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ORIGINAL RESEARCH

Evaluation of the Wateen App in the Blood-Donation Process in Saudi Arabia

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Background: Blood transfusions are essential for many medical procedures, but current supplies of blood are insufficient to meet the needs of all patients. Apps offer a means to improve donor recruitment and enhance blood-donation systems, if they are usable and useful. The Saudi Ministry of Health launched a blood-donation app, “Wateen”. However, there is currently no evidence of the app’s usability and usefulness among users.

Purpose: The aim of this research was to evaluate the usability, user satisfaction and perceived usefulness of this blood-donation app in Saudi Arabia.

Methods: A mixed-method study was conducted comprising a quantitative questionnaire with donors, and qualitative semi-structured interviews with healthcare professionals. Descriptive analysis was used for the quantitative data and a thematic approach for the qualitative data.

Results: A total of 401 donors completed the questionnaire, 53.7% of whom were males. Most participants were highly satisfied with the Wateen app and found this app easy to use and navigate. Older people found the app less easy to use compared with younger respondents. Key benefits identified by questionnaire respondents included the potential to encourage donation, and improve communication. A total of 12 healthcare professionals were interviewed. Most healthcare professionals expressed that the app was generally acceptable and easy to use. They felt that the app has the potential to be effective in enhancing donor awareness, facilitating communication between donors and healthcare professionals, and improving the efficiency of the donation process. Some accessibility issues were identified that need to be considered. It was also suggested that more be done to expand the app functionality and increase awareness of the app.

Conclusion: This blood-donation app is highly usable and acceptable among donors and healthcare professionals in Saudi Arabia, offering several benefits. Some accessibility issues were identified, along with possibilities for improving accessibility and expanding the app’s functionality.

Keywords: apps, blood donation, usability, user satisfaction, Wateen

Introduction

Blood transfusions are an essential part of many medical procedures and save lives. Without access to regular blood donations, healthcare systems cannot meet the need for transfusions, leading to lack of treatment for certain conditions, and losses of life. According to the World Health Organization, 3–5% of the population should donate blood annually to ensure adequate supplies.¹ Several studies have identified a number of factors that influence blood-donation rates, including being medically unfit,² lack of awareness or knowledge,³ fear of infections, lack of time,⁴ and lack of invitation.⁵

The Saudi blood transfusion system utilizes a system of blood banks at hospitals, in which individual hospitals house blood banks to meet the needs of their patients, with blood being donated from voluntary donors, or from replacement donors (comprising friends, family members or colleagues).² However, donation rates across Saudi Arabia are not adequate to meet the needs of patients, often leading patients and their families to seek donations via alternative routes, including social media requests.^{6–8} Official statistics record the number of blood donors in Saudi Arabia as 341,688 in



2011; to reach the target WHO rate of 3–5%, this figure should have been 814,109–1,356,849.⁹ This discrepancy between supply and demand is set to increase as the Saudi population grows.^{10–12}

In recent years, the potential for mobile and communications technology to drive blood donation has begun to be recognized.⁶ Several countries have launched apps to encourage blood donations, such as the UK's NHS Give Blood app. The Saudi Ministry of Health (MOH) recently launched its own smartphone application "Wateen", with the intention of improving awareness of blood donation among the Saudi population in an effort to increase availability of blood.¹³ Wateen is integrated with the SMS (text messaging) system, enabling it to send SMS messages to prospective donors of a specific blood type, and to signpost local donation facilities.¹²

It has been found that the usability of blood-donation apps, and levels of satisfaction with these apps, are important factors that influence donors' intent to use them, and to return for future donation.^{2,14,15} Previous studies have identified several key factors that influence mHealth adoption and efficiency, including user satisfaction with apps, and perceptions of their usefulness and ease of use.^{12,16} However, to date the investigation of these factors in the context of blood-donation apps has not been adequately examined globally, and even less research has been conducted specific to Saudi Arabia or the surrounding Gulf Region. One recent study assessed Saudi donors' opinions regarding the Wateen app via a mostly closed-ended questionnaire, without investigating donors' satisfaction with the usability of the app, or their perceptions of its usefulness.¹⁷ This study also did not consider healthcare professionals' views, despite their central role in the blood-donation process. The present study therefore employs a mixed-methods (quantitative and qualitative) design involving both donors and healthcare professionals to provide an in-depth picture of the usability of and user satisfaction with the Wateen app, and perceptions of its usefulness to the blood donation process in Saudi Arabia.

