Exploratory Factor Analysis of Dietary Intake Patterns in Children Aged 4–5 Years: Food Availability, Knowledge, Environmental, and Economic Factors

Mulyani Tanjung*, Riska Humaiya Nasution, Winna Anzelina

Universitas Negeri Medan, Medan, Indonesia

ABSTRACT

Dietary intake patterns among children aged 4–5 years constitute a crucial factor in supporting optimal growth and development. This study aimed to identify the main factors influencing dietary intake patterns of children aged 4–5 years in Patupangan Village, Barus Subdistrict, Central Tapanuli Regency. The study employed a quantitative approach using Exploratory Factor Analysis (EFA) through the Principal Component Analysis (PCA) method. The study population consisted of all parents with children aged 4–5 years, totaling 53 individuals, with a sample of 31 parents selected using cluster random sampling based on posyandu (integrated health service post) groups. The research instrument was a questionnaire comprising 30 indicators related to children's dietary intake patterns. The results of the analysis indicated that from the initial 30 variables, four main factors were formed, consisting of 13 dominant variables, which collectively explained 71.729% of the total variance after rotation. These four factors were: (1) food availability, (2) nutritional knowledge, (3) environmental factors, and (4) economic factors. Food availability emerged as the most dominant factor, characterized by insufficient fruit consumption after meals, low regularity of daily fruit intake, and inadequate fulfillment of complete nutritional requirements from daily meals. These findings suggest that efforts to improve dietary intake patterns in early childhood should focus on strengthening the availability of nutritious food at home, enhancing parents' nutritional education, improving children's eating environments, and providing economic support for families.

ABSTRACT

Pola asupan gizi anak usia 4–5 tahun merupakan salah satu faktor penting dalam mendukung pertumbuhan dan perkembangan anak. Penelitian ini bertujuan untuk mengidentifikasi faktor-faktor utama yang mempengaruhi pola asupan gizi anak usia 4–5 tahun di Desa Patupangan, Kecamatan Barus, Kabupaten Tapanuli Tengah. Penelitian menggunakan pendekatan kuantitatif dengan teknik Analisis Faktor Eksploratori (Exploratory Factor Analysis/EFA) melalui metode Principal Component Analysis (PCA). Populasi penelitian adalah seluruh orang tua yang memiliki anak usia 4–5 tahun sebanyak 53 orang, dengan sampel 31 orang tua yang dipilih menggunakan teknik cluster random sampling berdasarkan kelompok posyandu. Instrumen penelitian berupa angket yang memuat 30 indikator terkait pola asupan gizi anak. Hasil analisis menunjukkan bahwa dari 30 variabel awal terbentuk 4 faktor utama yang terdiri dari 13 variabel dominan, dan mampu menjelaskan 71,729% total variansi setelah rotasi. Keempat faktor tersebut adalah: (1) ketersediaan pangan, (2) pengetahuan gizi, (3) lingkungan, dan (4) ekonomi. Faktor ketersediaan pangan menjadi faktor yang paling dominan, ditandai dengan kurangnya konsumsi buah setelah makan, rendahnya keteraturan konsumsi buah harian, serta tidak terpenuhinya gizi lengkap dari makanan sehari-hari. Temuan ini menunjukkan bahwa peningkatan pola asupan gizi anak usia dini perlu diarahkan pada penguatan ketersediaan pangan bergizi di rumah, peningkatan edukasi gizi orang tua, perbaikan lingkungan konsumsi anak, serta dukungan ekonomi keluarga.

* Corresponding Author: tanjungmulyani26@gmail.com

Introduction

Early childhood represents a critical "golden period" that determines the direction of a child's growth and development, encompassing physical, cognitive, and socio-emotional domains. At the age of 4–5 years, children enter the preschool phase, which is characterized by increasing demands for energy and nutrients to support physical activity, brain development, and the formation of healthy lifestyle habits. During this stage, dietary intake patterns are not merely a matter of whether children eat or not, but also involve the quality, diversity, and regularity of food consumption provided by

parents at home.

