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RISK FACTOR ANALYSIS OF NUTRITIONAL STATUS OF TODDLERS IN KARRANG VILLAGE ENREKANG REGENCY 2026

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ABSTRACT

Child malnutrition remains a local health concern in Karrang Village, Enrekang Regency. This study examined factors related to abnormal nutritional status among toddlers aged 12–59 months, focusing on supplementary feeding, infectious disease history, maternal nutrition knowledge, and low birth weight. An analytical observational study with a matched case-control design was carried out from January to March 2026. From 79 eligible toddlers, 48 were included: 24 cases with abnormal nutritional status and 24 age- and sex-matched controls with normal nutritional status. Information was obtained through mother interviews, anthropometric assessment, and review of maternal-child health books, growth monitoring cards, and Posyandu records. Data were analyzed using Chi-square or Fisher's exact tests, odds ratios, and 95% confidence intervals. A previous infectious disease was significantly associated with abnormal nutritional status (OR = 5.92; 95% CI: 1.387–25.300; $p = 0.026$). Poor maternal knowledge and low birth weight indicated elevated but statistically non-significant risks, whereas inadequate supplementary feeding showed no association. Infectious disease history was the dominant factor linked to abnormal toddler nutritional status. Therefore, infection control, timely illness management, and maternal nutrition education need to be intensified.

Keywords: Child nutritional status, infectious disease, maternal knowledge, low birth weight.

ABSTRAK

Malnutrisi pada balita masih menjadi permasalahan kesehatan di Desa Karrang, Kabupaten Enrekang. Penelitian ini bertujuan menganalisis faktor-faktor yang berhubungan dengan status gizi tidak normal pada balita usia 12–59 bulan, meliputi pemberian makanan tambahan, riwayat penyakit infeksi, pengetahuan gizi ibu, dan berat badan lahir rendah. Penelitian ini menggunakan desain observasional analitik dengan pendekatan kasus-kontrol berpasangan yang dilaksanakan pada Januari hingga Maret 2026. Sampel penelitian berjumlah 48 balita dari 79 anak yang memenuhi kriteria, terdiri atas 24 balita dengan status gizi tidak normal sebagai kelompok kasus dan 24 balita dengan status gizi normal sebagai kelompok kontrol yang dicocokkan berdasarkan umur dan jenis kelamin. Data diperoleh melalui wawancara terstruktur, pengukuran antropometri, serta telaah buku KIA, KMS, dan register Posyandu. Analisis data menggunakan uji Chi-square atau Fisher's exact, odds ratio, dan interval kepercayaan 95%. Hasil penelitian menunjukkan bahwa riwayat penyakit infeksi berhubungan signifikan dengan status gizi tidak normal (OR = 5,92; 95% CI: 1,387–25,300; $p = 0,026$). Pengetahuan ibu yang kurang dan berat badan lahir rendah menunjukkan kecenderungan peningkatan risiko, tetapi tidak signifikan secara statistik. Pemberian makanan tambahan yang kurang tidak menunjukkan hubungan dengan status gizi tidak normal. Riwayat penyakit infeksi merupakan faktor utama yang berhubungan dengan status gizi tidak normal pada balita.

Kata kunci: status gizi balita, penyakit infeksi, pengetahuan ibu, berat badan lahir rendah.

INTRODUCTION

Undernutrition among children under five remains an important public health problem because it can interfere with physical growth, cognitive development, immunity, and future productivity. Recent joint estimates from UNICEF, WHO, and the World Bank show that stunting and wasting continue to affect millions of children worldwide, indicating the need for sustained prevention, early detection, and appropriate nutritional interventions (UNICEF et al., 2025). In Indonesia, stunting reduction is still a national priority. The 2024 Indonesian Nutritional Status Survey reported that the national prevalence of stunting was 19.8%, which remains higher than the government target of 14% (Kemenkes RI, 2025). At the regional level, South Sulawesi recorded a prevalence of 23.3%, while Enrekang Regency reached 34.3%, showing that nutritional problems in this area require more specific and context-based attention (Kemenkes RI, 2025; Pemerintah Sulawesi Selatan, 2024).

At the local level, nutritional problems in Karang Village, Enrekang Regency, were identified through the 2025 nutritional status monitoring conducted by UPT Puskesmas Kabare. The monitoring was carried out using routine Posyandu anthropometric measurements and record reviews. Among 91 children assessed, 9.9% were classified as underweight, 5.5% as stunted, and 2.2% as wasted (UPT Puskesmas Kabare, 2025). Although these figures were lower than the district prevalence, the presence of undernutrition cases at the village level still indicates the need for further investigation, particularly among children aged 12–59 months who meet the study criteria.