Materials and Methods

This study adopted a convergent mixed-methods design, utilizing both qualitative and quantitative data to evaluate the use of the Wateen app in the blood-donation process in Saudi Arabia.¹⁸ The study examined usability, usefulness and satisfaction from the perspectives of both donors and healthcare professionals.

Quantitative data collection utilized a self-administered questionnaire to explore donors' attitudes towards the Wateen app, whereas qualitative data was gathered via semi-structured interviews with doctors, to gain their expert opinions regarding the Wateen app in their own words. These data strands were gathered concurrently, and analyzed separately, before being integrated and synthesized so they could be interpreted together, leading to a higher knowledge yield and a fuller picture of the research topic.

The study was conducted at blood-donation centers, located in Riyadh Saudi Arabia during Oct-Dec 2021. The ethical approval for this study was obtained from Ministry of Health (MHO).

Study Instruments

To collect donors' opinions, a validated, structured, self-administered questionnaire was adapted from a previous study,¹⁷ with some questions modified to collect useful supplementary information. The questionnaire was translated into the Arabic language, before being validated using the WHO Process of Translation and Adaptation of Instruments (WHO). A pilot study was conducted, which found the questionnaire to have a Cronbach α of 0.9 and a scale level content validity index of 0.90.

To collect healthcare professionals' in-depth expert opinions regarding the Wateen app, a semi-structured interview was used. The interview topic guide was based on a literature review,^{2,5} and was designed to elicit healthcare professionals' opinions regarding the app's tasks/functions, their satisfaction towards the app, the usability of the app, the potential benefits, any perceived limitations or concerns, and their suggestions for improvement. The interview also collected demographic participant information including age.

Participants

The target population for this study was healthy adults who were eligible to donate blood, and who had previously used the Wateen app, as well as physicians, nurses, and phlebotomists involved with donation centers.

The sample size for the donor group was estimated at 382 participants, allowing for a 95% confidence interval, an alpha error of 0.05, an accuracy of $\pm 5\%$, and power of 80%. These sample sizes were calculated using the Raosoft

Sample Size Calculator.¹⁹ Healthcare professionals were recruited until data saturation was reached, ie, the point at which new interviewees no longer disclosed new information or data.

The inclusion criteria were as follows: for donors, eligible participants were adults aged over 18 years who had previously donated blood via the Wateen app at least once, who were able to provide informed consent and participate actively in the research; for the healthcare professional group, eligible participants were adults aged 24 years or over who had at least 6 months' experience in donation centers, and who were able to provide consent and participate actively.

Participant Recruitment

Questionnaire

A random sampling technique was adopted to recruit donor participants,¹⁸ in which the researcher approached each fourth donor who entered the waiting area at the donation centers. Willing donors were asked to complete a consent form, before being provided with a copy of the study questionnaire. Assistance with completing the questionnaire was provided if requested.

Semi-Structured Interviews

Healthcare professionals were approached purposively to participate.¹⁸ After assessing whether they met the study criteria, interested and eligible participants were asked to complete a consent form, which included publication of anonymised responses. An interview was then conducted with each participant by the researcher. Each interview lasted between 25 and 45 minutes. Interviews were conducted until data saturation was reached, ie when no new information was being revealed.²⁰ Interviews were recorded, then transcribed, with transcriptions checked for accuracy against the original recordings.

