Indonesian Journal of Global Health Research
Volume 6 Number S5, October 2024
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

CORRELATION OF VITAMIN D INTAKE WITH HEMOGLOBIN LEVELS IN PREGNANT WOMEN

Sagita Darma Sari[1,2], Radiyati Umi Partan[3]*, Peby Maulina Lestari[4], Iche Andriyani Liberty[5]
[1]Doctoral student of Biomedical Science study, Faculty of Medicine, Universitas Sriwijaya, Jl. Masjid Al Gazali, Bukit Lama, Ilir Barat I, Palembang, Sumatera Selatan 30128 Indonesia
[2]Department of Midwifery, Abdurahman College of Health Sciences, Jl. Kolonel H. Barlian Sukajaya, Suka Bangun, Sukarami, Palembang, Sumatera Selatan 30114 Indonesia
[3]Internal Medicine Department, Division of Rheumatology, Faculty of Medicine, Universitas Sriwijaya, Jl. Masjid Al Gazali, Bukit Lama, Ilir Barat I, Palembang, Sumatera Selatan 30128 Indonesia
[4]Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Sriwijaya, Jl. Masjid Al Gazali, Bukit Lama, Ilir Barat I, Palembang, Sumatera Selatan 30128 Indonesia
[5]Department of Public Health and Community Medicine, Universitas Sriwijaya, Jl. Masjid Al Gazali, Bukit Lama, Ilir Barat I, Palembang, Sumatera Selatan 30128 Indonesia
*radiyati.up@fk.unsri.ac.id

ABSTRACT
Pregnancy anemia called " potential danger to mother and child " (potential endanger mother and child), increasing risk antepartum hemorrhage , postpartum hemorrhage and surgery caesarean emergency . In babies risky malformation Congenital and Low Birth Weight Infants . The incidence of pregnancy anemia in Indonesia is experiencing increase every year . By clinical anemia closely connection with vitamin D deficiency . Vitamin D plays a role in arrange distribution substance iron inside body . Objective: to analyze the correlation of vitamin D intake with hemoglobin levels in pregnant women. Method : Cross Sectional research design. The sample was pregnant women in the Gandus Palembang Health Center working area who were taken by consecutive sampling, totaling 91 people. Data analyzed using a simple liner regression test. Results: The average hemoglobin level in pregnant women was 11.49 gr / dl and the average vitamin D intake was 12.05 µg. Pregnant women who had sufficient vitamin D intake ≥ 15 µg were 9 people (10%). Pregnant women with hemoglobin levels ≥ 11 gr / dl as many as 58 people (63.7%). The results of the simple linear regression test obtained p value = 0.028 and R square value 0.053. Conclusion: there is a correlation between vitamin D intake and hemoglobin levels in pregnant women with the effect of vitamin D intake on hemoglobin levels of 5.3%.

Keywords: hemoglobin levels; pregnant women; vitamin D

How to cite (in APA style)
Sari, S. D., Partan, R. U., Lestari, P. M., & Liberty, I. A. (2024). Correlation of Vitamin D Intake with Hemoglobin Levels in Pregnant Women. Indonesian Journal of Global Health Research, 6(S5), 227-234. https://doi.org/10.37287/ijghr.v6iS5.4162.

INTRODUCTION

Pregnancy anemia is also called " potential danger to mother and child " (potential harm to mother and child) (Putri et al., 2023) . Anemia is a global health problem that not only attacks pregnant women and women of childbearing age, but also children and young women (Kerna et al., 2020) . The World Health Organization (WHO) in 2019 estimates that the global incidence of anemia is 29.9%, 40% in children aged 6–59 months, 37% in pregnant women, and 30% in women of childbearing age (15–49 years) (WHO, 2021)The risk of anemia increases during pregnancy, this occurs because the increase in hormones during pregnancy causes hemodilution which results in hemoglobin concentration becomes low (Lo et al., 2019)WHO defines anemia in pregnant women if the hemoglobin level is <11 gr/dl (Nurhaidah & Rostinah, 2021). WHO reports, the percentage of pregnant women (15 – 49 years) who experienced anemia in Indonesia in 2017 was 43.2%, in 2018 it was 43.7% and in 2019 it was 44.2%. This figure shows an increase in cases of pregnant women with anemia of

