# The Relationship of Anemia in Pregnant Women and the Incidence of Premature Delivery: Systematic Review

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## ABSTRACT

**Background:** Anemia causes serious complications for the mother in pregnancy, childbirth and the postpartum period and can result in the birth of a premature baby. Pregnant women with anemia are known to be more at risk of having preterm labor. In Indonesia in 2018 the prevalence of anemia in pregnant women increased to 48.9% compared to 2013 with a prevalence of 37.1%. This study aims to determine the relationship between anemia in pregnant women and the incidence of preterm labor in Indonesia.

**Subjects and Method:** This study uses a systematic review conducted by searching for articles from several databases, namely Neliti and Garuda with a search range from 2017-2020. Article search is based on PICO. P= Pregnant women. I= Supplementation to prevent anemia. C= anemia status. O= The incidence of premature birth. The keywords used to search for articles were "anemia" OR "pregnant women" AND "preterm birth" OR "preterm". The articles included in this study are full-text articles with a randomized controlled trial study design. Articles were collected using the PRISMA flow chart.

**Results:** There are 6 articles included in this review. The results showed that there was a relationship between anemic pregnant women and premature birth, and the risk was 79.286 times greater for preterm delivery. Effective interventions that can be given in preventing the birth of premature babies in pregnant women are Antenatal Care (ANC) visits, taking 60 mg Fe tablets/day during pregnancy and maintaining diet as well as nutritional intake.

**Conclusion:** There is a relationship between anemic pregnant women and premature birth.

**Keywords:** anemia, premature birth, pregnant women.

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## BACKGROUND

Premature labor is delivery that occurs under 37 weeks of gestation with a fetal weight <2,500 grams (Carolin and Widiastuti, 2019). Preterm labor is divided into three types, namely premature labor (32-36 weeks), very premature labor (28-32 weeks) and extreme premature labor (20-27 weeks) (Mustika and Minata, 2021). Factors known to be associated with

preterm labor include parity, body weight, hypertension, anemia, and a history of infection (Fatmini et al., 2020; Mustika and Minata, 2021).

Data from the World Health Organization (WHO) in 2013 showed that the highest number of preterm deliveries occurred in India as many as 3,519,100 and Indonesia was ranked 5th with the number of preterm deliveries as many as 675,700 (Blencowe et al., 2013). The prevalence of preterm labor in Indonesia continues to increase every year, from 2014 (15.5%) to 2019 (29.5%) it is known that preterm labor has increased by 14% (Ministry of Health of the Republic of Indonesia, 2020). Premature delivery in Indonesia is predominantly known to be associated with the incidence of anemia (Mustika and Minata, 2021).

Anemia is a condition in which the number and size of red blood cells or a person's hemoglobin concentration decreeses to <12 grams/dl (WHO, 2021). The results of the Basic Health Research (riskesdas) data in Indonesia in 2018 showed that the prevalence of anemia in pregnant women was 48.9%, indicating an increase from 2013 with a prevalence of 37.1% (Kemenkes RI, 2018). Anemia not only affects the health of pregnant women but also the health of the fetus, because it can lead to premature birth or low birth weight in babies (Aditianti and Djaiman, 2020).

Research conducted by Larumpaa et al (2017) showed that there was a significant relationship between anemia in pregnant women and the incidence of preterm birth. The data in this study showed that all pregnant women who had anemia gave birth prematurely (Larumpaa et al., 2017). Another recent study also stated that anemia in pregnant women was significantly associated with premature birth (p< 0.001) (Subriani et al., 2019).

Based on these problems, this study was conducted to examine the relationship between anemia in pregnant women and the incidence of preterm labor in Indonesia.

## SUBJECTS AND METHOD

### 1. Study Design
The method used in this systematic review is PRISMA-P (Items used to report back on systematic reviews and Meta-analysis.

Search articles using 2 databases, namely Neliti and Garuda. The keywords used for the article search were "anemia" OR "pregnant women" AND "preterm birth" OR "preterm".

### 2. Inclusion Criteria
The inclusion criteria for the articles were Randomized Control Trial research design, published in 2011-2020, open acces article, English language, research subjects were older adults aged over 50 years with/or without comorbidities, which were given an internet-based physical activity intervention, the results obtained were the duration of physical activity (minutes/day), with the unit of effect size of the relationship used was mean SD.

### 3. Exclusion Criteria
The inclusion criteria for articles that can be reviewed are full paper articles in Indonesian, with the subject of pregnant women suffering from anemia, the incidence of premature birth in 2017 to 2020 and published articles that have been processed.

