation phase, those solutions are tested and refined based on how well they meet users' needs, repeating the cycle as needed to improve the results [17].

The UCD approach is valuable for several reasons. By involving users throughout the design process, it helps create products that are more intuitive, accessible, and enjoyable to use. This ongoing collaboration allows for continuous feedback and improvement, ensuring that the final product truly fits the users it is meant for. UCD also considers the full user

experience not just functionality, but also ease of use, accessibility, and overall satisfaction. Because of its focus on early testing and regular evaluation, UCD works especially well for refining designs and making sure they really work for people in the real world [18].

1.1.5 Importance of mHealth App in Hepatitis

The mHealth Summit hosted by the Foundation for the National Institutes of Health (FNIH) defined mobile health, or mHealth, as the use of mobile communication devices to deliver healthcare services in 2010 [19]. Around the same time, the Global System for Mobile Association (GSMA) which represents the global mobile industry released a report highlighting a fresh perspective on healthcare. The study explored how mobile technology could play a key role in transforming healthcare systems, making them more efficient and cost-effective, while also improving how care is delivered to people around the world [20].

mHealth apps are proving to be a game-changer in managing hepatitis and promoting liver health. It can offer clear, reliable information about the different types of hepatitis, how the disease spreads, what symptoms to watch for, and how to prevent it. For those living with hepatitis B or C, the app can make life a bit easier by sending reminders to take medications, attend medical appointments, or get vaccinated. It can also help users track their symptoms, monitor their health over time, and even connect with doctors remotely when needed. Such as the ‘KnowHBV’ treatment decision tool was developed for chronic hepatitis B. It provides advice on management techniques and treatment alternatives to assist in well-informed decision-making [21]. The ‘Hepatitis Connect’ app, which links users to healthcare services and provides educational materials, emphasizes community involvement and offers useful digital resources to increase access to services related to hepatitis [22]. This app helps people receiving treatment for hepatitis C by offering community engagement tools, health task notifications, daily medication reminders, and educational content [23]. The purpose of the ‘HepTalk’ app is to enable two-way communication between patients and medical professionals [24]. The ‘Learn about Hepatitis and Live Well’ app gives users information about the liver, liver transplants, and liver-healthy diet [25]. Beyond medical care, these apps can support healthier habits by sharing tips on diet, exercise, and avoiding things that might harm the liver. Overall, a mHealth app not only supports daily management of the disease but also helps people feel more informed, in control, and connected to the care they need.

1.2 Problem Statement

In Bangladesh, hepatitis remains a significant public health concern, with its impact varying depending on the type of virus. The prevalence of hepatitis continues to rise, with hepatitis B and C posing the greatest risk. While Bangladesh has made significant progress in vaccinating infants against hepatitis B, vaccination coverage for adults, particularly among high-risk groups such as pregnant women, healthcare workers, and intravenous drug users, remains insufficient [26]. For example, Hepatitis B affects about 4% of the population, placing the country in the intermediate prevalence zone [27]. Hepatitis C, with estimates suggesting that it affects between 0.2%, and 1% of the population [28]. Meanwhile, hepatitis E is more widespread, particularly among vulnerable groups, and is a leading cause of acute jaundice. Alarming, hepatitis E has been linked to up to 20% of maternal deaths in the country [29]. Rapid urbanization and internal migration have altered hepatitis transmission patterns, especially in slum areas where access to sanitation and healthcare services is limited [30]. Furthermore, there is a notable lack of public awareness regarding the transmission, prevention, and treatment of hepatitis, particularly

in rural regions [31]. On the bright side, Bangladesh has made notable progress in combating hepatitis when children received a three-dose series of the hepatitis B vaccine in Bangladesh, it was very successful in preventing chronic Hepatitis B Virus (HBV) infection. However, challenges persist. Because many people in rural and low-income areas still face barriers to accessing healthcare and education about hepatitis.

Smartphone use in Bangladesh has grown rapidly in recent years, driven by the country's widespread mobile network coverage and the affordability of mobile devices [32]. Today, many people rely on their smartphones for everyday tasks whether it is staying connected, browsing the internet, or finding information. This shift in technology opens up a valuable opportunity to use smartphones for healthcare, especially when it comes to managing hepatitis through mHealth apps. However, based on our research, we found that there is currently no app available in the Bangla language that specifically focuses on educating and supporting people with liver hepatitis. This gap highlights the need for a localized solution and points to an important area for further research and development.

1.3 Research Gap

A research gap is basically a part of a topic or area of knowledge that has not been fully explored or addressed in earlier studies. Finding these gaps is important because they open the door for new research that can move the field forward, fill in missing pieces of understanding, and help solve unanswered questions [33].

To spot the research gap for our study, we took a deep dive into the existing literature. By carefully reviewing current research, we were able to see which areas have been well-covered and which ones still need attention. This helped us shape the direction and focus of our study.

Based on this review, here are the main research gaps we identified:

- No prior app for Bangladeshi people to manage all types of hepatitis.
- No integrated platform covering all types of hepatitis.
- No prior app in Bangla language for hepatitis.

1.4 Research Objectives and Questions

1.4.1 Research Objectives

The primary objectives of this research were:

- To provide a comprehensive resource for understanding all types of hepatitis in a single platform which helps to increase knowledge among Bangladeshi people about the various forms of hepatitis.
- To design a mHealth app specifically for Bangladeshi people to manage hepatitis effectively using UCD methodology.
- To provide guidelines for managing hepatitis during pregnancy.
- To offer a vaccination schedule to promote prevention.
- To include a feature to connect users directly with doctors for consultations.

- Offering “Medication Reminders” to ensure adherence to treatment plans.
- Providing a “Chatbox”, users can connect with expert consultants including doctors and experienced patients
- “Symptoms Tracker” allows the users to log and monitor their symptoms over time.

1.4.2 Research Questions

A research question (RQ) is a focused and specific question that helps guide the direction of a study. It sets the boundaries for what the research will explore and how it will be carried out [34].

To address the research gap we discovered, we came up with the following research questions:

- **RQ1:** What types of mHealth apps have been developed and tested to support hepatitis awareness, prevention, and management?
- **RQ2:** What specific hepatitis-related issues including transmission, vaccination, and treatment do these mHealth apps aim to address?
- **RQ3:** What features like vaccination reminders, symptom trackers, and appointment booking are most commonly found in hepatitis-related mHealth apps?

1.5 Research Outcome

In order to prevent hepatitis and make people educated and aware of this, we began by reviewing research papers and conducting needfinding survey to gather user’s requirements. A low-fidelity prototype was initially sketched by hand. After creating a low-fidelity prototype, then we developed a high-fidelity version using the Figma tool.

The main purpose behind the creation of the ‘HepCare’ app is to fill a vital gap in public health by providing easy access to information about all types of hepatitis in one place for Bangladeshi people. By offering the app in Bangla, we are ensuring that more people especially in Bangladesh can learn about hepatitis. With a focus on making the app user-friendly and continually improving its features, ‘HepCare’ is designed to educate and empower users, helping them make better decisions about their health. This paper outlines the plan to build a robust prototype that could make a real difference in raising awareness and helping to prevent the spread of hepatitis.

1.6 Report Outline

Chapter 1 (Introduction):

The introduction part provides an overview of hepatitis in Bangladesh and highlights why it is so important to raise awareness and improve how people manage this condition. Hepatitis continues to affect many lives, often due to a lack of knowledge, late diagnosis, and limited access to proper care. This section introduces the idea of using a mHealth app to help individuals better understand and manage hepatitis, with a special focus on making the experience simple, user-friendly, and culturally relevant. It also explains how the principles of HCI and UCD are being used to ensure the app truly meets the needs of the people it is meant to serve. The motivation behind this research comes from a clear

gap: there simply are not enough tools out there designed specifically for the Bangladeshi population to deal with hepatitis in a practical, everyday way. Based on what we learned during our literature review, we have developed research questions to guide the direction of this project.

Chapter 2 (Literature Review):

This section contains the systematic literature review work done using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method. From an initial set of 93 articles, 12 were selected following the inclusion criteria. Eight research questions (RQs) were utilized to guide the analysis of the selected studies.

Chapter 3 (Interactive Prototype Development):

The methodology part of the paper consists of what is UCD method and how the UCD method is used in this process. The process of making the prototype is also described in this part such as gathering requirements through literature review, and needfinding survey analysis. Then how the low-fidelity prototype and high-fidelity prototypes were developed.

Chapter 4 (Prototype and Its Features):

This section contains the development journey of the high-fidelity prototype of ‘HepCare’ following HCI principles and UCD. This chapter also shows screenshots of the high-fidelity prototype alongside the app flow.

Chapter 5 (Discussion):

This part gives an overview of the entire research and design process of the ‘HepCare’ app, from literature review to survey findings. It explains the app’s purpose and key features. Though still in development, the app aims to prevent hepatitis and awareness in Bangladesh. It also highlights the main limitations of the ‘HepCare’ app, including language and device accessibility, and literacy issues. It also points out cultural and lifestyle differences that affect user experience.

Chapter 6 (Conclusion):

This part gives a summary of all the chapters that are present in the above with a description and process of the app’s development.

- **Appendix A:** This section provides a comprehensive list of all abbreviations used throughout the research.
- **Appendix B:** This part contains a list of published papers that have resulted from this work.

2 Literature Review

While there are mobile app-based interventions aimed at hepatitis prevention and awareness, the scientific proof for their efficacy is still limited and fragmented. Hence, we conducted a systematic literature review on mHealth apps for hepatitis prevention and awareness, as there are still notable gaps in the existing systematic studies on this topic. In this study, we use the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method of systematic review to focus on the most recent developments in mHealth apps for hepatitis prevention and awareness [35]. We started with 93 articles from our initial search of relevant studies using the PRISMA method. After that, we chose 12 articles for our research. We developed three RQs for research findings. We discuss in more detail about our responses to these RQs in a later section.

2.1 Materials and methods

The objective is to analyze and identify the research on mHealth-based interventions for hepatitis prevention and awareness in Bangladesh. Thus, we began searching the databases PubMed, Scopus, IEEE Xplore Digital Library, and ACM Digital Library for relevant studies. These were chosen because they cover a wide range of information technology and healthcare topics and have been used consistently in systematic literature reviews on related subjects [36]. By carefully selecting credible academic sources, the study's goals were met and a comprehensive review of previous research was made easier. Based on abstracts and titles, we constrained our search to English-language publications. For this systematic review, we followed the PRISMA [35] methodology, as illustrated in Fig. 1

2.1.1 Search strategies

A search string was generated with appropriate keywords to make a query in the databases. The keywords used to make the search string were: “mHealth”, “Hepatitis”, “Prevention techniques”, “Transmission” and the search string used was:

(“mHealth” OR “mobile health” OR “mobile applications” OR “smartphone”) AND (“Hepatitis” OR “Hepatitis A” OR “Hepatitis B” OR “Hepatitis C” OR “Hepatitis D” OR “Hepatitis E”) AND (“prevention” OR “preventive strategies” OR “prevention techniques”) AND (“transmission” OR “disease transmission” OR “infection control”)

2.1.2 Inclusion criteria

In order to continue with the research, the filtration process begins by taking into consideration the particular criteria that are crucial to our study and are chosen based on inclusion criteria. The following are the requirements for inclusion:

- The study had to be original research or an experiment, written in English.

- Deals with mHealth-related apps.
- Deals with the prevention of hepatitis-related apps and research papers.
- Mobile apps based.

2.1.3 Exclusion criteria

The criteria used for exclusion remove the criteria that are not taken into consideration for the study. The following are the exclusions:

- Short papers.
- Papers published before 2016.
- Not written in English.

2.2 Data extraction

Topical association

- **Title Based:** The first screening was based on titles, we checked if the titles included hepatitis prevention and a mobile app.
- **Keyword Based:** The authors' keywords were used to search papers.

Publication profile

- **First Author Location:** To determine which nations are interested in and working on hepatitis prevention efforts.
- **Publication Type:** To keep track of the number of conferences and journals that are published on this topic.
- **Publication Year:** To determine the publishing year trend, the year is tracked.

Research objectives

- **Hepatitis Risk Factors:** The assessment of individual hepatitis risk factors by the mHealth platforms or applications is examined in this section. It covers the kinds of screening instruments, questionnaires, and symptom checkers that are used for initial risk assessment.
- **Addressing Hepatitis Prevention:** This category describes the particular hepatitis prevention techniques that the mHealth intervention concentrated on, such as transmission education, and vaccination reminders.
- **Improving Public Health Awareness:** The features of the mHealth tools intended to improve users' understanding of hepatitis prevention, and transmission modes, are described in detail in this section.
- **Findings:** This information will be utilized for assessing how well mHealth apps promote awareness and prevent hepatitis.