0.5% per year (WHO, 2021). The South Sumatra Provincial Health Service stated that the prevalence of anemia in pregnant women in 2018 from 17 districts and cities was 22,681, the highest being in Muara Enim Regency with 4,391 people, Banyuasin with 3,269 people and Palembang City with 1,780 people (South Sumatra Provincial Health Office, 2018). In Palembang City, the highest percentage of anemia in pregnant women in 2018 was in the Pembina Community Health Center working area, namely 21.6%. In 2019 the highest percentage was 21.6% in the Tegal Binangun area and in 2020 the highest percentage of pregnancy anemia was still in the Tegal Binangun area at 26.8% (Muliani et al., 2021)

Anemia of pregnancy increases the risk of antepartum hemorrhage (p=0.001), postpartum hemorrhage (p=0.002) and emergency caesarean section (p=0.017) (Bukhari et al., 2022)Anemia in pregnancy No only risk to the mother, however own risk to the baby with congenital malformations (p=0.002) and low birth weight (p=0.042). Pregnancy anemia increases the risk of a baby being born with a low APGAR Score and nine times the risk of experiencing newborn death (Pradhan et al., 2021). A study in Malawi showed that of 150 pregnant women, 32% had iron deficiency and a deficiency of one or more micronutrients. such as vitamin D (Van den Broek & Letsky, 2000). Low levels of vitamin D in pregnant women have negative impacts on mothers such as preeclampsia, postpartum depression, anemia in pregnant women can increase the risk of LBW, IUGR and stunting (Evanchuk et al., 2024)Currently, vitamin D deficiency is identified as a potential risk factor for anemia, specifically anemia caused by inflammation (Sabta Aji, 2016)Inflammatory anemia can occur due to disturbances in iron recycling secondary to pro-inflammatory cytokines that increase hepcidin production in the liver (Pasricha & Drakesmith, 2016)Hepcidin is a hormone that regulates systemic iron homeostasis, meaning, this hormone regulates the storage and distribution of iron through tissues to be distributed throughout the body (Endang Wahyuningsih et al., 2023)Iron is a mineral needed for the formation of hemoglobin in red blood cells (Qin et al., 2016)

Study (Hitesh et al., 2023) showed that pregnant women with anemia had serum vitamin D concentrations <20 ng/ml which were much lower than non-anemic pregnant women as a control group. The results of the study found a correlation between hemoglobin and vitamin D levels in pregnant women (Pearson's r=0.200, p=0.05). Vitamin D deficiency or deficiency during pregnancy may be a risk factor for anemia and correction of Vitamin D levels may increase hemoglobin levels (Arabi et al., 2021) During pregnancy, vitamin D metabolism increases so that pregnant women need adequate vitamin D intake from various main sources of vitamin D (Dror, 2023)which consists of sun exposure, food intake, supplementation, fortified food intake (Uwaezuoke, 2017)Food intake containing vitamin D is found in dairy products, milk has 3-10 times better bioavailability than food sources of oil-soluble vitamin D (Damayanti et al., 2017)Apart from that, food comes from fish, such as fish liver oil which contains lots of vitamin D, including cod liver oil which is used as a treatment for rickets. Cod liver oil contains 1,360 IU of vitamin D per tablespoon. The most vitamin D from fish sources contains 200-600 IU of vitamin D per 100 grams. Other sources of fish are salmon, mackerel and tuna (Paramita & Louisa, 2017).

Study (Sari et al., 2021) shows that there is an effect of egg consumption on increasing Hb levels in adolescent girls who experience anemia in Tanjung Ratu sub-district, Central Lampung (p value 0.001). Data obtained from Gandus Palembang Community Health Center shows that amount Mother pregnant with hemoglobin levels < 11 gr/dl in 2022 will be 39.2%, figure This experience increase compared to 2021 , namely amounting to 36.5%. The purpose

of this study was to determine the correlation between Vitamin D intake and the incidence of anemia in pregnant women at the Gandus Health Center, Palembang.