### 4. Exclusion Criteria
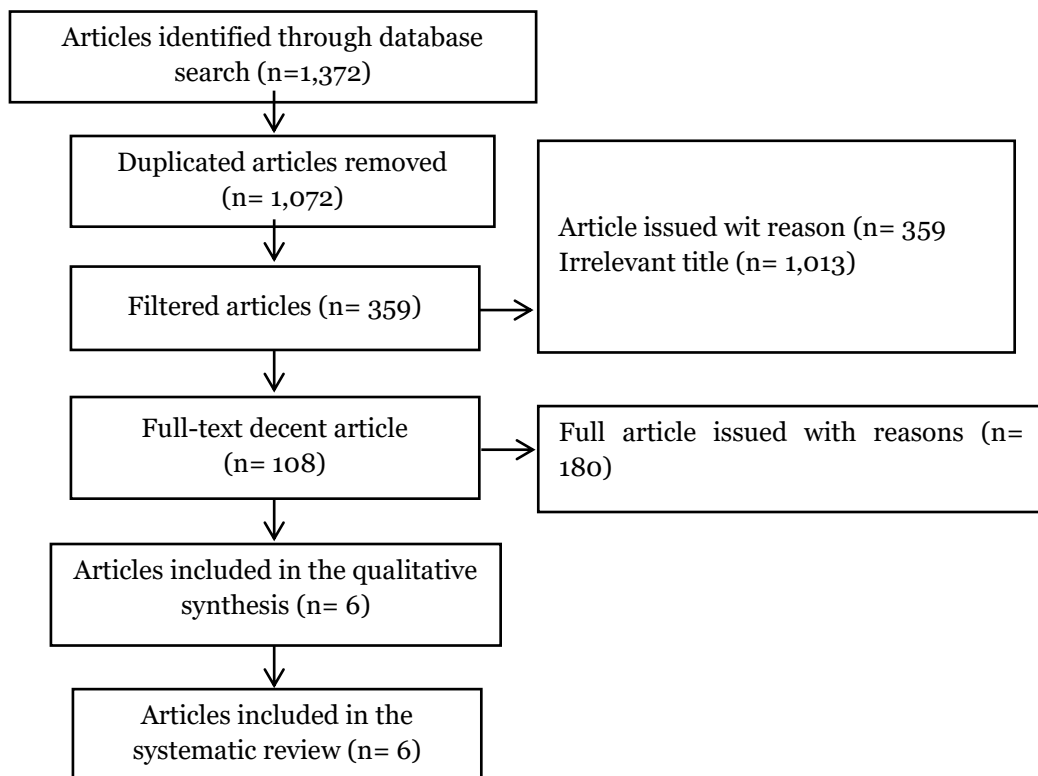The exclusion criteria in this study were articles published in addition to using the Indonesian language.

### 5. Data Extraction
In the early stages, 1,372 articles were found. After that, the article screening process was carried out with a total of 359 articles, there were 279 articles that could not be downloaded so that the total articles became 80 articles, articles that were not

full papers were 74, a final total of 6 articles could be submitted for review.

Process of searching article was carried out by searching several journal databases including Neliti and Garuda. PRISMA flowchart can be seen in Figure 1.

Articles identified through database search (n=1,372)

↓

Duplicated articles removed (n= 1,072)

↓

Filtered articles (n= 359) → Article issued wit reason (n= 359 Irrelevant title (n= 1,013)

↓

Full-text decent article (n= 108) → Full article issued with reasons (n= 180)

↓

Articles included in the qualitative synthesis (n= 6)

↓

Articles included in the systematic review (n= 6)

**Figure 1. Results of Prisma Flow Diagrams**

Research related to relationship of anemia in pregnant women with the incidence of premature delivery care consisted of 6 articles from the initial search process yielding 1,372 articles, after the deletion process, articles were published with 359 requirements for full-text review more carry on. A total of 6 articles that met the quality assessment were included in the systematic review.

There are 6 articles included in this review. The results showed that there was a relationship between anemic pregnant women and premature birth, and the risk was 79,286 times greater for preterm delivery. Effective interventions that can be given in preventing the birth of premature babies in pregnant women are Antenatal Care (ANC) visits, taking 60 mg Fe tablets/day during pregnancy and maintaining diet as well as nutritional intake.

The results of a systematic literature review on 6 selected articles showed a relationship between anemia in pregnant women and preterm labor. Of the 6 articles reviewed, 5 articles showed a significant relationship between anemia in pregnant women and the incidence of preterm delivery. The relationship between the two is known to be very significant.

