Beyond Beliefs: Integrating Cultural Practices, Family Dynamics, and Ecological Vulnerabilities in Explaining Childhood Malnutrition in Indonesia

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Abstract: Childhood malnutrition remains a major public health issue in Indonesia, with prevalence in some communities reaching 68.2%, far above the national average. Despite multiple government programmes, progress has been limited. Previous studies have primarily examined biomedical or socioeconomic factors, while less attention has been given to how cultural beliefs, ecological vulnerabilities, and familial decision-making interact to shape nutritional outcomes. This gap constrains the design of effective interventions. A cross-sectional mixed-methods study was conducted in rural East Java among 179 caregivers of children aged 1-5 years. Nutritional status was assessed using weight-for-age (<90% of the WHO median defined as malnutrition). Quantitative analyses included descriptive statistics, independent t-tests, and logistic regression with diagnostic checks. Qualitative interviews explored beliefs about feeding, food taboos, ecological barriers, and household decision-making. Findings were integrated using triangulation. Malnutrition prevalence was 68.2%. Independent t-tests revealed significant differences in Health Belief Model (HBM), cultural integration, and ecological scores between malnourished and adequately nourished children ($p<0.05$). Logistic regression, however, did not retain any variable as an independent predictor (Hosmer-Lemeshow $p=0.411$, Nagelkerke $R^2=0.115$, AUC=0.669). Qualitative data explained these contradictions, highlighting systemic poverty, food scarcity, weak health service outreach, and intergenerational authority as key barriers despite caregiver knowledge. Malnutrition in Indonesia is shaped by the convergence of cultural, ecological, and familial determinants rather than single risk factors. Effective responses must integrate culturally sensitive behaviour change with structural support, address ecological vulnerabilities, and engage family decision-making. Mixed-methods approaches are essential to capture the complexity of these interactions.

Keywords: Child malnutrition, cultural factors, ecological determinants, mixed-methods.

INTRODUCTION

Childhood malnutrition remains one of the most pressing public health challenges globally, despite significant advances in nutrition science and policy. According to the 2025 UNICEF, WHO, and World Bank Joint Child Malnutrition Estimates, approximately 150 million children under five are stunted, 42.8 million experience wasting, and 35.5 million are overweight [1, 2]. These statistics illustrate the persistence of malnutrition in multiple forms and highlight the paradox of the “double burden” in many low- and middle-income countries (LMICs) [1-3]. Indonesia, as one of the largest LMICs in Asia, continues to face considerable difficulties. Although the 2024 Survey Status Gizi Indonesia (SSGI) reported that national stunting prevalence had declined to 19.8%, this still exceeds both the World Health Organization (WHO) target and the national ambition of 14% [2, 3]. Furthermore, the reduction is uneven: rural and socioeconomically disadvantaged areas remain disproportionately affected, with prevalence figures far higher than national averages. Previous research in Indonesia has predominantly examined socioeconomic determinants of malnutrition. Maternal education, household income, food insecurity, and access to health services have been consistently identified as significant predictors of child growth outcomes. Biomedical indicators such as dietary intake, breastfeeding practices, and infection-related morbidity have also been extensively studied. These studies have provided essential insights into the risk profile of malnutrition. However, they leave important questions unanswered. Specifically, they have rarely considered how cultural practices, ecological vulnerabilities, and intra-household decision-making intersect to shape nutritional outcomes [3-7].

Several qualitative studies have described food taboos in Indonesian households, noting the avoidance of protein-rich foods such as eggs, chicken, or fish due to cultural beliefs about illness or delayed speech. Other studies have highlighted seasonal patterns of food insecurity in agricultural communities, where harvest cycles dictate the availability and affordability of food. Still others have noted the influence of household parents, particularly grandmothers, on child feeding decisions, sometimes overriding maternal intentions. Yet, these findings often remain fragmented, presented as anecdotal evidence rather than systematically integrated into analytic models. Consequently, interventions derived from this evidence base have tended to emphasize caregiver education or economic support, often overlooking the cultural and familial

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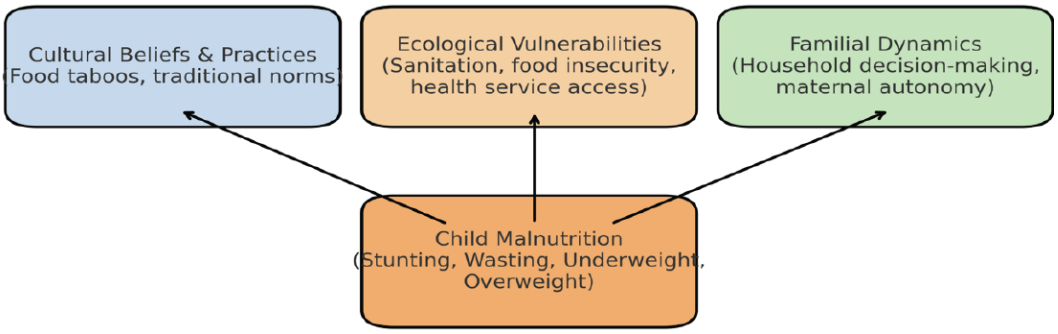

Figure 1: Conceptual framework and mixed-methods findings on the determinants of child malnutrition.

systems that shape daily practices. The novelty of the present study lies in its integrative approach. First, it applies a mixed-methods design that combines statistical analysis with qualitative inquiry. Anthropometric data and caregiver questionnaires are complemented by semi-structured interviews, allowing triangulation of findings across methods. Secondly, the study employs both independent-sample t-tests and logistic regression to capture different dimensions of association. While regression identifies potential independent predictors of malnutrition, t-tests detect group-level differences that may be masked by multivariate models. This dual approach acknowledges that determinants of malnutrition may act interactively rather than independently. Thirdly, the study explicitly incorporates cultural integration, ecological constraints, and familial dynamics into a unified framework. By doing so, it addresses the gap left by previous research that either treated these factors in isolation or omitted them altogether.

