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Effect of intensive animal-source protein support on weight recovery in infants aged 6–12 months with weight faltering: A quasi-experimental study

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Abstract

Background: Weight faltering in infancy is an early growth disorder associated with an increased risk of subsequent stunting. Globally, 149.2 million children under five years of age (22.2%) were affected by stunting and 45.4 million by wasting in 2020. In Indonesia, the prevalence of stunting among children under five was 21.6% in 2022. Inadequate animal-source protein intake remains common among infants aged 6–12 months, with reported inadequacy rates of 73.9%–82.8%. A preliminary survey in Tanjung Gusta Village, Medan City, found that 73.3% of infants with weight faltering had undernutrition based on the weight-for-length indicator.

Purpose: To evaluate the effectiveness of intensive support for animal-source protein provision in accelerating weight recovery among infants aged 6–12 months with weight faltering in Tanjung Gusta Village, Medan City, Indonesia.

Method: A quasi-experimental study using a pretest–posttest control group design was conducted among 60 infants aged 6–12 months with weight faltering. Participants were recruited using purposive sampling and allocated into an intervention group ($n=30$) and a control group ($n=30$). The intervention was implemented for 12 weeks from April to June 2026. Anthropometric measurements were assessed before and after the intervention. Statistical analyses included the paired-samples t -test, Wilcoxon signed-rank test, and Mann–Whitney U test.

Results: Maternal adherence to the animal-source protein intervention reached 83.3%. In the intervention group, mean body weight increased from 6.16 ± 0.29 kg at baseline to 7.23 ± 0.31 kg after the intervention. The mean weight-for-age Z-score (WAZ) improved from -2.63 ± 0.59 to -1.25 ± 0.55 ($p < 0.001$). Changes in body weight, body length, WAZ, and weight-for-length Z-score were significantly greater in the intervention group than in the control group ($p < 0.001$).

Conclusion: Intensive support for animal-source protein provision was effective in promoting weight recovery and improving nutritional status among infants aged 6–12 months with weight faltering. This approach may be considered as a potential intervention strategy within primary health-care services to support growth recovery in infants at risk of growth faltering.

Keywords: Animal-Source Protein; Infant Nutritional Status; Intensive Support; Weight Faltering; Weight Recovery.

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INTRODUCTION

Infancy is a critical period of rapid physical growth and brain development, requiring adequate nutritional support to ensure optimal growth and development (Paninsari et al., 2024). One of the early manifestations of impaired growth is *weight faltering*, which may indicate inadequate nutrient intake, feeding difficulties, or underlying health problems. Persistent weight faltering during infancy is of particular concern because impaired early growth is associated with an increased risk of subsequent stunting and adverse developmental outcomes. If not identified and appropriately managed, prolonged growth impairment may negatively affect cognitive development, learning capacity, and later-life productivity, while potentially increasing the risk of non-communicable diseases in adulthood (Trisasmata & Randabunga, 2025). Therefore, early detection and effective management of weight faltering are essential components of strategies to prevent persistent growth impairment.

Childhood undernutrition remains a major global public health concern. In 2020, approximately 149.2 million children under five years of age were affected by stunting and 45.4 million by wasting, reflecting a substantial burden of chronic and acute undernutrition, particularly in low- and middle-income countries (Trisasmata & Randabunga, 2025). An analysis of 56 Demographic and Health Surveys from low- and middle-income countries reported that approximately 17.4% of infants younger than six months had weight-for-age deficits, while 15.5% had weight-for-length deficits (Kerac et al., 2025). These findings indicate that nutritional deficits can emerge early in life and may persist into later childhood if appropriate interventions are not provided.

The period between 6 and 12 months is particularly important because infants transition from exclusive breastfeeding to complementary feeding. During this period, breast milk alone is no longer sufficient to meet increasing energy and nutrient requirements, making the quality and diversity of complementary foods increasingly important. Evidence from Sri Lanka demonstrated that more than 60% of children experienced weight faltering during the first 18 months of life, with nearly 80% of cases emerging before four months of age and many persisting through the first year (Sithamparapillai et

al., 2022). These findings highlight the importance of early nutritional intervention before growth faltering becomes established and potentially progresses to stunting.

