

BIOMETRIC-BASED FRISTA APPLICATION AND OUTPATIENT SATISFACTION AT DARKUTHNI PRIMARY CLINIC

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ABSTRACT

Outpatient care requires accurate, timely, convenient, and secure patient identification. However, problems related to patient identification, administrative efficiency, and data security may affect patients' experiences and satisfaction. FRISTA is a biometric authentication system designed to support automated patient identification. Nevertheless, the association between FRISTA use and outpatient satisfaction in primary healthcare settings in Indonesia remains insufficiently evaluated. This study aimed to examine the association between the use of the FRISTA application and outpatient satisfaction at Darkuthni Primary Clinic, Tojo Una-Una Regency, Central Sulawesi, Indonesia. A quantitative approach with a cross-sectional design was employed, involving 150 outpatients selected using stratified random sampling from the Obstetrics and Gynecology, Internal Medicine, and Neurology Clinics. Data were analyzed using the Chi-square test and multivariate binary logistic regression, with results expressed as odds ratios (OR) and 95% confidence intervals (CI). The Chi-square test showed that ease of service access, service speed, patient identification accuracy, and personal data security were significantly associated with patient satisfaction ($p < 0.05$). Multivariate binary logistic regression showed that patient identification accuracy (OR = 2.226; 95% CI: 1.019–4.861; $p = 0.045$) and personal data security (OR = 1.748; 95% CI: 1.028–2.972; $p = 0.039$) remained significantly associated with patient satisfaction, whereas ease of service access and service speed were not independently associated with patient satisfaction. The multivariate binary logistic regression model yielded a Nagelkerke R^2 of 0.897. The use of the FRISTA biometric application was significantly associated with outpatient satisfaction. Therefore, improving patient identification accuracy and strengthening personal data security should be prioritized in implementing biometric-based digital health systems in primary healthcare settings to enhance patient satisfaction.

ABSTRAK

Pelayanan rawat jalan memerlukan identifikasi pasien yang akurat, tepat waktu, mudah, dan aman. Namun, permasalahan terkait identifikasi pasien, efisiensi administrasi, dan keamanan data dapat memengaruhi pengalaman dan kepuasan pasien. FRISTA merupakan sistem autentikasi biometrik yang dirancang untuk mendukung identifikasi pasien secara otomatis. Meskipun demikian, hubungan antara penggunaan FRISTA dan kepuasan pasien rawat jalan di fasilitas pelayanan kesehatan primer di Indonesia masih belum banyak dievaluasi. Penelitian ini bertujuan untuk menganalisis hubungan antara penggunaan aplikasi FRISTA dan kepuasan pasien rawat jalan di Klinik Utama Darkuthni, Kabupaten Tojo Una-Una, Sulawesi Tengah, Indonesia. Penelitian ini menggunakan pendekatan kuantitatif dengan desain cross-sectional, yang melibatkan 150 pasien rawat jalan yang dipilih menggunakan teknik stratified random sampling dari Klinik Kebidanan dan Kandungan, Klinik Penyakit Dalam, dan Klinik Saraf. Data dianalisis menggunakan uji Chi-square dan regresi logistik biner multivariat, dengan hasil analisis disajikan dalam bentuk odds ratio (OR) dan 95% confidence interval (CI). Hasil uji Chi-square menunjukkan bahwa kemudahan akses layanan, kecepatan pelayanan, keakuratan identifikasi pasien, dan keamanan data pribadi berhubungan secara signifikan dengan kepuasan pasien ($p < 0,05$). Hasil regresi

logistik biner multivariat menunjukkan bahwa keakuratan identifikasi pasien (OR = 2,226; 95% CI: 1,019–4,861; p = 0,045) dan keamanan data pribadi (OR = 1,748; 95% CI: 1,028–2,972; p = 0,039) tetap berhubungan secara signifikan dengan kepuasan pasien, sedangkan kemudahan akses layanan dan kecepatan pelayanan tidak berhubungan secara independen dengan kepuasan pasien. Model regresi logistik biner multivariat menghasilkan nilai Nagelkerke R² sebesar 0,897. Penggunaan aplikasi biometrik FRISTA berhubungan secara signifikan dengan kepuasan pasien rawat jalan. Oleh karena itu, peningkatan keakuratan identifikasi pasien dan penguatan keamanan data pribadi perlu menjadi prioritas dalam penerapan sistem kesehatan digital berbasis biometrik di fasilitas pelayanan kesehatan primer untuk meningkatkan kepuasan pasien.

