

Iron Use in Pregnant Women and Prevalence of Prenatal Anemia

Berrin Telatar, Ethem Erginöz, Yasemin Akın, Engin Tutkun,
Nilgün Gündücü, Serdar Cömert, Sibel Cevizci, Mehmet Cem Turan

İstanbul Bilim University, Department of Family Medicine and Public Health, Istanbul
Istanbul University Cerrahpaşa Faculty of Medicine, Department of Public Health, Istanbul
Dr.Lütfi Kırdar Kartal Training and Research Hospital, 1th Pediatric Clinic,
Istanbul Hospital of Occupational Diseases, Ankara

İstanbul Bilim University, Department of Obstetrics and Gynecology, Istanbul
Süleymaniye Obstetrics and Gynecology Training and Research Hospital, Istanbul
Canakkale University Faculty of Medicine, Department of Public Health, Canakkale
Dr.Lütfi Kırdar Kartal Training and Research Hospital, 2th Department of Obstetrics and Gynecology, Istanbul

ABSTRACT

Iron Use in Pregnant Women and Prevalence of Prenatal Anemia

Iron deficiency anemia is the most common medical disorder of pregnant women. Especially severe anemia is an important factor increasing mortality. Therefore, promoting use of appropriate doses and duration of iron has great importance in preventing iron deficiency in terms of health of the mother and baby. This cross-sectional study was designed to determine the number of women who consumed iron and the duration of intake during pregnancy; to examine the effect of age and the number of births on prenatal iron intake, and to determine prenatal anemia prevalence in a tertiary hospital which provides service for an area of medium and low-income families in Istanbul. 4,041 pregnant women who got admitted to Dr. Lütfi Kırdar Kartal Training and Research Hospital for labor were enrolled in the study during the period between 2001-2004. Age, number of pregnancies and duration of iron intake were recorded. Pregnant women with a less than 11 g /dl hemoglobin concentration were considered anemic. Iron intake rate in pregnant women was 56% and the prevalence of anemia was 46%. Mean hemoglobin concentration was 11.1±1.5 g/dl, mean age was 26.5±5.4 years, and mean duration of iron intake was 3.0±2.2 months. Anemia was found in 36.4% of the iron supplemented group, and 58.1% of the unsupplemented group. Hemoglobin (Hb), Hematocrit (Hct), Mean Corpuscular Volume (MCV) values were statistically different between two groups. It was determined that maternal age does not influence the use of iron; but an increase in parity caused a decrease in iron use and an increase in anemia prevalence. It was observed that there was an increase in the use of iron from 2001 to 2004. In conclusion, it was determined that approximately half the pregnant women admitted to the hospital for delivery received iron during their pregnancy; anemia is less common among iron receivers; iron intake is mainly affected by parity not by maternal age and the effect of iron on blood parameters is positive.

