Sarcouncil Journal of Medical Series

ISSN(Online): 2945-3550

Volume- 01| Issue- 08| 2022

Research Article **Received:** 22-09-2022 | **Accepted:** 05-10-2022 | **Published:** 18-10-2022

Ultrasound Diagnosis of Anemia and It's Effect on Iron Deficiency in Pregnant Iraqi Women

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Abstract: **Background:** The current study was conducted in the period from 5-5-2021 to 22-4-2022. It is a descriptive cross-sectional study; 120 patients were collected according to the severity of anemia, where demographic information and data were collected from different hospitals of Iraq. The data and demographic information for this study were analysed by using IBM soft SPSS statistical analysis program, in addition to Microsoft Excel 2013. The results which found in this study showed 120 patients were collected and divided into two groups according to the incipient of the anemia (mild anemia for 80 patients with 66.6%, severe anemia for 40 patients 33.33%). Mild anemic patients had haemoglobin levels of 9.8 ±0.3, while for severe anemia patients, levels of haemoglobin were 7.2 ± 0.5. AFI at delivery was checked, and a clear increase in levels was noted; and this explains the role of incidence anemia, where a significant relationship was found between AFI levels and anemia incidence, with a p-value < 0.05. The study found that low concentrations of haemoglobin in the first trimester of pregnancy appeared to be associated with low body weight, as a positive and significant association was observed between fetal weight and increased haemoglobin concentration. Currently, anemia is still of great importance, so it is necessary to design strategies to prevent iron deficiency, to identify and supplement women at the most severe stage of anemia, and to detect it early in pregnant women.

Keywords: Anemia, Ultrasound diagnosis, AFI, pregnant, haemoglobin, Iron, LBW.

INTRODUCTION

Iron deficiency anemia leads to serious consequences for a pregnant woman, which are associated with the followings: reduced ability to work, fatigue, weakness, and psychological dysfunction, which in total affect the quality of life both physically and psychologically [Sharma, J.B. *et al*., 2016; Tomkins, A, 2003; Ganz, T. *et al*., 2009].

In the fetus/newborn, iron deficiency can have severe consequences for developing brain function, increasing the prevalence of preterm birth and the frequency of low birth weight, as well as perinatal mortality. Babies born to iron-deficient mothers have lower cognitive, motor, socio-emotional and physiological development [Guida, C. *et al*., 2015; Byg, K.E. *et al*., 2000; Rial-Crestelo, M. *et al*., 2019]. There are different definitions of anemia during pregnancy, and the World Health Organization (WHO) considers that in order for anemia to exist, haemoglobin (Hb) values must be less than 11 g/dl. On the other hand, the Centre for Disease Control and Prevention (CDC) takes various lower limits, so it defines gestational anemia as when hemoglobin is less than 10.5 g/dl and/or hematocrit (Hct) is less than 32% during the second trimester, or when it is less than 11 g/dl and/or 33% in the first and third trimesters [Siu, A.L, 2015; Sekhar, D.L. *et al*., 2017; Milman, N, 2006; Yadav, K. *et al*., 2020].

The World Health Organization considers that approximately 42% of pregnant women will develop anemia at some point during pregnancy. The most common types of anemia are iron deficiency, megaloblastic and sickle cell.

Iron deficiency anemia is most common in underdeveloped countries and accounts for nearly 75% of cases and is due to poor nutrition during pregnancy and a lack of prenatal diagnosis of anemia.

Given the high frequency of this disorder and its association with serious maternal and fetal outcomes, the identification and differentiation of pathological anemia from physiological pregnancies in all pregnant patients is of fundamental importance, especially in high-risk patients. The aim of this research will be the ultrasound diagnosis of anemia and its effect on iron deficiency in Iraqi pregnant women [Teng, X. *et al*., 2018; Moretti, D. *et al*., 2015].

Presence of anaemia during pregnancy increases perinatal mortality, and intrauterine growth retardation (IUGR) alters placental development

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DOI- https://doi.org/ 10.5281/zenodo.7221449

and increases the risk of fetal loss; In addition, it reduces the tolerance for blood loss. In addition, iron deficiency is associated with a threefold increase in the risk of low birth weight (LBW) and a twofold increase in the risk of preterm birth [Stefopoulou, M. *et al*., 2020].

