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Digital Premarital Health via KesCatin: Implementation Challenges in Pringsewu, Indonesia

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ABSTRACT

Stunting remains a major public health concern in Indonesia. Prevention during the premarital period is essential, as risk factors such as anemia, undernutrition, and early pregnancy (<20 years) are often established before conception. To address this, the Ministry of Health developed the KesCatin application as a digital innovation to enhance premarital reproductive health education and screening. This study aimed to explore the implementation process, challenges, and opportunities of the KesCatin application in improving digital-based premarital health services as part of stunting prevention efforts in Pringsewu District. A descriptive qualitative design was employed. Data were collected through four Focus Group Discussions (FGDs) involving 35 cross-sector program managers and in-depth interviews with 26 brides-to-be who had used KesCatin. Data were analyzed thematically following Braun and Clarke's six-step framework, supported by source triangulation and member checking for validation. All 5,818 prospective brides registered in January–June 2024 received digital health screening and counseling via KesCatin. However, 3.2% were anemic (Hb <12 g/dL) and 1.8% had chronic energy deficiency (MUAC <23.5 cm). Thematic analysis identified three main themes: (1) strong cross-sector collaboration, (2) improved access to reproductive health information, and (3) barriers including poor internet connectivity, limited digital literacy, and absence of offline features. KesCatin has significant potential to strengthen premarital health services and support stunting prevention. To optimize its impact, offline access, user training, and continuous monitoring are recommended.

Keywords
Digital Health
KesCatin
Premarital Services
Reproductive Health
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Introduction

Stunting remains a major global public health problem and a key indicator of child nutritional status. The World Health Organization (WHO) has set a target to reduce stunting among children under five by 40% by 2030 [1]. In Indonesia, the prevalence of stunting remains high—27.67% in 2020—placing the country among the top five with the largest number of stunted children worldwide [2]. Stunting not only hinders children's physical growth but also impairs cognitive development, reduces productivity, and ultimately affects the quality of human resources in the future [3].

Evidence indicates that the determinants of stunting often originate from the preconception and early maternal health period, including early pregnancy (<20 years), short birth spacing, maternal anemia, and chronic energy deficiency (CED), which contribute to low birth weight and preterm birth [3],[4]. Therefore, improving women's health during the preconception stage, particularly among prospective brides (*Catin*), is recognized as a strategic entry point in breaking the intergenerational cycle of stunting [3].

To address these issues, the Indonesian Ministry of Health developed the KesCatin and E-Cohort applications as digital innovations to strengthen premarital health education, early detection, and readiness for healthy pregnancy [5][6]. Pringsewu Regency in Lampung Province is among the first regions to fully implement these digital services across all community health centers (*Puskesmas*) [7],[8]. However, the persistence of anemia (8.5%) and CED (11.2%) among prospective brides suggests ongoing challenges in translating policy into effective practice [9],[10].

This study aims to evaluate the implementation process, identify key challenges and enabling factors, and explore the perceived contribution of the KesCatin application in improving premarital reproductive health as part of the stunting prevention strategy in Pringsewu Regency. The study is guided by the assumption that effective use of digital health applications can enhance preconception health readiness and contribute indirectly to stunting prevention outcomes.

Material and Methods

A. Design

This study employed a descriptive qualitative design using a case study approach to explore the implementation of digital-based reproductive health services for Couples of Fertile Age (*Pasangan Usia Subur*/ PUS) and Prospective Brides (*Calon Pengantin*/ Catin) through the KesCatin and E-Cohort applications as part of stunting prevention efforts in Pringsewu Regency in 2024 [1][2]. This design was chosen because it allows an in-depth understanding of contextual factors, implementation dynamics, and stakeholder experiences at the local level [3].

B. Study Setting and Participants

The study was conducted across 13 community health centers (Puskesmas) in Pringsewu Regency, Lampung Province, where the KesCatin application has been implemented as a mandatory premarital health service tool since 2023. The study population consisted of all stakeholders directly involved in the implementation and use of the KesCatin program. Purposive sampling was used to select participants with relevant roles, experience, and active engagement in the program [4]. Participants were grouped as follows: Family Health Program Managers (District Health Office), KesCatin Program Operators at 13 Puskesmas, Prospective Brides who had used KesCatin, Representatives of the Office of Religious Affairs (*Kantor Urusan Agama* or KUA) and Religious Communication Forum (*Forum Komunikasi Umat Beragama* or FKUB), and Nutrition Officers and Midwives providing premarital health services. A total of 35 participants took part in four Focus Group Discussions (FGDs) (8–10 participants per group) and 26 brides-to-be were interviewed individually. The sample size was determined based on data saturation, which was operationalized as the point at which no new codes or themes emerged during data analysis [6],[9]. A total of 61 participants were involved in this study, consisting of 26 prospective brides and grooms who had completed premarital health screening using the E-KesCatin application and 35 program stakeholders representing the District Health Office, community health centers (Puskesmas), professional organizations, BKKBN, and religious institutions.

