E-ISSN: 2788-9270
P-ISSN: 2788-9262
www.pharmajournal.net
NJPS 2023; 3(1): 38-44
Received: 20-11-2022
Accepted: 23-12-2022

Remya Paul Mukkathu
MSc, RD, CDE.
PhD Scholar, Manasarovar Global University Bhopal Madya Pradesh, India

Sona Anna Sibi
MSc, Department of Clinical Nutrition and Dietetics Caritas Hospital, Thellakom, Kottayam, Kerala, India

Corresponding Author:
Remya Paul Mukkathu
MSc, RD, CDE.
PhD Scholar, Manasarovar Global University Bhopal Madya Pradesh, India

Imparting knowledge regarding protein intake and anaemia during pregnancy

Remya Paul Mukkathu and Sona Anna Sibi

Abstract
Maternal nutrition is an essential part of a healthy pregnancy. For the foetus' growth and development as well as the mother's continued health throughout her pregnancy and potential long-term consequences on both of their health, optimal diet is crucial. Protein and iron has an important role during pregnancy. Due to its roles in oxygen supply, electron transport, and enzymatic activity, iron is crucial for the health and operation of all cells. High metabolic rate cells have higher iron needs and are more susceptible to iron deficiency-related malfunction. As the mother's blood volume rises and the foetus grows and develops, iron requirements during pregnancy substantially rise. Pregnancy, then, is a situation of potential or actual iron insufficiency that may be challenging to identify due to limits in often employed indicators like haemoglobin and ferritin concentrations. Contraceptive failure, low birth weight, preterm, and intrauterine growth restriction are all linked to iron deficiency during pregnancy. This paper is going to discuss about the knowledge regarding protein and anaemia during pregnancy.

Keywords: Maternal nutrition, optimal diet, high metabolic rate, malfunction

Introduction
Maternal nutrition is essential to the growth and development of the foetus. Additionally, nutrition serves as the cornerstone of maternal health and prepares the mother for labour and delivery as well as postpartum recovery. Improved dietary intake has the potential to lessen these difficulties and the short- and long-term morbidities they are connected with because nutrition is known to be linked to pre-eclampsia and gestational diabetes (Ho., 2016) [9]. It is generally known that diet during pregnancy plays a crucial influence on the health of the mother and her unborn children, including results in later adulthood. If it is maintained throughout pregnancy, proper prenatal nutrition encourages ideal foetal growth and development. An important factor in determining the survival, growth, and development of the embryo is the maternal nutrition throughout pregnancy, particularly the consumption of dietary protein. Due to a lack of certain amino acids that are crucial for cell metabolism and function, low maternal dietary protein consumption can result in embryonic losses, intrauterine growth restriction, and lower postnatal growth. Notably, excessive amino acid consumption during pregnancy can cause intrauterine growth restriction and foetal mortality due to the toxicity of ammonia, homocysteine, and H2S that are produced during amino acid catabolism (Herring., *et al*. 2018) [7] Complex metabolic processes that may affect foetal growth and child health are a feature of pregnancy. The placenta must deliver nutrients continuously for normal foetal growth and development. Amino acids are transported, used, produced, and converted by the placenta (AAs). It is preferable to use the word protein deficit instead of the more often used term hypoproteinemia for at least two reasons. Its meaning is clear. First of all, the term "hypoproteinemia" does not take into account the various levels of protein depletion, which are nonetheless significant even if they do not significantly drop the levels of circulating proteins to that of hypoproteinemia. The second is that hypoproteinemia, from an etymological perspective, only affects the blood's circulating protein, which is today thought to be less significant to the body's economy than the protein depots in the tissues and whose repair is just as crucial as the repair of the tissues (Arnel *et al*., 1945) [1]

Globally, anaemia is a significant public health issue for women of reproductive age. It is a significant cause of maternal death both directly and indirectly, and it is also linked to high foetal wastage (Ogunbode., 2021) [15].

