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Techahealth's Digital Technology *Based Collaborative Intranatal Care Model* for Optimizing Healthy Births in Stunting Prevention

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Abstract

The delivery process is a crucial phase in determining the baby's initial condition through the quality of intranatal care, the prevention of complications, and the success of early breastfeeding initiation (IMD). However, the practice of intranatal care in health facilities still faces obstacles in the form of collaboration between professions that is not optimal and the use of digital technology. This study aims to analyze the influence of the TECH4HEALTH Digital Technology-Based Collaborative Intranatal Care Model on the optimization of healthy births in stunting prevention. This study used a quasi-experimental design with *pretest-posttest with a control group*. The sample consisted of 80 maternity mothers who were divided into an intervention group (n=40) and a control group (n=40). The intervention group received collaborative intranatal care based on digital TECH4HEALTH technology involving midwives, doctors, nurses, and nutritionists, while the control group received conventional intranatal care. The results showed a significant improvement in the quality of intranatal care in the intervention group with an average score increasing from 72.4 to 88.6 ($p<0.001$), while the control group only increased from 73.1 to 76.5. The success of IMD in the intervention group reached 87.5% compared to 62.5% in the control group. The incidence of asphyxia decreased to 5% in the intervention group compared to 17.5% in the control group, and the proportion of babies with normal birth weight was higher (92.5% vs 77.5%). The level of maternal understanding of stunting prevention increased significantly ($p<0.001$) after the application of the TECH4HEALTH model. Conclusions: The application of a collaborative intranatal care model based on digital technology TECH4HEALTH proven to significantly improve the quality of childbirth care compared to conventional services. The TECH4HEALTH model suggestions are recommended to be applied more widely in first-tier health facilities, as well as developed through follow-up research with a larger scope and duration.

Keywords: intranatal care, interprofessional collaboration, Tech4health, stunting

INTRODUCTION

Stunting is a form of chronic malnutrition characterized by the length or height of a child who is below the age standard (< −2 SD based on WHO growth standards)[1]. This condition occurs due to inadequate nutritional intake and exposure to repeated infections in the first 1,000 days of life, and is an indicator of the quality of health and nutrition of a nation. Globally, stunting is still a major problem of children's health that affects physical growth, cognitive development, and future productivity. Based on data from the 2024 Indonesian Nutrition Status Survey (SSGI), the national prevalence of stunting decreased from 21.5% in 2023 to 19.8% in 2024, showing positive achievements in Indonesia's nutrition and public health intervention programs. However, this figure is still quite high and is above the government's target for 2025 of 18.8% and the national medium-term target of 14.2% in 2029 [2].

Globally, stunting is still a major child health challenge despite declining trends over the past decade [3]. It is estimated that by 2024 there will be 150.2 million children under the age of five who are stunted, equivalent to 23.2% of children under five globally. Most stunting cases occur in the Asian and African regions, reflecting the gap in progress between regions [4]. *The Sustainable Development Goals* (SDG-2) target to significantly reduce the prevalence of stunting is still difficult to achieve without innovative and coordinated interventions globally and locally, especially in low- and middle-income countries. Data from UNICEF, WHO, and World Bank Group shows that the problem of stunting is not only a national problem, but also a global health burden that requires a more comprehensive approach to health services, including in the context of *intranatal care* and prevention from the beginning of a child's life [5].

The decrease in the prevalence of stunting shows an improvement in child nutrition and health in general, but the figure of almost 1 in 5 children under five is still stunted, indicating that there is a need to strengthen intervention strategies that touch more on determinants from an early age, including during childbirth [6]. Childbirth is a critical phase in maternal and neonatal continuum of care, where the quality of intranatal care plays a role in determining the initial condition of the newborn, including the risk of asphyxia, low birth weight (BBLR), and the success of early breastfeeding initiation (IMD) [7]. The practice of IMD and nutritional support from the beginning of life has been proven to be related to nutritional status and reduce the risk of stunting later in life[8].

Although various stunting prevention interventions have been implemented, challenges in the field are still significant, especially related to the lack of coordination between health professions during the delivery process, the lack of optimal education of mothers about stunting prevention from the beginning, and the low use of digital technology as a tool to support collaboration and service documentation. The *Interprofessional Collaboration* (INC) approach involving midwives, doctors, nurses, and nutritionists is believed to be able to improve the quality of intranatal care through effective communication, clear division of roles, and joint decision-making[7]. On the other hand, digital technologies such as health education applications, electronic documentation systems, and cross-professional communication platforms can strengthen such collaborative strategies [9].

