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Effect of a Developmental Program Using the Developmental Assessment for Intervention Manual (DAIM) with Parental Engagement in Newborns with Birth Asphyxia

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Abstract

This case-control study utilized a two-group controlled design to evaluate the effects of a developmental promotion program using the Developmental Assessment for Intervention Manual (DAIM) combined with parental engagement for newborns with birth asphyxia. Assessments were conducted at pre- (birth) and post-study (6 months of age). The sample consisted of two groups (n = 26) per group: 1) a case group where families received monthly DAIM-based developmental training, and 2) a control group receiving standard care. Research instruments included a parental training skills assessment, a parental developmental knowledge questionnaire, and the DAIM development assessment. Data were analyzed using t-tests, chi-square tests, odds ratios, and Fisher's exact tests to compare parental skills, knowledge, and child development. The findings revealed that parents in the case group demonstrated significantly better motor and language training skills than the control group, whereas parental knowledge did not differ significantly. Regarding child development, no significant differences were observed between the two groups across all five domains, although the majority of infants in both groups met the passing developmental criteria. The program effectively enhanced parents' developmental intervention skills, showing prominent positive trends in both the motor (OR = 6.42, 95% CI: 1.72–23.90, $p < 0.01$) and language domains. [receptive language ($p = 0.04$) and expressive language ($p < 0.01$]

Introductions

Neonatal asphyxia is defined as a circulatory abnormality that impairs gas exchange via the placenta (in utero) or the lungs (during or immediately after birth when the newborn attempts spontaneous breathing but experiences respiratory failure), resulting in an inadequate oxygen supply to vital organs and concurrent hypercapnia. This condition ranges from partial oxygen deprivation (hypoxia) to progressive depletion culminating in complete cerebral anoxia, thereby precipitating acidosis. Consequently, this may lead to brain injury, the severity of which is contingent upon the duration of oxygen deprivation, the magnitude of the deficit,

and the promptness of resuscitation (Gillam-Krakauer et al., 2024; Sam Uribe, 2021) The incidence is 2 per 1,000 live births in high-resource countries, rising up to 10-fold in countries with limited public health resources. The neonatal mortality rate ranges from 15% to 20%, making this condition one of the leading causes of death during the neonatal period. Among survivors, approximately 25% experience permanent neurological deficits. (Gillam-Krakauer et al., 2024) According to data from the Department of Health from 2018 to 2022, the situation in Thailand showed a relatively stable trend, with the incidence rates of Birth asphyxia being 1.66%, 1.64%, 1.56%, 1.65%, and 1.67%, respectively. When comparing data by health region in 2022, the highest incidence was recorded in Health Region 7 at 2.83%, followed by Health Region 1 at 2.21%, and Health Region 10 at 1.89% (Chaiyawun, 2023; Department of Health, 2018, 2019, 2020, 2021, 2022) Data from the Newborn Center at Khon Kaen Hospital showed that between 2021 and 2022, the morbidity rates of Birth asphyxia were 54.9% and 37.7%, respectively, or 502 out of 915 and 365 out of 914 total live births, respectively. (Newborn Center, 2023) Furthermore, data from the Occupational Therapy Unit, Rehabilitation Medicine Department at Khon Kaen Hospital between 2021 and 2022 showed that the number of service visits by infants with Birth asphyxia compared to the total service visits for all pediatric patient groups were 714 out of 964 and 737 out of 1,149 visits, respectively. This indicates that a high volume of infants in this group received services during those years. (Occupational Therapy Unit, 2023) Regarding developmental assessment and stimulation guidelines in Thailand, the Ministry of Public Health has developed the Developmental Assessment for Intervention Manual (DAIM) to evaluate and promote the development of high-risk children. This targeted demographic includes infants with low birth weight—resulting from prematurity, poor maternal nutrition during pregnancy, or Birth asphyxia—as well as full-term infants who may subsequently experience developmental delays. (Ministry of Public Health of Thailand, 2015) Hospitals under the jurisdiction of the Ministry of Public Health distribute the DAIM to mothers of all high-risk newborns. The manual provides practical, home-based developmental guidelines that parents can readily implement. This approach fosters direct parental engagement, particularly during the first three years of life—a critical window characterized by rapid brain development and heightened neuroplasticity. (World Health Organization, 2018, 2020a, 2020b, 2022) Furthermore, these high-risk children exhibit an elevated vulnerability to developmental delays, particularly within the motor and cognitive domains, throughout their first year of life. (World Health Organization, 2020b) A review of the literature on early childhood development indicates that empowering parents and families to serve as primary caregivers—integrated through everyday routine activities—significantly enhances child development outcomes. (Bann et al., 2016; Chang et al., 2024; Khotrthan, 2020; Sprong et al., 2024; World Health Organization, 2020a; Boonjeam, 2022) Furthermore, studies examining the effects of developmental promotion using the Developmental Assessment for Intervention Manual (DAIM) combined with adult learning theory in high-risk infants 45 days post-discharge demonstrated that these interventions successfully promoted age-appropriate development. (Buhsabun et al., 2021) In the context of tertiary-care hospitals in Thailand—which manage a high volume of newborns with Birth Asphyxia—there is a scarcity of empirical research evaluating the effectiveness of developmental promotion programs that integrate the Developmental Assessment and Intervention Manual (DAIM) with parental engagement. Consequently, this study applies a conceptual framework emphasizing the interaction between the environment and child development, positioning the DAIM-based program, combined with parental engagement, as the independent variable. This intervention serves as a targeted stimulus intended to drive developmental changes in newborns with Birth Asphyxia, who represent the dependent variable. The underlying rationale posits that consistent, developmentally appropriate stimulation tailored to the infant's baseline level—administered continuously by parents under the guidance of healthcare professionals—can mitigate the adverse sequelae of Birth asphyxia and yield superior developmental outcomes compared to standard care.