Review of literature

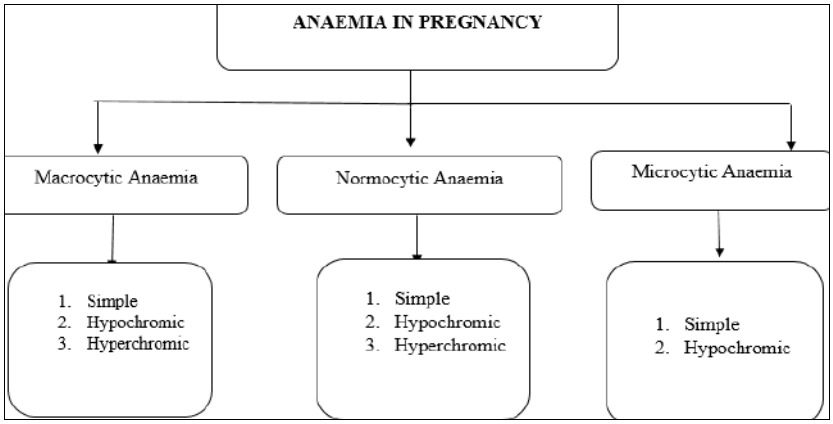
Importance of protein during pregnancy

Humans require adequate protein in their diets to maintain both development and maintenance. Enzymes, transport proteins, hormones, and keratin are examples of the structural and functional roles that proteins play in the body (WHO 2007) [17]. Since there are 20 distinct amino acids in the majority of human proteins, our bodies require a sufficient amount of both total protein and amino acids (nitrogen). The current definition of protein requirement is as follows: "the lowest level of dietary protein intake that will balance the losses of nitrogen from the body, and thus maintain the body protein mass, in persons at energy balance with modest levels of physical activity, plus, in children or in pregnant or lactating women, the needs associated with the deposition of tissues or secretion of milk at rates consistent with good health (WHO 2007) [17]. Therefore, it is essential to consume enough protein throughout pregnancy, a unique stage of life marked by rapid growth and development as well as significant physiologic changes in the mother from conception to delivery. Within a few weeks following conception, modifications to protein metabolism take place to support foetal development and growth while preserving maternal homeostasis and getting the body ready for nursing (King,2007). At the steps of absorption, amino acid transport, protein synthesis, and proteolysis, protein use from diets and deposition as new tissues depend on energy. In order to ensure the full-term delivery of a healthy baby, nutritional intake during pregnancy must contain enough calories and protein. It has been calculated that an additional 77,000 kcal will be needed throughout the whole pregnancy (FAO, 2004) [6]. Despite the fact that the gestational period's energy expenditure is not distributed uniformly, in pregnancy. This is due to the fact that during pregnancy, the quantity of protein deposited in maternal and foetal tissues fluctuates, with minimal deposition occurring during the first trimester, progressive increases during the second trimester, and the majority occurring in the third trimester (Butte *et al*., 2005) [4] Women are more likely to experience unfavourable pregnancy outcomes if their dietary protein consumption falls below a certain threshold needed for metabolic adaptations, and it may be necessary to implement an effective nutritional intervention that includes enough protein and amino acids. In fact, recent research by Thame, Kurpad, and colleagues has demonstrated that amino acid kinetics are changed throughout adolescent pregnancy and in adult pregnancy in people with low BMIs, such that the metabolic adjustments are insufficient to maintain a favourable pregnancy outcome (Kurpad *et al*., 2014) [12], Therefore, determining the best protein and amino acid needs at various stages of pregnancy is essential for developing suitable nutritional consumption guidelines throughout this key life stage (Elango *et al*., 2016) [5].

Anaemia

Pregnancy-related anaemia has emerged as a serious global health issue. Despite the fact that anaemia affects everyone, it is most common in developing nations. It should be highlighted that people of all ages, including men and women, are impacted, but that pregnant women and young children are the most at risk. Over 50% of expectant mothers and over 30% of all women worldwide experience anaemia. Nearly 66% of pregnant women in developing nations experience anaemia, which is also linked to poor prenatal and maternal outcomes. The unfavourable effects of anaemia in women include increased fatigue, impaired cognition, decreased work productivity, and greater economic expenditures due to higher morbidity and mortality rates and low birth weight (Naila Baig-Ansar *et al*., (2008), Compared to pregnant women who are not anaemic, women with severe anaemia have a 3.5 times higher risk of dying from obstetric complications. The most common dietary deficit and the main cause of anaemia in the globe is iron deficiency (Carolyn, 2002) [19]. About 50% of all episodes of anaemia are caused by iron deficiency. Other notable causes that may differ geographically include dietary shortages, malaria, helminth (worm) infections, and a number of other illnesses. Investigation of the primary causes and ongoing use of an integrated package of therapies to address all major causes are necessary for effective management of anaemia in contexts with high prevalence (WHO, 2011).

