



# Overview of Anemia; risk factors and solution offering<sup>☆</sup>

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## ABSTRACT

**Objective:** The study aims to determine the picture risk factor-related anemia and the solution offered by searching the literature and reviewing it.

**Method:** using literature studies. Article searches using online data-based Science Direct, PubMed, and Google Scholar from 2019 to 2021. They have obtained as many as 20 articles based on inclusion criteria and relevance.

**Result:** Anaemia in young women is still a severe problem among the community. There need to be early detection measures to quickly determine the incidence of anemia and describe anemia as one of the information for all circles young women. Women have a higher risk of anemia, especially young women. This is due to strict dietary habits to prevent weight gain, resulting in malnutrition due to the unmet intake of essential nutrients for the body. Whereas in adolescence, there is an increase in iron demand due to growth and menstruation. Therefore it is very important to provide smart solutions to the incidence of anemia. One that is offered is early detection so that prevention can be done. The use of information technology can be used to conduct early detection of anemia in adolescents because it has been widely utilized among the community, especially adolescents.

**Conclusion:** From the entire literature review, it seems that nutritional status greatly influences the incidence of anemia suffered, and young women are a target for the best intervention. Early detection and use of technology are innovative solutions offered.

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## Introduction

Anemia is a condition of red blood cell count below the normal threshold that serves as carrying oxygen to the body and remains a major public health problem worldwide, especially in developing countries.<sup>1–5</sup> In 2016 33% of women of childbearing age suffered from anemia, with the highest prevalence in Asia and Africa.<sup>6</sup>

Causes of anemia include nutritional deficiencies, especially iron, vitamin A, B vitamins, folic acid, chronic inflammation, parasitic infections, and congenital conditions.<sup>1,7,8</sup> But iron deficiency is considered the leading cause worldwide.<sup>4,7–14</sup>

Young women are a vulnerable group of iron deficiency anemia due to the relatively high need for iron caused by growth, sexual maturity, and menstruation.<sup>9,13,15</sup> In addition, the lack of iron intake from foods consumed daily also increases the chances of anemia. This is associated with consumption patterns due to dieting to manage the body.<sup>16–19</sup>

Basic Health Research Results (Riskesmas) 2018 reported as many as 48.9% of cases of anemia, with the most significant proportion occurring in vulnerable age 15–24 years.<sup>20</sup> The impact of iron deficiency on adolescents affects cognitive development and physical growth 5, 21–26 adversely.

If anemia in young women is not immediately resolved and continues, it will affect its intelligence and capture, especially a teenager still in its infancy and development.<sup>21</sup> In addition, it will be a significant risk to become an anemic mother and have a 1.8 times greater risk of postpartum bleeding.<sup>22–24</sup> Then the impact of anemia will be carried away until becoming a pregnant woman will increase the risk of Stunted Fetal Growth, premature childbirth, and Low Birth Weight and result in stunting in children.<sup>9,25,26</sup>

By looking at the incidence rate and the impact of anemia on adolescents still high, proper countermeasures are still very important to give birth to the next generation of the nation, especially the preparation to be a mother. Good anemia management if risk factors can be known early.

## Methods

Using Literature studies, scientific article searches use data-based such as ScienceDirect, Pubmed, and Google Scholar with a range of years 2019–2021. Data collection using ScienceDirect data-based was done by entering the keyword “Prevalence Anemia