Objectives

To compare the effects of a developmental promotion program utilizing the DAIM manual combined with parental engagement against those of standard care.

Methods

This case–control study included parents and newborns with Birth Asphyxia who were admitted to Khon Kane Hospital between March 2024 and February 2025. Participants were recruited using purposive sampling because Birth asphyxia is a relatively uncommon condition compared with other neonatal disorders. The study comprised 52 families, including 26 families in the case group and 26 families in the control group. The required sample size was determined based on a review of a previously published study. (Srituravanich et al., 2019) The sample size for this study was determined using the two independent proportions formula without continuity correction (Ngamjarus, 2016), resulting in an initial requirement of 26 families per group. To account for potential dropouts and loss to follow-up, the sample size was recalculated and adjusted to 33 families per group. Nevertheless, at the conclusion of the study period, the final data collection yielded exactly the minimum specified target of 26 families per group.

Research Instruments

1) Standardized Programs and Assessments Tools:

1.1) DAIM-based Developmental Promotion Program: A program utilizing the Developmental Assessment for Intervention Manual (DAIM) for infants aged from birth to 6 months.

1.2) DAIM Child Development Assessment: An evaluation form based on the DAIM protocol for the age range from birth to 6 months.

1.3) Parental Skills Evaluation Form: An assessment tool derived from the DAIM training methods to evaluate parents' proficiency in promoting child development from birth to 6 months.

2) Self-Developed Data Collection and Assessment Tools:

2.1) Parental General Information Questionnaire (8 items): Covers gender, age, relationship, education level, marital status, primary income earner, history of child-rearing, and secondary caregivers.

2.2) Infant Clinical Data Form (10 items): Covers gender, age, birth date, maternal age, gestational age, birth weight, delivery method, Apgar scores (at 1, 5, and 10 minutes), twin status, and clinical complications.

2.3) Parental Developmental Knowledge Questionnaire (13 items): Adapted from the DAIM framework to measure parental knowledge across the five domains of child development from birth to 6 months of age.