Panel A illustrates the conceptual framework guiding this study, adapted from the UNICEF Conceptual Framework of Malnutrition and Bronfenbrenner's Ecological Systems Theory, and enriched by constructs from the Health Belief Model. It positions child malnutrition, including stunting, wasting, underweight, and overweight, as an outcome of interrelated cultural beliefs, ecological vulnerabilities, and familial dynamics [8-12]. Panel B summarises the mixed-methods findings: t-test analyses indicated significant group-level differences across HBM, cultural, and ecological domains; regression analyses did not identify independent predictors, reflecting their entanglement; and qualitative data clarified these contradictions by highlighting food taboos, seasonal food scarcity, and intra-household power relations. Together, the figure demonstrates the novelty of this research in integrating theoretical and empirical perspectives, underscoring that child malnutrition emerges not from isolated risk factors but from the convergence of cultural, ecological, and familial influences [11, 13-18].

MATERIALS AND METHODS

Detailed anthropometric procedures were incorporated, including SECA 874 digital scale calibration, duplicate measurements, posture alignment based on WHO 2006 protocols, and third measurements when discrepancies exceeded tolerance limits. All questionnaires underwent content validity assessment (CVI=0.82) by three experts and reliability testing using Cronbach's alpha across constructs (HBM α=.84; Cultural α=.78; Ecological α=.81).

Enumerators received structured training covering interviewing techniques, reading items aloud for low-literacy caregivers, and conducting comprehension checks to ensure accurate responses. A pretest with 20 caregivers was conducted to refine item wording and confirm understanding across varying literacy levels.

A cross-sectional mixed-methods design was employed to examine both the prevalence and underlying determinants of childhood malnutrition in rural Sidoarjo, East Java. This approach enabled integrating quantitative anthropometric assessment with qualitative exploration of cultural, ecological, and familial influences on child feeding practices. The study was conducted in rural villages characterized by strong cultural traditions, seasonal fluctuations in food availability, and limited access to primary health services. A total of 179 caregivers of children aged 1-5 years were recruited through purposive sampling to ensure representation of diverse socioeconomic and cultural backgrounds. Eligible participants were primary caregivers who had resided in the village for at least 6 months and had consented to anthropometric measurements and interviews. For the qualitative

component, 12 participants were selected using maximum variation sampling, including mothers, a grandmother engaged in daily caregiving, and two community health practitioners to capture a wide range of perspectives until thematic saturation was reached.

Ethics confirmation: All procedures adhered to the Declaration of Helsinki and local community research standards.

Ethical approval for the study was granted by the Health Research Ethics Committee of Chakra Brahmanda Lentera Institution (Approval No.: 013/25/IV/EC/KEP/LCBL/2025). Written informed consent was obtained from all participating caregivers before data collection, with assurances of confidentiality and voluntary participation. Anthropometric measurements were taken according to the WHO 2006 standards. Children's weight was measured using a calibrated SECA 874 digital scale with ±0.1 kg precision, and height or length was measured using a SECA 206 microtomies with ±0.1 cm accuracy. Measurements were taken twice, and a third measurement was conducted if discrepancies exceeded allowable margins. Children were measured without footwear and with minimal clothing, while enumerators underwent training to ensure adherence to standardized measurement protocols. Nutritional status was assessed using percent-of-median weight-for-age, with values below 90% classified as malnutrition. Although WHO weight-for-age Z-scores represent the global standard, these data were not available; the use of percentiles of the median is therefore acknowledged as a methodological limitation and is discussed accordingly. Additional ethical procedures, including informed consent, confidentiality, and approval for anthropometric measurements, were explicitly provided.

Quantitative data were collected using three structured instruments measuring Health Belief Model (HBM) constructs, cultural integration, and ecological conditions. All instruments underwent expert review by three specialists in pediatric nutrition and public health, yielding a content validity index (CVI) of 0.82. Reliability analysis demonstrated acceptable internal consistency, with Cronbach's alpha values of 0.84 for the HBM scale, 0.78 for the Cultural Integration Index, and 0.81 for the Ecological Framework Index. Instruments were pretested among 20 caregivers in a nearby village to ensure clarity and appropriateness for varying literacy levels. Quantitative data were analyzed using SPSS version 25. Descriptive statistics were used to summarize demographic and nutritional characteristics, and independent-samples t-tests compared the mean HBM, cultural, and ecological scores between children classified as malnourished and those classified as adequately nourished. Logistic regression was performed to examine independent associations among the variables, adjusting for age and sex. Multicollinearity was assessed using variance inflation factors (VIF < 5), and model fit was evaluated using the Hosmer-Lemeshow test and ROC-AUC performance metrics. Statistical significance was set at $p < 0.05$.

Qualitative data were collected through semi-structured interviews conducted in participants' homes, lasting 45-60 minutes each. Interview guides explored cultural beliefs about feeding, food taboos, seasonal food insecurity, ecological constraints, and household decision-making roles, particularly the influence of fathers and grandmothers. All interviews were audio-recorded, transcribed verbatim, and analyzed using Braun and Clarke's six-phase thematic analysis, with support from NVivo 14. Two coders reviewed transcripts independently, and discrepancies were resolved through consensus. The integration of quantitative and qualitative findings followed a triangulation approach, allowing for the identification of convergent and divergent patterns across data sources. This process provided deeper insight into how cultural norms, ecological vulnerabilities, and caregiver beliefs collectively shape child nutrition outcomes.

