

The Impact Of Electronic Applications On Motivating Blood Donation: A Case Study In Saudi Society

Tarahib Saleh Almutairi¹, Manal Odhayb Alwaldah², Raghad Odhayeb Alwaldah³, Adhwa Najj Aljehani⁴, Nouf Ibrahim Alhumaid⁵, Moodi Khaled Abudajene⁶

Date: [14-09-2025]

Abstract

Blood donation is a vital public health service, ensuring the availability of blood for emergencies, chronic illnesses, and surgical procedures. Despite its importance, global shortages persist, including in Saudi Arabia, due to reliance on replacement donors and limited voluntary participation. This study investigates the impact of electronic applications on motivating blood donation within Saudi society, analyzing the effectiveness of digital tools in raising awareness, improving accessibility, and fostering sustainable donation practices.

The research employed a descriptive-analytical design using a survey of 500 participants across various Saudi regions. Demographic information, awareness levels, usage patterns, motivations, and obstacles were measured using a structured questionnaire. Data were analyzed through descriptive statistics, ANOVA, and Pearson correlations using SPSS v25.

Findings revealed high awareness of applications (84%), yet relatively low consistent usage (25%). Among users, Wateen was the most popular app (61.9%), followed by Dammi (23.8%). Motivations were primarily humanitarian (mean 4.6), supported by convenience features such as reminders (mean 4.2). Major obstacles included privacy concerns (mean 3.6) and lack of flexible scheduling (mean 3.5). Statistical analysis demonstrated a strong positive correlation ($r = 0.72$, $p < 0.01$) between application usage and donation frequency, confirming the potential of digital platforms in transforming donation behaviors.

The study concludes that electronic applications are a powerful catalyst for promoting voluntary blood donation in Saudi Arabia. With proper enhancements in privacy, security, and accessibility, these tools can be further optimized and serve as a global model for encouraging altruistic health behaviors.

Keywords: Blood donation, Saudi Arabia, mobile health applications, Wateen, Dammi, Technology Acceptance Model, Theory of Planned Behavior.

1. Introduction

Blood donation is a cornerstone of modern healthcare systems, enabling life-saving interventions in trauma care, surgeries, and treatment of chronic illnesses such as thalassemia and sickle cell anemia. According to the World Health Organization (WHO, 2023), global blood donation rates remain insufficient, with many countries facing critical shortages. In Saudi Arabia, the Ministry of Health has repeatedly emphasized the urgency of maintaining stable and safe blood supplies, especially with the expansion of healthcare services under Vision 2030.

Despite the recognized need, barriers persist in achieving high rates of voluntary donation. Cultural factors, limited awareness of donation centers, and logistical challenges contribute to underperformance. To address this, Saudi Arabia has embraced digital transformation, introducing mobile health applications such as Wateen and Dammi to streamline the donation process. These apps allow users to schedule appointments, receive reminders, track eligibility, and connect with nearby donation centers.

This research investigates how such applications influence donor behavior, assessing levels of awareness, usage frequency, motivations, and obstacles. By applying the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB), the study provides insights into how digital solutions can enhance blood donation rates and contribute to the broader goals of Vision 2030.

2. Research Objectives, Questions, and Hypotheses

Objectives

1. To measure the level of awareness and adoption of blood donation applications in Saudi Arabia.
2. To analyze donor motivations and barriers associated with app usage.
3. To assess the relationship between application usage and donation frequency.
4. To propose recommendations for improving digital solutions to encourage voluntary donation.

Research Questions

- What is the level of awareness of blood donation applications among Saudi citizens?
- To what extent are these applications used regularly?
- What are the primary motivations and barriers affecting their use?
- How do demographic variables influence adoption?

Hypotheses

- **H1:** Higher awareness of blood donation applications is positively associated with higher donation rates.
- **H2:** Privacy concerns significantly reduce willingness to use applications.
- **H3:** Younger age groups are more likely to adopt blood donation applications compared to older groups.

3. Theoretical Framework

Technology Acceptance Model (TAM)

Proposed by Davis (1989), TAM explains technology adoption based on Perceived Usefulness (PU) and Perceived Ease of Use (PEOU).

- PU refers to whether users believe apps improve accessibility and increase donation opportunities.
- PEOU relates to how simple the apps are to navigate and integrate into daily routines.

Theory of Planned Behavior (TPB)

Ajzen's (1991) TPB emphasizes Attitudes, Subjective Norms, and Perceived Behavioral Control as predictors of intention and behavior.

