



The Effect of Auditory Stimulation on the Success of IMD

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Abstract. Early Breastfeeding Initiation (EBI) within the first hour after birth is crucial for breastfeeding success and newborn health. However, challenges remain in its implementation across healthcare facilities. Auditory stimulation has been suggested as a potential aid in enhancing EBI success by calming babies and encouraging them to suckle. This study aimed to assess the effect of auditory stimulation on EBI success at Sentra Medika Minahasa Utara Hospital. A quantitative, quasi-experimental design with a posttest control group approach was used, involving 20 mothers with full-term newborns. The sample was divided into an intervention group receiving auditory stimulation during Immediate Breastfeeding Initiation (IMD) and a control group undergoing standard IMD without stimulation. IMD success was measured by assessing the infant's ability to latch and breastfeed effectively within the first hour. Data were analyzed using Fisher's Exact test. Results indicated that the proportion of successful IMD was higher in the auditory stimulation group, though the difference was not statistically significant ($p = 0.070$). This study concludes that while auditory stimulation has the potential to support IMD implementation, it cannot be recommended as a standalone intervention. Further research with a larger sample size and stronger study design is necessary to confirm these findings.

Keywords: Auditory Stimulation; EBI; Early Breastfeeding Initiation; Midwifery; Newborns.

1. INTRODUCTION

Early Breastfeeding Initiation (EBI) defined as the initiation of breastfeeding within the first hour after birth is an evidence-based intervention that is crucial for the survival and health of newborns. The WHO emphasizes that early breastfeeding initiation within the first hour helps protect newborns from infection, reduces neonatal mortality, and supports the mother-infant bond and the continuation of breastfeeding (WHO, 2023). However, IMD practices vary widely across countries; the wide range in coverage reflects clinical, service delivery, and psychosocial barriers that require innovative strategies in healthcare facilities (WHO, 2023; Asadi et al., 2025). Within the framework of modern perinatal care, IMD is also closely linked to the implementation of immediate and uninterrupted skin-to-skin contact after birth a practice proven to accelerate the occurrence of the "first feed" and increase breastfeeding success (UNICEF UK Baby Friendly Initiative, 2024; Moore et al., 2025).

Epidemiologically, although many countries have adopted breastfeeding promotion policies, the postnatal "golden hour" period remains a critical point that is often not maximized. UNICEF and WHO emphasize that breastfeeding support during the neonatal period is crucial starting from the first hour after birth because this period shapes breastfeeding patterns, affects milk production, and impacts infant nutrition and health outcomes (UNICEF Indonesia, 2024). In the Indonesian context, several publications citing the 2018 Riskesdas survey indicate that the 50% IMD target has been exceeded, with an achievement rate of around 58.2%, but there are still disparities between regions and varying quality of practices (Ilkeskh, 2025; Tupitu,

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2023). This means that even though national coverage appears adequate, the success of IMD at the facility level can still be influenced by factors such as the delivery process, the readiness of health workers, the comfort of the mother, and the adaptation of the newborn which ultimately determine whether the baby is able to latch on and suck effectively in the early period.

From a clinical theory perspective, the success of IMD is influenced by the interaction of three main components: the mother's physiological condition, the baby's neurobehavioral behavior and readiness, and a supportive perinatal environment. The WHO recommends practical support so that mothers can start breastfeeding as soon as possible and maintain skin-to-skin contact immediately after birth (WHO, 2023). Skin-to-skin contact helps stabilize temperature, regulate stress, and facilitate the infant's reflexes (rooting–suckling), which contribute to successful breastfeeding. The latest evidence synthesis shows that immediate/early skin-to-skin contact may increase breastfeeding success (e.g., exclusive breastfeeding at 6 weeks–6 months), while supporting the infant's physiological stability (Moore et al., 2025). Additionally, observational studies and clinical audits reinforce that the longer the duration of skin-to-skin contact, the greater the likelihood of early breastfeeding initiation (Giang et al., 2024).