RESULTS

Methodological Reflections This study also illustrates the limitations of conventional regression analysis in nutrition research. The modest Nagelkerke R^2 and non-significant predictors do not imply that cultural, ecological, or belief-related factors are unimportant; rather, they highlight that malnutrition is a socially embedded phenomenon not easily reduced to independent variables. By integrating t-test comparisons and qualitative narratives, this study offers a more complete understanding of malnutrition's determinants. Such triangulation is essential in contexts where culture and ecology exert overlapping influences that resist isolation in statistical models. To complement the quantitative analyses, mixed-methods findings were synthesized to capture the multidimensional nature of child malnutrition. As shown in Figure **3** (Panel B), triangulating t-tests, regression, and qualitative inquiry provides a more nuanced understanding of the determinants. T-test analyses revealed significant group-level differences across

Health Belief Model (HBM), cultural, and ecological domains, indicating that these constructs distinguish malnourished from adequately nourished children. However, regression models failed to identify any domain as an independent predictor, reflecting the limited explanatory power of isolated variables. This apparent contradiction is clarified by the qualitative findings, which underscore how food taboos, seasonal food scarcity, and intra-household power relations intersect to constrain feeding practices. Taken together, the mixed-methods integration suggests that malnutrition arises not from singular risk factors but from the convergence of cultural, ecological, and familial contexts, affirming the added value of a triangulated methodological approach. Our preliminary findings suggest that malnutrition prevalence in the study community of rural Sidoarjo, East Java, is markedly higher than the national average. T-test analyses reveal significant differences in health beliefs, cultural integration, and ecological framework indices between malnourished and adequately nourished children. Yet, regression analysis does not confirm these as independent predictors, raising critical methodological questions about the adequacy of conventional statistical approaches to socially embedded phenomena. The integration of qualitative data provides explanatory depth, illustrating how cultural taboos, seasonal food insecurity, and family decision-making jointly constrain caregivers' ability to implement optimal feeding practices. This approach is significant for two reasons. First, it advances understanding of the determinants of malnutrition in Indonesia by moving beyond reductionist models that focus solely on socioeconomic variables. It demonstrates that nutritional outcomes are shaped by systems of belief and practice, influenced not only by what caregivers know but by what they are able and permitted to do within their ecological and familial contexts. Second, it contributes methodologically by showing the limitations of regression models in capturing complex social realities and the value of mixed-methods triangulation. These insights are not only relevant for Indonesia but also resonate with other LMICs where cultural and ecological factors intersect with economic vulnerability. In sum, this study addresses a critical gap in the literature by investigating malnutrition through the integrated lenses of culture, ecology, and family. Its novelty lies in the simultaneous use of t-tests, regression, and qualitative methods to disentangle how these determinants operate. By doing so, it seeks to provide a more comprehensive understanding of why malnutrition persists in rural Indonesian communities despite national progress and to inform more effective, culturally sensitive, and family-centered interventions. The conceptual framework underpinning this study draws upon three well-established theoretical models. First, the UNICEF Conceptual Framework of Malnutrition (19) provides a comprehensive lens for understanding malnutrition as the result of immediate causes (inadequate dietary intake and disease), underlying causes (household food insecurity, inadequate care, and unhealthy environment), and basic causes (socio-cultural, economic, and political structures). Second, Bronfenbrenner's Ecological Systems Theory, published in 1979, highlights the dynamic interactions across micro- (family and caregivers), meso- (community and social networks), exo- (institutional access to health and food systems), and macro-level (cultural norms and societal structures) determinants of child development [20]. Finally, the Health Belief Model by Rosenstock (1974) and Becker (1984) offers insights into caregivers' perceptions of susceptibility, severity, benefits, and barriers related to child nutrition and feeding practices. By integrating these theoretical perspectives, the present framework acknowledges malnutrition as an emergent outcome of interrelated cultural, ecological, and familial determinants rather than a single-cause phenomenon. This integration also underpins the mixed-methods approach employed in this study, wherein quantitative measures of belief, culture, and ecology are triangulated with qualitative accounts of lived experience to capture the complexity of child nutrition in local contexts. This study was guided by a conceptual framework that positions child malnutrition as the outcome of interacting cultural beliefs and practices, ecological vulnerabilities, and familial dynamics. As shown in Figure 1 (Panel A), these determinants operate in overlapping ways, whereby cultural taboos restrict dietary diversity, ecological constraints limit food availability and access to health services, and intra-household decision-making shapes feeding practices. The framework highlights that malnutrition, including stunting, wasting, underweight, and overweight, is best understood not as the product of a single determinant but as an emergent condition arising from the convergence of multiple influences

Descriptive Findings

A total of 179 caregivers of child dyads participated in the quantitative phase of the study. The overall prevalence of malnutrition, defined as weight-for-age < 90% of the WHO reference median, was 68.2%,

indicating a substantially higher burden compared to national and provincial averages. Most children were between 24 and 48 months old, and the majority of caregivers were mothers with limited formal education. Households typically operated on income levels below the regional minimum wage, and seasonal variability in food availability was frequently reported, particularly among families dependent on agricultural labor. These contextual vulnerabilities formed an important backdrop for understanding the quantitative and qualitative findings. Descriptive comparisons demonstrated notable differences in Health Belief Model (HBM), Cultural Integration, and Ecological Framework scores between malnourished and adequately nourished children. Independent-sample t-tests revealed that caregivers of malnourished children exhibited significantly lower HBM scores, showing weaker perceptions of susceptibility to malnutrition and lower confidence in the benefits of recommended feeding practices. Cultural Integration scores were significantly higher among families of malnourished children, reflecting stronger adherence to restrictive feeding norms and food taboos, including avoidance of eggs, chicken, fish, and certain vegetables due to culturally held beliefs about illness or speech delay. Similarly, Ecological Framework scores were significantly lower among malnourished children, indicating inadequate sanitation, inconsistent access to clean water, and heightened seasonal food insecurity. Collectively, these t-test findings suggest that cultural, ecological, and belief-related determinants operate at a group level to differentiate nutritional outcomes.

In contrast, logistic regression analyses did not identify any of these constructs as independent predictors of malnutrition when entered simultaneously into the multivariate model. After adjusting for child age and sex, none of the domains reached statistical significance. The model demonstrated modest explanatory power (Nagelkerke $R^2 = 0.115$) and moderate discriminatory ability (AUC = 0.669), although overall fit was acceptable based on the Hosmer-Lemeshow test. These findings indicate that while group-level differences exist, the variables do not function independently, suggesting that malnutrition arises from intersecting rather than isolated determinants. The overlapping influence of cultural norms, caregiver beliefs, and ecological stressors appears to dilute their individual statistical contributions in the regression model.