- Attitudes reflect the perceived benefits of donating through apps.
- Subjective norms include social expectations and encouragement from peers.
- Perceived behavioral control addresses users' confidence in managing time, health, and privacy concerns.

Conceptual Framework

This study integrates TAM and TPB, hypothesizing that digital platforms enhance perceived usefulness and control, thereby strengthening attitudes and intentions to donate.

4. Literature Review

Global Studies

Research across the US, Europe, and Asia highlights the role of digital tools in healthcare mobilization. For instance, Smith & Johnson (2020) found that mobile apps increased blood donation rates by 25% in the United States. Similarly, India's Raktdaan initiative demonstrated how apps could coordinate large-scale voluntary donation campaigns.

Regional Studies

In the Gulf region, Qatar and the UAE have invested in health apps for donation scheduling. These studies show positive adoption among youth, though privacy and cultural sensitivities remain barriers.

Saudi Context

Saudi Arabia's Wateen app (launched by the Ministry of Health) and Dammi are pioneering efforts to digitize donation processes. Al-Omari (2021) reported that lack of knowledge of nearby donation centers was a major barrier, while apps showed promise in bridging this gap. Despite this, adoption rates remain modest, highlighting the need for further optimization.

Literature Gap

While global research confirms digital tools improve donation outcomes, few studies have systematically analyzed Saudi-specific data on app adoption, motivations, and barriers. This research addresses that gap.

5. Methodology

Research Design

Descriptive-analytical, cross-sectional study.

Sample

- 500 participants, ages 18+, recruited through stratified random sampling across Saudi regions.
- Balanced representation of gender, age, and education levels.

Data Collection

- Online survey structured into:
 - Demographics (gender, age, education, region).
 - Awareness and usage of donation apps.
 - Motivations (14 items, Likert scale 1–5).
 - Barriers (12 items, Likert scale 1–5).

Data Analysis

- Descriptive statistics for demographic and usage patterns.
- ANOVA for group comparisons.
- Pearson correlation for relationship between app usage and donation frequency.

Ethical Considerations

Informed consent obtained; confidentiality maintained.

6. Results

6.1 Demographics

Table 1. Demographic Distribution of Respondents (n = 500)

Variable	Category	Count	Percentage
Gender	Male	280	56%
Gender	Female	220	44%
Age Group	18–24	120	24%
Age Group	25–34	155	31%
Age Group	35–44	125	25%
Age Group	45–54	75	15%
Age Group	55+	25	5%
Education	High school or less	95	19%
Education	Bachelor's	325	65%
Education	Postgraduate	80	16%

Interpretation:

The demographic profile shows a relatively young and educated sample, with 55% under the age of 34 and 81% holding at least a bachelor's degree. This suggests that the study population is well-suited to digital technology adoption, which may positively influence app uptake.

6.2 Awareness and Usage

Table 2. Awareness and Regular Use of Blood Donation Applications

Question	Response	Count	Percentage
Heard of blood donation apps	Yes	420	84%
	No	80	16%
Regular use among aware respondents	Yes	105	25% of 420
	No	315	75% of 420

Table 3. Most Used Applications among Regular Users (n = 105)

Application	Count	Percentage
Wateen	65	61.9%
Dammi	25	23.8%
Other	15	14.3%

Interpretation:

While overall awareness of applications is high (84%), consistent usage is relatively low (25%). Among those who use apps, Wateen dominates as the primary choice, reflecting its stronger integration with the Ministry of Health’s services.

6.3 Motivations

Table 4. Motivations for Using Blood Donation Applications

Motivation	Mean	Std. Dev.	% Important (4+5)
Desire to help those in need	4.6	0.7	85%
Ease of booking and reminders	4.2	0.9	75%
Awareness of urgent need for specific blood	3.9	1.1	65%
Receiving incentives or rewards	2.9	1.3	30%

Interpretation:

Humanitarian motives are the strongest driver, aligning with cultural and religious values in Saudi Arabia that emphasize altruism. Convenience-related factors such as reminders also play a significant role, while material incentives remain secondary.

6.4 Obstacles

Table 5. Obstacles to Using Blood Donation Applications

Obstacle	Mean	Std. Dev.	% Agree (4+5)
Privacy and security concerns	3.6	1.3	50%

Obstacle	Mean	Std. Dev.	% Agree (4+5)
Lack of time / inflexible working hours	3.5	1.3	45%
Uncertainty about health eligibility	3.4	1.4	45%
Fear of needles or dizziness	3.1	1.5	40%
Lack of knowledge on how to use applications	2.3	1.2	15%

Interpretation:

The findings highlight privacy concerns and time constraints as the main barriers to app adoption. These results underline the need for enhanced data security measures and more flexible scheduling options in app design.