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INTRODUCTION

Patient satisfaction is a key indicator of healthcare service quality and has become an important outcome in evaluating the implementation of digital health technologies. Among these technologies, biometric-based patient authentication systems have attracted increasing attention because they improve patient identification accuracy, strengthen information security, and enhance service efficiency. The adoption of biometric technologies, including facial recognition and fingerprint identification, has expanded globally as healthcare systems seek to provide safer, faster, and more patient-centered services (Kortli et al., 2020; Wells & Usman, 2024).

These global developments have also influenced the digital transformation of healthcare services in Indonesia. In line with BPJS Kesehatan Regulation No. 6 of 2020 on fraud prevention in the National Health Insurance Program, healthcare facilities have begun implementing biometric authentication systems to improve patient verification and administrative efficiency (BPJS Kesehatan, 2020). One such innovation is the Face Recognition Integrated System for Trusted Authentication (FRISTA), which has been implemented at Darkuthni Primary Clinic since early 2024. FRISTA uses facial recognition technology to authenticate patients by matching their facial images with biometric data stored in the BPJS Kesehatan database, thereby reducing identification errors, accelerating the registration process, and enhancing administrative accuracy.

Although biometric technologies offer significant operational benefits, successful implementation depends not only on technical performance but also on patients' experiences with the system. Patient satisfaction may be influenced by ease of access, service speed, patient identification accuracy, personal data security, trust, and digital literacy. Furthermore, healthcare professionals require adequate digital competencies to ensure the effective and sustainable implementation of digital health technologies (Hege et al., 2020; O.Navarro-Martinez et al., 2023; Wells & Usman, 2024).

Since its implementation, FRISTA has reduced outpatient registration time at Darkuthni Primary Clinic from approximately eight minutes to two minutes and decreased complaints related to patient queues and identification errors. Nevertheless, internal evaluations indicated that some patients remained concerned about personal data security, while others still required assistance during digital registration. In addition, not all administrative staff had received comprehensive training on the FRISTA system. These findings suggest that, despite improving operational efficiency, the successful implementation of biometric technology also depends on patients' perceptions and experiences.

Previous studies on biometric technology in healthcare have primarily focused on system development, authentication performance, cybersecurity, and data protection (Meegada, 2025). However, evidence regarding the association between biometric-based patient authentication systems and patient satisfaction in primary healthcare settings, particularly in Indonesia, remains limited. Specifically, the association between FRISTA implementation and outpatient satisfaction based on ease of service access, service speed, patient identification accuracy, and personal data security has not been adequately evaluated. This gap provides the rationale for the present study, while its novelty lies in evaluating FRISTA implementation from a patient satisfaction perspective across these four service dimensions. Therefore, this study aimed to examine the association between the utilization of the biometric-based Face Recognition Integrated System for Trusted Authentication (FRISTA) application

and outpatient satisfaction at Darkuthni Primary Clinic, Tojo Una-Una District, Central Sulawesi, Indonesia.

METHOD

Type of Research

This study employed a quantitative approach with an analytical observational method and a cross-sectional design to analyze the effect of utilizing the biometric-based FRISTA application on outpatient satisfaction (Creswell & Ceswell, 2023).

Place and Time of Research

The study was conducted at Darkuthni Primary Clinic, Palu City, Central Sulawesi, Indonesia, from 5 Mei to 5 June 2025.