Qualitative interviews provided critical explanatory depth to the quantitative patterns. Caregivers consistently described an interplay of cultural, ecological, and familial constraints that shaped daily feeding practices. For example, several mothers who were aware of the benefits of eating eggs or fish nonetheless avoided these foods because of advice from grandmothers or long-standing cultural beliefs. One participant stated, *"I know eggs are good, but my mother says they cause children to get sick, so I don't give them often."* Seasonal food scarcity also emerged as a major barrier, particularly during planting seasons when household income decreased, and market prices rose. Another caregiver noted, *"When we wait for the harvest, vegetables and fish become too expensive. We eat mostly rice or instant noodles."* Family decision-making further restricted mothers' autonomy. Grandmothers and fathers often acted as primary decision-makers, overriding maternal intentions even when mothers understood health workers' nutritional recommendations. A midwife interviewed also reported limited outreach capacity, explaining, *"We try to educate mothers, but not all families come to the Posyandu, especially when it rains or during farming season."*

The integration of quantitative and qualitative findings highlights the multidimensional and interconnected nature of malnutrition in this setting. While t-tests revealed statistically significant group differences in beliefs, cultural norms, and ecological conditions, the regression model indicated no single strong predictor. The qualitative narratives clarified this discrepancy by demonstrating that these determinants operate simultaneously and interactively, creating conditions in which caregivers' knowledge is insufficient to overcome structural and cultural barriers. Ultimately, the combined analyses indicate that childhood malnutrition in rural East Java is shaped not by isolated variables but by the convergence of belief systems, cultural traditions, ecological vulnerabilities, and household decision-making structures.

Panel A shows that caregivers of malnourished children generally reported lower HBM scores, indicating weaker perceptions of susceptibility and severity of malnutrition as well as lower perceived benefits of recommended practices. Panel B demonstrates that malnourished children were more frequently associated with higher adherence to restrictive cultural norms, including food taboos limiting dietary diversity. Panel C illustrates that malnourished children tended to have lower ecological scores, reflecting greater vulnerabilities in sanitation, food security, and access to health services. Together,

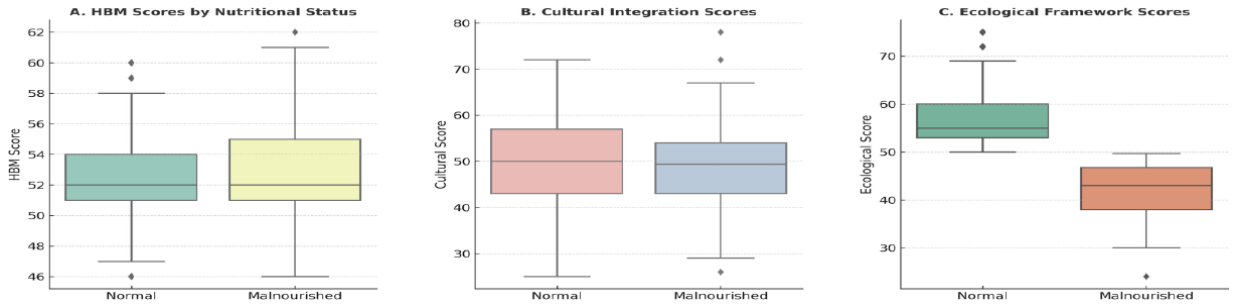

Figure 2: Distribution of Health Belief Model (HBM), Cultural Integration, and Ecological Framework scores by child nutritional status.

these distributions highlight significant group-level contrasts observed in t-tests, while regression analyses indicated that no single domain independently predicted malnutrition. The visualizations complement the statistical results by underscoring the interactive influence of cultural, ecological, and belief-related factors on child nutritional outcomes.

Independent-Sample t-Test Analyses

Comparisons between malnourished and adequately nourished children revealed several significant differences: Health Belief Model (HBM) scores: Caregivers of malnourished children scored significantly lower across dimensions of perceived susceptibility, severity, and benefits ($p < 0.05$). This suggests that those caring for malnourished children were less likely to perceive their child's vulnerability to growth faltering and less likely to believe in the effectiveness of preventive feeding practices. Cultural Integration scores: Malnourished groups had significantly higher adherence to cultural norms and taboos regarding child feeding ($p < 0.05$). Practices included avoiding certain protein sources, such as eggs or fish, due to beliefs about delayed speech or illness, and prioritizing staple foods for household distribution over nutrient-rich options for children. Ecological Framework indices: Children with malnutrition came from households with significantly higher ecological constraints ($p < 0.05$), including poorer sanitation, less consistent access to clean water, and longer distances to health services. Seasonal food insecurity was particularly noted in households where agriculture was the main livelihood. These t-test results demonstrate that cultural, ecological, and belief-related constructs meaningfully differentiate children's nutritional status at the group level.

Logistic Regression Analyses

Multivariate logistic regression was conducted to determine whether HBM, cultural integration, and ecological factors independently predicted malnutrition, while controlling for the others. Results indicated that none of these factors were statistically significant independent predictors: HBM: Adjusted odds ratio (aOR) = 0.95, $p = 0.483$, Cultural integration: aOR = 1.01, $p = 0.352$, Ecological framework: aOR = 1.01, $p = 0.413$. The model's explanatory power was modest, with Nagelkerke $R^2 = 0.115$, and its discriminative ability was moderate (AUC = 0.669). The Hosmer-Lemeshow test indicated acceptable model fit ($p = 0.602$). These findings suggest that while group-level differences are present, none of the examined variables function independently as strong predictors of malnutrition when assessed simultaneously. The overlapping and interacting effects of cultural, ecological, and belief-related factors dilute their statistical significance in multivariate models.

