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REVIEW ARTICLE

Anaemia in Pregnancy in Sabah, Malaysia: A Challenge

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ABSTRACT

Anaemia in pregnancy represents a critical maternal health concern in Malaysia, especially in the state of Sabah. Frequently discussed causes include intensifying the burden in Sabah relative to other states in Malaysia, limited access to healthcare, poor socioeconomic conditions, and geographic isolation. This article explores the epidemiological patterns, contributing factors, health consequences, and strategic responses to anaemia in pregnancy among Sabah's diverse communities. A few major contributing factors that are specific to Sabah include inadequate nutrition, early and multiple pregnancies, poverty, and cultural dietary restrictions. Anaemia in pregnancy increases the risk of complications for both mother and baby, such as preterm birth, low birth weight, and maternal mortality. A thorough Set of National and local health policies and interventions has been tailored, including routine haemoglobin assessments, iron-folic acid supplementation, and nutrition education. Even a good strategy will fail if not properly implemented. Promising results from case studies, such as the reduction in anaemia cases at Klinik Kesihatan Penampang, underscore the importance of tailored and aggressive implementation and intervention. A conclusion can be made that by aggressive implementation of the recommendation, such as actionable access to antenatal care, enhanced diagnostics, and promoting culturally sensitive health education to reduce anaemia in pregnancy and improve maternal and child outcomes in Sabah.

Keywords: *Anaemia, iron deficiency, iron supplementation, pregnancy, antenatal care.*

INTRODUCTION

Globally, anaemia in pregnancy poses a significant health concern, especially in developing countries. Anaemia in pregnancy, by definition, is a pregnant mother with a haemoglobin level below 11 g/dL. Anaemia significantly affects maternal and foetal health, which can lead to morbidity and mortality (WHO, 2023). Among Malaysian states, Sabah stands out for its high anaemia prevalence, attributed to regional disparities, nutritional deficiencies, and limited healthcare access (MOH, 2020). Another factor contributing to this problem in Sabah is the high prevalence of the Thalassemia trait. Sabah comprises fewer than 38 principal ethnic groups. Ethnic groups with the highest numbers of thalassemia and thalassemia trait carriers are Kadazan Dusun, Rungus, Bajau, and Murut (MOH, 2020; Mohd Ibrahim, 2020). This article examines the challenges of anaemia in pregnancy, particularly in Sabah, and identifies its contributing factors. This can help develop or implement strategies to improve (Abd Rahman et al., 2022; WHO, 2023).

METHOD

An electronic search of the available literature was conducted using ResearchGate, Google Scholar, and Scopus. The following keywords were used: Anaemia in Pregnancy, Iron Deficiency Anaemia, Iron Supplementation, and Sabah's health services from 2000 to 2025, for the available literature on anaemia in pregnancy in Sabah. A total of 38 articles were found. Thirty articles were included and synthesised in this review.

RESULT AND DISCUSSION

Anaemia in pregnancy in Sabah

Malaysia's anaemia prevalence during pregnancy ranges from 19.3% to 57.4%, depending on access to healthcare and regional differences, with the highest rates in Sabah (Abd Rahman et al., 2022; Neliti, 2020). Sabah is the second-largest state in Malaysia, characterised by vast rural areas and rugged terrain that limit accessibility. The limited availability of healthcare resources, along with the population's low socioeconomic status, contributes to higher rates than in other states, with some districts reporting prevalence rates exceeding 40% (Foo et al., 2004). A retrospective study involving 3,374 antenatal mothers registered with government clinics in Kota Kinabalu in 2021 showed that 43.3% had anaemia (Ling et al., 2022). Research from Kudat, in northern Sabah, found a higher rate of iron-deficiency anaemia (IDA) among schoolchildren than the national average. This condition, attributable primarily to widespread nutritional inadequacies, persists into adulthood (Annan et al., 2021; Roslie et al., 2019). These deficiencies extend to reproductive health, highlighting intergenerational effects (Yilmaz et al., 2018; Jack et al., 2022). Therefore, anaemia impacts not just the pregnant mother but also extends beyond.