Indonesia continues to face a substantial burden of childhood undernutrition. According to the Indonesian Nutritional Status Survey (SSG), the prevalence of stunting among children under five years of age was 21.6% in 2022 (Trisasmata & Randabunga, 2025). Among children aged 6–23 months, inadequate dietary diversity has also been associated with a greater risk of stunting, suggesting that the quality and variety of complementary foods remain important determinants of nutritional status (Samosir et al., 2023).

Although overall protein intake among the Indonesian population may meet or exceed recommended levels, the contribution of animal-source foods remains relatively limited. National dietary data indicate that daily consumption of fish and other aquatic foods, meat, and eggs and milk remains relatively low (Yusika & Tristianur, 2025). This issue is particularly relevant during infancy because animal-source foods provide highly bioavailable protein and essential amino acids that support tissue growth and development. Among children aged 6–11 months, inadequate protein intake has been reported in 73.9% of children in urban areas and 82.8% in rural areas, with diets tending to rely heavily on cereal- and plant-based foods rather than animal-source foods such as fish, eggs, and meat (Mauludyani et al., 2025). These nutritional gaps have contributed to national efforts promoting animal-source protein as an important component of complementary feeding.

Previous intervention studies have demonstrated the potential benefits of improving animal-source protein intake during complementary feeding. A study among infants aged 6–12 months in Tangerang reported significant improvements in nutritional status following education and promotion of animal-source protein-based complementary feeding. The proportion of infants classified as undernourished decreased from 23.3% before the intervention, with all participants classified as having normal nutritional status after the intervention ($p=0.008$) (Yusika & Tristianur, 2025). Similarly, a study in Maros, South Sulawesi, found that children with stunting had lower

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consumption of animal-source protein and lower dietary diversity than children without stunting (Trisasmita & Randabunga, 2025).

Evidence also suggests that more intensive nutritional management may support recovery from weight faltering. Among infants aged 6–12 months in Makassar, nutritional advice combined with oral nutritional supplementation resulted in 82.8% of infants achieving weight gain above the 15th percentile after one month. After three months, the combined intervention was also associated with greater gains in body weight and length than nutritional advice alone (Tanjung et al., 2024). These findings suggest that intensive caregiver support may play an important role in improving feeding practices and accelerating growth recovery.

Despite these findings, evidence regarding intensive nutritional support specifically focused on animal-source protein provision for infants with weight faltering remains limited, particularly in Indonesia. In North Sumatra, childhood undernutrition remains an important public health concern, with the province being among those reporting a stunting prevalence of at least 20% (Rukmana et al., 2022). Research conducted in Medan has also identified child age, birth weight, and family income as factors associated with height-for-age nutritional status, indicating the multifactorial nature of impaired child growth in the region (Rukmana et al., 2022). However, evidence on the occurrence of weight faltering among infants aged 6–12 months in Medan, as well as the effectiveness of intensive animal-source protein support at the primary health-care level, remains limited.

A preliminary survey conducted among 15 infants aged 6–12 months with weight faltering in Tanjung Gusta Village, Medan City, identified 11 infants (73.3%) with a weight-for-length Z-score below -2 SD, indicating undernutrition, while four infants (26.7%) had normal nutritional status. No infants were classified as severely wasted. These findings suggest that weight faltering in this community is accompanied by a substantial burden of acute undernutrition and warrants early intervention to promote weight recovery and prevent further growth impairment.

Therefore, an intervention that combines intensive caregiver support with increased provision of animal-source protein may represent a practical approach to addressing weight faltering during the complementary

feeding period. However, evidence on the effectiveness of this approach among infants with weight faltering in community settings remains limited. This study therefore aimed to evaluate the effectiveness of intensive support for animal-source protein provision in promoting weight recovery and improving nutritional status among infants aged 6–12 months with weight faltering in Tanjung Gusta Village, Medan City, Indonesia.

