Effect of Iron Deficient on the Pregnant Women

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ABSTRACT— A statistical study on the prevalence of anemia among pregnant women in the city of Baghdad during the COVID-19 pandemic (May 2020 to September 2021) was conducted by this paper. Data were collected from women whose ages ranged between 18-38 years, their gestation period ranged from 3-9 months and from visitors to 85 private clinics and laboratories in the capital, Baghdad, on both sides of Rusafa and Karkh. The results of the disease studied were obtained by performing a CBC test. While the chronic diseases that were observed in the sample women were diabetes and hypertension. The obtained results showed that nearly 34% of pregnant women suffer from anemia as a result of a low level of iron in their bodies, and 13% of them suffer from moderate anemia and 7% from severe anemia, while the percentage of pregnant women who did not know that they had this disease is 57%. The study noted that approximately 72% of the affected women did not suffer from any chronic diseases and that 62% of them had diabetes. The study also indicated a clear decrease in cases in the first two months of the study period and that the number of anemic women in 2020 was lower than for the same time period in 2021. The study showed that 47% of the infected women had one of their fathers with the disease.

KEYWORDS: Iron, deficient, pregnant women, anemia and COVID-19 pandemic

1. INTRODUCTION

Anemia can be defined as a health problem that occurs when the body lacks enough iron due to a lack of red blood cells or hemoglobin (responsible for transporting oxygen to the various cells of the body) [1]. Accordingly, the lack of healthy red blood cells or a decrease in hemoglobin leads to a lack of oxygen necessary for the cells of the body, and this prevents them from performing their function fully [2]. In fact, the severity of anemia ranges from mild to severe, depending on the percentage of hemoglobin in the blood [3]. In the normal case, the percentage of hemoglobin in men is more than 13.5 g/dl, and in women it is more than 12 g/dl [4]. It should be noted that anemia may be temporary in some cases and may last for a long time in others [5]. Anemia is the most common pathology in blood diseases, affecting about one third of the world's population, and iron deficiency anemia affects nearly one million people, according to 2013 statistics, and in the United States, this disease affects more than three and a half million Americans per year [6]. Women and people with chronic diseases may be at greater risk of developing anemia [7]. Iron deficiency anemia has caused about 183,000 deaths [8], and is more common in women during pregnancy, children and the elderly than in men [9]. Anemia increases medical care costs and reduces an individual's productivity as their ability to work decreases. Symptoms that appear on the person with anemia vary according to the cause of the infection, the type of anemia [6], the severity of symptoms, and the appearance of any other health complications, and the person may not feel the symptoms of the disease if it is mild or moderate, but if it is severe, he feels them [10]. The most important and most common of these symptoms are dehydration, feeling tired, general fatigue, inability to tolerate cold weather, rapid heartbeat, inability to breathe properly, especially when doing physical exertion such as exercise, constant feeling of fatigue and exhaustion, and loss of balance, headache, loss of ability to focus and sometimes forgetfulness, pale skin, feeling dizzy or lightheaded, feeling muscle tension in the leg and foot area, sleep problems such as

insomnia, chest pain, shortness of breath, coldness and numbness in the limbs followed by weakness of movement, activity and psychological suffering of the patient, and depression [11]. Abdominal pain can occur when a person has anemia caused by chronic lead poisoning [12].