Data Analysis

Quantitative data analysis was conducted using SPSS software package 19 to calculate descriptive statistics, eg means and standard deviations.²⁰ Interview transcripts were subjected to thematic analysis using NVivo 12 software. This analysis comprised the stages of: (1) data familiarization, (2) creation of initial codes, (3) collection of codes into broader themes, (4) specification of themes, (5) review of themes, and (6) writing the report.^{18,20} The qualitative and quantitative results of the study were integrated and analyzed together, recognizing any divergences and convergences between these results. The matrix can be seen in [Appendix 1](#).

Results

Quantitative Data (Questionnaire)

Socio-Demographic Characteristics

Of 401 donors included in the study, 53.7% were males. Most participants (32.6%) were in age the 25–34 age group. More than two thirds (67.2%) of the donors were Saudis, while others (32.2%) were foreign nationals, mostly from Yemen, India, Egypt and Syria ([Table 1](#)). A full breakdown of demographic factors is provided in [Table 1](#).

Ease of Use, Satisfaction and Benefits of Using the App

This section presents the findings of the questionnaire segments on Ease of Use, Satisfaction, and Potential Benefits. Overall results for each questionnaire segment was calculated by aggregating the average scores for each question in that segment. This showed the participants found the app easy to use (with a mean score of 4.06, and an SD of 0.15), that participants were satisfied with the app and its interface (mean 4.14, SD 0.27), and that they felt that use of the app would be beneficial (mean 4.30, SD 0.18). Mean scores and standard deviations for each questionnaire question are given in [Appendix 2](#).

Results from the “Ease of Use” segment of the questionnaire (as shown in [Appendix 2](#)) found that ease of use, navigation between screens, information available on the application, and the easiness of undoing mistakes were all rated as very good by >70% of respondents. In terms of demographic differences, the results indicated a large discrepancy in ease-of-use scores between older (=/>55 years) and younger (<55 years) participants, suggesting older participants found the Wateen app less easy to use.

Table I Donors Demographic Characteristics

Gender	
Male	(53.7%)
Female	(46.3%)
Age	
18–24	(28.1%)
25–34	(32.6%)
35–44	(17.5%)
45–54	(10.4%)
55–64	(7.6%)
>65	(3.8%)
Nationality	
Saudi	(67.2%)
Non-Saudi	(32.8%)
Education Level	
Secondary education degree	19.7%
Diploma degree	20%
Bachelor's degree	35.4%
Master's degree	21.7%
PhD degree	3.2%
Employment	
Yes	81%
No	19%

Results from the “Satisfaction” segment found that participants’ satisfaction levels with respect to various aspects of the Wateen app were also high. Convenience in accessing blood centers by finding the suitable time, location and date, time required to find and book, quality of the interface, relevance of tasks and functions on the application were aspects with which the participants were highly satisfied, and were rated very good by almost 60% of the participants.

The participants’ perceptions of the various benefits of the Wateen app are shown in [Appendix 2](#). In summary, these were as follows: providing easier access to blood donation centers, playing a key role in improving the blood supply, facilitating convenient and confidential communication with healthcare providers, delivering effective services remotely, saving time and encouraging users to donate more. Some participants reported that the rewards function helped to increase their motivation to donate. However, some reported that there were technical issues that affected their engagement with the app, such as failing to present rewards, leading them to contact IT support to resolve this issue.

Qualitative Data (Semi Structured Interviews)

Participant Characteristics

Twelve healthcare professionals participated in the semi-structured interviews. Eight of the participants were males (66.7%), and four were females (33.3%). Most participants (eight of twelve) were between 24 and 64 years old. A range of healthcare professionals were represented, including nurses (three), physicians (three), lab workers (three), and phlebotomists (three). A full breakdown of demographic information is provided in [Table 2](#).

Table 2 Healthcare Professionals Demographic Characteristics

Gender	
Male	(66.7%)
Female	(33.3%)
Age	
24–34	(33.3%)
35–44	(33.3%)
45–54	(25%)
55–64	(8.4%)
Nationality	
Saudi	(67.2%)
Non-Saudi	(32.8%)
Job Role	
Physician	3
Lab workers	3
Nurse	3
Phlebotomists	3

Qualitative analysis of the interview data identified three primary themes: usability and satisfaction, information and communication, and impact of the app on the blood-donation process.