Development and Validation of the Data Collection Form

To ensure the quality of the self-developed data collection form, both validity and reliability were evaluated. First, content validity was verified by three experts, including a developmental pediatrician, a pediatric occupational therapist, and a research-focused occupational therapist. The resulting Index of Item-Objective Congruence (IOC) scores ranged from 0.67 to 1.00, demonstrating acceptable item alignment with the study objectives. Second, a try-out was administered to a non-sample group of 30 parents who possessed baseline characteristics matching the study sample. The reliability of the entire questionnaire was assessed using Cronbach's alpha coefficient, achieving an internal consistency value of 0.95.

Data Collection Process

Data collection for this study was carried out according to the following steps:

1) An official letter was submitted to the Director of Khon Kaen Hospital to explain the study objectives and request permission for data collection in the Neonatal ward.

2) After obtaining official permission, the researcher coordinated with the head nurse of the neonatal ward to brief the staff on the study protocols before commencing the data collection process.

3) Eligibility Criteria:

Inclusion Criteria:

(1) Newborns with Birth Asphyxia (1-minute Apgar score of 5–7) admitted to the Neonatal ward at Khon

Kaen Hospital during the study period.
(2) Parents who serve as the primary caregiver for the child.
(3) Parents who can read, write, and effectively communicate in the Thai language.
(4) Parents who are committed to participating for the full 6-month study duration.

Exclusion Criteria:

(1) Infants with developmental delays caused by specific pathologies, including congenital comorbidities, genetic conditions impacting development, or brain disorders.
(2) Parents who requested to withdraw from the project or failed to complete all required sessions.

4) Study and Assessment Protocol:
Parental skills in child development training and children's development were evaluated, and parental training was provided. Participants were divided into two groups as follows:
(1) Case Group: A total of 7 sessions were conducted (approximately 30 minutes per session). Session 1 (at birth) served as the pre-study assessment at the Neonatal ward. Subsequently, monthly follow-up appointments were scheduled from Session 2 (at 1 month of age) to Session 7 (at 6 months of age), with the post-study assessment conducted at the Occupational Therapy clinic.
(2) Control Group: A total of 2 sessions were conducted (approximately 30 minutes per session). Session 1 (at birth) served as the pre- study assessment at the Neonatal ward. A follow-up appointment for Session 2 (at 6 months of age) was scheduled for the post-study assessment at the Occupational Therapy clinic (Figure 1).

5) The data collection process consisted of the following steps:
(1) Obtaining Informed Consent: The researcher explained the study details to the parents. After acknowledging and voluntarily consenting to participate, parents signed the informed consent form. They received a copy of the signed form and the information sheet as evidence.
(2) Parental and Child Baseline Data: Parents directly completed the baseline questionnaire to provide demo graphic details for both themselves and their children.
(3) Birth and Illness History: The researcher reviewed the children's medical records to record birth details and clinical illnesses onto the baseline data forms.
(4) Pre- and Post-test Knowledge: The researcher evaluated parental knowledge regarding child development before and after the implementation of the study.
(5) Developmental Assessment: The researcher assessed the children's development at birth and at 6 months of age using the Developmental Assessment for Intervention Manual (DAIM) guidelines and recorded the scores
(6) Parental Skills Training Evaluation: The researcher evaluated and recorded the parents' skills in child development training on the assigned evaluation form.

Statistical Analysis

1) Descriptive statistics (percentages, means, and standard deviations) were employed to summarize the baseline characteristics of the sample.
2) Inferential statistics (t-tests, chi-square tests, odds ratios, and Fisher's exact tests) were performed to evaluate and compare associations between the study groups.