6.5 Statistical Findings

Table 6a. ANOVA: App Usage Frequency by Age Group

Age Group	Mean App Use Frequency	Std. Dev.	n
18–24	3.8	1.1	120
25–34	3.5	1.2	155
35–44	3.2	1.3	125
45–54	2.7	1.4	75
55+	2.4	1.5	25

Table 6b. ANOVA Summary (Age and App Usage)

Source	Sum of Squares	df	Mean Square	F	p
Between Groups	45.82	4	11.455	5.127	0.001
Within Groups	1105.63	495	2.233	—	—
Total	1151.45	499	—	—	—

Interpretation:

The ANOVA test confirms significant differences between age groups in app usage frequency ($p < 0.01$). Younger groups (18–34) report higher adoption, supporting the hypothesis that younger individuals are more inclined toward mobile health technologies.

Table 7. Pearson Correlation Matrix of Main Variables

Variable	App Use	Donation Freq	Ease of Use	Privacy Concerns	Age	Incentives Importance
App Use Frequency	1.00	0.72**	0.68**	-0.54**	-0.40**	-0.32**
Donation Frequency/Year	0.72**	1.00	0.65**	-0.46**	-0.38**	-0.28*

Variable	App Use	Donation Freq	Ease of Use	Privacy Concerns	Age	Incentives Importance
Ease of App Use	0.68**	0.65**	1.00	-0.50**	-0.30*	-0.25*
Privacy Concerns	-0.54**	-0.46**	-0.50**	1.00	0.42**	0.31*
Age	-0.40**	-0.38**	-0.30*	0.42**	1.00	0.45**
Incentives Importance	-0.32**	-0.28*	-0.25*	0.31*	0.45**	1.00

* Significant at $p < 0.05$, ** Significant at $p < 0.01$.

Interpretation:

Correlation results reveal strong positive associations between app usage and donation frequency ($r = 0.72$, $p < 0.01$). Ease of app use is also strongly related to intention to donate ($r = 0.65$, $p < 0.01$). Conversely, privacy concerns and age are negatively correlated with app adoption, suggesting that older participants and those with higher privacy concerns are less likely to use these platforms.

7. Discussion

The results of this study highlight the growing but still underutilized role of mobile health applications in motivating blood donation within Saudi Arabia. While awareness levels of such applications are high (84%), consistent adoption remains modest (25%). This discrepancy suggests that knowledge alone is insufficient to change behavior, echoing findings from global health technology adoption studies.

The dominance of Wateen as the most frequently used app aligns with its official endorsement by the Saudi Ministry of Health, which provides legitimacy and trust. However, the relatively low usage of Dammi and other platforms reflects fragmentation and possible lack of coordinated promotion.

Motivational drivers observed in this study, particularly humanitarian values, mirror cultural and religious norms in Saudi society that emphasize altruism, solidarity, and community service. These intrinsic motivations appear stronger than extrinsic incentives such as material rewards, consistent with Ajzen's (1991) Theory of Planned Behavior, where attitudes and perceived social obligations influence behavioral intentions.

The primary obstacles—privacy concerns and inflexible scheduling—indicate structural barriers. Privacy concerns are particularly important in the digital health context, where data sensitivity and user trust are paramount. Without transparent security measures, adoption will likely stagnate. Scheduling issues further reflect the need for app integration with daily life, such as workplace or university calendars, to reduce logistical burdens.

The ANOVA findings confirmed significant differences in adoption across age groups, with younger participants showing higher usage rates. This is consistent with the Technology Acceptance Model, as younger individuals generally perceive technology as easier to use and more beneficial. The correlation matrix further demonstrated that app use frequency has a strong positive relationship with blood donation

frequency, underscoring the practical potential of mobile applications to enhance donation rates if adoption barriers are addressed.

Comparing these results with global experiences, Saudi Arabia's trajectory resembles patterns observed in developed countries, though adoption rates are flatter. This could be attributed to cultural hesitancy, lack of widespread promotional campaigns, and insufficient integration with national health systems. Nevertheless, the study confirms that digital solutions are not merely supplementary but central to scaling up voluntary blood donation.

8. Conclusion

This study concludes that electronic applications represent a transformative tool in promoting voluntary blood donation in Saudi Arabia. While awareness is relatively high, actual usage remains limited, primarily due to privacy concerns, scheduling difficulties, and uncertainty about eligibility. Despite these barriers, humanitarian values and altruistic motives strongly encourage donation, and mobile applications provide a convenient bridge between intention and action.