1. Inclusion criteria: Participants directly involved in KesCatin implementation for ≥6 months or users who had completed the premarital health screening via the application.
2. Exclusion criteria: Participants unwilling to provide informed consent or not actively involved in program activities.

C. Data Collection Procedures

Data collection was conducted between June and August 2024 using three complementary techniques.

1. In-depth Interviews

In-depth interviews were held with 26 brides-to-be who had used the KesCatin application. A semi-structured interview guide was developed and validated by two public health experts. Each session lasted 45–60 minutes, conducted face-to-face at Puskesmas or via secure online meetings, depending on participant convenience. All interviews were conducted in Bahasa Indonesia, with the use of local dialects if necessary for better comprehension. Interviewers were trained qualitative researchers who underwent a two-day facilitator workshop on ethical interviewing, probing skills, and neutrality. All sessions were audio-recorded with consent, transcribed verbatim, and reviewed for accuracy. Translations into English for analysis were verified by bilingual reviewers.

2. Focus Group Discussions (FGDs)

Four FGDs were conducted with 35 informants representing health offices, Puskesmas staff, KUA, FKUB, and related sectors [3],[5]. Each session lasted 90–120 minutes and was held offline at meeting rooms of the District Health Office and selected Puskesmas. Discussions explored implementation experiences, coordination mechanisms, and technical challenges of KesCatin and E-Cohort. Each FGD was facilitated by a lead moderator, a note-taker, and an observer all trained in qualitative facilitation. FGDs were conducted in Bahasa Indonesia, recorded with prior permission, transcribed verbatim, and verified through member checking to ensure accuracy.

3. Document and Secondary Data Review

Secondary data were obtained from official reports, program monitoring records, and intersectoral coordination documents on KesCatin and E-Cohort utilization [2],[6],[7],[9]. These were used for triangulation to validate primary data.

D. Data Analysis

Data were analyzed using thematic analysis following Braun and Clarke's six-step framework: familiarization with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. Two independent coders conducted open coding using NVivo 12 software, followed by discussion to achieve inter-coder agreement. An audit trail was maintained to document all analytical decisions. Triangulation of sources and methods was performed to enhance credibility and confirmability [8],[11].

E. Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee, Poltekkes Kemenkes Tanjungkarang with No. No.456/KEPK-TJK/VI/2024. All participants were informed

about the research objectives, procedures, and their voluntary participation rights. Written informed consent was obtained prior to data collection. To ensure confidentiality, all personal identifiers were removed and replaced with pseudonyms or codes.

Given that the study involved digital health data (KesCatin and E-Cohort), strict data protection measures were applied, including password-protected storage, encrypted devices, and restricted data access, in compliance with Indonesia's Personal Data Protection Law (No. 27/2022) and ethical standards for digital health research.

F. Data Analysis Technique

The data were analyzed using thematic analysis following the six-phase framework proposed by Braun and Clarke, supported by NVivo 12 software to facilitate data organization and coding. The analysis procedure consisted of the following stages [11].

1. Data Familiarization and Transcription

   All recordings from interviews and FGDs were transcribed verbatim and read repeatedly to achieve data immersion and ensure contextual accuracy [3].

2. Initial Coding and Coding Framework Development

   Two independent coders performed line-by-line coding to identify meaningful units of information. An initial coding framework was developed deductively from the research objectives and inductively from emerging data patterns. The coders compared and discussed discrepancies until reaching inter-coder agreement (>85% consistency), ensuring reliability of interpretation [5],[8].

3. Theme Construction and Review

   Codes were clustered into broader categories and refined into final themes through iterative comparison across data sources (interviews, FGDs, and documents). Themes were reviewed and validated against the raw data to maintain coherence and representativeness.