Population and Sample

The study population comprised all outpatients attending the Obstetrics, Internal Medicine, and Neurology clinics at Darkuthni Primary Clinic. These three clinics were selected because they had the highest patient attendance based on records from January to March 2025, with an average of 241 visits per month. The study sample consisted of 150 eligible outpatients aged 18–65 years who had visited the clinic at least once during the study period. The sample size was determined using Slovin's formula. Participants were selected through proportionate stratified random sampling according to the number of patient visits in each clinic and randomly selected from the patient visit lists within each stratum (Handayani & Saeni, 2024).

Ethical approval was obtained from the Health Research Ethics Committee, Faculty of Public Health, Hasanuddin University (Approval No. 6241/UN4.14.1/TP.01.02/2024), and all participants provided informed consent.

Data Collection

Data were collected using a structured questionnaire administered through face-to-face interviews, with Google Forms used solely as a digital platform to record respondents' responses. The face-to-face interviews were conducted only to administer the questionnaire and assist respondents in completing it; no qualitative interview data were collected or analyzed. The questionnaire consisted of two sections: respondent characteristics and five study variables, namely ease of access, service speed, patient identification accuracy, personal data security, and patient satisfaction. Each variable was measured using 10 items on a five-point Likert scale ranging from 5 (strongly agree) to 1 (strongly disagree) (Creswell & Ceswell, 2023). The total scores were categorized into low (10–24), moderate (25–39), and high (40–50) for the independent variables, while patient satisfaction was categorized as dissatisfied (10–39) and satisfied (40–50) for statistical analysis.

The questionnaire was tested for validity using the Pearson product-moment correlation test and for reliability using Cronbach's alpha coefficient (Field, 2024; Hair et al., 2021). All 50 questionnaire items demonstrated statistically significant Pearson product-moment correlation coefficients ($p < 0.05$) and were therefore retained for analysis. The questionnaire demonstrated excellent reliability, with an overall Cronbach's alpha coefficient of 0.982, indicating excellent internal consistency.

Data Analysis and Processing

Data were analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics were used to summarize respondents' characteristics and study variables. Associations between independent variables and patient satisfaction were examined using the Chi-square test. Variables specified a priori in the study framework (ease of access, service speed, patient identification accuracy, and personal data security) were entered simultaneously into a multivariable binary logistic regression model (Enter method). The results were reported as odds ratios (OR), 95% confidence intervals (95% CI), and p-values. Model performance was evaluated using the Nagelkerke R^2 statistic (Field, 2024).

RESULT

A total of 150 eligible outpatients participated in this study. The demographic characteristics of the participants are presented in Table 1.

Table 1. Demographic Characteristics of Respondents (n=150)

Respondent Characteristics	n	%
Gender		
Male	31	21.0
Female	119	79.0
Age Group (years)		
< 20 years	5	3.0
20–30 years	51	34.0
31–40 years	26	17.0
> 40 years	68	45.0
Last Education Level		
Elementary School	24	16.0
Junior High School	25	17.0
Senior High/Vocational School	57	38.0
Diploma 3 (D3)	7	4.0
Bachelor or Applied Bachelor	36	24.0
Master's Degree	1	1.0
Visit Frequency		
First-time Visit	26	17.0
2–5 Times	74	49.0
More than 5 Times	50	33.0
Visit Purpose		
Obstetrics Clinic	77	51.0
Internal Medicine Clinic	57	38.0
Neurology Clinic	16	11.0
Use of FRISTA Application		
Once	34	23.0
2–3 Times	52	35.0
More than 3 Times	64	43.0
Registration Method		
Self-service	0	0.0
With Staff Assistance	150	100.0

A total of 150 eligible outpatients participated in this study. The demographic characteristics of the participants are presented in Table 1. Overall, the respondents were predominantly female, aged over 40 years, had completed senior high school or equivalent, and had visited the clinic between two and five times. Most participants were recruited from the Obstetrics and Gynecology Clinic and had previously used the FRISTA application more than three times. All respondents completed the registration process with assistance from healthcare staff because the FRISTA biometric registration system was newly implemented at the study site, and staff assistance was routinely provided to ensure accurate patient authentication and facilitate the registration process.

