THE EFFECT OF DIGITAL ADVERTISING IN THE STUNTING DETECTION CALCULATOR (KALKULATING) APPLICATION ON VISITS TO OBSTETRICS AND GYNECOLOGY CLINICS

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ABSTRACT

Stunting is one of the health problems with long-term impacts on the quality of human resources and regional economic growth. Globally, 22% of children are affected by stunting, with 19,8% in Indonesia, 15,9% in West Java, and 20,3% in Ciamis Regency. Digital transformation in the health sector offers a potential approach to improve access to and utilization of health services. This study aims to analyze the effect of digital advertising through the Stunting Detection Calculator (Kalkulating) application on the increase in visits to the Obstetrics and Gynecology Clinic at RSU Al-Arif Ciamis. The Kalkulating application has been used as a promotional medium since October 2024. This study applied a quantitative approach using secondary data on patient visits from July 2024 to March 2025. The average number of visits before the advertisement was 106, which increased to 138.33 after the advertisement. The t-test result showed a t-value of 3.93 and a p-value of 0.0095, indicating a statistically significant difference. These findings suggest that digital health promotion can improve the utilization of health services. The implication of this study recommends expanding the use of digital media in public health promotion strategies to support stunting reduction efforts and strengthen sustainable regional health systems.

Keywords: Advertising; digitalization; health promotion; kalkulating; polyclinic visits; stunting

INTRODUCTION

Stunting remains one of the major public health challenges that affects the quality of human resources and sustainable economic development in many countries. Stunting is defined as a condition of chronic malnutrition characterized by impaired growth and development in children due to prolonged inadequate nutritional intake, recurrent infections, and poor psychosocial stimulation. The impact of stunting is not only limited to physical growth disorders but also affects cognitive development, educational achievement, productivity, and the risk of degenerative diseases in adulthood. Therefore, stunting prevention has become a strategic priority in global and national health development agendas.

Globally, approximately 22% of children under five years old experience stunting.(UNICEF, 2025) In Indonesia, the prevalence of stunting remains relatively high at 19,8%,(Ministry of Health of the Republic of Indonesia, 2025) while West Java Province records a prevalence of 15,9%(Ministry of Health of the Republic of Indonesia, 2024) In Ciamis Regency, the prevalence reaches 20,3%,(Dinkes Ciamis, 2025) indicating that stunting continues to be a significant health problem requiring comprehensive and innovative interventions. The government has implemented various programs through nutritional interventions, maternal and child health services, and community empowerment programs. However, challenges related to public awareness, accessibility of health services, and

effectiveness of health promotion strategies remain obstacles in accelerating stunting reduction efforts.(Suminar, 2024)

Along with the rapid development of information technology, digital transformation in the health sector has created new opportunities for improving health promotion and health service utilization.(Suminar, 2025) Digital health promotion through mobile applications, social media, and online platforms has demonstrated effectiveness in increasing public access to health information and encouraging behavioral changes. Digital media are considered more flexible, interactive, and capable of reaching broader populations compared to conventional promotional approaches. Several studies have shown that digital advertising can influence public decision-making in utilizing healthcare services because information can be delivered quickly, personally, and continuously. Digitalization is the process of transforming information or data from physical or analog forms into digital formats processed using information technology. This process enables data storage, processing, and exchange to be conducted more efficiently and rapidly (Ministry of Health of the Republic of Indonesia, 2019). Through the Regulation of the Minister of Health Number 14 of 2019, nutritional surveillance in Indonesia is implemented using the Nutrition Information System (Sistem Informasi Gizi (SIGIZI), which includes the electronic Community-Based Nutrition Recording and Reporting module (electronic Pencatatan Pelaporan Gizi Berbasis Masyarakat [e-PPGBM]) to electronically record individual target data obtained from Posyandu services.

A study conducted by Meidiawani et al. (2021) showed that the e-PPGBM application has several limitations, including long response times, difficulties in accessing the system during peak hours when many health workers use the application simultaneously, and output data that cannot yet be optimally utilized for decision-making because data entry completion has not reached 100%. Another study reported that e-PPGBM frequently experiences technical problems, such as system errors causing previously entered data to disappear and difficulties in accessing the information system (Saria et al., 2023). These findings are consistent with previous research indicating that the process of recording child growth data at Posyandu through e-PPGBM requires considerable time (Hakim et al., 2022).

Furthermore, the use of e-PPGBM remains limited to healthcare workers. This limitation presents a challenge in increasing community participation in monitoring nutritional status in the digitalization era toward Society 5.0. The process of detecting stunting cases is also primarily based on measurements conducted at Posyandu, while community awareness regarding independent reporting of stunting cases remains limited (Ministry of Health of the Republic of Indonesia, 2019). Early detection and timely identification of growth disorders are essential components in preventing long-term developmental problems among children (Savage et al., 2016).