Key Words: Anemia, Pregnancy, Iron Use, Parity, Age

ÖZET

Gebelerde Demir Kullanımı ve Doğum Öncesi Anemi Prevalansı

Demir eksikliği anemisi gebe kadınlarda en sık rastlanan medikal problemdir. Şiddetli anemi, özellikle mortaliteyi artıran önemli bir faktördür. Sonuç olarak demirin uygun doz ve sürede kullanımı anne ve bebekte demir eksikliğini önlemek açısından büyük önem taşır. Bu kesitsel araştırma İstanbul'da orta ve düşük gelirli ailelerin yararlandığı bir 3. basamak hastanede demir kullanan kadınların sayısını, alım süresini, yaş ve paritenin demir kullanımına etkisini ve prenatal anemi prevalansını tespit etmek amacıyla planlandı. Çalışma 2001-2004 yılları arasında dört yıllık dönemde doğum için hastaneye kabul edilen 4041 gebe kadınla yapıldı. Yaş, gebelik sayısı ve demir kullanma süresi kaydedildi. Hemogloblin konsantrasyonu < 11 g/dl olan gebe kadınlar anemik kabul edildi. Gebe kadınlarda demir alımı sıklığı %56, anemi sıklığı %46 bulundu. Ortalama Hb konsantrasyonu 11,1±1,5 g/dl, ortalama yaş 26,5±5,4 yaş ve ortalama demir kullanımı 3,0±2,2 ay aydı. Anemi sıklığı demir alan grupta %36,4, almayan grupta %58,1 bulundu. Hemogloblin (Hb), Hematokrit (Hct), MCV (Ortalama Eritrosit Hacmi) değerleri iki grup arasında istatistiksel olarak farklıydı. Anne yaşının demir kullanımı üzerine etkisi olmadığı ama kullanımın parite ile azaldığı ve aneminin arttığı tespit edildi. 2001 yılından 2004 yılına gidildikçe yıllar içinde demir kullanımında artma olduğu görüldü. Sonuç olarak doğum için hastaneye kabul edilen gebe kadınların gebelikleri sırasında yaklaşık yarısının demir kullandığı, demir takviyesi alanlarda aneminin daha az olduğu; demir alımının yaş yerine pariteden etkilendiği ve kan parametreleri üzerine pozitif etki yaptığı tespit edildi.

Anahtar Kelimeler: Anemi, Gebelik, Demir kullanımı, Yaş

Telatar B, Erginöz E, Akin Y, Tutkun E, Güdücü N, Cömert S, Cevizci S, Turan MC. Iron Use in Pregnant Women and Prevalence of Prenatal Anemia, *TJFMPC* 2014;8(1):13-18. DOI: 10.5455/tjfm.31798

Corresponding author:

Sibel Cevizci, Canakkale University Faculty of Medicine,
Department of Public Health, Canakkale
E-mail: cevizci.sibel@gmail.com
Received Date: January 22, 2014
Accepted Date: February 27, 2014

INTRODUCTION

Anemia is the most common medical problem in pregnancy. While its etiology, severity and degree shows variability among different populations, this problem mainly affects people in developing countries. It was reported that, anemia prevalence among pregnant women varies between 35% to 75% in developing countries, and approximately 18% in developed countries.¹

Iron is necessary for normal fetal development. During pregnancy, the most important cause of anemia is iron deficiency, and minor causes of anemia are folate and vitamin B12 deficiencies, hemoglobinopathy, and hemolytic anemia.²

Anemia is obviously a serious public health problem due to its known adverse effects on mother and baby. 115 000 maternal deaths are caused by iron deficiency anemia per year. Anemia is the second most common cause of maternal mortality in Asia. Not only severe anemia also mild to moderate anemia may increase the risk of death. A large-scale iron support programs have been implemented in some countries like Thailand and Nicaragua.³ In developed countries, routine use of iron is recommended as a pregnancy-support approach.⁴

During pregnancy, iron use leads to some changes in early, mid and long term maternal hematological parameters. Hemoglobin concentration of <11 g/dl in pregnant women is considered as anemia according to World Health Organization criteria.⁵

According to CDC reports, pregnant women that have hemoglobin values of <11 g/dl in the first and third trimester, and <10.5 g / dL in the second trimester are considered anemic.⁶

MATERIAL AND METHOD

Term pregnant women, who gave birth at the Departments of Obstetrics and Gynecology of Dr. Lutfi Kırdar Kartal Training and Research Hospital between 2001 and 2004, were included in the study. Approximately 5% of births in Istanbul took place in Kartal and 50% births in this county took place in the hospital. Also, this Training and Research Hospital serves to the individuals who have low socioeconomic level. Complete blood