However, empirical conditions indicate that the fulfillment of children's nutritional needs does not always occur optimally. In many families, children's diets are still dominated by certain types of foods, while the consumption of fruits and vegetables tends to remain low. Some children are also accustomed to consuming uncontrolled snacks, both in terms of nutritional quality and food safety. Such conditions have the potential to shape imbalanced eating patterns and negatively affect children's health in the long term. These issues become increasingly complex in rural contexts, where food access, purchasing power, and socio-cultural environments often play a decisive role in shaping household consumption habits.

Conceptually, UNICEF emphasizes that child nutrition problems do not occur in isolation but are influenced by interrelated underlying causes, particularly household access to adequate food in terms of both quality and quantity, family economic conditions, and socio-cultural environments that shape consumption practices (UNICEF, cited in the undergraduate thesis). This framework highlights that children's dietary intake patterns are the result of interactions among multiple factors rather than merely individual parental decisions.

Food availability within the household constitutes one of the fundamental aspects determining whether children can regularly obtain nutritious foods. Food availability is not only concerned with the presence or absence of food but also with whether the available food meets the principles of balanced nutrition and sufficient diversity. In this context, household food security becomes a crucial issue, as limited access to food often leads families to choose foods that are easily available and inexpensive, even though they may not adequately meet children's nutritional needs. This is consistent with the findings of Sulaiman et al. (2021), which indicate that vulnerability in food access and food insecurity are associated with household consumption patterns.

On the other hand, children's dietary intake patterns are strongly influenced by parents' level of nutritional knowledge. Parents' understanding of nutrient requirements, the functions of carbohydrates, proteins, and fats, as well as the importance of consuming nutritious foods, shapes how daily menus are planned and provided. Yao et al. (2020) reported that caregivers' knowledge of feeding practices is associated with dietary diversity and feeding frequency among children. Nevertheless, adequate knowledge does not always translate into daily practice, particularly when families face constraints related to access, economic limitations, or a lack of healthy food options in the surrounding environment.

Environmental factors represent another dimension that plays a significant role in shaping children's eating habits. The home environment, parental eating patterns, and the surrounding community culture influence how children become familiar with food. The family environment plays a central role in the formation of children's dietary intake patterns, as parents determine the types of food provided, methods of preparation and presentation, and eating habits introduced from an early age (Birch & Davison, 2001). Khasanah et al. (2024) further emphasize that community culture influences parents' decisions regarding the foods given to children, including food processing, preparation, presentation, as well as the timing and conditions under which food is consumed. This perspective is reinforced by Andriani et al. (2022), who explain that the surrounding cultural environment affects how individuals make food choices, including the classification of "healthy" and "unhealthy" foods in everyday practices.

Within the same context, family economic conditions often determine the quality of children's dietary intake patterns. Economic constraints can affect purchasing power, the stability of food availability, and the ability of families to provide a variety of healthy foods. Family economic status, reflected in income and expenditure levels, directly influences food purchasing power and households' capacity to provide healthy and nutritious foods for children (Septikasari, 2018). Setyaningsih et al. (2023) add that family welfare can be assessed through income and expenditure, which affect access to food in terms of both quantity and quality. Septikasari (2018) also notes that household expenditure reflects socio-economic stability and is therefore frequently used as an indicator to understand families' ability to meet nutritional needs.

Numerous previous studies have demonstrated that economic factors, nutritional knowledge, and food availability are strongly associated with child nutrition problems. Setyaningsih and Kumala (2023) found that socio-economic factors, maternal knowledge, and maternal behavior were associated with energy and protein intake among undernourished toddlers, indicating that children's dietary quality is highly dependent on family capacity and caregiving patterns. Another study by Avianty and Dewi (2023) showed that maternal knowledge and food availability were associated with

malnutrition among toddlers, while a history of infectious diseases was not significantly related. Meanwhile, Al-Fariq and Yunita (2021) emphasized that culture and maternal knowledge influence infant feeding practices, suggesting that children's consumption patterns are also shaped by social values embedded within the community. Chakona (2020) similarly highlighted that social conditions and cultural beliefs are major drivers influencing maternal eating habits and child-feeding practices.