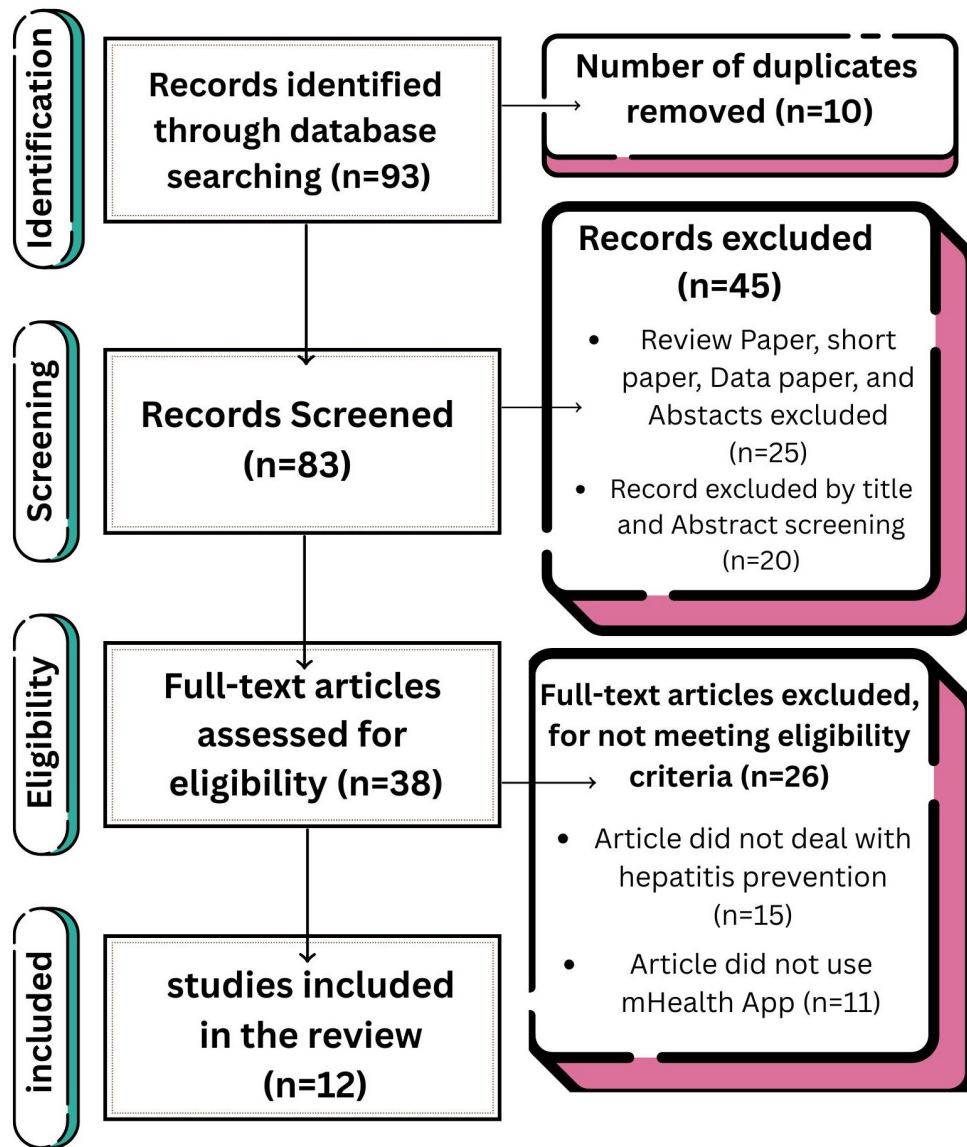


Figure 1: PRISMA flowchart for the literature search process

mHealth/Mobile apps in hepatitis-related research

- **Features Available:** The features that effectively raise awareness and prevent hepatitis will be analyzed in this section.
- **Platform:** This category indicates whether the article is only working with a website or if there is a mobile app available, as well as whether it is made for iOS or Android.

2.3 Literature Search Outcomes and Characteristics of Included Studies

An illustration of a thorough search flow and process diagram is shown in Fig. 1. From PubMed, Scopus, IEEE Xplore Digital Library, and ACM Digital Library, a total of 93 articles were found. Removing duplicates brought the number down by 10. 25 review papers, short papers, data papers, and abstracts were excluded as short papers and abstracts do not provide comprehensive analysis and contain enough information for a systematic

review. Following the preliminary screening procedure for the remaining articles, 20 articles were excluded following the screening of titles and abstracts, and 15 articles were selected for full-text screening. The eligibility of the remaining articles was manually assessed during full-text screening. 11 articles were excluded after full-text screening as they did not align with our inclusion criteria, which we discussed in a section ahead. 12 articles were finally selected for this systematic literature review.

The number of articles published between the years 2016 and 2024 is illustrated in Fig. 2. Although the search did not impose any explicit time restrictions, most of the relevant publications were from recent years, indicating that research on this particular topic is still relatively new and limited. A few older articles were retrieved during the search, including one from 2016, but they were not included in the final list as they did not meet the selection criteria.

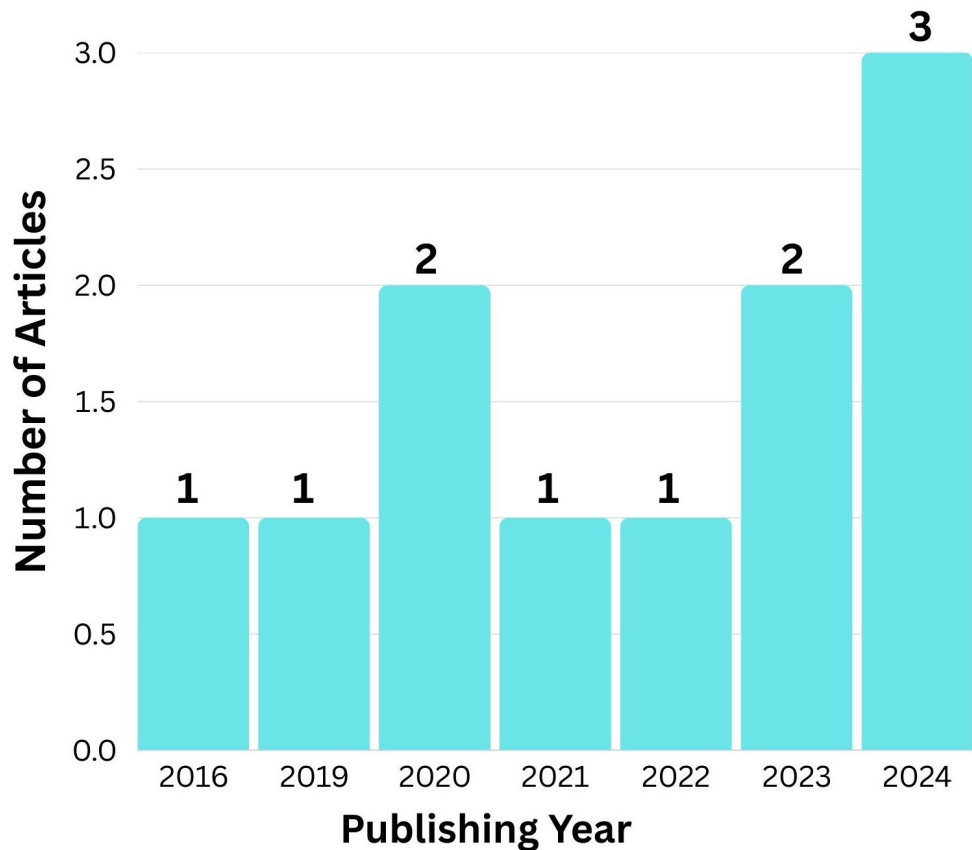


Figure 2: Year-wise published number of articles out of the 18 selected articles for review

From the data, it can be observed that the highest number of relevant publications ($n = 3$) were found in the year 2024. The next highest number of articles ($n = 2$) were published in the years 2020 and 2023. The years 2016, 2019, 2021, and 2022 each had one relevant article included. No relevant articles were found in the years 2017, and 2018. This trend reflects that while interest in the topic is growing, especially in the last couple of years, the overall research output remains modest.

In terms of geographical distribution, the selected studies originate from a limited range of countries. The United States contributed the most with a total of five articles. This includes one study involving an app developed by Perx Health, a company that operates in both the United States and Australia though no individual authors were specified in this case either. Bangladesh followed closely with four articles, while China had two articles. Additionally, one app-based study was developed by a team from Pakistan,

though specific individual authors were not mentioned. Additionally, we have created a map using the same data to better visualize how research on this topic is scattered across the globe as shown in Fig. 3.

Overall, the studies mostly originate from North America and South Asia. The United States and Bangladesh, in particular, appear to be leading research efforts on this topic. In contrast, there was little to no representation from Europe, Africa, or South America, suggesting a gap in global research coverage that may be worth exploring in future studies.

Table 2.1: Institution location (country) of the articles’ first authors

No. of Articles	First Author’s Country
4	United States
4	Bangladesh
2	China
1	United States and Australia



Figure 3: Map representing institution location (country) of the articles’ first authors based on the count of articles from each country.

2.4 Addressing RQs

2.4.1 RQ1: What types of mHealth apps have been developed and tested to support hepatitis awareness, prevention, and management?

Our review included a number of mHealth apps, each has unique features. The apps found are listed in Table 2.2. A total of 5 apps were found in our review. All the apps were based on the Android version and an iOS version of apps such as the ‘KnowHBV’ treatment decision tool was developed for chronic hepatitis B. It provides advice on management techniques and treatment alternatives to assist in well-informed decision-making [37]. The ‘Hepatitis Connect’ app, which links users to healthcare services and provides educational materials, emphasizes community involvement and offers useful digital resources to increase access to services related to hepatitis [38]. The ‘Perx Health app helps people receiving treatment for hepatitis C by offering community engagement tools, health task

notifications, daily medication reminders, and educational content [39]. The purpose of the ‘HepTalk’ app is to enable two-way communication between patients and medical professionals [24]. The ‘Learn about Hepatitis and Live Well’ app gives users information about the liver, liver transplants, and liver-healthy diet [40].

Table 2.2: The table shows the list of apps and their features found during the systematic review.

Name of the App	Citation	Features Available
KnowHVB app	[37]	Interactive tools to evaluate patient eligibility for treatment, guidance based on current clinical guidelines, and educational resources to enhance understanding of hepatitis B management.
Hepatitis Connect app	[38]	Community engagement, digital integration, support systems, helpline services, educational campaigns.
Perx Health app	[39]	Medication reminders, appointment alerts, gamification, community support, incentives, offline functionality.
HepTalk app	[24]	Two-way text messaging, appointment assistance, health education and guidance, financial navigation, follow-up reminders, culturally competent support, data tracking, and case notes.
Learn about Hepatitis and Live Well	[40]	Information on liver transplants, guidance on hepatitis during pregnancy, details about liver function tests, dietary recommendations for liver health, and vaccination procedures.

2.4.2 RQ2: What specific hepatitis-related issues including transmission, vaccination, and treatment do these mHealth apps aim to address?

A review of recent literature reveals several significant health-related challenges associated with hepatitis. The health-related issues are listed in Table 2.3. In China, even with major public health efforts, Hepatitis B (HBV) continues to affect a large number of people. Many are living with chronic infections, which can lead to life-threatening liver conditions like cirrhosis and liver cancer. Although vaccination programs for newborns have made a big impact, there are still gaps especially when it comes to vaccinating adults and people in high-risk groups. Access to treatment is another hurdle. The cost of care and the limited healthcare facilities in some areas make it difficult for many patients to get the support they need [41]. Another major concern is the risk of Hepatitis B being passed from mothers to their babies. Even with preventive steps in place, the risk remains high, especially when the mother has a high viral load. In many cases, the crucial steps like giving newborns Hepatitis B Immunoglobulin (HBIG) and the first dose of the vaccine right after birth are not always carried out on time [42]. The situation is just as worrying for pregnant women with Hepatitis C (HCV). These women are more likely to experience complications like high blood pressure during pregnancy, preeclampsia, problems with the placenta, and heavy bleeding after giving birth. Their babies also face increased risks, including being born early, having a low birth weight, and needing intensive care after delivery [43].

2.4.3 RQ3: What features like vaccination reminders, symptom trackers, and appointment booking are most commonly found in hepatitis-related mHealth apps?

We found some apps that showed RQ1 but most of the apps have unique features for specific types of hepatitis. Also, we reviewed some research papers where the authors mentioned some features. So reviewing the paper, we extracted several relevant features

Table 2.3: This table presents a summary of the various health issues, discussed and analyzed by the authors in other publications.