Ease of access to services was predominantly rated as moderate, whereas service speed, patient identification accuracy, and personal data security were predominantly rated as high. Overall, most respondents were categorized as satisfied with the outpatient registration services using the FRISTA application.

Table 2. Distribution of Respondents by Research Variables (n=150)

Research Variable	n	%
Ease of Access to Services		
Low (score 0–24)	2	1
Moderate (score 25–39)	102	68
High (score 40–50)	46	31
Service Speed		
Low (score 0–24)	3	2
Moderate (score 25–39)	24	16
High (score 40–50)	123	82
Patient Identification Accuracy		
Low (score 0–24)	3	2
Moderate (score 25–39)	20	13
High (score 40–50)	127	85
Personal Data Security		
Low (score 0–24)	2	1
Moderate (score 25–39)	7	5
High (score 40–50)	141	94
Patient Satisfaction		
Not Satisfied (score 0–39)	12	8
Satisfied (score 40–50)	138	92

Most respondents perceived ease of access to services as moderate, while patient satisfaction was highest among respondents who perceived ease of access as high. The Chi-square test demonstrated a statistically significant association between ease of access to services and patient satisfaction ($p = 0.029$).

Table 3. Association Between Ease of Access to Services

Ease of Access to Services	Patient Satisfaction				Total (N)	%	p-value
	Not Satisfied	%	Satisfied	%			
Low	0	0	2	1	2	1	0.029
Moderate	12	100	90	65	102	68	
High	0	0	46	33	46	31	
Total	12	100	138	100	150	100	

Most respondents perceived service speed as high, and patient satisfaction was highest among respondents who perceived service speed as high. The Chi-square test demonstrated a statistically significant association between service speed and patient satisfaction ($p < 0.001$).

Table 4. Association Between Service Speed and Patient Satisfaction

Service Speed	Patient Satisfaction				Total (N)	%	p-value
	Not Satisfied	%	Satisfied	%			
Low	2	17	1	1	3	2	<0.001
Moderate	10	83	14	10	24	16	
High	0	0	123	89	123	82	
Total	12	100	138	100	150	100	

Most respondents perceived patient identification accuracy as high, and patient satisfaction was highest among respondents who perceived patient identification accuracy as high. The Chi-square test

demonstrated a statistically significant association between patient identification accuracy and patient satisfaction ($p < 0.001$).

Table 5. Association Between Patient Identification Accuracy and Patient Satisfaction

Patient Identification Accuracy	Patient Satisfaction				Total (N)	%	p-value
	Not Satisfied	%	Satisfied	%			
Low	2	17	1	1	3	2	<0.001
Moderate	10	83	10	7	20	13	
High	0	0	127	92	127	85	
Total	12	100	138	100	150	100	

Most respondents perceived personal data security as high, and patient satisfaction was highest among respondents who perceived personal data security as high. The Chi-square test demonstrated a statistically significant association between personal data security and patient satisfaction ($p < 0.001$).

Table 6. Association Between Personal Data Security and Patient Satisfaction

Personal Data Security	Patient Satisfaction				Total (N)	%	p-value
	Not Satisfied	%	Satisfied	%			
Low	2	17	0	0	2	1	<0.001
Moderate	6	50	1	1	7	5	
High	4	33	137	99	141	94	
Total	12	100	138	100	150	100	

Multivariate binary logistic regression analysis showed that accurate patient identification and personal data security remained significantly associated with patient satisfaction, whereas ease of access to services and service delivery speed were not independently associated with patient satisfaction.