MATERIALS AND METHODS

In this study, 120 patients were collected according to the severity of anemia, where demographic information and data were collected from a number of different hospitals of Iraq with a study period for a full year from 5-5-2021 to 22-4-2022. In this study, pregnant women and those suffering from Anemia, Ultrasound diagnosis of anemia and its impact on iron deficiency in Iraqi pregnant women has been relied upon. Initiate the diagnosis of anemia in patients at risks of developing it, such as women with hemoglobinopathy or known genetic disorders.

Ultrasound detection of placental abnormalities, fetal neoplasms, or mono-placental pregnancy is another criterion of suspicion that warrants referral of this pregnant woman to the third level of care with specialists in prenatal diagnosis and treatment.

In this study, pregnant women were distributed into three groups by depending on the concentration of haemoglobin. The investment criteria in this study were patients between the ages of 25 to 40 years. As for the exclusion criteria, they included patients with fatal chronic diseases. In addition to pregnancy-related diseases such as gestational diabetes or preeclampsia.

Some preliminary information in the electronic record to the hospital was also based on, and cooperation was made with the committees that provided licenses for the purpose of conducting this study and collecting data related to patients.

The data and demographic information for this study were analysed by using IBM soft SPSS statistical analysis program, in addition to Microsoft Excel 2013.

RESULTS

Table 1: Distribution of patients according to age

		Age (mild)	**Age (severe)**
No.	Valid	80	40
	Missing	40	80
Mean		31.9875	31.1250
Std. Error of Mean		.54642	.67576
Median		31.0000	30.0000
Std. Deviation		4.88732	4.27388
Variance		23.886	18.266
Skewness		.118	-.035
Std. Error of Skewness		.269	.374
Range		15.00	13.00
Minimum		25.00	25.00
Maximum		40.00	38.00

Table 2: MEAN± SD of distribution value HG for patients

		Hb mild	**Hb severe**
No.	Valid	80	40
	Missing	40	80
Mean		9.8111	7.2650
Std. Error of Mean		.04084	.09409
Median		9.7000	7.4500
Std. Deviation		.36526	.59509
Variance		.133	.354
Skewness		.249	-.690
Std. Error of Skewness		.269	.374
Range		1.20	2.00
Minimum		9.20	6.20
Maximum		10.40	8.20

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Table 3: Characteristics results of patients according to gestational age by ultrasound

		gestational age (mild)	gestational age (severe)
No.	Valid	80	20
	Missing	40	100
Mean		33.4500	31.3000
Std. Error of Mean		.06632	.42981
Median		33.5000	30.5000
Std. Deviation		.59321	1.92217
Variance		.352	3.695
Skewness		-.549	.266
Std. Error of Skewness		.269	.512
Range		2.00	5.00
Minimum		32.00	29.00
Maximum		34.00	34.00