Health Issues Addressed	Citation
Chronic infections	[41]
Hepatitis transmission from mothers to their babies	[42]
Newborns hepatitis B immunoglobulin (HBIG)	[42]
High blood pressure during pregnancy	[43]
Heavy bleeding after giving birth (for mother)	[43]
Having a low birth weight	[43]
Needing intensive care after delivery	[43]

including Alam et al. reporting that digital tools have been effective in promoting vaccination programs in rural areas of Bangladesh [44]. In the specific context of contagious diseases like Hepatitis, Jahan et al. emphasized the importance of symptom monitoring tools in enhancing early diagnosis [45]. Rahman et al. found that tailored health communication through digital health interventions significantly improved health outcomes for rural populations in Bangladesh [46]. Wong et al. highlighted the importance of personalized feedback in health interventions to increase user awareness and drive behavior change [47].

3 Interactive Prototype Development

3.1 UCD Approach

The ‘HepCare’ app was developed using the UCD approach after a number of studies were carefully reviewed. We found some features through the literature review. This review concentrated on existing research, especially that which focuses on the prevention of infectious diseases such as hepatitis. The design process included conducting a design needfinding analysis and developing a low and high-fidelity prototype of the ‘HepCare’ app. We performed surveys as part of the needfindings to properly understand user requirements and problems. The next stage involves creating a low-fidelity prototype, which involves sketching the basic design concepts for the initial phase. Following that, Figma is used to transform it into high-fidelity interactive prototypes. We have added a demonstration flowchart of the methodology in Fig. 4

3.2 Needfinding Study

After reviewing the relevant literature and emphasizing key elements from our previous work, we focused on eliciting design requirements. We conducted brainstorming sessions to further expand the feature set to improve comprehensive information in a single app for Bangladeshis. We surveyed hepatitis patients to make sure the app takes into account their real preferences. By conducting this survey, we were able to determine which features the target users would consider most valuable in a mHealth app. The various methods used to gather and shortlist feature ideas are summarized in Table 3.1

Table 3.1: Feature ideas gathered from literature review, brainstorming, and survey and the features in ‘HepCare’ app.

Features	Literature Review	Brainstormed	Survey	HepCare
About the Types of Hepatitis		✓		✓
Prevention Guidelines From Online Resources	✓			✓
People at Risk		✓		✓
Chatbox	✓	✓	✓	✓
Guidelines for Living With Hepatitis			✓	✓
Symptoms Tracker	✓	✓		✓
Medication Reminder	✓	✓	✓	✓
Doctor’s Appointment Reminder	✓	✓		✓
Pregnancy and Hepatitis		✓	✓	✓
Advertisement and Alert		✓		✓

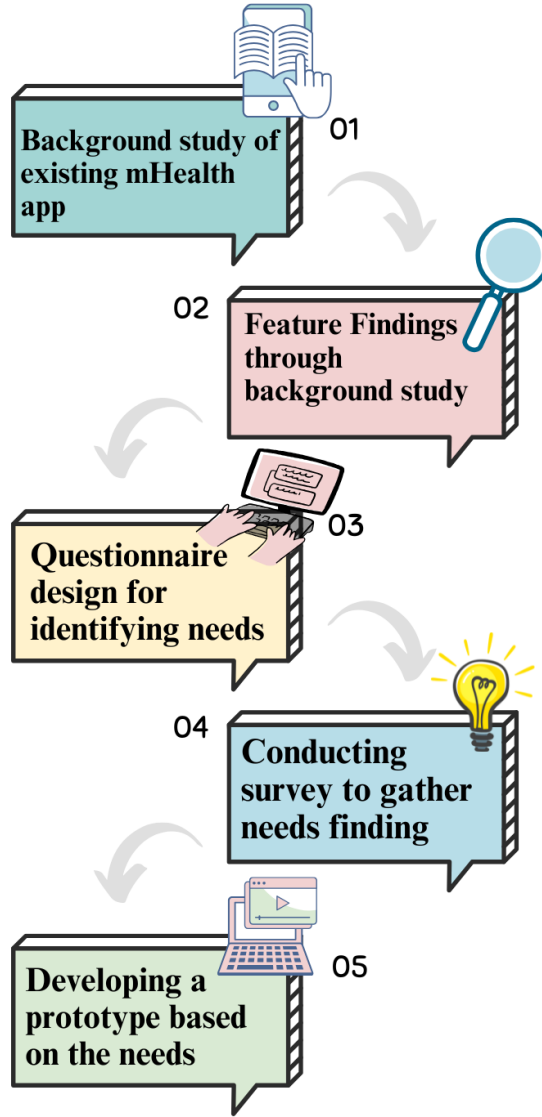


Figure 4: Components and Workflow of the UCD method.

3.2.1 Survey Design

This study was approved by our home institutional review board. This survey was arranged by Independent University, Bangladesh in collaboration with the Hepatology Department of Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh. At the beginning of the survey, started with a description to assist participants in understanding the purpose of the study. Firstly, the participants were asked to provide demographic data including age. They also provided information about which types of hepatitis they are affected and whether they have any family history of hepatitis. After that, participants were asked to provide certain details about their vaccination, disease transmission media, previous familiarity with mHealth applications, or any online resources. Then the next step contained questions about features like “People at Risk”, “Symptoms Tracker”, “Medication Reminder”, “Doctor’s Appointment Reminder”, “Chatbox” with experienced patients and doctors, “Prevention Guidelines Online Resources”, “Pregnancy and Hepatitis”. The survey was intended to be quick, requiring participants to devote little time to it. Furthermore, no personal data was gathered from participants, including names, phone numbers, or email addresses.

3.2.2 Participants

The survey was conducted physically and online by Google Forms. The survey received responses from 57 participants, 34 of whom were male and 23 of whom were female. The mean age of the participants was 40.5 years, with a standard deviation of 17.03. The age distribution included one response from individuals aged 11 to 15 years, 9 responses from those aged 21 to 25 years, 9 responses from individuals aged 26 to 30 years, 4 responses from those aged 31 to 35 years, 4 responses from individuals aged 36 to 40 years, 7 responded from those aged 41 to 45 years, 3 responded from individuals aged 46 to 50 years, 3 responded from those aged 51 to 55 years, 8 responded from those aged 56 to 60 years, 6 responded from individuals aged 61 to 65 years, and 3 responded from those aged 66 to 70 years.

3.2.3 Measures and Data Analysis

A variety of methods was utilized to collect survey responses, including multiple-choice questions, five-point Likert scales (ranging from “Strongly Disagree” to “Strongly Agree”), “yes”/“no” questions, and checkboxes. Data collection was facilitated through Google Forms, with the responses systematically stored in Google Sheets. Descriptive analysis was conducted by calculating means, standard deviations, and percentages. The results were visualized using pie charts and bar graphs generated in Google Sheets to present the data clearly and effectively. A total of 57 participants completed the survey, providing valuable feedback that contributed significantly to the study.

3.2.4 Findings

In the survey for developing the prototypical ‘HepCare’ app, information was collected using checkboxes, and a five-point Likert scale, ranging from “Strongly Disagree” (1) to “Strongly Agree” (5). According to the survey, we found that 73.2% of people have hepatitis B, 12.5% have hepatitis C, 10.7% have hepatitis A, and 1.8% have hepatitis D and E. The percentage of people affected chart is illustrated in Fig. 5.

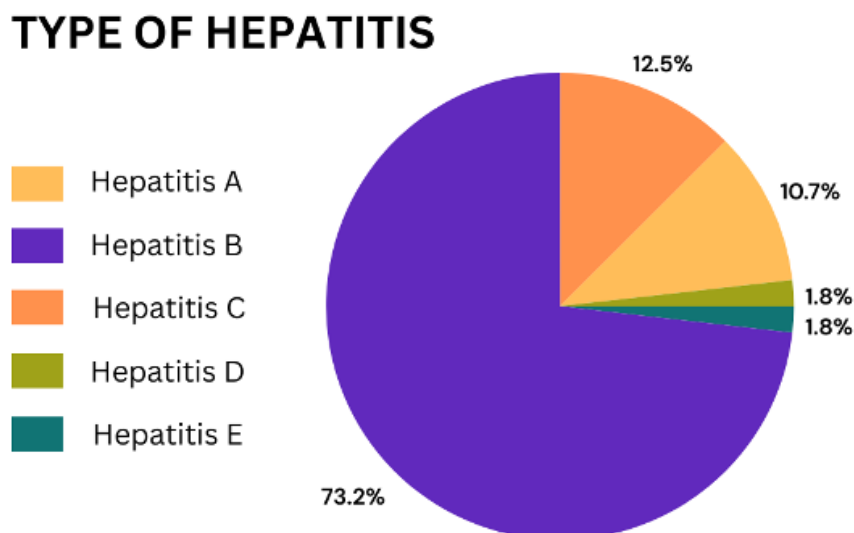


Figure 5: Percentage of people affected by the different types of hepatitis including A, B, C, D, and E.

On the other hand, 40.4% of people have a genetic predisposition to hepatitis. Remarkably, only 21.1% of people are vaccinated, and 63.2% of people are not. The percentage

of vaccinated is illustrated in Fig. 6.

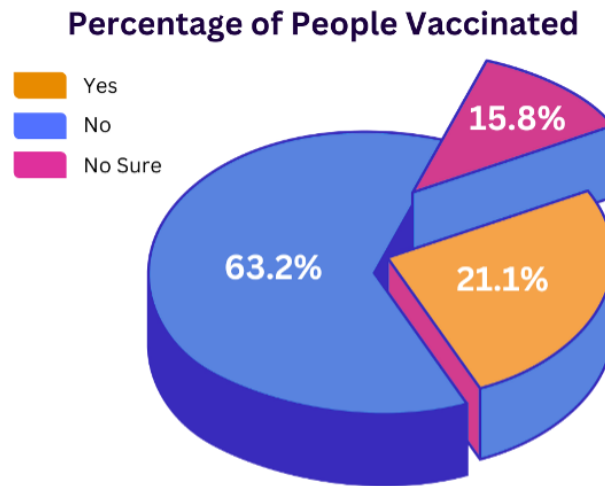


Figure 6: Percentage of vaccinated people

Among the 57 participants, 86% of participants expressed their interest in the “About The Types of Hepatitis”, while 78.9% of participants demanded to know about the “Prevention Guidelines From Online Resources”. The percentage of desired features illustrated in Fig. 7,

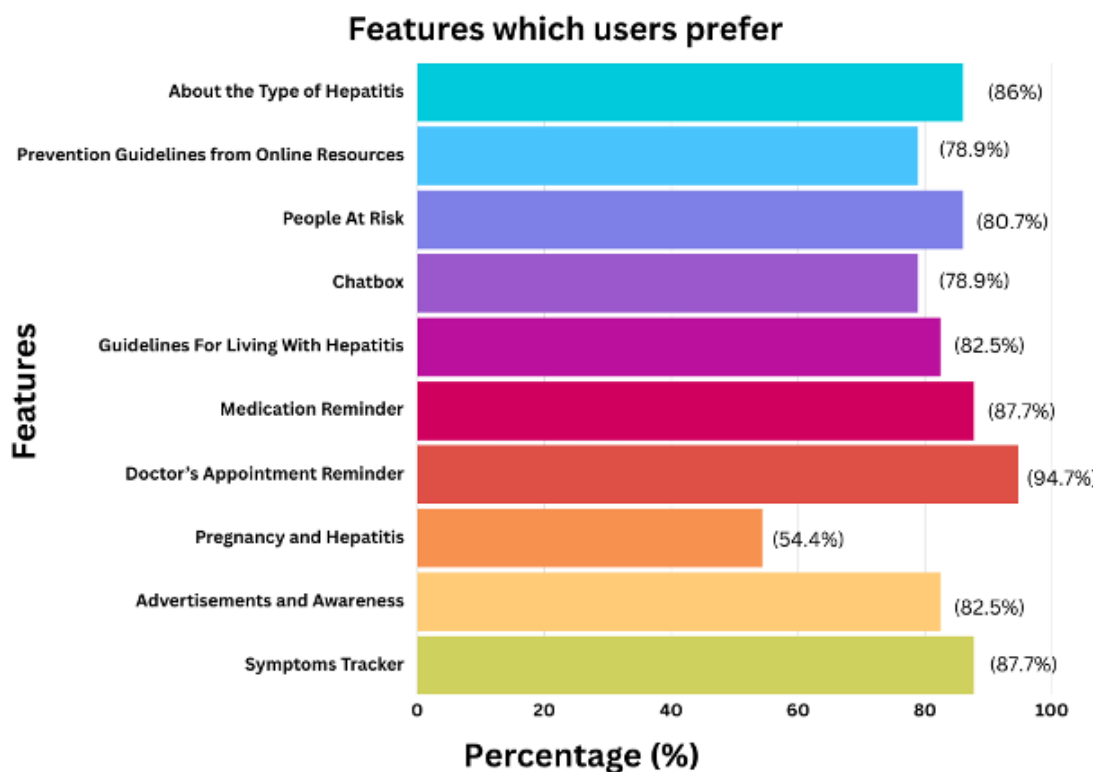


Figure 7: Percentage of desired features

We found that about 78.9% of participants were given positive feedback on “Prevention Guidelines From Online Resource”. Conversely, 80.7% highly appreciated using the “People at Risk”, while 78.9% expressed interest in a “Chatbox” feature to communicate with expert consultants for advice and support. 82.5% of participants expressed a desire for new features including “Guidelines for Living With Hepatitis” for practical advice for those individuals who are already affected by hepatitis. The demands for a “Medication

Reminder” and “Symptoms Tracker” feature were emphasized by 87.7% of participants. 94.7% of participants are highly interested in using the “Doctor’s Appointment” feature. On the other hand, 54.4% indicated a preference for guidelines on managing “Hepatitis and Pregnancy”. Additionally, 82.5% of the participants expressed their interest in the “Advertisements and Awareness”. This reflects a significant demand for personalized and professional guidance within the application.

