Nutritional Knowledge, Energy Intake, Iron Intake and Nutritional Status of Teenage Girls in Rural and Urban Areas

Erni Rukmana[a], M. Edwin Fransiari[b], Kanaya Yori Damanik[c] and Latifah Rahman Nurfazriah[d]
Nutrition Study Program, Department of Family Welfare Education, Faculty of Engineering, University of Negeri Medan, North Sumatera, Indonesia

Keywords: Nutritional Knowledge, Energy Intake, Iron Intake.

Abstract: Teenage girls must meet their needs for energy intake and micronutrients such as iron to achieve optimal nutritional status. This study was proposed to determine different nutritional knowledge, energy intake, iron intake, and nutritional status of teenage girls in rural and urban areas. This study used a comparative cross-sectional observation design with 30 girls (15 - 17 years old) from Bandung High School Foundation, Deli Serdang Regency and 30 girls at Pertiwi Private High School, Medan City, as the sample subjects. The nutritional knowledge was earned through a questionnaire, food consumption data were collected using the food recall method (1 × 24 hours), and Z-scores were applied for the BMI-for-age. The independent T-test analysis was used to differentiate the nutritional knowledge, energy intake, and iron intake between groups of subjects with normal data distribution. Differences were found in nutritional knowledge and energy intake among teenage girls in rural and urban areas, while iron intake and BMI for age revealed no difference. Therefore, nutritional knowledge is necessary for teenage girls to improve attitudes and actions in choosing healthy and nutritious foods.

1 INTRODUCTION

Adolescence is a transitional period between childhood and adulthood. Teenagers in Indonesia face numerous nutrition-related issues, including malnutrition, overnutrition, and nutrient deficiency. About one-fourth of the total teenagers in Indonesia suffer from stunting, and nine percent of them are underweight (UNICEF, 2021). The nutritional issues in teenagers are associated with physical, physiological, and psychosocial alterations.

Nutritional problems in teenagers gain more attention, as they will affect growth in adulthood. (Al-Jawaldeh et al., 2020). The lack of nutritional knowledge causes nutritional problems in t teenagers. The lack of nutritional knowledge and mistakes in food choices affect the health condition and lead to malnutrition. Low nutrition knowledge can be detected in appropriate eating behaviours (Hasanah et al., 2022).

During the rapid growth period, teenagers require adequate nutrient intake, specifically for teenage girls (Kahssay et al., 2020). For optimal nutrition, teenagers must meet their macro- and micronutrient intake requirements.

Teenagers with deficient energy have a poor nutritional status, whereas excessive energy intake can contribute to overweight and obesity. Obesity and other health hazards will likely manifest and impact adulthood (Norris et al., 2022). For teenage girls, the nutritional status of teenagers plays a vital role in hereditary health (Vaivada et al., 2020). Therefore, adolescence is crucial time to establish a healthy diet and lifestyle.

In addition, teenage girls frequently follow diets and restrict food consumption to maintain their appearance, which can result in essential minerals deficiency, particularly iron. A diet that does not meet the body's nutritional requirements causes iron and macronutrient deficiencies (Utami et al., 2022).

[a] https://orcid.org/0000-0002-9442-8010
[b] https://orcid.org/0009-0009-7744-384X
[c] https://orcid.org/0009-0001-8469-995X
[d] https://orcid.org/0000-0003-1415-8477

Rukmana, E., Fransiari, M. E., Damanik, K. Y. and Nurfazriah, L. R.
Nutritional Knowledge, Energy Intake, Iron Intake and Nutritional Status of Teenage Girls in Rural and Urban Areas.
DOI: 10.5220/0012919500004564
Paper published under CC license (CC BY-NC-ND 4.0)
In *Proceedings of the 5th International Conference on Social Determinants of Health (ICSDH 2023)*, pages 203-208
ISBN: 978-989-758-727-6; ISSN: 2975-8297
Proceedings Copyright © 2025 by SCITEPRESS – Science and Technology Publications, Lda.

Furthermore, low food intake and inadequate diet in teenage girls due to their preference to eat fast foods that contain high energy, fat, and sodium, and low vitamins, calcium, and iron, can result in malnutrition (ELMoslemany et al., 2019).

According to Nurwanti (2019), distinct risk factors are associated with overweight and obesity in both rural and urban regions in Indonesia. Urban dwellers have a prevalence of overweight and obesity. The presence of health services and access to nutritious food impact both urban and rural communities. The nutritional intake might be influenced by the environmental circumstances present in the residential setting.

This study was conducted in a rural area, namely Deli Serdang District, close to urban areas in Medan City, North Sumatra. Health disparities in rural and urban areas are the focus of this study.