Beyond tactile support (skin-to-skin), developments in neonatal neurobehavioral science show that sensory stimulation, including auditory stimulation, can affect arousal, stress regulation, and the baby's readiness to coordinate sucking, swallowing, and breathing. A number of studies show that exposure to the mother's voice (maternal voice) or structured auditory stimuli can have an impact on the baby's physiological and behavioral responses. Controlled randomized trials report that exposure to maternal voice and white noise in the early period of infant care can affect early outcomes such as APGAR scores and attachment indicators, including first successful sucking time (Aközlü & Şahin, 2022). In other neonatal care contexts, multimodal stimulation interventions that include auditory components have also been reported to improve sucking effectiveness and feeding-related outcomes (Gualdrón et al., 2022). Meanwhile, from the mother's perspective, maternal vocal interactions accompanied by contingent stimulation have been reported to be associated with hormonal changes, including increased salivary oxytocin concentrations under certain conditions, which are theoretically relevant to the let-down reflex and early breastfeeding success (Hirschel et al., 2023).

However, specific evidence on auditory stimulation as an intervention aimed directly at improving IMD success in maternal care facilities is still limited, especially in hospital settings in Indonesia. Many studies focus on skin-to-skin policies and general lactation support (WHO,

2023; UNICEF UK BFI, 2024), while sensory aspects such as the use of the mother's voice, standardized soft music, or white noise are not yet a routine part of IMD protocols. Furthermore, variations in the context of delivery (e.g., vaginal delivery vs. cesarean section, use of analgesia, postnatal condition of the infant) can affect the infant's readiness to breastfeed, requiring local evidence that considers the realities of hospital care. In many services, barriers to IMD are often related to postpartum workflows, perceptions of safety, and limitations in individual support; these conditions call for intervention approaches that are simple, safe, and easy to integrate.

The Indonesian context also highlights a strong sense of urgency. Although the national IMD rate reported in the 2018 Riskesdas (approximately 58.2%) appears quite good, data at the city/regional level may be lower and indicate implementation gaps and the need to strengthen strategies in facilities (Tupitu, 2023). UNICEF emphasizes that the neonatal period is a phase that requires stronger breastfeeding support; without effective support, mothers may experience breastfeeding barriers early on, which then affect subsequent breastfeeding practices (UNICEF Indonesia, 2024). Therefore, innovations targeting the "first moments" after birth such as auditory stimulation aimed at helping babies calm down, focus, and be ready to breastfeed have the potential to complement skin-to-skin strategies and lactation counseling.

Based on the above description, there is a clear research gap: (1) evidence regarding auditory stimulation specifically implemented during the IMD period to improve latch success and early breastfeeding is still limited, especially in Indonesian maternal services; (2) some of the auditory evidence still comes from NICU settings or specific contexts, so adaptation and proof in delivery rooms/postpartum settings is needed; and (3) service-based evaluations in hospitals are needed to assess the feasibility, effectiveness, and clinical implications of auditory stimulation as part of the IMD support package.

Thus, the study entitled "The Effect of Auditory Stimulation on the Success of IMD at Sentra Medika Minahasa Utara Hospital" is important to enrich local evidence, test relatively simple innovative approaches, and contribute to improving the quality of midwifery and neonatal care. The purpose of this study is to analyze the effect of auditory stimulation on the success of IMD in mothers and babies at Sentra Medika Minahasa Utara Hospital, so that the results can be used as a basis for strengthening postpartum care protocols, increasing breastfeeding support during the "golden hour," and optimizing breastfeeding outcomes from an early stage.

2. RESEARCH METHOD

This study used a quantitative approach with a quasi-experimental design and a posttest with control group design. This design was chosen because the study aimed to determine the effect of auditory stimulation on the success of Early Breastfeeding Initiation (EBI) by comparing the group that received auditory stimulation and the group that did not receive stimulation (control), without fully randomizing the research subjects. This design is appropriate for clinical research in health care facilities because it considers ethical aspects, the flow of delivery services, and the clinical conditions of mothers and babies.