RESEARCH METHOD

This study employed a quantitative approach with a quasi-experimental design using a pretest–posttest control group design. The study aimed to evaluate the effectiveness of intensive counseling and support for animal-source protein intake on weight recovery among infants aged 6–12 months with weight faltering. Participants were allocated into two groups: an intervention group receiving intensive support for animal-source protein provision and a control group receiving conventional nutrition education.

The study was conducted in Tanjung Gusta Village, Medan City, Indonesia, from April to June 2026. The intervention was implemented over a 12-week period. Anthropometric assessments were performed at baseline (pretest) and immediately after completion of the intervention (posttest) to assess changes in body weight, body length, nutritional status, and weight recovery.

The target population consisted of infants aged 6–12 months with weight faltering living in Tanjung Gusta Village, Medan City, during the study period. Participants were recruited using purposive sampling based on predetermined eligibility criteria. A total of 60 infants were included in the study, comprising 30 participants in the intervention group and 30 participants in the control group.

Infants were eligible if they were aged 6–12 months, had been identified as experiencing weight faltering based on growth monitoring records in the Maternal and Child Health (MCH) Handbook, had already received complementary feeding, and whose mothers or primary caregivers were willing to participate in the entire 12-week study period.

Infants were excluded if they had congenital abnormalities that could interfere with feeding or nutrient metabolism, severe acute or chronic infectious diseases that could affect growth, were

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receiving appetite-enhancing supplements or other nutritional treatments that could influence body weight, or belonged to families planning to relocate from the study area during the intervention period.

Participants in the intervention group received intensive support regarding the provision of animal-source protein as part of complementary feeding for 12 weeks. The intervention focused on improving the frequency and adequacy of animal-source protein intake according to the infant's age and complementary feeding requirements. Mothers or primary caregivers received structured education and regular assistance throughout the intervention period.

The control group received conventional nutrition education regarding infant feeding and complementary feeding according to routine health education practices. Both groups continued to receive routine maternal and child health services available in the community.

Primary data included anthropometric measurements and maternal adherence to the recommended provision of animal-source protein. Body weight and body length were measured at baseline and at the end of the 12-week intervention. Body weight was measured using a calibrated digital infant scale, while recumbent body length was measured using an infantometer. Anthropometric measurements were performed using standardized procedures to minimize measurement error.

Maternal adherence to animal-source protein provision was assessed using a structured monitoring instrument completed during the intervention period. The adherence score was used to describe the extent to which mothers followed the recommended animal-source protein provision.

Secondary data were obtained from the MCH Handbook, community health post records, and relevant health records. These data included participant characteristics, previous growth records, and baseline nutritional status.

Nutritional status was assessed using World Health Organization (WHO) Child Growth Standards. Body weight and recumbent body length were used to calculate age- and sex-specific anthropometric indices, including weight-for-age (WAZ) and weight-

for-length (WHZ). Z-scores were calculated using the WHO Anthro software.

Changes in anthropometric outcomes were calculated as the difference between posttest and pretest measurements (Δ). These included changes in body weight (ΔBW), body length (ΔBL), weight-for-age Z-score (ΔWAZ), and weight-for-length Z-score (ΔWHZ). Weight recovery was assessed based on the predefined operational criteria established in the study protocol.

Data were analyzed using descriptive and inferential statistics. Descriptive analysis was performed to summarize participant characteristics and the distribution of study variables. Continuous variables were presented as means and standard deviations for normally distributed data or medians and interquartile ranges for non-normally distributed data. Categorical variables were presented as frequencies and percentages.

The Shapiro–Wilk test was used to assess the normality of continuous variables. Within-group changes between pretest and posttest measurements were analyzed using the paired-samples *t*-test for normally distributed data and the Wilcoxon signed-rank test for non-normally distributed data.