On the other hand, 45.6% participants responded with “Strongly Agree” and rated 40.4% as “Agree” for the “Doctor’s Appointment Reminder” feature, a smaller percentage of 8.8% selected “Neutral” showing some participants neither agree nor disagree about the importance of the feature, a minimal number of participants 1.8% chose “Strongly Disagree” illustrated in Fig. 8.

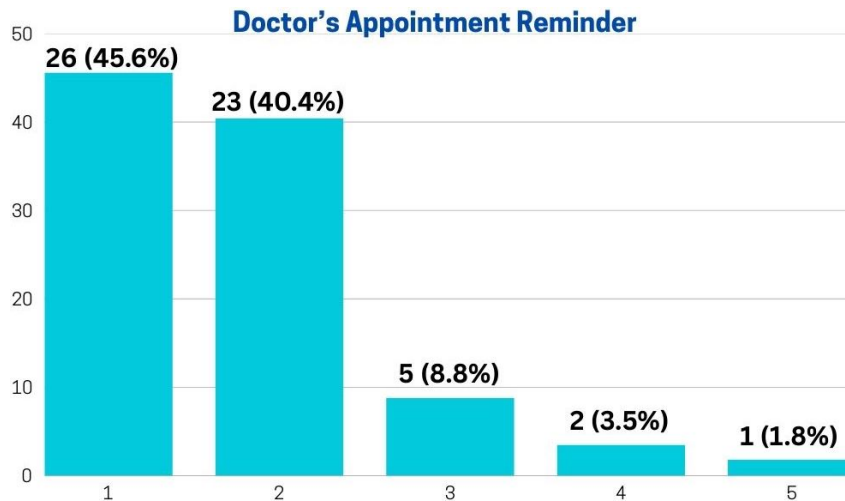


Figure 8: Demands of doctor’s Appointment Reminder

The “Medication Reminder” was well-received, with 40.4% rating as “Strongly Agree” and 31.6% as “Agree”. Fig. 9 illustrates the participant’s ratio on five-point Likert scales of “Medication Reminder”.

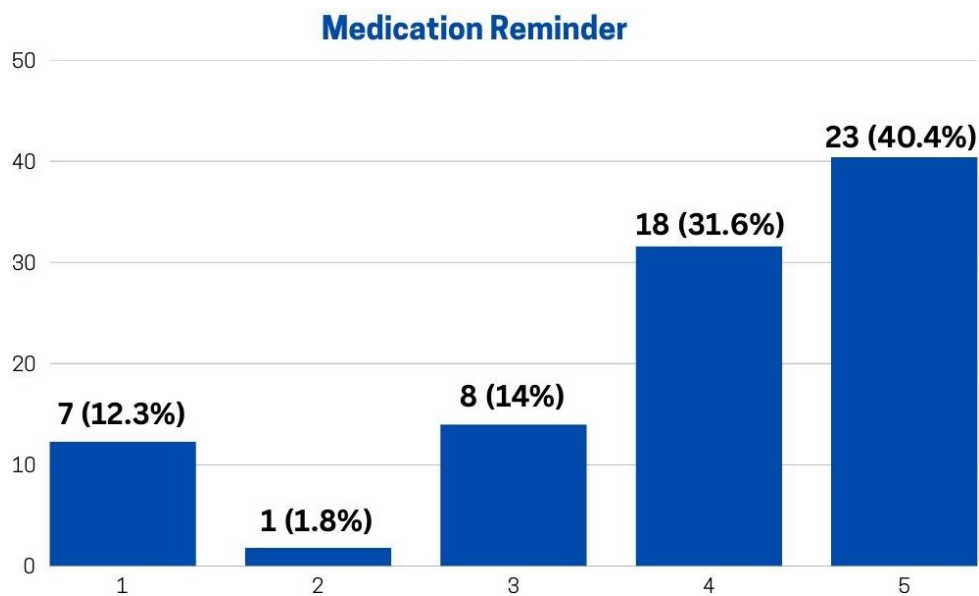


Figure 9: Demands of Medication Reminder

The “Symptoms Tracker” feature obtained positive feedback, with 36.8% rating it as “Strongly Agree” and another 40.4% as “Agree” illustrated in Fig. 10

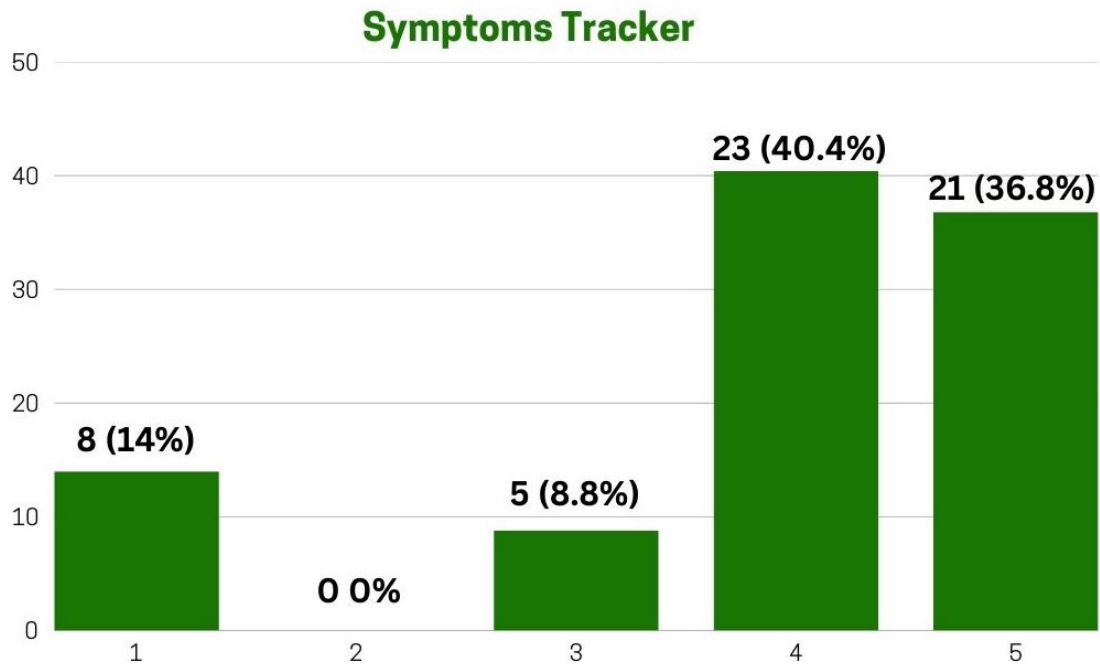


Figure 10: Demands of symptoms tracker

Overall, the percentage of people interested in using the ‘HepCare’ app is illustrated in Fig. 11.

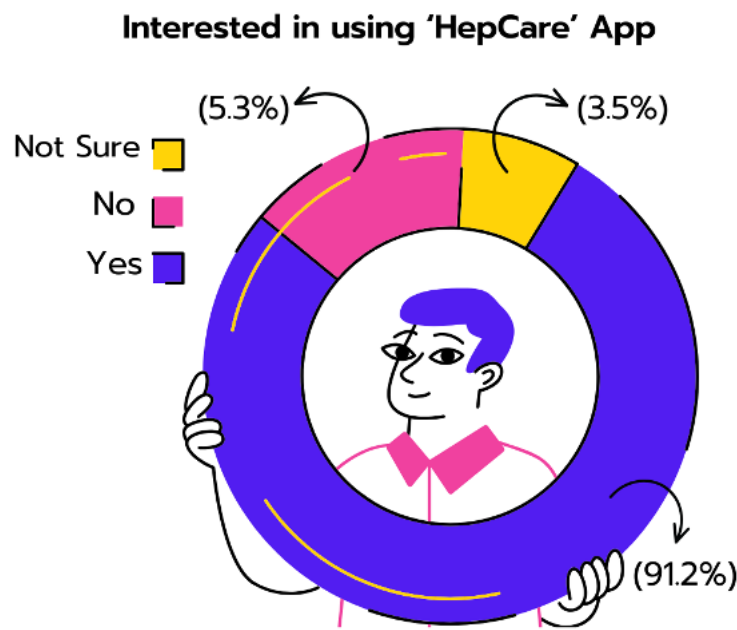


Figure 11: Percentage of interested people

3.3 Low Fidelity Prototype

In the early stages of design, a low-fidelity prototype is crucial for effectively visualizing concepts and obtaining feedback. These prototypes occur in a variety of formats, including interactive prototypes, storyboards, wireframes, sketches, and paper prototypes [48]. It is quick and simple to create and modify sketches, which are hand-drawn representations of the user interface. Additional components created from paper cutouts that users can

modify and interact with are included in paper prototypes. Sketches, or simple designs, can be made digitally or by hand and concentrate more on component placement and navigation than advanced designs [49]. In contrast to storyboards, which use a sequence of drawings or pictures to show how users will interact with an interface, clickable prototypes are made with programs like Figma that allow users to explore the interface to mimic navigation.

As shown in Table 3.1, the features for the ‘HepCare’ app were finalized using information gathered from the results of a need-finding survey. Key features and user flow were given priority in the early sketches. Several sketches were made with a pen and paper to create handmade prototypes. Then a low-fidelity prototype was created. Importantly, as far as we are aware, no mHealth app in Bangla or English is currently available that provides comprehensive resources for understanding all types of hepatitis in a single platform like the ‘HepCare’ app. According to our objective, the design was purposefully kept simple, taking into consideration the target audience. After several sketching iterations, the prototype progressively took shape and provided a distinct visual depiction of the intended application.

3.4 High Fidelity Prototype

The transition from a low-fidelity to a high-fidelity prototype represents a significant step forward in the app’s development for hepatitis prevention and awareness in Bangladesh. The development of the ‘HepCare’ app prototype was guided by the insightful information about hepatitis prevention and awareness that was obtained from the analysis of survey responses. The prototype’s design placed a strong emphasis on user needs, making sure that user interfaces were made simpler to improve accessibility for users. Using the Figma design tool, to make the high-fidelity prototype easy to use for the target audience who might not be used to using such apps, it was developed entirely in Bangla. Sample transformations from the low-fidelity to the high-fidelity prototypes are given in Fig. 12. Users can now click on the high-fidelity prototype to experience the app design in a more interactive and improved way. As a result, a live demonstration is possible, and users can provide immediate feedback.

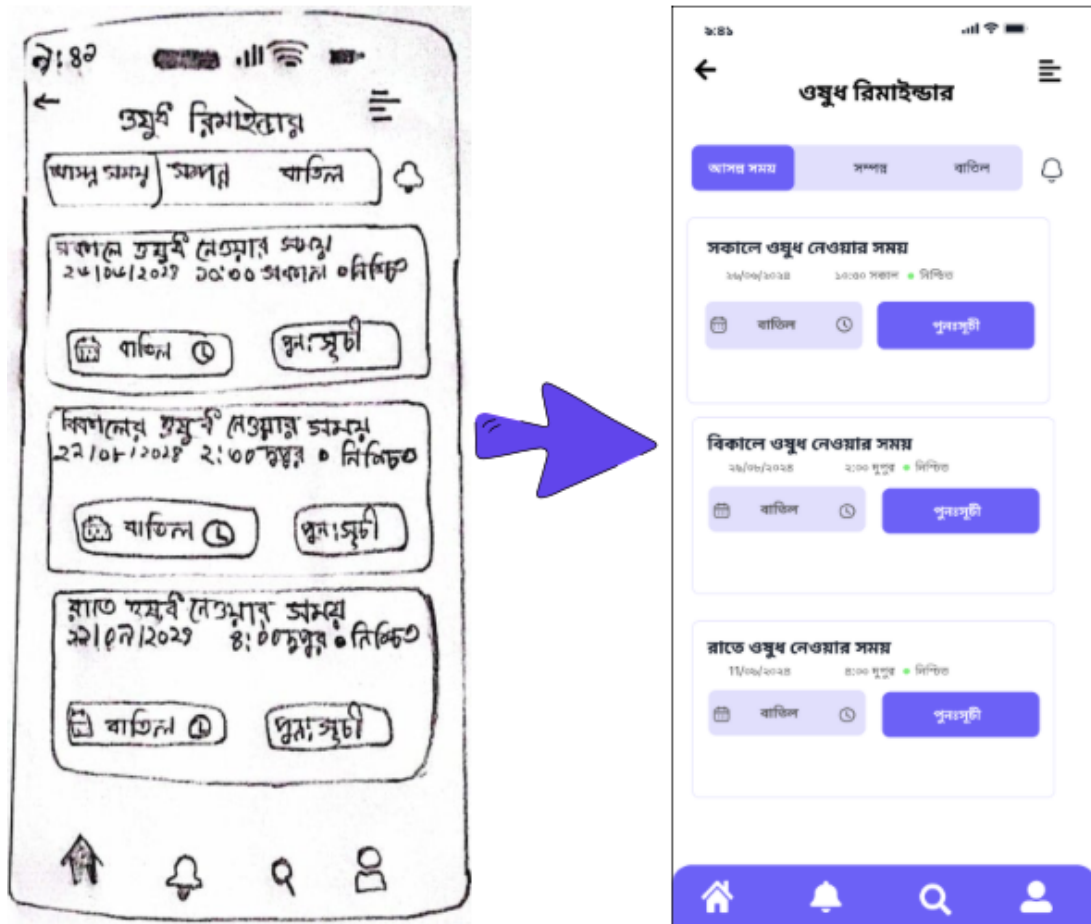


Figure 12: Transformation from hand-sketched low-fidelity prototype to polished high-fidelity prototype using Figma

4 Prototype and Its Features

4.1 Prototype

A prototype is an early model of a product that is used to test ideas, improve communication, and make better decisions before final production. It helps teams learn, solve problems, and refine designs efficiently.[50]. In software and app development, prototypes can vary from simple low-fidelity versions (like rough sketches or wireframes focusing on layout and functionality) to polished high-fidelity versions (realistic, interactive mockups that closely resemble the final product).