**Table 2. Article Search Results**

| No | Author | Title | Year | Study Design | Sample | Research result | Conclusion |
|---|---|---|---|---|---|---|---|
| 1 | Florensia S. Larumpaa, Erna Suparman and Rudy Lengkong | The Relationship of Anemia in Pregnant Women with the Incidence of Premature Delivery at Prof Dr R D Kandou Hospital Manado. | 2017 | This research is a cross-sectional study with analysis-observational method. | 168 | The results of this study indicate that there is a relationship between anemia in pregnant women and the incidence of preterm labor. The results of the chi-square test analysis showed that there was a significant relationship between maternal anemia during pregnancy and the incidence of preterm labor with a significance value of p <0.05, i.e. p value = 0.000. | There is a significant relationship between anemia in pregnant women and the incidence of preterm labor. |
| 2 | Eny Sendra, Indah Rahmaningtyan, Arika Indah Setyarini dan Dewi Ihvi Mahmudah | Risk of Premature Delivery in Mothers with Anemia at Gambiran Hospital | 2019 | The research used is a retrospective type. The population in this study were all medical record data for normal, surgical, and artificial births. | 40 | This study showed that births with anemia were 45 (36%) and 79 (64%). There were 35 (87.5%) anemia in premature labor and 5 (12.5%) non-anemic deliveries. From the results of the analysis using the Odds Ratio (OR = 79.286; 95% CI: 23.56 to 266.76). It can be concluded that the risk. | Premature delivery in mothers with anemia was 79.286 times compared to mothers who were not anemic. |
| 3 | Aulia Ulfa, Ariadi and Elmatris | Hubungan Antara Anemia pada Ibu Hamil dan Kejadian Persalinan Preterm di RSUP M. Djamil Padang Tahun 2013 (The Relationship Between Anemia in Pregnant Women and the Occurrence of Preterm Delivery at | 2017 | This research is an observational analytic study. The research design used was cross-sectional. | 30 | The results showed that there was a relationship between anemia in pregnant women and the incidence of preterm birth. Based on the results of the Chi-square statistical test, p value = 0.018, so it can be concluded. | there was a significant relationship between anemia in pregnant women and the incidence of preterm delivery (p <0.05). |

| No | Author | Title | Year | Study Design | Sample | Research result | Conclusion |
|---|---|---|---|---|---|---|---|
| | | M. Djamil Hospital, Padang in 2013) | | | | | |
| 4 | Wa Ode Dian Cahyani | Hubungan Anemia pada Ibu Bersalin Dengan Kejadian Prematur di RSU PKU Muhammadiyah Bantul (The Relationship of Anemia in Maternal Maternity with Premature Incidence at PKU Muhammadiyah General Hospital Bantul) | 2017 | The research used is an analytical survey with a cross sectional design. | 56 | The results of the Kendall Tau test obtained a significance of 0.008 with an error level of 0.05 so it can be concluded that there is a relationship between anemia and the incidence of preterm labor at PKU Muhammadiyah Hospital, Bantul in 2016. | There is a relationship between anemia and the incidence of preterm labor at PKU Muhammadiyah Bantul Hospital in 2016. For pregnant women, pregnant women should pay attention to their nutritional intake and check their pregnancy so that anemia is detected early because MMR in Bantul is the highest in DIY. |
| 5 | Saskia Nandatari, Yudhistya N Insan, Widardo | Hubungan Anemia pada Ibu Hamil dengan Kejadian Persalinan Prematur di RSUD Dr. Moewardi Surakarta (The Relationship of Anemia in Pregnant Women with the Incidence of Premature Delivery in Dr. Hospital. | 2020 | Analytical observational research with a case control approach. | 75 | Based on the results of the research that has been carried out, it can be concluded that there is a significant relationship and a strong correlation between Anemia in Pregnant Women and the Incidence of Premature Delivery at RSUD Dr. Moewardi, correlation with p value of 0.031. The results of the T-test showed a | There is a significant and significant relationship between anemia in pregnant women and the incidence of preterm labor at Dr Moewardi |

| No | Author | Title | Year | Study Design | Sample | Research result | Conclusion |
|---|---|---|---|---|---|---|---|
| | | Moewardi Surakarta) | | | | significant difference between the average hemoglobin value of mothers who had preterm labor and those who did not. Mothers with anemia are 3,273 times more likely to have preterm labor. | Hospital Surakarta in June 2017 - June 2019, where anemia in pregnant women increases the risk of childbirth. premature. |
| 6 | Erma Puspita Sari | Hubungan Plasenta Previa, dan Anemia Terhadap Kejadian Persalinan Prematur di Rumah Sakit Umum Daerah Lahat Tahun 2017 (Placenta Relationship Previa, and Anemia Against Occurrence Premature Delivery at the Lahat Regional General Hospital in 2017) | 2019 | Quantitatively using an analytical survey with a cross . approach | 94 | There is a significant relationship between anemia partially with | |