The Indonesian government has implemented various nutrition programs, including both specific and sensitive interventions. One of these efforts is the Supplementary Feeding Program or Pemberian Makanan Tambahan (PMT) based on local food. However, the effectiveness of PMT may differ across communities because it is influenced by food adequacy, program continuity, child acceptance, compliance, and the presence of other health or nutritional risk factors. In addition to PMT, several factors may contribute to impaired nutritional status in children, including a history of infectious diseases, poor maternal nutritional knowledge, and a history of low birth weight.

Previous studies in Karang Village are still limited, especially those that examine several risk factors simultaneously using a matched case-control approach. Most available local data only describe the prevalence of nutritional problems, while evidence regarding the combined role of PMT, infectious disease history, maternal knowledge, and low birth weight remains insufficient. Therefore, this study provides a local contribution by analyzing these factors as potential determinants of abnormal nutritional status among children aged 12–59 months in Karang Village.

This study aims to analyze the magnitude of risk between inadequate supplementary feeding, history of infectious diseases, poor maternal nutritional knowledge, and history of low birth weight with abnormal nutritional status among children aged 12–59 months in Karang Village, Enrekang Regency. The findings are expected to support local health authorities in developing more targeted and evidence-

based nutrition interventions according to the dominant risk factors found in the study area.

RESEARCH METHODS

This study used an analytical observational design with a case-control approach. This design was considered appropriate because nutritional status abnormalities had been identified from local growth monitoring data, allowing the researchers to compare previous exposure factors between toddlers with abnormal nutritional status and those with normal nutritional status. The case-control approach was also suitable for a relatively small study population and for estimating the strength of association between several potential risk factors and abnormal nutritional status through odds ratio analysis (Szklo, 2016).

The study was conducted in Karang Village, Enrekang Regency, South Sulawesi Province, from January to March 2026. The target population consisted of all toddlers aged 12–59 months who lived in Karang Village during 2025 and were registered in the Posyandu and UPT Puskesmas Kabere records. Samples were selected using a 1:1 matching technique based on toddler age and sex, resulting in 24 cases and 24 controls, with a total sample of 48 toddlers.

The case group included toddlers with abnormal nutritional status, defined as underweight, stunting, or wasting based on the WHO 2006 Child Growth Standards, indicated by a Z-score below -2 SD for weight-for-age, height/length-for-age, or weight-for-height. The control group consisted of toddlers whose nutritional status was within the normal range, with Z-scores of -2 SD to +2 SD across the same anthropometric indicators. Matching was applied to minimize differences in basic demographic characteristics between the case and control groups. The inclusion criteria were toddlers aged 12–59 months, living in Karang Village during the study period, having complete maternal and child health records, and having mothers or primary caregivers who agreed to participate. Toddlers with congenital abnormalities, chronic diseases unrelated to nutrition, severe illness during anthropometric measurement, incomplete records, or caregivers who were unable to provide reliable information were excluded from the study.

Primary data were collected through structured interviews with mothers or primary caregivers using a questionnaire. The questionnaire covered several exposure variables, including supplementary feeding practices, history of infectious diseases during the previous six months, and maternal nutritional knowledge. Supplementary feeding practice was assessed based on the adequacy of feeding, consumption compliance, frequency of provision, and suitability of the food with the toddler's age. History of infectious diseases included common childhood illnesses such as diarrhea, acute respiratory infection, fever, and other infections reported or recorded within the last six months. Maternal nutritional knowledge was measured using questions related to balanced nutrition, breastfeeding, appropriate feeding practices, hygiene and sanitation, infection prevention, and growth monitoring. The total score was then categorized into good or poor knowledge based on the predetermined scoring criteria.

Anthropometric data were obtained through direct measurement by trained enumerators using standardized procedures. Body weight was measured using a calibrated digital scale, while height or length was measured using a stadiometer or length board according to the child's age and ability to stand. Nutritional status was determined by comparing the measurement results with the WHO 2006 Child Growth Standards and converting them into Z-score indicators.

Before data collection, the questionnaire was reviewed for content validity by public health and nutrition experts and was pilot-tested among mothers of toddlers with similar characteristics outside the study sample. Item validity was assessed using item-total correlation, while reliability was evaluated using Cronbach's alpha. A Cronbach's alpha value of more than 0.70 was considered acceptable for the maternal knowledge section.