The types of anemia can be divided according to their causes into 1. Iron deficiency anemia, which is one of the most common types of anemia, affecting approximately 2%-3% of the adult population of the United States. The reason for this type of anemia is that the bone marrow needs iron in order to produce hemoglobin, and in the absence of good amounts of it, this may cause a decrease in the production of red blood cells [6]. 2. Vitamin Deficiency Anemia: The body needs many vitamins, such as: folic acid and vitamin B12 to produce an adequate amount of red blood cells. An incomplete diet may reduce red blood cell production, and there are some people who suffer from the inability of their body to absorb vitamin B12 effectively [13]. 3. Aplastic anemia: aplastic anemia is a rare but life-threatening type of anemia and usually occurs as a result of a reduced ability of the bone marrow to produce all types of blood cells. The cause of aplastic anemia is still unknown in most cases, but it is believed that it is related to diseases that affect the functioning of the immune system [14]. 4. Anemia caused by a disease in the bone marrow: There are many diseases, such as leukemia and myelodysplasia, which can lead to anemia and affect the bone marrow. It can cause a decrease or complete halt in the production of red blood cells [15]. 5. Hemolytic Anemia: This type of anemia occurs when red blood cells are destroyed faster than the bone marrow can produce new blood cells [16]. 6. Sickle cell anemia: Sickle cell anemia is inherited and in most cases affects people of African descent. It usually occurs as a result of an imbalance in hemoglobin that causes red blood cells to form in sickle shape, and thus these cells die prematurely [17]. 7. Infection with some diseases: There are some diseases that may cause significant damage to red blood cells, such as: immune system disorders that cause the production of antibodies (antibodies) to red blood cells and cause their premature destruction [18]. 8. Chronic disease: Anemia is caused by many chronic diseases, such as cancer, acquired immunodeficiency syndrome (AIDS), gout, Crohn's disease, some chronic inflammatory diseases, and kidney failure. There are a number of risk factors associated with anemia, including malnutrition. In most cases, the diet of many does not contain sufficient amounts of iron and other vitamins such as folic acid, which increases the risk of anemia [19,20]. There are a number of risk factors associated with anemia, including malnutrition. In most cases, the diet of many does not contain sufficient amounts of iron and other vitamins such as folic acid, which increases the risk of anemia. Menstrual cycle Women in the fertile period are more likely to develop iron-deficiency anemia than men, because women lose blood during menstruation [21]. A pregnant woman is at high risk of iron deficiency anemia, because the fetus needs quantities of iron and hemoglobin for its growth and development [9]. Genetic factors anemia is sometimes transmitted genetically, if a family member suffers from one of the types of anemia that is transmitted genetically, such as sickle cell anemia [22].

Anemia is diagnosed by a specialist doctor based on an understanding of the patient's health and family history, and the main point is that the disease is determined through a blood test, and this is done by conducting some tests [23], these tests including: 1. Complete blood count (CBC): by this test, the doctor can know the number of red blood cells, white blood cells, and platelets. With regard to anemia, the doctor is concerned with the number of red blood cells primarily, specifically as a result of hemoglobin and hematocrit, which represents the level of red blood cells in the blood. It should be noted that the normal level of hemoglobin in adult men ranges between 14 and 18 g/dl, while in adult women it ranges between 14 and 16 g/dl, while the normal percentage of hematocrit for adult men ranges between 40-52%, and for adult women Between 35-47%, and all this with the need to take into account the presence of simple differences between laboratories [24]. 2. Hemoglobin electrophoresis (HB electrophoresis) a blood test that measures and identifies the different types of protein found inside red blood cells known as hemoglobin.

This protein is responsible for transporting oxygen to tissues and organs, and some genetic mutations may lead to disturbances in the production and function of hemoglobin, which reduces the amount of oxygen that reaches tissues and organs [25]. 3. Iron and ferritin level: Ferritin is a blood protein that contains iron. A ferritin test measures the amount of ferritin in the blood. A ferritin test helps to understand how much iron is stored in the body. If the ferritin test shows that the level of ferritin in the blood is lower than normal, this indicates that the body's iron stores are low and that there is an iron deficiency. Hence, you may be anemic. If the test shows ferritin to be higher than normal levels, this may indicate a medical condition that causes the body to store too much iron [26]. 4. Total iron binding capacity (TIBC): This test is complementary to the ferritin test, and it checks the amount of additional iron that can bind to transferrin (betaglobulin that transports iron in plasma), in addition to the amount related to it before. When the level of iron in the blood is high, the amount of iron that can bind to transferrin is low, and vice versa.

Transferrin saturation results from dividing the iron content in the blood by the total iron binding, and generally ranges between 25% - 40% [27]. 5. Serum Iron Test: the test measures levels of iron in the serum, which is the fluid remaining after red blood cells and clotting factors, are removed from the blood sample. This test is used to check for abnormally high or low levels of iron in the blood, which causes serious health complications. Sometimes, such as iron deficiency or increased iron levels and what is called iron overload [28]. 6. Tests to find out the cause: After the doctor confirms that the patient suffers from anemia, it is necessary to conduct further tests to detect the cause and find out whether the patient suffers from serious health problems that caused him to suffer from anemia, and these tests include: a) A blood smear (Peripheral blood smear) to detect the shape of red blood cells, in other words, to see if the anemia caused a change in the shape of red blood cells. b) Osmotic fragility test, to see if red blood cells have become more fragile than normal. c) Endoscopy to detect the presence of internal bleeding, especially in the upper part of the digestive system, as well as to detect colon and other problems that may cause the patient to suffer from anemia. d) Chest X-ray: This is to rule out infection. e) Ultrasound imaging for the purpose of detecting internal health problems that may cause the patient to suffer from anemia, such as an enlarged spleen, as well as uterine fibroids. f) Computed tomography (CT scan) is used in cases where it is believed that there is internal bleeding and endoscopy cannot be performed, as well as used to detect problems with lymph nodes, bones and other internal causes of anemia. g) Magnetic Resonance Imaging MRI: This type of imaging can detect bone and bone marrow problems as well, in addition to helping to diagnose cases of iron overload, due to its role in detecting iron concentration in various organs, including the heart and liver [29]. The current research aims to determine the prevalence of anemia among pregnant women in the capital, Baghdad, during the year and a half of the Corona pandemic, by completing the statistical relationship that links the disease with other chronic diseases that the study samples suffer from, in addition to family history.