Ethical Considerations and Protection of Research Participants

This study was approved by the Institutional Review Board of Khon Kaen Hospital (Approval No. KEF66048, Date of Approval: February 23, 2024). The researcher disclosed all study details, objectives, procedures, expected benefits, and potential risks to the participants. Confidentially was guaranteed, and data will be used solely for this research. Participation was strictly voluntary; participants retained the right to withdraw at any time without affecting their medical treatment.

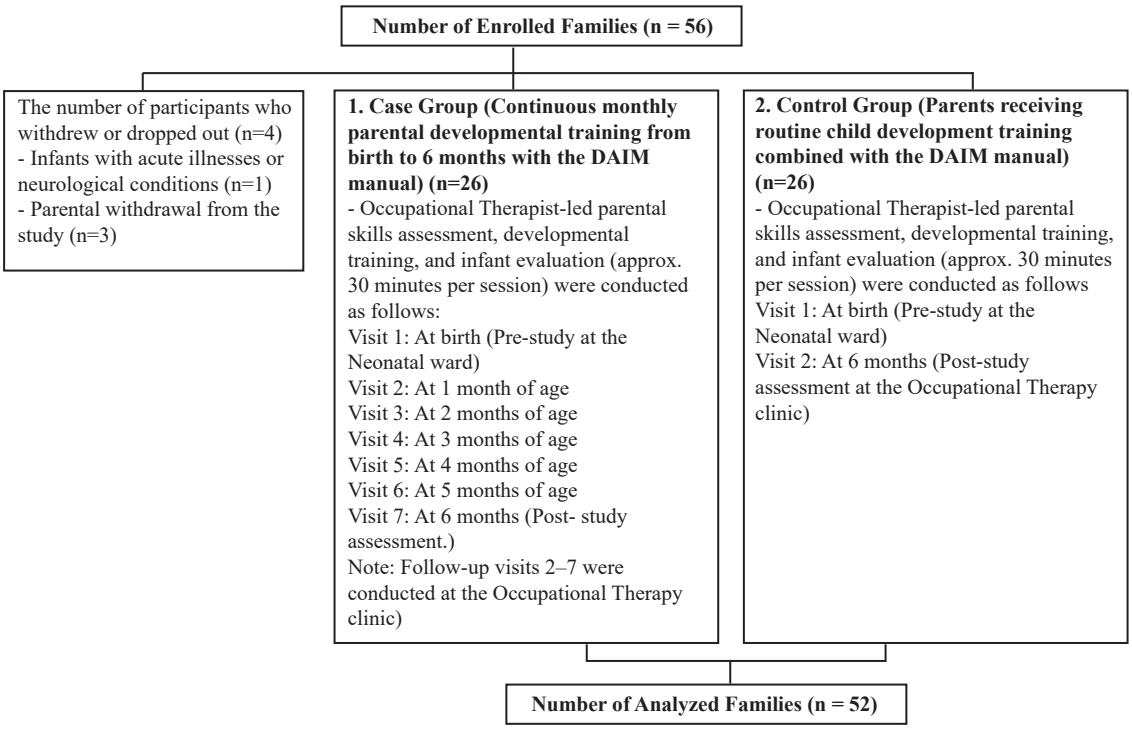


Figure 1: CONSORT flow diagram of participant progress through the study phases.

Results

The results of this study are presented in two main sections, detailed below:

1) Baseline Characteristics of Parents and Infants

1.1) Baseline demographic characteristics were comparable between the parental groups. All participants were female, with no statistically significant age difference between the intervention and control groups (mean: 29.08 ± 9.28 years vs. 31.81 ± 5.97 years, respectively; (p = 0.21). Most participants reported an educational level below a bachelor's degree. Although the case group had fewer participants with a bachelor's degree or higher than the control group (15.38% vs. 34.62%), the variance was not statistically significant (p = 0.11). Furthermore, the groups did not differ significantly regarding marital status, primary income earner, household income, history of child-rearing, or secondary caregivers (p > 0.05), demonstrating that the study sample was

Table 1: Baseline Characteristics of Parent. (n = 52)

Characteristics	Case group	Control group	p-value
Sex			
Female	26 (100)	26 (100)	-
Age (years)	29.08 (9.28)	31.81 (5.97)	0.21
Education level			
Sub-bachelor level	22 (84.62)	17 (65.38)	0.11
Bachelor level and above	4 (15.38)	9 (34.62)	
Marital status			
Single	5 (19.23)	2 (7.69)	1.00
Other	21 (80.77)	24 (92.31)	

Table 1: Baseline Characteristics of Parent. (n = 52) (Cont.)