Between-group differences in changes in anthropometric outcomes were assessed using the Mann–Whitney *U* test when the data did not meet the assumptions for parametric analysis. The variables compared between groups included ΔBW , ΔBL , ΔWAZ , ΔWHZ , and maternal adherence scores.

All statistical tests were two-sided, and statistical significance was set at $p < 0.05$. Statistical analyses were performed using appropriate statistical software.

The study was conducted after obtaining research permission from the relevant academic and local authorities. Before enrollment, mothers or primary caregivers received information regarding the study objectives, procedures, potential benefits, and their rights as participants. Written informed consent was obtained from each participant's parent or primary caregiver before data collection. Participant confidentiality was maintained throughout the study. Personal identifiers were removed from the analytical dataset, and the collected data were used solely for research purposes.

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RESEARCH RESULTS

Table 1. Characteristics of Participants

Variable	Intervention (n=30)	Control (n=30)
Maternal Age, (Mean±SD)(Range)(Years)	29.57 ± 3.65 (24–37)	29.60 ± 3.73 (24–37)
Maternal Education, n (%)		
Primary school	2 (6.7)	2 (6.7)
Junior high school	5 (16.7)	6 (20.0)
Senior high school	17 (56.7)	17 (56.7)
Diploma	3 (10.0)	3 (10.0)
Bachelor's degree	3 (10.0)	2 (6.7)
Maternal Occupation, n (%)		
Homemaker	18 (60.0)	19 (63.3)
Trader	3 (10.0)	5 (16.7)
Honorary employee	3 (10.0)	3 (10.0)
Private employee	3 (10.0)	2 (6.7)
Self-employed	3 (10.0)	1 (3.3)
Number of Children, n (%)		
1	6 (20.0)	7 (23.3)
2	14 (46.7)	13 (43.3)
3	6 (20.0)	5 (16.7)
4	4 (13.3)	4 (13.3)
5	0 (0.0)	1 (3.3)
Infant Gender, n (%)		
Male	12 (40.0)	15 (50.0)
Female	18 (60.0)	15 (50.0)
Infant Age, (Mean±SD)(Range) (Months)	8.70 ± 1.99 (6–12)	8.90 ± 2.01 (6–12)
Maternal adherence to animal-source protein complementary feeding, n (%)		
Adherent	25 (83.3)	-
Non-adherent	5 (16.7)	-

Note: Continuous variables are presented as mean ± standard deviation (range), and categorical variables as n (%).
Maternal adherence was assessed only in the intervention group. — = not assessed/not applicable.

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A total of 60 mother–infant pairs were included in the study, with 30 participants allocated to each group. The mean maternal age was comparable between the intervention and control groups (29.57 ± 3.65 vs. 29.60 ± 3.73 years), with maternal ages ranging from 24–37 years in both groups. The mean infant age was 8.70 ± 1.99 months in the intervention group and 8.90 ± 2.01 months in the control group, with an age range of 6–12 months. Most mothers in both groups had completed senior high school education (56.7% each) and were homemakers (60.0% in the intervention group and 63.3% in the control group). Mothers with two children represented the largest proportion in both groups (46.7% and 43.3%, respectively). Female infants predominated in the intervention group (60.0%), whereas the control group had an equal distribution of male and female infants (50.0% each). In the intervention group, 25 mothers (83.3%) were compliant in providing animal protein-based complementary foods, while 5 mothers (16.7%) were classified as non-compliant.

