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**Ciencia Huasteca Boletín Científico de la Escuela Superior de Huejutla**

*Publicación semestral, Vol. 11, No. 22 (2023) 1-5*

ISSN: 2007-493X

# Anemia Relacionada a la Malnutrición en el Embarazo: Ataque Preferencial a Sociedades Pobres, Subdesadorralladas y Marginalizadas

# Malnutrition-Related Anemia in Pregnancy: Preferential Targeting to Poor, Underdeveloped, Marginalized Societies

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**Abstract:**

Malnutrition is a common issue in rural communities. This health problem exerts long-lasting effects on pregnant women and their infants. The lack of iron during pregnancy can affect both mother's and child's health and needs to be diagnosed in time. Furthermore, infections such as malaria, tuberculosis and parasitic diseases increase the risk of anemia. This risk increases when the mothers have an irregular diet, excluding primarily dark green leafy vegetables and other iron-rich products. In addition, there is a predisposition towards developing certain diseases, even losing their offspring due to childhood mortality as a result of an inadequate diet. The objective of this review is to compile the latest findings regarding the relationship between malnutrition/anemia and health risks to both the pregnant women and their unborn products. Thus, this is a short, directed review of original articles available to the authors on the PubMed.gov search engine website with key words malnutrition and anemia and pregnancy limited to the Abstract/Title and the English language. Deficiency of Vitamins A, B12 and riboflavin, are the main micronutrient causes of pregnancy complications. Antenatal visits upon learning of the pregnancy, are recommended in order to detect any health issue related with malnutrition; also, iron supplementation is a general recommendation in pregnancies as are regular doctor check-ups. Pregnant teenagers are considered at a particularly high-risk of developing anemia, due to their limited education, lack of economic affluence, and (in most cases) the lack of planning for the pregnancy. To detect anemia, medical personnel generally perform blood tests to analyse hemoglobin levels. Unfortunately, in many marginalized communities, malnutrition and anemia go undetected and untreated, negatively affecting the quality of life of the mother and her offspring, leaving them to face to severe complications. This issue is a public problem and requires immediate attention, as its effects are long lasting both psychologically and physically.

***Keywords:***

*Pregnancy, Malnutrition, Anemia, Iron, and Risk*

**Resumen:**

La desnutrición es considerada un problema común en las comunidades rurales. Este problema de salud ejerce efectos de larga duración en mujeres embarazadas, así como en sus hijos. La deficiencia de hierro en el embarazo puede afectar tanto la salud de la madre, como la del niño, y necesita ser diagnosticado a tiempo. Por otra parte, las infecciones como malaria, tuberculosis y enfermedades parasitarias, aumentan el riesgo de la anemia. Este riesgo aumenta cuando las madres llevan una dieta irregular, únicamente incluyendo verduras de hojas verdes y excluyendo otros productos ricos en hierro. Así también, existe una predisposición para desarrollar enfermedades e incluso llegar a perder sus hijos debido a la mortalidad en la infancia como resultado de una alimentación inadecuada. El objetivo de esta revisión es reunir los últimos hallazgos sobre la relación entre malnutrición/anemia y los riesgos de salud que implican hacia las mujeres embarazadas y sus hijos. Por lo tanto, se presenta una revisión corta dirigida hacia los artículos originales disponibles a los autores en la página de PubMed.gov posterior a una búsqueda con las palabras clave **malnutrición y anemia y embarazo** limitados al Resumen/Titulo y al lenguaje Ingles. Las deficiencias de los principales micronutrientes como vitamina A, B12 y riboflavina, causan múltiples complicaciones durante el embarazo. Las consultas prenatales se recomiendan para para conocer sobre el embarazo y así detectar algún problema de salud que estar relacionado con la desnutrición. Cabe destacar que, la suplementación de hierro es recomendable en el embarazo, así como, las valoraciones medicas regulares con el médico. Las adolescentes embarazadas son el grupo de alto riesgo de desarrollar anemia, debido a su educación limitada, su baja estabilidad económica, y (en la mayoría de los casos) tienen una inadecuada planeación del embarazo. Para detectar la anemia, el personal médico generalmente realiza estudios de laboratorio, para analizar los niveles de hemoglobina. Desafortunadamente, en las comunidades marginadas, la desnutrición y anemia no son detectados y tratados, esto afecta negativamente la calidad de vida de la

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*Fecha de recepción: 28/07/2022, Fecha de aceptación: 05/04/2023, Fecha de publicación: 05/07/2023*

madre y del hijo, conllevando a graves complicaciones. Esta situación es un problema de salud pública y requiere atención inmediata, ya que sus efectos tienen un largo plazo de duración, tanto psicológica como físicamente.

