



# The Impact of Instant Noodle Consumption Patterns on Hemoglobin Levels among Medical Laboratory Technology Students at Poltekkes Medan

Evi Irianti<sup>1</sup>, Ice Ratnalela Siregar<sup>1</sup>, Elizawarda<sup>1</sup>, Rinson Sitohang<sup>1</sup>

<sup>1</sup>Poltekkes Kemenkes Medan, Indonesia

Email correspondence: [evidesman@gmail.com](mailto:evidesman@gmail.com)

## Track Record Article

Revised: 22 December 2025  
Accepted: 1 February 2026  
Published: 31 March 2026

### How to cite :

Irianti, E., Siregar, I. R., Elizawarda, & Sitohang, R. (2026). The Impact of Instant Noodle Consumption Patterns on Hemoglobin Levels among Medical Laboratory Technology Students at Poltekkes Medan. *Contagion : Scientific Periodical of Public Health and Coastal Health*, 8(1), 131–140.

## Abstract

*Instant noodles are widely consumed worldwide due to their convenience, affordability, and long shelf life, particularly among university students. Despite their popularity, these products are nutritionally imbalanced, with high in carbohydrates and sodium, but low in protein, iron, and essential vitamins, raising concerns about their impact on hemoglobin levels and anemia risk. This study specifically examines hemoglobin status in relation to both frequency and duration of instant noodle consumption, while considering gender and sleep duration. A cross-sectional analytical study was conducted among 163 third-year Medical Laboratory Technology students at Poltekkes Kemenkes Medan. Hemoglobin concentration was measured from venous blood samples, while dietary patterns, sleep duration, and instant noodle consumption habits were assessed via structured questionnaires. Associations were analyzed using the Chi-square test ( $p < 0.05$ ). Most students maintained normal hemoglobin levels regardless of instant noodle consumption frequency or duration. Female students had lower hemoglobin than males, reflecting hormonal and menstrual influences. Sleep duration did not significantly affect hemoglobin. Nearly all students reported adding vegetables and eggs to their noodles, potentially mitigating the adverse effects of sodium and supporting iron absorption. However, this effect was not statistically controlled, rendering the observed maintenance of hemoglobin suggestive rather than definitive. Hemoglobin status in young adults is primarily influenced by gender-related biological factors and overall dietary quality, rather than instant noodle consumption patterns alone. The findings highlight the importance of nutrient-rich complementary foods and warrant longitudinal studies to clarify the causal impact of dietary habits on hematological health*

**Keywords:** Noodles, Hemoglobins, Anemia, Sleep, Gender Factors

## INTRODUCTION

Instant noodles are one of the most consumed instant foods worldwide, primarily due to their convenience and ease of preparation. Besides, instant noodles come in many flavors, they taste good, and they are quick to prepare. Indonesia, the country where this research was carried out, ranks second globally in instant noodle consumption, with an estimated average of 52 servings per capita annually (Pratama et al., 2024; Fahira et al., 2024; Ananda Putri et al., 2024). There are many brands of instant noodles in Indonesia, for example: Indomie which has expanded to international markets, yet the taste of Indomie in Indonesia remains more delicious compared to its variants abroad. Instant noodles are very popular among university students because they are affordable, easy to prepare, and has long extended shelf life (Mendila et al., 2025; Queiroz et al., 2025; Fitriani et al., 2023). Informal observational indicates that students

enrolled in Medical Laboratory Technology programs exhibit similar consumption patterns, with instant noodles constituting a frequent component of their dietary intake.

Indeed, instant noodles are popular, and many students love them, however, these instant food are not healthy enough to be classified as staple food due to their nutritionally imbalanced composition. Instant noodles have a high carbohydrate content (77.3%) and sodium levels (approximately 1,200 mg per serving), alongside relatively low proportions of protein (9.6%) and fat (12.3%), and negligible amounts of iron and essential vitamins (Maryam, 2022; Wati, 2023; Handriyanti & Fitriani, 2021). Approximately 70% of students who consume instant noodles more than three times per week have been associated with a reduction in hemoglobin levels, potentially mediated by impaired iron absorption resulting from high sodium exposure (Istianah & Hardiati, 2024; Wati, 2023; Pasa et al., 2024).