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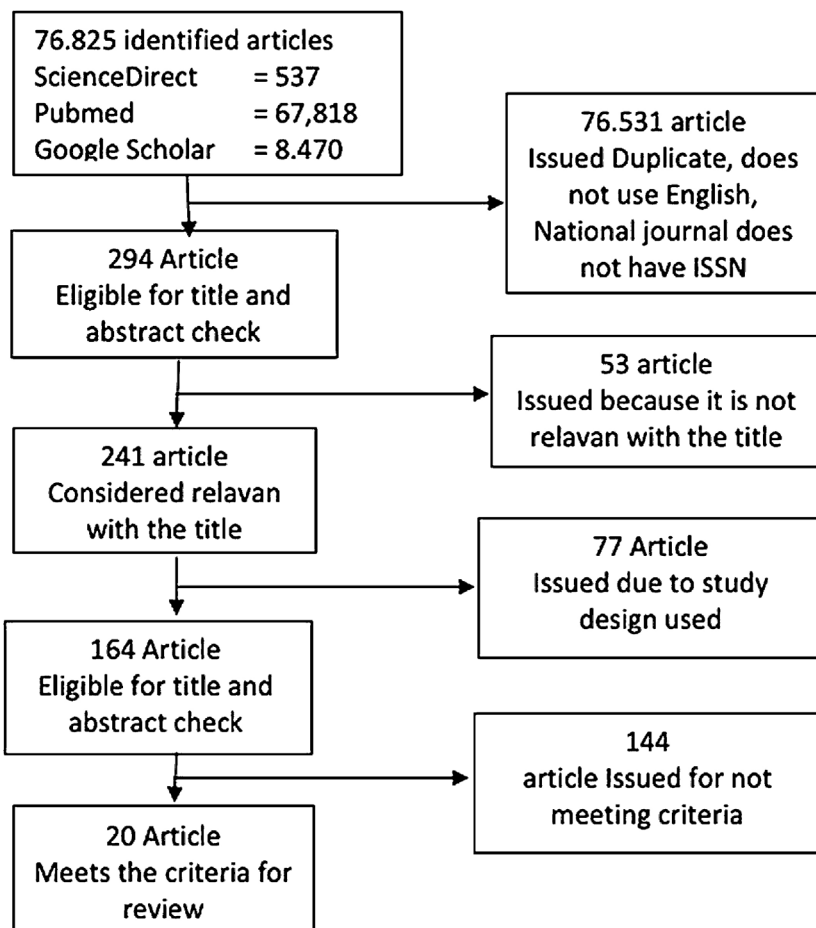


Fig. 1. Article search strategy.

Adolescent Girl” in 2019–2021 obtained 537 articles after filtering with research articles obtained 183 articles, open access articles as many as 53 articles. Furthermore, the search for data using Pubmed by entering the keyword anemia “prevalence or anemia or adolescent or girls” obtained as many as 67,818 articles after additional filters related to species, language, sex, journal, research articles, and open access obtained as many as 17. Further approval using google scholar data-based by entering the keyword “prevalence anemia adolescent girls” obtained 8470 articles then filtered title, abstract, and year obtained 94 articles (Fig. 1).

Of the three data-based used, 164 articles were found to be screening full text, double publication, and eligibility obtained as many as 40 articles. Then the final process is to read and select articles based on the criteria obtained 20 relevant articles (Table 1). Articles are evaluated based on:

1. Inclusion criteria
  - a. Article discussing the incidence rate and early detection of anemia in young women
  - b. Year publication 2019–2021
  - c. International and national publications
  - d. National Journal has ISSN
  - e. Articles using Indonesian and English
  - f. Original articles, full text, and open access
2. Exclusion criteria
  - a. Articles other than Indonesian and English
  - b. Do not have ISSN for national journal
  - c. Literature review, systematic review, and RCT

## Result

Several articles related to this study are presented in Table 1 as follows.

## Discussion

Adolescence is growing rapidly, so it requires a balanced intake of nutrients. In fact, all that is considered is the intake of macronutrients and not paying attention to micronutrients. In contrast, many children in adolescence have anemia, namely lack of micronutrients in iron.<sup>19,47,48</sup> If this situation continues, it will cause teenagers to experience problems that result in a decrease in youth productivity. The declining productivity of adolescents will cause the quality of existing human resources to decline. In general, it will also affect the quality of the successor of this nation.

Literature review results show that anemia in young women is still a serious problem that has not been resolved until now, even with the government’s blood-added tablet program in addition to the improper way of consuming Fe tablets, poor adherence, and the lack of adequate nutritional improvement among young women. In addition, young women’s knowledge of anemia also needs to be improved to raise awareness to take precautions against anemia.<sup>49,50</sup> Early detection as an effort to screen the initial incidence of anemia in young women can be developed to become easier.