Table 7. Multivariable Binary Logistic Regression Analysis of Factors Associated with Patient Satisfaction

Independent Variable	Adjusted OR	95% CI	p-value
Ease of Access to Services	2.649	0.512–13.700	0.245
Service Speed	0.551	0.287–1.058	0.073
Patient Identification Accuracy	2.226	1.019–4.861	0.045
Personal Data Security	1.748	1.028–2.972	0.039

DISCUSSION

The bivariate analysis showed that all study variables were significantly associated with patient satisfaction. However, in the multivariable binary logistic regression analysis, only patient identification accuracy and personal data security remained independently associated with patient satisfaction. These findings indicate that these two factors are the primary determinants of patient satisfaction in the implementation of the FRISTA biometric system.

1. Patient Identification Accuracy and Patient Satisfaction

The results of this study demonstrate that patient identification accuracy was independently associated with patient satisfaction after adjustment for other variables in the multivariable model (OR = 2.226; 95% CI: 1.019–4.861; $p = 0.045$). Patients with better perceptions of patient identification accuracy had approximately 2.23 times higher odds of reporting satisfaction than those in the reference category, suggesting that accurate patient identification is an important component

of patient satisfaction in the implementation of the Face Recognition Integrated System for Trusted Authentication (FRISTA) at Darkuthni Primary Clinic.

Accurate patient identification is essential for ensuring that patients are correctly matched with their corresponding health information and medical records, particularly in digitally integrated healthcare environments. An open-source facial recognition system integrated with electronic health records demonstrated a sensitivity of 99.0% for unique patient matching, supporting the potential of facial recognition as a reliable approach to patient identification in healthcare settings (Ampamy et al., 2020).

This finding is consistent with previous evidence demonstrating a significant relationship between appropriate patient identification and patient satisfaction. A cross-sectional study involving 99 patients found a statistically significant association between correct patient identification and patient satisfaction ($p < 0.001$), supporting the importance of accurate patient identification in shaping a positive patient experience (Kodobo et al., 2022).

In the context of FRISTA, accurate identity verification may strengthen patients' perceptions of service reliability and safety. Facial recognition linked with electronic medical records enables patient identities to be verified during registration and appropriately matched with their medical records. When patients perceive this process as accurate and reliable, they may develop greater confidence in the registration process and the healthcare services they receive. Thus, accurate patient identification may represent not only an administrative requirement but also an important aspect of patients' overall experience with digitally supported healthcare.

Overall, patient identification accuracy was independently associated with patient satisfaction, highlighting the importance of maintaining reliable patient identification and accurate linkage with electronic medical records in biometric-based healthcare systems such as FRISTA. However, because the present study demonstrates an association rather than causation, further longitudinal or comparative studies are needed to determine whether improvements in biometric-based patient identification accuracy lead to measurable improvements in patient satisfaction.

2. Personal Data Security and Patient Satisfaction

The results of this study demonstrate that personal data security was independently associated with patient satisfaction after adjustment for other variables in the multivariable model (OR = 1.748; 95% CI: 1.028–2.972; $p = 0.039$). Patients with better perceptions of personal data security had approximately 1.75 times higher odds of reporting satisfaction than those in the reference category, suggesting that perceived data protection is an important component of patient satisfaction in the implementation of FRISTA at Darkuthni Primary Clinic.

This finding is supported by evidence emphasizing the importance of privacy and security in digital healthcare. Secure management of electronic health information requires robust authentication, access control, and privacy mechanisms to protect sensitive patient information from unauthorized access, data leakage, and tampering. Blockchain and distributed ledger approaches have similarly been proposed to strengthen privacy, security, and reliable sharing of healthcare information (Liu et al., 2020).

Trust may provide an important explanation for the observed association. A cross-sectional study in Sweden found that 81.9% of respondents had high trust in healthcare providers' ability to protect electronic patient data, whereas those with lower trust were less willing to allow their personal data to be used and perceived greater risks from unauthorized access (Belfrage et al., 2022).