Characteristics	Case group	Control group	p-value
Primary income earner			
Father/Mother	8 (30.77)	7 (26.92)	0.31
Other	18 (69.23)	19 (73.08)	
Household income (THB/month) (mean, SD)	17,730.77 (13,504.24)	21,192.31 (14,243.65)	0.37
History of child-rearing			
No	11 (42.31)	10 (38.46)	0.77
Yes	15 (57.69)	16 (61.54)	
Secondary caregivers			
No	4 (15.38)	6 (23.08)	0.48
Yes	22 (84.62)	20 (76.92)	

Data are presented as n (%), mean (SD), t-test, chi-square test, Fisher's exact test, *p < 0.05

demographically well-balanced (Table 1).

1.2) At pre-study, parental skills in child development stimulation across all five domains showed no statistically significant differences between the two groups. In particular, for the fine motor and cognitive development domains, an identical proportion of parents in both groups successfully passed the skills assessment (88.46%, (p = 1.00). For the remaining developmental domains, the majority of parents in both groups passed rather than failed the assessment.

Table 2: Parental Skills in Fostering Five Domains of Child Development Pre-study at Birth. (n = 52)

Parental skill			
Gross Motor (GM)	Case group	Control group	p-value
No	12 (46.15)	17 (65.38)	0.16
Pass	14 (53.85)	9 (34.62)	
Fine Motor (FM)			
No	3 (11.54)	3 (11.54)	1.00
Pass	23 (88.46)	23 (88.46)	
Receptive Language (RL)			
No	8 (30.77)	12 (46.15)	0.25
Pass	18 (69.23)	14 (53.85)	
Expressive Language (EL)			
No	14 (53.85)	15 (57.69)	0.78
Pass	12 (46.15)	11 (42.31)	
Personal and Social (PS)			
No	9 (34.62)	10 (38.46)	0.92
Pass	17 (65.38)	16 (61.54)	

Data are presented as n (%), mean (SD), t-test, chi-square test, Fisher's exact test, *p < 0.05

1.3) Post-study data revealed that while both groups showed an increase in the proportion of parents achieving the 80% competency threshold in knowledge across the five developmental domains (birth to 6 months), the actual number remained very low, as detailed in Table 3.

Table 3: Pre- and Post-test Scores of Parental Knowledge of the Five Domains of Child Development (n=52)

Parental knowledge Score ≥ 80%	Case group	Control group
Pre-test	4 (15.38)	2 (7.69)
Post-test	6 (23.08)	3 (11.54)

Data are presented as n (%)

1.4) There were no statistically significant differences between the two groups regarding gestational age and birth weight. The mean gestational age was 31.54 ± 2.89 weeks in the case group versus 31.00 ± 3.21 weeks in the control group ($p = 0.53$). Similarly, the mean birth weights were comparable between the groups (1,567.12 ± 440.20 g vs. 1,524.62 ± 382.31 g; ($p = 0.71$). Regarding sex distribution, the case group had a slightly higher proportion of males, though this difference was not statistically significant ($p = 0.41$). In terms of clinical complications, a notable and significant difference was observed in the incidence of Intraventricular Hemorrhage (IVH), which occurred in 30.77% of the control group but was entirely absent in the case group ($p < 0.01$); notably, all cases were classified as grade I IVH. Conversely, Tongue Tie (Ankyloglossia) was observed exclusively in the case group (15.38%; ($p = 0.04$), with all cases being mild. Other complications, including Respiratory Distress, Respiratory Failure, and Neonatal Jaundice, showed differing trends but did not reach statistical significance ($p > 0.05$). These data are summarized in Table 4.