The study results generally mention that anemia in young women occurs as a result of lack of nutrient intake, especially iron (Fe) and vitamin C and diet such as breakfast habits and bad habits

**Table 1**  
Data extraction research.

No	Publisher name/journal/year	Research title	Population/sample	Methods	Result
1	Anis Muhayati & Diah Ratnawati/Jurnal Ilmu Keperawatan Indonesia/2019	The Relationship Between Nutritional Status and Diet with Anemia in Young Women.	The population in this study was young women at SMAN 97 Jakarta and sampled 188 young women.	Quantitative research design with cross-sectional approach. Stratified random sampling techniques Bivariate analysis in this study using chi-square test	There is a link between diet and anemia with a value of OR = 0.407 <sup>27</sup>
2	Dewi Aprilia Ningsih & Fitri Andri Lestari/CHMK Midwifery Scientific Journal/2020	Relationship of Fe Tablet Consumption with Hb News in Young Women at SMPN 19 Bengkulu	The population of all grade VII and VIII students at SMPN 19 In March 2019 amounted to 245 people, and samples were taken with cluster sampling techniques as many as 71 people.	An analytical survey research method with a cross-sectional approach was used. Analyze data using the chi-square test.	The chi-square test results obtained a value of $p = 0.000 < \alpha = 0.05$ shows that there is a relationship between the consumption of Fe Tablets and Hb levels in young women in grade VII and VIII at SMPN 19 Bengkulu. The contingency coefficient test result obtained the value $C = 0.685$ with $p = 0.000 < 0.05$ means significant. $C = 0.685$ is compared to the value $C_{max} = 0.707$ (because the lowest value of a row or column is 2). Because the value of $C$ is close to the value of $C_{max} = 0.707$ , the category of strong relationships, so the factor of consumption of Fe tablets greatly affects the normal level of Hb in adolescents <sup>28</sup>
3	Ika Mustika Dewi, Prastiwi Putri Basuki & Ratri Candra Marlina/Jurnal Ilmiah Permas/2020	Relationship of Knowledge Level About Anemia With Incidence of Anemia in Young Women	The population of grade X students in the 2019/2020 school year at SMKN Tepus Gunung Kidul DIY and samples was taken with a total sampling technique with a total of 77 people	Non-Experimental research with correlational research design and using cross-sectional approach was used. Knowledge questionnaires are conducted validity tests using person product moments, reliability tests using Cronbach alpha, and data analysis using Chi-Square tests.	Based on the analysis using the chi-square test, the results were obtained that there is a relationship between the level of knowledge about anemia and the incidence of anemia in young women of class X at SMKN Tepus, Gunung Kidul, DIY ( $p$ -value = 0.024) <sup>29</sup>
4	Yeti Septiasari/Jurnal Ilmiah Kesehatan/2020	Differences of Hemoglobin Adolescent Princesses Getting With Not Getting Additional Blood Tablets Government	The young women population at Ambarawa High School and a total sample of 50 people by sampling method is random sampling.	Research observational analytical methods with a cross-sectional approach. Data analysis using non-paired independent $t$ -test	Statistical test results obtained a $p$ -value of 0.657. This means $H_0$ was accepted, and $H_a$ rejected, so it was concluded that there was no difference in hemoglobin levels of young women who get Fe supplementation intervention program with those who do not get Fe supplementation in the high school work area of Puskesmas Ambarawa <sup>30</sup>
5	Yatty Destani Sandy, Didik Gunawan Tamtomo & Dono Indarto/Jurnal Dunia Gizi/2020	Relationship of Body Weight With Anemia in Female Students in Boyolali District	The young women's high school population in Boyolali. Sample as many as 90 young women using the Multi-Stage Sampling technique.	Analytical observational research with a cross-sectional design was used. Weight data collection is measured by anthropometry and measurement of hemoglobin levels using the cyanmethemoglobin method. The data was analyzed using Chi-Square statistical tests.	Young women of weight were 6273 times more at risk of anemia ( $p = 0.013$ ). Thus, it is known that weight loss is positively associated with the incidence of anemia. Young women are expected to control weight and consume foods that contain high iron. Provision of iron supplementation is incorporated into the UKS program <sup>31</sup>
6	Rizqi Widyantori Hasanah Putra, J. Supadi & Wiwik Wijaningsih/Jurnal Riset Gizi/2019	The Effect of Nutrition Education on Knowledge and Attitude About Anemia in Adolescent	The population of young women/students of SMPN 31 Semarang and a sample of 54 people divided into two groups	True Experiment research with pre-post test control group design was used. The sample consisted of 27 people in the intervention group and 27 people in the control group—data analysis using Man Whitney Test, Independent T-Test, and Anova Repeater measurements.	Based on statistical tests found $p = 0.000$ , nutritional education about anemia affects students' attitudes. With nutrition education, students have a better perspective about anemia to better attitude change for the future. Statistically meaningful ( $p < 0.05$ ), it is said that nutrition education can change attitudes for the better <sup>32</sup>