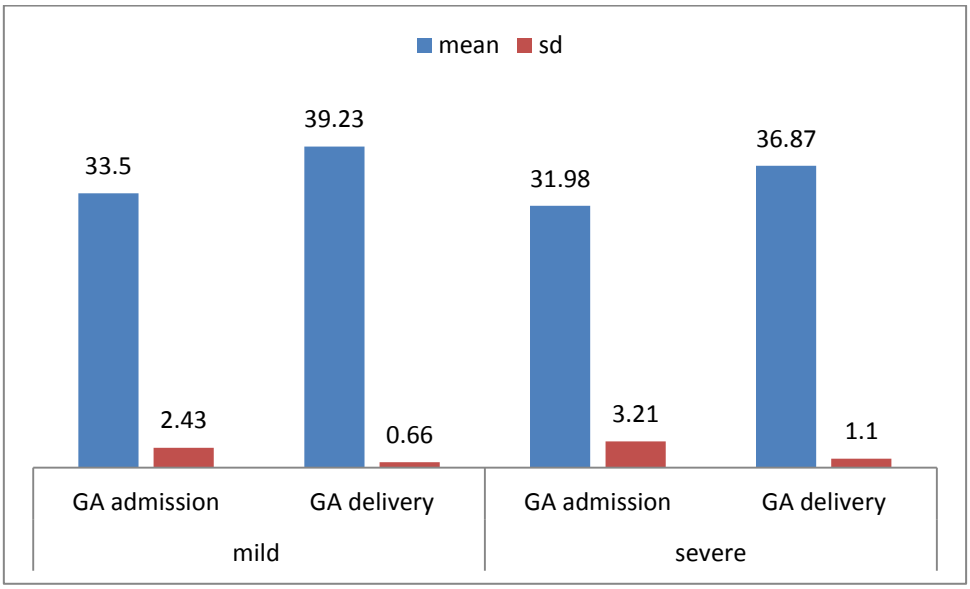

Fig 1: Distribution of patients according to gestational age at admission and delivery

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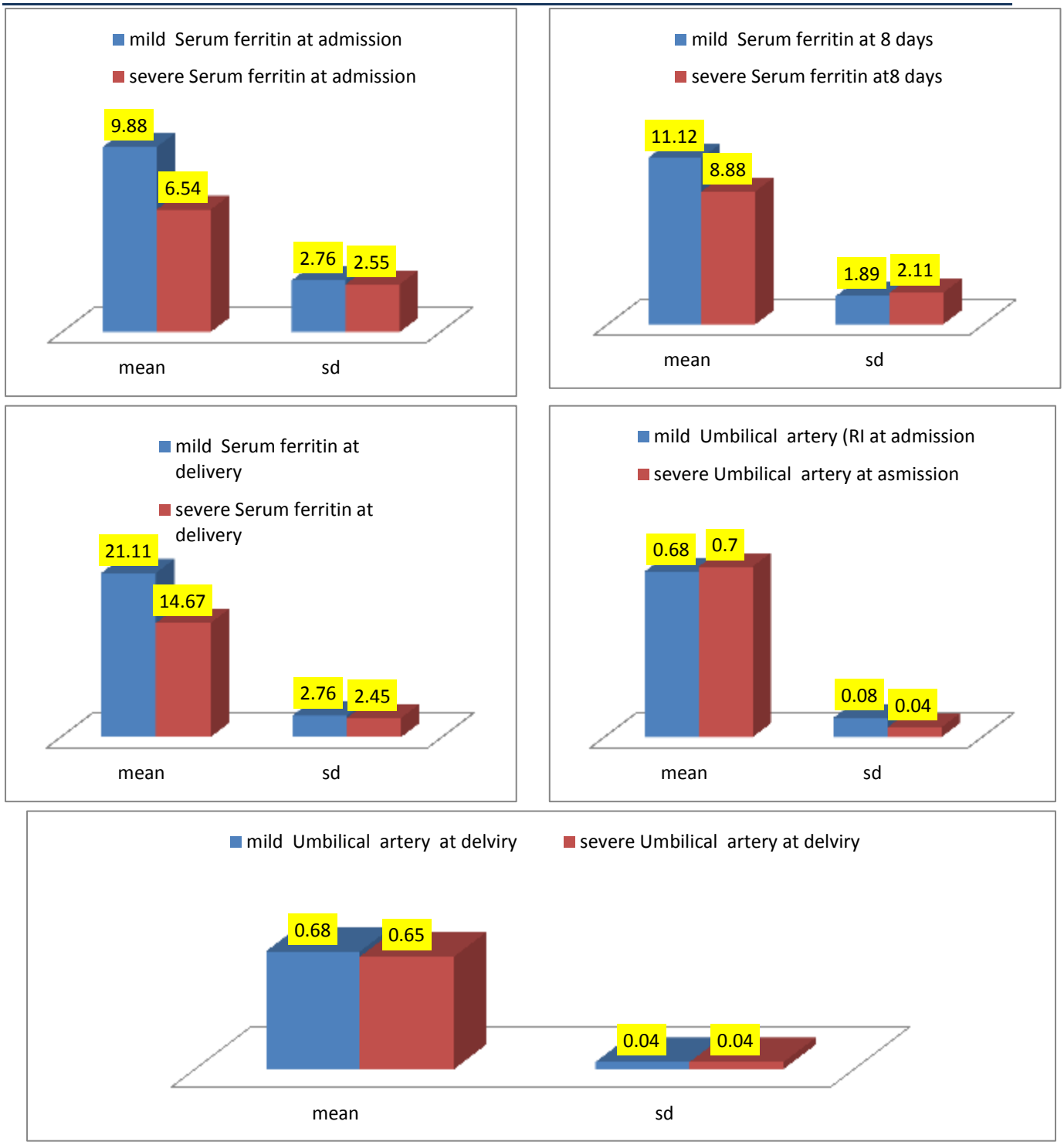