***Palabras Clave:***

*Embarazo, Desnutrición, Anemia, Hierro y Riesgo*

## Introduction

As a nursing student who practiced in clinics in the Huasteca region of the state of Hidalgo, Mexico, an evident main health concern in the rural communities is the malnourishment faced by a large percentage of the population. According to ENSANUT, the prevalence of anemia in Hidalgo was 9.6%, mostly affecting to rural communities. Particularly worrisome in this regard are the highly susceptible individuals: the young, the elderly, and the unborn. Economically and geographically-isolated communities in Mexico, including many Huasteca populations, are negatively impacted by lack of financial resources to appropriately educate and feed themselves and families. The National Survey on Health and Nutrition of Mexico (Enasanaut) in 2018-2019 revealed that anemia prevalence in non-pregnant women was associated with sociodemografic factors, including low body mass index (BMI), belonging to an indigenous group and living outside the central part of Mexico[1]. An earlier study in Mexico found that over thirty percent of fertile-aged women (12-49 years of age) from the lowest income families living in communities comprised of < 100,000 inhabitants, presented anemia [2]. Later studies showed that although anemia in reproductive-aged females did not significantly change from the year 2006 to 2019 and that more than 95% of the cases were evaluated as moderate-mild, anemia prevalence more than doubled (approximately 40%, compared to urban prevalence of 18%) in regions of poverty, rural areas, and those with moderate-severe food insecurity [1].

In this review we will focus on pregnant females and their unborn, regardless of the country or state. Our objective is to review the latest research in the field, without focusing on any one geographical area or country, the prevalence of anemia in Mexico is mentioned in order to situate the reader on the local situation of this issue. Interestingly, the following literature review, conducted on the PubMed search engine utilizing specific parameters described below, did not cast forth any study on the national problematic.

## Methods

To conduct this short review of the literature listed on February 4th 2022 on the PubMed.gov search engine website after performing the search for the following in the Abstract/Title: malnutrition and anemia and pregnancy. The search items were limited to original research articles available in the English language, published in the last decade (2012-2022). 42 research articles were found. Due to the internal funding limitations, we only included free-access articles in the English language (23 articles), excluding articles from written in other languages, reviews, or those not freely available.

## Social Impact of Deficient Nutrition During Pregnancy

Currently, iron deficiency in infants is considered a public health issue worldwide; in fact, anemic women and their newborns are at risk of developing future health problems due to lack of nutrients during the pregnancy. Mothers and their infants with anemia have low possibilities of survival [3]. Meanwhile, anemia prevalence is a well-known problem in the world. It is known that 41.8% of pregnant women are anemic, worldwide. If this issue is not diagnosed early in the pregnancy, it can lead to a significant community health problem [4]. For this reason, it is very important to do check-ups regularly early in the pregnancy. Anemia during pregnancy occurs more frequently in the third trimester, so it is important to estimate the birth weight before delivery, as it is a risk factor for poor neonatal outcomes [5]. In addition, the risk of stillborns and neonatal deaths is higher when the combination of anemia and underweight coexist, and this requires effective public health interventions in order to improve birth outcomes [5]. Economically and geographically-isolated communities in Mexico, including many Huasteca populations, are negatively impacted by lack of financial resources to appropriately educate and feed themselves and families.

## Maternal Parasitosis and Deficient Nutrition

A study conducted in Ghana demonstrated that a malaria infection leads to a two-fold increase in anemia prevalence amongst pregnant women in their third trimester [3]. Malaria infection in pregnancy may cause maternal anemia due to the destruction of parasitized red cells, including depletion of non-parasitized erythrocytes [6]. Besides, there are some intermittent preventive treatments considered effective for this infection, such as Sulfadoxine- Pyrimethamine and Mefloquine [7]. There are some other diseases that can also increase the risk of anemia, such as HIV/AIDS and tuberculosis. These are considered the most prevalent infectious diseases in

Africa, especially in sub-Saharan Africa [8]. Added to the anemia, another health problem posed by these infections is fetal growth restriction, leading to fetal weight deficit and increased fetal risk, a situation that is more often diagnosed in developing countries [9], for early detection it is recommended have an ultrasonography in order to estimate fetal weight [10]. Furthermore, the hookworm, *Necator Americanus*, is a soil-transmitted fecal parasitic infection that prevails in tropical regions. Hookworm infection is considered a detonating factor to malnutrition and even mortality in pregnant women [11]. These, commonly known as "human hookworms", can produce over 10,000 eggs per day being laid in feces. Humans can become infected by larvae penetrating the skin, these travel through subcutaneous blood to the small intestine [11]. Parasitic diseases, such as hookworm and schistosomiasis can lead to high prevalence of anemia in pregnancy, and primarily affect underdeveloped societies and economically-challenged areas [12]. Parasite infection causes nutrient malabsorption and even immune-mediated destruction of red blood cells [13].