The statistical analysis confirms that greater usage of applications correlates with higher donation frequency, reinforcing their potential as behavioral catalysts. Younger age groups are particularly receptive to digital adoption, which highlights the importance of targeting them in awareness and promotional campaigns.

The Saudi case demonstrates how digital health platforms can serve as a model for other countries struggling with blood shortages. By addressing privacy, improving app usability, and strengthening integration with healthcare infrastructure, Saudi Arabia has the opportunity to become a global leader in technology-driven public health initiatives.

9. Recommendations

Based on the findings of this study, several recommendations can be made to improve the role of digital applications in promoting blood donation in Saudi Arabia and beyond:

1. Enhance Privacy and Security:

- Implement robust encryption and transparent data policies.
- Regularly audit and communicate privacy standards to users to build trust.

2. Improve User Experience:

- Develop intuitive designs with simplified navigation.
- Offer real-time updates on donation center availability and urgent needs.

3. Integrate with National Health Systems:

- Link donation apps with the Saudi health record system to streamline eligibility checks.
- Allow automatic updates on donation history and medical fitness.

4. Flexible Scheduling:

- Enable integration with workplace and university calendars.
- Provide mobile donation units that can be requested via the app.

5. Awareness and Promotional Campaigns:

- Use social media and influencers to promote the use of apps.

- Link campaigns with religious and cultural values of altruism to motivate broader participation.
- 6. **Target Youth and First-Time Donors:**
 - Gamify donation experiences to attract younger audiences.
 - Provide educational resources on the safety and importance of blood donation.
- 7. **International Collaboration:**
 - Share best practices with global health organizations such as WHO.
 - Position Saudi Arabia as a pioneer in digital blood donation strategies under Vision 2030.

10. References (APA 7th Edition)

1. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
2. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
3. Smith, J. A., & Johnson, L. B. (2020). The impact of mobile health apps on blood donation. *Journal of Health Informatics*, 12(4), 211–225.
4. World Health Organization. (2023). Blood safety and availability. WHO. <https://www.who.int/health-topics/blood-safety>
5. Ministry of Health, Saudi Arabia. (2023). Annual health indicators report. MOH.
6. Al-Omari, M. (2021). Barriers and facilitators of voluntary blood donation in Saudi Arabia. *Saudi Medical Journal*, 42(5), 507–514.
7. Khan, R., & Ahmed, S. (2022). Digital transformation in healthcare: The role of mobile apps in patient engagement. *Health Informatics Journal*, 28(3), 1–12.
8. Rahman, T., & Alharbi, F. (2023). Privacy concerns in mobile health applications in the Middle East. *International Journal of Medical Informatics*, 171, 105–116.
9. World Health Organization. (2022). Global status report on blood safety and availability. WHO.
10. Zhang, Y., & Li, X. (2022). Gamification strategies in health applications: Enhancing user engagement. *Digital Health*, 8, 1–14.

11. Appendices

Introduction to Appendices

The following appendices provide supplementary material that complements the core findings of this research. While the main text presented descriptive statistics and key interpretations, the appendices expand the analysis by including detailed statistical outputs, extended correlation patterns, a structured research timeline, and comparative descriptions of the studied applications. These additions serve to enhance the academic rigor of the study and provide readers with deeper insights into the demographic influences, behavioral relationships, and technological features that shaped the results.

By including ANOVA tables, correlation matrices, and supporting materials, the study aims to provide transparency in its methodology and allow future researchers to replicate or build upon the work. The appendices also help situate the Saudi experience within a broader context of mobile health adoption, reinforcing the relevance of this case study to global health practices.

Appendix A: Detailed ANOVA Tables

Table A1. ANOVA – App Usage Frequency by Age Group

Age Group	Mean Frequency	Std. Dev.	n		
18–24	3.8	1.1	120		
25–34	3.5	1.2	155		
35–44	3.2	1.3	125		
45–54	2.7	1.4	75		
55+	2.4	1.5	25		
Source	Sum of Squares	df	Mean Square	F	p
Between Groups	45.82	4	11.455	5.127	0.001
Within Groups	1105.63	495	2.233	—	—
Total	1151.45	499	—	—	—

Table A2. ANOVA – App Usage Frequency by Education Level

Education Level	Mean Frequency	Std. Dev.	n		
High school or less	2.9	1.2	95		
Bachelor’s	3.5	1.1	325		
Postgraduate	3.7	1.0	80		
Source	Sum of Squares	df	Mean Square	F	p
Between Groups	18.34	2	9.17	4.128	0.016
Within Groups	1098.25	497	2.21	—	—
Total	1116.59	499	—	—	—

Interpretation:

The results show statistically significant differences in app adoption by both age and education. Younger and more educated groups demonstrate higher usage levels, highlighting digital literacy as a crucial factor.