Table 1 (Continued)

No	Publisher name/journal/year	Research title	Population/sample	Methods	Result
7	Cynthia Almaratus Sholicha & Lailatul Muniroh/Media Gizi Indonesia/2019	Correlation Between Intake of Iron, Protein, Vitamin C and Menstruation Pattern with Haemoglobin Concentration among Adolescent Girl in Senior High School 1 Manyar Gersik	The population of grade X and XI students at SMAN 1 Manyar Gresik and a sample of 62 students were selected using a proportional random sampling method with the criteria set	This study uses a cross-sectional design—data retrieval using semi-quantitative food frequency questionnaires, structured questionnaires, and digital hemoglobin. The data analysis uses Spearman and Chi-Square correlation tests.	Young women with abnormal menstrual patterns tend to experience anemia compared to students who have good or normal menstrual patterns <sup>33</sup>
8	Diana Fabriyanti Quraini, Farida Wahyu Ningtyias & Ninna Rohmawati/Jurnal Promkes: The Indonesia Journal of Health Promotion and Health Education/2020	Compliance Behavior of Iron Tablet Supplement Consumption to Adolescent Girls in Jember, Indonesia	The student population in 5 schools represents the working area of Puskesmas Sumber Sari Sample. A total of 328 young women were taken by multi-stage random sampling method and have met the criteria.	Analytical research with a cross-sectional design, using chi-square test using was used ( $\alpha = 5\%$ ).	Adolescents who had strong behavioral control would have 3906 times more regular TTD-compliant intentions than young women with weak behavioral control over TTD consumption <sup>34</sup>
9	R. Arunjyothi dan Afifa Jahan/The Pharma Innovation Journal/2021	Effect of Nutritional Intervention in Ameliorating Anemia Among Adolescent Girls of Rural Telangana State	The population of young women ages 14–19 years. Sample of 30 teenagers	The interview/survey schedule is conducted semi-structured to study the subject, and the researcher records responses. The research instrument consists of questionnaires, a one-day recall method format to know diet patterns, and checklists. Nutritional interventions include two components, namely supplementation of nutritious food and nutrition education	Diet patterns in post-intervention observed an increase in portion and frequency of food consumption and also included nutritious snacks at low cost that had previously been lost in their diets. Increased HB levels clearly show positive effects of nutritional interventions. In addition to supplemental nutrition, nutrition education programs and demonstrations of cheap, nutritious diets may have created awareness among groups in enriching their diets <sup>35</sup>
10	Kadek Agustina Puspa Ningrum, Andi Nilawati Usman & Syafruddin Syarif/Advances in Life Science and Technology/2020	Score Detection and Anemia Education Prospective Bridals Using Android Based Macca Botting Application	The population of brides-to-be in KUA Biringkanaya Makassar. A sample of 60 people divided into two groups	This research uses Research and Development method with simplified Bord and Gall development model. With quantitative research design using the quasi-experiment method. Sampling using a purposive sampling method. Data analysis using the Mann Whitney test.	Mann–Whitney test results with a $p$ -value of $0.001 < 0.05$ , which showed that there were significant differences in nutritional knowledge and nutritional adequacy levels associated with the prevention of anemia after being given nutritional education <sup>36</sup>
11	Deepika Anand & R.K. Anuradha/International Journal of Health Sciences and Research/2019	Prevalence of Anaemia Among Adolescent Girls: A Cross-Sectional Study	The population of vulnerable young women aged 13–17 in 10 different schools. The sample of 1300 young women was randomly selected.	Cross-Sectional methods in 10 different schools in Puttaparthi, Mandal, Anantapur District. A total sample of 1300 young women from age group Data analysis was conducted with SPSS applications. Analysis of the relationship between hemoglobin profile (Hb) and BMI was tested with Pearson's Correlation Coefficient and Regression Analysis.	Anemia in adolescence greatly interferes with physiological and cognitive development. There is an urgent need to improve the nutritional status of young women as a whole using a multisector community-based approach, especially for girls <sup>37</sup>
12	Lee Budhathoki, Bikal Shrestha, Naveen Phuyal & Lochana Shrestha/J Nepal Med Assoc/2021	Prevalence of Anemia in Adolescent Girls Attending Specific Schools of Kavrepalanchok, Nepal	Respondents were young women at the Panchkhal Municipal school in Kavre district, Nepal. The sample numbered 95 vulnerable young women ages 10–19.	Cross-Sectional descriptive research method. Analyze descriptive data using Microsoft Excel 2016.	The study showed a lower prevalence of anemia than reported by national data, but it was higher than reported by developed countries. Anemia and malnutrition have long-term adverse impacts on young women, so education and health prevention are needed <sup>38</sup>