Anaemia in pregnancy increases risks for both mother and child. Mothers with anaemia often experience fatigue, shortness of breath, palpitations, and dizziness, and they face higher chances of complications such as gestational hypertension, preeclampsia, prolonged labour, and postpartum haemorrhage (Haniff et al., 2007; Mahmood et al., 2019). These morbidities are compounded by diminished oxygen-carrying capacity, impairing uterine muscle contraction and increasing the likelihood of caesarean delivery and blood transfusions. Anaemia in pregnant mothers significantly increases the risk of delivery-related complications, chiefly postpartum haemorrhage during childbirth. Pre-delivery anaemia has been shown to double the risk of post-partum haemorrhage (PPH). A meta-analysis reports an odds ratio for post-partum haemorrhage ranging from 1.45 to 3.28 depending on anaemia severity (Tura et al., 2021). Specifically, severe anaemia is linked to a sevenfold higher risk of PPH-related mortality, with each 1g/dL

reduction in haemoglobin concentration correlating with higher PPH risk. Empirical studies further confirm that women with moderate-to-severe anaemia (haemoglobin < 9 g/dL) experience significantly greater blood loss during vaginal delivery and the postpartum period (Samsuriati et al., 2024; Tura et al., 2021). Consequently, anaemic mothers are more likely to require blood transfusions intrapartum or postpartum. One extensive cohort study reported transfusion rates of 5.1 per 1,000 in non-anaemic women, compared with 21 per 1,000 in women with moderate anaemia. Taken together, these data underscore the vital importance of early anaemia detection, optimised prenatal iron management, and targeted labour monitoring to reduce haemorrhagic risks during delivery (WOMAN-2, 2023).

For the foetus, maternal anaemia is strongly associated with prematurity, intrauterine growth restriction, low birth weight, low Apgar scores, neonatal asphyxia, and even early neonatal death (Azizah et. al., 2022). One study reported a nearly threefold increase in the risk of low birth weight, with an odds ratio of 3.42 (95% confidence interval, 1.85-6.34). Moreover, maternal anaemia can impair placental development and reduce neonatal iron stores, heightening the risk of infant anaemia and potentially causing long-lasting neurodevelopmental delays (Sifakis, 2000).

Severe anaemia (<7 g/dL) in pregnancy can compromise oxygen delivery to the foetus and often requires blood transfusions. The situation is exacerbated by the fact that blood transfusions are not always readily available in Sabah's remote areas (Abd Rahman et al., 2022; Benson et al., 2022). There are still many areas in Sabah without access to health services or that are far from services. Some individuals must travel for several hours to reach the nearest health facility, which may not be equipped to address complications that arise during delivery. Taken together, it can be concluded that the importance of managing anaemia in pregnancy lies in preventing complications during delivery, particularly in areas with limited or no access to health services. Managing anaemia in pregnancy is easier compared to managing complications that can arise.

The causes of anaemia in pregnancy in Sabah are complex and interrelated. Iron deficiency is the leading cause of anaemia in pregnancy, primarily due to poor dietary intake and increased iron requirements during pregnancy (Jack et al., 2022; NH Nik et al., 2012; Wong et al., 2024). Additional causes include folate and B12 deficiency, parasitic infections, and genetic blood disorders such as thalassemia (Abd Rahman et al., 2022; Thirukkane et al., 2010). A few factors have been recognised that can contribute to the high cases of anaemia in pregnancy in Sabah. Inadequate nutrition is the most prominent cause. Many families in rural areas consume plant-based diets that are low in bioavailable iron (Foo et al., 2004; Nurnaningsih, 2022). Financial hardship limits access to nutritious food and supplements, thereby worsening iron replenishment (Milman, 2015; Yuen et al., 2023).

Additionally, very young mothers and frequent pregnancies contribute to the problem. Sabah has a high number of early motherhood and problems with pregnancy spacing. Closely spaced births reduce maternal iron reserves (Abd Rahman et al., 2022). This may also be due to a lack of awareness and contraceptive accessibility. Cultural beliefs also contribute to iron-deficiency anaemia in pregnancy. In some communities, dietary restrictions are being practised for pregnant mothers. Sabah's population includes diverse ethnic groups, including Kadazan-Dusun, Bajau, and Murut. Cultural food practices may contribute to iron-deficiency anaemia among pregnant women. For example, some traditions discourage the consumption of meat and eggs, exacerbating nutritional deficiencies (NH Nik et al., 2012).

Limited coverage of health services also contributes to the high prevalence of anaemia in pregnancy. Some rural areas in

Sabah have rugged terrain, making access to healthcare difficult. This hinders early diagnosis and treatment, as the patient presents to the clinic late in pregnancy or with fewer visits than necessary. There is also a lack of availability of haemoglobin level checks required for diagnosis and treatment monitoring. Underdiagnosis or delayed diagnosis can delay treatment and exacerbate this problem. Delayed or missed antenatal care (ANC) visits are common due to transportation issues, language barriers, and low health literacy (Abd Kadir et al., 2021). All these factors are closely related, so a holistic approach is required.