This study aimed to examine the disparities in nutritional knowledge, energy intake, iron intake, and nutritional status among teenage girls residing in rural and urban areas.

2 METHODS

The present study used a comparative cross-sectional design. This study was carried out in June-July, 2023. This study investigated teenage girls as a study subject who attend the Bandung High School Foundation in a rural area and Pertiwi Private High School in an urban area. The collective focus of investigation for each educational institution encompassed a cohort of 30 teenage girls. Subjects were selected non-systematic within each class, with a minimum number of subjects required.

In this study, data were composed of primary and secondary sources. The primary data includes information on the subject's characteristics and expertise, obtained through a questionnaire. Additionally, data on food intake, including energy and iron, were collected using the 24-hour food recall questionnaires. The weight data were collected using digital thumb scales with 0.1 kg accuracy, while body height data were obtained using microtoise with 0.1 cm accuracy. These data were collected for the nutritional status of individuals across different age groups according to their body mass index (BMI). The secondary data were derived from school records regarding the student population within the school.

The nutritional knowledge was classified into three distinct categories. The first category is characterized by a low level of knowledge, as the percentage of correct answers is below 60%. The second category represents a moderate level of knowledge, with a percentage of correct answers between 60% to 80%. The third and final category signifies a high level of knowledge, as the percentage of correct answers exceeds 80% (Khomsan A, 2000). The concept of nutrient adequacy encompasses two distinct categories, namely macronutrients and micronutrients. The macronutrient adequacy level is classified into five categories: severe deficiency (<70%), moderate deficiency (70%–79%), mild deficiency (80–89%), normal intake (90–119%), and excessive intake (120%) (Kartono et al., 2012). The micronutrient adequacy level is bifurcated into two classifications: insufficient, denoted by levels below 70%, and sufficient, indicated by levels equal to or over 70% (Houghton et al., 2019). The classification of nutritional status is based on the body mass index (BMI) in relation to age. Poor nutrition is indicated by a z-score less than -3 of standard deviations (SD), low nutrition is indicated by a z-score between -3 of SD and -2 of SD, normal nutritional status is indicated by a z-score between -2 of SD and +1 of SD, overweight is indicated by a z-score between +1 of SD and +2 of SD, and obesity is indicated by a z-score greater than +2 of SD (Kemenkes RI, 2020).

The acquired data were subjected to both descriptive and inferential analyses. This study examined the descriptive data pertaining to age characteristics, knowledge levels, energy levels, iron intake, and nutritional status. If the data was assumed to follow a normal distribution, the inferential analysis employed an independent t-test. An independent t-test was used to examine the disparities in nutritional knowledge, energy intake, iron intake, and nutritional status among teenage girls residing in rural and urban areas. The study has been formally submitted for ethical clearance in the Medical Faculty of the Christian University of Maranatha, as indicated by ethical committee decision No. 137/KEP/VI/2023 on June 13, 2023

3 RESULTS

The subject quality is presented in Table 1. The teenage girls as the subjects are between 15 - 18 years old. The majority of participants in both the rural group (56.7%) and the urban group (36.7%) were 17 years old.

Table 1. Distribution of subject characteristic.

Subject Characteristics	Rural n (%)	Urban n (%)
Age		
15	1 (3.3)	12 (40)
16	17 (56.7)	11 (36.7)
17	10 (33.3)	7 (11.7)
18	2 (6.7)	-
Total	30	30

Table 2 illustrates a nutrition knowledge disparity between girls residing in rural and urban areas, with lower knowledge levels. Specifically, the percentage of rural girls who possess healthy nutrition knowledge is 6.7%, while their urban counterparts demonstrate a significantly higher rate of 56.7%. This finding demonstrates that individuals residing in urban areas possess superior nutritional knowledge compared to their rural counterparts. The scope of obtaining nutritional information is more extensive among teenage girls residing in rural areas.

Table 2. Distribution of nutritional knowledge.

Nutritional knowledge	Rural n (%)	Urban n (%)
Low	5 (16.7)	3 (10)
Medium	23 (76.7)	10 (33.3)
High	2 (6.7)	17 (56.7)
Total	30	30

Table 3 displays the average nutrition knowledge in rural and urban areas. In rural areas, the average nutritional knowledge is 68.88 (10.22). The 86.67 value is the utmost output of rural knowledge. In statistical comparison analysis, the nutrient knowledge results reveal a significant difference (p 0.05).

Table 3. Percentage of mean and differences in nutritional knowledge between rural and urban areas.