4. Interpretation and Synthesis

   The finalized themes were synthesized into an analytic narrative describing implementation dynamics, barriers, and enabling factors related to the KesCatin and e-Cohort applications in stunting prevention. Secondary quantitative indicators (e.g., number of catin, anemia prevalence) were used to support and triangulate qualitative insights [1],[8],[9].

5. Validation and Trustworthiness

   To ensure analytical rigor, the study employed method and source triangulation by comparing perspectives between program managers, field implementers, and users. Member checking was conducted with key participants to verify interpretive accuracy, while an audit

trail documented each analytical decision for transparency and traceability [10]. The criteria of credibility, dependability, confirmability, and transferability were applied in accordance with Lincoln and Guba's standards of qualitative trustworthiness [12].

This systematic and iterative analytical approach ensures that the findings genuinely reflect participants' experiences and contextual realities in implementing digital premarital health services through KesCatin in Pringsewu Regency.

Results and Discussion

A. Participant Characteristics

This study explores the challenges and opportunities in implementing digital-based reproductive health services through the KesCatin application as part of stunting prevention efforts in Pringsewu Regency, Lampung Province. Data were analyzed thematically following the COREQ (Consolidated Criteria for Reporting Qualitative Research) framework to ensure methodological rigor and transparency.

Table 1. Participants Characteristics: Prospective Brides and Program Stakeholders

Participant characteristics	Prospective brides		Program stakeholders		Total	
	n=26	%	n=35	%	n=61	%
Age (years)						
≤20	4	11.5	0	0	4	6.6
21–25	17	65.4	0	0	17	27.9
26–35	5	23.1	18	51.4	23	37.7
36–50	0	0	11	31.4	11	18.0
>50	0	0	6	17.1	6	9.8
Educational Level						
Junior High School	1	3.8	0	0	1	1.6
Senior High School	12	46.2	3	8.6	15	24.6
Diploma	8	30.8	10	28.6	18	29.5
Bachelor's degree or higher	5	19.2	22	62.8	27	44.3
Socioeconomic Status						
Low (≤ IDR 3,000,000/month)	7	26.9	5	14.3	12	19.7
Middle (IDR 3,000,000–5,000,000/month)	15	57.7	22	62.8	37	60.7
High (> IDR 5,000,000/month)	0	0	8	22.8	8	13.1

Among the prospective bride and groom group, most participants were aged 20–25 years (65.4%), followed by those aged ≤20 years (11.5%), and the remaining 23.1% were in the 26–35 age range. In terms of education level, the majority had completed senior high school (46.2%), while 19.2% held a diploma or bachelor's degree, and a small proportion had only junior high school education (3.8%). Most participants in this group belonged to the middle socioeconomic category (57.7%), followed by the low category (26.9%), with no respondents classified in the high socioeconomic category.

In the stakeholder group, the dominant age range was 31–40 years (51.4%), followed by 41–50 years (31.4%), and a smaller percentage aged above 50 years (17.1%). Most stakeholders held at least a bachelor's degree or higher (71.4%), while the remaining 28.6% held a diploma. Regarding socioeconomic status, the majority belonged to the middle category (62.8%), followed by the high (22.8%) and low (14.3%) categories.

Overall, the characteristics of participants indicate that both user and provider groups have sufficient educational backgrounds and digital exposure to support active engagement and acceptance of the KesCatin application within premarital health services.

B. Coverage of Premarital Health Services

Data from 13 Puskesmas recorded 5,818 prospective brides enrolled in the KesCatin-based premarital health service between January–June 2024. All participants underwent standard premarital screening and reproductive health counseling. Among them, 3.2% were anemic (defined as Hb <12 g/dL, measured via Hemocue device) and 1.8% had chronic energy deficiency (CED) (MUAC <23.5 cm), based on validated facility reports. Despite 100% screening coverage, the persistence of anemia and CED indicates unmet nutritional needs among future mothers.

Table 2. Coverage and Screening Results of Premarital Health Services in 13 Puskesmas, Pringsewu (Jan–Jun 2024)

Indicator	Total Participants (n=5,818)	%	Criteria/Definition	Data Source
Health Screening Coverage	5,818	100	All catin screened	KesCatin Report, DHO 2024
Anemia (Hb <12 g/dL)	187	3.2	WHO criteria	Facility Hb check
CED (MUAC <23.5 cm)	105	1.8	National Nutrition Guideline	Puskesmas record

C. Thematic Findings from FGDs and Interviews

Four FGDs (n=35) and 26 in-depth interviews generated three dominant themes (Fig. 1):

1. Cross-sectoral Support and Coordination

   Integration between the Health Office, MoRA, FKUB, and community leaders improved service outreach.