Theme 1: Usability and Satisfaction

Overall Usability and Satisfaction. Most participants generally satisfied with the app and they found this app is easy to use, easy to learn, and easy to navigate. They reported that tasks such as booking a donation appointment could be completed in just a few steps, and that no instructions or training were required. Some participants noted that people of all ages attended donation centers having booked an appointment using the app, suggesting it is usable by people of all age groups, including older users.

I believed the app is very easy to use because it just requires simple interaction to achieve a task; just select and click to book a donation appointment; no more steps. (Phlebotomists 3)

Donors did not need training or instructions; they can use it immediately because the app needs only a few clicks to do a task. (Nurse 1)

During my work period in this center I noticed many donors who are aged from 18 to 70 years old who book their donation appointment using this app, so I think this app is easy to use for everyone. (Lab worker 2)

App Accessibility. Some participants believed that some donors, particularly older people or those with low vision, may have difficulty reading text within the app as it is small, and suggested it would be good to enable users to magnify text, or to change the font size in the app overall.

I think this application is excellent and users will not face any challenges but the size of the text might be a big barrier because it is too difficult to read for some people. (Doctor 2)

Customizing the size of fonts would help the app to be more accessible for all people, including older people, or people with vision problems. (Phlebotomists 1)

Including other languages would help to make the app more accessible to all people living in Saudi Arabia.

The app is available only in Arabic and English language. Other users who [...] do not know Arabic/English [...] cannot use it and engage in donation. (Nurse 3)

Theme 2: Information and Communication

App as an Informative Tool. Participants reported that the educational information in the app plays a key role in increasing donors' awareness about the blood-donation process, motivating and attracting more people to donate. However, including more attractive educational materials, eg, clips, would help to reduce users' anxieties surrounding transmission of infectious diseases, needles, dizziness etc. The inclusion of educational materials was also recommended to advise donors how to manage the post-donation period, and improve users' engagement and attitudes towards blood-donation.

I believe this app helps a lot in increasing donors' knowledge and awareness about blood donation but I think it would be good if [it included] more information about what they [donors] should do after their donation (Nurse2)

Educational information is not improved awareness alone but it enhances their overall opinions towards blood donation (Doctor1)

App as a Communication Tool. The app enhances communication with donors compared with traditional methods of recruitment, making it easier to find, communicate with, and recruit donors. For example, the app has the ability to send notifications when particular blood types are in short supply, which users can then share with other donors, making donors feel more motivated to donate and help others.

Before Wateen there were no official channels to call for donors who can offer specific blood types for patients that are in demand the app now could help to send requests in this case for people who have the same blood [type] and they can also share it with friends/relatives (Doctor1)

Healthcare professionals had confidence in the app's protection of donors' confidential information as this app is only used for donation purposes. Some healthcare professionals suggested that it would be more efficient if the app presented the results of blood screening after donation. However, other healthcare professionals disagreed with this as this may increase users' stress, particularly when concerns were identified, which require explanation from a healthcare professional.

Many people visit the center asking about their blood results ... I suggest adding the blood results in the app to promote people to donate more, save their time and effort, and increase their communication through the app.

(Lab worker3) If the result is positive the patients will be stressed and of course it should be discussed with their doctors. I do not think it is the most appropriate way to send these via the app. (Doctor2)

Theme 3: Impact of the App on the Blood-Donation Process

Time and Effort. The analysis revealed that the quality of services was a key factor influencing users' engagement with the blood-donation process. Healthcare professionals noted that using this app saves time and effort for both donors and

healthcare professionals. They further reported that the app reduced waiting times for donors, and allowed centers to operate more efficiently, by enabling donors to select a specific time, date and location in advance.