Along with the development of the digital era, health technology (*digital health*) is a strategic opportunity to answer these various challenges. WHO in its *Global Strategy on Digital Health* emphasizes that the use of digital technology can improve the quality of health services, strengthen collaboration between health workers, and expand access to health education for the public[3]. In the context of intranatal midwifery care, digital technology can be used as a media for maternal education, clinical decision support systems, integrated documentation, and a means of effective communication between health professions [6].

Based on theoretical studies and data on the prevalence of stunting in the national which is still high despite showing a downward trend, it is necessary to develop a holistic and innovative intranatal care model. The Digital Technology-Based Collaborative Intranatal Care Model is TECH4HEALTH expected to be able to bridge the service gap, optimize the delivery process, and contribute to stunting prevention from the beginning of a child's life. This approach is expected not only to improve the quality of clinical

care, but also to have a positive impact on achieving the national stunting reduction target [10].

This research was carried out at the Pidie Health Center by considering regional conditions that still contribute to the high prevalence of stunting in Pidie Regency and Aceh Province, which until now are still above the threshold of public health problems according to WHO standards. The stunting data shows that preventive interventions need to be carried out from the early period of life, including in the intranatal phase as an early determinant of the baby's health and nutritional status. The Pidie Health Center has high maternity coverage and cross-professional health worker support, so it is a representative location to implement and evaluate a collaborative intranatal care model based on digital technology (TECH4HEALTH) in order to improve the quality of healthy births and support efforts to reduce stunting since the delivery process.

RESEARCH METHODOLOGY

This study uses *a quasi-experimental design* with a pretest–posttest with control group design approach. This design was chosen to assess the effectiveness of the application of the Digital Technology-Based Collaborative Intranatal Care Model TECH4HEALTH on the optimization of healthy births as an effort to prevent stunting from the delivery process, without conducting full randomization on the study subjects. The research will be carried out at the Pidie Health Center on March 10, 2025. The study population was the entire maternity population that came to the study site during the data collection period. Mothers with full-term pregnancy, single delivery, and stable maternal and fetal conditions were included as study subjects. Mothers with severe obstetric complications requiring immediate referral as well as infants with congenital abnormalities were excluded from the study. The number of samples of 80 respondents was determined using the Slovin formula, taking into account the number of maternity population at the Pidie Health Center and the margin of error of 10%. Based on the data of the population of maternal mothers in the study period, a minimum number of samples was obtained which was then rounded to 80 respondents to increase the strength of the analysis. Furthermore, the sample was proportionally divided into an intervention group and a control group, each with 40 respondents. The sampling technique uses purposive sampling based on the inclusion and exclusion criteria that have been set. The inclusion criteria in this study include maternity mothers who gave birth at the Pidie Health Center, were at full gestational age, were willing to become research respondents by signing an *informed consent* sheet, and were able to communicate well during the data collection process. The exclusion criteria include maternity mothers with severe obstetric complications that require immediate referral to a follow-up health care facility, mothers with serious health problems that can affect the delivery process and research results, and respondents who did not complete the entire data collection series. The division of groups is carried out based on the location of the service to minimize intervention contamination. The intervention group received the Digital Technology-Based Collaborative Intranatal Care Model TECH4HEALTH, which integrates the Interprofessional Collaboration (INC) approach between midwives, doctors, nurses, and

nutritionists. Interventions include the use of TECH4HEALTH digital applications as a medium for childbirth education and stunting prevention, an integrated intranatal documentation system, and a means of cross-professional communication in clinical decision-making during the delivery process. The control group received intranatal care according to conventional midwifery service standards without the support of integrated digital technology. The independent variable is the application of the Collaborative Intranatal Care Model Based on Digital Technology TECH4HEALTH. Dependent variables included the quality of intranatal care, the success of early breastfeeding initiation (IMD), the incidence of neonatal asphyxia, the baby's birth weight, and the level of maternal understanding of stunting prevention. The quality of intranatal care was measured using a structured observation sheet, while maternal understanding was measured through pretest and posttest questionnaires that had been tested for validity and reliability. Hasil uji validitas menunjukkan seluruh butir pertanyaan memiliki nilai koefisien korelasi lebih besar dari nilai r tabel (r > 0,30), sehingga dinyatakan valid. Uji reliabilitas menghasilkan nilai Cronbach's Alpha sebesar >0,70. Data collection was carried out through direct observation during the delivery process, recording the results of delivery and the condition of the newborn, as well as filling out questionnaires by the mother before and after the intervention. All data is collected by researchers and enumerators who have received training to ensure uniformity of research procedures total 2 people. Data analysis was carried out descriptively and inferentially. The *paired t-test* or *Wilcoxon test* was used to analyze the difference in scores before and after the intervention in each group. The *independent t-test* or *Mann–Whitney test* is used to compare the results between the intervention group and the control group. The level of statistical significance was set at a p value < 0.05. All respondents were given an explanation of the objectives and procedures of the research and signed an *informed consent sheet*. Data confidentiality and respondents' rights are maintained in accordance with research ethical principles [7][11].