   "Coordination between health workers and KUA is much better now; we can track catin health faster." (FGD Participant, Health Office staff)

2. User Perceptions and Digital Literacy

   Most users found KesCatin easy to use and informative.

   "The app helps me understand how to prepare for a healthy pregnancy, but sometimes I struggle with weak internet." (Interviewee, Catin #07)

3. Technical and Infrastructure Barriers

Limited internet access, lack of offline mode, and varying digital literacy levels hindered consistent utilization.

> *"In remote villages, internet signal is very weak, so sometimes we can't update data on time."* (FGD Participant, Health Office Operator)

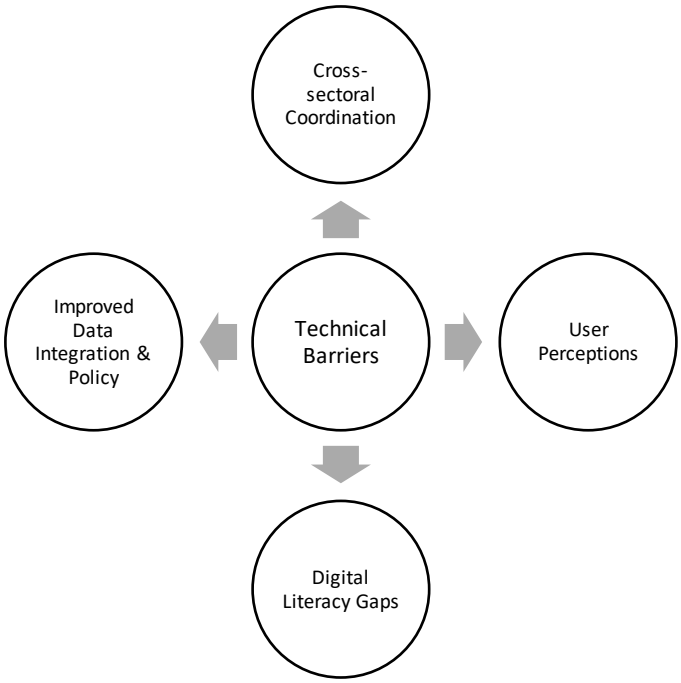


Fig. 1. Thematic Map of Implementation Factors for the KesCatin Application

Discussion

The demographic and socioeconomic characteristics of participants highlight important contextual determinants influencing the acceptance and implementation of digital reproductive health applications such as KesCatin. Most prospective brides and grooms were within the reproductive and socially normative marriage age range, particularly 20–25 years (65.4%), which corresponds with national recommendations promoting optimal reproductive readiness. Individuals in this stage of life are generally more receptive to premarital health preparation, including engagement with digital health interventions, as they are transitioning into family life and are more aware of the importance of maternal and child health outcomes. Evidence from global preconception health studies indicates that individuals in early adulthood are more likely to adopt preventive health behaviors when supported by accessible digital platforms [13], [14].

In terms of educational background, nearly half of the prospective user group (46.2%) had completed secondary education, indicating a moderate level of health and digital literacy. This level of education is generally sufficient to facilitate the use of mobile health applications, although

not without challenges. Prior studies have shown that digital health usability is strongly associated with users' educational attainment and familiarity with technology interfaces [15]. This finding is consistent with the qualitative results of this study, which revealed that while most users could operate the KesCatin application, some still required assistance, particularly in navigating features and overcoming internet-related barriers. These findings align with broader evidence suggesting that digital literacy gaps remain a critical barrier to equitable e-health implementation, especially in low- and middle-income settings [16].

Conversely, the stakeholder group responsible for implementing KesCatin demonstrated relatively high educational attainment, with 71.4% holding at least a bachelor's degree. This reflects adequate professional capacity in areas such as public health programming, health promotion, and digital system management. The dominant age group among stakeholders (31–40 years) represents a workforce that is generally adaptive to technological innovations and capable of supporting digital transformation initiatives. International research supports the notion that health worker readiness, including technical competency and openness to innovation, is a key determinant of successful digital health implementation [17]. Furthermore, trained and digitally competent health personnel are essential in ensuring accurate data entry, effective user guidance, and sustained system utilization.