Despite the growing body of evidence on factors related to child nutrition, a critical research gap remains. Most previous studies have employed correlational designs or bivariate association analyses, in which factors such as knowledge, economic conditions, environment, and food availability are treated as separate variables. In reality, however, these factors are interrelated and form a more complex structure. For instance, parents may possess adequate nutritional knowledge but be unable to apply it due to economic constraints. Conversely, food access may be sufficient, yet socio-cultural environments may encourage unhealthy consumption habits.

This is where the Exploratory Factor Analysis (EFA) approach becomes particularly relevant. EFA enables the reduction of a large number of indicators into a smaller set of representative core factors, thereby revealing the latent structure underlying children's dietary intake patterns. Through EFA, correlated indicators can be grouped into dominant factors that are more meaningful for intervention planning. The application of EFA in the context of dietary intake patterns among children aged 4–5 years, particularly in rural settings, remains relatively limited, giving this study significant academic and practical relevance.

Based on the foregoing discussion, this study holds substantial urgency, as it provides empirical evidence on the factor structure influencing dietary intake patterns among children aged 4–5 years in Patupangan Village, Barus Subdistrict, Central Tapanuli Regency. The findings are expected to serve as a foundation for developing more targeted strategies, including parental nutrition education, strengthening household food security, creating healthier eating environments, and supporting village-level policies through nutritious food programs for early childhood.

Method

This study employed a quantitative approach using Exploratory Factor Analysis (EFA). Factor analysis was applied to identify the underlying factor structure that shapes dietary intake patterns among children aged 4–5 years based on a set of interrelated indicators.

The study was conducted in Patupangan Village, Barus Subdistrict, Central Tapanuli Regency, in 2024. The study population consisted of all parents who had children aged 4–5 years in Patupangan Village, totaling 53 individuals. The sample comprised 31 parents selected using a cluster random sampling technique. Cluster grouping was based on posyandu (integrated health service post) areas, namely Mawar 1 Posyandu and Mawar 2 Posyandu. One cluster was then randomly selected, and Mawar 2 Posyandu was chosen as the sample cluster, consisting of 31 respondents.

The research instrument was a questionnaire designed to measure indicators related to children's dietary intake patterns. The questionnaire consisted of 30 items covering the aspects of food availability, nutritional knowledge, environmental factors, and economic factors. Prior to data collection, the instrument underwent expert validation to ensure content relevance and alignment with the research objectives. The research procedure was carried out in three stages:

1. Preparation stage, which included preliminary observations, questionnaire development, and instrument validation.
2. Implementation stage, involving data collection through the distribution of questionnaires to parent respondents.
3. Final stage, comprising data tabulation, data analysis using EFA, conclusion drawing, and the preparation of the research report.

Data were analyzed using Exploratory Factor Analysis (EFA) with the Principal Component Analysis (PCA) extraction method. The analysis aimed to reduce the initial 30 variables into a smaller number of more representative core factors. The resulting factor structure was interpreted using the Rotated Component Matrix to determine variable loadings on each factor. The extracted factors were subsequently labeled according to the dominant characteristics of the indicators within each factor.

Result and Discussion

Data were analyzed using Exploratory Factor Analysis (EFA) with the Principal Component Analysis (PCA) method to identify the underlying factor structure of dietary intake patterns among

children aged 4–5 years. Based on the analysis, from the initial 30 variables measured via questionnaire, four main factors emerged, consisting of 13 dominant variables. These four factors collectively explained 71.729% of the total variance after rotation, indicating that the resulting factor model is sufficiently robust to represent the structure of dietary intake patterns in children aged 4–5 years.

The Rotated Component Matrix revealed that the study variables grouped into four primary factors: food availability, nutritional knowledge, environment, and economic factors.

Factor 1: Food Availability, the first factor comprised three main indicators: Parents provide fruits for children to consume after meals; Children regularly consume fruits on a daily basis; Children receive complete nutrition from daily meals. This factor was named food availability, as its indicators reflect the household's provision of nutritious foods, particularly the availability of fruits and fulfillment of complete nutrition in daily meals. These findings suggest that children's nutritional fulfillment is strongly influenced by how well families consistently provide healthy foods at home.