2. SAMPLES COLLECTING AND TESTING

2.1 Samples of Study

The study samples were collected from pregnant women who visited 85 private clinics and laboratories in the city of Baghdad for at least one time during the period from 05/01/2020 to 09/30/2021. The laboratories covered by the study were distributed over most of the geographical areas in the Iraqi capital, and the population density was taken into account during the distribution of samples, where the Rusafa side accounted for 60% of them, while the Karkh side accounted for the rest. The study was conducted on 1386 pregnant women, their ages ranged between 18-48 years, while their gestational ages were between 3-9 months. The results of whether or not the samples were infected with anemia were confirmed by a comprehensive blood count (CBC) test and with the help of a special questionnaire prepared for this study.

The questionnaire includes knowing whether there are chronic diseases, such as diabetes and blood pressure, as well as whether one of the parents has the disease, in addition to the previous infection of the disease, as well as confirming the pregnant woman's prior knowledge of the disease or not.

2.2 Analysis of the results

The results obtained from the prepared questionnaire were analyzed using the Microsoft Excel system and based on the normal limits of the CBC examination indicative in determining anemia, which ranged between (12-16) g/dl and according to the values specified in Table (1) below:

Table (1) Specified Values of Blood Test

Test	Name of Test	Measuring unit	Normal Range		
			Man	Woman	Children
WBC	White Blood Cell	$\times 10^9$/L	4.0-10	4.0-10	5.0-17
RBC	Red Blood Cell	$\times 10^{12}$/L	4.2-6.0	3.8-5.2	4.0-5.2
HGB	Hemoglobin	g/dl	13.0-18.0	12.0-16.0	1.0-5.2
HCT	Hematocrit	L/L	0.37-0.54	0.35-0.5	0.36-0.46
MCH	Mean cell hemoglobin	pg	26-34	23-31	30-42
MCHC	Mean cell hemoglobin concentration	g/dL	32-36	32-36	30-34
MCV	Mean cell volume	fL	80-100	78-94	95-125
RDW	Red blood cell distribution width	%	11.5-14.5	11.5-14.5	-
PLT	Platelets	$\times 10^9$/L	150-450	150-450	150-450
MPV	Mean platelet volume	fL	6.5-12	6.5-12	6.5-12
PDW	Platelet Distribution Width	%	9.0-17	9.0-17	9.0-17
PCT	Plateletcrit	%	0.11-0.28	0.11-0.28	0.11-0.28
ANC	Absolute Neutrophil Count	$\times 10^9$/L	2.0-7.0	2.0-7.0	2.0-7.0
	Neutrophils	$\times 10^9$/L	1.7-7.5	1.7-7.5	1.5-11.0
Lymph	Lymphocytes	$\times 10^9$/L	1.0-3.2	1.0-3.2	1.5-11.1
Mon	Monocytes	$\times 10^9$/L	0.1-1.3	0.1-1.3	0.1-1.9
	Eosinophils	$\times 10^9$/L	0.0-0.3	0.0-0.7	0.0-1.5
	Basophils	$\times 10^9$/L	0.0-0.2	0.0-0.3	0.0-0.7

3. RESULTS AND DISCUSSION

The results obtained from the study samples amounting to 1386 pregnant women were discussed on both sides of the city of Baghdad, Karkh and Rusafa, depending on several variables, namely the age of the pregnant woman, pregnancy period, diabetes and blood pressure, family history of injury, where the results of the questionnaire were divided in relation to the variables above and from The results were interpreted statistically. In general, the results showed that 469 pregnant women suffer from anemia, or 33.84% of the total study samples and 69.16% do not suffer from the disease. This indicates the importance of paying attention to the health of pregnant women and raising the awareness required to avoid anemia.