Classification of anaemia in pregnancy



Flow chart 1: Classification of anaemia during pregnancy (Labate. 1939) [13].

Table 1: clinical symptoms of anaemia in pregnancy (Malinowski *et al*., 2021) [14]

Clinical symptoms of anaemia in pregnancy	Fatigue
	Feeling weak
	Having headache
	Palpitations
	Dizziness
	Dispnea
	Loosing the hair
	Low Hb

Iron deficiency effects

A condition known as iron deficiency is characterised by the absence of mobilizable iron reserves and the presence of symptoms indicating a compromised iron delivery to tissues, including the erythron. With or without anaemia, iron deficiency is possible. Even without anaemia, there may be some functional alterations, but it seems that anaemia development is what causes the majority of functional losses (Wood *et al*., 2005) [18] Even mild and severe forms of iron deficiency anaemia can lead to functional problems with the immune system, labour capacity, and cognitive development, Increased risk of sepsis, maternal mortality, perinatal death, and low birth weight are just a few of the negative effects of iron deficiency during pregnancy for both mother and child (Wood *et al*., 2005) [18].

Diagnosis of anaemia during pregnancy

Anaemia has a very diverse aetiology. Therefore, a diagnosis solely based on haemoglobin levels is typically insufficient. Therefore, it is imperative to identify the underlying cause of the decreased haemoglobin production in all circumstances, whether through the taking of a focused medical history, performing a clinical assessment, or through the use of additional investigations done in addition to the basic diagnostic tests. Oral iron therapy trials can serve as both diagnostic and therapeutic procedures. If the presence of hemoglobinopathy is unknown, it is appropriate to begin oral iron therapy while screening is being done. Within two to three weeks, an oral iron supplementation study should show an increase in Hb. If there is a spike, the diagnosis of iron deficiency is confirmed. Further testing must be done if there isn't a rise. Serum ferritin levels in patients with known haemaglobinopathies ought to be examined first. Treatment should be started as soon as ferritin levels fall below 30 ng/l, and readings under 15 ng/l are indicative of established iron deficiency (Sabina *et al*., 2015).

Methodology

This chapter deals with the description and various steps adopted to collect and organize data for the present study. The study is conducted on 100 pregnant women's randomly selected from a multispecialty hospital. The survey method based on standard one-on-one questionnaire and by using a frequency distribution table by due visits to hospital.

Selection of sample and sample size

100 pregnant women are selected as sample that are ready to co-operate, from a multi-speciality hospital. Simple random sampling is used for the selection of sample.

Research Design

The subjects of the study were selected randomly for one on one questionnaire.

Intervention

The subjects were randomly selected and one on one questions were asked to check the knowledge regarding protein intake and anemia during pregnancy.

Statistical analysis and Interpretation

In this chapter, statistical analysis and data interpretation are described. The most crucial stage of the research process is data analysis and interpretation, which includes computing. The various metrics and looking for patterns of links between different data groupings. In this instance, the study objectives are taken into consideration while data are analysed and evaluated. Compilation, editing, categorization, and presentation of data all fall under the category of analysis and interpretation of data (King *et al*., 2000) [10].

As the data obtained does not address the study's research objectives or test its hypotheses, the analysis of the data is meant to provide a meaningful description of the data. In order to identify trends and patterns of the connection, the data utilised must undergo a methodical analysis (King *et al*., 2000) [10]. The study subjects were analysed in terms of pie charts and cylinder graph. The collected data was organised, tabulated, summarised and analysed based on the objectives.