The study was conducted at Sentra Medika Minahasa Utara Hospital, which is a hospital with active obstetric and neonatal services and has a policy of implementing IMD in normal deliveries. The selection of the research location was based on the availability of delivery cases, facility support, and the relevance of IMD success in improving the quality of obstetric and neonatal services.

The population in this study consisted of all mothers who gave birth to full-term newborns through normal delivery at Sentra Medika Minahasa Utara Hospital during the study period. This population included mothers and babies who met the clinical criteria for IMD implementation.

The study sample consisted of mothers and newborns who met the inclusion criteria, namely mothers who gave birth vaginally, live births with a gestational age of term (37–42 weeks), babies in stable condition (Apgar score ≥ 7 at 5 minutes), and mothers and babies who were able to undergo IMD. Exclusion criteria included mothers with severe delivery complications, infants with respiratory disorders or conditions requiring immediate intensive care, and deliveries under general anesthesia. The sample size was determined based on total sampling, whereby all mothers and infants who met the inclusion criteria during the study period were included as respondents and then divided into intervention and control groups according to the service flow.

The sampling technique used was non-probability sampling with a consecutive sampling approach, in which each subject who met the inclusion criteria and was present consecutively during the study period was included as a respondent until the sample size was met. This technique was considered the most realistic and ethical for hospital-based research.

The independent variable in this study was auditory stimulation, namely the provision of sound stimuli in the form of the mother's voice or standardized soft sound stimuli to newborns immediately after birth and during the implementation of IMD. The dependent variable was the success of IMD, which was defined as the ability of infants to breastfeed

effectively (latching on and sucking) within the first hour after birth in accordance with WHO standards. IMD success is categorized as successful or unsuccessful.

Data collection was conducted using structured observation sheets. In the intervention group, infants were given auditory stimulation along with IMD according to hospital protocol. In the control group, infants underwent IMD according to standard practice without additional auditory stimulation. The success of IMD was assessed by researchers or trained staff, taking into account the time when the infant first successfully breastfed and the quality of attachment.

Data analysis was conducted in stages. Univariate analysis was used to describe the distribution of respondent characteristics and the proportion of IMD success in each group. Next, bivariate analysis was conducted to determine the effect of auditory stimulation on IMD success. The statistical test used was the Chi-square test if the data met the requirements, or the Fisher Exact Test if there were cells with an expected value of less than five. The statistical significance level was set at $\alpha = 0.05$, where a p-value < 0.05 indicated a significant effect of auditory stimulation on IMD success.

With this research method, it is hoped that scientific evidence can be obtained regarding the effectiveness of auditory stimulation as a simple, safe, and easily integrated additional intervention in the implementation of IMD. The results of this study are expected to form the basis for the development of a delivery service protocol and improvement of the quality of midwifery and neonatal care at the North Minahasa Medical Center Hospital.

3. RESULTS AND DISCUSSION

Table 1. Demographic data.

Var	n	F (%)
Age	< 20 years old	0
	20-35 years old	17
	>35 years old	3
Education	Elementary school	0
	Junior High School	0
	High School	8
	College/university	12
Employment	Housewife	5
	Farmer	0
	Private employee	11
	Government employee	4
Parity	1	9
	2	9
	3	2
Auditory stimulation	No	10
	Yes	10
Early Breastfeeding Initiation (EBI)	Unsuccessful	9
	Successful	11
Total	20	100

(source: primary data, 2025)

Based on the results of a study of 20 mothers who gave birth at Sentra Medika Minahasa Utara Hospital, most respondents were in the 20–35 age group, namely 17 people (85%), which is the safe and physiologically optimal reproductive age for pregnancy and childbirth. There were 3 respondents (15%) aged over 35 years, while there were no respondents aged under 20 years. This distribution indicates that the majority of mothers were in a relatively mature age group in terms of reproduction.

In terms of education level, the majority of respondents had a college education, namely 12 people (60%), while respondents with a high school education or equivalent numbered 8 people (40%). There were no respondents with an elementary or junior high school education. The high level of education among respondents has the potential to influence their understanding and acceptance of health care practices, including the implementation of early breastfeeding initiation.