RESULTS AND DISCUSSION

A. Univariate Analysis

Tabel 1. Karakteristik Responden Penelitian

Karakteristik	Intervensi	Kontrol
Usia Ibu		
< 20 tahun	2 (5,0)	3 (7,5)
20-35 tahun	34 (85,0)	32 (80,0)
> 35 tahun	4 (10,0)	5 (12,5)
Paritas		
Primipara	18 (45,0)	17 (42,5)
Multipara	20 (50,0)	21 (52,5)
Grande Multipara	2 (5,0)	2 (5,0)
Status Pekerjaan		
Tidak Bekerja	25 (62,5)	26 (65,0)
Bekerja	15 (37,5)	14 (35,0)

Data Source 2025

Berdasarkan Tabel 1, sebagian besar responden pada kelompok intervensi maupun kontrol berada pada usia reproduksi sehat (20–35 tahun). Mayoritas responden merupakan multipara, dengan tingkat pendidikan didominasi oleh pendidikan menengah. Karakteristik ini menunjukkan bahwa kedua kelompok memiliki distribusi karakteristik yang relatif seimbang, sehingga layak untuk dibandingkan dalam analisis pengaruh penerapan model asuhan intranatal kolaboratif berbasis teknologi digital TECH4HEALT

B. Bivariate Analysis

1. Results

1. Quality of Care Before and After Intervention

Table 2. Frequency Distribution of Care Quality Score Comparison Before and After Intervention

Groups	*Pretest*	*Posttest*	p-value
Intervention (Techahealth)	72.4	88.6	0,001
Control (Konvensional)	73.1	76.6	>0,05

Data source 2025

Based on the table above, it shows that the application of the collaborative intranatal care model based on digital technology techahealth has a positive impact on optimizing stunting prevention. In the intervention group, the quality of intranatal care experienced a significant improvement after the application of the model. The average score of the quality of intranatal care increased from 72.4 before the intervention to 88.6 after the intervention ($p<0.001$). In contrast, in the control group that received conventional intranatal care, the increase in scores was relatively lower, from 73.1 to 76.5 and showed no clinically significant change.

Table 3. Frequency Distribution of Healthy Birth Optimization in Stunting Prevention

Variabel	Intervention (n=40)	Control (n=40)	p-value
The Success of IMD	35	25	0,001
Asfiksia Neonatorum	2	7	0,001
Normal Birth Weight	37	31	0,001

Data source 2025

Based on the table above, it shows that the success of Early Breastfeeding Initiation (IMD) in the intervention group is 87.5% of mothers successful in IMD, while in the control group the success of IMD only reaches 62.5%, in addition to the incidence of neonatal asphyxia in the intervention group is recorded at 5% compared to the control group of 17.5%. The results also showed that the proportion of babies with normal birth weight in the intervention group was higher, at 92.5%, compared to the control group of 77.5%.

Table 4. Frequency Distribution of Maternal Understanding of Stunting Prevention

Groups	*Pretest*	*Posttest*	p-value
Intervention (Techahealth)	55.0	85.0	0,001
Control (Konvensional)	56.5	63.0	>0,05

Data source 2025

From the table above, it shows that from the educational aspect, maternal understanding of stunting prevention in the intervention group experienced a significant increase after being given digital technology-based interventions, with a statistically significant difference ($p<0.001$), while the improvement in

understanding in the control group was relatively minimal.

DISCUSSION

The improvement in the quality of intranatal care in the intervention group showed that the integration *of Interprofessional Collaboration* (INC) with the support of digital technology was able to strengthen the delivery service process [12]. Effective collaboration between midwives, doctors, nurses, and nutritionists allows for faster, more precise, and coordinated clinical decision-making, so the risk of intranatal complications can be reduced. These findings are in line with the WHO concept which emphasizes the importance of cross-professional collaboration in improving the quality of maternal and neonatal services. The application of the Digital Technology-Based *Collaborative Intranatal Care* Model is TECH4HEALTH effective in improving the quality of childbirth services. These results are in line with the *Interprofessional Collaboration* (INC) theory which states that collaboration between health workers improves patient safety, quality of care, and maternal-neonatal clinical outcomes. WHO emphasizes that childbirth services that involve coordinated cross-professional teamwork can reduce clinical errors and improve maternal and infant outcomes [1]. Research by Reeves et al (2017). reported that collaborative practices between professions had a positive impact on service quality and patient satisfaction, especially in maternal and neonatal services [13].