Before donors spent a long time in some centers to donate and there were long queues ... however, nowadays using this app donors have the ability to book the time and date and come to that appointment where they can be served easily by the center staff. (Nurse 3)

Features That Impact Donor Engagement. This app has the ability to record the number of times users donated, in addition to issuing reminders. These features increase people's motivation to engage with the app and to undertake more blood donation, by increasing their feelings of satisfaction.

The app encourages donors to donate particularly for humanitarian reasons, eg., in order to save people's lives, as they usually do not know them ..., so being a volunteer helps them to feel satisfied and happy. (Phlebotomists 2)

Some doctors reported that although the app posts the names of the donors who achieve a high number of donations as a reward, additional reward features could improve engagement with blood donation, increasing donation rates in Saudi Arabia.

I suggest that if donors donate a specific number of times, let's say 11–12 times a year, they [could be rewarded by] waiving specific fines or even given shopping coupons, which could be integrated easily in the app by linking with government entities. (Doctor 1)

Information on Donation Centers. Some healthcare professionals reported that whilst the app helps donors to find the nearest donation location with accurate information including GPS, distance (the time needed to reach), and opening hours, the app could improve the blood-donation service further if it also offered information about which hospitals have the most urgent need.

Sometimes donors come and ask whether the center has an urgent need for blood, and say they would like to donate to those in most need. (Lab worker 1)

Awareness of the App. Despite the benefits of the Wateen app, there is a need for official advertisement about the app, as some donors who came to donate were unaware of it.

Some donors until now did not know about this app ... More advertisements would help people to know about it. (Nurse 2)

Discussion

This research evaluated the usability, usefulness and user satisfaction of the Wateen app in the blood-donation process in Saudi Arabia. The results presented in this paper show high levels of satisfaction regarding the app and its usefulness, and good usability outcomes among participants. Whilst these findings suggest positive experiences with the Wateen app, they should be interpreted in the specific Saudi context. Previous research suggests that positive attitudes towards blood donation are already prevalent across Saudi Arabia, and that these attitudes may influence prospective donors' engagement with recruitment methods.¹¹ At the same time, such contextual factors highlight the importance of the current research, which examined the Wateen app in this specific cultural context. This research into Saudi donors' and healthcare professionals' experiences with the Wateen app identified a number of possibilities for improvement, relating to how the app could further enhance blood donation, and meet users' differing needs, expectations and preferences in Saudi Arabia.

Several recent studies have identified perceived ease of use as a key factor that influences potential users' engagement with e-health applications.^{12,16,21} The findings of the present research into the ease of use of the Wateen app revealed that both donors and healthcare professionals found the app generally easy to use, learn, and to navigate. Ease of navigation and interaction with the app, ease of recovery following mistakes, and ease of accessing information were rated as high by the majority of donors. Similarly, healthcare professionals expressed that the app is easy to use and navigate and noted that the app is used by donors from different age groups, highlighting its usability by older people.

The questionnaire, however, found that younger people reported good usability more often, and were more motivated, than older people. These findings are in line with prior research, which has found that older users may be less engaged and/or experience greater issues with technological interventions.^{22–24} Some concerns were raised by healthcare professionals regarding app accessibility, for example, the lack of a zoom feature and inability to change font sizes, which may hinder older people or people with impaired vision. Whilst these accessibility issues are likely to affect older people disproportionately, this population also has a higher frequency of underlying health conditions, meaning they are less likely to donate blood anyway.^{23,25} Such issues surrounding age and digital competence are also likely to lessen as younger, technologically literate people grow into old age. In the meantime, training could enable older users to engage more with this app, and other e-health technologies.^{22,26} Ouhbi et al showed that very few donation apps are available in multiple languages, limiting the number of potential donors they can reach.^{14,15} The present research also found that widening the language provision of the Wateen app beyond Arabic and English could increase its accessibility and user base. These findings suggest that understanding the needs of older adults, people with impaired vision, and Non-Arabic Speakers is crucial to helping maximize apps' usability and reach within this context.