Variable	Rural (Mean± SD)	Min-Max	Urban (Mean± SD)	Min-Max	p-value
Nutritional knowledge	68.88± 10.22	40-86.67	81.77± 13.32	53.33-100	0.00

The findings indicate that energy intake was recorded for a 24-hour period in both rural and urban food data. The information is presented in Table 4. A significant proportion of rural (40%) and urban (30%) populations experience substantial deficiencies in energy intake adequacy across various levels.

Table 4. Distribution of nutrient adequacy levels.

The level of nutritional adequacy	Rural n (%)	Urban n (%)
Energy		
Severe deficiency	24 (80)	18 (60)
Moderate deficiency	1 (3.3)	3 (10)
Low Deficiency	2 (6.7)	4 (13.3)
Normal Intake	2 (6.7)	3 (10)
High Intake	1 (3.3)	2 (6.7)
Iron (Fe)		
Deficit	25 (83.3)	22 (73.3)
Normal	5 (16.7)	8 (26.7)

A difference in the sufficient energy intake in rural and urban groups was found ($p<0.05$). The energy intake of rural teenage girls is 462.41 kcal, which is lower than that of urban teenagers.

Table 5. Mean and differences in nutritional adequacy levels between rural and urban area.

Nutritional adequacy level	Rural (Mean±SD)	Min-Max	Urban (Mean ±SD)	Min-Max	p-value
Energy (kcal/day)	962.10± 563.50	259.60 - 2399.20	1424.51±555.72	482.00- 2943.20	0.002
Iron (Fe) (mg/day)	5.79±6.75	0.80-26.8	5.62±4.27	1.50-19.20	0.97

The nutritional status of the subjects is presented in Table 6. Most respondents in both rural and urban groups exhibit a normal nutritional status. The rural group exhibits a greater nutritional level of 20%, whereas the urban group demonstrates a nutritional status of 13.3%.

Table 6. Distribution of nutritional status (BMI-for-age).

Nutritional Status	Rural n (%)	Urban n (%)
Underweight	1 (1.7)	1 (3.3)
Normal	23 (76.7)	25 (83.3)
Overweight	6 (20)	4 (13.3)

The mean Z-score of teenage females' BMI for age in rural areas was 0.12, while in urban areas was -0.17. Notably, there was no variation in BMI for age. Both sources suggest that typical teenagers possess a typical body mass index (BMI-for-age).

Table 7. Mean and Differences of nutritional status (BMI-for-age) between rural and urban area.

Nutrional Status (Z-score)	Rural (Mean± SD	Min-Max	Urban Mean± SD	Min-Max	p-value
BMI-for-age	0.12±1.22	-2.25-2.32	-0.17±0.96	-2.15-1.54	0.30

4 DISCUSSIONS

Adolescence is the phase of life between childhood and adulthood, which begins at 9 years old to 19 years old (WHO, 2022). Nutritional deficits can have severe effects on teenage girls. If their nutritional needs are not addressed, they are more likely to have undernourished offspring, then pass on to future generations (Rasyid et. al, 2022).

This study shows nutritional knowledge between rural and urban girls is significantly different. Girls in urban areas understand the importance of breakfast and animal and vegetable protein consumption compared to rural areas. According to Gultom (2020), the average nutritional knowledge of rural teenagers was 3.49 points, which was lower than that of urban teenagers. A person's dietary preferences and food intake are factors in determining their nutritional status. Egg et al. (2020) showed that higher nutritional knowledge is independently associated with meat intake, low-sugar energy drinks, and iced tea, besides higher vegetable and vegetable oil intake.

The results indicate differences in energy intake and energy sufficiency levels among girls in rural and urban areas. Merlisia, (2017) showed that smaller rural teenagers had a proclivity to have meals more than three times a day (odds ratio: 0.82). Additionally, these individuals tend to consume higher amounts of fruits (odds ratio: 1.39) and vegetables (odds ratio: 1.22). In contrast to Rakhmawati (2020), urban areas exhibit a greater average energy intake of 1176 kcal than rural areas at 1092 kcal. There is no statistically significant difference in energy intake. Iron deficiency is observed in teenage girls both across rural and urban areas.

A minimal disparity was observed in the average iron intake between the rural and urban areas. The study's findings indicate no discernible disparity in nutritional sufficiency degree between the two treatments, as reinforced by Annisa (2021). The present study suggests a lack of iron intake disparity between urban and rural teenagers. This observation can be attributed to various variables, including the availability of dietary resources, the influence of modernization, and globalization in both regions. Consequently, the observed homogeneity in iron intake across urban and rural girls indicates a limited degree of variety in this aspect. Similarly, Faradilla et al. (2019) reported no significant disparities in food choices between urban and rural areas. The consumption of unsuitable dietary options has a detrimental impact on inadequate iron intake in urban and rural areas. These findings contradict Gultom (2020), who demonstrated that the iron level among teenagers in rural areas was comparatively lower than in urban areas, resulting in a higher prevalence of anaemia (70% of teenagers in rural areas).