Table 2. Distribution of Anthropometric Measures and Nutritional Status Before and After Intervention

Variable	Intervention Group (n=30)		Control Group (n=30)	
	Before, n (%)	After, n (%)	Before, n (%)	After, n (%)
Anthropometric Measure Category				
Body weight				
<6.5 kg	24 (80.0)	0 (0.0)	25 (83.3)	12 (40.0)
≥6.5 kg	6 (20.0)	30 (100.0)	5 (16.7)	18 (60.0)
Body length				
<65 cm	9 (30.0)	0 (0.0)	9 (30.0)	9 (30.0)
≥65 cm	21 (70.0)	30 (100.0)	21 (70.0)	21 (70.0)
Anthropometric Indicator and Nutritional Status				
Weight-for-age (WAZ)				
Normal (≥ -2 SD)	7 (23.3)	30 (100.0)	1 (3.3)	5 (16.7)
Moderate underweight (-3 to < -2 SD)	17 (56.7)	0 (0.0)	19 (63.3)	16 (53.3)
Severe underweight (< -3 SD)	6 (20.0)	0 (0.0)	10 (33.3)	9 (30.0)
Weight-for-length (WHZ)				
Normal (≥ -2 SD)	16 (53.3)	30 (100.0)	12 (40.0)	15 (50.0)
Moderate wasting (-3 to < -2 SD)	14 (46.7)	0 (0.0)	18 (60.0)	15 (50.0)
Severe wasting (< -3 SD)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

At baseline, most infants in both groups had a body weight of <6.5 kg. In the intervention group, 24 infants (80.0%) weighed <6.5 kg, compared with 25 infants (83.3%) in the control group. After 12 weeks of follow-up, all infants in the intervention group (30, 100.0%) had a body weight of ≥6.5 kg, whereas the proportion in the control group increased from 16.7% to 60.0%.

Regarding body length, 9 infants (30.0%) in each group had a body length of <65 cm at baseline, while 21 infants (70.0%) had a body length of ≥65 cm. After 12 weeks, all infants in the intervention group (30, 100.0%) had a body length of ≥65 cm. In the control group, the distribution remained unchanged, with 9 infants (30.0%) having a body length of <65 cm and 21 infants (70.0%) having a body length of ≥65 cm at both assessments.

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At baseline, the intervention group had a high proportion of infants classified as undernourished according to both weight-for-age (WAZ) and weight-for-length (WHZ). Based on WAZ, 7 infants (23.3%) had a normal weight-for-age status, while 17 (56.7%) were moderately underweight and 6 (20.0%) were severely underweight. Based on WHZ, 16 infants (53.3%) had a normal weight-for-length status, whereas 14 (46.7%) were moderately wasted. No infants in the intervention group were classified as severely wasted according to WHZ.

After 12 weeks of intervention, all infants in the intervention group (30, 100.0%) were classified as having normal WAZ and WHZ. Consequently, no infants remained in the moderate or severe underweight categories based on WAZ, and no infants remained in the moderate wasting category based on WHZ.

In the control group, 1 infant (3.3%) had a normal WAZ at baseline, whereas 19 (63.3%) were moderately underweight and 10 (33.3%) were severely underweight. Based on WHZ, 12 infants (40.0%) had a normal weight-for-length status and 18 (60.0%) were moderately wasted. After 12 weeks, the proportion of infants with normal WAZ increased to 5 (16.7%), while 16 (53.3%) remained moderately underweight and 9 (30.0%) remained severely underweight. For WHZ, the proportion with normal weight-for-length status increased to 15 (50.0%), while 15 (50.0%) remained moderately wasted.

Overall, the descriptive findings indicate greater changes in anthropometric and nutritional-status categories in the intervention group than in the control group over the 12-week follow-up period.

Table 3. Within-Group Changes in Anthropometric Measurements Before and After the Intervention

Anthropometric variable	Direction of change	n	Mean rank	Sum of ranks	p-value
Body weight	Negative ranks	0	0.00	0.00	<0.001
	Positive ranks	30	15.50	465.00	
	Ties	0	—	—	
Body length	Negative ranks	0	0.00	0.00	<0.001
	Positive ranks	30	15.50	465.00	
	Ties	0	—	—	

Note: Statistical analysis was performed using the Wilcoxon signed-rank test. Negative ranks indicate a decrease from baseline to post-intervention, whereas positive ranks indicate an increase. A p-value <0.05 was considered statistically significant.