count was established before delivery for all cases. Pregnant women who had a hemoglobin concentration of <11 g/dl were included in anemic group, and ≥ 11 g/dl were included in the non-anemic group. The questionnaires were used before birth delivering in order to determine socio-demographic characteristics of pregnant women. Demographic data were acquired through information on the pregnant women's age, number of pregnancies and parity, and the information related to iron use via questions asked orally by the same physician. Iron intakers for less than one month were included in the non-receiving group. Total iron receiving time was recorded regardless of which pregnancy period iron was received. Pregnant women with no previous deliveries were included in nullipara group, one previous delivery were included in primipara group, 2-4 deliveries were included in multipara group, 5 and over deliveries were included in grand multipara group. Statistical analysis was performed by using SPSS-11 program. Independent Sample T test was used for continuous variables, and chi-square test was used for categorical variables. The independent variables that gave significant results in the double analyses were then included in the logistic regression analysis. Probability level of $p < 0.05$ was considered statistically significant.

RESULTS

The total of 4041 term pregnant women with age ranging from 15 to 48 were included in the study. It was found that duration of iron use was longer than one month in 2271 of 4041 pregnant women, and 56% of all pregnant women received iron. The prevalence of anemia in all women was found to be 46% (n: 1858). Mean hemoglobin concentration was 11.1 ± 1.5 g/dl and average duration of iron use was 3.0 ± 2.2 months. All pregnant women were divided into two separate groups as; iron supplemented group (n=2271) and unsupplemented group (n=1770). Mean hemoglobin level of iron supplemented group was 11.4 ± 1.4 g/dl and of unsupplemented group was 10.7 ± 1.6 g/dl (Table I). Anemia ratio was found to be 36.4% (828/2271) in iron supplemented group, and 58.1% (1030/1770) in unsupplemented group ($p=0.000$). The risk of being anemic was found to be 2.4 times greater in unsupplemented group compared to iron supplemented group at 95% confidence interval (OR= 2.4, 95% confidence interval 2.13 to 2.76; $p < 0.001$).

As shown in Table 1, iron supplemented and unsupplemented groups were compared with each other for hematological parameters, in terms of age. The difference in hemoglobin, hematocrit, mean corpuscular volume was statistically

significant ($p < 0.001$). Significant relationship was not determined in terms of age between iron supplemented and unsupplemented groups ($p = 0.115$)

Table 1. Comparison of pregnant women that received and did not received iron

Variables	Iron supplemented group (N=2271)	Iron unsupplemented group (N=1770)	<i>p</i>
Age	26.6 ± 5.3	26.4 ± 5.5	0.115
Hb (g/dl)	11.4 ± 1.4	10.7 ± 1.6	< 0.001
Hct (%)	34.6 ± 3.8	32.8 ± 4.4	<0.001
MCV (fL)	85.9 ± 7.5	83.4 ± 8.6	<0.001

* Results of Independent t test

Table 2. Comparison of iron intake status according to the parity

The number of parity	The number of iron supplemented women n (%)	The number of iron unsupplemented women n (%)	Total	P
Nullipara	892 (63.2)	520 (36.8)	1412	<0.001
Primipara	745 (57.9)	541 (42.1)	1286	
Multipara	587 (48.9)	614 (51.1)	1201	
Grand multipara	48 (33.8)	94 (66.2)	142	

*Chi square test

Table 3. Comparison of the anemic status according to parity

Number of parity	Anemic pregnant women n (%)	Non-anemic pregnant women n (%)	Total	P
Nullipara	566 (40.1)	846 (59.9)	1412	<0.001
Primipara	591 (46)	695 (54)	1286	
Multipara	617 (51.4)	584 (48.6)	1201	
Grand multipara	81 (57)	61 (43)	142	

*Chi square test

There was statistically significant relationship between parity and iron use ($p < 0.001$). It was determined that iron use decreased as the number of parity increased (Table 2). The statistical analysis between parity and anemia showed a significantly increased anemia rate as the parity increased ($p < 0.001$) (Table 3). It was found that nulliparous group had used much more iron than the other three groups and being much less anemic. Primiparous group had used much more iron than multiparous and grand multiparous groups. Anemia rate among Primiparous group is lower than those of multiparous and grand multiparous groups. It was detected that there was no difference between multiparous and grand multiparous groups in terms of iron intake and anemia prevalence.

