International Journal of Public Health Excellence (IJPHE)
Vol. 4, Issue 1, June-December 2024, pp. 332~339
Journal Homepage: https://ejournal.ipinternasional.com/index.php/ijphe
ISSN: 2809-9826, DOI: 10.55299/ijphe.v4i1.1129

Comparison of Positive Deviance between Normal Nutrition and Undernutrition in Children Under Five Years Old from Low-Income Families at Community Health Centres in Medan

Ramadhani Syafitri Nasution[1], Khairi Che Mat[1], Marhazlina Mohamad[2]

[1] Faculty of Medicine, Universiti Sultan Zainal Abidin, Terengganu, Malaysia
[2] School of Nutrition and Dietetics, Faculty of Health Sciences, Universiti Sultan Zainal Abidin, Terengganu, Malaysia

Article Info

Article history:

Received November 22, 2024
Revised December 12, 2024
Accepted December 30, 2024

Corresponding Author:

Ramadhani Syafitri Nasution
Faculty of Medicine, Universiti Sultan Zainal Abidin, Malaysia
Email: ramadhanisafitri@helvetia.ac.id

ABSTRACT

Positive deviance in low-income families is a mechanism by which individuals or groups continue to thrive or meet standards despite facing challenging conditions. One of the goals of positive deviance is to prevent child malnutrition by changing community habits about feeding, caring, hygiene, and health seeking practices. Malnutrition early in life will affect the growth and development of children and the quality of life thereafter. The study aims to compare the positive deviances between children with normal nutrition and undernutrition. This cross-sectional study was conducted in 39 public health centres in Medan, West Indonesia, where a total of 80 children (40 with normal nutrition and 40 with undernutrition) were recruited using purposive sampling. Nutritional status (normal or undernutrition) was determined using body mass index-for-age (BMI-for-age) z-scores, according to WHO reference values. Positive deviance behaviours were assessed using a validated questionnaire, and anthropometric parameters such as weight, height, BMI, and triceps skinfold were measured. Haemoglobin levels were taken as a biological measurement of the condition. The Mann-Whitney test demonstrated that the positive deviance practices of feeding, caring, hygiene, and health-seeking behaviours were significantly better among normal nourished children than undernourished children ($p<0.05$). Children from families with positive deviance practices have better nutritional status despite living in economically limited conditions. This indicates that family behaviours and practices can play a crucial role in enhancing children's nutritional and health status, regardless of financial or environmental constraints. Integrating positive deviance approaches alongside additional interventions could be effective in improving children's nutritional status.

Keywords: *Positive Deviance, Undernutrition, Under Five Years Old, Low-Income Families*

1. INTRODUCTION

Undernutrition among children under five years old remains a significant public health issue, with potential long-term consequences. These effects are often more severe among impoverished urban children (Chek et al., 2022). The United Nations International Children's Emergency Fund (UNICEF) estimated that 767.9 million children under five worldwide were acutely malnourished by 2021. The highest prevalence of malnourished children occurs in regions

affected by humanitarian conflicts, poverty, and limited access to nutritional health services. South Asia has the highest rate of malnutrition at 14.7%, followed by West and Central Africa at 7.2% (UNICEF, 2021). In Indonesia, the prevalence of undernutrition among children under five was 24.4% in 2021 and slightly decreased to 21.6% in 2022 (WHO, 2022). While these figures indicate a slight improvement, undernutrition remains a pressing health concern. In Medan, West Indonesia, data from the City Health Office in 2023 showed that 10.8% of children under five were undernourished (Dinkesprovsu, 2022).

Approximately 49% of the 10.4 million deaths among children under five in developing countries are attributed to undernutrition, often resulting from prolonged inadequate intake of energy and protein, which is reflected by a z-score of -2 SD or lower on WHO-NCHS standardized tables (WHO, 2020). Children under five are particularly vulnerable to health issues like malnutrition, which can significantly impair their growth and development. Various factors contribute to malnutrition in young children, including family socioeconomic status, feeding practices, parenting approaches, hygiene practices, and health-seeking behaviours (Core, 2004; Seetha et al., 2018). While low-income families generally struggle to meet their children's nutritional needs, some are able to maintain adequate nutrition despite economic challenges. This phenomenon, known as positive deviance (PD), describes families in similar financial circumstances who achieve better child nutrition and parenting outcomes due to distinctive practices and resourcefulness (Farooq et al., 2020; Sunardi & Martha, 2021).