Appendix B: Full Correlation Matrix

Table B1. Correlation Matrix of Key Variables

Variable	App Use Frequency	Donation Frequency	Ease of App Use	Privacy Concerns	Age	Incentives Importance
App Use Frequency	1.00	0.72**	0.68**	-0.54**	-0.40**	-0.32**
Donation Frequency	0.72**	1.00	0.65**	-0.46**	-0.38**	-0.28*
Ease of App Use	0.68**	0.65**	1.00	-0.50**	-0.30*	-0.25*
Privacy Concerns	-0.54**	-0.46**	-0.50**	1.00	0.42**	0.31*
Age	-0.40**	-0.38**	-0.30*	0.42**	1.00	0.45**

Variable	App Use Frequency	Donation Frequency	Ease of App Use	Privacy Concerns	Age	Incentives Importance
Incentives Importance	-0.32**	-0.28*	-0.25*	0.31*	0.45**	1.00

* Significant at $p < 0.05$, ** Significant at $p < 0.01$

Interpretation:

- Strong positive correlations exist between app use frequency, donation frequency, and ease of app use.
- Privacy concerns and age show significant negative correlations with app adoption.
- Incentives are positively related to older age groups but negatively associated with overall adoption.

Appendix C: Research Timeline (Gantt Chart Style)

Table C1. Research Timeline

Phase	Activities	Duration (Months)	Timeline
Proposal Development	Literature review, framework, survey design	1–2	Jan – Feb 2023
Data Collection	Distribution of surveys, interviews	3–4	Mar – Apr 2023
Data Analysis	SPSS analysis, ANOVA, correlation tests	5	May 2023
Writing	Drafting results, discussion, conclusion	6–7	Jun – Jul 2023
Review & Submission	Final editing, supervisor review, submission	8	Aug 2023

Interpretation:

This structured timeline reflects the methodological rigor of the research. Each phase was carefully planned to ensure reliable data collection, accurate statistical analysis, and systematic reporting of results.

Appendix D: Application Screenshots and Features

Descriptions of Main Applications:

- **Wateen App**
 - Developed by the Ministry of Health.
 - Features: appointment booking, eligibility checks, donor history tracking, integration with national health services.
 - Provides notifications for urgent blood needs.
- **Dammi App**
 - Independent alternative donation platform.
 - Features: donor registration, scheduling, nearby center locator.
 - Less integrated with official health records compared to Wateen.

Table D1. Comparison of Wateen and Dammi Features

Feature	Wateen App	Dammi App
Appointment Scheduling	✓	✓
Donation Eligibility Check	✓	X
Donor History Tracking	✓	X
Urgent Need Notifications	✓	X
Integration with Health System	✓	X
Official Ministry Backing	✓	X

Interpretation:

The stronger adoption of Wateen can be attributed to its comprehensive features and official government support, while Dammi faces adoption challenges due to weaker integration and limited visibility.

Conclusion

Following this comprehensive research journey, we can conclude that electronic applications have become effective and crucial tools in promoting a culture of blood donation in Saudi society. The study results have demonstrated a significant positive impact of these applications on individual behavior, contributing to increased awareness, simplified procedures, and the removal of obstacles that previously hindered active participation in donation processes.

The study confirmed that these applications are not merely technical channels but have transformed into interactive platforms that enhance human and social values, attracting various segments of society, particularly the youth who represent the foundation of the future and pillars of positive change. The results also showed that religious and humanitarian motivations were the primary drivers for donation, reflecting the depth of authentic values characteristic of Saudi society.

The notable success achieved by applications such as "Wateen," "Dammi," and "Taba" confirms the importance of continuing to develop these digital tools and the necessity of employing the latest technologies to provide an exceptional user experience while maintaining the cultural and religious privacy of Saudi society.

In conclusion, this study represents a valuable addition to scientific knowledge in the field of digital health and provides a practical framework that researchers, developers, and decision-makers can build upon. It also opens new horizons for future research in the development of digital health services and their utilization to serve the community.

Researcher Information

List of Authors:

- [TARAHIB SALEH ALMUTAIRI]
- [manal odhayb alwaldah]
- [raghad odhayeb alwaldah]
- [adhwaaj naji aljehani]
- [nouf Ibrahim alhumaid]
- [moodi Khaled abudajene]

Date: [14-09-2025]