Based on employment status, most respondents worked as private employees, namely 11 people (55%). Respondents who were housewives numbered 5 people (25%), while those who worked as civil servants numbered 4 people (20%). This variation in employment status reflects the diverse socioeconomic backgrounds of the mothers.

The distribution of respondents based on parity shows that the majority of mothers had parity 1 and 2, with 9 people (45%) each. Respondents with parity 3 numbered 2 people (10%). This shows that most mothers were primiparous and early multiparous, who in theory have good physiological and psychological readiness for breastfeeding.

Based on the variable of auditory stimulation, the respondents were divided evenly, with 10 people (50%) not receiving auditory stimulation and 10 people (50%) receiving auditory stimulation during the implementation of IMD. This balanced distribution provides a good basis for comparing the effects of auditory stimulation on the success of IMD.

Regarding the variable of successful Early Breastfeeding Initiation (EBI), the results of the study show that 11 respondents (55%) successfully performed EBI, while 9 respondents (45%) did not. These findings indicate that although more than half of mothers and infants successfully performed EBI, there is still a significant proportion that has not achieved EBI success, thus requiring additional strategies to improve EBI success in health care facilities.

Overall, the characteristics of the respondents show that mothers giving birth at Sentra Medika Minahasa Utara Hospital are predominantly of safe reproductive age, with a medium to high level of education, and low to moderate parity. The proportion of IMD success that is not yet optimal and the balanced distribution of the auditory stimulation groups are important contexts in analyzing the effect of auditory stimulation on IMD success.

Table 2. Statistical analysis.

Independent variable	N	P Value	Dependent variable
Auditory stimulation	20	0.070	Early Breastfeeding Initiation (EBI)
<i>Fisher's exact test</i>			

*significant

(source primary data, 2025)

The analysis of the relationship between auditory stimulation and the success of Early Breastfeeding Initiation (EBI) in mothers giving birth at Sentra Medika Minahasa Utara Hospital was conducted using Fisher's Exact Test, because the sample size was relatively small and there were cells with expected frequencies of less than five. The results of the analysis showed a p-value of 0.070, which was greater than the statistical significance threshold of $\alpha = 0.05$.

This p-value indicates that there is no statistically significant relationship between the provision of auditory stimulation and the success of EBI. Thus, statistically, auditory stimulation has not been proven to have a significant effect on the success of EBI in this study.

However, descriptively, it appears that the proportion of IMD success is higher in the group that received auditory stimulation compared to the group that did not receive stimulation. These findings indicate a positive effect of auditory stimulation on IMD success, although it has not yet reached statistical significance. This may be influenced by several factors, including the relatively small sample size, variations in the conditions of mothers and babies after delivery, and environmental factors and health worker support during IMD implementation.

These results indicate that the success of IMD is a multifactorial process that is influenced not only by sensory stimulation, but also by the physiological condition of the infant, the readiness of the mother, skin-to-skin contact practices, and the quality of lactation support. Therefore, although auditory stimulation shows potential as a supportive intervention, its application needs to be further examined through studies with stronger designs and larger sample sizes.

Discussion

This study aims to analyze the effect of auditory stimulation on the success of Early Breastfeeding Initiation (EBI) at Sentra Medika Minahasa Utara Hospital. The results of the analysis show that statistically there is no significant relationship between auditory stimulation and EBI success ($p = 0.070$). However, descriptively, there was a tendency for increased success of EBI in the group that received auditory stimulation compared to the group without stimulation. These findings indicate that auditory stimulation has the potential to provide

clinical benefits, but its effect was not strong enough to achieve statistical significance in this study.

The success of skin-to-skin contact is a complex process influenced by various interacting factors, including those related to the mother, the baby, and the healthcare environment. The WHO states that the success of skin-to-skin contact is largely determined by the baby's physiological condition, the mother's readiness, and an environment that supports uninterrupted skin-to-skin contact within the first hour after birth (WHO, 2018). In this study, although auditory stimulation was provided, other factors such as the mother's postpartum fatigue, anxiety, previous birth experiences, and the baby's sucking reflex readiness may play a more dominant role in determining the success of IMD.