Food consumption is not the only factor that determines the regulation of hemoglobin (Hb) levels, as adequate sleep is essential for optimal erythropoiesis (Syarifah & Saputra, 2024; Ariani et al., 2022; Lussy, Nur, & Toy, 2023). Individuals who lack sleep and a nutritious diet can develop anemia. Anemia remains a significant public health concern among adolescents and young adults, particularly during this period of rapid growth and physiological development that necessitates sufficient nutritional intake. The prevalence of anemia among Indonesians aged 15–24 years reached 32% in 2024, underscoring the urgent need for enhanced awareness and interventions aimed at promoting balanced nutrition (Novitarum et al., 2024) ('Islamiyah & Soebiantoro, 2022; Istianah & Hardiati, 2024; Ananda Putri et al., 2024). It means students cannot rely on instant food, like instant noodles, because it can contribute to inadequate micronutrient intake. Although some students add complementary ingredients such as vegetables, this dietary pattern still poses risks if not nutritionally balanced ('Islamiyah & Soebiantoro, 2022; Wati, 2023; Alashmali, 2024).

Instant noodles are consumed by many students these days, but their impact on health, especially hemoglobin levels and anemia risk, has not been clearly explained in young adult populations, yet dietary inadequacies can trigger anemia. This suggests that frequent consumption of highly processed foods may be associated with reduced micronutrient status, including iron, which is essential for hemoglobin synthesis (Soans et al., 2025). Instant noodles alone are not healthy enough to consume, and this makes many people add vegetables and eggs into them. This suggests that students realized the importance of nutritious food for their health, so adding complementary ingredients such as eggs, a rich source of protein, and vegetables is understood to provide essential vitamins and minerals when preparing instant noodles.

These dietary practices can enhance nutritional quality, mitigate potential adverse effects of high sodium and low micronutrient content, and help maintain hematological health. The novelty of this study lies in simultaneously examining hemoglobin status in relation to instant noodle consumption patterns, including frequency and duration, while accounting for gender, sleep duration, and these compensatory dietary behaviors. By integrating these factors, this research provides a more comprehensive understanding of the nutritional and hematological implications of instant noodle consumption among university students. Against this backdrop, hemoglobin status among university students warrants further investigation in relation to instant noodle consumption patterns, particularly frequency and duration of intake, as well as gender and sleep duration, given their potential implications for nutritional adequacy and hematological health.

## **METHODS**

This study employed an analytical observational design with a cross-sectional approach. The study population comprised third-year students enrolled in the Medical Laboratory Technology Department at Poltekkes Kemenkes Medan, with a total population of 276 students. The sample size was calculated using the Slovin formula, resulting in a total of 163 participants. Eligible participants were those without self-reported acute infectious or inflammatory conditions (e.g., diarrhea or febrile illness), without a history of physician-diagnosed chronic diseases, including tuberculosis, chronic kidney disease, or cardiovascular disease at the time of data collection, and who did not report regular use of iron or other micronutrient supplements during the preceding three months. Data collection was conducted at the Hematology Laboratory of Poltekkes Kemenkes Medan between January and April 2025.

The independent variables assessed included gender, frequency of instant noodle consumption, duration of instant noodle consumption habits, and sleep duration. Hemoglobin concentration served as the dependent variable. Dietary and lifestyle data were obtained using a structured questionnaire, while hemoglobin levels were measured from venous blood samples using an automated hematology analyzer. Statistical analyses were performed using SPSS software version 16.0. Associations between independent variables and hemoglobin levels were evaluated using the Chi-square test, with statistical significance set at  $p < 0.05$ . Ethical approval for the study was granted by the Research Ethics Committee of Poltekkes Kemenkes Medan (Number. 01.26.949/KEPK/POLTEKKES KEMENKES MEDAN/2025), and informed consent was obtained from all participants before data collection.