Table 4: Baseline Characteristics of Infants (n = 52)

Characteristics	Case group	Control group	p-value
Sex			
Male	12 (46.15)	14 (53.85)	0.41
Female	14 (53.85)	12 (46.15)	
Gestational age (weeks) (mean, SD)	31.54 (2.89)	31.00 (3.21)	0.53
Birth weight (grams) (mean, SD)	1,567.12 (440.20)	1,524.62 (382.31)	0.71
Method of delivery			
Normal vaginal delivery	7 (26.92)	9 (34.62)	0.47
Cesarean delivery	19 (73.08)	17 (65.38)	
Apgar score (mean, SD)			
at 1 minute of life	6.46 (0.76)	6.12 (0.82)	0.12
at 5 minutes of life	8.23 (0.08)	7.65 (1.47)	0.08
at 10 minutes of life	8.85 (0.46)	8.96 (0.92)	0.57
Endotracheal intubation			
No	22 (84.62)	24 (92.31)	0.39
Yes	4 (15.38)	2 (7.69)	
Twin status			
No	20 (76.92)	20 (76.92)	1.00
Yes	6 (23.08)	6 (23.08)	
Clinical Complication			
Fetal Distress	2 (7.69)	2 (7.69)	1.00
Placenta Previa	3 (11.54)	1 (3.85)	0.30
Respiratory Distress	19 (73.08)	13 (50)	0.09
Respiratory Distress Syndrome	7 (26.92)	13 (50)	0.09

Table 4: Baseline Characteristics of Infants (n = 52) (Cont.)

Characteristics	Case group	Control group	p-value
Clinical Complication			
Respiratory Failure	5 (19.23)	11 (42.31)	0.07
Early Neonatal Jaundice	22 (84.62)	20 (76.92)	0.48
Subclinical Hypothyroidism	3 (11.54)	1 (3.85)	0.30
Patent Ductus Arteriosus	3 (11.54)	5 (19.23)	0.44
Intraventricular Hemorrhage	0 (0)	8 (30.77)	<0.01*
Meningitis	3 (11.54)	2 (7.69)	0.64
Tongue Tie	4 (15.38)	0 (0)	0.04*

Data are presented as n (%), mean (SD), t-test, chi-square test, Fisher's exact test, *p < 0.05

1.5) Pre-study developmental assessments revealed no statistically significant differences between the two infant groups across the five domains. Nonetheless, most infants successfully passed the evaluation (see Table 5).

Table 5: Five Domains of Child Development at Pre-study (Birth) (n = 52)

Child development			
Gross Motor (GM)	Case group	Control group	p-value
No	0 (0)	3 (11.54)	-
Pass	26 (100)	23 (88.46)	
Fine Motor (FM)			
No	2 (7.69)	3 (11.54)	0.64
Pass	24 (92.31)	23 (88.46)	
Receptive Language (RL)			
No	1 (3.85)	2 (7.69)	0.55
Pass	25 (96.15)	24 (92.31)	
Expressive Language (EL)			
No	3 (11.54)	4 (15.38)	0.69
Pass	23 (88.46)	22 (84.62)	
Personal and Social (PS)			
No	2 (7.69)	0 (0)	-
Pass	24 (92.31)	26 (100)	

Data are presented as n (%), mean (SD), t-test, chi-square test, Fisher's exact test, *p < 0.05

2) The associations between parental skills in fostering child development and infant development post-study at six months of age are as follows:

2.1) Regarding parental skills in training the five domains of child development at six-month post-study assessment, the program effectively enhanced parental training skills. A prominent effect was observed in the gross motor domain (OR = 6.42, 95% CI: 1.72–23.90, p < 0.01); although the odds ratios indicated a strong directional association, the confidence interval was notably wide. In terms of language development, statistically significant differences were observed in both receptive language (p = 0.04) and expressive language (p < 0.01), though the corresponding

odds ratios could not be mathematically calculated. Conversely, no statistically significant associations were found for the fine motor and personal-social domains ($p > 0.05$). These data are comprehensively detailed in Table 6

Table 6: Associations between Parental Skills in Fostering the Five Domains of Child Development Post-study at Six Months of Age. (n = 52)

Parental skills				
Gross Motor (GM)	**Case group**	**Control group**	**Odd ratio with 95% CI**	**p-value**
No	4 (15.38)	14 (53.85)	6.42 (1.72 to 23.90)	<0.01*
Pass	22 (84.62)	12 (46.15)		
Fine Motor (FM)				
No	4 (15.38)	7 (26.92)	2.03 (0.51 to 8.00)	0.31
Pass	22 (84.62)	19 (73.08)		
Receptive Language (RL)				
No	0 (0)	4 (15.38)	-	0.04*
Pass	26 (100)	22 (84.62)		
Expressive Language (EL)				
No	0 (0)	8 (30.77)	-	<0.01*
Pass	26 (100)	18 (69.23)		
Personal and Social (PS)				
No	0 (0)	1 (3.85)	-	0.31
Pass	26 (100)	25 (96.15)		

Data are presented as n (%) and odds ratio with 95% confidence interval (95% CI), Fisher's exact test, *p < 0.05

2.2) Regarding child development outcomes at six months post-study, the program demonstrated no statistically significant differences between the case and control groups across all five developmental domains ($p > 0.05$ for all domains). However, a positive trend was observed in the case group, which exhibited higher pass rates in receptive language (96.15% vs. 88.46%) and expressive language (69.23% vs. 58.85%). Although the odds ratios indicated a directional advantage for the case group, these findings did not reach statistical significance. For the personal and social domain, an odds ratio could not be mathematically calculated; nevertheless, nearly all infants in both groups successfully passed the assessment. These data are comprehensively detailed in Table 7.

Table 7: Associations between the Five Domains of Child Development Post-study at Six Months of Age. (n = 52)

Child development				
Gross Motor (GM)	**Case group**	**Control group**	**Odd ratio with 95% CI**	**p-value**
No	15 (57.69)	13 (50)	0.73 (0.25 to 2.19)	0.58
Pass	11(42.31)	13 (50)		
Fine Motor (FM)				
No	8 (30.77)	12 (46.15)	0.83 (0.25 to 2.75)	0.76
Pass	18 (69.23)	14 (53.85)		

Table 7: Associations between the Five Domains of Child Development Post-study at Six Months of Age. (n = 52) (Cont.)

Child development				
Receptive Language (RL)				
No	1 (3.85)	3 (11.54)	3.26 (0.37 to 33.61)	0.30
Pass	25 (96.15)	23 (88.46)		
Expressive Language (EL)				
No	8 (30.77)	12 (41.15)	1.93 (0.25 to 6.00)	0.25
Pass	18 (69.23)	14 (58.85)		
Personal and Social (PS)				
No	0 (0)	1 (3.85)	-	0.31
Pass	26 (100)	25 (96.15)		

Data are presented as n (%) and odds ratio with 95% confidence interval (95% CI), Fisher's exact test, *p < 0.05

Discussion

1. Comparison of the program's impact on parental knowledge of the five domains of early childhood development (birth to six months) from pre- to post- Test Scores (Table 3) revealed only a marginal increase in the proportion of participants meeting the passing threshold. This trend likely stems from the fact that the majority of participants in both groups held an educational attainment below a bachelor's degree, and their household incomes were nearly half the national average of Thailand in 2023 (National Statistical Office, 2024)—particularly in the case group (Table 1). These socioeconomic indicators highlight financial vulnerability and economic hardship, which may subsequently constrain caregivers' capacity to engage with and absorb child development education.

