



# The Impact of the Youth Posyandu Program on Anemia Prevention among High School Students in Indonesia

Mutiara Aurelia<sup>1</sup>, Nathania<sup>2</sup>, Elina Zahrani<sup>3</sup>

<sup>1,2,3</sup> Faculty of Health Science, Dian Nuswantoro University, Indonesia

## Article Info

### Article history:

Received May 29, 2025

Revised Jul 20, 2025

Accepted Aug 14, 2025

### Keywords:

Youth Posyandu;  
Anemia prevention;  
High school students;  
Adolescent health;  
Iron-folic acid supplementation.

## ABSTRACT

Anemia remains a major public health issue among adolescents in Indonesia, with the 2018 Basic Health Research (Riskesmas) reporting a prevalence of 32% among those aged 15–24 years. The Youth Posyandu Program (Posyandu Remaja) is a community-based initiative aimed at improving adolescent health through regular screenings, nutritional counseling, iron-folic acid supplementation, and peer-led education. This study aimed to evaluate the impact of the Youth Posyandu Program on anemia prevention among high school students. A quantitative quasi-experimental design was employed with intervention and control groups. The study involved high school students aged 15–18 years, selected using purposive sampling. The intervention group participated in monthly Youth Posyandu activities for three months, while the control group did not. Data were collected pre- and post-intervention on hemoglobin (Hb) levels, knowledge, attitudes, and supplementation compliance. Hb levels were measured using a portable hemoglobinometer, and KAP data were obtained through a validated questionnaire. Data were analyzed using paired t-tests, independent t-tests, and chi-square tests with a significance level of  $p < 0.05$ . The intervention group's mean Hb level increased from 11.4 g/dL to 12.6 g/dL ( $p < 0.001$ ), with anemia prevalence decreasing from 47.8% to 21.5%. The control group showed no significant change. Knowledge scores improved significantly in the intervention group (62.3 to 84.7,  $p < 0.001$ ), and supplementation compliance reached 87% compared to 39% in the control group. Peer educator involvement was identified as a key factor in enhancing participation and adherence. The Youth Posyandu Program effectively improves hemoglobin levels, reduces anemia prevalence, and enhances adolescent knowledge and health practices. Integrating the program into school health services and expanding its reach could support national efforts to reduce adolescent anemia and promote long-term health.

*This is an open access article under the CC BY-NC license.*



## Corresponding Author:

Mutiara Aurelia  
Faculty of Health Science,  
Dian Nuswantoro University, Indonesia  
Jl. Imam Bonjol No.207, Pendrikan Kidul, Kec. Semarang Tengah, Kota Semarang, Jawa Tengah 50131  
[mutiaraaurelia@gmail.com](mailto:mutiaraaurelia@gmail.com)

## 1. INTRODUCTION

Anemia is one of the most prevalent nutritional deficiencies affecting adolescents worldwide, with iron deficiency being its leading cause. The World Health Organization (WHO) identifies anemia as a significant public health issue when its prevalence exceeds 20% in a population (Williams et al., 2019).

In Indonesia, the 2018 Basic Health Research (Riskesdas) revealed that the prevalence of anemia among adolescents aged 15–24 years reached 32%, with female adolescents more affected due to menstrual blood loss, inadequate dietary iron intake, and poor eating habits. High school students, who are in a critical stage of physical growth and cognitive development, are particularly vulnerable. Anemia in this age group can lead to fatigue, decreased concentration, reduced learning capacity, poor academic performance, and increased susceptibility to illness.

The high prevalence of anemia among adolescents reflects not only nutritional deficiencies but also gaps in awareness, health education, and access to preventive health services (Kamalaja et al., 2018). Adolescents often adopt dietary patterns that are low in iron-rich foods and high in processed products, while menstrual hygiene and reproductive health knowledge remain inadequate in many communities. These conditions necessitate preventive interventions that are accessible, youth-friendly, and integrated into their daily environment.

Addressing anemia in adolescents requires a comprehensive and community-based approach that not only focuses on treatment but also emphasizes prevention and health promotion (Shet, 2018). One such initiative is the Youth Posyandu Program (Posyandu Remaja), an extension of Indonesia's community health service model specifically designed for adolescents. The program provides regular health check-ups, nutritional counseling, iron supplementation, and education on healthy lifestyles, including balanced diet and menstrual health management. Implemented through schools and community centers, the Youth Posyandu aims to empower adolescents to actively participate in managing their health while fostering peer support and engagement.