4.2 Warning Page

As illustrated in Fig. 13, After opening the ‘HepCare app’, users will first see the app’s logo and name displayed prominently in the center of the screen. Just below this, a clear disclaimer appears: “All health information in this app comes exclusively from trusted sources like the World Health Organization (WHO) and the Centers for Disease Control (CDC). Please remember: this app provides prevention guidelines only and should never replace professional medical advice. For any health concerns, always consult with your doctor or healthcare provider”. A warning disclaimer in a healthcare app is important because it lets users know that the information provided is for general guidance only and not a substitute for professional medical advice, diagnosis, or treatment. It reminds users to always consult a qualified doctor before making any health-related decisions. This helps protect users from misunderstandings and also protects the app developers from legal issues if someone misuses the app or faces a health problem after relying on it. In short, it keeps things clear, safe, and responsible for both sides.[51].

4.3 Sign Up

As shown in Fig. 14, the sign-up page of the ‘HepCare’ app offers a smooth and user-friendly experience for new users. It asks for basic details such as full name, email, and secure password, with easy-to-understand input fields. To keep things safe, users need to re-enter their password before completing registration. The page follows the app’s clean and consistent design to make everything feel familiar and simple. Once the information is filled out, users can tap the clear “*Sign Up*” button to create their account. There’s also a helpful note at the bottom saying, “Already have an account? Login in,” which takes users to the login page if someone already has an account or ends up in the registration section. Overall, the sign-up process and design are secure, accessible, and thoughtfully made for both hepatitis-affected and non-affected users.



Figure 13: Warning page

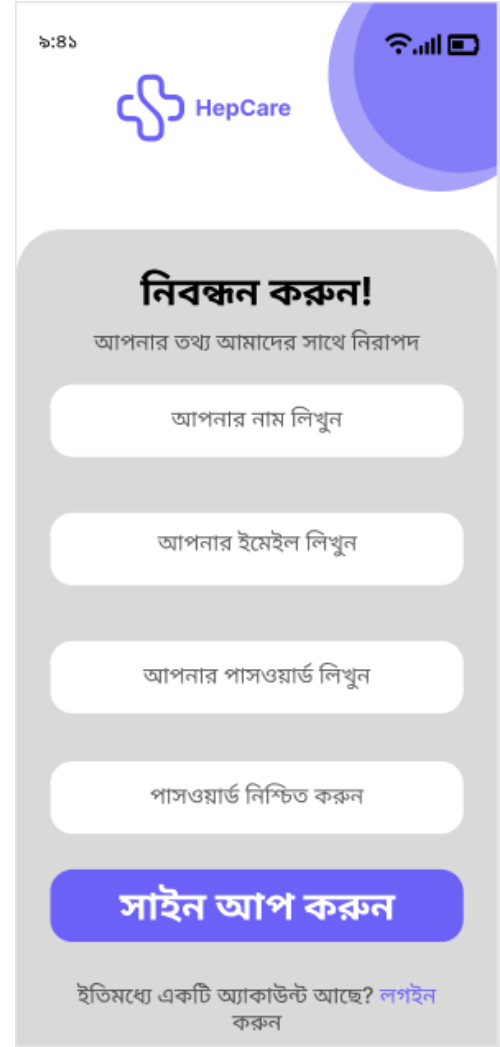


Figure 14: Sign Up

4.4 Log In

As shown in Fig. 15, the login page provides a secure and user-friendly interface for accessing the ‘HepCare’ app. Users will be prompted to enter their registered email address and password in clearly defined input fields. The page features a clean, intuitive design consistent with the app’s overall user experience. A prominent “*Sign In*” button allows users to access their personalized account after entering their credentials. For users who have forgotten their password, a “*Forgot Password*” option is strategically placed, enabling them to easily reset their access through a secure verification process. New users who have not yet created an account can utilize the “*No account? Do Sign Up*” button, which will redirect them to a registration page where they can create a new profile. The multilingual support extends to this page, allowing users to switch between English and Bengali with a single tap, ensuring accessibility for a diverse user base. The login page also incorporates robust security measures to protect user data and ensure a safe, confidential experience for both hepatitis-affected and non-affected users using the ‘HepCare’ app.

4.5 Home Page

As illustrated in Fig. 16, when users first arrive on the homepage of the ‘HepCare’ app, they’re welcomed with a simple and easy-to-follow layout that gently guides them through everything the app has to offer. From the start, they can explore a range of features designed to help them better understand hepatitis and manage it in their daily lives. These include sections like “About the Type of Hepatitis”, “Prevention Guidelines from Online Resources”, “People at Risk”, “Chatbox”, “Guidelines for Living with Hepatitis”, “Medication Reminder”, “Pregnancy and Hepatitis”, “Symptoms Tracker”, and “Advertisement and Awareness”. Each section is marked and easy to access. The homepage is designed to feel approachable, so whether someone is looking for medical info, trying to track their health, or just wants to learn more, they can find what they’re looking for without getting confused. It is meant to guide users smoothly, without any confusion, and offer a little bit of support no matter where they are in their journey.



Figure 15: Log In



Figure 16: Home Page

4.6 About the Type of Hepatitis

As shown in Fig. 17, the “About the Type of Hepatitis” section of the ‘HepCare’ app is designed to help users gain a clear and complete understanding of the different types

of hepatitis, specifically Hepatitis A, B, C, D, and E. This feature breaks down each type in an organized and easy-to-follow way, covering important aspects such as what causes each type, how it spreads, common symptoms to watch out for, available treatment options, and effective ways to prevent infection. It also highlights which age groups or individuals are more at risk, so that users can be more aware of their personal risk factors. Whether someone is newly diagnosed, worried about possible exposure, or simply trying to understand the disease better, this section offers straightforward and reliable information in one place. By presenting each type of hepatitis side by side, the app helps users compare and learn how each one differs—making medical knowledge more approachable and less intimidating. The goal is to empower users with the facts they need to take better care of themselves and others, without the confusion that often comes with medical information.

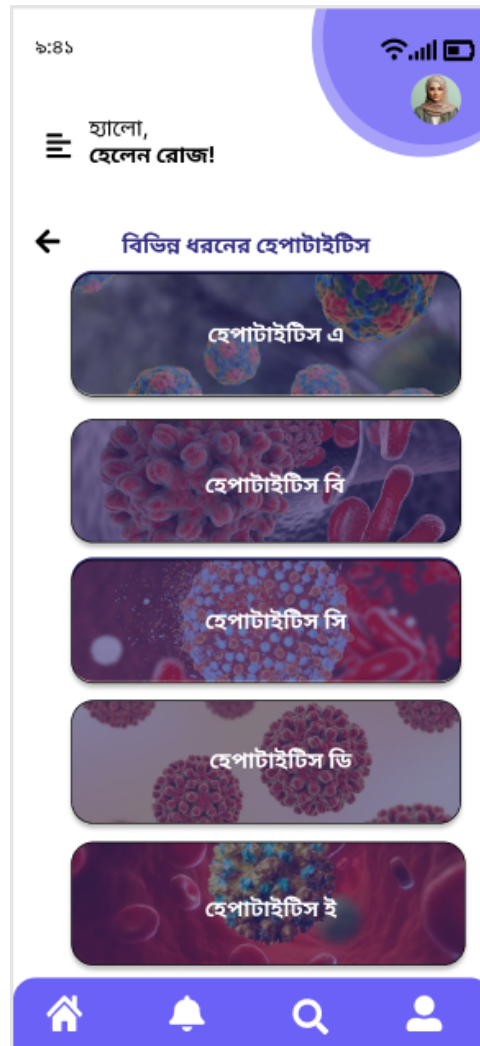


Figure 17: About the Type of Hepatitis Page

4.7 Prevention Guidelines From Online Resources

This feature is thoughtfully divided into two main sections to help users take preventive steps against hepatitis and stay up to date with their vaccination needs. The first part focuses on preventive guidelines, offering users a variety of helpful resources aimed at

reducing the risk of hepatitis transmission in everyday life. The other part is information on the vaccination schedule. This feature is illustrated in Fig. 18.

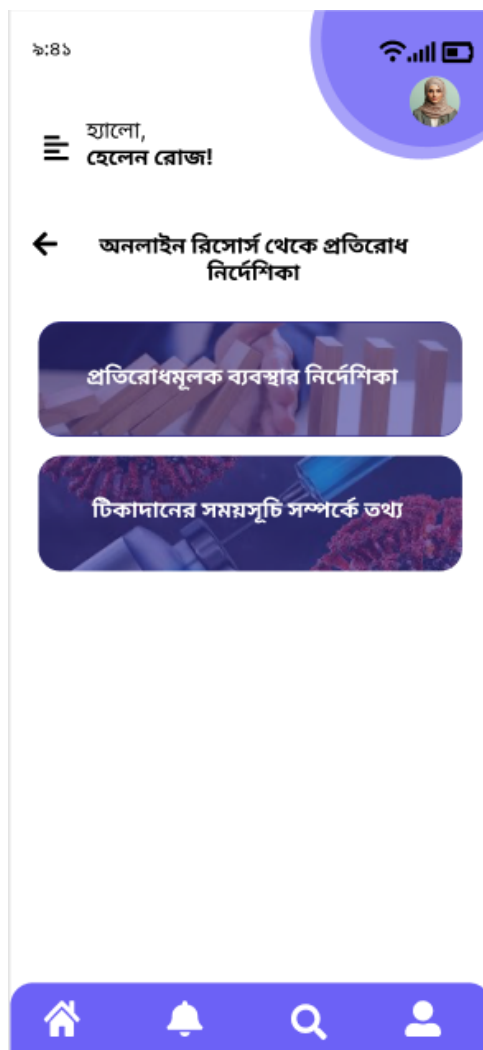


Figure 18: Prevention Guidelines
From Online Resources Page

4.7.1 Guidelines for Preventive Measures

As illustrated in Fig. 19, The first part of preventive guidelines includes sections like “Tips for Proper Practices”, which share everyday hygiene habits and lifestyle adjustments—such as hand-washing, safe food handling, and clean water usage that are especially important in areas where hepatitis A and E are more common. The “Warnings Regarding the Use of Injections” section gives clear advice on avoiding the reuse of needles and emphasizes the importance of safe injection practices, especially in healthcare settings or regions with limited access to sterilized medical tools. Another part called “Long-Term Effects” explains how hepatitis—particularly types B and C—can silently cause liver damage over time if left untreated, which helps users understand why early prevention and ongoing care are so important. Additionally, the section on “Information on Transmission Methods” breaks down the different ways each type of hepatitis spreads—whether through contaminated water, blood, sexual contact, or mother-to-child transmission—so that users can be better informed and cautious in their day-to-day lives.