The first article written by Larumpaa et al (2017) showed that there was a relationship between anemia in pregnant women and the inci-dence of preterm labor with a significance value of p< 0.001. The second article written by Sendra et al (2019) showed that there was a relationship between anemia in pregnant women and the incidence of premature birth with a significance value of p = 0.018.

The third article written by Cahyani (2017) showed that there was a relationship between anemia and the incidence of pre-term labor at PKU Muhammadiyah Bantul Hospital in 2016 with a significance value of p= 0.008.

The fourth article written by Nanda-tari et al (2020) shows a significant rela-tionship and a strong correlation between anemia in pregnant women and the inci-dence of preterm labor at RSUD Dr. Moe-wardi with a significance value of p = 0.031. The fifth article written by Sari (2019) also showed that there was a significant rela-tionship between anemia and the incidence of preterm labor in Lahat Hospital in 2017 with a significance value of p = 0.002.

The results of a systematic literature review also show that among the 6 selected articles there are 2 articles that show a significant difference in risk between preg-nant women with anemia and not during the delivery process.

The article written by Sendra et al (2019) showed data that pregnant women wi anemia had a 79,286 times greater risk of preterm delivery compared to pregnant women without anemia. Another article written by Nandatari et al (2020) also showed that mothers with anemia were 3,273 times more likely to have premature labor. The presentation of these results is summarized in table 2 of the selected article matrix.

## DISCUSSION

The results of the meta-analysis in this stu-dy showed a relationship between anemia in pregnant women and preterm labor (Ul-fa, Ariadi and Elmatris, 2018; Sari, 2019; Sendra et al., 2019; Nandatari, Insan and Widardo, 2020). Research by Sudiat et al (2016) of anemia as a risk factor for pre-term labor showed that p = 0.041 (<0.05) which means that there is a relationship between anemia in pregnant women and premature labor at Tugurejo Hospital Se-marang. The results of a multivariate analy-sis of research on pregnant women with premature delivery at Tugurejo Hospital Semarang showed a value (OR = 1.670; p = 0.022) which means that anemia has an effect on the incidence of preterm labor (Sudiat et al., 2016).

Another study conducted in Manado in 2017 also stated that there was a very sig-nificant relationship between anemia and preterm labor, where this anemia increased the risk of preterm labor (Larumpa et al., 2017). Research conducted by Beckert et al in California also stated that pregnant wo-men with anemia had an 8.9% risk of pre-term delivery compared to pregnant women who were not anemic (Beckert et al., 2019).

Interventions that can effectively be given in preventing premature birth in pregnant women are by checking the preg-nancy of pregnant women or conducting re-gular Antenatal Care (ANC) examinations, routinely consuming 60 mg Fe tablets/day during pregnancy, and paying attention to the nutritional intake of pregnant women (Nugraha et al. al., 2020). ANC visits also need to be routinely carried out by pregnant women to monitor the condition of their pregnancy and can increase the discipline of consuming blood-added tablets to pre-vent premature labor (Anggraini et al., 2018; Fatmini et al., 2020). In addition,

ANC visits can also be a way of educating pregnant women about health.

The administration of 60 mg/day Fe tablets during pregnancy is known to be one of the effective interventions to prevent anemia in pregnant women. Based on the results of research conducted in Bandar Lampung in 2016 showed that the intake of 60 mg/day Fe tablets was proven to be effective in increasing Hb levels of pregnant women and preventing anemia in pregnant women (Keswara and Hastuti, 2017). Another study conducted at the Ampenan Health Center, NTB in 2017 also showed the effectiveness of giving Fe tablets on Hb levels in late trimester pregnant women with the incidence of anemia (Mutianingsih et al., 2018). Mutianingsih et al. (2018) explained that giving Fe tablets to pregnant women has a significant effect on increasing Hb levels when balanced with consuming foods containing iron.