Findings from previous research indicate that training could be one way to improve users' competence and confidence with an e-Health app, and therefore improve their acceptance.^{27,28} However, the majority of healthcare professionals in the present research revealed that donors use the Wateen app without receiving any training, and donors also reported that they typically did not require help to use it. The lack of training required to use e-health apps is associated with high levels of usability.^{22,27}

There was disagreement between interviewees as to the benefit of sharing blood screening results with donors via the app. Some interviewees thought this would be a beneficial feature, which could encourage prospective donors to engage with the app and to donate. However, other healthcare professionals expressed concerns with such practices, related to confidentiality and increased stress for users, particularly in the case of concerning test results. This latter finding is in keeping with those of Batis and Albarak, who assert that sharing results via apps is not good practice, and that confidentiality is a more important consideration than convenience in these situations.² Both donors and healthcare professionals expressed confidence in the app's protection of donors' confidential information where it is only used for blood-donation purposes. Some interviewees expressed concerns about ensuring confidentiality if the functionality of the app were expanded in future to include sharing of blood screening results with donors.

Users' perceptions of the effectiveness of m-health apps play a key role in determining their intention to use such applications.^{28,29} Guglielmetti et al determined that the quality of blood-donation services specifically influences prospective donors' engagement.³⁰ The Wateen app performed well in this regard, with donors and healthcare professionals identifying a number of benefits it could bring to users, and to the blood-donation process. Findings from both study groups indicate that the app offers a more effective route for users to donate blood versus previous donation methods, and has the potential to reduce latency between the need for blood and blood donation, a finding in line with previous research.¹¹ Participants agreed that the app enhances knowledge and awareness by offering information, that it improves communication between donors and donation centers, and that it improves efficiency by enabling easier recruitment of donors and by directing donors to the most convenient donation centers. These reported benefits are in line with those identified in previous research.^{2,30,31}

Previous research highlighted that the lack of availability of qualified healthcare professionals and high waiting times are two of the biggest factors that prevent prospective donors from donating.¹⁰ In keeping with previous research suggesting that m-health applications are associated with increased efficiency, the present research found that the Wateen app can help to reduce these pressures.^{32,33} Specifically, participants reported that it helps to strengthen the blood-donation service by reducing the time and effort contributed by qualified healthcare professionals, and by reducing waiting times at donor centers.

Strengths and Limitations

The main strength of this study is in its use of a rigorous, mixed-methods approach to deliver insight into the attitudes of donors and healthcare professionals towards the Wateen blood-donation app, and their impressions of its usability and perceived benefits. This design allowed for a nuanced picture of the app, as evidenced by the sometimes-divergent

findings between the study groups. Some potential limitations of this study pertain to the representativeness of the study sample. The small number of female participants relative to male is one consideration, but reflects the method of recruiting participants and the relatively low number of females among the population of existing donors in Saudi Arabia.¹¹ The low number of older versus younger participants is another factor, which may be of particular concern due to the relative difficulty with technology typically experienced by older users. The findings' generalizability beyond the Saudi context may be limited, given its particular cultural factors, and the particulars of the blood-donation process in Saudi Arabia. Finally, the qualitative data was analyzed by a single researcher. However, the analysis was discussed with an expert in qualitative data to ensure its credibility.

Recommendation for Further Studies

This study examined key stakeholders' perceptions of the benefits of this app in facilitating blood donations. Future research could empirically assess the impact of this or other blood donation apps on key aspects of blood donation, such as healthcare professionals' workloads, waiting times and knowledge for donors. The results also suggest there is a need for ongoing assessment of the needs and preferences of target users for this and other m-health apps.

Conclusion

This study found that a blood donation app was highly usable and acceptable by donors and healthcare professionals in Saudi Arabia, offering benefits to prospective donors, healthcare professionals, and the blood donation process. Some accessibility issues were identified, along with possibilities for improving accessibility and expanding the app's functionality.

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