## RESULT

**Table 1. Distribution of Student Hemoglobin Levels by Gender (n = 163)**

Hemoglobin (g/dL)	Gender				<i>p.value</i>
	Female		Male		
	f	%	f	%	
Low	7	5	5	20	<b>0,000</b>
Normal	128	92,8	15	60	
High	3	2,2	5	20	
<b>Total</b>	<b>138</b>	<b>100</b>	<b>25</b>	<b>100</b>	

Table 1 indicates that female students constituted the majority of the study population (n = 138), with most exhibiting hemoglobin levels within the normal range (92.8%). In contrast, male students showed comparable proportions of elevated and reduced hemoglobin levels (20% each), both of which were higher than those observed among female students. Chi-square analysis demonstrated a statistically significant association between gender and hemoglobin status ( $p < 0.05$ ). The mean hemoglobin concentration was higher among male students (14.49 g/dL) compared with female students (13.21 g/dL).

**Table 2. Distribution of hemoglobin status by gender according to frequency and duration of instant noodle consumption (n = 163)**

Gender	Hemoglobin status	Frequency $\geq 3$ packs/week		Frequency $< 3$ packs/week		Duration $\geq 3$ months		Duration $< 3$ months	
		f	(%)	f	(%)	f	(%)	f	(%)
		Male	Low	3	2.3	2	6.3	0	0.0
Normal	12		9.2	3	9.4	8	11.1	7	7.8
High	5		3.8	0	0.0	3	4.1	2	2.2
Female	Low	6	4.6	1	3.1	5	6.8	2	2.2
	Normal	102	77.8	26	81.2	55	75.3	73	81.1
	High	3	2.3	0	0.0	2	2.7	1	1.1
p-value		<b>0.633*</b>				<b>0.172**</b>			
<b>Total</b>		<b>131</b>	<b>100</b>	<b>32</b>	<b>100</b>	<b>73</b>	<b>100</b>	<b>90</b>	<b>100</b>

\*Chi-square test for frequency of instant noodle consumption

\*\*Chi-square test for duration of instant noodle consumption

Table 2 presents the distribution of hemoglobin status by gender according to the frequency and duration of instant noodle consumption. Across all categories, normal hemoglobin levels predominated among both male and female students, regardless of consumption frequency or duration. Female students consistently exhibited a higher proportion of normal hemoglobin levels compared with male students, whereas male students showed relatively higher proportions of both low and high hemoglobin levels.

When consumption frequency was considered, students who consumed instant noodles  $\geq 3$  packs per week did not demonstrate a statistically different hemoglobin status compared

with those consuming < 3 packs per week ( $p = 0.633$ ). Similarly, no significant association was observed between the duration of instant noodle consumption ( $\geq 3$  months vs < 3 months) and hemoglobin status ( $p = 0.172$ ). These findings suggest that, within this study population, neither short-term nor more frequent consumption of instant noodles was independently associated with altered hemoglobin status.

A descriptive trend was observed in which male students who frequently consumed instant noodles tended to exhibit a higher proportion of non-normal hemoglobin levels compared with their female counterparts. This pattern may reflect gender-specific physiological differences, including variations in iron metabolism, dietary diversity, and lifestyle behaviors, which were not fully captured in the present analysis.

**Table 3. Distribution of Student Hemoglobin Levels by Sleep Duration (n = 163)**

Gender	Hemoglobin (g/dL)	Sleep duration/hour/a day				<i>p-value</i>
		<7		$\geq 7$		
		<b>f</b>	<b>%</b>	<b>f</b>	<b>%</b>	
Male	Low	4	4,7	1	1,3	<b>0,399</b>
	Normal	10	11,9	5	6,3	
	High	2	2,4	3	3,8	
Female	Low	2	2,4	5	6,3	
	Normal	64	76,2	64	81	
	High	2	2,4	1	1,3	
<b>Total</b>		<b>84</b>	<b>100</b>	<b>79</b>	<b>100</b>	

As shown in Table 3, more than half of the respondents (51.5%) reported sleeping <7 hours per day. Statistical analysis ( $p > 0.05$ ) confirmed no significant differences in hemoglobin levels between students sleeping <7 hours and those with  $\geq 7$  hours of sleep. Both male and female students maintained hemoglobin levels largely within normal ranges, regardless of sleep duration.