One of the digital innovations developed to support stunting prevention is the Stunting Detection Calculator (Kalkulating) application.(Suminar, 2025) In addition, through the Gerakan Bersama Cegah Stunting Masyarakat Ciamis (Gerabah Stunting Manis) program initiated by the DP2KBP3A Kabupaten Ciamis, the Stunting Detection Calculator (Kalkulating) has been utilized as a stunting detection instrument that can be used by parents to monitor their children's growth and developmental status. The program involved 63 Posyandu cadres, 25 prospective brides and grooms, 114 pregnant women, 40 postpartum mothers, and 440 toddlers (Suminar et al., 2025a).

Currently, the Stunting Detection Calculator not only functions to detect child growth and development through nutritional status and developmental screening, but it is also equipped with a feature for detecting stunting risk among adolescents. To date, adolescent stunting risk screening has not become a primary focus, as most interventions still concentrate on the first 1,000 days of life. In fact, adolescence represents a critical period in the life cycle that has not

been optimally addressed. One of the major risk factors associated with stunting is anemia. A study conducted in one of the schools in Ciamis Regency during October 2024 and May 2025 identified 44 adolescents with anemia. After the implementation of interventions, including education regarding iron tablet consumption and routine monitoring using the Kalkulating platform, follow-up screening identified only 10 cases of anemia. This result indicated a reduction of 34 anemia cases from the initial 44 cases, demonstrating an effectiveness rate of 77.27% and a Cohen's effectiveness value of 3.34. Based on the classification of effectiveness according to percentage change, the intervention was categorized as effective (Suminar et al., 2025b).

Based on previous studies, further evidence is needed to evaluate the role of Kalkulating Ads as a digital health platform in supporting health promotion and stunting prevention programs (Suminar et al., 2024; Suminar & Karim, 2024).

The application functions not only as an early detection tool for stunting risk but also as a medium for health education and promotion. Since October 2024, the application has integrated digital advertisements promoting maternal and child health services available at the Obstetrics and Gynecology Clinic of RSU Al-Arif Ciamis. The advertisements contain information regarding antenatal care services, nutritional counseling, pregnancy examinations, and preventive health programs related to stunting reduction.

Previous studies have widely discussed the role of digital health promotion in increasing health literacy and influencing health behavior. However, studies specifically examining the effectiveness of digital advertising integrated into stunting-related applications on healthcare visitation remain limited, particularly in regional healthcare settings. Most previous studies focused on social media campaigns, telemedicine services, or general mobile health applications without evaluating their direct impact on healthcare utilization indicators such as clinic visitation rates. This condition indicates a research gap regarding the effectiveness of application-based digital promotion in supporting maternal healthcare services and stunting prevention programs at the local level. Early detection of growth disorders is essential to improve children's prognosis and well-being. However, many countries still do not have standardized growth monitoring systems, resulting in delayed diagnosis and intervention. Finland has successfully implemented an integrated digital growth monitoring system, while the Netherlands applies evidence-based anthropometric criteria in child growth surveillance. Digital monitoring systems support clinical decision-making processes, enabling faster and more accurate interventions (Komanchuk et al., 2023).

In addition, research conducted in Canada demonstrated that digital screening improves the detection of developmental disorders in children. The study identified five screening instruments that were proven to be reliable. The effectiveness of these instruments was influenced by examiner competency, assessment timing, tool modification, and the availability of human resources (Komanchuk et al., 2023).

Another study reported that nutritional problems in developing countries are often difficult to detect early, thereby increasing the risk of complications. Artificial intelligence (AI)-based screening technologies have significant potential to support early detection through machine learning (ML) algorithms. Nevertheless, the implementation of AI in healthcare must consider ethical principles, morality, autonomy, justice, human rights, respect, independence, well-being, equality, and privacy protection. If these challenges can be addressed appropriately, AI technologies may reduce the workload of healthcare workers and expand the availability of health data for decision-making purposes (Khan et al., 2022).

Another international study examined the GROWIN growth detection application, which was primarily used in Spain (65%), Latin America (30%), and other regions (5%). The study demonstrated that digital growth monitoring effectively detects growth disorders, encourages

early intervention, improves dietary patterns, and enhances children's nutritional status (de Arriba Muñoz et al., 2022).

This study attempts to address the existing gap by analyzing the effect of digital advertising through the Kalkulating application on the increase in visits to the Obstetrics and Gynecology Clinic at RSU Al-Arif Ciamis. The findings of this study are expected to provide empirical evidence regarding the effectiveness of digital health promotion as a strategy for increasing healthcare utilization and strengthening stunting prevention programs. In addition, this research is expected to contribute to the development of technology-based public health promotion models that are adaptive to current digital transformation trends.