Logistic regression analysis (Enter Method) was applied for anemia status which has been an outcome variable and iron intake and delivery number as predictive values. We found that anemia rates increased 2.36 (95%CI: 2.08-2.69) times more in iron unsupplemented group. Moreover, compared to the nullipars, the risk of anemia was 1.23 (95%CI: 1.05-1.44) times higher in primiparous, 1.37 (95%CI: 1.17-1.61) times more likely in the multiparous and 1.59 (95%CI: 1.11-2.27) times more likely in the grand multiparous.

The percentage of iron intake was found to be increased in pregnant women who applied to the hospital for birth delivering from 2001 to 2004. It was found that 845 (51.6%) pregnant women of 1637 in 2001, 686 (56.7%) pregnant women of 1210 in 2002, 548 (61.3%) pregnant women of 894 in 2003, 134 (64.5%) pregnant women of 209 in 2004 had used iron for one month and over. It was observed that iron intake among pregnant women had increased in years (Figure 1).

DISCUSSION

Anemia in pregnancy poses a significant problem in developing countries.⁷ Multipara, vegetarians, blood donors, those with low socioeconomic level and those who migrated especially from Asia may have the risk of anemia, even in developed countries. In Peru, 35% of women at childbearing age and 50% of pregnant women are anemic.⁸ It's assumed that, 42% of women in Africa, 30% of women in Latin America, 80% of women in Southeast Asia and 65% of women in the Eastern Mediterranean are anemic and it has been demonstrated that changes in hemoglobin and serum ferritin concentration during pregnancy is related to hemoglobin concentration at the beginning of pregnancy.⁹