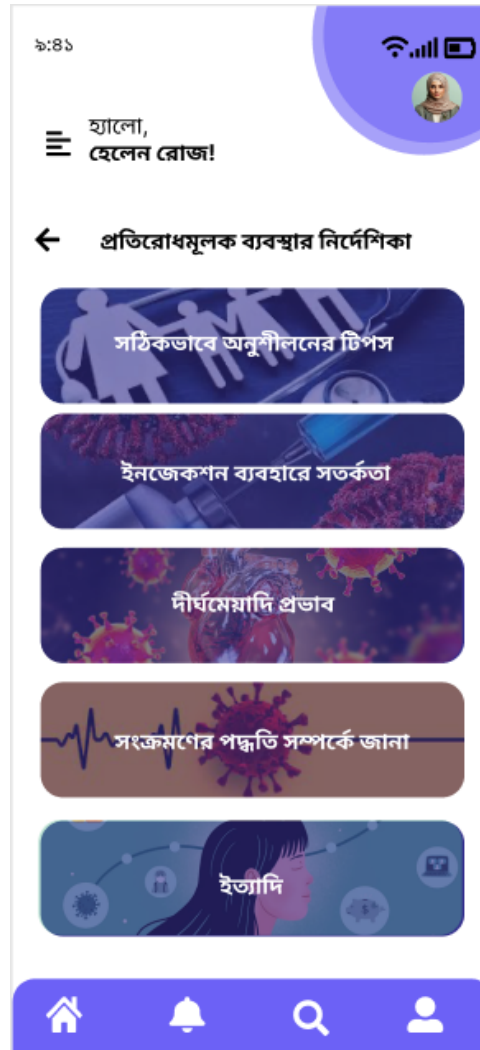


Figure 19: Guidelines for Preventive Measures Page

4.7.2 Vaccination Schedule Information

The second part of this feature covers vaccination time-related information, which is especially useful for users who want to protect themselves or their families against hepatitis. As illustrated in Fig. 20, the app offers a simple and visual vaccination schedule that allows users to check which vaccines they've already received, which ones are still pending, and when their next dose is due. It's easy to track past and upcoming vaccination dates, and users can also manually input new data if they've taken a vaccine outside of the system. To make sure no one misses a dose, the app includes a helpful reminder feature that sends alerts before scheduled vaccinations. This section ensures users stay on top of their health without needing to remember every detail on their own. Together, both parts of this feature work to raise awareness, encourage prevention, and make vaccination tracking as smooth and stress-free as possible for users from all walks of life.

4.8 People at Risk

As illustrated in Fig. 21, the "People at Risk" feature of the 'HepCare' app is designed to help users better understand their risk of contracting hepatitis through a simple, interactive questionnaire. This self-assessment tool presents users with a series of easy-to-answer

questions based on key risk factors such as “Have you experienced any sudden weight gain or loss?”, “Do you track how many calories you eat in a day?”, “Have you noticed a change in your heart rate lately?”, “Have you had symptoms like yellowing of the skin or eyes (jaundice)?”, or “Do you often feel pain in your upper belly?”. All of these questions help build a clearer picture of their health and possible risk factors related to hepatitis [52]. Each question is crafted in plain, non-judgmental language to make the experience feel more like a helpful conversation than a clinical survey.

Once the user completes the quiz, the app provides a personalized result that shows their potential level of risk—categorized as low, moderate, or high. Along with this result, the app also shares brief explanations to help users understand why certain responses may increase their risk, and what steps they can take to reduce it. If the result indicates a higher risk, users are gently encouraged to take preventive measures, consider getting tested, or speak with a healthcare provider. This feature isn’t just about numbers or scores—it’s about raising awareness and empowering users to take control of their health in a supportive, informative way. Whether someone is simply curious or genuinely concerned, this tool helps them gain a clearer insight into their situation, all within just a few minutes.

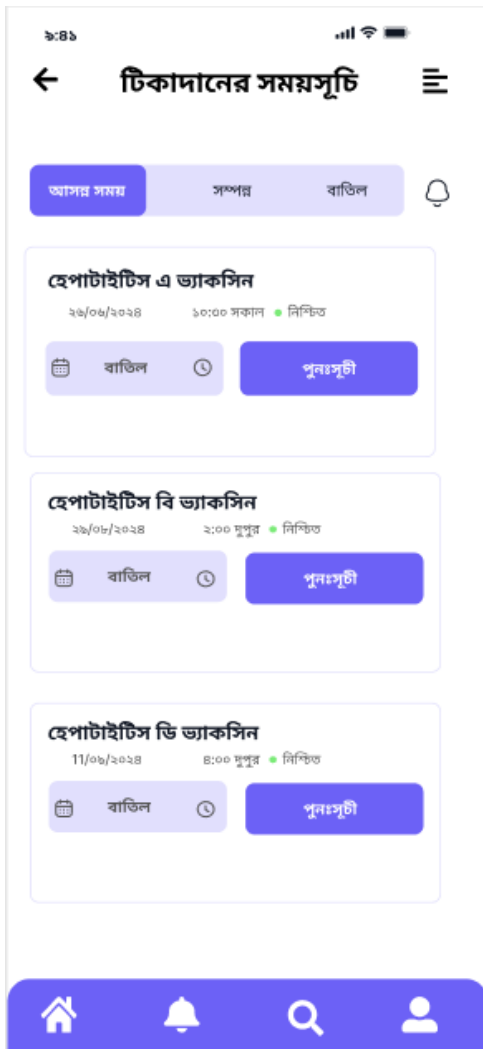


Figure 20: Vaccination Schedule Information Page

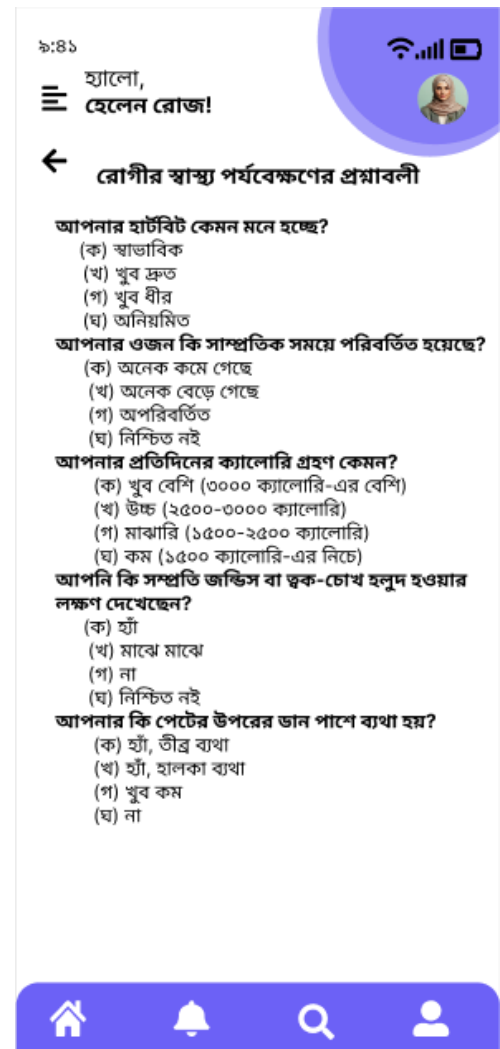


Figure 21: People at Risk Page

4.9 Chatbox

The “Chatbox” feature of the app is designed to create a supportive space where users can directly connect with expert consultants, including licensed doctors and individuals who have real-life experience living with hepatitis. This interactive tool goes beyond simple messaging it is a bridge between users and a trusted community where questions can be asked freely, personal stories can be shared, and emotional support can be exchanged. Whether someone is newly diagnosed, looking for treatment options, or simply in need of reassurance, the chatbox offers a safe environment for open conversation.

As illustrated in Fig. 22, users can choose to communicate via text chat for convenience, or if they prefer a more personal interaction, they can also switch to audio or video calls depending on availability, as illustrated in Fig. 23,. The system is designed to match users with the right consultant based on their specific concerns—such as symptoms, medication side effects, or lifestyle adjustments—ensuring they receive relevant and personalized guidance. In addition to medical professionals, the inclusion of experienced patients allows for peer-to-peer support, which can be incredibly helpful in easing anxiety and offering practical advice from someone who truly understands the journey.

This feature encourages users not only to seek help but also to support others, fostering a sense of community within the app. Whether it is asking a doctor about treatment options, connecting with someone who has gone through a similar experience, or simply having someone to talk to, the Chatbox is built to make sure no one feels alone in their fight against hepatitis.

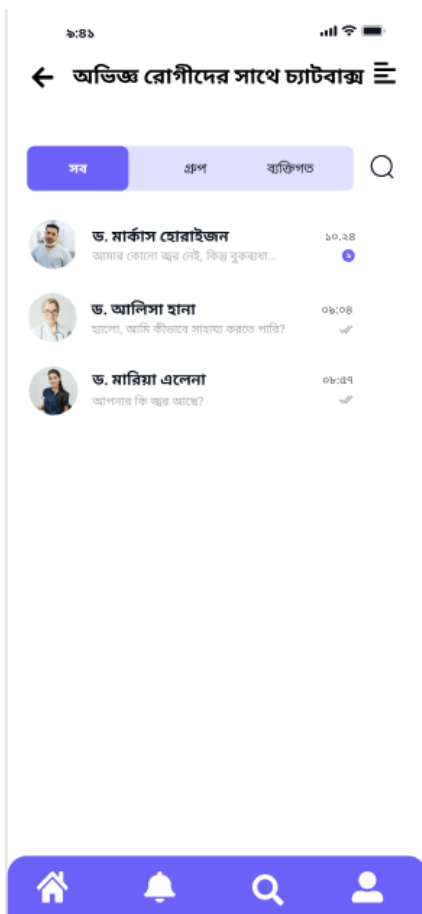


Figure 22: Chatbox Page

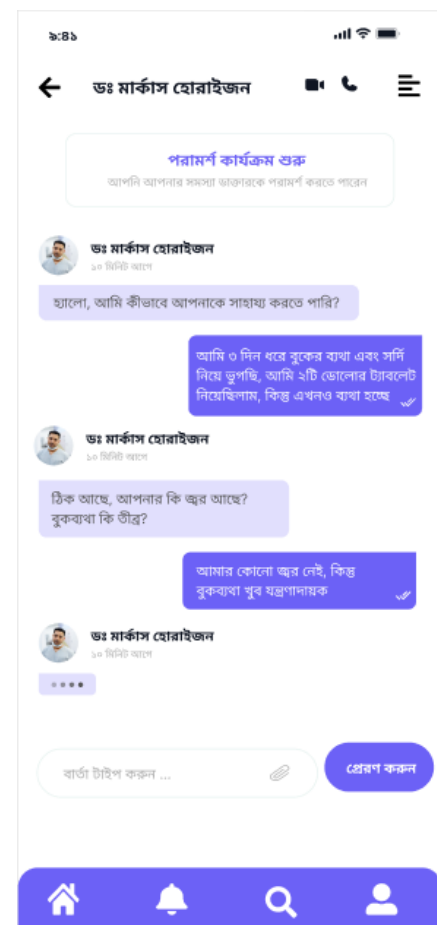


Figure 23: Chat with Doctor's Page

4.10 Guidelines for Living With Hepatitis

As illustrated in Fig. 24, the “Guidelines for Living with Hepatitis” feature offers practical, easy-to-follow advice to help users maintain a healthier lifestyle while managing hepatitis. This section focuses on supporting overall liver health by guiding users through three core areas: food advice and recommendations, exercise guidelines, and reduced mental stress. This feature is made to help people who have hepatitis live a healthier and better life. It is not full of big medical terms or hard instructions instead, it gives simple, helpful tips that anyone can follow. Whether it’s what to eat, how to move your body, or how to feel calmer inside, this part of the app gently guides the user step by step. The goal is to make everyday life easier, not harder.



Figure 24: Guidelines for Living With Hepatitis Page

4.10.1 Food Advice and Recommendation

One of the most important parts of this feature is food guidance. When someone has liver problems, the food they eat matters a lot. That’s why this section shares easy and clear suggestions on what’s good to eat and what’s better to avoid. It is not a strict diet it is more like friendly advice, like which fruits are good for the liver, or how to drink more

water this way.” The idea is to help the body feel better, without making the person feel stressed. This feature is illustrated in Fig. 25.



Figure 25: Food Advice and Recommendation Page



Figure 26: Exercise Guideline Page

4.10.2 Exercise Guideline

Exercise is another gentle focus in this feature. For people living with hepatitis, staying active can be tough but it's still important. That's why this section offers simple, non-strenuous movements that keep the body active without putting pressure on it. There's no pressure to “work out hard”. Instead, users are encouraged to try things like light walking, stretches, or breathing-based routines. The goal here is to keep the body feeling fresh and active, not tired. This feature is illustrated in Fig. 26.

4.10.3 Reduce Mental Stress

Mental well-being is just as important as physical health, and this app does not forget that. The mental stress section offers thoughtful ways to ease the emotional weight that often comes with chronic illness. Through calming strategies like deep breathing, mindfulness, or simply creating small peaceful routines at home, users can slowly begin to feel more at

ease. Sometimes, just a few minutes of quiet care for the mind can help the body begin to heal. This feature is illustrated in Fig. 27.