In the context of FRISTA, which uses facial recognition for patient authentication and is integrated with electronic medical records, concerns regarding the protection of personal and biometric information are particularly relevant. Patients who perceive that their information is securely managed may have greater confidence in the reliability and professionalism of healthcare services. Thus, data security may represent not only a technical requirement but also an important aspect of patients' overall experience with digitally supported healthcare.

Overall, personal data security was independently associated with patient satisfaction, highlighting the importance of maintaining secure authentication, access control, confidentiality, and responsible data-management practices in biometric-based healthcare systems such as FRISTA. However, because the present study demonstrates an association rather than causation, further

longitudinal studies are needed to determine whether improvements in perceived and objectively measured data security lead to measurable improvements in patient satisfaction.

3. Service Speed and Patient Satisfaction

The results of this study showed that service speed was not independently associated with patient satisfaction after adjustment for other variables in the multivariable model (OR = 0.551; 95% CI: 0.287–1.058; $p = 0.073$). The 95% confidence interval included 1 and the p -value exceeded 0.05, indicating that the association was not statistically significant. These findings suggest that service speed alone may not independently explain patient satisfaction in the context of the implementation of the Face Recognition Integrated System for Trusted Authentication (FRISTA) at Darkuthni Primary Clinic.

Previous studies have nevertheless demonstrated that waiting time is associated with patient satisfaction in outpatient healthcare settings. A cross-sectional study conducted in the outpatient department of a tertiary care hospital found that patients with shorter waiting times were significantly more satisfied with hospital services ($p = 0.004$), indicating that timely service remains an important component of the patient experience (Belfrage et al., 2022).

Similar evidence has been reported in Indonesia. A cross-sectional study at the Surgical Polyclinic of Bekasi District Hospital found a significant relationship between waiting time and patient satisfaction ($p < 0.001$), suggesting that patients' satisfaction may be influenced by the time spent waiting for healthcare services (Yuliati, 2024).

In contrast to these previous studies, service speed did not remain statistically significant in the adjusted model of the present study. This difference may reflect variations in study settings, patient characteristics, measurement approaches, and statistical analyses. In the context of FRISTA, service speed represents only one aspect of the digitally supported registration process; therefore, its relationship with patient satisfaction may be influenced by other aspects of the service experience. Importantly, the present findings do not indicate that service speed is unimportant, but rather that it was not independently associated with patient satisfaction after adjustment for the other variables included in the model.

Overall, service speed remains a relevant dimension of healthcare service delivery, although it was not an independent factor associated with patient satisfaction in the present study. Maintaining efficient service processes should therefore remain an important consideration in the implementation of FRISTA, while recognizing that patient satisfaction may reflect multiple dimensions of the healthcare experience. Further studies are needed to determine how service speed interacts with other aspects of biometric-based digital healthcare services in shaping patient satisfaction.

4. Ease of Access to Services and Patient Satisfaction

The results of this study showed that Ease of Access to Services was not independently associated with Patient Satisfaction after adjustment (AOR = 2.649; 95% CI: 0.512–13.700; $p = 0.245$). Although the odds ratio suggests that patients with easier access to services had higher odds of being satisfied, the wide confidence interval and non-significant p -value indicate considerable uncertainty in this association. Thus, ease of access may contribute to a positive healthcare experience, but its independent association with patient satisfaction appears to be limited when other factors are considered simultaneously.

Evidence from previous digital healthcare studies nevertheless demonstrates that ease of use and accessibility are important components of patients' experiences. Simola et al. (2023) evaluated 4,719 users of Finland's national My Kanta patient portal and reported good overall usability, with a mean System Usability Scale score of 74.3 (SD 14.0). Very positive experiences were significantly associated with better perceived usability ($\beta = 0.51$, $p < 0.001$), whereas very negative experiences were associated with poorer usability ($\beta = -1.28$, $p < 0.001$). Importantly, 25.15% of respondents who described very positive experiences specifically mentioned ease of use, while 20.03% valued being able to find and access health information easily and quickly. Patients also appreciated being able to access information regardless of time or place and without having to contact healthcare services directly. These findings indicate that ease and convenience of access are meaningful elements of a positive digital healthcare experience.