Factor 2: Nutritional Knowledge, the second factor consisted of four indicators: Understanding that the body obtains energy from carbohydrates, proteins, and fats; Awareness that egg consumption supports children's cognitive development; Availability of healthy snacks in the surrounding environment; Family income capacity to provide a variety of nutritious foods. This factor was labeled nutritional knowledge, as it represents parents' understanding of children's nutrient requirements and the link between such knowledge and the supporting conditions for its application.

Factor 3: Environment. the third factor included three indicators: Awareness that obesity can result from excessive carbohydrate consumption; Ease of obtaining nutritious foods in the local area (markets or small shops); Parents' habit of avoiding bringing fast food or instant meals into the home. This factor was named environment, as its indicators depict the surrounding conditions that influence children's eating habits, including both access to foods near the home and family dietary practices shaped by the local environment.

Factor 4: Economic Factors, the fourth factor comprised three indicators: Understanding that fruits and vegetables are sources of vitamins and minerals; Habit of encouraging children to consume vegetables from an early age; Tendency to select affordable foods that are still nutritious. This factor was labeled economic factors, as its indicators demonstrate the relationship between nutritional awareness and a family's ability to manage expenditures while choosing affordable but nutritionally valuable foods.

Among the four factors, food availability emerged as the most dominant factor affecting dietary intake patterns in children aged 4–5 years. This dominance is evident in indicators emphasizing the fulfillment of complete nutrition from daily meals and the regular consumption of fruits. The findings underscore that early childhood dietary patterns are primarily determined by the consistent availability of healthy foods at home, which serves as a foundational factor for proper nutrition.

This study aimed to identify the main factors influencing dietary intake patterns of children aged 4–5 years in Patupangan Village, Barus Subdistrict, Central Tapanuli Regency using Exploratory Factor Analysis (EFA) with the Principal Component Analysis (PCA) method. The analysis revealed that from the initial 30 indicators, four main factors comprising 13 dominant indicators were extracted, explaining 71.729% of the total variance. These findings reinforce the notion that early childhood dietary patterns are influenced by multidimensional factors, including not only the foods themselves but also parental knowledge, environmental conditions, and family economic status.

Overall, the results align with the UNICEF framework, which posits that children's nutrition is affected by household food access, economic conditions, and socio-cultural environments. The four factors identified in this study—food availability, nutritional knowledge, environment, and economic factors—highlight the interconnection of these dimensions in shaping children's eating habits.

Food availability emerged as the first and most dominant factor affecting dietary intake patterns. This factor included indicators such as regular daily fruit consumption, the practice of providing fruits after meals, and the fulfillment of complete nutrition from daily meals. Its dominance suggests that the availability of healthy and varied foods at home is a foundational element in ensuring adequate nutrition for children. The findings indicate that even when parents are aware of the importance of nutrition, children remain at risk of suboptimal dietary patterns if nutritious foods are not consistently available. In rural contexts, food availability is also influenced by market access, community consumption patterns, and family habits in daily meal preparation. These results are consistent with Avianty and Dewi (2023), who reported a significant association between food

availability and malnutrition among toddlers, and Sulaiman et al. (2021), who emphasized household food security as a key determinant of family dietary quality. The dominance of food availability suggests that early childhood nutrition interventions in Patupangan should not only focus on education but also on strengthening family access to nutritious foods, for example, through local food programs, supplemental feeding initiatives, or household gardening.

The second factor, nutritional knowledge, included parents' understanding of key nutrients (carbohydrates, proteins, fats), beliefs that egg consumption supports children's cognitive development, and environmental support indicators such as the availability of healthy snacks and family income to provide varied foods. These results underscore the importance of parental knowledge in shaping children's eating patterns. Nutritional knowledge guides parents in understanding what foods are necessary, how to plan daily meals, and the importance of dietary diversity. This is consistent with Yao et al. (2020), who reported that caregivers' knowledge of feeding practices correlates with the diversity and frequency of children's meals. However, this factor also illustrates a gap between knowledge and practice: while parents may understand what constitutes a healthy diet, they may face challenges in providing nutritious foods due to limited options or economic constraints. These findings align with Setyaningsih and Kumala (2023), highlighting that parental knowledge and behavior are closely linked to children's nutrient intake. Thus, nutrition education remains important but should be complemented with environmental and economic support to translate knowledge into practice.