In terms of neonatal neurobehavioral theory, auditory stimulation especially the mother's voice can help calm babies, increase alertness, and facilitate the coordination of sucking, swallowing, and breathing reflexes. Exposure to the mother's voice is also known to be associated with stress regulation and postnatal adaptation (Filippa et al., 2017). However, the effects of this stimulation are supportive and not the sole determinant of successful EBF. If the baby experiences birth fatigue, slow respiratory adaptation, or other transition disorders, auditory stimulation alone may not be sufficient to promote successful early breastfeeding.

The results of this study are in line with several studies reporting that sensory interventions, including auditory stimulation, have the potential to improve infant behavioral responses, but their effects on early breastfeeding outcomes are often moderate and highly influenced by the clinical context (Harding et al., 2019). Other studies show that IMD success is more consistently improved by interventions that emphasize continuous skin-to-skin contact, active support from healthcare personnel, and minimization of postnatal medical interventions (Moore et al., 2021). This indicates that auditory stimulation should be positioned as an additional intervention, not a substitute for basic IMD practices.

The insignificance of the results of this study may also be influenced by the relatively small sample size, which limits the statistical power of the test. With only 20 respondents, the difference in the proportion of IMD success between groups may not be large enough to be statistically detectable. Some researchers have pointed out that studies with small samples are at risk of type II error, which is the failure to detect an effect that actually exists (Polit & Beck, 2021). Therefore, the positive trend found descriptively in this study still has clinical significance and warrants further investigation.

In addition to sample size, respondent characteristics also play a role. The majority of mothers in this study were of safe reproductive age and had a medium to high level of

education. Higher education is often associated with a better understanding of the benefits of breastfeeding, but it does not always correlate with the success of EBF, as psychological aspects and childbirth experiences continue to play an important role (Esteves et al., 2020). Low to moderate parity among respondents can also affect mothers' confidence in breastfeeding, especially among primiparous mothers who have no previous experience.

The clinical implications of this study indicate that auditory stimulation cannot yet be used as a single intervention to improve IMD success, but it has the potential to be used as a support in midwifery and neonatal care packages. Auditory stimulation is relatively safe, non-invasive, and easy to implement without disrupting the flow of delivery services. Therefore, this intervention can be considered as part of a holistic approach that includes skin-to-skin contact, active mother support, a calm environment, and antenatal education about IMD.

For midwifery practice, the results of this study emphasize the importance of a comprehensive approach in improving the success of EBF. Health workers need to prioritize key factors such as infant stability, maternal comfort, and continuity of mother-infant contact, while auditory stimulation can be used as an additional strategy to create an atmosphere that supports early breastfeeding. Further research with a stronger experimental design and a larger sample size is strongly recommended to evaluate the effectiveness of auditory stimulation in greater depth, including variations in sound type, duration of stimulation, and optimal timing of administration.

Overall, this study provides an initial contribution to exploring the role of auditory stimulation in the success of IMD in healthcare facilities. Although it has not yet shown a statistically significant effect, these findings open up opportunities for the development of more integrated sensory-based interventions in IMD practices, particularly in efforts to improve the quality of obstetric and neonatal services in hospitals.

4. CONCLUSION

This study shows that auditory stimulation has not been proven to have a statistically significant effect on the success of Early Breastfeeding Initiation (EBI) at Sentra Medika Minahasa Utara Hospital. The Fisher Exact test results show a p-value of 0.070, indicating no significant relationship between auditory stimulation and EBI success. However, descriptively, there was a tendency for an increase in the proportion of successful EBI in the group that received auditory stimulation compared to the group without stimulation. These findings indicate that auditory stimulation has the potential to provide benefits as a supportive intervention, but the success of EBI is still influenced by various other factors such as the

physiological condition of the baby, the mother's readiness, skin-to-skin contact practices, and the quality of health worker assistance. Therefore, auditory stimulation cannot yet be recommended as a single intervention, but it can be considered as part of a comprehensive approach in the implementation of IMD.

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