Structured education and collaborative mentoring during the delivery process are important in increasing the success of IMD. The use of TECH4HEALTH applications as educational media and reminders of evidence-based practices helps health workers ensure that IMD is carried out according to standards. The success of IMD is one of the key factors in stunting prevention because it plays a role in the fulfillment of initial nutrition, increased immunity, and the sustainability of exclusive breastfeeding. In line with the *Continue of Care theory* which emphasizes the continuity of services from pregnancy, childbirth, to postpartum care. IMD is an evidence-based intervention that plays an important role in preventing stunting through optimal nutrition and improving the baby's immune system. *A Cochrane Review* by Moore et al (2016) showed that structured and consistent health worker support during labour significantly increases the success of IMD. WHO and UNICEF also emphasized that IMD in the first hour of life is a key strategy in reducing the risk of malnutrition and stunting in children [14].

Quality intranatal care contributes directly to the initial condition of the newborn. Babies born without complications and with normal birth weight have a lower risk of developing growth disorders and stunting later in life[15]. This emphasizes that stunting prevention does not only focus on postpartum nutritional interventions, but must also start from the delivery process. The decrease in the incidence of neonatal asphyxia in the intervention group supports the theory *of Patient Safety and Team-Based Care*, which emphasizes the importance of effective communication, team readiness, and rapid clinical decision-making during labor. Studies by Darmstadt et al. show that improving the quality of intranatal care and health team preparedness can lower neonatal complications, including asphyxia and neonatal mortality. Neonatal asphyxia is known to contribute to impaired growth and development of children, so its prevention plays an indirect role in efforts

to prevent stunting. The higher proportion of babies with normal birth weight in the intervention group supports the *Life Course Approach* theory, which states that health conditions from the beginning of life affect long-term health status. Research by Black et al (2018). It shows that babies with low birth weight have a higher risk of stunting, cognitive developmental disorders, and chronic diseases later in life. Therefore, optimizing intranatal care that is able to prevent childbirth complications and maintain the condition of the baby at birth is an important strategy in stunting prevention [16].

In addition to the clinical aspect, a significant increase in maternal understanding of stunting prevention in the intervention group showed that digital technology was effective as a means of health education [17]. The information provided in a structured, easily accessible, and sustainable manner helps mothers understand the importance of nutrition, breast milk, and infant care from an early age. Thus, the Digital Technology-Based Collaborative Intranatal Care Model TECH4HEALTH not only improves the quality of childbirth services, but also strengthens the role of mothers in the sustainable prevention of stunting [18]. In line with the *Health Promotion Model* theory of Nola J. Pender, which emphasizes that an increase in individual knowledge and perception will influence health behaviors. The use of digital technology TECH4HEALTH as an educational medium allows for a more interactive, sustainable, and easy-to-understand delivery of information. These results are in line with Murray et al.'s research that digital-based health interventions are effective in improving maternal health literacy and adherence to infant care and breastfeeding practices [19].

Overall, the results of this study are consistent with various theories and empirical findings that confirm that stunting prevention requires a multidimensional approach from the delivery process[20]. The integration of quality intranatal care, collaboration between professions, and digital technology is a relevant and strategic innovation in supporting the national and global agenda to reduce stunting.

CONCLUSIONS

The application of the Collaborative Intranatal Care Model Based on Digital Technology TECH4HEALTH proven to be effective in optimizing healthy births as an effort to prevent stunting from the delivery process [9]. This model is able to significantly improve the quality of intranatal care through strengthening collaboration between health professions and the use of digital technology to support services and education. The application of the TECH4HEALTH model has a positive impact on healthy birth indicators, which is shown by the increase in the success of early breastfeeding initiation, the decrease in the incidence of neonatal asphyxia, and the increasing proportion of babies with normal birth weight. This condition confirms that the optimal quality of intranatal care plays an important role in determining the initial condition of the baby and contributes to the prevention of stunting indirectly. In addition to the clinical aspect, this model is also effective in improving maternal understanding of stunting prevention. The use of digital technology as a health education medium has been proven to strengthen maternal health literacy, thereby encouraging better infant care behavior and nutritional fulfillment after

birth. These findings show that the integration of technology-based education in childbirth care is a relevant and sustainable strategy. Overall, the Digital Technology-Based Collaborative Intranatal Care Model TECH4HEALTH is a potential obstetric service innovation to be implemented in first-level health care facilities. This model not only improves the quality of childbirth care, but also supports the national and global agenda in accelerating stunting reduction through interventions from the beginning of a child's life.

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