## DISCUSSION

After analyzing the data, it can be seen (as shown in Table 1) that the proportion of students with normal hemoglobin levels was highest among females. It means there is a difference in hemoglobin levels between genders, with females having lower values. Such differences may be influenced by several factors, including the hormonal factor. Males' testosterone regulates genetic mechanisms, particularly hematopoietic gene activity, thereby enhancing erythropoietin secretion and stimulating erythropoiesis.

In contrast, estrogen in females tends to reduce erythroid proliferation (Rosyidah et al., 2022; Renatasiva et al., 2024; Mwajib et al., 2024). Moreover, males have greater muscle mass and higher oxygen demand, necessitating a higher oxygen transport capacity. Females, on the

other hand, experience monthly menstruation, leading to blood loss and reduced iron reserves during reproductive age, which results in lower hemoglobin levels. Another theory suggests that males have higher total body iron content, which more effectively supports hemoglobin synthesis (Rosyidah et al., 2022; Renatasiva et al., 2024).

These findings are consistent with Fahira et al. (2024), who reported that average hemoglobin levels in females are lower than in males. Thus, since females experience a blood loss due to monthly menstruation cycles, female students are advised to consume nutrient-rich foods, particularly iron-containing foods, to restore hemoglobin levels, especially after menstruation (Fahira et al., 2024; Martiasari et al., 2022; Baroroh, 2022).

The lowest hemoglobin level among female students was 11.60 g/dL with declining health conditions and those who had recently completed menstruation (based on interviews during Hb examinations). The highest hemoglobin level (17.50 g/dL), was found in both male and female students. Among males, this was likely due to adaptation to hypoxia, particularly in heavy smokers (as confirmed through questionnaire responses), serving as a physiological compensation for reduced oxygen availability. In females, elevated hemoglobin may be influenced by hematopoietic genetic factors, such as variations in genes regulating erythropoietin production or bone marrow sensitivity to hormones, leading to higher erythrocyte production in some individuals (Rizka et al., 2024; Sebayang et al., 2024)..

Interviews further revealed that some students, both male and female, frequently consumed chicken liver as part of their breakfast. According to Sebayang et al., 2024, chicken liver is a rich source of heme iron, which is more easily absorbed by the body than non-heme iron from plant sources, thereby enhancing hemoglobin levels. Questionnaire data also showed that almost all students (96.6%) added vegetables and eggs when consuming instant noodles, helping to maintain hemoglobin levels within normal ranges (Sebayang et al., 2024). However, in contrast, Rifky et al. (2024) found that students who regularly consume instant noodles show a potential for anemia, particularly iron-deficiency anemia (Rifky et al., 2024). A similar finding in another study explains that instant noodles fall into the category of high-energy but low-nutrient processed foods (junk food), which are examined as a risk factor for anemia if consumed without accompanying protein, vitamins, and other minerals (Soans et al., 2025). Another study also found that individuals who consume instant noodles have lower levels of iron in the blood, which is suspected to contribute to a decrease in hemoglobin (Yousif, 2025).

Table 2 indicates that neither the frequency nor the duration of instant noodle consumption was significantly associated with hemoglobin levels among Medical Laboratory Technology students at Poltekkes Kemenkes Medan, with most respondents maintaining

normal hemoglobin values. Although a substantial proportion of students reported consuming  $\geq 3$  packs per week or for  $\geq 3$  months, largely due to academic demands and limited resources, hemoglobin fluctuations were not markedly different across consumption patterns. This finding may be partially explained by compensatory dietary behaviors, as nearly all students (96.6%) reported adding vegetables and eggs when consuming instant noodles. Such practices likely improve dietary quality by increasing potassium and protein intake, which may counterbalance excess sodium and support iron absorption and hemoglobin synthesis, as suggested in previous studies indicating that adverse hematological effects of instant noodle consumption typically emerge over prolonged periods in the absence of nutrient-dense complementary foods (Pasa et al., 2024).