The apparent contradiction between the t-test and regression outcomes is illuminated by qualitative interviews. Caregivers described how cultural taboos, ecological stressors, and family decision-making often interacted rather than acted separately. For instance, mothers aware of the benefits of protein-rich foods reported avoiding eggs due to cultural advice from elders, even at they struggled with seasonal unavailability. Household decision-making further constrained practices, as fathers and grandparents often overruled maternal intentions. These narratives demonstrate why statistical independence was not observed: child malnutrition emerges from entangled systems of belief, culture, and ecology rather than isolated variables.

DISCUSSION

The present study provides valuable insights into the multifaceted determinants of childhood malnutrition in rural Indonesia, by integrating quantitative analyses with qualitative narratives. The overall prevalence of malnutrition in this sample (68.2%) is strikingly higher

than national estimates, underscoring the need for focused attention on community-specific vulnerabilities. The integration of t-test, regression, and qualitative findings allows a nuanced understanding of how cultural, ecological, and familial factors shape nutritional outcomes.

Health Belief Model (HBM)

Independent-sample t-tests showed significant differences in HBM scores between malnourished and adequately nourished children, suggesting that caregivers' beliefs about susceptibility, severity, benefits, and barriers differ between groups. Caregivers of malnourished children were less likely to perceive their child's growth as vulnerable or to recognize the long-term risks of undernutrition. However, logistic regression did not identify HBM as an independent predictor of malnutrition. This indicates that while differences in health beliefs exist, they alone are not sufficient to determine nutritional outcomes. Qualitative data support this interpretation: several mothers expressed awareness of nutrition messages but reported barriers such as lack of money, cultural prohibitions, or deference to parents' advice. Thus, beliefs influence behaviour only insofar as they are mediated by broader cultural and ecological contexts [21-26].

Cultural Integration

The results of the T-test revealed significant differences in cultural integration scores across the groups examined, highlighting the critical role of traditional practices and societal norms in shaping dietary behaviors. In particular, families with malnourished children were found to have a pronounced tendency to adhere strictly to certain food taboos. These taboos often included avoiding nutritionally beneficial foods such as eggs, fish, and certain vegetables, which are commonly regarded as inappropriate for young children.

While regression analysis did not substantiate cultural integration as an independent predictor of nutritional outcomes, qualitative interviews provided a deeper understanding of its pervasive influence on dietary choices. For instance, many mothers acknowledged the substantial nutritional advantages of incorporating eggs into their children's diets, recognizing their high protein content and overall health benefits [27-30]. However, despite this awareness, these mothers often refrained from including eggs in their children's meals due to entrenched beliefs that such foods could potentially lead to adverse health effects, such as illness or developmental delays in speech. These practices serve as a compelling illustration of how cultural integration exerts a collective influence that may not be readily apparent in individual-level statistical analyses. Rather than being perceived as isolated risk factors, cultural norms fundamentally shape the everyday decisions made by caregivers and families. This systemic adherence to traditional beliefs and practices can significantly undermine the nutritional quality of children's diets, perpetuating cycles of malnutrition and poor health outcomes. As such, understanding the intricate interplay between cultural beliefs and dietary practices is essential to addressing nutritional deficiencies and improving the health of vulnerable populations [27, 31-37].

Ecological Framework

The ecological framework index showed clear differences among groups in t-tests; however, this did not translate into a clear independent effect in regression models. This seeming contradiction illustrates the complicated relationship between ecological issues such as seasonal food scarcity, poor sanitation, and limited access to healthcare, and the strong effects of cultural and family factors. For example, families dealing with rice shortages during the planting season often had to cut back on the variety of foods they ate. This decrease not only worsened nutritional problems but also interacted with existing cultural food limitations, making the nutritional situation more complex. Caregivers shared moving stories about how environmental issues, such as floods, significantly hindered their ability to access vital health services and local markets. These challenges greatly restricted their ability to obtain nutritious foods, even when they knew how to make healthier choices. Such stories highlight the structural nature of ecological stressors, showing how they limit caregivers' capacity to turn their health beliefs into real actions. The combination of these stressors with cultural customs and family responsibilities creates a complex barrier to health, emphasizing the need for a comprehensive approach to tackle the root causes of nutritional and health inequalities in these communities. While the ecological framework index may indicate differences among groups in t-tests, the absence of a clear independent link in regression models suggests that these results could be misleading. It raises doubts about the relevance of the ecological vulnerabilities being studied, such as seasonal food shortages and poor

sanitation, as key factors affecting health outcomes. Instead, it may be more relevant to consider that cultural and family dynamics are not just influences but rather the main factors driving health behaviors and food choices. For instance, families facing rice shortages may reduce their dietary variety not only because of environmental factors but also because of cultural preferences that emphasize certain foods regardless of their availability. This implies that the discussion around nutritional deficiencies may be too simplistic and does not fully acknowledge families' ability to choose what to eat based on cultural importance rather than just availability. Additionally, while caregivers mention disruptions caused by environmental factors such as floods, it is crucial to recognize that these disruptions may not affect all families equally. Differences in community resilience, social connections, and personal resourcefulness can lead to varied outcomes, suggesting that some caregivers might still effectively manage these challenges despite environmental pressures. Therefore, focusing on a comprehensive approach to tackle health disparities may miss the importance of empowering individuals and families to use their cultural practices and social networks as strengths rather than viewing them solely as obstacles. This viewpoint suggests that interventions should aim more at boosting individual agency and cultural relevance in health promotion instead of only addressing ecological stressors [38-42].