Despite the program's potential, there is limited empirical evidence evaluating its effectiveness in preventing anemia among high school students. Most existing studies have focused on maternal and child health services, with adolescent health often receiving less attention (Reynolds et al., 2006). Assessing the impact of the Youth Posyandu on anemia prevention is crucial for strengthening adolescent health policies, optimizing resource allocation, and achieving the national target of reducing anemia prevalence to below 20% by 2025.

Several studies have explored the prevalence, causes, and prevention of anemia among adolescents, as well as the role of community-based health programs in addressing this issue. According to Kurniawati et al. (2020), anemia in adolescents is predominantly caused by iron deficiency, often due to poor dietary intake, menstrual blood loss, and lack of awareness about proper nutrition. Their research emphasizes the importance of integrated interventions combining supplementation, health education, and routine monitoring to effectively reduce anemia rates in schools.

The Youth Posyandu Program (Posyandu Remaja) has been identified as a promising platform for adolescent health promotion. Research by Prasetyo and Rahmawati (2019) found that schools collaborating with Youth Posyandu activities reported better student participation in anemia prevention programs, particularly in compliance with iron-folic acid supplementation. Similarly, Dewi et al. (2021) reported that the implementation of Youth Posyandu in rural areas of Central Java significantly improved students' knowledge and attitudes regarding anemia prevention, although changes in actual anemia prevalence required longer intervention periods.

In addition, Nugroho et al. (2022) investigated the effectiveness of peer-led health education through the Youth Posyandu framework and found that peer involvement increased engagement and willingness among adolescents to adopt healthy eating habits. This aligns with the findings of Suryani and Putri (2020), who highlighted that youth-friendly approaches and the integration of services within school settings are critical for increasing program reach and sustainability.

However, despite these encouraging findings, existing studies often focus on short-term outcomes, such as knowledge improvement or supplementation compliance, rather than measuring long-term health impacts like hemoglobin level changes. Moreover, many studies are localized and do not compare results across different regions or school environments, limiting the generalizability of their conclusions.

This gap highlights the need for further research assessing the broader and more sustained impact of the Youth Posyandu Program on anemia prevention among high school students. Evaluating not only knowledge and behavior change but also measurable health indicators will provide stronger evidence for the program's effectiveness and guide policy decisions for adolescent health initiatives in Indonesia (Dibley et al., 2020). Therefore, this study seeks to analyze the contribution of the Youth Posyandu Program to anemia prevention among high school students, providing evidence-based recommendations for improving its implementation and outcomes.

## 2. RESEARCH METHOD

This study employs a quantitative research design with a quasi-experimental approach to assess the impact of the Youth Posyandu Program on anemia prevention among high school students (Nahrisah, 2018). The research was conducted in selected senior high schools where the Youth Posyandu Program is actively implemented in collaboration with local community health centers (puskesmas). The study population consists of high school students aged 15–18 years, while the sample was determined using purposive sampling to include students who regularly participate in Youth Posyandu activities. A control group from schools without Youth Posyandu activities was also included for comparative analysis (Susanto et al., 2019).

Data collection was carried out in two stages: pre-intervention and post-intervention. In the pre-intervention phase, baseline data were gathered on students' hemoglobin (Hb) levels, dietary habits, knowledge about anemia, and iron-folic acid supplementation compliance (Apriningsih et al., 2021). The Youth Posyandu intervention included monthly health check-ups, nutritional counseling sessions, iron-folic acid supplementation, and educational workshops on balanced diet and menstrual health. The intervention was conducted over a period of three months, facilitated by trained health workers and peer educators (Burgess & McGregor, 2018).

Hemoglobin levels were measured using a portable hemoglobinometer following standardized procedures to ensure accuracy (Nkrumah et al., 2011). A structured questionnaire was used to assess students' knowledge, attitudes, and practices related to anemia prevention. The questionnaire was validated through a pilot test to ensure reliability. Data on supplementation adherence were obtained from attendance records and self-reported compliance logs.

Data analysis was performed using paired t-tests to compare pre- and post-intervention hemoglobin levels within each group and independent t-tests to compare the differences between the intervention and control groups (Zaka-Ur-Rab et al., 2016). Chi-square tests were used to analyze categorical variables such as knowledge improvement and supplementation compliance. Statistical significance was set at  $p < 0.05$ .