The research results of Mutianingsih et al. (2018) mentioned above are in line with the suggestion to pay attention to the nutritional intake of pregnant women as an effective intervention in preventing the incidence of anemia. The nutritional intake of pregnant women can be fulfilled when pregnant women maintain a good diet, including maintaining the types of food they consume. It is evident from the results of research at the Buleleng III Health Center, Bali in 2018 which showed that the diet of pregnant women had a significant relationship with the incidence of anemia (Gozali, 2018).

According to Ghozali (2018), poor diet is one of the causes of anemia during pregnancy due to lack of consumption of foods containing iron. So that pregnant women are expected to have a good diet in accordance with the amount of nutritional needs during pregnancy (Gozali, 2018). Based on a study conducted by Anggraeni et al. (20-21) in pregnant women in Indonesia it is known that pregnant women are advised to reduce caffeine consumption in the form of tea and coffee during pregnancy. In addition, pregnant women are also advised to increase the consumption of iron-rich foods or supplements such as meat, eggs, liver and milk (Anggraeni et al., 2021).

The results of a systematic literature review of 6 selected articles showed that there were 5 articles which stated that there was a significant relationship between anemia in pregnant women and the incidence of preterm labor and there were 2 articles which stated that pregnant women with anemia were more at risk of having preterm labor compared to pregnant women who did not. anemia. So, to prevent premature labor due to anemia, pregnant women are expected to routinely perform ANC, consume 60 mg/day Fe tablets during pregnancy, and pay attention to diet and nutritional intake by increasing the consumption of iron-rich foods as well as reducing caffeine consumption.

The health workers at the nearest health care facility are also expected to be able to improve supervision of compliance with Fe tablet consumption for pregnant women by making a control card for Fe tablet consumption compliance. This, in addition to increasing the compliance of pregnant women in taking Fe tablets, also increases the interaction between health workers and pregnant women to monitor the health development of the mother and fetus during pregnancy.

## AUTHOR CONTRIBUTION

Arini Banowati Azalia Adnin is a researcher who chooses a topic, searches for and collects research data and analyzes the data. Made Sintha Kurnia Dewi urged to play a role in reviewing research documents.

## REFERENCES

Anggraeni MD, Fatoni A, Setiyani R (2021). Food consumption as a risk factor of anemia among indonesian pregnant women: A cross-sectional study among javanese ethnic group. Maced J Med Sci. 9(E): 552–558. DOI: 10.3889/oamjms.2021.6066.

Anggraini DD, Purnomo W, Trijanto B (2018). Interaksi Ibu Hamil Dengan Tenaga Kesehatan Dan Pengaruhnya Terhadap Kepatuhan Ibu Hamil Mengonsumsi Tablet Besi (Fe) Dan Anemia Di Puskesmas Kota Wilayah Selatan Kota Kediri', Buletin Penelitian Sistem Kesehatan, 21(2): 92–89. DOI: 10.22435/hsr.v21i2.346.

Beckert RH, Baer RJ, Anderson JG, Pawlowski LLJ, Rogers EE (2019). Maternal anemia and pregnancy outcomes: a population-based study. Am J Perinatol. 39(7): 911–919. DOI: 10.1038/s41372-019-0375-0.

Blencowe H, Cousens S, Chou D, Oestergaard M, Say L, Moller AB, Kinney M, eat al. (2013). Blencowe reprod health 2013.pdf>, Born Too soon the global epidemiology of 15 million preterm births, 10(1): 1–14. DOI: 10.1186/1742-4755-10-S1-S2

Carolin BT, Widiastuti I (2019). Faktor-Faktor Yang Berhubungan Dengan Kejadian Persalinan Preterm Di Rumah Sakit Muhammadiyah Taman Puring Kebayoran Baru Jakarta Selatan Periode (Januari-Juni) Tahun 2017 (Factors Associated with the Incident of Preterm Delivery at Muhammadiyah Hospital Taman Puring Kebayoran Baru, South Jakarta Period (January-June) 2017), Jurnal Ilmu Keperawatan Dan Kebidanan Nasional, 1(1).

Fatmini F, Santoso H, manurung K, Rosdiana (2020). Faktor-Faktor Yang Berhubungan Dengan Konsumsi Tablet Tambah Darah Pada Ibu Nifas Di Wilayah Kerja Puskesmas Mutiara Barat Tahun 2019 (Factors Associated with Consumption of Blood-Adding Tablets in Postpartum Mothers in the Work Area of Mutiara Barat Health Center in 2019), Jurnal Muara Sains, Teknologi, Kedokteran dan Ilmu Kesehatan, 4(2): 321–328. DOI: 10.24912/jmstkik.v4i2.5377.