Therefore, the objective of this study is to analyze the influence of digital advertising in the Kalkulating application on visits to the Obstetrics and Gynecology Clinic at RSU Al-Arif Ciamis. The hypothesis proposed in this study is that digital advertising integrated into the Kalkulating application significantly increases visits to the Obstetrics and Gynecology Clinic.

METHOD

Participant Characteristics and Research Design

This study employed a quantitative analytic design using a pre-experimental approach with a pretest–posttest comparison based on secondary data. The study was conducted at the Obstetrics and Gynecology Clinic of RSU Al-Arif Ciamis. The research aimed to analyze the effect of digital advertising integrated into the Stunting Detection Calculator (Kalkulating) application on the number of patient visits to the clinic.

The study population consisted of all patient visit records documented in the medical record unit of the Obstetrics and Gynecology Clinic from July 2024 to March 2025. The period from July to September 2024 represented the condition before the implementation of digital advertising, while the period from October 2024 to March 2025 represented the condition after the implementation of digital advertising through the Kalkulating application.

The inclusion criteria included complete monthly patient visitation data recorded in the hospital medical record system during the observation period. Incomplete visitation reports or duplicated records were excluded from the study. Because this study used aggregate secondary data from hospital records, no direct participant recruitment was conducted.

This study obtained permission from the hospital management and complied with ethical standards for research involving secondary data. Patient identity and confidential information were not accessed or disclosed during the study process.

Sampling Procedures

The sampling procedure used in this study was total sampling, in which all monthly visitation records meeting the inclusion criteria were included in the analysis. Data were collected from the medical record department of RSU Al-Arif Ciamis through official institutional permission.

The study did not involve self-selection of participants because the data originated entirely from secondary hospital documentation. No financial compensation or incentives were provided because no direct respondents participated in the study. Data collection was conducted in the hospital setting using documented monthly visitation reports from the Obstetrics and Gynecology Clinic.

Sample Size, Power, and Precision

The intended sample size in this study was all available monthly visitation data before and after digital advertising implementation. The actual sample size consisted of nine months of visitation reports from July 2024 to March 2025.

The sample size was determined based on the availability and completeness of secondary data from hospital medical records. Since the study used total sampling of monthly visitation reports, no additional power analysis was conducted. However, the available data were considered sufficient to identify differences in visitation trends before and after the intervention period.

Measures and Covariates

The primary variable in this study was the implementation of digital advertising in the Kalkulating application, while the outcome variable was the number of patient visits to the Obstetrics and Gynecology Clinic. The digital advertising intervention included promotional banners and health information regarding antenatal care, nutritional counseling, maternal health services, and stunting prevention programs displayed in the application.

The study used secondary data obtained from hospital medical record reports. The research instrument consisted of a structured data extraction sheet developed by the researchers to record monthly visitation data before and after the implementation of digital advertising. Data collected included monthly patient visit totals and the implementation timeline of digital advertisements in the application.

To ensure data quality, the researchers verified the consistency and completeness of the visitation records with the hospital medical record officers. Multiple observations of the recorded data were conducted to minimize recording errors and improve data reliability.

Data Analysis

Data analysis was conducted using descriptive and inferential statistical methods. Descriptive analysis was used to present visitation trends before and after the implementation of digital advertising in the Kalkulating application. The average number of clinic visits, frequency distributions, and percentage changes were calculated to describe visitation patterns.

Inferential analysis was performed using the paired t-test to compare the mean number of patient visits before and after digital advertising implementation. Statistical significance was determined at a p-value of less than 0.05. Data analysis was performed using IBM SPSS Statistics version 25.

RESULTS AND DISCUSSION

Result

The implementation of digital advertising through the Stunting Detection Calculator (Kalkulating) application was evaluated by comparing the number of patient visits to the Obstetrics and Gynecology Clinic at RSU Al-Arif Ciamis before and after the advertisement intervention. The digital advertising feature began to be implemented in October 2024 through promotional banners and health information integrated into the application.

The descriptive analysis showed an increase in the average number of patient visits after the implementation of digital advertising. Before the intervention, the average number of monthly visits was 106 patients, whereas after the intervention the average increased to 138.33 patients per month. This finding indicates a positive trend in healthcare utilization following the implementation of digital health promotion.

Table 1
Comparison of Average Patient Visits Before and After Digital Advertising

Period	Mean Visits	Standard Deviation
Before Digital Advertising	106.00	12.11
After Digital Advertising	138.33	15.27

The inferential analysis was conducted using the paired t-test to determine whether the increase in patient visits was statistically significant. The analysis showed a t-value of 3.93 with a p-value of 0.0095, indicating a significant difference in clinic visits before and after the implementation of digital advertising in the Kalkulating application.