Secondary data were obtained from Maternal and Child Health books, Growth Monitoring Cards, Posyandu registers, and UPT Puskesmas Kabere records. These records were used to verify information such as birth weight, age, sex, previous nutritional status, and documented history of illness. Data analysis consisted of univariate analysis to describe the distribution of each variable and bivariate analysis to examine the association between risk factors and abnormal nutritional status. Because this study used a matched case-control design, matched analysis such as McNemar test or conditional logistic regression was considered appropriate. Odds ratios with 95% confidence intervals were calculated to determine the strength of association, and statistical significance was set at $p < 0.05$. Data analysis was performed using SPSS software.

RESULTS AND DISCUSSION

Respondent Characteristics

Table 1 presents the complete distribution of respondent characteristics in the case and control groups. Most mothers were aged 25-35 years at the time of the study, namely 20 respondents (83.3%) in the case group and 21 respondents (87.5%) in the control group. At delivery, the same age category also predominated, with 16 mothers (66.7%) in the case group and 18 mothers (75.0%) in the control group. Senior high school education was the most common educational level in both groups (17 respondents; 70.8% each), and most mothers were housewives (22 respondents; 91.7% in cases and 24 respondents; 100.0% in controls). The distribution of children by sex and age was identical between groups because age and sex matching was applied.

Table 1. Distribution of Respondent Characteristics

Characteristic	Case (n=24)		Control (n=24)	
	n	%	n	%
Mother's Age at Study				
≤25 Years	0	0.0	0	0.0
25-35 Years	20	83.3	21	87.5
≥35 Years	4	16.7	3	12.5
Mother's Age at Delivery				
≤25 Years	5	20.8	5	20.8
25-35 Years	16	66.7	18	75.0
≥35 Years	3	12.5	1	4.2
Education: https://fahruddin.org/index.php/jth/				4
Senior High (SMA)	17	70.8	17	70.8
Others	7	29.2	7	29.2
Mother's Occupation				
Housewife	22	91.7	24	100.0
Others	2	8.3	0	0.0

Table 2 shows that the proportion of inadequate supplementary feeding (PMT) was the same in the case and control groups (7 toddlers; 29.2% each), while good PMT was reported for 17 toddlers (70.8%) in each group. A history of infectious disease was more frequent among cases (11 toddlers; 45.8%) than controls (3 toddlers; 12.5%). Poor maternal knowledge was also more common in the case group (13 mothers; 54.2%) than in the control group (6 mothers; 25.0%). History of low birth weight (LBW) was found only in the case group (3 toddlers; 12.5%).

Table 2. Distribution of Research Variables

Variable	Case (n=24)		Control (n=24)	
	n	%	n	%
Supplementary Feeding (PMT)				
Less	7	29.2	7	29.2
Good	17	70.8	17	70.8
History of Infectious Disease				
Yes	11	45.8	3	12.5
No	13	54.2	21	87.5
Maternal Knowledge				
Poor	13	54.2	6	25.0
Good	11	45.8	18	75.0
History of Low Birth Weight (LBW)				
Yes	3	12.5	0	0.0
No	21	87.5	24	100.0

Table 3 presents the bivariate analysis using odds ratios (OR), 95% confidence intervals (CI), and p-values. Inadequate PMT was not associated with abnormal nutritional status (OR = 1.00; 95% CI: 0.288-3.472; p = 1.000). History of infectious disease was significantly associated with abnormal nutritional status (OR = 5.92; 95% CI: 1.387-25.300; p = 0.026). Poor maternal knowledge showed increased odds but did not reach statistical significance based on $p < 0.05$ (OR = 3.55; 95% CI: 1.042-12.059; p = 0.077), so it should be interpreted as a borderline association. History of LBW also indicated an increased tendency but was not statistically significant (OR = 7.98; 95% CI: 0.390-163.342; p = 0.119).

Table 3. Bivariate Analysis of Risk Factors for Abnormal Nutritional Status

Variable	Case n (%)	Control n (%)	OR (95% CI)	p-value
Supplementary Feeding – Less	7 (29.2)	7 (29.2)	1.00 (0.288-3.472)	1.000
History of Infectious Disease – Yes	11 (45.8)	3 (12.5)	5.92 (1.387-25.300)	0.026
Maternal Knowledge – Poor	13 (54.2)	6 (25.0)	3.55 (1.042-12.059)	0.077
History of LBW – Yes	3 (12.5)	0 (0.0)	7.98* (0.390-163.342)	0.119

Note: *Continuity correction was applied because one cell contained a zero value.

The present study found that history of infectious disease was the only factor statistically associated with abnormal nutritional status among toddlers in Karrang Village. Inadequate PMT, poor maternal knowledge, and history of LBW showed different magnitudes of association, but they did not meet the $p < 0.05$ significance criterion. Therefore, interpretation of the findings should distinguish between statistically significant

associations and non-significant risk tendencies.

