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Design and Development of a Mobile Application for the Control and Prevention of Viral Gastroenteritis as a Public Health Problem

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ABSTRACT

OBJECTIVE: This study aims to design and implement a mobile application, "Viral Gastroenteritis", and assess mobile users' satisfaction with this application.
METHODOLOGY: This study was conducted in February 2021 in two stages: designing and constructing a viral gastroenteritis disease application based on the Android system and investigating mobile users' satisfaction with this application.
RESULTS: Six hundred individuals responded to the questionnaire in this study; 36.5 % were males, 63.5 % were females, 35% were between 20-30 years old, and 43.83% had a bachelor's degree. The study results showed that more than 95% and 90% of the participants had no trouble installing the app. The images adequately conveyed the meaning of viral gastroenteritis, respectively.
CONCLUSION: According to the inquiry outcomes, using this didactic software can increase users' awareness when facing viral gastroenteritis.

KEYWORDS: Viral gastroenteritis, Public health, Mobile application, Software, Rotavirus, Norovirus.

INTRODUCTION

Viral gastroenteritis is a common infectious disease syndrome, and it is a leading cause of significant morbidity from virals in young children and older people worldwide, especially in underdeveloped countries. Still, in developed countries, viral gastroenteritis is generally self-limiting, with a benign course, and recovery occurs during 2–5 days[1-3]. Treatment efforts have focused on reducing the days of diarrhea with adequate fluid, nutritional, and electrolyte therapy[4,5].

Two hundred million cases of diarrheal diseases occur annually worldwide, and an estimated 1.9 million children below five years of age die each year, mainly in developing countries[6,7].

Enteric viruses associated with the acute diarrheal disease include Rotavirus, Norovirus, Adenovirus and Astrovirus[1,6,8]. There are several different forms of contact transmission, including dirty hands and food or water contaminated by human sewage (faecal-oral route), and airborne transmission has been proposed in recent decades[5].

Viral gastroenteritis starts suddenly with watery diarrhea and vomiting, often followed by varying combinations of headache, anorexia, myalgia, malaise, nausea, vomiting, abdominal cramps and low-grade fever[5,9].

Viral gastroenteritis infection outbreaks most frequently occur during the cooler temperature with peak seasonality in winter. Climate seasonal may vary depending on the region[6,10].

Today, with the advancement and evolution of technology, mobile applications have significantly increased the knowledge of personal hygiene and public health awareness about the hazards of significant epidemics and the potential pandemic of viral infections. This study aimed to design and implement a mobile application, "Viral Gastroenteritis", and assess mobile users' satisfaction with this application. Our goal in designing this application is to inform the whole community about the dangers of viral gastroenteritis.

METHODOLOGY

Study design

This study was conducted in two stages. The first stage included the design and construction of a viral gastroenteritis disease application based on the Android system, and the second stage investigated the satisfaction of mobile users with this application

Design and construction of application

In the first step, software development is done in four stages, including:

1. Designing of the graphic template,
2. Collection of information associated with viral gastroenteritis from world health organization (WHO) and centres for disease control and prevention (CDC) guidelines,
3. Entering information taken into the graphic design template, and
4. Summarizing and the final design of the software were done.

The scientific contents of this educational app, which were associated with the most important viral agents that cause gastroenteritis, including Rotavirus, Norovirus, Adenovirus, and Astrovirus, were taken from WHO and CDC guidelines[7]. The graphic design template was coded, and the internal Android database (Roman database) was used for programming. The overview of the software was in XML language, and also Java was used as the primary language for application software. This educational application was written with Android studio software version 3.6. The required contents and parts of this software, which included identification, prevention and control methods of Rotavirus, Norovirus, Adenovirus and Astrovirus infections, were entered into the graphic design template in batches in one step and separately. Finally, the software was developed and prepared for users.