The third factor, environment, comprised indicators such as ease of accessing nutritious foods locally, awareness of obesity risks from excessive carbohydrate consumption, and family habits of avoiding fast food or instant meals at home. The environment plays a critical role in shaping children's eating habits, as young children are highly influenced by parental behavior. If a household routinely consumes instant or processed foods, children are likely to develop similar preferences. The family environment directly contributes to dietary patterns by determining the types of food provided, methods of preparation, and eating habits introduced from an early age (Birch & Davison, 2001). Furthermore, socio-cultural norms also affect perceptions of healthy foods. Khasanah et al. (2024) note that community culture shapes parental decisions regarding food preparation and presentation. Food choices are influenced not only by biological needs but also by the norms, values, and cultural practices embedded within the family and community (Contento, 2016). These findings indicate that improving children's dietary intake requires interventions beyond the household, incorporating community habits, market access, and nutrition-focused community education.

The fourth factor, economic factors, included indicators such as the habit of encouraging vegetable consumption from an early age, awareness that fruits and vegetables provide essential vitamins and minerals, and a tendency to select affordable yet nutritious foods. This factor suggests that economic constraints do not necessarily imply neglect of nutrition but reflect limitations in food selection. Parents may be aware of the importance of fruits and vegetables, yet family economic conditions drive them to choose more affordable options. Amalia (2023) emphasizes that family purchasing power determines the quality and quantity of food consumed, while Setyaningsih et al. (2023) report that income and expenditures directly affect food access and quality. Septikasari (2018) further notes that household expenditure reflects socio-economic stability, which is closely linked to the ability to meet nutritional needs. Therefore, economic conditions determine the extent to which families can provide varied and balanced foods, with less stable households more likely to rely on cheaper options, increasing the risk of limited dietary diversity.

The findings demonstrate that dietary intake patterns among children aged 4–5 years are influenced by an interconnected set of factors. Food availability is the dominant factor, highlighting the need for interventions prioritizing household access to nutritious foods. However, parental knowledge, environmental conditions, and economic factors are also essential and cannot be overlooked. Practically, this suggests that integrated intervention approaches are required. Nutrition education for parents should be continuous, paired with strategies to strengthen children's eating environments and provide economic support. Village authorities can contribute through supplemental feeding programs, local food empowerment initiatives, or collaboration with posyandu to promote healthy eating habits among young children. Additionally, early childhood educators can reinforce healthy eating through nutrition-based learning activities and structured mealtime practices in schools.

Conclussion

Based on the findings from Exploratory Factor Analysis (EFA) using the Principal Component Analysis (PCA) method, it can be concluded that dietary intake patterns of children aged 4–5 years in Patupangan Village, Barus Subdistrict, Central Tapanuli Regency are influenced by four main factors: food availability, nutritional knowledge, environment, and economic factors. From the initial 30 indicators, 13 dominant indicators were grouped into these four factors, collectively explaining 71.729% of the total variance.

The most dominant factor was food availability, reflected in daily fruit consumption, the practice of providing fruits after meals, and the fulfillment of complete nutrition from daily meals. These findings underscore that the quality and consistent provision of nutritious foods at home constitute the primary foundation for shaping dietary intake patterns in early childhood.

Therefore, efforts to improve dietary intake patterns among children aged 4–5 years should focus on strengthening the availability of healthy foods at the household level, alongside enhancing parental nutritional knowledge, supporting a healthier consumption environment, and improving family economic capacity to provide varied and nutritious foods.

Acknowledgments

Disclosure statement

The author declares that there is no conflict of interest in the preparation or publication of this article.