Strategies and Interventions

The Malaysian government has already implemented a few national strategies through the Ministry of Health to combat anaemia in pregnancy. Current ongoing programmes are making 'haemoglobin testing' become a standard during ANC visits, supplying iron-folic acid supplements for all pregnant women (Rahman et al., 2022), giving health education to every pregnant woman on iron-rich diets, and infection control, such as deworming and malaria prevention programs in high-risk zones (WHO, 2023).

The government should place greater emphasis on health staff training. Training is a crucial factor in reducing anaemia in pregnancy. By equipping healthcare providers with up-to-date knowledge and practical skills, they can better identify, manage, and prevent anaemia among pregnant women. Training should cover topics such as nutritional counselling, iron and folic acid supplementation, screening protocols, and effective communication strategies. Malaysia's government health clinics, which are known as Klinik Kesihatan, have well-trained staff, a necessity in combating anemia in pregnancy. They can ensure early detection of anaemia, provide timely treatment, and educate expectant mothers about a healthy diet and adherence to supplementation (Abd Manaf et al., 2022). Strengthening health staff training at both urban and rural levels is essential to improve maternal health outcomes and reduce the risks associated with anaemia in pregnancy across the country.

The Ministry of Health has established a method to measure and monitor the intervention's effectiveness by setting an improvement target, which is tracked through the annual Key Performance Indicator (KPI). The KPI is the percentage of pregnant women at 36 weeks with anaemia. The targets set by the Ministry of Health for Sabah in 2023 are lower than the national target of 5% (PKKP, 2024). A conclusion that Sabah is far behind other states in Malaysia can be drawn from this large discrepancy in targets alone.

There will be a significant improvement if all the national strategies are well implemented. In Sabah, an exemplary case of significant improvement is evident at Klinik Kesihatan Penampang, a government clinic. Multiple significant efforts have been implemented to address anaemia in pregnancy, primarily focusing on improved nutrition and supplementation. The supplementation includes aggressive escalation of the iron dose and earlier initiation of IV iron therapy in cases that fail to improve haemoglobin after oral iron therapy. In addition to a static health clinic, mobile outreach services were launched to improve access and ensure that health services reach most rural areas (Rahman et al., 2022). Klinik Kesihatan Penampang demonstrated success by reducing the prevalence of anaemia among pregnant women from 12.1% to 5.7% within a year through more aggressive iron supplementation (Daily Need Group, 2023; PKKP, 2024). A similar improvement is also observed in other high-prevalence areas, primarily through reinforcing the pregnant mother's diet and supplementation.

Sabah requires additional government health clinics or infrastructure improvements to enhance health access. However, at present, this solution is not feasible due to limited government resources. To further address anaemia in pregnancy in Sabah, there is a need to expand health services, particularly antenatal care coverage, by mobilising mobile

clinics with the assistance of community health workers (Abd Rahman et al., 2022). The availability of a haemoglobin point-of-care machine is also important. Every health clinic should be equipped with hemoglobinometers and ferritin tests (Benson et al., 2022). All health staff need adequate knowledge of anaemia and its health education tailored to the local culture. Culturally relevant health education materials should be developed and distributed to specific local communities. Strengthening surveillance through effective data collection can guide interventions and their outcomes (Neliti, 2020). The current target set by the Sabah Health Authority for anaemia in pregnancy at 36 weeks is less than 6%, which is commendable, as every health worker has a target to meet. However, it is well above the national target of 5% or less.

CONCLUSION

Anaemia in pregnancy in Sabah remains a significant issue for pregnant women, but it can be solved with the proper implementation of the National Strategies. The main issues to be resolved are regarding access to health services and iron supplementation. Other than that, recognising anaemia in pregnancy has multifactorial causes, ranging from nutritional and cultural factors to systemic healthcare barriers, and thus implementing targeted strategies can achieve significant improvements in maternal and neonatal health.

CONFLICT OF INTEREST

The authors have no conflicts of interest.