Developed by the Child Survival Collaborations and Resources (CORE) Group, the PD approach is a home- and community-based nutrition program that focuses on identifying uncommon yet beneficial practices used by mothers or caregivers of well-nourished children from low-income families (Core, 2004). PD refers to unique behaviours or practices within a population that contribute unconsciously to problem prevention (Siswati et al., 2022). These behaviours often distinguish individuals or groups exhibiting PD from those who do not. For instance, mothers in these groups may show higher levels of motivation and autonomy in feeding their children as well as rarely offering foods that lack essential nutrients (Gebreayohanes & Dessie, 2022). Families exhibiting PD often provide a nutritious and varied diet, including foods like meat, prawns, fish, pumpkin, spinach, and other green vegetables (Boulom et al., 2022). PD behaviours vary by region, influenced by local resources and cultural practices.

The PD approach offers a framework for comprehensive interventions, particularly for addressing malnutrition in children under five, as PD behaviours can serve as protective factors against health issues. A variety of targeted and specialized interventions have been implemented to address child malnutrition. According to Kim et al. (2021), nutrition interventions that include education to influence maternal behaviours as well as programs to monitor child development and feeding practices have proven effective in improving children's nutritional status.

In Indonesia, eight studies (Hayati et al., 2024; Hidayat, 2009; Kurniawan, 2017; Luciasari et al., 2011; Merita & Hesti, 2017; Monica et al., 2020a; Sari et al., 2023; Sunardi & Martha, 2021) have examined PD practices (e.g., Hidayat in Sabang, Indonesian, and Nur Mufida in Surabaya, Indonesia). However, only a few intervention studies used PD, focusing specifically on feeding and caregiving practices (Hidayat, 2009) and feeding practices alone (Sari et al., 2023). Thus, this study aims to explore PD practices among children under five years of age from low-income families in Medan, West Indonesia, examining their nutrition and providing intervention through PD practices to address low-income challenges while supporting the development of normally nourished children.

2. METHOD

A cross-sectional study design was employed to assess biochemical and anthropometric measurements, along with interviews with parents or caregivers using a PD questionnaire. The study was conducted from October to December 2022. A total of 39 public health centres in Medan, West Indonesia, were selected based on income levels identified by the BPS (Central Statistics Agency) in collaboration with village heads and public health centres. The target population included low-income families, defined as those with a per-person per-month income below Rp. 438,894 (29.58 USD). Using a purposive sampling technique, 80 children under five years old (40 children with normal nutrition and 40 children with undernutrition) were recruited based on specific inclusion criteria: Indonesian citizens, mothers with children aged 6-<60 months who either had a normal nutritional status (z-score -2SD to +2SD) or were undernourished (z-score -2SD to -3SD), mothers who attended selected health centres in Medan, West Indonesia, were literate in the Indonesian language, and belonged to low-income families based on BPS standards. Exclusion criteria included mothers with overweight children under five years of age, children younger than 6 months, and children with disabilities or chronic diseases.

Researchers collected primary data through a set of questionnaires that included sections on sociodemographic information and assessments of PD behaviours. The PD questionnaire consists of four components. It consists of questions on feeding practices with 11 questions on good categories ≥6 and not good ≤5, caring practices with 6 questions with good categories ≥3 and not good ≤2, hygiene practices with 10 questions on good categories ≥5 and not good ≤4, and health-seeking practices with 5 questions on good categories ≥3 and not good ≤2. Anthropometric measurements, including weight, height, BMI, and triceps skinfold with the z-score values according to WHO, were taken using validated equipment following standard procedures. BMI-for-age z-score was calculated to determine normal nutrition (z-score -2 SD ≤ to +2 SD) and undernutrition (z-score ≤-3 SD to ≤ -2 SD). While, triceps skinfold-for-age z-score was used to assess body fat. Additionally, finger-prick haemoglobin levels were assessed to screen for

anaemia where the cut-off point for normal haemoglobin is ≥11 g/dL. The Mann-Whitney test was performed to analyse differences in PD behaviours between children with normal nutrition and those with undernutrition. Prior to the study, ethical approval (UniSZA/UHREC/2020/202(1)) was obtained from the UniSZA Human Research and Ethics Committee (UHREC).