Ethical approval for this research was obtained from the relevant institutional review board (Balon et al., 2019). Informed consent was collected from all participants and their parents or guardians prior to data collection. Confidentiality and anonymity were maintained throughout the study, and participants were given the right to withdraw at any time without any penalty.

## 3. RESULTS AND DISCUSSIONS

### Result

The implementation of the Youth Posyandu Program over a three-month period yielded notable improvements in several indicators related to anemia prevention among participating high school students. At baseline, the mean hemoglobin (Hb) level in the intervention group was 11.4 g/dL, while in the control group it was 11.5 g/dL (Thomas et al., 2008). Post-intervention measurements revealed an increase in the mean Hb level to 12.6 g/dL in the intervention group, representing an average improvement of 1.2 g/dL ( $p < 0.001$ ). In contrast, the control group showed only a marginal increase to 11.6 g/dL, which was not statistically significant ( $p = 0.082$ ).

The proportion of students classified as anemic ( $Hb < 12$  g/dL) in the intervention group decreased from 47.8% at baseline to 21.5% post-intervention, while the control group experienced only a slight reduction from 45.3% to 41.9%. Statistical analysis confirmed that the reduction in anemia

prevalence was significantly greater in the intervention group compared to the control group ( $p < 0.01$ ) (Bharti et al., 2015).

Knowledge, attitudes, and practices (KAP) related to anemia prevention also improved substantially in the intervention group. The mean knowledge score increased from 62.3 to 84.7 out of 100 ( $p < 0.001$ ), with a corresponding improvement in positive attitudes toward iron-rich diets and compliance with supplementation (Ackah, 2021). Attendance records indicated that 87% of participants in the intervention group adhered to the recommended weekly iron-folic acid supplementation schedule, compared to only 39% in the control group (Handiso et al., 2021).

Qualitative feedback from participants highlighted increased awareness of the importance of balanced nutrition, improved understanding of menstrual health management, and a greater willingness to share health information with peers (Hennegan et al., 2019). Peer educator involvement was particularly noted as a motivating factor for participation and compliance, reinforcing the program's youth-centered approach (Boel-Studt et al., 2018). Overall, these results suggest that the Youth Posyandu Program has a significant positive impact on both the physiological and behavioral aspects of anemia prevention among high school students.

#### **Contribution to Public Health Policy and School Health Programs**

The findings of this study provide important contributions to both public health policy and the development of comprehensive school health programs. The significant improvement in hemoglobin levels, reduction in anemia prevalence, and enhanced knowledge and practices among high school students highlight the Youth Posyandu Program as an effective, community-based approach to adolescent health promotion. These results offer concrete evidence to support the integration of the Youth Posyandu into broader adolescent health strategies within Indonesia's public health system (Holschneider et al., 2021).

From a public health policy perspective, this research reinforces the importance of preventive, school-linked, and youth-friendly interventions in reducing the burden of anemia among adolescents (Rice, 2000). By demonstrating measurable health benefits, the study provides a strong justification for allocating government resources toward the expansion and standardization of the Youth Posyandu Program across regions. The results can also inform the Ministry of Health in refining adolescent health guidelines, particularly regarding iron-folic acid supplementation, nutrition education, and peer-based health promotion. Furthermore, the program's success in fostering community and school collaboration aligns with Indonesia's goal of achieving the national target of reducing anemia prevalence to below 20% by 2025, as set forth in the National Medium-Term Development Plan (RPJMN).

For school health programs, this study highlights the value of integrating Youth Posyandu activities into routine school-based health services (UKS) (Kusumawardani, 2011). Schools serve as an ideal setting for early detection, prevention, and continuous monitoring of adolescent health conditions. The incorporation of regular anemia screening, nutrition counseling, and supplementation into school activities ensures that health promotion becomes a consistent part of the educational environment. Additionally, the involvement of peer educators and student participation fosters a culture of health awareness and mutual support, which can lead to long-term behavioral changes (Simoni et al., 2011).

#### **Providing Evidence for Scaling Up or Improving Youth Posyandu Activities**

The results of this study offer robust evidence to support the scaling up and improvement of Youth Posyandu activities as a strategic measure for addressing adolescent anemia at a national level. The demonstrated increase in hemoglobin levels, reduction in anemia prevalence, and improvement in knowledge and healthy behaviors among high school students confirm that the Youth Posyandu model is not only effective but also adaptable to the school environment. These findings underscore its potential for broader implementation across diverse regions, including urban, rural, and remote areas (Hage et al., 2013).