Objectives

- Prevalence of anemia among pregnant women attending a multi-specialty hospital.
- Factors associated with anemia among pregnant women attending a multi-specialty hospital.
- Signs and symptoms associated with anemia among pregnant women attending a multi-specialty hospital

Background characteristics of pregnant women

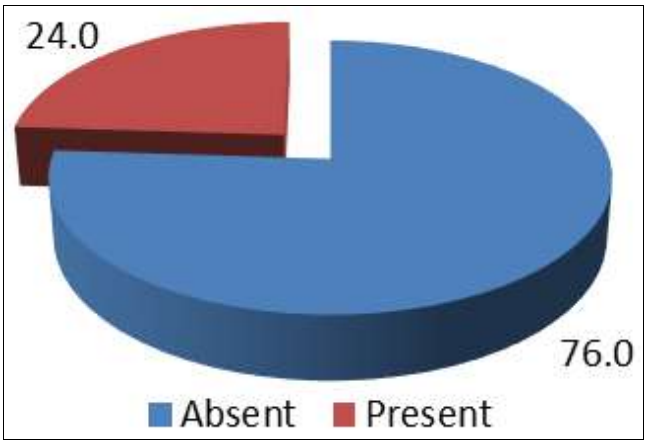


Fig 2: Prevalence of anemia among pregnant women attending a multi-specialty hospital

Table 2: Percentage distribution of the sample according to background characteristics

Background characteristics		Count	Percent
Age	21 - 25	22	22.0
	26 - 30	44	44.0
	>30	34	34.0
	Mean ± SD	29.2 ± 4.4	
Monthly income	<10000	5	5.0
	10000 - 25000	10	10.0
	25000 - 50000	36	36.0
	>50000	49	49.0
Educational status	Higher secondary	5	5.0
	Graduate	71	71.0
	Post graduate and above	24	24.0
Type of family	Joint/Extended	27	27.0
	Nuclear	73	73.0
Activity pattern	Sedentary	90	90.0
	Moderate	9	9.0
	Heavy	1	1.0
Residential area	Muncipality	29	29.0
	Panchayat	71	71.0
Past medical history	Diabetes	2	2.0
	Hypertension	5	5.0
	Dyslipidemia	1	1.0
	Hypothyroidism	17	17.0
Family history	F/o Diabetes	60	60.0
	F/o Obesity	27	27.0
Take folic acid supplement during pre-pregnancy	Yes	45	45.0
	No	55	55.0
Parity of current pregnancy	Primi gravida	49	49.0
	Second para	37	37.0
	Third para	12	12.0
	Fourth para and above	2	2.0

Prevalence of anaemia among pregnant women attending a multi-specialty hospital

Table 3: Prevalence of anaemia among pregnant women attending a multi-specialty hospital

Anemia	Count	Percent	95% CI
Absent	76	76.0	15.6 – 32.4
Present	24	24.0	

Factors associated with anemia among pregnant women

Table 4: Factors associated with anemia among pregnant women

		Anemia				p
		Absent		Present		
		Count	Percent	Count	Percent	
Diabetes	Yes	1	50.0	1	50.0	0.384
	No	75	76.5	23	23.5	
Hypertension	Yes	1	20.0	4	80.0	0.003
	No	75	78.9	20	21.1	
Take folic acid supplement during pre-pregnancy	Yes	39	86.7	6	13.3	0.024
	No	37	67.3	18	32.7	
Use oral contraceptives before this pregnancy	Yes	4	36.4	7	63.6	0.001
	No	72	80.9	17	19.1	
Duration of pregnancy	<24 weeks	4	57.1	3	42.9	0.129
	24 - 26 weeks	7	53.8	6	46.2	
	27 - 29 weeks	8	100.0	0	0.0	
	>29 weeks	57	79.2	15	20.8	
Serum Albumin	Absent	75	96.2	3	3.8	$p<0.01$
	present	1	4.5	21	95.5	