## Maternal Underlying Conditions and Anemia Development

Underlying maternal conditions, such as advanced chronic kidney disease lead to anemia development, closely correlated with the biomarker known as PAPP-A (pregnancy-associated plasma protein A). This biomarker is also used to determine the micronutrient deficiency in patients treated with hemodialysis and those diagnosed with cardiovascular dysfunction. However, multiple reports regarding this biomarker, demonstrate that it not only associates with pregnancy [14], but rather with the preexisting maternal pathology. Other maternal conditions that can affect the condition of the fetus during pregnancy include diabetes mellitus, renal diseases, substance abuse, as well as a short interpregnancy interval [10]. Moreover, fatigue has been associated with anemia due to the lack of micronutrients, and this is a risk for depression during or post pregnancy. Women may experience low energy, a frequent symptom reported postpartum [15]. Finally, major surgeries, including bariatric surgery, must also be considered before pregnancy, as a 1-year time period is recommended post-surgery, because the Hemoglobin and Hematocrit tend to decrease and this may affect the product. To prevent anemia in either the mother or the product, iron and folic acid supplementations are administered preferably starting before pregnancy [16].

## Causes of Anemia

Anemia can be caused by many factors, the main ones being a lack of iron and folate in the diet. In places with poverty and lack of health promotion, the elevated prevalence of infectious diseases such as HIV, are associated with increased pregnancy complications and even maternity deaths. One of the articles reviewed determined that women exposed to groundwater are at a higher risk of developing anemia, due the high arsenic concentration ingested which can then bind to hemoglobin. This situation is more common in marginalized places because they do not have sufficient resources [6].

## Consequences of malnutrition in pregnancy

The absence of nutritional assessment during pregnancy may have some complications for either the mother and the newborn, the latter being the most affected. If the mother is anemic, intrauterine fetal growth may be compromised, leading to an increase in perinatal mortality [18]. However, iron deficiency is only one of many problems that results from malnutrition in this critical stage. A mother´s malnutrition can lead to offspring with cognitive impairments, predisposition to multiple infections and an increased propensity of childhood mortality have [4]. For example, Vitamin D deficiency is associated with certain central nervous system disorders in children, such as hyperactivity and attention deficit [4]. Even in our present day, a large amount of pregnant woman die each year due to pregnancy-related causes, associated with poor prenatal care or lack of maternal health check-ups [19]. Furthermore, malnourished mothers do not produce the high-quality colostrum required by the newborn, thus increasing the risk of malnutrition in the growing baby [20]. On the other hand, amenia in children is generally related to a protein-energy malnutrition [13]. Finally, it is noteworthy to state, that newborns themselves can also develop nutritional deficiency, and this can manifest as dermatitis due to vitamin E deficit [21] or in other characteristic phenotypes according to the etiology of the malnutrition.

## Risk of malnutrition in pregnancy

Some micronutrient deficiencies that may increase the risk for anemia Vitamin A and B12, riboflavin and folate [8]. Lower levels of hemoglobin and ferritin are associated with pregnancy, this situation may affect the fetus and lead to developmental problems [22]. It has been also been documented that pregnant women lacking Vitamin D have a higher prevalence of iron deficiency, as do their unborn products [4]. Moreover, in order to determine the preventable causes of anemia, it is also necessary to assess the role of other factors, such as vitamin B12 deficiencies, folic acid or hemoglobinopathies [12]. There is a higher prevalence of anemia among pregnant women who have an inadequate micronutrient intake, as they can experience severe forms of anemia, leading to complications [17].