The Wilcoxon signed-rank test demonstrated significant changes in anthropometric measurements following the 12-week intervention. All 30 infants in the intervention group showed an increase in body weight compared with baseline, with no infants experiencing a decrease or showing tied values ($p < 0.001$). Similarly, all 30 infants demonstrated an increase in body length after the intervention, with no negative ranks or ties ($p < 0.001$). These findings indicate statistically significant improvements in both body weight and body length following the intensive animal-source protein support.

DISCUSSION

Maternal adherence to animal-source protein-based complementary feeding was relatively high, with 25 mothers (83.3%) classified as adherent and 5

(16.7%) as non-adherent. Animal-source protein provides essential amino acids with high bioavailability, as well as important micronutrients such as heme iron, zinc, and vitamin B12, which support infant growth and development. This is consistent with the Indonesian Ministry of Health's emphasis on animal-source protein-rich complementary feeding as an important strategy for stunting prevention (Ministry of Health of the Republic of Indonesia, 2024). Solikhah and Dewi (2022) similarly highlighted the important role of animal-source protein in preventing stunting through its contribution of high-quality protein and essential micronutrients. The relatively high adherence in this study may be related to the intensive and repeated counseling provided during the intervention, which

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encouraged mothers to apply recommended animal-source protein-based complementary feeding more consistently.

At baseline, most infants in the intervention group had a body weight <6.5 kg (24 infants; 80.0%), whereas after the 12-week intervention, all infants (100.0%) reached ≥6.5 kg. In contrast, 12 infants (40.0%) in the control group remained below 6.5 kg at post-intervention assessment. This finding is consistent with Yusika and Tristianur (2025), who reported that health promotion on animal-source protein-based complementary feeding improved the nutritional status of all infants aged 6–12 months included in the study. Similarly, a systematic review by Dewey and Adu-Afarwah (2008) showed that appropriate complementary-feeding interventions can improve weight gain and growth among children in developing countries. The greater improvement observed in the intervention group may be related to the contribution of animal-source protein as a source of essential amino acids and other nutrients required for tissue synthesis and growth, thereby supporting weight recovery during the complementary-feeding period.

The intervention group also showed an improvement in body length, with the proportion of infants measuring ≥65 cm increasing from 21 (70.0%) at baseline to all infants (100.0%) after the intervention, whereas no substantial change was observed in the control group. This finding is consistent with Tang et al. (2018), who reported that complementary diets containing adequate animal-source protein were associated with more favorable linear growth than diets with lower animal-source protein content. Similarly, Saputra et al. (2025) emphasized that the timing, type, and quantity of complementary foods are important determinants of growth and development among infants aged 6–12 months. The observed improvement may be related to the contribution of high-quality animal-source protein to tissue and skeletal growth, potentially through pathways involving insulin and insulin-like growth factor-1 (IGF-1), although the present study did not directly measure these biological mechanisms.

Based on weight-for-age (WAZ), the intervention group showed a substantial improvement in nutritional status, with all infants (100.0%) classified as having normal weight-for-age status after the intervention,

compared with 23.3% at baseline. In contrast, 53.3% of infants in the control group remained moderately underweight at post-intervention assessment. This finding is consistent with Norberta and Rohmawati (2022), who reported a positive association between maternal knowledge of complementary feeding and the nutritional status of infants aged 6–24 months. Septiani (2014) also found that introducing complementary foods before 6 months of age was associated with a substantially higher risk of abnormal nutritional status, highlighting the importance of appropriate timing, type, and composition of complementary foods. Furthermore, Paninsari et al. (2024) emphasized the importance of adequate nutrition during the 6–12-month period, with appropriate breastfeeding history associated with better infant development. The improvement in WAZ observed in the intervention group may therefore be related to the combination of nutritional education, continuous monitoring, and practical support for animal-source protein-based complementary feeding, which may have promoted more consistent maternal feeding practices.