These findings indicate no discernible disparity in nutritional status between rural and urban populations. The results align with Armi & IMP (2018), indicating no significant differences in nutritional status between rural and urban populations. Contreras et al. (2021) discovered that teenagers who live in rural areas had higher levels of internalizing mental health symptoms and a greater propensity to engage in the emotional overeating condition. Several factors within the rural environment have been identified as potential contributors to the prevalence of obesity. These factors encompass economic conditions, limitations on physical activity, barriers to accessing nutritious food, healthcare services availability, and the provision of nutrition education. (Buro et al., 2015).

In contrast to (Thapa et al., 2021), urban teenagers exhibit an elevated IMT and a greater likelihood of obesity, which may be attributed to economic considerations, as socioeconomic status is associated with an increased prevalence of obesity.

5 CONCLUSIONS

There are differences between rural and urban teenage girl's nutritional knowledge and energy intake. Nutritional knowledge levels and energy intake among teenage girls in rural areas is comparatively lower than in urban areas. There is no significant difference in iron intake and nutritional status (BMI-for-age) between teenage girls in rural and urban areas.

Enhancing nutritional awareness among teenage girls might positively influence their attitudes and behaviours towards choosing a healthy and nourishing diet. Teenage girls require conscientious endeavours to optimally uphold their dietary intake and nutritional well-being. This can be achieved through guidance on consuming a balanced diet,

adhering to appropriate portions, and avoiding any imbalances in essential nutrients.

ACKNOWLEDGMENTS

The authors would like to thank all parties who have assisted this project, namely high school teenage girls, to participate in this study. In particular, Authors would also like to show gratitude to the Institute for Research and Community Service, Medan State University (LPPM Universitas Negeri Medan), for funding this project through BOPTN research grant in 2023.

REFERENCES

Al-Jawaldeh, A., Taktouk, M., & Nasreddine, L. (2020). Food consumption patterns and nutrient intakes of children and adolescent in the Eastern Mediterranean Region: A call for policy action. *Nutrients*, *12*(11), 3345.

Annisa, N. (2021). Studi Literature: Perbedaan Asupan Makanan Sumber Zat Besi (Fe) Pada Remaja Putri Di Wilayah Perkotaan Dan Pedesaan. *Majalah Kesehatan Masyarakat Aceh (MaKMA)*, *4*(2).

Armi, M. W. P., & IMP, D. (2018). Perbedaan prevalensi obesitas dan berat badan lebih pada siswa Sekolah Menengah Atas (SMA) Negeri antara daerah urban dan rural di Kabupaten Gianyar. *E-Journal Medika*, *7*(2), 72–76.

Buro, B., Gold, A., Contreras, D., Keim, A. L., Mobley, A. R., Oscarson, R., Peters, P., Procter, S., & Smathers, C. (2015). An ecological approach to exploring rural food access and active living for families with preschoolers. *Journal of Nutrition Education and Behavior*, *47*(6), 548–554.

Contreras, D. A., Martoccio, T. L., Brophy-Herb, H. E., Horodynski, M., Peterson, K. E., Miller, A. L., Senehi, N., Sturza, J., Kaciroti, N., & Lumeng, J. C. (2021). Rural–urban differences in body mass index and obesity-related behaviors among low-income preschoolers. *Journal of Public Health*, *43*(4), e637–e644.

Egg, S., Wakolbinger, M., Reisser, A., Schätzer, M., Wild, B., & Rust, P. (2020). Relationship between nutrition knowledge, education and other determinants of food intake and lifestyle habits among adolescent from urban and rural secondary schools in Tyrol, Western Austria. *Public Health Nutrition*, *23*(17), 3136–3147.

ELMoslemany, A. G., ELBbandrawy, A. M., Elhosary, E. A., & Gabr, A. A. (2019). Relation between body mass index and iron deficiency anemia in adolescent females. *Current Science International*, *8*(02), 406.

Faradilla, O. E., Kuswari, M., & Gifari, N. (2019). Perbedaan Pemilihan Makanan dan Faktor yang Berkaitan pada Remaja Putri di SMA Daerah Kota dan Kabupaten. *Jurnal Gizi, Pangan Dan Aplikasinya*, *3*(2), 103–114.