## Risk of malnutrition in teenage pregnancies

A study conducted in Bangladesh demonstrated that pregnant teens were more likely to develop anemia, the authors suggested this was due to their age and status

being more closely associated with malnutrition [8]. However, there is a multitude of factors that lead to anemia in maternal teenagers, including: unplanned pregnancy, low education, infections such as Malaria, belonging to the AB blood group, and poor dietary intake. Most pregnant adolescents are likely to present a high risk for anemia. Young girls, have more risk of anemia due to monthly blood loss, which could be crucial during pregnancy, so it is necessary to increase iron availability for better fetal development of fetus [17]. Overall, early marriage is associated to multiple pregnancy-related issues as a result of inexperienced young mothers and their limited education [23]. In fact, the nutrition status of a child can also be affected by the age of teen mothers, who generally have a higher risk of mortality [20], especially in perinatal life stages when they are younger. In addition, the frequency of teenage pregnancies is higher in rural areas, this is related to early puberty, thus teenagers tend to start sexual activity early, increasing the maternal mortality due to obstructed labor, sepsis and preeclampsia [24].

## Detection of anemia in pregnant women

For diagnosing anemia, it is very common and useful to do a blood test, in order to analyze hemoglobin levels. The normal hemoglobin levels for women are 11.6 to 15 g/dl. Less than 11 g/dl, is indicative of anemia. Prenatal check-ups are important, as well as recording the patients morbidities, such as nutrient malabsorption or anorexia [20].

## Anemia Prevention

One way to prevent anemia in pregnancy is to take iron-folic supplementation before becoming pregnant, as it can benefit the mother and newborn. In infants who were breastfeed before 6 months of age, the risk of anemia is low and iron supplements can be given intermittently or daily [3]. Medical personal suggests that through antenatal health care, maternal education about pregnancy could be a good way to prevent and improve nutrition in pregnant woman [9]. It is very important to educate young and inexperienced mothers about proper nutrition, meals rich in iron, so they can prevent complications [4]. The importance of the first antenatal visit on pregnancy is to identify high-risk complications, such as postpartum hemorrhage, a common problem in rural areas [5]. Iron-folic acid supplements, along with a balanced diet, are general recommendations prior to becoming pregnant, as these aid in fetal growth and prevent both anemia and neonatal mortality. In order to improve absorption of iron, it is useful to educate regarding about food processing methods such as fermentation, soaking or germination [17]. Low anemia prevalence is associated with higher education and socioeconomic levels and routine check-ups are a primary requirement in order to detect and prevent other risks associated with the pregnancy [19].

Although iron supplements are a general recommendation to prevent anemia, there are some contraindications. For example, according to some maternal guidelines, iron supplementation cannot be recommended to pregnant women without prior screening, as overdosing may lead to negative side effects [25]. Generally, health practitioners do not recommend daily high doses of iron supplements in Caucasian women, because they tend to have higher hemoglobin than other ethnic groups [22]. Finally, the personal patient's opinion must also be evaluated, as there are women who may refuse to take iron supplementation due to its sides effects, such as vomiting and gastrointestinal upset, and/or because they believe that it might be harmful to themselves or their baby [24].

## Conclusion

This brief review of free-access, English-language literature available on the topic: malnutrition and anemia and pregnancy on February 4th 2022 on the PubMed.gov search engine website focused on gaining insight of the relationship between malnutrition, anemia and health concerns of pregnant women and their unborn. The literature reviewed revealed other health factors that are associated with anemia, such as parasitic diseases. Together these can coexist and increase childhood mortality. The main element that determines if a woman is anemic is iron, along with vitamins such as B12. The most usual assessment of anemia is done with a blood test that determines hemoglobin and hematocrit count. Proper and timely doctor check-ups before becoming pregnant is an important factor to obtain better outcomes. Most anemic pregnant woman are from rural areas, and the main differences they face are: poor availability of health resources, education, inadequate diet and insufficient household income. Moreover, health personnel highly recommend to prepare for pregnancy, as planned pregnancies are associated with lower risks for both mother and newborn and a higher quality of life.

In conclusion, it would appear that malnutrition-related anemia in pregnancy is preferentially targeting poor, underdeveloped, marginalized societies and this should be taken as an alarm call for help to both the government and health system in Mexico, with emphasis in high-risk demographic regions, including the Otomí-Tepehua and Huasteca regions of Hidalgo recognized as having state´s worst malnutrition status [26]. The local work has been focused on pediatric anemia. For example, a pilot study in the Huasteca region of San Luis Potosi, a neighboring state to Hidalgo, found that a four-month intervention consisting of informative talks and cooking workshops resulted in a marked decrease in indigenous pediatric anemia prevalence (from 37 to 25.9%) [27]. Follow-ups on diet supplements distributed through the PROSPERA government-aid program revealed their efficiency at reducing pediatric anemia from 36.9 to 28.6% [28]. Regardless of the measures already implemented, it is

worrisome that the prevalence of this preventable condition in reproductive-aged Mexican women appears to be on the rise [2].

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