A similar pattern was observed for weight-for-length (WHZ), with the proportion of infants in the intervention group classified as having normal nutritional status increasing from 53.3% at baseline to 100.0% after the intervention. In contrast, the control group showed a more limited improvement, with normal and underweight classifications each accounting for 50.0% at post-intervention assessment. Muniarti (2010) reported a significant association between maternal knowledge and attitudes regarding complementary feeding and the nutritional status of children aged 6–24 months ($p=0.004$), supporting the importance of caregiver-related factors in improving child nutrition. In addition, the Indonesian Pediatric Society (Indonesian Pediatric Society [IDAI], 2026; Parikh et al., 2022; Headey et al., 2018; Iannotti et al., 2017) emphasizes the importance of animal-source foods, including fish, eggs, poultry, meat, and liver, for preventing growth failure in children aged 6–23 months because of their essential amino acids and micronutrient content. The marked improvement in WHZ in the intervention group may reflect the combined effects of improved dietary quality and continuous caregiver support during the intervention period.

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The Mann–Whitney U test demonstrated significant differences in post-intervention weight-for-age (WAZ) and length-for-age (LAZ) between the intervention and control groups, with mean ranks of 45.50 and 15.50, respectively ($p < 0.001$ for both outcomes). These findings indicate that anthropometric outcomes were significantly better in the intervention group following intensive animal-source protein support. In addition, the Wilcoxon signed-rank test showed that all 30 infants (100.0%) in the intervention group experienced increases in body weight and body length, with no negative ranks, yielding $p < 0.001$ for both outcomes. These findings are consistent with Yusika & Tristianur (2025), who also reported significant improvements in infant nutritional status following an animal-source protein-based complementary-feeding intervention using the Wilcoxon test. The greater improvement observed in the present study may be related to differences in participant characteristics, intervention duration, frequency of follow-up, and consistency in the type and quantity of animal-source protein provided.

The statistically significant improvements in anthropometric outcomes support the potential effectiveness of intensive animal-source protein support in promoting weight recovery among infants aged 6–12 months with weight faltering. Several contextual factors may have contributed to the observed outcomes, including high maternal motivation to improve infant nutritional status, relatively easy access to locally available animal-source foods, and active involvement of community health cadres in monitoring infant growth during the intervention. These factors may have facilitated adherence and strengthened the implementation of the intervention. Overall, intensive support for animal-source protein-based complementary feeding appears to be a promising community-based nutritional strategy for promoting weight recovery and potentially reducing the risk of persistent growth faltering and subsequent stunting. However, further studies with randomized designs and larger samples are needed to establish the causal effectiveness and long-term sustainability of this intervention.

CONCLUSION

This study showed that intensive support for animal-source protein-based complementary feeding was associated with improved anthropometric outcomes among infants aged 6–12 months with

weight faltering in Tanjung Gusta, Medan. Maternal adherence to the intervention was relatively high, with 83.3% of mothers classified as adherent. Following the 12-week intervention, all infants in the intervention group experienced increases in body weight and body length, while substantial improvements were also observed in weight-for-age and weight-for-length nutritional status. Significant differences between the intervention and control groups further support the potential effectiveness of intensive animal-source protein support in promoting weight recovery. These findings suggest that structured and continuous caregiver support for animal-source protein-based complementary feeding may be a promising community-based strategy for addressing early growth faltering and reducing the risk of subsequent malnutrition and stunting.

RECOMMENDATIONS

For educational institutions: The findings may be incorporated into community midwifery and infant nutrition education, particularly regarding early detection of weight faltering and intensive support for appropriate complementary feeding.

For primary healthcare services and community health cadres: Midwives and community health cadres are encouraged to integrate regular monitoring of infant growth with practical counseling and follow-up on animal-source protein-based complementary feeding through Posyandu and other primary healthcare services.

For future researchers: Further studies should involve larger samples, longer follow-up periods, and preferably randomized designs to strengthen causal inference. Future research may also examine additional factors, including household support, cultural practices, dietary intake, food accessibility, and biochemical indicators, to better understand the mechanisms and sustainability of weight recovery.

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