Familial Decision Making

Although not measured as a separate quantitative variable, family dynamics emerged as a recurrent theme in qualitative data. Mothers often lacked autonomy over food-related decisions, deferring to fathers who controlled finances or grandmothers who upheld traditional norms. In households with multiple caregivers, competing voices frequently diluted maternal intentions to implement health education messages. These findings highlight that malnutrition cannot be understood solely in terms of individual caregiver behavior; it must be situated within the household's power structures. Interventions that target mothers alone risk failure if fathers and elders are not engaged. Contrary to the view that family dynamics play a significant role in food-related decisions, it can be argued that individual caregiver behavior is a more critical factor in addressing malnutrition. While mothers may sometimes defer to fathers or grandmothers, many can assert their preferences and make informed choices about nutrition, especially when equipped with the right knowledge and resources. Furthermore, the emphasis on power structures within the household may overlook the importance of caregivers' personal agency and motivation. Interventions that focus solely on mothers can be effective if they equip them with the skills and information to make independent decisions about nutrition. Engaging fathers and elders is important, but it should not detract from the fact that many mothers are capable of leading health initiatives within their families. Additionally, emphasizing the role of multiple caregivers may complicate the narrative, suggesting that malnutrition is an insurmountable issue rather than one that can be addressed through targeted education and empowerment of mothers. By focusing on individual behavior change, we can create a more straightforward path to improving nutrition without the need for extensive collaboration with other household members [43, 44].

Integrating Quantitative and Qualitative Findings

The integration of results reveals why t-tests detected differences that regression failed to confirm. Cultural, ecological, and belief-related factors influence child nutrition at a collective and interactive level. When entered into regression models simultaneously, their overlapping effects reduce the explanatory power of any single factor. Yet qualitative narratives make clear that these dimensions are inseparable in caregivers' lived realities. For example, a caregiver may believe in the benefits of protein, but her decision to feed eggs is constrained by ecological scarcity and cultural taboos imposed by parents. This demonstrates that malnutrition emerges not from discrete risk factors but from an entangled web of beliefs, practices, and vulnerabilities [39, 42-45].

Implications for Policy and Practice

The findings suggest that nutrition interventions in rural Indonesia must move beyond individual knowledge transfer. While education is necessary, it is insufficient without structural and cultural engagement. Programs should be culturally sensitive, addressing taboos through dialogue with parents and community leaders. At the same time, ecological vulnerabilities must be tackled through improved food security, infrastructure, and access to services. Family-centered strategies that include fathers and grandparents can strengthen maternal decision-making power and create supportive environments for healthier feeding practices [38, 43, 46, 47].

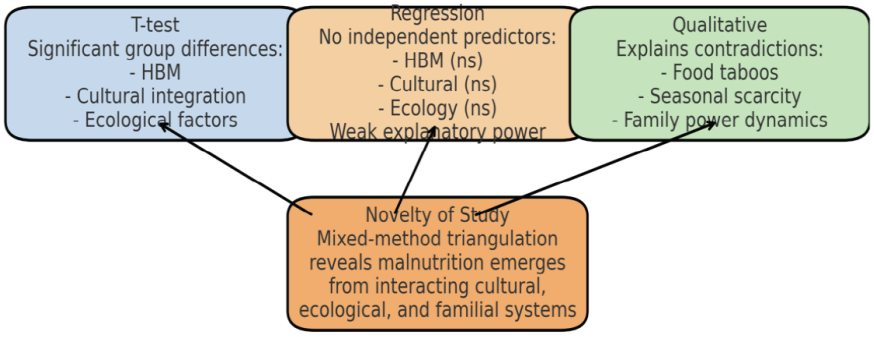

Figure 3: Mixed-methods findings to capture the multidimensional nature of child malnutrition and novelty.

Methodological Reflections

This study also illustrates the limitations of conventional regression analysis in nutrition research. The modest Nagelkerke R^2 and non-significant predictors do not imply that cultural, ecological, or belief-related factors are unimportant; rather, they highlight that malnutrition is a socially embedded phenomenon not easily reduced to independent variables. By integrating t-test comparisons and qualitative narratives, this study offers a more complete understanding of malnutrition's determinants. Such triangulation is essential in contexts where culture and ecology exert overlapping influences that resist isolation in statistical models. To complement the quantitative analyses, mixed-methods findings were synthesized to capture the multidimensional nature of child malnutrition. As shown in Figure **3** (Panel B), triangulating t-tests, regression, and qualitative inquiry provides a more nuanced understanding of the determinants. T-test analyses revealed significant group-level differences across Health Belief Model (HBM), cultural, and ecological domains, indicating that these constructs distinguish malnourished from adequately nourished children. However, regression models failed to identify any domain as an independent predictor, reflecting the limited explanatory power of isolated variables. This apparent contradiction is clarified by the qualitative findings, which underscore how food taboos, seasonal food scarcity, and intra-household power relations intersect to constrain feeding practices. Taken together, the mixed-methods integration suggests that malnutrition arises not from singular risk factors but from the convergence of cultural, ecological, and familial contexts, affirming the added value of a triangulated methodological approach [39, 42, 44, 45].

CONCLUSION

This study highlights that childhood malnutrition in Indonesia is not the product of a single determinant but emerges from the interplay of cultural beliefs, ecological vulnerabilities, and familial dynamics. Quantitative analyses failed to identify independent predictors, whereas qualitative narratives revealed structural barriers such as poverty, food insecurity, limited health service outreach, and constraints on household decision-making. These findings emphasize the value of mixed-methods approaches in exposing the gap between theoretical models and lived realities. Effective interventions must therefore move beyond knowledge transfer and address systemic vulnerabilities while engaging with cultural norms. Culturally sensitive and structurally supported programmes are required to reduce malnutrition and improve child health outcomes.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] UNICEF, WHO, World Bank. Level and trend in child malnutrition. World Health Organization [Internet] 2023; 4. Available from: https://www.who.int/publications/i/item/9789240073791

[2] UNICEF Indonesia. Indonesian Nutritional Status Survey (SSGI) [Internet] 2024. Available from: https://www.unicef.or.id

[3] UNICEF, World Bank. Levels and trends in child malnutrition 2023.