METHOD

This research uses a cross-sectional study approach . Data collection on variable intake of food sources of vitamin D in pregnant women used Food Frequency Questionnaire (FFQ) and conversion using the nutri survey application, checking hemoglobin levels using a Digital Hemoglobin Meter with the Yofalab brand (YF-727). FFQ includes type of food, amount of food and portion of food. The characteristics of respondents measured were age, parity, education and current BMI. The sample was pregnant women in the work area of the Gandus Palembang Health Center who were taken by consecutive sampling , totaling 91 people. Data normality test using Kolmogorov Smirnov . The test results showed that the data was normally distributed ($p>0.05$) for hemoglobin levels. The next statistical analysis of the data uses a simple linear regression test

RESULTS

The results of the univariate analysis in (Table 1) show that the average the respondent is 3 4 years old (age No risk) with the majority aged 20 – 35 years as much as 82.4% , then based on parity it can be seen that the average respondent own amount child 1.55 (parity No risk) with part big parity ≤ child as much as 94.5%. Mother's BMI pregnant has an average of 26.3 with part the normal BMI is 45.1 % and the average education Mother pregnant namely high school with part big education tall as much as 72.5%. Average maternal hemoglobin levels pregnant namely 11.5 gr/dl with normal hemoglobin levels ≥ 11 gr/dl were 63.7%, while average maternal vitamin D intake pregnant as big as 12,050 µg with 90% of respondents lacking vitamin D.

Tabel 1 .
Characteristics Respondents (n= 91)

Respondent characteristics	f	%	Mean±SD
Age			
1. < 20 years and > 35 years	16	17.6	29.93±5.783
2. 20 – 35 years	75	82.4	
Parity			
1. > 3 children	86	94.5	1.55±1.128
2. ≤ 3 children	5	5.5	
Body Mass Index (BMI)			
1. Thin	12	13.2	
2. Normal	41	45.1	
3. Overweight	22	24.2	26.93±4.60
4. Obesity	16	17.5	
Education			
1. < High school	25	27.5	-
2. ≥ high school	66	72.5	
Hemoglobin levels			
1. < 11 gr/dl	33	36.3	11.49±1.62
2. ≥ 11 gr/dl	58	63.7	
Vitamin D intake			
1. Less < 15 µg	82	90	12.05±2.81
2. Enough ≥ 15µg	9	10	

Table 2.
Pearson Correlation test results

Variable	Mean±SD	*P value*	*R*	*R square*
Hemoglobin levels	11.49±1.62	0.028	0.230	0.053
Vitamin D intake	12.05±2.81			

Simple linear regression test results obtained p value <0.05 , namely 0.028 which shows that There is correlation between intake of vitamin D with hemoglobin levels in the pregnant women with an R square value of 0.053, which means influence Vitamin D intake against hemoglobin level of 5.3%

DISCUSSION

On results study This known as many as 71 mothers pregnant (82.4%) were in the group aged 20 – 35 years . In groups aged 20 – 35 years This is Safe age For pregnancy also known as term reproduction Healthy that is and between 20 to 30 years , it is said safe because maternal death in women get pregnant and give birth in the range age the it turns out 2 to 5 times more low than maternal deaths occurring in the range age not enough from 20 or more of 30 (Amini et al., 2018)That's the age ripe will influence pattern think a mother , so Mother will obedient in maintenance pregnancy. Pregnant women aged 20 to 30 years has enter in range age mature beginning, where Mother start undergo a maturity process emotional and capable accept information with Good as well as take right decision about behavior health like benefit maintenance breast during pregnancy, so Mother pregnant will the more aware For do maintenance pregnancy (Rangkuti & Harahap, 2020)