Investigating the satisfaction of users

The second stage of this descriptive cross-sectional study was performed on 600 users per year to evaluate their satisfaction with the application in 2020. Data collection tools in the second stage were done through an electronic questionnaire. In general, the questionnaire had questions related to demographic information and nine closed-ended questions (yes, no, to some extent) regarding the graphic and educational capabilities of the application contents. Here, there are two questions: "Do you prefer to use this application over reading texts?" and "How helpful was the application in the familiar with viral gastroenteritis disease?" options were given as "low, medium, high and very high". After installing the software, users were invited to participate in this study and were asked to complete the electronic questionnaire carefully. From an ethical point of view, the participants in the study were assured that their information would remain strictly confidential. The data obtained from this study were analyzed by SPSS software version 24 using descriptive statistics.

RESULTS

In the present study, a viral gastroenteritis mobile application was designed for the Android system. The final design of the app pages is shown in **Figure I**. When the application is launched, the first page appears and shows attention "the contents of this program are for educational and awareness-raising purposes only and should not be considered medical advice". After approval by users, the main page, which includes the main menu, emerges; the main menu has four sections. One of these sections is "gastroenteritis," which provides information on the symptom, diagnostic, treatment, and vaccine of gastroenteritis. Another section is the "frequently asked questions in gastroenteritis with answer" section, enabling the users to get more information about gastroenteritis. In the next section, viruses that cause gastroenteritis, including rotaviruses, adenovirus, astrovirus, and norovirus, are classified, and every virus has unique information related to gastroenteritis. The contents of the third page are shown in **Figure I**. By clicking on any of the sections, the relevant page containing information and images appears.

As shown in **Table I**, 600 individuals responded to the questionnaire in this study; 36.5 % were males, and 63.5 % were females. Moreover, 35% were between 20-30 years old, and 43.83% had a bachelor's degree. The demographic characteristics of the participants' responses have been described in **Table I**.

Table II summarizes the participants' responses to the study questions, most of which were "Yes" and "Somewhat." The study results showed that more than 95% of the participants reported no troubles in the app installation and conceived the app size and speed as favourable. Furthermore, more than 90% of the participants reported that the app images adequately conveyed the meaning of Viral Gastroenteritis disease. Besides, more than 95% of the participants reported that the app's scientific content was up to date, and they could easily understand them.

The results also showed that 97% of users had no trouble using the application or contacting the developers. Moreover, 92% of the participants answered yes to "what is your first impression about this software?" and scored 4.5/5 on the question "How innovative do you think this software is?"

There were some suggestions and limitations; the participants suggested that the developers add some videos related to the Viral Gastroenteritis on the app and provide an IOS version. Also, some of them could not install the application on their phones due to an outdated OS (Android 4 and below).

Figures II and III summarize the responses to the following questions: (1) How preferable is this application for you in reading over physical texts? (2) How beneficial do you think the scientific content of the application is in improving Viral Gastroenteritis?

The results showed that 75% of the responders preferred to refer to the application at the time of disease instead of reading physical texts (**Figure II**). They reported the effectiveness of the application content in improving disease as 86% (**Figure III**).

TABLE I: THE DEMOGRAPHIC DATA OF THE APPLICATION USERS

Characteristics	Number (%)
Gender	
Male	219(36.5)
Female	381(63.5)
Age group	
< 20 years old	52(8.66)
20-30	210(35)
30-40	146(24.33)
40-50	105(17.5)
> 50 years	87(14.5)
Education level	
High school	45(7.5)
Diploma	55(9.16)
Bachelor's degree	263(43.83)
Higher than a bachelor's degree	237(39.5)

TABLE II: THE RESPONSES OF THE PARTICIPANTS TO USER SATISFACTION QUESTIONS

Questions	Yes Number (%)	No Number (%)	Somewhat Number (%)
Did you find the size of the application adequate?	580(96.66)	15(2.5)	5(0.83)
Did you have any trouble installing the application?	572(95.33)	20(3.33)	8(1.33)
Could you realize what message the images conveyed?	583(97.16)	10(1.66)	7(1.16)
Was the application's design (i.e., size, font, color, and brightness) favorable to you?	592(98.66)	5(0.83)	3(0.5)
Could the application convey its scientific message easily?	575(95.83)	20(3.33)	5(0.83)
Did you have any trouble using the application?	589(98.16)	8(1.33)	3(0.5)
Were you pleased with the speed and smoothness of the application?	573(95.5)	20(3.33)	7(1.16)
Did you find the information provided in the application up to date?	596(99.33)	3(0.5)	1(0.16)
Did you have any trouble contacting the app developers?	586(97.66)	10(1.66)	4(0.66)