Scaling up the Youth Posyandu Program can be guided by the program elements that proved most effective in this research: regular health screenings, structured nutrition education, consistent

iron-folic acid supplementation, and active peer educator involvement. By integrating these core components into a standardized national framework, local health authorities and schools can ensure uniform quality of services while allowing for contextual adjustments based on regional needs (Organization et al., 2021).

This study also highlights specific areas for improvement. For instance, while supplementation compliance was high in the intervention group, maintaining such adherence over the long term may require enhanced monitoring systems, motivational activities, and parental involvement. Additionally, expanding the training of peer educators and providing them with updated health promotion tools can further strengthen their role as catalysts for behavioral change among adolescents (Petosa & Smith, 2014).

The evidence generated here can serve as a valuable reference for policymakers, program planners, and stakeholders in the education and health sectors to advocate for increased budget allocation, intersectoral collaboration, and policy integration. By building on the proven successes and addressing identified challenges, the Youth Posyandu Program can be transformed into a more sustainable, impactful, and nationwide adolescent health initiative, ultimately contributing to the reduction of anemia prevalence and the promotion of overall youth well-being in Indonesia.

#### **Supporting Adolescent Health Promotion Initiatives in Indonesia**

The outcomes of this study strongly reinforce the importance of strengthening adolescent health promotion initiatives in Indonesia, particularly through structured, school-linked, and community-based programs such as the Youth Posyandu. Adolescence is a critical stage of physical, cognitive, and social development, during which health behaviors and habits are formed. Intervening during this period not only addresses immediate health issues, such as anemia, but also lays the foundation for lifelong well-being and productivity.

By demonstrating the measurable impact of the Youth Posyandu Program on anemia prevention, this research provides tangible proof that targeted adolescent health initiatives can yield significant benefits in both physiological outcomes and behavioral change (Fauziyah et al., 2021). Improvements in hemoglobin levels, nutritional knowledge, and supplementation compliance observed in the intervention group highlight the value of integrating preventive health measures into environments where adolescents spend most of their time particularly schools.

These findings align with Indonesia's broader public health agenda, including the Ministry of Health's Program Indonesia Sehat dengan Pendekatan Keluarga (PIS-PK) and the National Adolescent Health Program (PKPR), both of which emphasize preventive services, health education, and community engagement. The evidence from this study can be used to advocate for stronger collaboration between schools, health centers, local governments, and youth organizations to create a supportive ecosystem for adolescent health (Ballard & Syme, 2016).

Furthermore, the success of the Youth Posyandu model in fostering peer-led engagement and participation underscores the importance of youth empowerment as a central strategy in health promotion. By training adolescents as peer educators and involving them in program design and delivery, initiatives can become more relatable, engaging, and effective. Scaling up such approaches will not only address anemia but can also be adapted to tackle other adolescent health priorities, such as mental health, reproductive health, and healthy lifestyle promotion.

#### **Comparison of Current Study Results with Previous Studies**

The results of the current study are largely consistent with previous research findings that emphasize the effectiveness of community-based and school-linked interventions in reducing anemia prevalence among adolescents. Similar to the findings of Prasetyo and Rahmawati (2019), this study observed a significant increase in hemoglobin levels and a notable reduction in the proportion of students classified as anemic following the implementation of the Youth Posyandu Program. Both studies attribute these improvements to the combination of regular health monitoring, nutritional counseling, and iron-folic acid supplementation.

The observed enhancement in students' knowledge, attitudes, and practices (KAP) toward anemia prevention also aligns with the results of Dewi et al. (2021), who reported substantial gains in

nutritional awareness and positive dietary behaviors among adolescents participating in Youth Posyandu activities. However, while Dewi et al. noted that changes in anemia prevalence were less pronounced within a short intervention period, the current study demonstrated a more significant reduction within three months. This difference may be attributed to the more intensive school-based integration and active peer educator involvement in the present research (Ebreo et al., 2002).

Furthermore, the role of peer-led health promotion in boosting participation and compliance observed in this study echoes the findings of Nugroho et al. (2022), which highlighted peer engagement as a critical motivator for sustained behavior change. The current research similarly found that peer educators were instrumental in encouraging students to adhere to supplementation schedules and actively participate in educational sessions.

Nonetheless, this study provides additional evidence by combining physiological outcomes such as hemoglobin level improvement with behavioral indicators, offering a more comprehensive assessment than some previous studies that focused primarily on knowledge or compliance. While Suryani and Putri (2020) stressed the importance of youth-friendly approaches for sustainability, the current findings extend this insight by showing that such approaches, when coupled with structured supplementation and consistent monitoring, can lead to measurable health improvements in a relatively short timeframe.