Research result This show that Mother pregnant with parity > 3 children totaling 86 people (94.5%). Parity is one factor important in incidence of substance anemia iron in mother pregnant. frequent women experience pregnancy and childbirth risky experience more anemia big Because Lots lost substance iron, this caused during pregnancy woman use reserve the iron inside his body (Teja et al., 2021)This matter similar with study Amirudin (2010) who confirms in his research about Anemic patients during pregnancy at HA Sultan Daeng Raja Hospital, Regency Bulukumba in Year This show that parity tall or amount 4 children have risk maternal anemia pregnant. Parity tall have risk 1,454 times more big For suffer from anemia in comparison with parity low (Amini et al., 2018) Characteristics of BMI in the study This show majority mother there were 41 people (45%) pregnant in the normal group. Nutritional status is balance amount substance intake nutrition with the amount needed (requirement) by the body as function biological (growth physical, development, activity, maintenance health and others (Kasmayani et al., 2022)Research result This show level education Mother pregnant the majority ≥ high school, totaling 66 people (72.5%). High school education to on show level more knowledge and behavior good because education is one factor affecting formation behavior somebody. The behavior and actions produced by education are based on the knowledge and awareness that is formed through learning and behavioral processes this expected will lasts a long time and persists because based on consciousness (Wati et al., 2016)

The results of this study also showed that the vitamin D intake of pregnant women was < 15µg in 82 people (90%). FFQ results in research this show that average pattern consumption food principal subject study is rice 2-3 times/ day (100-200g/ portion). Apart from rice, they also consume rice cassava, potatoes, bread and biscuits. The most vegetable side dish consumed that is tofu and tempeh 1-3 pieces medium/ day (25-50 gr/ portion). However, consumption side dish animal good from material food experience nor food or drink already Vitamin D fortification is classified as less and no diverse. Subject average only consume egg chicken 2–4 times/ week (60 g/ portion) and meat chicken 1 time/ week whereas meat beef and fish, both freshwater fish (such as catfish , catfish , tilapia , seluang) or sea fish (salmon, mackerel, sardines, shrimp, squid, tuna) rarely very consumed. Majority the subject is also rare consuming milk. Subject study no consume fortified foods or Vitamin D enriched (milk,

orange juice packaging, yoghurt and margarine). Only 5 subjects consumed it supplement food once/ day containing vitamin D (400 IU).

The results of this study are the same as research conducted by Nurhikmah (2020) showing that the average intake of vitamin D in pregnant women in the third trimester is 280.53 IU (7µg) which is very far from the daily requirement of 600 IU (15µg) so that many pregnant women do not meet their vitamin D intake which resulted in 58 people (93.5%) serum 25(OH)D < 30 ng/mL (Nurhikmah et al., 2020)Research conducted by Damayanti (2017) shows that 100% of breast cancer patients at Dr. Hospital. Moewardi Surakarta's vitamin D intake was <600 IU and had an average serum 25(OH)D of 16 ng/mL, which means vitamin D deficiency (Damayanti et al., 2017) From several study the seen that Vitamin D intake can affects serum 25(OH)D, which means If low vitamin D intake then serum 25(OH)D is also low. Vitamin D deficiency in a person especially Mother pregnant can risky for anemia, preeclampsia, LBW, postpartum (Sabta Aji, 2016).

On research we correlate this intake give mother vitamin D pregnant with incidence of anemia, the results of the simple linear regression test obtained p value 0.028, which indicates that there is a significant relationship between vitamin D intake and hemoglobin levels in anemic pregnant women with the effect of vitamin D intake on hemoglobin levels of 5.3%. The results of this study are supported by study (Sari et al., 2021)which shows that there is an effect of egg consumption on increasing Hemoglobin levels in adolescent girls who experience anemia in Tanjung Ratu sub-district, Central Lampung (p value 0.001). Eggs are a food source that contains vitamin D. Research (Inayah et al., 2023)was conducted on 20 pregnant women in the work area of the Bendan Community Health Center, Pekalongan City who were divided into 2 groups where the intervention group was given 3 ounces of salmon floss filled buns per week for one month and the intervention group received no treatment. The results showed that there was a significant effect of giving bakpau filled with salmon floss on hemoglobin levels but there was no significant effect of giving bakpau filled with salmon floss on ferritin levels.