Gultom, Y. T. (2020). Kejadian Anemia pada Remaja Putri SMP Pedesaan dan Perkotaan Pancur Batu Ditinjau dari Pengetahuan Gizi, Uang Saku, dan Pola Makan. *Repositori Institusi Universitas Sumatera Utara. Http://Repositori.Usu.Ac.Id/Handle/123456789/28314* .

Hasanah, Z., Sholikhah, D. M., & Supriatiningrum, D. N. (2022). Hubungan Pengetahuan Gizi, Body Image Dan Konsumsi Makanan Cepat Saji Dengan Status Gizi Remaja Putri Di SMA Kecamatan Gresik. *Ghidza Media Jurnal*, *4*(1), 45–57.

Houghton, L. A., Trilok-Kumar, G., McIntosh, D., Haszard, J. J., Harper, M. J., Reid, M., Erhardt, J., Bailey, K., & Gibson, R. S. (2019). Multiple micronutrient status and predictors of anemia in young children aged 12-23 months living in New Delhi, India. *PloS One*, *14*(2), e0209564.

Kahssay, M., Mohamed, L., & Gebre, A. (2020). Nutritional status of school going adolescent in Awash Town, Afar Region, Ethiopia. *Journal of Environmental and Public Health*, *2020*.

Kartono, D., Hardinsyah, H., Jahari, A. B., Sulaeman, A., Astuti, M., & Soekatri, M. (2012). Ringkasan-angka kecukupan gizi (AKG) yang dianjurkan bagi orang Indonesia 2012. *Widyakarya Nasional Pangan Dan Gizi (WNPG) X Conference*, 20–21.

Kementerian Kesehatan RepubIik Indonesia (Kemenkes RI). (2020). *Peraturan Peraturan Menteri Kesehatan Republik Indonesia Nomor 2 Tahun 2020 tentang Standar Antropometri Penilaian Status Gizi Anak. Keputusan Menteri Kesehatan Republik Indonesia*.

Khomsan A. (2000). *Teknik Pengukuran Pengetahuan Gizi*. Institut Pertanian Bogor.

Merlisia, M. (n.d.). Kebiasaan Makan dan Indeks Massa Tubuh Remaja Perdesaan dan Perkotaan (Analisis Data IFLS5). *Repository Universitas Gadjah Mada*.

Norris, S. A., Frongillo, E. A., Black, M. M., Dong, Y., Fall, C., Lampl, M., Liese, A. D., Naguib, M., Prentice, A., & Rochat, T. (2022). Nutrition in adolescent growth and development. *The Lancet*, *399*(10320), 172–184.

Nurwanti, E., Hadi, H., Chang, J.-S., Chao, J. C.-J., Paramashanti, B. A., Gittelsohn, J., & Bai, C.-H. (2019). Rural–urban differences in dietary behavior and obesity: Results of the riskesdas study in 10–18-year-old Indonesian children and adolescent. *Nutrients*, *11*(11), 2813.

Rakhmawati, R. I. N. (2020). Perbedaan Asupan Energi, Asupan Protein, dan Citra Tubuh pada Remaja Kurang Energi Kronik di Pedesaan dan Perkotaan. *Repository Universitas Soedirman. Http://Repository.Unsoed.Ac.Id/Id/Eprint/13629* .

Rasyid, P. S., Zakaria, R., & Munaf, A. Z. T. (2022). *Remaja dan Stunting*. Penerbit NEM.

Thapa, R., Dahl, C., Aung, W. P., & Bjertness, E. (2021). Urban–rural differences in overweight and obesity among 25–64 years old Myanmar residents: a cross-

sectional, nationwide survey. *BMJ Open*, *11*(3), e042561.

UNICEF. (2021). Social and Behaviour Change Communication Strategy: Improving Adolescent Nutrition in Indonesia. *UNICEF Indonesia: Jakarta*.

Utami, K., Yolanda, H., Albayani, M. I., Suprayitna, M., Sulistiawati, F., & Mentari, I. N. (2022). Screening Anemia, Status Gizi Dan Asupan Nutrisi Remaja Putri. *JMM (Jurnal Masyarakat Mandiri)*, *6*(6), 5086–5095.

Vaivada, T., Akseer, N., Akseer, S., Somaskandan, A., Stefopulos, M., & Bhutta, Z. A. (2020). Stunting in childhood: an overview of global burden, trends, determinants, and drivers of decline. *The American Journal of Clinical Nutrition*, *112*(Supplement_2), 777S-791S.

World Health Organization (WHO). (2022). Kesehatan Remaja. *https://www.who.int/health-topics/adolescent-health#tab=tab_1*.

SCITEPRESS
SCIENCE AND TECHNOLOGY PUBLICATIONS