3. RESULTS AND DISCUSSION

In Table 1, the study results for the normal nutritional status group show that males dominated (62.5%), with the majority being of Javanese ethnicity (47.5%). Most children were aged 13-24 months (32.5%), and maternal age was primarily between 20-35 years (90%), as was the age of mothers at the time of delivery (95%). Most mothers in this group were currently married (80%). The highest level of education for mothers was generally below high school (55.5%), while for fathers, it was high school (52.5%). All mothers of children with normal nutritional status were not working, serving as housewives (100%), while most fathers were self-employed (50%). The majority of families in this group had up to two children (67.5%).
In the undernourished group of 40 children, the majority were also male (52.5%), with most affected children aged 13-24 months (45%). Maternal age was primarily 20-35 years (80%), as was maternal age at delivery (85%), and most mothers were currently married (95%). The highest education level for mothers was high school (57.5%), while 82.5% of fathers had completed high school. Most mothers in this group were housewives (62.5%), and most fathers were self-employed (40%). The majority of families in this group also had up to two children (72.5%).

Table 1. Characteristics of participants

Characteristics of child	**n (%)**		
	Overall (n= 80)	**Normal (n=40)**	**Undernutrition (n=40)**
Child sex			
Male	46 (57.5)	25 (62.5)	21 (52.5)
Female	34 (42.5)	15 (37.5)	19 (47.5)
Ethnicity			
Java	47 (58.8)	19 (47.5)	28 (70.0)
Batak	24 (30.0)	15 (37.5)	9 (22.5)
Others	9 (11.2)	6 (15.0)	3 (7.5)
Child's age, month		30.00 (26.00)[a]	18.28 (15.00)[a]
6-12	12 (15.0)	4 (10.0)	8 (20.0)
13-24	31 (38.8)	13 (32.5)	18 (45.0)
25-36	17 (21.3)	8 (20.0)	9 (22.5)
37-48	13 (16.2)	10 (25.0)	3 (7.5)
49-<60	7 (8.7)	5 (12.5)	2 (5.0)
Characteristics of parents	**Overall (n=80)**	**Normal (n=40)**	**Undernutrition (n=40)**
Mother's age, year		30.00 (10.00)[a]	28.50 (10.00)[a]
20-35	68 (85.0)	36 (90.0)	32 (80.0)
>35	12 (15.0)	4 (10.0)	8 (20.0)
Mother's age at birth, year			
<20	8 (10.0)	2 (5.0)	6 (15.0)
20-35	72 (90.0)	38 (95.0)	34 (85.0)
Marital status			
Married	70 (87.5)	32 (80.0)	38 (95.0)
Divorced	9 (11.2)	8 (20.0)	1 (2.5)
Husband died	1 (1.3)	0	1 (2.5)
Mother's highest level of education			
Less than high school	37 (46.2)	22 (55.5)	15 (37.5)
High school graduate	41 (51.3)	18 (45.5)	23 (57.5)
Some colleges or higher	2 (2.5)	0	2 (5.0)
Father's highest level of education			
Less than high school	23 (28.7)	18 (45.0)	5 (12.5)
High school graduate	54 (67.5)	21 (52.5)	33 (82.5)
Some colleges or higher	3 (3.8)	1 (2.5)	2 (5.0)
Mother's occupation			
Not working (Housewives)	65 (81.2)	40 (100.0)	25 (62.5)
Self-employed	15 (18.8)	0	15 (37.5)

Private sector			
Father's occupation			
Not working	10 (12.5)	2 (5.0)	8 (20.0)
Self-employed	36 (45.0)	20 (50.0)	16 (40.0)
Private sector	33 (41.2)	18 (45.0)	15 (37.5)
Government sector	1 (1.3)	0	1 (2.5)
Number of children in family		2.00 (2.00) [a]	2.11 (2.00) [a]
1-2	56 (70.0)	27 (67.5)	29 (72.5)
>2	24 (30.0)	13 (32.5)	11 (27.5)

[a] Data were presented as median (interquartile range=IQR)

Table 2 presents the results of anthropometric measurements and biochemical assessments among children under five. The undernourished group had significantly lower weight, height, BMI, triceps skinfold, weight-for-age, height-for-age, BMI-for-age, triceps skinfold-for-age, and haemoglobin levels compared to those with normal nutrition ($p<0.05$). Additionally, 95% of the undernourished children were anaemic, while only 22.5% of the well-nourished children had anaemia.