2. Regarding parental proficiency in developmental stimulation from birth to six months (Tables 2 and 6), the pre-study assessment demonstrated no statistically significant differences between groups. In contrast, the post-study assessment indicated distinct, positive trends in motor and language development training, with most parents in both cohorts meeting established proficiency thresholds across nearly all aspects. This potentially demonstrates the therapeutic value of the DAIM intervention program for high-risk infants, a finding consistent with prior research by Buhsabun et al. (2021)

3. A comparison of child development across all five domains from birth to six months, pre- and post-studies (Tables 5 and 7), revealed no statistically significant differences between the two groups. The majority of infants in both cohorts passed their developmental assessments in nearly all aspects. This outcome reflects the rapid brain growth and peak neurological development characteristic of this age group, combined with the fact that parents in both groups diligently practiced according to the guidance provided (Clark et al., 2021; Clark & Kingsley, 2020; Tanner et al., 2020; World Health Organization, 2018, 2020a, 2022) Post-study findings revealed that the majority of infants in both groups successfully passed the assessments for receptive language and personal -social aspects. This suggests that receptive language and social responsiveness to caregiver interactions are naturally occurring processes. Consequently, these milestones may not rely solely on parental skill training, but are also fundamentally associated with environmental factors and parent-infant emotional attachment. (World Health Organization, 2018, 2020a, 2022) This aligns with previous research emphasizing the promotion of parental and familial roles in early childhood developmental care to prevent developmental delays and establish a strong foundation for lifelong learning. (Bann et al., 2016; Chang et al., 2024; Cioni et al., 2016; Keawpiam et al., 2023; Khotrthan, 2020; Ponmark et al., 2019; Sangsirilak & Sansirilak, 2020; Tanner et al., 2020; Wongsaeng et al., 2023)

4. Baseline characteristics of the infants in both groups (Table 4) indicated that complications, specifically

Intraventricular Hemorrhage and Tongue Tie, varied between the groups. While their immediate impacts were not explicitly apparent in this study, they may potentially influence long-term developmental outcomes. Notably, these infants continue to receive continuous care despite the conclusion of the study.

Limitations

This study utilized purposive sampling based on predefined criteria, which limits the generalizability of the findings to populations with characteristics different from those of the current sample.

Conclusion

The program effectively enhanced parents' developmental intervention skills, showing prominent positive trends in both the motor and language domains. Regarding child development across all five domains, no statistically significant differences were observed between the two groups, although the majority of participants in both cohorts met the required developmental benchmarks.

Recommendations

Recommendations and Practical Implications

For Program Implementation

1) Parents of newborns with Birth Asphyxia who attend post-discharge follow-up sessions from birth up to six months of age should undergo assessments regarding their developmental training skills. In instances where execution is inadequate or incorrect, healthcare professionals must provide intensive, hands-on demonstrations until parental proficiency is achieved.

2) Healthcare professionals should raise awareness among parents of newborns with Birth Asphyxia regarding the critical importance and necessity of thoroughly understanding and implementing the DAIM manual to promote developmental milestones throughout early childhood until the transition into formal schooling.

For Policy

1) Newborns diagnosed with Birth Asphyxia should undergo continuous developmental surveillance at least once a month from birth up to six months of age.

2) It is essential that healthcare professionals provide comprehensive developmental promotion training to parents of all newborns with Birth Asphyxia before hospital discharge to support holistic early childhood development.

For Future Research

1) Longitudinal investigations utilizing larger sample sizes are warranted to validate the effectiveness of the DAIM manual-based intervention, specifically highlighting how parental engagement drives concrete outcomes.

2) Future studies should implement stricter controls for confounding variables within the sample population. Specifically, factors such as Intraventricular Hemorrhage, Tongue Tie, parental educational attainment, and parents' prior knowledge regarding the use of the DAIM manual must be accounted for, as they may confound long-term developmental outcomes.

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