[4] Gagnon-Dufresne M, Fortin G, Bunkeddeko K, Kalumuna C, Zinszer K. Understanding malnutrition management through a socioecological lens: evaluation of a community-based child malnutrition program in rural Uganda. Health Soc Care Community 2022. https://doi.org/10.1101/2021.09.01.21262681

[5] Seedat F, Tollman SM, Twine W, Cappola AR, Wade AN. Double malnutrition and associated factors in a middle-aged and older rural South African population. BMC Nutr 2024; 10(1): 1-10. https://doi.org/10.1186/s40795-024-00890-6

[6] Turjo EA, Rahman MH. Assessing risk factors for malnutrition among women in Bangladesh and forecasting malnutrition using machine learning approaches. BMC Nutr [Internet] 2024; 10(1): 1-25. https://doi.org/10.1186/s40795-023-00808-8

[7] Andriani H, Friska E, Arsyi M, Sutrisno AE, Waits A. A multilevel analysis of the triple burden of malnutrition in Indonesia: trends and determinants from repeated cross-sectional surveys. BMC Public Health [Internet] 2023: 1-15. https://doi.org/10.1186/s12889-023-16728-y

[8] Micha R, Mannar V, Afshin A, Allemendi L, Baker P, Battersby J, *et al.* Global Nutrition Report - Independent Expert Group 2020.

[9] Karlsson O, Kim R, Sarwal R, James KS, Subramanian SV. Trends in underweight, stunting, and wasting prevalence and inequality among children under three in Indian states, 1993-2016. Sci Rep 2021; 11(1). https://doi.org/10.1038/s41598-021-93493-1

[10] Likhar A, Patil MS. Importance of maternal nutrition in the first 1,000 days of life and its effects on child development: a narrative review. Cureus 2022; 14(10): e8-13. https://doi.org/10.7759/cureus.30083

[11] Nassar MF, Abdel-Wahed MA, Abdelhaleem BA, Ahmed AK, ElKholy HE. Nutritional rehabilitation of malnourished children detected by Screening Tool for Assessment of Malnutrition in Pediatric: urban versus rural settings. Clin Nutr ESPEN 2023; 57: 749-54. https://doi.org/10.1016/j.clnesp.2023.08.026

[12] Gillespie J, Wright H, Pinkney J, Lloyd H. Blending behavioural theory and narrative analysis to explore the lived experience of obesity and assess potential engagement in a UK weight management service. Healthcare 2024; 12(7). https://doi.org/10.3390/healthcare12070747

[13] Dhami MV, Ogbo FA, Osuagwu UL, Ugboma Z, Agho KE. Stunting and severe stunting among infants in India: the role of delayed introduction of complementary foods and community and household factors. Glob Health Action 2019; 12(1). https://doi.org/10.1080/16549716.2019.1638020

[14] Dewey KG, Matias SL, Mridha MK, Arnold CD. Nutrient supplementation during the first 1000 days and growth of infants born to pregnant adolescents. Ann N Y Acad Sci 2020; 1468(1): 25-34. https://doi.org/10.1111/nyas.14191

[15] Gagnon-Dufresne MC, Fortin G, Bunkeddeko K, Kalumuna C, Zinszer K. Understanding malnutrition management through a socioecological lens: evaluation of a community-based child malnutrition program in rural Uganda [Internet] 2021. https://doi.org/10.1101/2021.09.01.21262681

[16] Andriani H, Friska E, Arsyi M, Sutrisno AE, Waits A, Rahmawati ND. A multilevel analysis of the triple burden of malnutrition in Indonesia: trends and determinants from repeated cross-sectional surveys. BMC Public Health 2023; 23(1). https://doi.org/10.1186/s12889-023-16728-y

[17] Van der Spek L, Sonneveld BGJS. Analyzing the impact of an MDG-Fund program on childhood malnutrition in Timor-Leste. J Health Popul Nutr 2024; 43(1). https://doi.org/10.1186/s41043-024-00539-x

[18] Birhanu F, Yitbarek K, Bobo FT, Atlantis E, Woldie M. Undernutrition in children under five associated with wealth-related inequality in 24 low- and middle-income countries from 2017 to 2022. Sci Rep 2024; 14(1). https://doi.org/10.1038/s41598-024-53280-0

[19] UNICEF. UNICEF conceptual framework on maternal and child nutrition 2020.

[20] Wang Z, Liu C, Li T, Zhao F. Paternal parenting and depressive symptoms among adolescents: a moderated mediation model of deviant peer affiliation and school climate. Child Youth Serv Rev [Internet] 2020; 119: 105630. https://doi.org/10.1016/j.childyouth.2020.105630

[21] Kazemi SM. Effect of the planned behavior-based education intervention on timely initiation of infants' complementary feeding in primiparous mothers: a randomized controlled trial. Health Educ Health Promot 2022; 1(10): 75-81.

[22] El-Abbassy AA, Abel A, Hussein M, Ahmed HM, Salah S, Diab EM, *et al.* Nutrition intervention based on Health Belief Model for promoting dietary calcium intake among adolescent girl students. Int Egypt J Nurs Sci Res 2022. https://doi.org/10.21608/ejnsr.2022.212467

[23] Baldemor RVV, Ong AKS, German JD, Bautista NS, Alonso MLV, Alidio OJP. Health belief and behavioral analysis of fad diets: a perspective from younger generations in a developing country. Foods 2024; 13(12). https://doi.org/10.3390/foods13121858

[24] Riazi S, Ghavami V, Sobhani SR, Shoorab NJ, Mirzakhani K. The effect of nutrition education based on the Health Belief Model on food intake in pregnant Afghan immigrant women: a semi-experimental study. BMC Pregnancy Childbirth 2024; 24(1). https://doi.org/10.1186/s12884-024-06728-0

[25] Beressa G, Whiting SJ, Belachew T. Effect of nutrition education integrating the Health Belief Model and Theory of Planned Behavior during pregnancy on gestational weight gain and birth weight in Southeast Ethiopia using complex analyses. BMC Pregnancy Childbirth 2025; 25(1). https://doi.org/10.1186/s12884-025-07284-x