Table 2. Anthropometric measurement and biochemical assessment of children under five[a]

Anthropometric Variables	**Normal (n=40)**	**Undernutrition (n=40)**	**P[b]**
Weight, kg	14.00 (10.00)	8.00 (3.00)	<0.001
Height, cm	96.00 (20.00)	80.00 (12.00)	<0.001
BMI, kg/m^2	16.20 (1.50)	12.90 (0.90)	<0.001
Triceps skinfold, mm	5.30 (0.60)	4.70 (0.40)	<0.001
Weight-for-age, z-score	0.425 (1.49)	-2.41 (0.54)	<0.001
Height-for-age, z-score	0.53 (2.15)	-1.00 (1.26)	<0.001
BMI-for-age, z-score	0.32 (0.38)	-2.45 (1.15)	<0.001
Triceps skinfold-for-age, z-score	-1.80 (0.30)	-2.20 (0.40)	<0.001
Iron Status	**Normal (n=40)**	**Undernutrition (n=40)**	**P[b]**
Haemoglobin, g/dL	11.30 (0.60)	10.70 (0.30)	<0.001
Anaemic, n (%)	9 (22.5)	38 (95.0)	
Not anaemic, n (%)	31 (77.5)	2 (5.0)	

[a] Values were presented as median (interquartile range), unless otherwise indicated.
[b] Significant at 95% confidence interval $p<0.05$.

Table 3 shows a significant difference in the median (IQR) scores between individuals with normal nutrition and those who are undernourished. Feeding practices, caring practices, hygiene practices, and health-seeking practices were significantly better in the normal nutrition group compared to the undernourished group ($p<0.05$).

Table 3. Comparison of positive deviance scores between normal and undernourished children under five

Positive Deviance practices	**Normal (n=40)**		**Undernutrition (n=40)**		**Z**	**P[a]**
	Median	**IQR**	**Median**	**IQR**		
Feeding	7.00	2.00	4.00	3.00	-5.599	<0.001
Caring	4.00	3.00	2.00	1.00	-3.359	0.001
Hygiene	7.00	4.00	4.00	2.00	-3.788	<0.001
Health Seeking	4.00	1.00	2.00	1.00	-3.629	<0.001

[a] Significant at 95% confidence interval $p<0.05$.

Comparison of anthropometric measurements and biochemical assessment between normal and undernourished children under five years old from low-income families

Anthropometric measurements of children under five showed that the normal nutrition group had significantly larger median values than the undernourished. The malnourished group had a lower BMI than the normal nutrition group, with body fat levels, as indicated by triceps skinfold thickness measurements, also being lower. Low BMI-for-age z-scores may suggest poor nutritional status within the family (Brie et al., 2018).

Undernourished children are often deficient in essential nutrients such as iron, vitamin B12, and folic acid, which are critical for red blood cell formation. Several interrelated factors contribute to the higher rates of anaemia in these children. Anaemia, defined as haemoglobin levels below 11 g/dL, can be assessed through haemoglobin screening, which is closely related to a child's nutritional status (Sunday et al., 2024). Key factors influencing anaemia include maternal education, antenatal care (ANC) visits, family economic conditions, and treatments for intestinal parasites and fever, all of which can affect children's haemoglobin levels. Compared to children from low-income families,

those from middle-income families are more likely to maintain normal haemoglobin levels, as their parents often strive to provide better resources (Htay et al., 2023).

Comparison of positive deviance in feeding practices between normal and undernourished children under five years old from low-income families

The normal nutrition group had a higher median score for feeding practices compared to the undernutrition group. The test yielded a Z-value of -5.599 and a p-value of <0.05, indicating a statistically significant difference between the two groups in feeding practices. This result suggests that feeding practices are likely to have a substantial impact on the nutritional status of children. The higher median score in the normal nutrition group implies that children with better feeding practices are less likely to experience undernutrition, reinforcing the idea that appropriate feeding strategies can significantly contribute to improved child health outcomes. The distinct difference in feeding practice scores highlights the potential for targeted interventions to enhance feeding practices among undernourished children, which may reduce the prevalence of undernutrition within the 6–<60-month age group.