The wording of PMT requires conceptual caution. PMT itself should not be interpreted as a risk factor; rather, the potential risk lies in inadequate PMT in terms of quantity, quality, duration, and compliance. In this study, inadequate PMT was not associated with abnormal nutritional status because its proportion was identical in the case and control groups (29.2% each; OR = 1.00; 95% CI: 0.288-3.472; $p = 1.000$). This result suggests that PMT exposure, as measured in this study, did not differentiate toddlers with abnormal and normal nutritional status.

From a nutritional perspective, PMT may improve child nutritional status when it provides sufficient energy, protein, and micronutrients to complement daily intake. However, its effect depends on program implementation, including adequacy of portion size, nutrient density of local food ingredients, duration and regularity of distribution, child compliance in consuming the food, possible food sharing within the household, and monitoring by health workers. Previous studies have reported benefits of PMT, but differences in implementation quality may explain why the association was not significant in this study (Widiastuti et al., 2025; Ruhana et al., 2025).

History of infectious disease was a significant factor associated with abnormal nutritional status (OR = 5.92; 95% CI: 1.387-25.300; $p = 0.026$). Toddlers with a history of infection had nearly six times higher odds of abnormal nutritional status than those without such history. This finding is biologically plausible because infections can reduce appetite, impair nutrient absorption, increase inflammatory responses, and raise metabolic demands, thereby worsening nutritional status (Sari & Agustin, 2023; Cono et al., 2021).

Poor maternal knowledge showed higher odds of abnormal nutritional status, but the association was not statistically significant at $p = 0.05$ (OR = 3.55; 95% CI: 1.042-12.059; $p = 0.077$). Therefore, it should not be stated as a confirmed significant risk factor in this study. The result indicates a borderline tendency, suggesting that maternal knowledge may influence feeding practices, food selection, hygiene behavior, and health-seeking behavior, but its effect may also be shaped by education, income, food availability, and family support. Madiha et al. (2026) similarly reported that maternal knowledge was not directly associated with child nutritional status, whereas maternal education and family income were significant.

History of low birth weight (LBW) showed an increased but non-significant tendency toward abnormal nutritional status (OR = 7.98; 95% CI: 0.390-163.342; $p = 0.119$ with continuity correction). The wide confidence interval reflects the small number of LBW cases and indicates limited statistical precision. Although LBW infants are generally more vulnerable to growth faltering because of lower nutrient reserves and greater biological vulnerability, the present data are insufficient to confirm LBW as a statistically significant factor in this sample (Theresya, 2025; Maineny et al., 2022).

These findings underscore the need for integrated interventions in Karrang Village. Priority should be given to preventing infectious diseases through improved hygiene, immunization, early treatment, and caregiver education, because infectious diseases can reduce appetite, impair nutrient absorption, increase metabolic needs, and worsen toddlers'

nutritional status (Cono et al., 2021; Sari & Agustin, 2023). PMT programs should also be strengthened by ensuring adequate energy-protein content, regular distribution, compliance monitoring, and evaluation of child consumption, so that the program can address actual nutritional deficits rather than merely providing food assistance (Hartini et al., 2023; Ruhana et al., 2025; Widiastuti et al., 2025).

This study provides context-specific evidence for local health authorities. However, the interpretation of the findings should consider the relatively small sample size and the case-control design, which cannot establish causality (Setia, 2016). Future studies with larger samples and prospective follow-up are recommended to examine the combined effects of PMT quality, infection history, maternal knowledge, low birth weight, and household-level factors on toddler nutritional status (Madiha et al., 2026; Maineny et al., 2022).

CONCLUSION

Based on the results of the risk factor analysis of toddlers' nutritional status in Karrang Village, Enrekang Regency, it can be concluded that the provision of Supplementary Feeding (PMT), history of infectious disease, and maternal knowledge act as risk factors for abnormal nutritional status in toddlers. The analysis showed that inadequate PMT is a risk factor with an odds ratio (OR) of 4.67 (95% CI: 1.187–18.352). A history of infectious disease showed the same risk level (OR = 4.67; 95% CI: 1.187–18.352). Poor maternal knowledge increased the risk of abnormal nutritional status by 4 times (OR = 4.00; 95% CI: 1.051–15.223). Meanwhile, a history of low birth weight (LBW) had an OR of 0.71 (95% CI: 0.590–0.857), indicating it is not a risk factor in this study but rather shows a tendency toward a protective effect on toddlers' nutritional status.

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