[26] Nyaaba JA, Akurugu E. Knowledge, barriers, and uptake towards cervical cancer screening among female health workers in Ghana: a perspective of the Health Belief Model. Int J Africa Nurs Sci 2023; 19. https://doi.org/10.1016/j.ijans.2023.100587

[27] Watson D, Mushamiri P, Beeri P, Rouamba T, Jenner S, Proebstl S, *et al.* Behaviour change interventions improve maternal and child nutrition in sub-Saharan Africa: a systematic review. PLOS Glob Public Health 2023; 3(3). https://doi.org/10.1371/journal.pgph.0000401

[28] Livingstone KM, Love P, Mathers JC, Kirkpatrick SI, Olstad DL. Cultural adaptations and tailoring of public health nutrition interventions in Indigenous peoples and ethnic minority groups: opportunities for personalised and precision nutrition. Proc Nutr Soc 2023; 82: 478-86. https://doi.org/10.1017/S002966512300304X

[29] Chapman AJ, Ebido CC, Tening RN, Huang Y, Sougou NM, Kolopaking R, *et al.* Creating culturally informed protocols for a stunting intervention using a situated values-based approach (WeValue InSitu): a double case study in Indonesia and Senegal. BMC Public Health 2024; 24(1). https://doi.org/10.1186/s12889-024-18485-y

[30] Pienaah CKA, Molle MN, Luginaah I. The role of child nutrition counselling, gender dynamics, and intra-household feeding decision-making on child dietary diversity in semi-arid northern Ghana. Appetite 2025; 204. https://doi.org/10.1016/j.appet.2024.107755

[31] Meher C, Zaluchu F. Cultural influences of early food introduction on exclusive breastfeeding rates in the Nias Islands, Indonesia. J Multidiscip Healthc 2024; 17: 5653-63. https://doi.org/10.2147/JMDH.S478448

[32] Paudel R, Gurung YB, Khatri B, Poudyal AK, Acharya D, Upadhyaya DP, *et al.* Impact of a community-based intervention program on nutritional status of children aged under 5 years with undernutrition in western rural Nepal. J Nutr Educ Behav 2025; 57(7): 602-13. https://doi.org/10.1016/j.jneb.2025.03.003

[33] Gemily SC, Fikawati S, Syafiq A. Gerakan Nusantara program on children's nutrition practices. Kesmas 2020; 15(3): 113-9. https://doi.org/10.21109/kesmas.v15i3.3258

[34] Short E, Council SK, Bennett Milburn A, Ammerman A, Callaghan-Koru J, Mendoza Kabua P, *et al.* Assessing the acceptability and implementation feasibility of a culturally adapted parenting intervention for Marshallese mothers: a study protocol. Contemp Clin Trials Commun 2024; 37. https://doi.org/10.1016/j.conctc.2023.101240

[35] Diana R, Rachmayanti RD, Anwar F, Khomsan A, Christianti DF, Kusuma R. Food taboos and suggestions among Madurese pregnant women: a qualitative study. J Ethn Foods 2018; 5(4): 246-53.

[36] Rahmiwati A, Djokosujono K, Krianto T, Utari DM, Djuwita R, Setiarini A, *et al.* Effect of local culture-based nutrition education on compliance with iron and folic acid supplementation in female adolescents. Kesmas 2023; 18(2): 112-21. https://doi.org/10.21109/kesmas.v18i2.6832

[37] Koh L, Durkin AC, Fiske S, Hingorani U. Culturally tailored plant-based interventions to improve health outcomes in pediatric populations: an integrative review. Prev Med Rep 2025; 52. https://doi.org/10.1016/j.pmedr.2025.103024

[38] Mahrer NE, Holly LE, Luecken LJ, Wolchik SA, Fabricius W. Parenting style, familism, and youth adjustment in Mexican American and European American families. J Cross Cult Psychol 2019; 50(5): 659-75. https://doi.org/10.1177/0022022119839153

[39] Krahe M, O'Leary K, Reilly S, Wallis K, Walsh K. Factors affecting young mothers' access to child healthcare services: a behavioural analysis to guide the development of interventions. Behav Change 2022. https://doi.org/10.1017/bec.2022.23

[40] Pastwa-Wojciechowska B, Koralewska-Samko J, Lammek M. Resilience and coping in difficult social situations among children from low socioeconomic families. Curr Issues Pers Psychol 2021. https://doi.org/10.5114/cipp.2021.108286

[41] Evans GW, De France K. Childhood poverty and psychological well-being: the mediating role of cumulative risk exposure. Dev Psychopathol 2021. https://doi.org/10.1017/S0954579420001947

[42] Dwi Utari IN, Hamid AS. Academic stress in adolescent students of an Islamic-based school: the correlation with parenting style and spirituality. J Public Health Res 2021. https://doi.org/10.4081/jphr.2021.2330

[43] David BE, Kumar S. Child development beyond the nutrition-specific models: bridging the pathways via psychosocial stimulation. Front Psychol 2023; 14: 1-13. https://doi.org/10.3389/fpsyg.2023.1273591

[44] Zhong J, Luo R. Interrelationships of parenting information, family care, and child development: a cross-sectional study in rural China. Int J Environ Res Public Health 2020. https://doi.org/10.3390/ijerph17165737

[45] Meliati L, Karunia Ekayani NP, Khadijah S. Effects of the mother's individual stimulation on the growth and development of infants with low birth weight history. J Holist Nurs Midwifery 2020. https://doi.org/10.32598/jhnm.30.4.2039

[46] Meliati L, Ekayani NPK, Khadijah S. Effects of the mother's individual stimulation on the growth and development of infants with low birth weight history. J Holist Nurs Midwifery 2020; 30(4): 200-7. https://doi.org/10.32598/jhnm.30.4.2039

[47] Aquila I, Sacco MA, Ricci C, Gratteri S, Abenavoli L, Oliva A, *et al.* The role of the COVID-19 pandemic as a risk factor for suicide: what is its impact on the public mental health state today? Psychol Trauma Theory Res Pract Policy 2020. https://doi.org/10.1037/tra0000616

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