Fig 2: Outcomes of clinical criteria for Serum ferritin and Umbilical artery (RI) between mild anemia and severe

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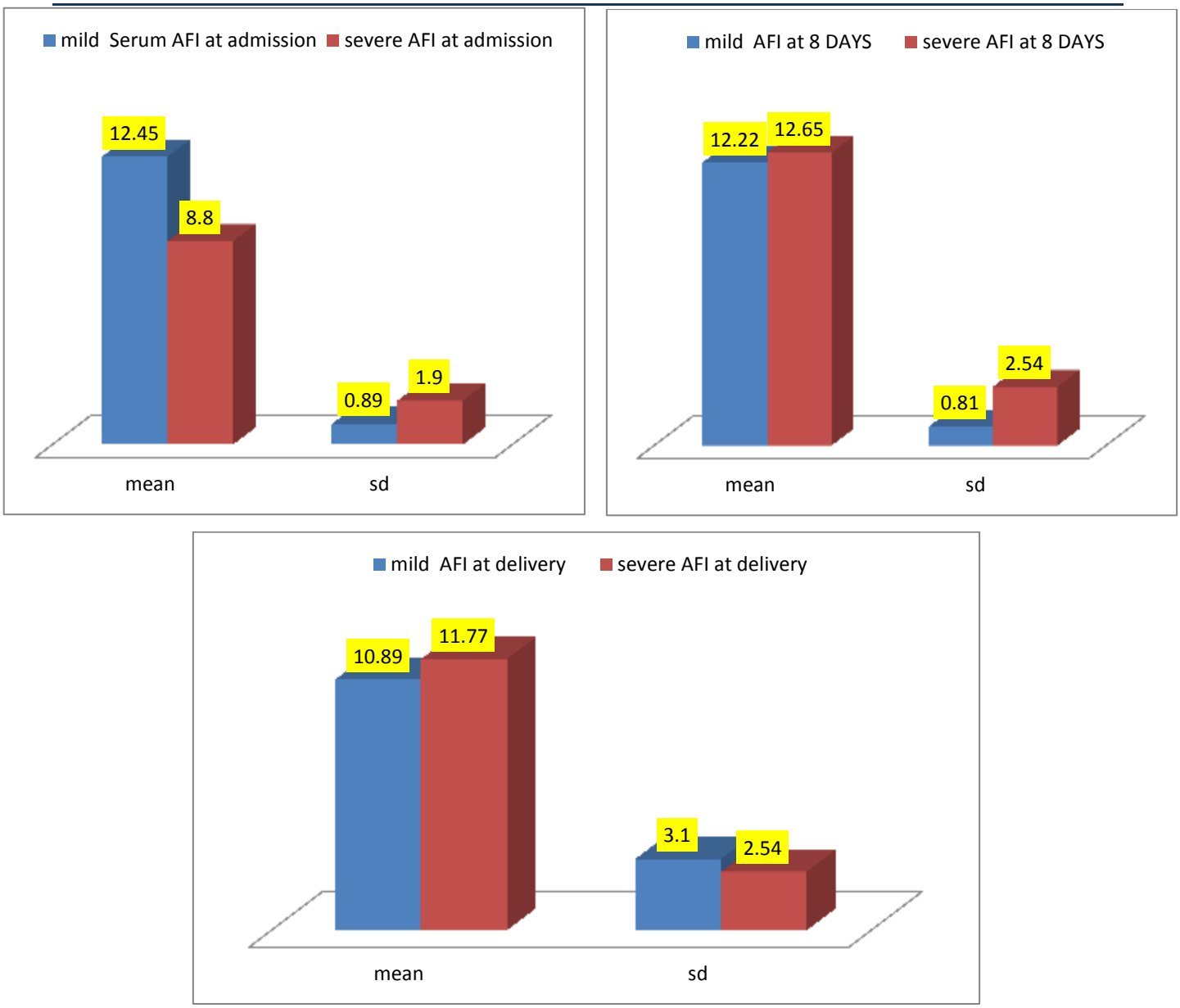