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REFERENCES

Annan, R. A., Gyimah, L. A., Apprey, C., Edusei, A. K., Asamoah-Boakye, O., Aduku, L. N. E., Azanu, W., & Lutterodt, H. E. (2021). Factors associated with iron deficiency anaemia among pregnant teenagers in Ashanti Region, Ghana: A hospital-based prospective cohort study. PLOS ONE, 16(4), e0250246. https://doi.org/10.1371/journal.pone.0250246

Azizah, F. K., Dewi, Y. L. R., & Murti, B. (2022). The effect of maternal anaemia on low birth weight: A systematic review and meta-analysis. Journal of Maternal and Child Health, 7(1), 32–41. https://doi.org/10.26911/thejmch.2022.07.01.04

Abd Kadir, N., et al. (2021). Knowledge of oral iron consumption among pregnant women at Hospital Universiti Sains Malaysia. Malaysian Journal of Medicine and Health Sciences, 17(SUPP9), 109–117. DOI prefix: 10.47836/mjmhs

Abdul Manaf, R., & Ismail, T. A. T. (2022). The prevalence and determinants of anemia during pregnancy in Malaysia: A systematic review. Frontiers in Nutrition, 9, 847693. https://doi.org/10.3389/fnut.2022.847693

Abd Rahman, R., Idris, I. B., Isa, Z. M., Rahman, R. A., & Mahdy, Z. A. (2022). The Prevalence and Risk Factors of Iron Deficiency Anemia Among Pregnant Women in Malaysia: A Systematic Review. Frontiers in Nutrition, 9(9). https://doi.org/10.3389/fnut.2022.847693

Benson, A. E., Shatzel, J. J., Ryan, K. S., Hedges, M. A., Martens, K., Aslan, J. E., & Lo, J. O. (2022). The incidence, complications, and treatment of iron deficiency in pregnancy. European Journal of Haematology, 109(6). https://doi.org/10.1111/ejh.13870

Daily Need Group. (2023, June 5). Understanding the risks of anemia in pregnancy: Protecting maternal and fetal health. Retrieved June 24, 2025, from https://dailyneedgroup.com/understanding-the-risks-of-anemia-in-pregnancy-protecting-maternal-and-fetal-health

Foo, L. H., Khor, G. L., Tee, E. S., & Prabakaran, D. (2004). Iron status and dietary iron intake of adolescents from a rural community in Sabah, Malaysia. Asia Pacific journal of clinical nutrition, 13(1), 48–55. PMID: 15003914

Haniff, J., Das, A., Onn, L. T., Sun, C. W., Nordin, N.

M., Rampal, S., Bahrin, S., Ganeslingam, M., Kularatnam, K. I., & Zaher, Z. M. (2007). Anemia in pregnancy in Malaysia: a cross-sectional survey. Asia Pacific journal of clinical nutrition, 16(3), 527–536. PMID: 17704035

Jack, M. Z., Hui, T. J., Ariffin, N. A. B. C., Mun, O. S., Nagandla, K., & Idris, N. (2022). Prevalence of iron deficiency anemia in pregnancy and its therapeutic response to treatment: a retrospective audit in a tertiary hospital. International Journal of Advances in Medicine, 9(11), 1090. https://doi.org/10.18203/2349-3933.ijam20222661

Ling, S. N., et al. (2022). Not all anaemia are IDA: A retrospective study of anaemia among antenatal mothers in Kota Kinabalu, Sabah. Malaysian Family Physician, 17, 16. doi: 10.51866/oa.135

Mahmood, T., Rehman, A. U., Tserenpil, G., Siddiqui, F., Ahmed, M., Siraj, F., Kumar, B., T, M., A, R., G, T., F, S., M, A., F, S., & B, K. (2019). The Association between Iron-deficiency Anemia and Adverse Pregnancy Outcomes: A Retrospective Report from Pakistan. Cureus Journal of Medical Science, 11(10). https://doi.org/10.7759/cureus.5854

Milman, N. (2015). Iron Deficiency and Anaemia in Pregnant Women in Malaysia? Still a Significant and Challenging Health Problem. Journal of Pregnancy and Child Health, 02(03). https://doi.org/10.4172/2376-127x.1000168

Minhat, H. S., & Thangarajah, P. (2022). Anaemia and its associated factors among pregnant women in Malaysia. Malaysian Journal of Nutrition, 28(1). https://doi.org/10.31246/mjn-2021-0047

Ministry of Health Malaysia. (2020). Annual report of the Malaysia Thalassaemia Registry 2020 (MOH/P/PAK/519.23). Retrieved from https://www.moh.gov.my