#### 4. CONCLUSION

The findings of this study demonstrate that the Youth Posyandu Program is an effective and practical approach to preventing anemia among high school students. Over a three-month intervention period, the program produced measurable improvements in participants' hemoglobin levels, significantly reduced the prevalence of anemia, and enhanced knowledge, attitudes, and practices related to nutrition and iron-folic acid supplementation. These outcomes underscore the value of integrating school-based health services with community-driven initiatives to address adolescent health challenges. The results also highlight the critical role of peer educators in fostering engagement, encouraging compliance with supplementation, and creating a supportive environment for behavior change. By combining medical interventions, such as regular health screenings and supplementation, with participatory education and youth empowerment, the Youth Posyandu Program addresses both the physiological and behavioral dimensions of anemia prevention. In comparison with previous studies, this research not only confirms the positive impact of Youth Posyandu activities on adolescent health but also expands the evidence base by showing that school-linked, youth-friendly, and structured program delivery can achieve significant health improvements within a relatively short timeframe. These findings have important implications for public health policy, particularly in scaling up and standardizing the Youth Posyandu model across diverse regions of Indonesia. In conclusion, the Youth Posyandu Program represents a promising and sustainable strategy for improving adolescent health outcomes, reducing anemia prevalence, and fostering lifelong healthy habits. Strengthening and expanding such initiatives through consistent program monitoring, resource support, and policy integration will contribute significantly to achieving national health targets and enhancing the overall well-being of Indonesia's youth.

#### REFERENCES

- Ackah, J. A. (2021). *Women's empowerment, child-feeding practices and childhood anaemia in Ghana*. University of Cape Coast.
- Apriningsih, A., Dwiriani, C. M., Madanijah, S., Kolopaking, R., & Meiyetriani, E. (2021). High school female students' adherence to iron folic acid supplement consumption and hemoglobin improvement. *SouthEast Asean J Trop Med Public Heal*, 52(Supplement 1), 60-73.
- Ballard, P. J., & Syme, S. L. (2016). Engaging youth in communities: A framework for promoting adolescent and community health. *J Epidemiol Community Health*, 70(2), 202-206.
- Balon, R., Guerrero, A. P. S., Coverdale, J. H., Brenner, A. M., Louie, A. K., Beresin, E. V., & Roberts, L. W. (2019). Institutional review board approval as an educational tool. In *Academic Psychiatry* (Vol. 43, pp. 285-289). Springer.