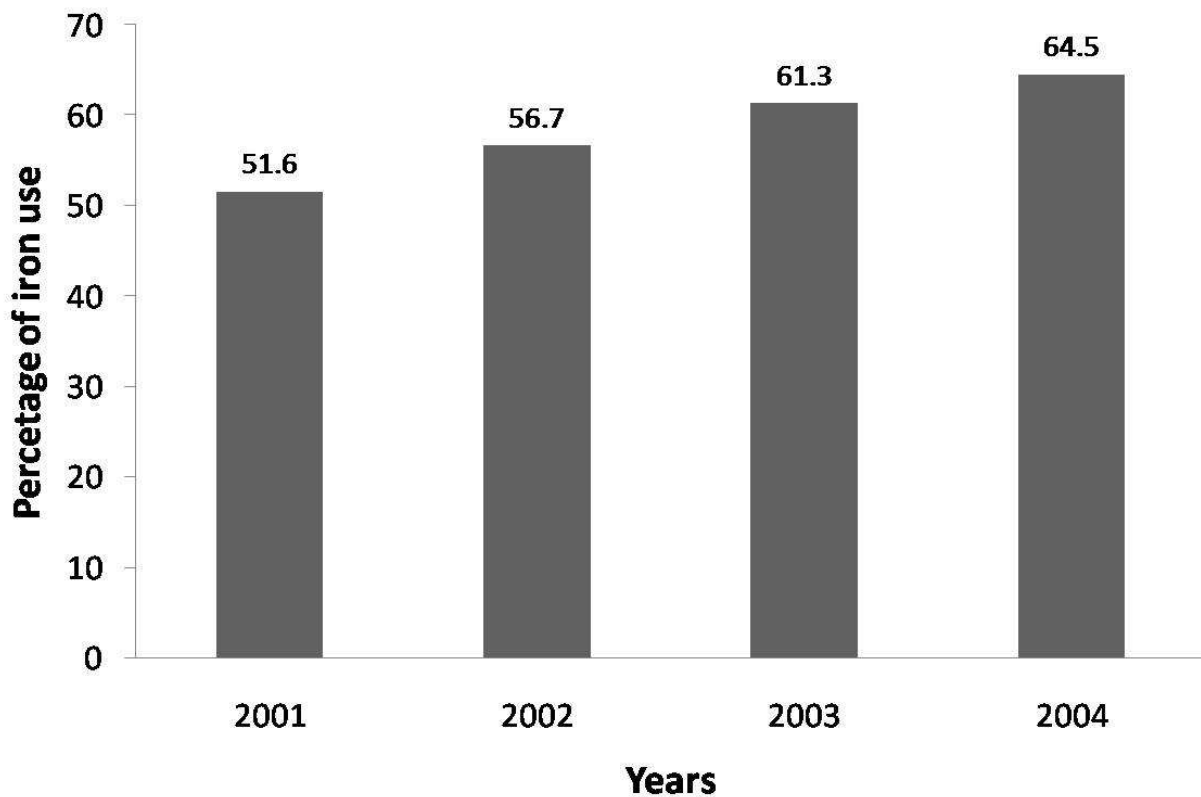


Figure 1. Iron receiving status by years

The prevalence of anemia was found to be 38.6% in a study, which considered anemia for less than 11 g/dl level, with 1304 third-trimester pregnant women in Thailand; and with using the same criteria it was found that the prevalence of anemia was 57% in 6413 Chinese women in another study.¹⁰ Marti-Carvajal et al. found that mean hemoglobin level was 11.4 ± 1.5 g/dl and the anemia prevalence was 34.4% at birth in 630 Venezuelan pregnant women and iron deficiency anemia is related to use of iron ($p= 0.02$) and parity ($p= 0.002$).¹¹ In another hospital-based study, Göker et al., have found that anemia prevalence of pregnant women in third-trimester was 39.6%. They observed that hemoglobin level was under 11 g/dl in 23.1% of pregnant women.¹² Karaoglu et al., reported that anemia prevalence was 37.5% in pregnant women with third-trimester.¹³ In our study, we found that the mean hemoglobin level was 11.1 ± 1.5 g/dl, anemia prevalence was 46%. Anemia prevalence was also found to be 57% in grand multipar.

While prenatal anemia prevalence is 14-52% in third-trimester pregnant women who received placebo, it is 0-25% in third-trimester pregnant women who received iron supplementation.⁶ The anemia ratio of 46%, found in this study, fell to 36.4% with iron supplement and rose to 58.1% with no iron supplement. It is found that, anemia ratio was 22% in 107 third trimester pregnant women who received placebo after 14th gestational week and 2% in 100 third trimester pregnant women who received 66 mg of iron after 14th gestational week, in Denmark.¹⁴ The positive effect of iron on anemia with pregnancy is shown in many other studies.¹⁵

This study showed that iron supplementation has extremely positive effects on parameters (Hb, Hct, MCV) that we have evaluated. Iron supplementation in pregnancy reduces anemia prevalence and increases the hemoglobin and ferritin values.¹⁶ Although serum ferritin level was accepted as a single indicator of iron stores and iron deficiency anemia, hemoglobin and hematocrit parameters are used to define maternal anemia in public health programs.¹⁷ Different results were obtained from studies investigating the relationship between parity and anemia. Although there is prevalence of anemia as high as 73% in women with grand multigravida, Adam et al. determined, no statistical significant relationship between anemia and parity in 744 Sudanese pregnant women in their study.¹⁸ It has been reported that the highest prevalence of anemia was found in the women who were in 3th trimester and also had high parity in a chinese

study performed on 465 057 female.¹⁹ In our study, the highest rate of anemia was determined in grandmultipara; and it was also found that there was statistically significant difference between parity and anemia.