Table 2
Paired t-test Analysis of Patient Visits

Variable	t-value	p-value	Interpretation
Patient Visits Before and After Advertising	3.93	0.0095	Significant

The results indicate that digital advertising integrated into the Kalkulating application contributed to increased patient visits to the Obstetrics and Gynecology Clinic. The increase suggests that digital promotional media can influence public awareness and encourage the utilization of maternal health services.

Discussion

The findings of this study demonstrate that digital advertising through the Kalkulating application significantly increased visits to the Obstetrics and Gynecology Clinic at RSU Al-Arif Ciamis. The increase in average patient visits from 106 to 138.33 indicates that digital health promotion has the potential to improve healthcare utilization, particularly maternal and child health services related to stunting prevention programs.

The effectiveness of digital advertising identified in this study is consistent with previous studies reporting that digital media can improve health literacy, increase public engagement, and encourage positive health-seeking behavior. Digital platforms provide easier access to health information because users can receive educational and promotional messages quickly and continuously through mobile devices. In addition, digital advertising allows healthcare providers to target specific populations more effectively compared to conventional promotional strategies.

The Kalkulating application not only functions as a stunting risk detection tool but also serves as an educational and promotional platform. This integration may explain the increase in clinic visits observed after the implementation of digital advertising. Users who accessed information regarding antenatal care, nutritional counseling, and maternal health services through the application may have become more aware of the importance of routine healthcare utilization during pregnancy and early child development.

Another important finding is that application-based health promotion may strengthen communication between healthcare providers and the community. Digital advertisements integrated into health applications can create continuous exposure to health messages, which may influence decision-making and healthcare utilization behavior. This finding supports the theory that repeated digital exposure can improve public trust and responsiveness toward healthcare services.

Despite these positive findings, this study has several limitations. The research used secondary data from hospital medical records, which limited the availability of individual-level

demographic variables and behavioral information. In addition, external factors such as seasonal healthcare trends, economic conditions, or other promotional activities outside the application may also have influenced clinic visitation rates. Therefore, future studies are recommended to include larger datasets, longer observation periods, and additional variables related to user behavior and digital engagement.

This study contributes to the development of digital health promotion strategies, particularly in supporting stunting prevention programs and maternal healthcare services at the regional level. The findings suggest that integrating digital advertising into health applications can become an innovative and sustainable approach for increasing healthcare utilization in the era of digital transformation.

LIMITATION OF THE STUDY

This study has several limitations that should be considered when interpreting the findings. The primary limitation of this research was the relatively short observation period, which only covered patient visitation data from July 2024 to March 2025. As a result, the study was limited in its ability to evaluate the long-term effect and sustainability of digital advertising implementation in the Kalkulating application on healthcare utilization.

In addition, the study relied on secondary data obtained from the medical records of the Obstetrics and Gynecology Clinic at RSU Al-Arif Ciamis. Therefore, the researchers were unable to explore individual behavioral factors, patient perceptions, or external variables that may also influence clinic visitation rates. Future studies are recommended to involve longer observation periods, larger datasets, and additional variables related to user engagement and digital health behavior to obtain more comprehensive findings.

CONCLUSIONS AND SUGGESTIONS

The findings of this study indicate that digital advertising integrated into the Stunting Detection Calculator (Kalkulating) application significantly increased visits to the Obstetrics and Gynecology Clinic at RSU Al-Arif Ciamis. The implementation of digital health promotion through the application contributed to a measurable increase in average patient visits after the advertisement intervention period. These results demonstrate that digital-based promotional strategies can support the utilization of maternal health services and strengthen efforts to prevent stunting through broader dissemination of health information.

This study contributes to the development of public health science by providing empirical evidence regarding the effectiveness of integrating digital advertising into health applications as a strategy to improve healthcare utilization. The findings also highlight the potential of digital transformation in strengthening sustainable health promotion systems, particularly in regional healthcare settings. The integration of educational content and promotional messages within a health application can become an innovative approach to improving community engagement with maternal and child healthcare services.

Future studies are recommended to conduct longer observation periods and involve larger datasets to evaluate the long-term effectiveness of digital advertising on healthcare utilization. Further research is also needed to explore additional variables such as user engagement, patient satisfaction, demographic characteristics, and behavioral responses toward digital health promotion in order to obtain more comprehensive findings regarding the impact of application-based health promotion strategies.

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ETHICAL CONSIDERATIONS

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Conflict of Interest Statement

The authors declare that they have no conflict of interest related to this manuscript.

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