Hemoglobin is part from cell blood red that gives color blood red. Hemoglobin also carries it oxygen to all over body so you do activities well. Iron role in hemoglobin formation. If substances iron in body lacking, ability body For Hemoglobin production is also reduced. A meta-analysis study and systematic literature review conducted by Arabi et al (2020) stated different results. Based on review results from 14 articles about influence vitamin D supplementation against hemoglobin levels are obtained results that no There is influence between vitamin D supplementation against hemoglobin and ferritin levels. Effect positive found namely transferrin saturation. Transferrin is an internal protein transporting blood substance iron to all over body. Source The main vitamin D is sun exposure, intake food sources of vitamin D, supplementation, intake food fortification (Napolitano, 2021)The need for vitamin D is the most obtained from sun exposure gives contribution as much as 90%. Meanwhile, those who come from from food only role by 10% in contribution 25(OH)D levels in blood (Fiscaletti et al., 2017)Source Foods that contain vitamin D, namely originate of fish, like oil fish liver, include oil cod liver is used as one of the treatment healing disease rickets. Oil Cod liver contains 1,360 IU of vitamin D per scoop Eat. Most vitamin D from the source of fish is contains 200-600 IU of vitamin D per 100 grams. Other fish sources are mackerel, seluang, salmon, mackerel and tuna. In addition, vitamin D is obtained from milk, eggs, yogurt, liver beef and oysters (Dror, 2023)

According to Ministry of Health and IOM, pregnant women need Vitamin D intake namely 15 µg/ day (Oviana et al., 2019)Vitamin D has role in body for arrange hepcidin (Li et al., 2021)Hepcidin is hormone that regulates iron homeostasis systemic, that is, hormonal this arrange storage and distribution substance iron through network For streamed to all over body. Iron is a necessary mineral for formation of hemoglobin inside cell blood red (Lima et al., 2021)Research result shows the average maternal vitamin D intake pregnant per day that is amounting to 12,050 µg, meaning the average mother pregnant no sufficient required intake of vitamin D from source food. However, facts study show that lots pregnant women with intake food source of vitamin D lacking , having normal hemoglobin levels. This matter indicated that pregnant women obtain other sources of vitamin D like sun exposure. Pregnant women are quite pregnant Vitamin D intake only as many as 9 people (10%) and the average hemoglobin level was 11.5 gr/dl, which means that the average respondent own Normal hemoglobin levels. Writer assume that mother 's intake of vitamin D pregnant will influence vitamin D levels in blood so that can pressing hepcidin resulting in iron homeostasis systemic more well that's the end will lower risk of anemia in the pregnant women.

CONCLUSION

Based on results analysis carried out, then can concluded that No There is connection between obtained vitamin D intake from food being measured with FFQ questionnaire on maternal anemia pregnant. Needed time intervention giving food source of vitamin D in mothers pregnant for see relationship with hemoglobin levels

REFERENCES

Amini, A., Pamungkas, C. E., & Harahap, A. P. (2018). Umur Ibu dan Paritas Sebagai Faktor Risiko Yang Mempengaruhi Kejadian Anemia Pada Ibu Hamil di Wilayah Kerja Puskesmas Ampenan. Midwifery Journal, 3(2), 108–113.

Arabi, S. M., Ranjbar, G., Bahrami, L. S., & Norouzy, A. (2021). Correction to: The effect of vitamin D supplementation on hemoglobin concentration: a systematic review and meta-analysis (Nutrition Journal, (2020), 19, 1, (11), 10.1186/s12937-020-0526-3). Nutrition Journal, 20(1), 1–11. https://doi.org/10.1186/s12937-021-00679-4

Bukhari, I. A., Alzahrani, N. M., Alanazi, G. A., Al-Taleb, M. A., & AlOtaibi, H. S. (2022). Anemia in Pregnancy: Effects on Maternal and Neonatal Outcomes at a University Hospital in Riyadh. Cureus, 14(7). https://doi.org/10.7759/cureus.27238

Damayanti, A. Y., Indarto, D., Wasita, B., & Ardyanto, T. D. (2017). Indeks massa tubuh, asupan vitamin D, dan serum 25-hydroxyvitamin D pada pasien kanker payudara. Jurnal Gizi Klinik Indonesia, 14(2), 56. https://doi.org/10.22146/ijcn.17243