3.1 Age

The obtained results showed that the percentage of pregnant women suffering from anemia at the age of 41-46 years constituted 52.025%, while the percentage was 20.47% and 12.58% for the age groups 36-41 and 30-35, respectively, while the percentage of those infected with the disease who belonged to the 24-year group 29 years is 8.96%, while the 18-24 age group had a lower rate of illness than all previous groups. Age is an important factor in the incidence of anemia. As a person age progress, the body's ability to produce enough red blood cells decreases, and thus an increase in anemia. People over the age of 65 are more exposed than other age groups to the risk of developing anemia.
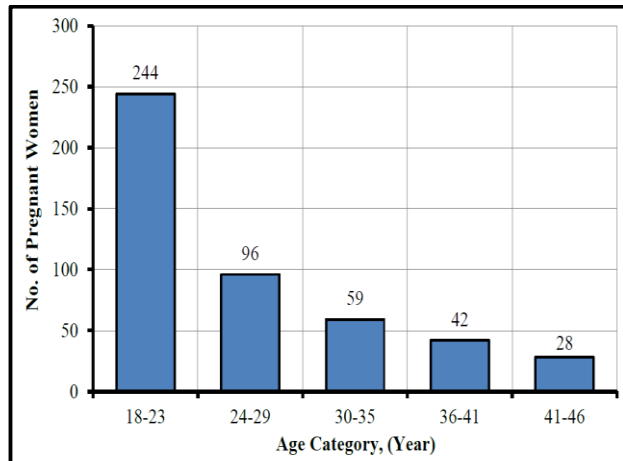
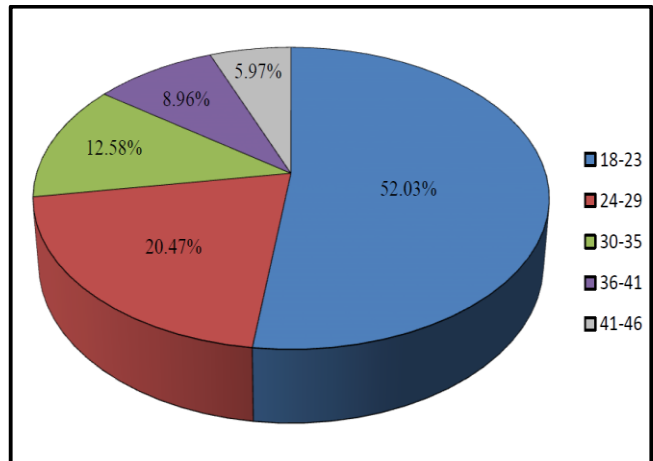**Figure 1** Distribution of infected pregnant women by anemia according to age factor (*by number*)

Figure 2 Distribution of infected pregnant women by anemia according to age factor (*by percentage*)

3.2 Pregnancy period

It was noted from the results of the study that the percentage of women suffering from anemia increases with the advancing gestational age, as the percentage was 13.43%, 29.42%, 45% among pregnant women aged 3-4 months, 5-6 months and 7-8 months, respectively. When the number of pregnant women at the age of 9 months until delivery and suffering from anemia was only 57 women, equivalent to 12.15%, this is the lowest percentage among all groups. Anemia is a very common condition in pregnancy and after childbirth all over the world, during pregnancy a woman is exposed to many psychological and physical changes and health problems, and the most prominent thing she faces is anemia or anemia caused by a lack of iron level in the body. These results can be attributed to several factors, including a lack of iron stores before pregnancy, a digestive defect that impedes the absorption of iron and nutrients, or pregnancy with more than one fetus (twins and more), to increase their iron need, or successive pregnancy (separating the two pregnancies by one year), or having anemia in a previous pregnancy.
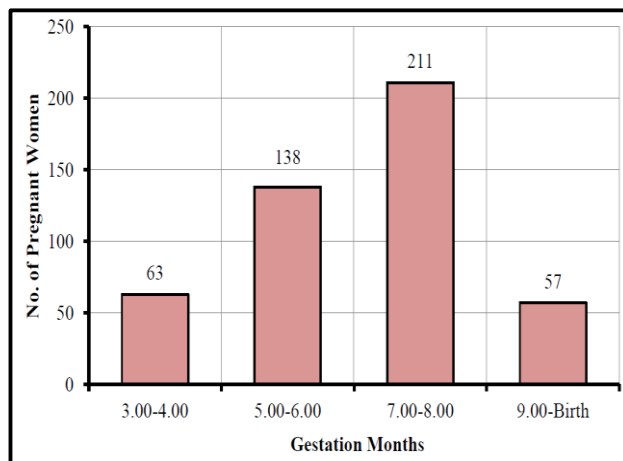