Fig 3: Compare in results according to Amniotic Fluid Index mean

Table 4: Final outcomes of study related to Neonatal birth weight in (Kg) and APGAR score

Variable	Mild	Severe	P-value	Chi-square
Neonatal birth weight	3.48±0.1	2.26±0.045	0.0034	4.55
APGAR score	8.82±0.2	7.45±0.042	<0.001	6.33

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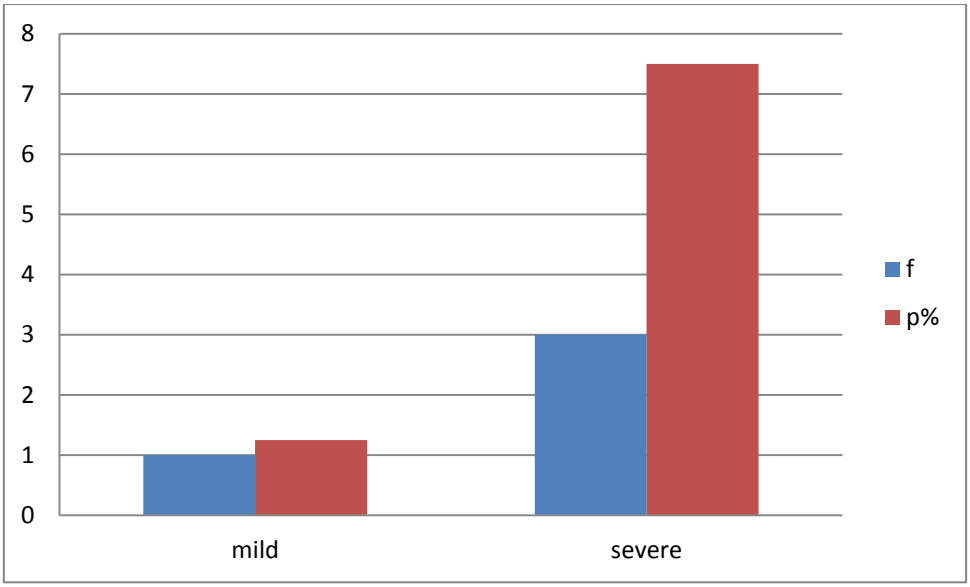

Fig 4: Differences in the two groups according to The Neonatal Intensive Care Unit

DISCUSSION

This study discussed the ultrasound diagnosis of anemia and its impact on iron deficiency in pregnant Iraqis, where 120 patients were collected and divided into two groups according to the severity of the anemia (mild anemia for 80 patients with 66.6%, severe anemia for 40 patients). with 33.33%).

According to the statistical analysis program IBM spss soft 22, the average age of the patients was calculated. The mean and std value was for the mild anemia group (31.98 ± 4.88), while for the severe anemia group (32.12 ± 4.27), the average age, in general, ranged between 25-40 years. Normal hemoglobin levels for men are between 14.0 and 17.5 grams per decilitre (g/dL); For women, it weighs between 12.3 and 15.3 g/dL.

Anemia is defined as a condition in which the hemoglobin content in the blood is lower than normal as a result of a deficiency in one or more essential nutrients (such as iron and folic acid). The cause may also be excessive blood loss.

Anemia patients were classified according to haemoglobin, and Table 2 shows that mild anemic patients had haemoglobin levels of 9.8 ±0.3, while for severe anemia patients, levels of haemoglobin were 7.2 ±0.5.

Determining the gestational age through ultrasound diagnosis based on the organs of the fetus is more accurate than relying on the date of the mother's last menstruation, and its importance lies in evaluating the rate of fetal growth and detecting abnormalities that may appear in the form of exceptional measures of the head, abdomen, bones or other organs of the fetus.