Furthermore, potassium supports gastric acid-base balance, which is vital for the activation of pepsinogen into pepsin, an enzyme that digests protein. Optimal protein digestion is critical for hemoglobin formation (Wati, 2023). These findings align with highlighted the highlighted roles of potassium and protein in maintaining sodium balance and optimizing hemoglobin synthesis (Baroroh, 2022). These results underscore that dietary quality, rather than instant noodle consumption patterns alone, is a critical determinant of hematological health, aligning with previous studies showing that adverse hematological effects of instant noodle consumption typically manifest over prolonged periods if not accompanied by nutrient-dense complementary foods (Pasa et al., 2024; Wahyuni et al., 2024).

Another study explains that foods supplemented with a plant-based diet, such as vitamin C obtained from vegetables and fruits, can significantly enhance the absorption of non-heme iron, thereby improving hemoglobin and red blood cell (RBC) levels (Skolmowska & Glabska, 2022; López-moreno et al., 2025; Peter et al., 2025). These findings suggest that simple dietary modifications accompanying instant noodle consumption may help maintain hematological homeostasis; however, the absence of quantitative data on complementary food intake and micronutrient adequacy limits the evaluation of cumulative effects on hemoglobin synthesis, highlighting the need for longitudinal studies with comprehensive dietary and hematological assessments.

This study also reveals that most respondents reported sleeping  $< 7$  hours per day, as presented in Table 3. However, both male and female students with  $< 7$  hours or  $\geq 7$  hours of sleep demonstrated hemoglobin levels within normal ranges. This indicates that sleep duration did not significantly influence hemoglobin levels. These findings are consistent with Rosyidah et al (Rosyidah et al., 2022), who reported that sleep quality has minimal impact on hemoglobin, while dietary factors play a more dominant role. Although sleep contributes to

cell regeneration, occasional sleep deprivation does not immediately reduce hemoglobin levels. Questionnaire data revealed that reduced sleep duration was largely due to academic workload, while the consumption of instant noodles supplemented with vegetables and eggs provided sufficient nutrition to maintain normal hemoglobin levels (Ariani et al., 2022).

The present study found that neither the frequency nor the duration of instant noodle consumption was significantly associated with hemoglobin levels among Medical Laboratory Technology students, with most maintaining values within the normal range. Nearly all students reported adding complementary foods, such as vegetables and eggs, which are rich in potassium and protein, potentially mitigating the adverse effects of excess sodium and supporting iron absorption and erythropoiesis. However, the study did not statistically control for these dietary additions; therefore, the observed maintenance of normal hemoglobin levels is suggestive rather than definitive. Gender-related biological differences, including hormonal regulation and menstrual blood loss in females, further contributed to variations in hemoglobin. Sleep duration did not significantly affect hemoglobin, indicating that dietary quality plays a more dominant role than lifestyle factors in this population. These findings underscore the importance of promoting nutrient-dense dietary habits alongside common consumption practices, while highlighting the need for longitudinal studies to confirm causal relationships and quantify the impact of complementary foods on hematological health.

## CONCLUSION

Hemoglobin status among university students is predominantly determined by gender-related biological factors, with females exhibiting lower levels due to hormonal influences and menstrual blood loss. Neither frequency nor duration of instant noodle consumption, nor sleep duration, significantly affected hemoglobin, likely because compensatory intake of vegetables and protein supported iron absorption and erythropoiesis. These findings emphasize that adequate nutrient intake, rather than instant noodle consumption patterns alone, is critical for maintaining hematological health in young adults.

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