FIGURE I: AN OVERVIEW OF THE MAIN PAGES IN THE PROPOSED APPLICATION

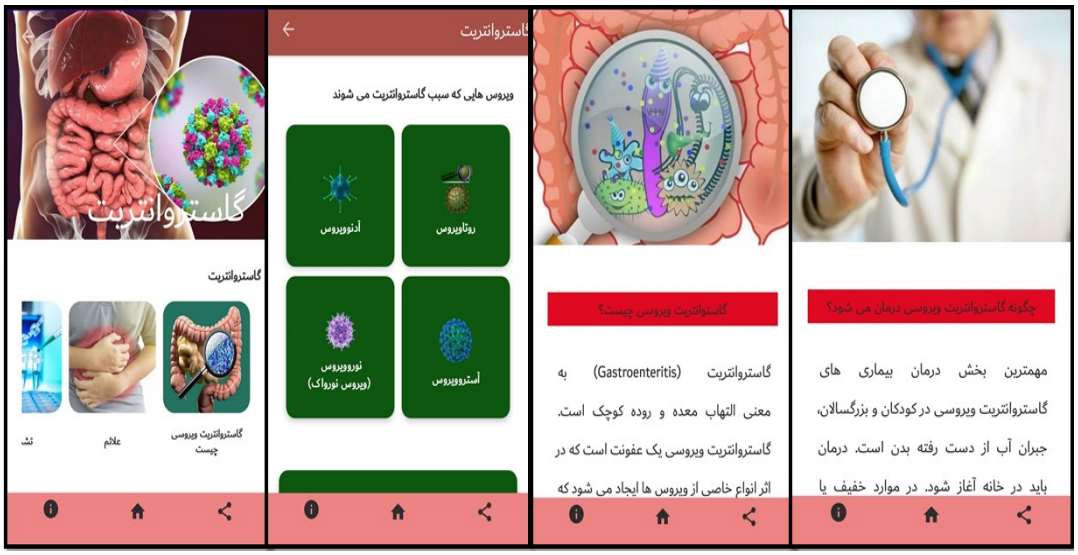


FIGURE II: THE RESULTS OF USER PREFERENCE BETWEEN USING THE APPLICATION AND READING PHYSICAL TEXTS

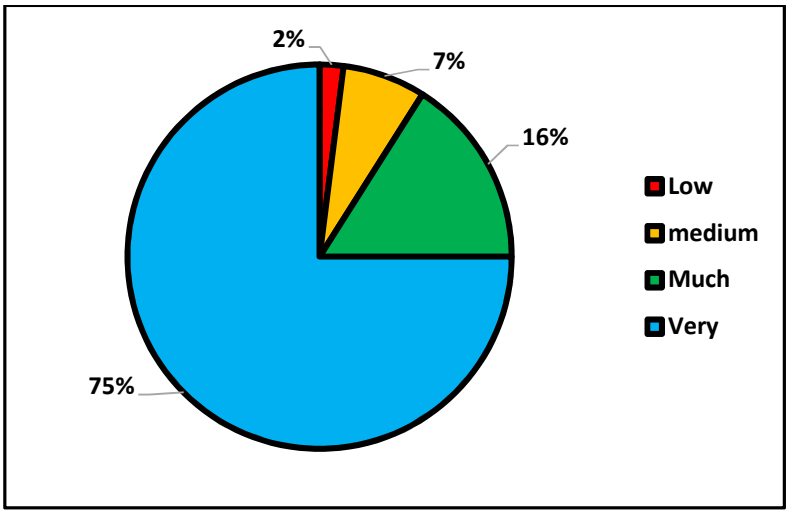
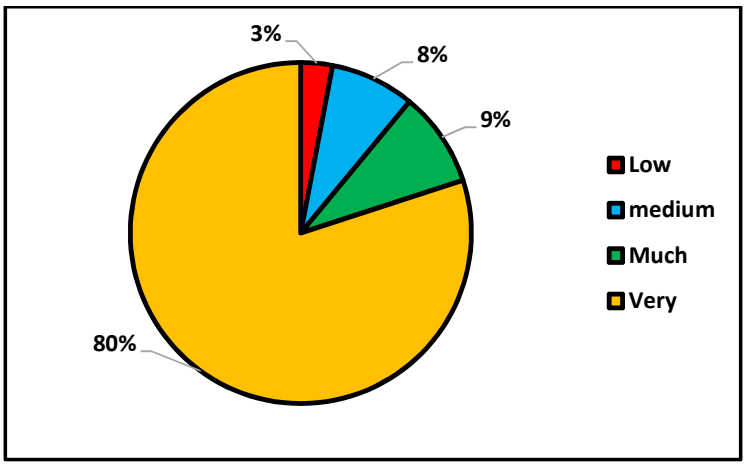