**: - Significant at 0.01 level, *: - Significant at 0.05 level

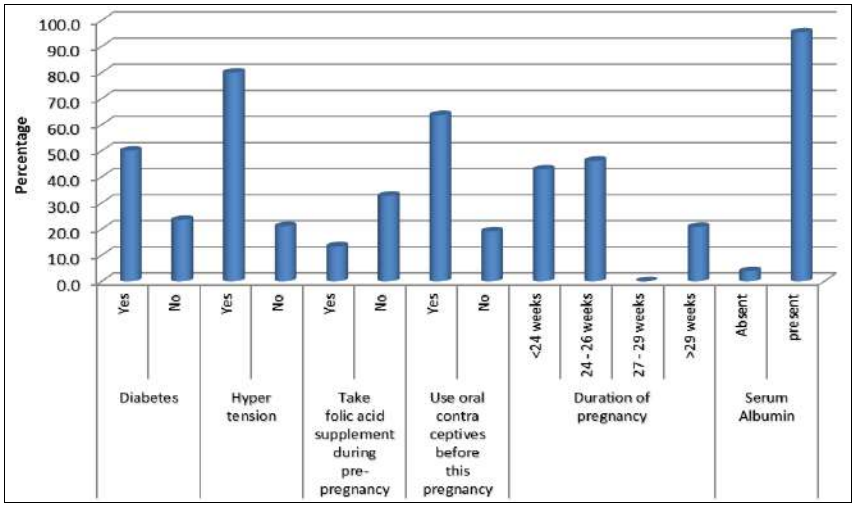


Fig 3: Presence of anemia among pregnant women based on selected variables

Table 5: Association of anemia & protein with food pattern and frequency of pregnant women

Food Pattern		Anemia				p
		Absent		Present		
		Count	Percent	Count	Percent	
Whole Grain Cereals	Never/ rarely	0	0.0	0	0.0	-
	Twice or more in week	76	76.0	24	24.0	
Pulses	Never/ rarely	1	4.3	22	95.7	*p*<0.01
	Twice or more in week	75	97.4	2	2.6	
Fish	Never/ rarely	11	35.5	20	64.5	*p*<0.01
	Twice or more in week	65	94.2	4	5.8	
Meat	Never/ rarely	50	69.4	22	30.6	0.014
	Twice or more in week	26	92.9	2	7.1	
Nuts	Never/ rarely	0	0.0	21	100.0	*p*<0.01
	Twice or more in week	76	96.2	3	3.8	
Green leafy vegetables	Never/ rarely	59	72.0	23	28.0	0.043
	Twice or more in week	17	94.4	1	5.6	
Fruits	Never/ rarely	0	0.0	22	100.0	*p*<0.01
	Twice or more in week	76	97.4	2	2.6	
Bakery Products	Never/ rarely	74	97.4	2	2.6	*p*<0.01
	Twice or more in week	2	8.3	22	91.7	
Fried Snacks	Never/ rarely	68	97.1	2	2.9	*p*<0.01
	Twice or more in week	8	26.7	22	73.3	
Fast food	Never/ rarely	76	97.4	2	2.6	*p*<0.01
	Twice or more in week	0	0.0	22	100.0	
Junk food	Never/ rarely	76	97.4	2	2.6	*p*<0.01
	Twice or more in week	0	0.0	22	100.0	