Gozali W (2018). Hubungan Pola Makan dengan Kejadian Anemia pada Ibu Hamil di Wilayah Kerja Puskesmas Buleleng III (Relationship between Diet and Anemia in Pregnant Women in the Work Area of Buleleng III Public Health Center), Int. j. eng. res., 2(3): 117–122. DOI: 10.31539/jks.v1i2.83.

Kemenkes RI (2018). Hasil Riset Kesehatan Dasar Tahun 2018 (2018 Basic Health Research Results), Kementrian Kesehatan RI, 53(9), pp. 1689–1699.

Kementerian Kesehatan RI (2020) PMK RI No. 21 Tahun 2020 tentang Rencana Strategis Kementerian Kesehatan Tahun 2020-2024.

Keswara UR, Hastuti Y (2017). Efektifitas Pemberian Tablet Fe Terhadap Peningkatan Kadar Hb Pada Ibu Hamil (The Effectiveness of Giving Fe Tablets to Increase Hb Levels in Pregnant Women), Jurnal Dunia Kesmas, 6(1):

17–21.

Larumpaa FS, Suparman E, Lengkong R (2017). Hubungan Anemia pada Ibu Hamil dengan Kejadian Persalinan Prematur di RSUP Prof Dr. R. D. Kandou Manado (The Relationship of Anemia in Pregnant Women with the Incidence of Premature Delivery at RSUP Prof. Dr. R.D. Kandou Manado). e-CliniC, 5(1): 11–15. DOI: 10.35-790/ecl.5.1.2017.14700.

Mustika E, Minata F (2021). Analisis Hubungan Faktor Maternal Dan Penyakit Kronik Pada Persalinan Prematur (Analysis of the Relationship between Maternal Factors and Chronic Diseases in Premature Delivery), Jurnal Kesehatan dan Pembangunan, 11(21): 19–27. DOI: 10.52047/jkp.v11i21.94.

Mutianingsih R, Wathaniah S, Ariawati F (2018). Efektivitas Pemberian Tablet Fe Terhadap Kadar Hemoglobin Ibu Hamil Trimester Iii Dengan Kejadian Anemia Di Puskesmas Ampean (Effectiveness of Giving Fe Tablets Against Hemoglobin Levels of Pregnant Women in Third Trimester with Anemia Incidence at Ampean Health Center), 6(2). Jurnal Ilmu Kesehatan dan Farmasi. DOI 10.51673/jikf.v6-i2.559

Nandatari S, Insan YN, Widardo W (2020). Hubungan Anemia pada Ibu Hamil dengan Kejadian Persalinan Prematur di RSUD Dr. Moewardi Surakarta' (The Relationship of Anemia in Pregnant Women with the Incidence of Premature Delivery in Dr. Hospital. Moewardi Surakarta), Smart Medical Journal, 3(2): 68. DOI: 10.13057/-smj.v3i2.37849.

Nugraha A, Sukmawati, Herliani YK (20-20). Anemia Prevention in Pregnant Women, Journal of Maternity Care and Reproductive Health, 3(1): 11–21. DOI: 10.36780/jmcrh.v3i1.115.

Subriani ST (2019). Faktor Yang Berhubungan Dengan Kejadian Bayi Lahir Prematur di RSUD Syekh Yusuf Gowa Tahun 2019 (Factors Associated with the Incidence of Premature Birth at Syekh Yusuf Gowa Hospital in 2019), J. kesehat. Delima Pelamonia, 3(2): 103–110. DOI: 10.37337/jkdp.v3-i2.132.

Sudiat M, Setiawan MR, Azzahra I (2016). Anemia Sebagai Faktor Risiko Persalinan Prematur (Anemia as a Risk Factor for Premature Delivery), Jurnal Kedokteran Muhammadiyah Unimus, 5(1): 1–5.

Ulfa A, Ariadi A, Elmatris E (2018). Hubungan Antara Anemia pada Ibu Hamil dan Kejadian Persalinan Preterm di RSUP M. Djamil Padang Tahun 2013 (The Relationship Between Anemia in Pregnant Women and the Occurrence of Preterm Delivery at M. Djamil Hospital, Padang in 2013), Jurnal Kesehatan Andalas, 6(3): 559. DOI: 10.25-077/jka.v6i3.738.

WHO (2021) Anemia. Available at: https://www.who.int/healthtopics/anaemia#tab=tab_1 (Accessed: 30 July 2021).