Funding

References

Al Fariqi, M. Z., & Yunika, R. P. (2021). Pengaruh budaya dan pengetahuan ibu terhadap praktik pemberian makan pada bayi di wilayah kerja Puskesmas Narmada Lombok Barat. Nutriology: Jurnal Pangan, Gizi, Kesehatan, 2(1), 77–81.

Amalia, A. R., Rasyida, A. U., Buana, A. W., & Adam, O. M. (2023). Hubungan antara pendapatan keluarga, pola pemberian makan, dan pengetahuan ibu tentang gizi dengan kejadian stunting di wilayah kerja Puskesmas Bangkingan. Surabaya Biomedical Journal, 2(3), 186–193.

Aritonang, E. A., Margawati, A., & Dieny, F. F. (2020). Analisis pengeluaran pangan, ketahanan pangan, dan asupan zat gizi anak bawah dua tahun (BADUTA) sebagai faktor risiko stunting. Journal of Nutrition College, 9(1), 71–80.

Avianty, B. S. E., & Dewi, M. K. (2023). Hubungan pengetahuan ibu, riwayat penyakit infeksi, dan ketersediaan pangan terhadap kejadian malnutrisi pada balita di Puskesmas Cempaka Kabupaten Garut tahun 2023. SENTRI: Jurnal Riset Ilmiah, 2(10), 4279–4292.

Birch, L. L., & Davison, K. K. (2001). Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. Pediatric Clinics of North America, 48(4), 893–907. https://doi.org/10.1016/S0031-3955(05)70347-3

Chakona, G. (2020). Social circumstances and cultural beliefs influence maternal nutrition, breastfeeding and child feeding practices in South Africa. Nutrition Journal, 19(1), Article 47. https://doi.org/10.1186/s12937-020-00566-4

Contento, I. R. (2007). Nutrition education: Linking research, theory, and practice. Jones and Bartlett Publishers.

Khasanah, P. W. Z., & Sumarmi, S. (2024). Faktor sosial budaya yang mempengaruhi keragaman konsumsi pangan pada balita. Jurnal Kesehatan Tambusai, 5(3).

Septikasari, M. (2018). Status gizi anak dan faktor yang mempengaruhi. UNY Press.

Setyaningsih, S., & Kumala, F. D. (2023). Faktor-faktor yang berhubungan dengan asupan zat gizi pada balita gizi kurang. Jurnal Surya Muda, 5(2), 255–268.

Simanjuntak, B. Y. (2018). Tuntunan praktis menghitung kebutuhan gizi.

Sugiyono. (2021). Metode penelitian kuantitatif, kualitatif, dan R&D. Alfabeta.

Sulaiman, N., Yeatman, H., Russell, J., & Law, L. S. (2021). A food insecurity systematic review: Experience from Malaysia. Nutrients, 13(3), Article 945. https://doi.org/10.3390/nu13030945

Syahroni, M. H. A., Astuti, N., Indrawati, V., & Ismawati, R. (2021). Faktor-faktor yang mempengaruhi kebiasaan makan anak usia prasekolah (4–6 tahun) ditinjau dari capaian gizi seimbang. Jurnal Tata Boga, 10(1), 12–22.

Talango, S. R. (2020). Konsep perkembangan anak usia dini. Early Childhood Islamic Education Journal, 1(1), 92–105.

UNICEF. (2025). Child nutrition data and indicators. UNICEF DATA. Diakses September 2025, dari https://data.unicef.org/nutrition

Wijaya, T., & Budiman, S. (2016). Analisis multivariat untuk penelitian manajemen. Pohon Cahaya.

Yao, S., Wang, J., Xiao, S., Jin, X., Xiong, M., Peng, J., & Xu, T. (2020). Inadequate nutrition and associated factors in children aged 6 to 24 months—4 counties, Liangshan Yi Autonomous Prefecture, China, 2018. China CDC Weekly, 2(45), 873–877.

Yunianto, A. E., Saragih, E., Rahmaniah, R., Puspareni, L. D., Rokhmah, L. N., Ramdany, R., … Hasanah, L. N. (2023). Kesehatan dan gizi untuk anak usia dini. Yayasan Kita Menulis