Dror, D. (2023). Vitamin D in pregnancy. Handbook of Vitamin D in Human Health, May, 670–691. https://doi.org/10.3920/9789086867653_035

Endang Wahyuningsih, Hartati, L., & Dewi Puspita, W. (2023). Analisis Resiko Kejadian Anemia pada Ibu Hamil. Professional Health Journal, 4(2), 303–313. https://doi.org/10.54832/phj.v4i2.388

Evanchuk, J. L., Kozyrskyj, A., Vaghef-Mehrabani, E., Lamers, Y., Giesbrecht, G. F., Letourneau, N., Aghajafari, F., Dewey, D., Leung, B., Bell, R. C., & Field, C. J. (2024). Maternal Iron and Vitamin D Status during the Second Trimester Is Associated with Third Trimester Depression Symptoms among Pregnant Participants in the APrON

Cohort. The Journal of Nutrition, 154(1), 174–184. https://doi.org/https://doi.org/10.1016/j.tjnut.2023.10.029

Fiscaletti, M., Stewart, P., & Munns, C. F. (2017). The importance of vitamin D in maternal and child health: A global perspective. Public Health Reviews, 38(1), 1–17. https://doi.org/10.1186/s40985-017-0066-3

Hitesh, T., Khatuja, R., Agrawal, P., Dhamnetiya, D., Jha, R. P., & Renjhen, P. (2023). Unlocking the mystery of the role of Vitamin D in iron deficiency anemia in antenatal women: a case control study in a tertiary care hospital in New Delhi. BMC Pregnancy and Childbirth, 23(1), 1–8. https://doi.org/10.1186/s12884-023-06047-w

Inayah, M., Pratikwo, S., & Anonim, T. (2023). Peningkatan kadar Hb dan fernitin ibu hamil yang mengalami anemia dengan konsumsi ikan salmon (Oncorhynchus masou). Holistik Jurnal Kesehatan, 16(8), 690–698. https://doi.org/10.33024/hjk.v16i8.8426

Kasmayani, Mawarni, M., Adeliana, & Arnianti. (2022). Hubungan Status Gizi Ibu Hamil Trimester I Dengan Anemia Di Pustu Tobadak Tahun 2021. Jurnal Ilmiah Kesehatan Diagnosis, 17(3), 89–93.

Kerna, N., Akabike, L., Solomon, E., … K. P.-E., & 2021, U. (2020). Anemia in Pregnancy: a Practical Review. EC Gynaecology, December 2020, 35–43. https://doi.org/10.31080/ecgy.2021.10.00565

Li, D., Wang, K., Yang, Z., Li, H., & Wang, S. (2021). Vitamin D supplementation in mice with advanced maternal age and cognitive function of the offspring. American Journal of Translational Research, 13(7), 7641–7653.

Lima, M. S., Pereira, M., Castro, C. T., & Santos, D. B. (2021). Vitamin D deficiency and anemia in pregnant women: a systematic review and meta-analysis. Nutrition Reviews, 80(3), 428–438.

Lo, T. H., Wu, T. Y., Li, P. C., & Ding, D. C. (2019). Effect of Vitamin D supplementation during pregnancy on maternal and perinatal outcomes. Tzu Chi Medical Journal, 31(4), 201–206. https://doi.org/10.4103/tcmj.tcmj_32_19

Muliani, R., Radatullah, M., & Noviyanti Putri, R. (2021). Faktor-Faktor Yang Berhubungan Dengan Kejadian Anemia Pada Ibu Hamil di Wilayah Kerja Puskesmas Tegal Binangun Kota Palembang 2021. Jurnal Kesehatan Terapan, 9(1), 29–33.