Similar findings were reported by Farias et al., (2024) among 115 patients receiving telemedicine for substance-related disorders in Argentina. More than 90% of participants agreed that virtual consultations were easy to perform, 95.7% reported being satisfied with virtual care, and more than 85% indicated that they would undergo treatment virtually again. Telemedicine also provided practical accessibility benefits: 93.9% reported saving money, while 66.1% reported saving more than two hours per week. Furthermore, the study's multivariable analysis showed that the composite users' assessment of telemedicine, which included ease of use together with adequacy of consultation time, willingness to reuse telemedicine, and perceived equivalence of care, significantly predicted satisfaction ($p = 0.042$).

However, these findings should not be interpreted as evidence that ease of access alone determines patient satisfaction. In Farias et al., ease of use was incorporated into a multidimensional assessment rather than tested as an independent predictor of satisfaction. Similarly, Simola et al. primarily examined perceived usability and positive or negative patient experiences rather than satisfaction as a separate outcome. Therefore, the present finding extends this evidence by suggesting that, although convenient and accessible digital services may enhance patients' experiences, Ease of Access to Services may not independently determine satisfaction once other dimensions of service experience are taken into account.

One possible explanation is that accessibility functions primarily as a facilitating condition rather than the principal determinant of satisfaction. Digital healthcare can reduce geographical and logistical barriers by allowing patients to obtain services remotely, while also reducing transportation, waiting time, and associated costs. Farias et al. demonstrated these practical advantages, yet time saved was only marginally associated with satisfaction ($p = 0.083$), while money saved was also not independently associated with satisfaction ($p = 0.106$). This suggests that making healthcare easier to reach does not necessarily guarantee that patients will be satisfied with the overall service.

The findings of Simola et al. further illustrate why accessibility should be understood as multidimensional. Although many users valued easy and rapid access, negative experiences occurred when information was unavailable or delayed, difficult to locate, or when users experienced navigation and technical problems. For example, 27.2% of respondents reporting very negative experiences described difficulties related to finding or organizing information, while 17.39% reported delayed access to information. Therefore, simply providing digital access may be insufficient; the quality, timeliness, organization, and usability of the information or service accessed are also important components of the patient experience.

The non-significant association observed in the present study should also be interpreted in light of the relatively wide confidence interval (95% CI: 0.512–13.700). This indicates limited precision in estimating the independent association of Ease of Access and suggests that the true magnitude of the association remains uncertain. Consequently, the absence of statistical significance should not necessarily be interpreted as evidence that accessibility is unimportant. Rather, its contribution to satisfaction may overlap with other dimensions of digital healthcare quality included in the multivariable model.

Overall, these findings indicate that ease of access remains an important component of a positive digital healthcare experience, but it may not function as an independent determinant of Patient Satisfaction. Previous studies demonstrate that patients value services that are easy to use, rapidly accessible, time-saving, and convenient, whereas the present study suggests that these advantages alone may be insufficient to determine satisfaction after adjustment for other factors. Digital healthcare strategies should therefore extend beyond simply improving access and focus on the broader quality of the patient experience, including usability, timely information, service efficiency, and other patient-centered aspects of care.

CONCLUSION AND SUGGESTION

This study concludes that specific aspects of FRISTA implementation were associated with outpatient satisfaction at Darkuthni Primary Clinic. Although ease of access to services, service speed, patient identification accuracy, and personal data security were significantly associated with patient satisfaction in the bivariate analysis, only patient identification accuracy and personal data security

remained independently associated with patient satisfaction after adjustment for other variables in the multivariable model. These findings highlight the importance of reliable patient identification and personal data protection in implementing biometric-based digital healthcare systems. Therefore, these aspects should receive particular attention in the implementation and further development of FRISTA and similar biometric-based digital health systems in primary healthcare settings.

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