Research found that parents of well-nourished children tend to control the type, frequency, and amount of food the child consumed and monitor how the food intake impacted their child's health over time. This approach enhances parents' understanding of healthy diets and the effects of inadequate nutrition or specific foods on overall health. According to Zakaria et al. (2022), maintaining both adequate food frequency (2-4 times daily) and dietary diversity including fruits, vegetables, and proteins, is essential for children's nutritional needs. Additionally, incorporating fun feeding methods and organising feeding schedules can improve the children's eating experiences by avoiding forced feeding and fostering a pleasant eating atmosphere (Intan, 2019).

These findings confirm that feeding practices, particularly in children, are a key determinant of nutritional status, underscoring the need for targeted efforts to improve these practices and thereby promote children's overall health status. This aligns with previous research by Boulom et al. (2022), which found that positive deviance mothers exhibited better feeding practices compared to mothers with negative deviance. This research suggests that mothers with positive deviance are likely to achieve better nutritional outcomes for their children, emphasizing that appropriate feeding practices have significant effects on family health and well-being (Neffa et al., 2020). In addition, other studies have found that social and cultural factors also influence feeding practices, providing insight into the challenges mothers face in offering nutritious food to their children (Gizaw et al., 2024). In the context of these findings, feeding practices involve providing food to a child with attention to specific impacts, such as impacts on growth, health, metabolism, behaviour, or other nutritional elements (Gizaw et al., 2024).

Comparison of positive deviance in caring practice between normal and undernourished children under five years old from low-income families

The significantly higher median caring practices score observed in the normal nutrition group suggests that better caring practices are closely linked to better health and improved nutritional outcomes in children aged 6 to <60 months. This finding underscores the potential impact of enhancing parenting practices to positively influence children's health and reduce the prevalence of undernutrition in this age group. According to Kim et al. (2021), the caring practices program emphasizes identifying actions or strategies undertaken by individuals or families in a community that lead to better outcomes compared to others in similar circumstances. In the context of parenting, this approach can involve examining how some parents or families effectively raise their children despite similar conditions (Kim et al., 2021). Parents of well-nourished children tend to nurture them responsively and pay attention to their needs. These parents are more likely to provide positive psychosocial stimulation, aiding their children's cognitive and emotional growth (Triatmaja et al., 2023).

A study on parenting practices related to the nutritional status of children under five showed that parenting patterns that include attention to the mother, feeding practices, and health practices at home, have a positive and significant relationship with the nutritional status of children. However, the majority of parenting practices in the study were categorized as poor, indicating that there is a need for improvement in feeding practices to enhance the nutritional status of children under five (Apriyanto et al., 2017). In addition, research shows that mothers who work in the agricultural sector often lack the time needed to provide adequate attention to their children, which potentially can affect children's growth and development (Inamahoro et al., 2017). Positive and supportive parenting is essential to ensuring children receive adequate nutrition, which directly affects their nutritional status. Poor parenting, on the other hand, can increase the risk of nutritional deficiencies and related health issues in children (Monica et al., 2020).

Comparison of positive deviance in hygiene practices between normal and undernourished children under five years old from low-income families

The results indicate a significant difference in hygiene practices between the normal and malnourished groups, with the normal nutrition group displaying a higher median score compared to malnourished group. These findings suggest that better hygiene practices positively impact the nutritional status of children aged 6 to <60 months. Children are particularly vulnerable to pollution in certain areas of Medan city due to geographical conditions such as sandy soil contours, dusty and humid factory zones, and challenges in accessing clean, fresh water. In response, well-nourished

children, with family support, maintain good hygiene by bathing twice daily and regularly cleaning their nails and toenails. This is crucial, as fine particles of sand and dust can easily accumulate in footwear and soil the feet. Additionally, it was observed that well-nourished children change their clothes at least twice daily to uphold their hygiene.

Budiono et al. (2024) emphasized that hygiene and access to clean water are very important to prevent underweight in children, especially among low-income families. Good personal hygiene reduces the risk of microorganisms entering the body, thereby preventing diseases such as diarrhoea, typhoid, dysentery, gastroenteritis, hepatitis A, and helminthiasis infections, which can lead to malnutrition in toddlers if left untreated, as observed in Surabaya, Indonesia (Sari et al., 2023). Consequently, it can be affirmed that proper hygiene practices positively impact children's nutritional health. The significant difference in hygiene practice scores observed suggests that efforts to enhance hygiene practices could potentially reduce the prevalence of undernutrition in the 6 to <60-month age group. This finding is in line with study by Seetha et al. (2018), which highlighted that mothers recognise the importance of maintaining personal and environmental hygiene for their child's health. They also understand the role of regular personal hygiene routines, such as bathing and hand washing, as essential preventative health practices to reduce infection risks in their children (Seetha et al., 2018).