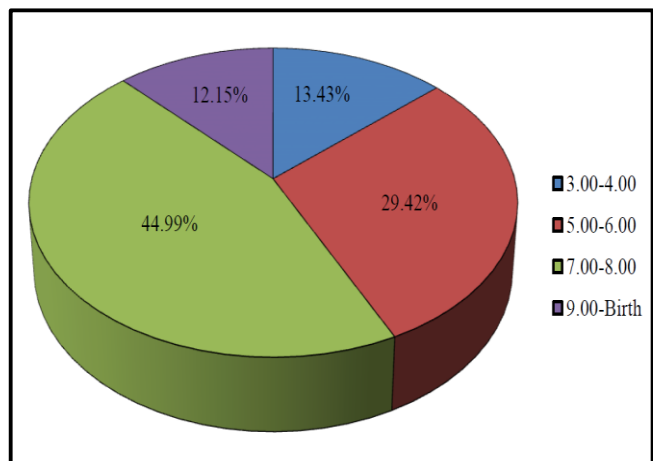**Figure 3** Distribution of infected pregnant women by anemia according to gestation months factor (*by number*)

Figure 4 Distribution of infected pregnant women by anemia according to gestation months factor (*by percentage*)

3.3 Incidence of chronic diseases

The results collected from the questionnaire indicated that 72% of pregnant women suffer from a chronic disease (either high blood pressure or diabetes or both), and that 51.63% of them have diabetes, and that 33.13% of them have high blood pressure and 15.24% of them have both diseases. Diabetes does not cause

anemia directly, but some complications and conditions related to diabetes can contribute to it. For example, both diabetes-related kidney disease (nephropathy) and nerve damage (neuropathy) can contribute to the development of anemia. In addition, taking some diabetes medications by mouth can increase the risk of anemia, and people with diabetes can develop anemia as a result of not eating well, or because of a condition that interferes with the absorption of nutrients. Normally, the kidneys secrete a hormone called erythropoietin, which stimulates the bone marrow to produce red blood cells. In diabetic nephropathy, the small blood vessels that filter waste from the body are damaged and "leaky" substances (such as protein) begin to appear in the urine, at the same time, the amount of erythropoietin produced by the kidneys is reduced, which leads to anemia. Some studies have shown that lower erythropoietin production and anemia occur earlier in people with diabetes and kidney disease, compared to those with kidney disease and no diabetes, and both high blood glucose levels and high blood pressure can lead to damage in the kidneys. In some cases of anemia, the heart works to compensate for the lack of red blood cells by pumping blood faster, the heartbeat increases, and blood pressure rises, which can later lead to an enlarged heart over time, and then its failure. If a person has diabetes, the chances of developing heart problems, including high blood pressure, increase dramatically, according to Every Day Health. There is a protein in the blood called "haptoglobin", which helps prevent some complications of diabetes related to heart problems.

3.4 Family history

The results of the current study concluded that 56.29% of women with anemia had no family history of infection and that 14.5% and 19.4% of them had the father or mother affected, respectively, while the percentage of infected pregnant women who had both parents affected is 9.81%. The index of previous familial infection has an important effect among those with iron deficiency anemia, whether in pregnant women or others. This calls for other advanced tests, electrophoresis of hemoglobin, or examination of a sample of bone marrow to see if the cause of the disease is genetic or not.
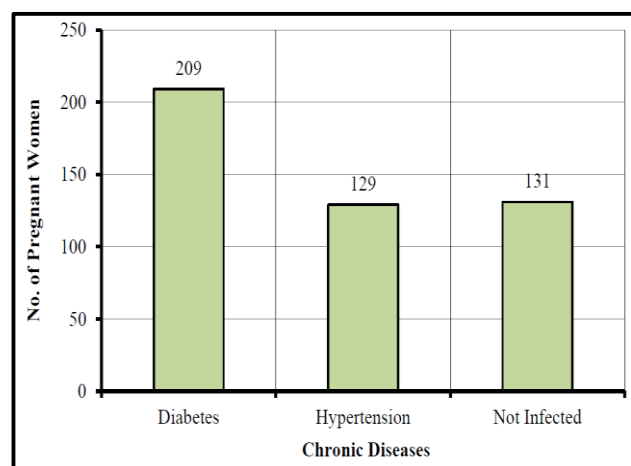