Lastly, there's a section for "Etcetera" or additional resources and this is where the app adds a more human touch. Not everything in life fits into categories. This space is for the little extras — maybe inspiring stories from others, lifestyle tips, or answers to questions people don't always know how to ask. It adds color and warmth to the overall experience, making users feel seen, heard, and supported. This feature is illustrated in Fig. 28.



Figure 27: Reduce Mental Stress Page



Figure 28: "Etcetera" or additional resources Page

4.11 Medication Reminder

As illustrated in Fig. 29, the "Medication Reminder" feature is designed to help users stay consistent with their hepatitis treatment by offering an easy-to-use and personalized scheduling tool. Managing a chronic illness like hepatitis often requires strict adherence to prescribed medication routines, and missing even a single dose can affect the effectiveness of the treatment. This feature allows users to set daily reminders based on their doctor's instructions, so they never miss a dose. Whether the medication is to be taken once or multiple times a day, the app sends timely notifications to gently remind users at the

right moments. Each medication entry includes details like the name of the medicine, dosage, time of intake, and any additional instructions, all of which can be added or edited according to the treatment plan. This visual tracking not only helps them stay organized but also provides a sense of routine and accountability.

Additionally, the feature includes a calendar view that allows users to look back at previous days to see what was taken, as well as plan ahead. Whether someone is newly diagnosed or undergoing long-term treatment, this feature supports them in building healthy habits and maintaining consistency—two things that are key to managing hepatitis effectively.

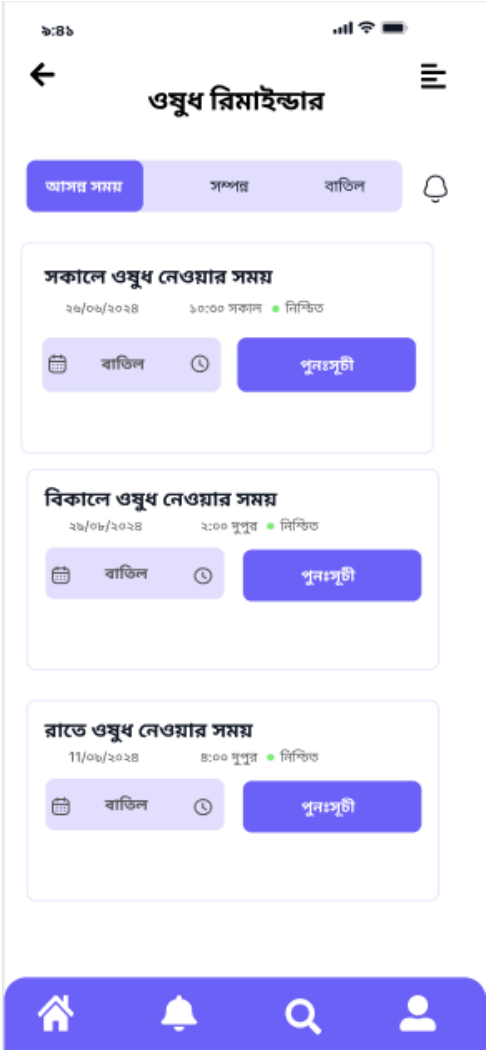


Figure 29: Medication Reminder Page

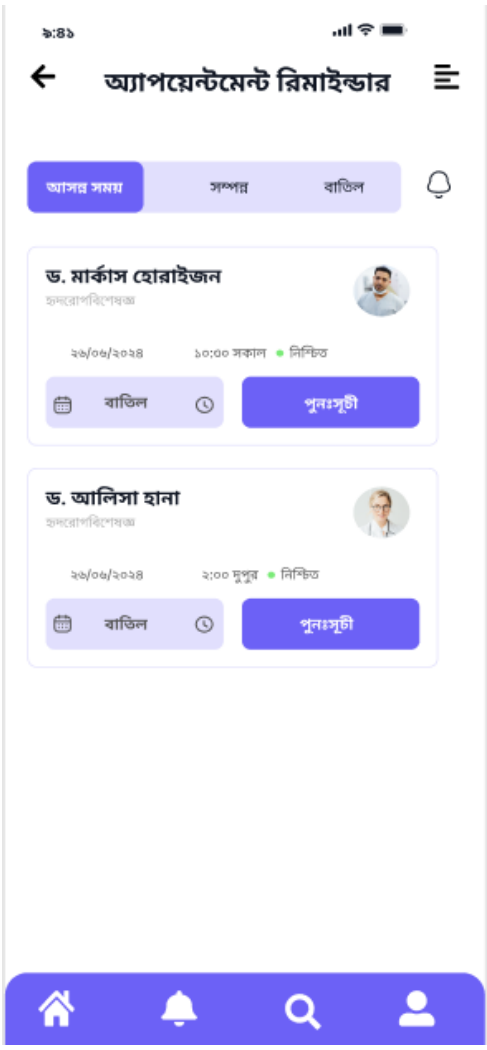


Figure 30: Doctor's Appointment Reminder Page

4.12 Doctor's Appointment Reminder

As illustrated in Fig. 30, The “Doctor Appointment Reminder” feature is designed to simplify and streamline the process of finding and booking medical consultations for hepatitis-related care. Through this interface, users can easily search for doctors who specialize in liver diseases or infectious illnesses, view their profiles, and check their available time slots in real time. As illustrated in Fig. 31, Each doctor's profile includes essential information such as qualifications, areas of expertise, consultation fees, patient ratings, and

the languages they speak—helping users make informed decisions based on their personal preferences and needs. Once a suitable doctor is found, users can book an appointment directly through the app with just a few taps. The calendar-style layout makes it easy to view open appointment slots and pick a time that fits the user’s schedule.

After booking, the user sets up an appointment reminder, ensuring that users never miss their scheduled consultation. The reminder system sends gentle notifications leading up to the appointment, which can be customized to alert the user a few hours or even a day in advance.

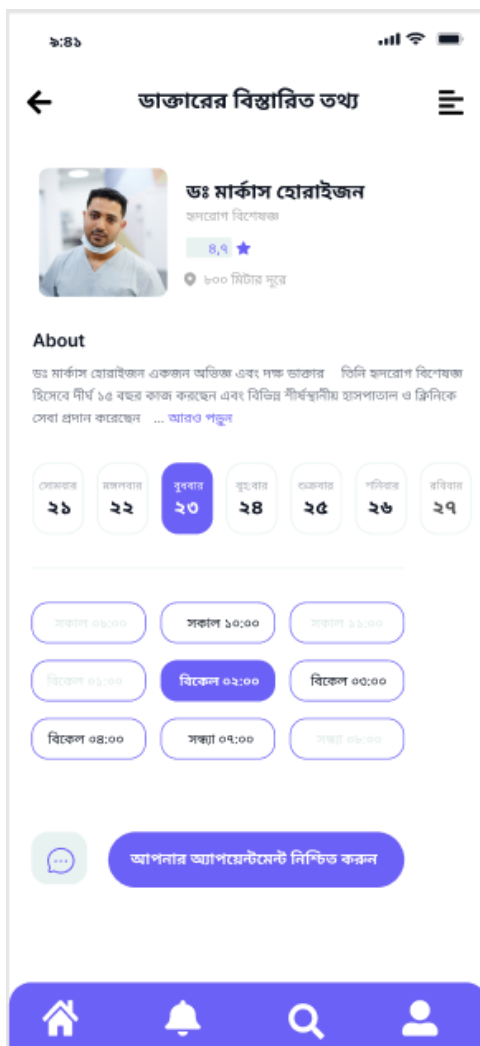


Figure 31: Doctor’s Details Page

4.13 Symptoms Tracker

As illustrated in Fig. 32, the “Symptoms Tracker” feature of the HepCare app is a powerful tool designed to help users monitor their health in a structured and personalized way. It allows individuals living with hepatitis to regularly record how they’re feeling, keep an eye on specific symptoms, and visualize changes over time through easy-to-read charts and summaries. This feature is divided into three main sections Chart, Tracker, and History each serving a unique purpose to support better health awareness and communication with doctors.

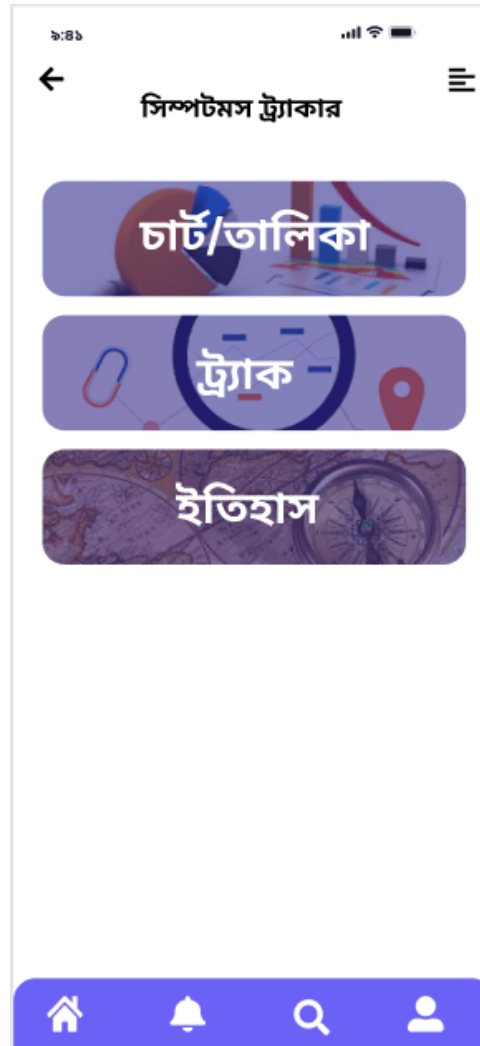


Figure 32: Symptoms Tracker Page

4.13.1 Tracker

As illustrated in Fig. 33, in the “Tracker” section, users can log their daily symptoms by rating how they’re feeling in specific areas such as fatigue, belly pain, nausea, jaundice (yellowing of the skin or eyes), appetite, weight changes, and overall mood. These inputs are quick and user-friendly, making it easy to track even on busy days. The information collected here forms the base of the other sections.

4.13.2 Chart

As illustrated in Fig. 34, the “Chart” view then takes this data and turns it into visual graphs, helping users see patterns, improvements, or worsening symptoms over time. Whether it’s a week of fatigue getting better or a new symptom starting to appear, the graphs allow users to detect trends that might not be obvious from memory alone.

4.13.3 History

Lastly, As illustrated in Fig. 35, the “History” section stores all the data, allowing users to go back and review past entries from previous weeks or months. This helps them reflect on their health journey and provides useful insights that they can share with their

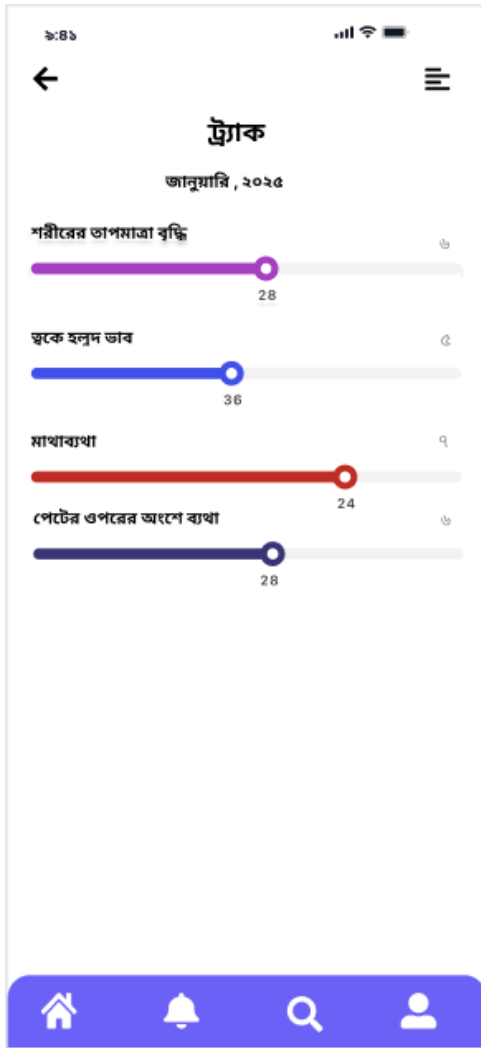


Figure 33: Tracker Page



Figure 34: Chart Page

healthcare providers during appointments. Having this record not only helps in better communication with doctors but also empowers users to take an active role in their care.

4.14 Pregnancy and Hepatitis

Pregnancy is a life-changing journey for every woman, and it becomes even more sensitive when hepatitis comes into the picture. This feature is built to offer helpful, practical, and heartfelt guidance to women during their pregnancy, whether they are infected with hepatitis or not. The goal is to make sure every female user feels informed, supported, and cared for. From learning about hepatitis to understanding how to manage symptoms and care for a newborn, this feature acts like a helpful companion every step of the way. This is illustrated in Fig. 36.