FIGURE III: THE RESULTS OF USERS' OPINIONS REGARDING THE EFFECTIVENESS OF THE APP'S SCIENTIFIC DATA IN IMPROVING THE DISEASE



DISCUSSION

Viral Gastroenteritis mobile health application is designed to increase the awareness of different people in society, including ordinary people, medical school teachers, students, and health centre specialists in health departments with diseases directly caused by the aforementioned Viral Gastroenteritis.

Based on our awareness, it can be declared that an application for this disease has not been made in Iran, and this mobile-based application is the first software which deals with Viral Gastroenteritis.

Our study results showed that applying a mobile application to increase individuals' health awareness accompanied high user satisfaction. More than 80% of the study participants conceived of mobile health applications as beneficial in improving Viral Gastroenteritis. The present study results were in line with Alizadeh I 2019[11], who reported user satisfaction higher than 80% and user conception of the app's scientific beneficence higher than 78%.

A study on an application developed for tuberculosis[12] reported high user satisfaction, which was consistent with our study results. In line with our results, another study by Ghazisaeedi M 2015[13] reported that 82% of the caregivers welcomed the application and conceived it beneficial for providing their necessary information. A study in 2014 showed that users preferred to use mobile apps in learning English and integrate this method with other learning procedures. In line with theirs, our study results showed that the study participants preferred to use the application in learning over the classic methods.

Nasiri M 2014[14] showed that, like having lectures, mobile health applications improve medical students' learning and memorization processes. Our study results showed that students prefer studying on phones over the classic physical paper. In line with our study, it was established in several studies, including Kamal MN[15] and Papzan AAH 2010[16], that using mobile education applications further improves the students' performance in learning.

Generally, this mobile health application doesn't need an internet connection and the internet and allows its users to enable offline access. Using this mobile-based software, people gained full knowledge and consciousness to identify and control viral gastroenteritis, which can be helpful in emergencies such as natural disasters (floods).

CONCLUSION

According to the inquiry outcomes, using this didactic software can increase users' awareness when facing viral gastroenteritis. According to the lack of such application and the increase in the prevalence of viral gastroenteritis in many provinces in recent years, designing such software can help increase people's awareness and prevent the epidemic of viral disease. Hence, we suggested this software to the target community, including families, school teachers, health centre experts and students of medical universities.

Ethical Permission: Abadan School of Medical Sciences Iran Research Ethics Committee letter No. IR.ABADANUMS.REC.1399.084, Dated: 26-08- 2020.
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DATA SHARING STATEMENT: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

Zandi M: Idea conceived and designed software
Alizadeh I: Analysis
Soltani S: Text writing
Vali M: Data collection
Ebrahimi S: Data collection
Abbasi S: Supervision of research

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