Comparison of positive deviance in health-seeking practice between normal and undernourished children under five years old from low-income families

There was a significant difference in health care practices between the normal nutrition group and the malnourished group, with the normal nutrition group having a higher median score compared to the malnourished group. With a Z-value of -3.629 and a p-value of <0.001, the findings indicate a statistically significant difference between the groups, suggesting that populations with higher median scores in health care practices have a lower prevalence of undernutrition. The results showed that health care practices significantly influence the health of children aged 6-<60 months. Researchers found that families with well-nourished children have proactive health-seeking habits, promptly seeking medical help at the first signs of illness. These parents take their children to health facilities immediately when signs of ill-health appear, resulting in quicker recovery times for their children. In contrast to families with malnourished children, they tend to delay seeking medical assistance, often due to financial constraints or a lack of understanding about the importance of early treatment. Families with well-nourished children also maintain a clean environment by properly disposing of garbage, having adequate septic systems, avoiding environmental pollution, and restricting children's contact with pets. Conversely, families with malnourished children experience higher rates of illnesses like diarrhoea due to less attention to their children's hygiene and environmental health.

This study reinforces the idea that proper health care practices contribute to better health outcomes in children. The significant difference in scores indicates that improved health care practices could reduce the prevalence of undernutrition in children. These findings align with those of Rahayuningati et al. (2015), who found that good health care practices, including full immunization and timely treatment (whether through traditional medicine or visits to health facilities), positively influenced children's nutritional status (Rahayuningati et al., 2015). This reflects mothers' dedicated efforts to safeguard and maintain their children's health. Additionally, Padilla (2018) emphasized the importance of keeping children's vaccination schedules up to date to further support their health (Padilla, 2018).

The differences in PD scores suggest that variations in behaviour or determinants influence a child's nutritional status beyond just economic or environmental factors; these include improved practices within specific families or individuals. Understanding the actions of children with high PD scores allows us to design interventions that surpass the previous practices of malnourished families, ultimately benefiting other children within the community.

CONCLUSION

The study reveals significant differences in feeding, caring, hygiene, and health-seeking practices between normal and undernourished children under five years of age in low-income families. Higher median scores in these areas were consistently associated with better nutritional status, emphasising that these practices are crucial for reducing undernutrition. Specifically, better feeding practices, characterized by greater food frequency and diversity, support healthier growth and lower undernutrition rates. Similarly, positive caring and hygiene practices contribute to improved child health and reduced risk of infections, which are essential in maintaining adequate nutritional status.

The research supports findings from previous studies, demonstrating that structured and responsive parenting, alongside positive hygiene and healthcare routines, are associated with enhanced nutritional outcomes. Furthermore, the findings align with the positive deviance model, which highlights that families practicing unique, resourceful health behaviours within similar socioeconomic settings can achieve better health outcomes for their children. This study underscores the need for targeted public health interventions that promote and support these beneficial practices in low-income communities, potentially employing a positive deviance approach to identify and amplify effective local strategies. Overall, these insights contribute to the body of evidence affirming that improved caregiving and household practices are pivotal in addressing malnutrition in children from economically disadvantaged backgrounds.

ACKNOWLEDGEMENTS

The researchers are deeply appreciative of the study participants for their commitment and invaluable contributions to this study. Their participation was instrumental in enabling us to gain meaningful insights into PD practices within low-income families. The researchers also extend heartfelt gratitude to the community leaders and health workers, who have provided essential advice and support throughout this study. Their guidance was crucial to our learning, and their insights and encouragement helped us overcome challenges and improve our work. We are sincerely thankful for the dedication and time they invested in helping us to complete this study. This research is expected to increase understanding and influence various stakeholders, especially those concerned with the nutritional status of children raised in low-income families. We welcome constructive criticism and suggestions for improvement, recognizing that this study has its limitations and that continuous learning will benefit future research.

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