4.14.1 Newborn Baby Care

One of the key parts of the “Pregnancy and Hepatitis” feature focuses on “Newborn Baby Care”. For mothers who are already infected with hepatitis, it’s normal to feel worried about the health of their baby. As illustrated in Fig. 37, this section offers peace of mind by providing clear and reassuring guidelines. It explains that newborns should receive the



Figure 35: History Page

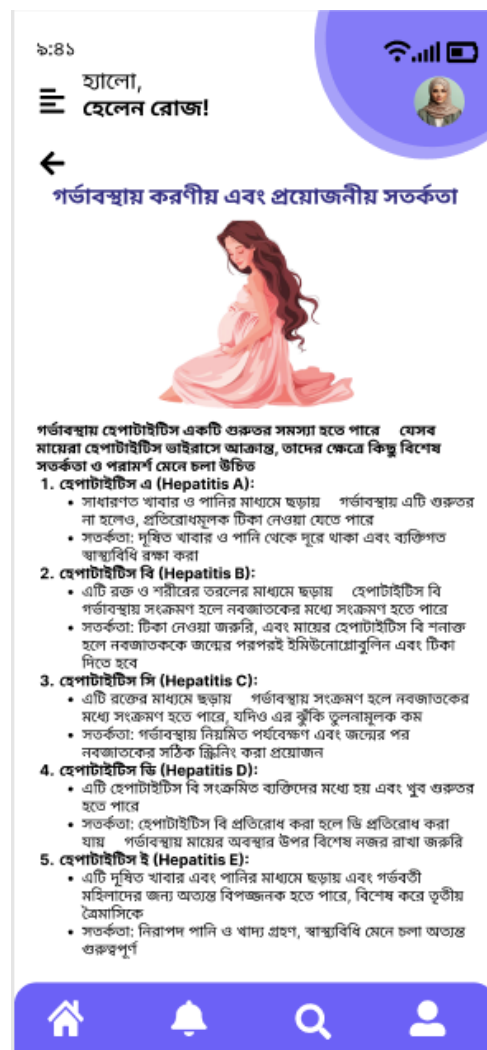


Figure 36: Prevention Guidelines From Online Resources Page

hepatitis B vaccine within the first 12 to 24 hours of birth to prevent transmission. It also includes advice on breastfeeding reminding mothers that they can still safely breastfeed. Basic hygiene steps like regular hand washing, safe handling of baby items, and routine follow-up tests for the newborn are also covered. The idea is to help mothers feel confident and capable of giving their babies the best start in life.

4.14.2 Tracking Health and Symptoms During Pregnancy

Pregnancy already brings many physical and emotional changes. When hepatitis is also involved, tracking symptoms becomes even more crucial. As illustrated in Fig. 38, In the “Tracking Health and Symptoms During Pregnancy” section talks about how a pregnant woman can take care of herself if she is infected with hepatitis A, B, C, D, or E. It also explains how some of these types can pass from mother to baby. For example, hepatitis B and C can spread during delivery, especially if not properly managed, while hepatitis D can only occur along with B, making it more serious. Hepatitis A and E usually don’t pass to the baby directly, but they can cause complications for the mother, especially in the third trimester. That’s why it’s important for pregnant women to stay in close touch with their doctor, maintain good hygiene, and take medicine if advised. The section gently reminds women to be alert, stay careful, and never ignore any symptoms—for their safety

and their baby's well-being.



Figure 37: Newborn Baby Care Guidelines Page



Figure 38: Tracking Health and Symptoms During Pregnancy Page

4.14.3 Screening Guidelines During Pregnancy

As illustrated in Fig. 39, in “Screening Guidelines During Pregnancy” section explains screening guidelines during pregnancy. Screening is especially important in the early stages of pregnancy, usually around the third month or during the first prenatal visit. Early screening helps doctors figure out the best care for both. If something's wrong, the woman is sent to a specialist and is asked to have regular check-ups throughout her pregnancy.

4.15 Advertisements and Awareness

The “Advertisement and Awareness” feature plays a vital role in educating users and spreading reliable information about hepatitis to a wider audience. Through this section, users can explore a curated collection of news articles, global reports, awareness campaigns, and research updates related to hepatitis. By staying informed through trusted sources, users can gain a deeper understanding of the disease—including its causes, transmission

methods, symptoms, prevention strategies, and treatment options. This is illustrated in Fig. 40.



Figure 39: Screening Guidelines During Pregnancy Page

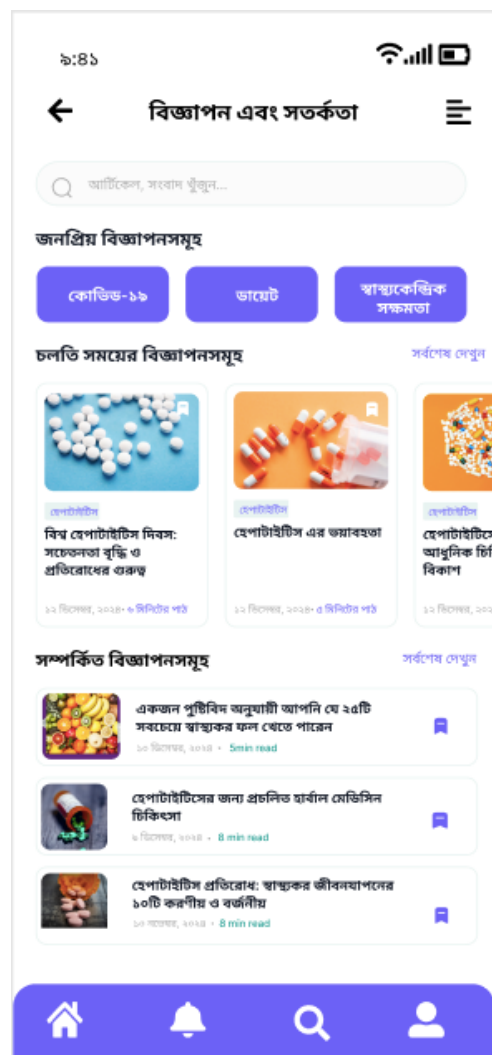


Figure 40: Advertisement and Awareness Page

5 Discussion

Through our research, we developed the ‘HepCare’ app which is designed to help people manage hepatitis with daily symptom tracking, medication reminders, doctor’s consultations, and reliable health awareness in Bangladesh. The journey began with a literature review using the PRISMA method, which demonstrated the critical need for such a solution, especially in Low- and Middle-Income Countries (LMICs).

The ‘HepCare’ app is designed for informational purposes only and is not suitable as a replacement for medical treatment. Data for developing the ‘HepCare’ app was gathered through surveys from patients. At the beginning, we gave participants a brief explanation of the research purpose and topic, and the survey was conducted with their permission and fully anonymously. Around 91.2% of the participants expressed their willingness to use such an app. The participants who showed interest in using the app also rated its features and the quality of the information provided.

In this research, we surveyed 57 patients to collect user preferences and identify key features for the ‘HepCare’ app. Features include “About the Types of Hepatitis”, “Prevention and Guidelines From Online Resources”, “Chatbox” support for expert consultations, and so on. Additionally, the ‘HepCare’ app includes “Doctor’s Appointment Reminder”, “Symptoms Tracker”, and “Medication Reminder” settings, along with the opportunity to talk with doctors as needed. The ‘HepCare’ app also has features like “Pregnancy and Hepatitis” for newborn baby care guidelines. From the survey, we found that 40.4% of people are genetically affected by hepatitis. Shockingly 63.2% of people are not vaccinated and only 21.1% of people are vaccinated. Additionally, we found that 73.2% of people are affected by hepatitis B, 12.5% by hepatitis C, 10.7% by hepatitis A, and 1.8% by hepatitis D and E. The majority of hepatitis-infected patients are aged 21-30. About 31.6% of people in this age group are affected by hepatitis.

We understood by talking with patients that those who had no prior knowledge of mHealth apps showed more curiosity and interest in using the ‘HepCare’ app after knowing about it. It is also helpful for creating awareness for taking the vaccination against hepatitis. Although the ‘HepCare’ app is still under development, it is currently very useful for people who are affected by hepatitis and those interested in learning more about hepatitis.

In conclusion, ‘HepCare’ represents a significant step forward for both hepatitis-affected and non-affected users in Bangladesh. While further evaluation and refinement are necessary, this work makes an important contribution to the emerging field of mobile health solutions for hepatitis prevention and awareness in Bangladesh.

5.1 Limitation and Challenges

While the ‘HepCare’ app has been developed to spread awareness and support those affected by hepatitis, several limitations still exist that need to be addressed. One of the primary concerns is language accessibility—the app is currently available only in

Bangla, which poses a barrier for non-Bangali speakers or international users who may be interested in its resources. Expanding the app to include English or multilingual support would significantly broaden its reach and impact.

Lack of Device

Another important limitation is device accessibility. Although most patients surveyed showed interest in using the app, a notable portion of them do not own smartphones. Many older users rely on their children or caregivers to access digital tools and retrieve information from the app on their behalf. This dependency highlights a gap in direct access and may delay timely interaction with the features.

Lack of Education

In addition, illiteracy remains a major challenge. For users who cannot read or write, navigating a digital interface, even in their language can be confusing and discouraging. They may struggle to understand the app's instructions, health guidelines, or input tracking data. Future versions of the app could consider incorporating voice-based navigation or visual aids to support these users. Moreover, internet connectivity poses another practical issue. In many rural or underdeveloped areas, users experience unstable or slow internet connections, which hinders real-time access to information, and chat support. Ensuring offline availability of basic information or integrating a lightweight app mode could help users with limited internet.

The Impact of Cultural and Lifestyle Differences

Lastly, cultural differences, dietary habits, lifestyle patterns, and awareness levels vary significantly across regions. What works as a health tip in one area might not be practical or relevant in another. Encouraging localized content and region-specific guidelines could help improve adoption. Additionally, many people still find it difficult to follow preventive measures or long-term guidelines consistently, especially when lifestyle changes are required.

6 Conclusion and Future Work

The ‘HepCare’ app has been thoughtfully designed with features that really meet the needs of people in Bangladesh who are dealing with hepatitis. It fills an important gap in public health by making it easy for users to find reliable information about all types of hepatitis in one convenient place. By offering the app in Bangla, we are making sure that more people especially those who feel more comfortable in their native language can learn about hepatitis and take steps to protect their health. With a strong focus on making the app simple and easy to use, we are also committed to improving it over time based on user feedback. ‘HepCare’ aims to not only inform but also empower people to make better decisions for themselves and their loved ones. This paper shares our plan to build a strong and helpful prototype that we hope will truly make a difference in raising awareness and helping to prevent the spread of hepatitis in communities across Bangladesh.

‘HepCare’ app is different from other mHealth apps because it has user-centric features, which are designed to support hepatitis prevention among the Bangladeshi population. A built-in vaccination schedule will help users stay on track with important prevention measures. To make expert help easily accessible, the app will include a feature that connects users directly with doctors for consultations. “Medication Reminders” will be there to gently prompt users to take their medicines on time and stick to their treatment plans. The app will also have a “Chatbox” where users can talk to others who have been through similar experiences for advice and support. Lastly, the “Symptoms Tracker” will let users log how they are feeling over time, helping them stay on top of their health and notice any changes early.

In the future, we will continue to add more features based on user requirements, gathering feedback directly from them. We also plan to incorporate perspectives and features for other types of users, such as doctors or hospitals, allowing them to access patient’s health data while maintaining privacy and permissions. Additionally, we are planning to provide access to a family member to monitor the patient’s updates. For now, we are offering the app in Bangla, but in the future, we plan to convert the app into the English language.

A Appendix

A.1 Appendix A: Abbreviations

1. **Apps:** Applications
2. **mHealth:** Mobile Health
3. **EHR:** Electronic Health Record
4. **HVB:** Hepatitis B Virus
5. **FNIH:** Foundation for the National Institutes of Health
6. **PRISMA:** Preferred Reporting Items for Systematic Reviews and Meta-Analyses
7. **LMICs:** Low- and Middle-Income Countries
8. **HCI:** Human-Computer Interaction
9. **UI:** User Interfaces
10. **UCD:** User-Centered Design
11. **SLR:** Systematic Literature Review
12. **RQ:** Research Question
13. **WHO:** World Health Organization
14. **NLP:** Natural Language Processing
15. **iOS:** iPhone Operating System
16. **HBIG:** Newborns Hepatitis B Immunoglobulin
17. **CDC:** Centers for Disease Control

A.2 Appendix B: List of Key Publications from this Work

1. Mst. Shikha Khatun, Anikah Hossain, Sumaiya Akter, Md Abu Sayed, Ashraful Islam, and M. Ashraful Amin, “Designing HepCare App: Promoting Hepatitis Prevention and Awareness in Bangladesh,” *27th International Conference on Human-Computer Interaction (June 2025)*, Springer.

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