Table 1 (Continued)

No	Publisher name/journal/year	Research title	Population/sample	Methods	Result
13	Juhrotun Nisa, Adevia Maulidya Chikmah & Riska Arsitia Harnawati/SIKLUS: Journal Research Midwifery Politeknik Tegal/2020	The Effect of Gadgets on The Occurrence of Anemia in Teenage Girls	The student population in SMK 1 Tegal. The sample of 40 students in the catering department was taken by the total sampling method.	Analytical survey research with Cross-Sectional design, univariate analysis, and bivariate with Chi-Square was used.	Based on the analysis results, there is an influence between the length of use of gadgets to diet ( $p$ -value = 0.005), and there is an influence between the use of gadgets to the incidence of anemia ( $p$ -value = 0.037). The increasing use of gadgets requires support from across sectors such as teachers and parents to always remind and limit the use of smartphones <sup>39</sup>
14	M. Abirami & K.S. Puspha/International Journal of Research Publication and Reviews/2020	A Study of Anaemia Prevalence and Deworming Practices Among Adolescent Girls in Palani Block	The population of young women from Thiruvalluvar subject schools numbered 40 young women with vulnerable ages 15–17 years	Descriptive research with Cross-Sectional method. Analysis using SPSS version 23 with Chi-Square test.	It is concluded that awareness needs to be socialized in young women about nutritional anemia and the practice of worming in preventing complications due to anemia and worm infestation <sup>40</sup>
15	Sri Kubillawati & Diah Warastuti/Jurnal Kesehatan dan Kebidanan/2019	Gender Differences, Maternal Education, Mother's Work, and Breakfast Habits Against Anemia in Adolescents	The population of all students in MAN 3 Bogor is 315 people. Sixty-eight people used samples.	Analytical survey research with quantitative approach, using Cross-Sectional method—sampling using an accidental sampling technique. Analyze the data using a quadratic kai test (chi-square).	The results showed no meaningful relationship between gender, maternal education, and maternal work with the incidence of anemia, but there was a meaningful relationship between breakfast activities and the incidence of anemia ( $p$ -value 0.002) <sup>41</sup>
16	Daholah Jannah & Sumi Anggraeni/Jurnal Ilmiah Kesehatan/2021	Nutritional Status Related to Anemia in Young Women at SMAN 1 Pagelaran Pringsewu	The population is young women in SMAN 1 Pagelaran Pringsewu. Sample numbered 96 people (total sampling)	This type of descriptive-analytical research uses the Cross-Sectional method. Data analysis was conducted with the Chi-Square test.	Based on the analysis test, chi-square produced a value of $p$ -value < 0.05 ( $p$ -value = 0.000), which means there is a relationship between nutritional status and the incidence of anemia in young women in SMAN 1 Pagelaran Pringsewu <sup>42</sup>
17	Yeni Indrawatiningsih, ST Aisjah Hamid, Erna Puspita Sari & Heru Listiono/Jurnal Ilmiah Universitas Batanghari Jambi/2021	Factors Influencing Anemia in Young Women	The population of all young women recorded by village midwives in Sidomakmur Village amounted to 212 people, and the sample amounted to 98 people through Proportional Random Sampling.	Analytical survey research with cross-sectional research design. Univariate (proportion), bivariate (chi-square test), and multivariate (logistic regression) analysis.	Based on the final model of multivariate analysis of variables that have the greatest effect on anemia status is the variable nutritional status. The need to provide counseling to young women and improve the way information is delivered when young women conduct examinations on how to prevent the onset of anemia, both in the form of a good healthy lifestyle and how to maintain health for the growth and development of young women themselves <sup>43</sup>
18	Ida Ayu Eka Padmiari, Pande Putu Sri Sugiani & Ni Nengah Ariati/Jurnal Sangkareang Mataram/2019	The Impact of Socialization of Blood-Added Tablets on The Level of Knowledge and Incidence of Anemia in Students in Karangasem Regency, Bali Province	The population was high school and vocational school students in Karangasem Regency, Bali Province. The sample that meets the criteria amounted to 84 students.	Analytical observational research with a cross-sectional design was used. Sampling techniques use random sampling.	The social impact of TTD socialization is a decrease in prevalence compared to the national data, which was originally 26.7% to 22.6% <sup>44</sup>
19	I.G.A.T.P. Nofianti, N.K. Juliasih & I.W.G. Wahyudi/Jurnal Widya Biologi/2021	Relationship of Menstrual Cycle with Anemia incidence of young women in SMP Negeri 2 Kerambitan Tabanan Regency	The young women population of SMP Negeri 2 Kerambitan is 290 students. The research sample of 89 respondents who met the criteria for inclusion and exclusion	Analytical observational research with a cross-sectional approach was used. Analyze the data used by univariate and bivariate using the chi-square test.	The results prove a link between the menstrual cycle and the incidence of anemia in young women in SMP Negeri 2 Kerambitan Tabanan regency with a value of $p$ = 0.001. The analysis obtained the value of OR = 36.08 (CI 95% = 10.82–120.3), which means that young women whose menstrual cycle is abnormal are 36.08 times more likely to experience anemia than those whose menstrual cycle is normal <sup>45</sup>
20	Sri Wardini Puji Lestari, zulfa Rufaida & Ika Yuni Susanti/Jurnal Ilmiah Kesehatan Sekolah Tinggi Ilmu Kesehatan Majapahit/2018	Menstrual Patterns with Anemia in Young Women at Aulia Husada Clinic, Jetis, Mojoketo	The population of young women aged 11–19 at Aulia Husada Clinic, as many as 115 respondents. Simple random sampling technique obtained by 73 respondents	Type of cross-sectional research: The research design used is correlational research—data analysis techniques using chi-square test.	There is a relationship of menstrual patterns with anemia in young women. And young women who have menstrual pattern disorders are at risk of 3–6 times anemia <sup>46</sup>