*: - Significant at 0.05 level

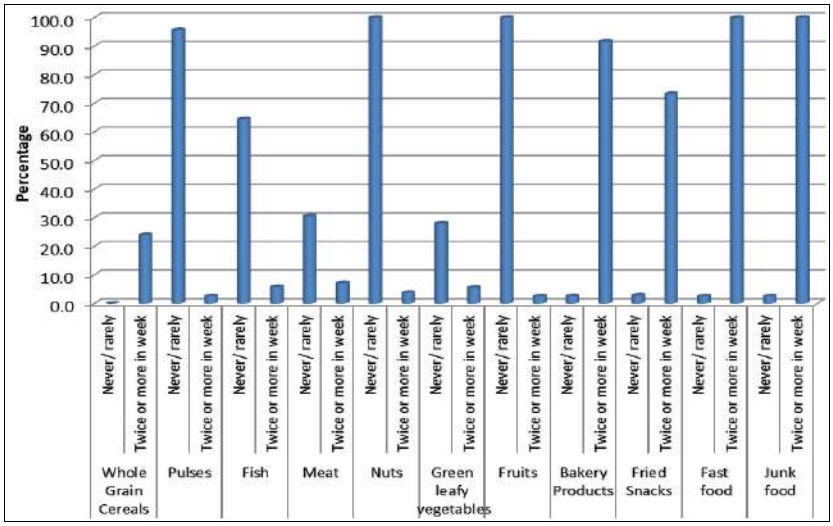


Fig 4: Presence of anemia among pregnant women based on selected variant

Adverse signs and symptoms associated with anemia among pregnant

Table 6: Association of signs and symptoms with anemia among pregnant

Signs and symptoms		Anemia				p
		Absent		Present		
		Count	Percent	Count	Percent	
Face	Absent	62	81.6	8	33.3	p<0.01
	Pigmentation/Facial oedema	14	18.4	16	66.7	
Skin	Absent	57	75.0	3	12.5	*p*<0.01
	Dry/Pigmentation/Oedema	19	25.0	21	87.5	
Eyes	Absent	73	96.1	2	8.3	*p*<0.01
	Dry/Pale	3	3.9	22	91.7	
Tongue	Absent	76	100.0	19	79.2	*p*<0.01
	Inflammation	0	0.0	5	20.8	
Leg	Absent	41	53.9	1	4.2	*p*<0.01
	Oedema	35	46.1	23	95.8	
Nails	Absent	71	93.4	0	0.0	*p*<0.01
	Discolouration/Spoon shaped	5	6.6	24	100.0	

*: - Significant at 0.05 level

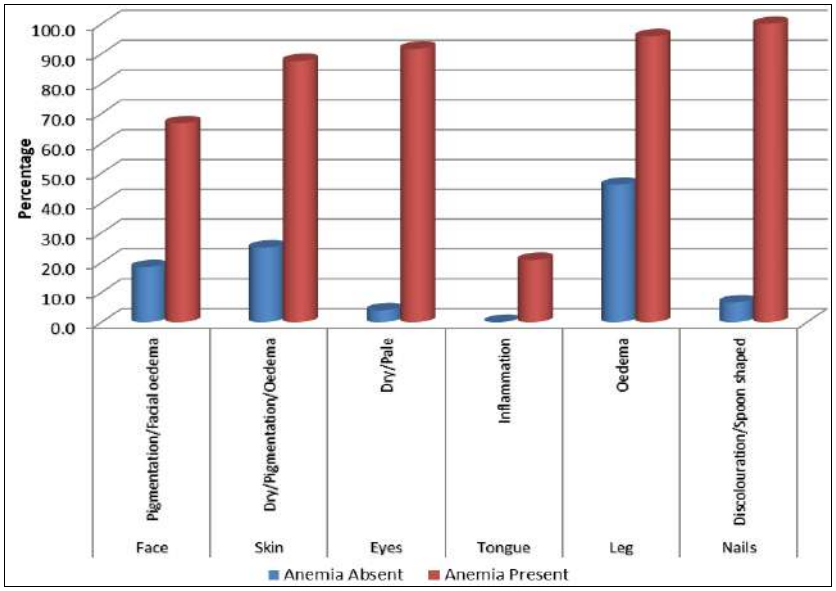


Fig 5: signs and symptoms with anemia among pregnant

Conclusion

Iron deficiency anaemia is the most frequent form of anaemia in pregnant women, Through this study we can understood that 24% of pregnant women have anemia because their protein intake is low, similarly pregnant women with low intake of vitamin c are also found to be anaemic at the same time pregnant women with excessive use of processed foods and junk foods also have anaemia. The signs and symptoms with anaemia among pregnant women are pigmentation and oedema in face, dry and pigmented skin, dry and pale eyes, inflammation on tongue, oedema on legs, discoloured and spoon shaped nails etc…These are some of the symptoms seen in pregnant women with anaemia. Avoid iron deficiency anemia and vitamin deficiency anaemia by eating a diet that includes a variety of vitamins and minerals, including: Iron. Iron-rich foods include beef and other meats, beans, lentils, iron-fortified cereals, dark green leafy vegetables and dried fruit, Folate. Iron transport from ferritin and the reticuloendothelial system is increased by ascorbic acid, or vitamin C, which raises iron usage during heme production. It is widely known to actively participate in the gut's absorption and metabolism of iron. Studies on the treatment of anaemic non-pregnant women with vitamin C showed considerable improvements in haemoglobin levels.