Mohd Ibrahim, H., Muda, Z., Othman, I. S., Mohamed Unni, M. N., Teh, K. H., Thevarajah, A., Gunasagaran, K., Ong, G. B., Yeoh, S. L., Muhammad Rivai, A., Che Mohd Razali, C. H., Din, N. D., Abdul Latiff, Z., Jamal, R., Mohamad, N., Mohd Ariffin, H., & Alias, H. (2020). Observational study on the current status of thalassaemia in Malaysia: a report from the Malaysian Thalassaemia Registry. BMJ Open, 10(6). https://doi.org/10.1136/bmjopen-2020-037974

Neliti. (2020). ARIMA forecasting of the prevalence of anemia among pregnant women in Malaysia. https://media.neliti.com

NH Nik, R., & S Mohd, N. (2012). The Rate and Risk Factors for Anemia among Pregnant Mothers in Jerteh Terengganu, Malaysia. Journal of Community Medicine & Health Education. https://doi.org/10.4172/2161-0711.1000150

Nurnaningsih, N., Ahmad, M., Sunarno, I., & Arsyad, N. (2022). Risk factors for the anemia in pregnant women: A literature review. Nurse and Health: Jurnal Keperawatan, 11, 137–150. https://doi.org/10.36720/nhjk.v11i1.305

Pejabat Kesihatan Kawasan Penampang (PPKP). (2024). Laporan Pencapaian Anemia dan PPKZM 2023 (Unit Dietik) [Review of Laporan Pencapaian Anemia dan PPKZM 2023]. Klinik Kesihatan Penampang.

Roslie, R., Mohd Yusuff, A. S., & Hossain Parash, M. T. (2019). The prevalence and risk factors of iron deficiency anemia among rural school children in Kudat, Sabah. Malaysian Journal of Medicine and Health Sciences, 15(3), 54–60. DOI prefix: 10.47836/mjmhs

Sifakis, S., & Pharmakides, G. (2000). Anemia in pregnancy. Annals of the New York Academy of Sciences, 900(1), 125–136. https://doi.org/10.1111/j.1749-6632.2000.tb06223.x

Syamsuriyati, S., Sari, N., Yulianti, D., & Ahmad, W. (2024). Anemia during pregnancy and its influence on postpartum hemorrhage. Medisains, 22(2), 72–78.https://doi.org/10.30595/medisains.v22i2.22562

Thirukkane, S., & Zahara, A. M. (2010). Compliance to Vitamin and Mineral Supplementation among Pregnant Women in Urban and Rural Areas in Malaysia. Pakistan Journal of Nutrition, 9(8), 744–750. https://doi.org/10.3923/pjn.2010.744.750

Tura, A. K., Gashu, K. D., Ayele, B. H., Nigatu, D., Fekadu, G. A., & Fekadu, M. (2021). Prenatal anaemia and postpartum hemorrhage risk: A systematic review and meta-analysis. Journal of Obstetrics and Gynaecology Research, 47(8), 2565–2576. https://doi.org/10.1111/jog.14834

Wong, M. F., Kavita Jetly, Ismail, B., Krishnan, V. K., Chandrakant, J. A., & Tham, S. W. (2024). Risk Factors for Anemia in Adolescent Pregnancies: Evidence From the Lembah Pantai Urban Health District in Malaysia. Cureus. https://doi.org/10.7759/cureus.68094

WOMAN-2 Trial Investigators. (2023). Maternal anaemia and the risk of postpartum haemorrhage: A cohort analysis of data from the WOMAN-2 trial. The Lancet Global Health, 11(8), e1166–e1174. https://doi.org/10.1016/S2214-109X(23)00245-0

World Health Organization. (2023). Anaemia in women and children. Global Health

Observatory. Retrieved June 24, 2025, from https://www.who.int/data/gho/data/themes/topics/anaemia_in_women_and_children

Yilmaz, elif, Yazıcı Işıtan, O., Soysal, Ç., vural yılmaz, zehra, Kara, O. F., & Küçüközkan, T. (2018). The influence of anemia on maternal and neonatal outcomes in adolescent pregnant. Journal of Surgery and Medicine. https://doi.org/10.28982/josam.393143

Yuen, S. P., Nasir, A., & Mohamad, N. (2023). The Prevalence of Anaemia and Its Associated Risk Factors in Children Admitted To General Paediatric Ward At Hospital Universiti Sains Malaysia, Kelantan. NOVEMBER 2023, 19(6), 77–82. https://doi.org/10.47836/mjmhs.19.6.11