such as improper dietary habits and consumption of Fe absorption inhibitors. There is a close relationship between diet and the incidence of anemia. A poor diet such as not having breakfast, adequate intake of iron, protein, and vitamin C that is less resulting in the incidence of anemia.<sup>27,33,41</sup>

The nutritional status of young women is also one of the triggering factors for anemia. Malnutrition status is one of the risk factors for anemia. Young women often do not pay attention to food consumption, so they often eat unhealthy foods such as fried foods and fast food. Young women often go on unhealthy diets and, without the supervision of a doctor or nutritionist, can interfere with the growth and nutrients the body needs. Young women also drink mostly tea or coffee less than an hour after meals, which can interfere with iron absorption, affecting hemoglobin levels.<sup>27</sup>

Anemia in young women has a major impact on their health, including resulting in irregular menstruation, and if left unchecked, it will result in the reproductive health of young women who are future mothers-to-be. This is a real action to prevent and treat anemia in young women. However, it should be realized that anemia in young women can only be done by using hb examination equipment in health facilities, while young women in Indonesia are still very few who come to health facilities if they feel they are not sick. So there needs to be a breakthrough in early detection of anemia, among others, by utilizing the current technological advances for early detection of anemia that can be used anytime and anywhere.<sup>36</sup>

Technological advances in today's digital age can help humans in various fields, including in the implementation of early detection of anemia that relies on diagnosis based on the symptoms experienced. Smartphones have become one of the most widely used technologies in everyday life, especially teenagers today<sup>51,52</sup> which can be a medium to conduct early detection of anemia and information delivery more practically and efficiently when compared to print media in the form of sheets or leaflets.<sup>53</sup> This is in line with Budiarto's research which mentions that the use of android to increase the knowledge and support of husbands in exclusive breastfeeding is more effective compared to lecture methods.<sup>54</sup>

Android-based apps and using smartphones can be accessed anytime and anywhere so that their use becomes easier. Nowadays, almost all teenagers have smartphones, and they become active users. In a day, teenagers can use smartphones for 6–8 h that are usually used to access social media, play games, the internet, or just message. Thus, many people, especially teenagers, think smartphones have become an important part of their lives. This can be used to make smartphones a medium for interpreting and acting on reminders and can detect differences over time as monitoring actions.<sup>55</sup>

## Conclusion

From the entire literature reviewed, nutritional status greatly influences the incidence of anemia suffered, and young women are a target for the best intervention. Early detection and use of technology are smart solutions offered.

## Conflict of interests

The authors declare no conflict of interest.

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