Napolitano, L. M. (2021). Vitamin D supplementation and hemoglobin: dosing matters in prevention/treatment of anemia. Nutrition Journal, 20(1), 23. https://doi.org/10.1186/s12937-021-00680-x

Nurhaidah, N., & Rostinah, R. (2021). Faktor yang Berhubungan dengan Kejadian Anemia pada Ibu Hamil di Wilayah Kerja Puskesmas Mpunda Kota Bima. Jurnal Manajemen Kesehatan Indonesia, 9(2), 121–129. https://doi.org/10.14710/jmki.9.2.2021.121-129

Nurhikmah, A., Aminuddin, & AM, N. (2020). Hubungan Asupan Vitamin D Dengan Kadar Serum 25 (OH) D Pada Ibu Hamil Trimester III. Jurnal Riset Kesehatan Poltekkes Depkes Bandung, 12(2 SE-), 416–422. https://doi.org/10.34011/juriskesbdg.v12i2.845

Oviana, A., Friadi, A., & Ilmiawati, C. (2019). Hubungan asupan vitamin D dengan kadar 25(OH)D serum pada ibu hamil trimester III etnis minangkabau. Majalah Kedokteran Andalas, 42(3S), 11. https://doi.org/10.25077/mka.v42.i3s.p11-18.2019

Paramita, & Louisa, M. (2017). Berbagai Manfaat Vitamin D. Cdk, 44(10), 736–740.

Pasricha, S.-R., & Drakesmith, H. (2016). Iron Deficiency Anemia: Problems in Diagnosis and Prevention at the Population Level. Hematology/Oncology Clinics of North America, 30(2), 309–325. https://doi.org/https://doi.org/10.1016/j.hoc.2015.11.003

Pradhan, N., Tamrakar, S. R., & Karmacharya, S. B. (2021). Effect of Anemia in Pregnancy and its Perinatal Outcome : A Prospective Cohort Study. Journal of Lumbini Medical College, 9(2). https://doi.org/10.22502/jlmc.v9i2.445

Putri, G. S. Y., Sulistiawati, S., & Laksana, M. A. C. (2023). Analisis faktor-faktor risiko anemia pada ibu hamil di Kabupaten Gresik tahun 2021. Jurnal Riset Kebidanan Indonesia, 6(2), 119–129. https://doi.org/10.32536/jrki.v6i2.220

Qin, L. L., Lu, F. G., Yang, S. H., Xu, H. L., & Luo, B. A. (2016). Does maternal Vitamin D deficiency increase the risk of preterm birth: A meta-analysis of observational studies. Nutrients, 8(5). https://doi.org/10.3390/nu8050301

Rangkuti, N. A., & Harahap, M. A. (2020). Hubungan Pengetahuan dan Usia Ibu Hamil Dengan Kehamilan Risiko Tinggi di Puskesmas Labuhan Rasoki. Journal Education and Development, 8(4), 513–517.

Sabta Aji, A. (2016). Vitamin D in Pregnancy. https://www.researchgate.net/publication/315807856

Sari, R., Septiasari, Y., Fitriyana, F., & Saputri, N. (2021). Pengaruh Konsumsi Telur Terhadap Peningkatan Kadar Hemoglobin Pada Remaja Putri Yang Mengalami Anemia. Jurnal Wacana Kesehatan, 5(2), 574. https://doi.org/10.52822/jwk.v5i2.151

Teja, N. M. A. Y. R., Mastryagung, G. A. D., Ayu, I., & Diyu, N. P. (2021). Hubungan Pengetahuan dan Paritas Dengan Anemia Pada Ibu Hamil. Jurnal Menara Medika, 3(2), 143–147.

Uwaezuoke, S. N. (2017). Vitamin D deficiency and anemia risk in children: a review of emerging evidence. Pediatric Health, Medicine and Therapeutics, 8, 47—55. https://doi.org/10.2147/phmt.s129362

van den Broek, N. R., & Letsky, E. A. (2000). Etiology of anemia in pregnancy in south Malawi. The American Journal of Clinical Nutrition, 72(1), 247S-256S. https://doi.org/10.1093/ajcn/72.1.247S

Wati, D. W., Febry, F., & Rahmiwati, A. (2016). Faktor-Faktor Yang Berhubungan Dengan Defisiensi Zat Besi Pada Ibu Hamil Di Wilayah Kerja Puskesmas Gandus Palembang. Jurnal Ilmu Kesehatan Masyarakat, 7(1), 42–47.

WHO. (2021). Who | 2021. In Noncommunicable diseases (p. https://www.who.int/news-room/fact-sheets/detail/n).