Ethical approval

Ethical clearance taken from institutional ethics committee

Reference

1. Arnell Rupert, Goldman Daniel, Bertucci Frank. Protein deficiencies in pregnancy. Journal of the American Medical Association. 1945;127;1101-1107.
2. Adams EB, Scragg JN, Naidoo BT, Liljestrand SK, Cockram VI. Observations on the aetiology and treatment of anaemia in kwashiorkor. British Medical Journal. 1967;3(5563):451.
3. Breymann C. Iron deficiency anemia in pregnancy. In Seminars in hematology. WB Saunders. 2015 Oct;52(4):39-347.
4. Butte NF, King JC. Energy requirements during pregnancy and lactation. Public Health Nutr 2005;8:1010-27.
5. Elango R, Ball RO. Protein and Amino Acid Requirements during Pregnancy. Adv Nutr. 2016 Jul

15;7(4):839S-44S. doi: 10.3945/an.115.011817. PMID: 27422521; PMCID: PMC4942872.
6. FAO. Human energy requirements. Report of a Joint FAO/WHO/UNU Expert Consultation. Rome (Italy): FAO; c2004. FAO Food and Nutrition Technical Report Series 1.
7. Herring CM, Bazer FW, Johnson GA, Wu G. Impacts of maternal dietary protein intake on fetal survival, growth, and development. Experimental Biology and Medicine. 2018;243(6):525-533.
8. Hallberg L, Rossander-Hulten L. Iron requirements in menstruating women. The American journal of clinical nutrition. 1991;54(6):1047-1058.
9. Ho A, Flynn AC, Pasupathy D. Nutrition in pregnancy. Obstetrics, Gynaecology & Reproductive Medicine. 2016;26(9):259-264.
10. King G, Tomz M, Wittenberg J. Making the most of statistical analyses: Improving interpretation and presentation. American journal of political science; c2000. p. 347-361.
11. King JC. Physiology of pregnancy and nutrient metabolism. Am J Clin Nutr. 2000;71:1218S-25S.
12. Kurpad AV, Anand P, Dwarkanath P, Hsu JW, Thomas T, Devi S, *et al*. Whole body methionine kinetics, transmethylation, transulfuration and remethylation during pregnancy. Clin Nutr. 2014;33:122-9.
13. Labate John S. Classification and treatment of the anemias of pregnancy. American Journal of Obstetrics and Gynecology, 1939;38(1):48-56. doi:10.1016/s0002-9378(39)90476-x
14. Malinowski AK, Murji A. Iron deficiency and iron deficiency anemia in pregnancy. CMAJ. 2021 Jul 26;193(29):E1137-E1138. Doi:10.1503/cmaj.210007. PMID: 34312167; PMCID: PMC8321297.
15. Ogunbode O, Ogunbode O. Anaemia in Pregnancy. In: Okonofua, F., Balogun, J.A., Odunsi, K., Chilaka, V.N. (eds) Contemporary Obstetrics and Gynecology for Developing Countries. Springer, Cham; c2021. https://doi.org/10.1007/978-3-030-75385-6_29
16. Sabina S, Iftequar S, Zaheer Z, Khan MM, Khan S. An overview of anemia in pregnancy. J Innov Pharm Biol Sci. 2015;2(2):144-51.
17. WHO/FAO/UNU. Protein and amino acid requirements in human nutrition. Report of a joint WHO/FAO/UNU Expert Consultation. World Health Organ Tech Rep Ser. 2007;935:103-33.
18. Wood RJ, Ronnenberg A. Iron. In: Shils ME, Shike M, Ross AC, Caballero B, Cousins RJ, editors. Modern Nutrition in Health and Disease. 10th ed. Baltimore: Lippincott Williams & Wilkins; c2005. p. 248-70.
19. Carolyn FC, Karen NK. From prisoners to apostles: A typology of repeat buyers and loyal customers in service businesses. Journal of services Marketing. 2002;16(4):322-41.