Figure 5 Distribution of infected pregnant women by anemia according to chronic diseases factor (*by number*)
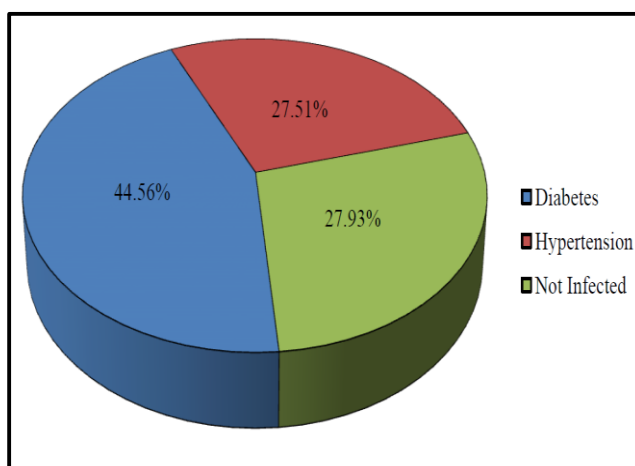

Figure 6 Distribution of infected pregnant women by anemia according to chronic diseases factor (*by percentage*)
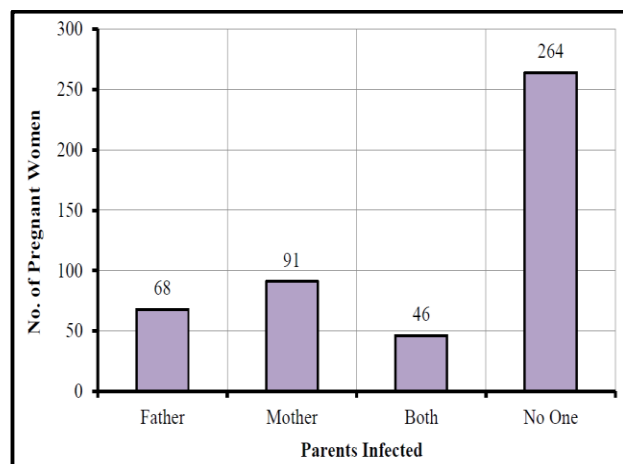
Figure 7 Distribution of infected pregnant women by anemia according to parents infected factor (*by number*)
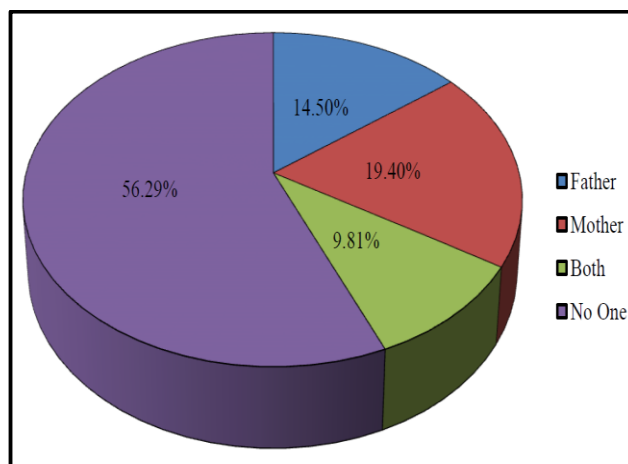

Figure 8 Distribution of infected pregnant women by anemia according to parents infected factor (*by percentage*)

4. Conclusion

The study indicated that one third of the pregnant women included in this study in the Iraqi capital suffer from anemia during the period from the beginning of May 2020 to the end of September 2021, and that there are several important factors affecting the spread of this disease among this important group that needs to be treated by special care. In terms of age, it has been found that the age factor is very important, and the older the pregnant woman, the higher the incidence of anemia. This result was similar to the factor of gestational age, where the relationship was direct between gestational age and the number of pregnant women diagnosed with anemia. On the other hand, the study found a simple relationship between chronic diseases (diabetes and high blood pressure) with anemia among women in the study sample. As for the family history, it had a limited effect, as 44.71% of the affected women had one or both of their fathers suffering from anemia. However, this factor is important and must be followed up in a more focused manner to avoid the possibility of complications that may harm the health of the mother or fetus.

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