Ultrasound during pregnancy aims to diagnose, and it consists in imaging the fetus inside the mother's womb to detect any abnormalities and conduct a comprehensive follow-up of the fetus during pregnancy.

The mean gestational age was in the first group 33.4500 ± 0.59321. As for the second group, a decrease in the average gestational age index was noted: 31.3000 ± 1.92217.

A decrease in ferritin levels was observed in patients with severe anemia, where the mean values and SD were (6.54 ± 2.55), and ferritin levels were tested. After several days, a significant increase in ferritin levels was found.

Anemia is a terminal iron deficiency condition in which the initial steps of iron deficiency result in decreased blood ferritin levels and increased levels of the soluble transferrin receptor.

Low ferritin values are usually accompanied by low iron values or decreased red blood cell volume and are one of the most common conditions where ferritin levels are insufficient during pregnancy [Balarajan, Y. *et al*., 2013].

Haemoglobin decreases physiologically between the second and third trimesters of pregnancy and then regains its pre-pregnancy values at the end of the third trimester or at the end of pregnancy. Under this condition, hemoglobin reference points were established to define anemia in pregnant women, which is different from that of non-pregnant women (Hb = 12 g/dL). The World

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Health Organization has stated that to diagnose anemia in pregnant women in the second and third trimesters, haemoglobin values must be less than 11 g/dL. The CDC sets a value of 10.5 g/dL in the second trimester and 11 g/dL in the third trimester [Cao, C. *et al*., 2013; Kozuki, N. *et al*., 2012].

Also, in this study, the fact that iron supplementation significantly helped haemoglobin levels in the blood in the long term was recognized, and the results of this study agree with llio dro 2013.

As for the levels of AFI for severe anemia patients (8.8 ± 1.9), the levels of AFI at delivery were checked, and a clear decrease in levels was noted, and this explains the role of severity Anemia: a significant relationship was found between AFI levels and anemia severity, with a p-value < 0.05.

Table 5: Spearman's rho correlation between Severe anemia with AFI

Correlations				
			Severe anemia	**AFI**
Spearman's rho	Severe anemia	Correlation Coefficient	1.000	.274
		Sig. (2-tailed)	.	.088
		N	80	40
	AFI	Correlation Coefficient	.274	1.000
		Sig. (2-tailed)	.088	.
		N	40	40

The results presented in this study showed that there was a statistically significant difference between the neonatal birth weight of anemic women (P < 0.0001). Although the neonatal birth weight of anemic mothers had a higher prevalence of low body weight, this difference was not significant (p > 0.05).

Similarly, Ma, *et al*. found that lower maternal Hb levels have an effect on the weight of newborns with Hb values less than eight g/dL; While Lelic, *et al*., (28) found that newborns of mothers with anemia had higher haemoglobin levels than the study of Ma, *et al*., (p < 0.0001).

It has been indicated that the risk of LBW depends on the severity of the anemia; pregnant women with moderate/severe anemia reported a high risk of giving birth to a baby with low body weight, and even in cases of mild anemia, another study found that lower concentrations of haemoglobin at months The first trimester of pregnancy appears to be associated with low body weight, as a positive and significant association between fetal weight and increased maternal haemoglobin concentration was observed in the first trimester.

CONCLUSION

A study was established to know the effect of anemia on iron deficiency in pregnant women, and an ultrasound was used for the purpose of diagnosis. In this study, we conclude that patients with severe anemia had low levels of haemoglobin, and patients who received oral treatment contributed to raising Haemoglobin levels were also found to have an effect of severe anemia on patients who were transferred to the neonatal intensive care unit with 7.5%, and a statistically significant relationship with the severity of anemia was found, p-value < 0.001.

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Source of support: Nil;
Conflict of interest: Nil.

Cite this article as:
Latif, M.K.A., Ismael, V.A. and Salman, S.Z. "Ultrasound Diagnosis of Anemia and its Effect on Iron Deficiency in Pregnant Iraqi Women." *Sarcouncil Journal of Medical Series* 1.8 (2022): pp 9-16.

Publisher: SARC Publisher