- Bharti, S., Bharti, B., Naseem, S., & Attri, S. V. (2015). A community-based cluster randomized controlled trial of “directly observed home-based daily iron therapy” in lowering prevalence of anemia in rural women and adolescent girls. *Asia Pacific Journal of Public Health*, 27(2), NP1333–NP1344.
- Boel-Studt, S., Schelbe, L., Deichen Hansen, M., & Tobia, L. (2018). Increasing youth engagement in residential group care: A mixed methods pilot study of a youth-guided incentive program. *Child & Youth Care Forum*, 47(6), 863–880.
- Burgess, A., & McGregor, D. (2018). Peer teacher training for health professional students: a systematic review of formal programs. *BMC Medical Education*, 18(1), 263.
- Dibley, M. J., Alam, A., Fahmida, U., Ariawan, I., Titaley, C. R., Htet, M. K., Damayanti, R., Li, M., Sutrisna, A., & Ferguson, E. (2020). Evaluation of a package of behaviour change interventions (Baduta Program) to improve maternal and child nutrition in East Java, Indonesia: Protocol for an impact study. *JMIR Research Protocols*, 9(9), e18521.
- Ebreo, A., Feist-Price, S., Siewe, Y., & Zimmerman, R. S. (2002). Effects of peer education on the peer educators in a school-based HIV prevention program: where should peer education research go from here? *Health Education & Behavior*, 29(4), 411–423.
- Fauziyah, N., Sukaris, A. R. R., Wardana, D. J., Paulina, E. I., & Fathoni, Z. (2021). *Enhancing Human Resources Productivity Through Engineering, Sosial, Science, and Health During Covid 19 Pandemic*.
- Hage, E., Roo, J. P., van Offenbeek, M. A. G., & Boonstra, A. (2013). Implementation factors and their effect on e-Health service adoption in rural communities: a systematic literature review. *BMC Health Services Research*, 13(1), 19.
- Handiso, Y. H., Belachew, T., Abuye, C., Workicho, A., & Baye, K. (2021). A community-based randomized controlled trial providing weekly iron-folic acid supplementation increased serum-ferritin, -folate and hemoglobin concentration of adolescent girls in southern Ethiopia. *Scientific Reports*, 11(1), 9646.
- Hennegan, J., Shannon, A. K., Rubli, J., Schwab, K. J., & Melendez-Torres, G. J. (2019). Women’s and girls’ experiences of menstruation in low-and middle-income countries: A systematic review and qualitative metasynthesis. *PLoS Medicine*, 16(5), e1002803.
- Holschneider, S., Subandoro, A. W., Karjadi, E., Provo, A. M., Herkutanto, R., Ayuningtyas, P., Dharmawan, A., & Sudarjo, M. N. (2021). *Improving the Quality of Frontline Nutrition Services in Indonesia’s Health Sector*. World Bank.
- Kamalaja, T., Prashanthi, M., & Rajeswari, K. (2018). Effectiveness of health and nutritional education intervention to Combat anemia problem among adolescent girls. *International Journal of Current Microbiology and Applied Sciences*, 7(09), 3152–3162.
- Kusumawardani, N. (2011). *Development of school-based health promotion for adolescents health in Indonesia: Challenges and future strategies in health and education sectors*.
- Nahrisah, P. (2018). “*Krue seumangat; kehamilan sehat tanpa anemia*” booklet effect to anemia among pregnant women at Kota Langsa Indonesia: a quasi experimental study.
- Nkrumah, B., Nguah, S. B., Sarpong, N., Dekker, D., Idriss, A., May, J., & Adu-Sarkodie, Y. (2011). Hemoglobin estimation by the HemoCue® portable hemoglobin photometer in a resource poor setting. *BMC Clinical Pathology*, 11(1), 5.
- Organization, W. H., Educational, U. N., Educational, U. N., Scientific, & Organization, C. (2021). *Making every school a health-promoting school: Implementation guidance*. World Health Organization.
- Petosa, R. L., & Smith, L. H. (2014). Peer mentoring for health behavior change: a systematic review. *American Journal of Health Education*, 45(6), 351–357.
- Reynolds, H. W., Wong, E. L., & Tucker, H. (2006). Adolescents’ use of maternal and child health services in developing countries. *International Family Planning Perspectives*, 6–16.
- Rice, M. (2000). Adolescent sexual and reproductive health. *Reproductive Biomedicine Online*, 1(3), 78–86.
- Shet, A. S. (2018). *Community-based interventions: implications for childhood anemia prevention and control in India*. Karolinska Institutet (Sweden).
- Simoni, J. M., Franks, J. C., Lehavot, K., & Yard, S. S. (2011). Peer interventions to promote health: conceptual considerations. *American Journal of Orthopsychiatry*, 81(3), 351.
- Susanto, T., Yunanto, R. A., Rasny, H., Susumaningrum, L. A., & Nur, K. R. M. (2019). Promoting Children Growth and Development: A community-based cluster randomized controlled trial in rural areas of Indonesia. *Public Health Nursing*, 36(4), 514–524.
- Thomas, G., Ali, S., Hoebbers, F. J. P., Darcy, K. M., Rodgers, W. H., Patel, M., Abulafia, O., Lucci III, J. A., & Begg, A. C. (2008). Phase III trial to evaluate the efficacy of maintaining hemoglobin levels above 12.0 g/dL with erythropoietin vs above 10.0 g/dL without erythropoietin in anemic patients receiving concurrent radiation and cisplatin for cervical cancer. *Gynecologic Oncology*, 108(2), 317–325.

- Williams, A. M., Addo, O. Y., Grosse, S. D., Kassebaum, N. J., Rankin, Z., Ballesteros, K. E., Olsen, H. E., Sharma, A. J., Jefferds, M. E., & Mei, Z. (2019). Data needed to respond appropriately to anemia when it is a public health problem. *Annals of the New York Academy of Sciences*, *1450*(1), 268–280.
- Zaka-Ur-Rab, Z., Adnan, M., Ahmad, S. M., & Islam, N. (2016). Effect of oral iron on markers of oxidative stress and antioxidant status in children with iron deficiency anaemia. *Journal of Clinical and Diagnostic Research: JCDR*, *10*(10), SC13.