Socioeconomic status also plays a significant role in shaping access to and utilization of digital health services. The majority of participants were categorized within the middle socioeconomic group (60.7%), suggesting relatively adequate access to smartphones, internet connectivity, and supporting infrastructure. However, the presence of participants from lower socioeconomic backgrounds (19.7%) highlights the risk of digital exclusion. Global evidence consistently demonstrates that disparities in income and access to technology can significantly hinder the adoption of digital health innovations [18], [19]. This underscores the importance of designing inclusive interventions that address affordability, connectivity, and usability to ensure equitable access for all population groups.

Overall, the participant profile indicates a relatively favorable baseline readiness for engagement with digital reproductive health platforms. Nevertheless, the findings emphasize the need for targeted capacity-building strategies, including continuous digital literacy training, provision of technical support systems, and adaptation of user-friendly interfaces. Such strategies are crucial to bridging gaps among vulnerable populations who may face structural and technological barriers. Studies in comparable settings suggest that combining digital interventions

with community-based facilitation significantly improves adoption and sustained engagement [20].

The findings confirm that KesCatin digitalization has improved access to premarital health services and strengthened data integration, aligning with previous studies showing that preconception digital interventions increase awareness and service compliance [21]. At the same time, the persistence of anemia and chronic energy deficiency (CED) among prospective couples indicates that digital solutions alone are insufficient. These findings reinforce global recommendations emphasizing the integration of digital health tools with direct nutritional interventions and counseling services [22], [23]. A comprehensive, multi-sectoral approach is therefore necessary to effectively address stunting risk factors at the preconception stage.

Institutional collaboration emerged as a critical enabling factor in program implementation. Strong coordination between the Health Office, Ministry of Religious Affairs, and FKUB facilitated synergy and program alignment. Similar findings were reported by Oktaviani et al., highlighting the importance of cross-sectoral partnerships in achieving sustainable reproductive health outcomes [24]. International evidence also supports that multi-stakeholder governance models enhance the scalability and effectiveness of digital health programs by ensuring shared responsibility and resource optimization [25].

Despite these strengths, several implementation challenges remain. Technical constraints, including unstable internet connectivity and the absence of offline functionality, limited application use in rural areas. In addition, variations in digital literacy among users affected the consistency of engagement. These challenges are consistent with findings from other digital health initiatives in rural Indonesia, which emphasize the importance of infrastructure readiness and digital inclusion [26]. Similar barriers have also been documented globally, where connectivity limitations and usability issues continue to hinder the equitable rollout of e-health systems [27].

To address these challenges, several strategic recommendations can be proposed. First, the development of offline features is essential to ensure continuous access in low-connectivity settings. Second, regular digital literacy training should be conducted for both users and implementers to enhance confidence and competency. Third, integrating KesCatin with nutrition programs will provide a more holistic approach to stunting prevention. Finally, strengthening monitoring and evaluation mechanisms, including the use of COREQ-aligned reporting standards, will improve accountability, data quality, and program sustainability. Collectively, these strategies align with global best practices in digital health governance, emphasizing the creation of enabling environments that support long-term impact and scalability [28].

Conclusion

The KesCatin application demonstrates significant potential in strengthening digital premarital health services and indirectly supporting stunting prevention. However, optimization requires investment in digital infrastructure, literacy enhancement, and intersectoral policy integration to ensure equitable benefits across all regions.

Suggestions

The program emphasizes enhancing applications by enabling offline functionality and interoperability with national health systems to support continuous data recording. It also promotes digital literacy training for health workers and prospective brides to improve engagement. Integrated nutrition counseling is combined with screening to prevent stunting. Strengthening cross-sector collaboration ensures sustainable governance, while scaling and replication of the KesCatin model in other regions are encouraged through context-sensitive adaptation.

Limitations of the Study

Several limitations should be considered when interpreting this study's findings. The research was limited to 13 Puskesmas in Pringsewu over six months, restricting broader generalization. Connectivity challenges in rural areas affected participation, while variations in digital literacy influenced user engagement. Some findings relied on self-reported data, introducing potential bias despite triangulation. Additionally, the descriptive qualitative design does not assess causal relationships but focuses on implementation processes and contextual influencing factors. Despite these limitations, the findings provide valuable insights for policymakers and program implementers to strengthen digital premarital health initiatives as part of Indonesia's long-term stunting prevention strategy.

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