In another study conducted in 1999 in our hospital, including 1300 pregnant women and their newborns, prevalence of anemia was found to be 43.5% and mean hemoglobin value was 11.1 ± 1.4 g/dl. Rate of Iron use was calculated as 35.7%.²⁰ It is important to note that, in spite of increasing iron use there is no change in hemoglobin values in this study; and this condition may be due to inadequate iron use in terms of time and amount. Another interesting issue in our study is the 36.4% of anemia rate in iron receiving group. This situation may be explained by pregnant women's extremely poor iron pool at the beginning of pregnancy and inadequate iron use during pregnancy.

At their meta-analysis, Sloan et al.¹⁶ reviewed about 70 articles, most of them being studies from developing countries, and concluded that iron supplementation results in an increase in hemoglobin levels, but they also found that this effect is related to the dose of iron and initial hematological status. In developing countries, the effect of the use of iron on hematological parameters was higher in pregnant women with hemoglobin level <11 g/dl compared to those of hemoglobin level 11-12 g/dl.

In the present study, if we knew blood levels in the baseline of pregnancy, we could explain why some pregnant women, who had used iron, found to were anemic and some pregnant women, who had not used iron, found to were not anemic. The aim of this study was to determine the percentage of pregnant women receiving iron and the prevalence of anemia of patients admitted to our hospital for labor. In our country, 40-60 mg daily iron supplementation is administered in a total of 9 months starting from fourth month of pregnancy to third month of post-natal period according to "Iron Support Program for Pregnant" conducted by Ministry of Health in 2005.

This study shows that, iron use significantly increased over the years. It is important to determine whether there is any change in the iron use and frequency of anemia after Iron Support Program. There is need for larger-scale, more detailed clinical studies on iron intake, the dosage to use and starting criteria of this treatment during pregnancy in our country.

In some countries, despite the percentage of admission to antenatal clinics and the implementation of routine iron use is high in

pregnant women despite of their national policies, there is still an extremely high prevalence of anemia present in these countries. Adequate dose may have a lower effect when registration to the system is late, even in countries where active antenatal programs are implemented and where prevalence of anemia is very high.²¹

Mothers and babies are at serious risk in terms of anemia due to of inadequate care before pregnancy, inadequate iron intake and poor diet due to socio-economic factors.

Because of the negative effects of anemia during pregnancy on maternal and infant health, iron intake and provision of a well-conducted anemia follow-up with hemoglobin screening and if possible with ferritin screening is extremely important especially in women with high risk of anemia (low socioeconomic status, especially multipara) in the period before pregnancy. The actual prevalence of anemia and iron intake in our country will be documented more accurately with new studies.

REFERENCES

- 1- World Health Organization. The prevalence of anaemia in women: a tabulation of available information. 2nd ed. Geneva: World Health Organization, 1992.
- 2-Maternal adaptations to Pregnancy. Cunningham FG, Gant NF, Leveno KJ, Gilstrap LC, Hauth JC, Wenstrom KD(Eds) Williams Obstetrics 21st Ed.McGraw-Hill International ED.2001;177.
- 3-Sanghvi T G, Harvey P W, Wainwright E. Maternal iron-folic acid supplementation programs : evidence of impact and implementation. Food Nutr Bull 2010; 31: 100-107.
- 4-Centers For Disease Control: Recommendations to Prevent and Control Iron Deficiency in the United States, 1998 MMWR; 1-36.
- 5-World Health Organization. Iron deficiency anaemia: assessment, prevention and control.WHO/NHD/01.3, 2001.
- 6-Milman N. Prepartum anaemia: prevention and treatment. Ann Hematol 2008; 87: 949-59.
- 7- Lops VR, Hunter LP, Dixon LR. Anemia in pregnancy . Am Fam Physician. 1995 ;51(5):1189-97.
- 8-Zavaleta N, Caulfield L E, Garcia T. Changes in iron status during pregnancy in peruvian women receiving prenatal iron and folic acid supplements with or without zinc. Am J ClinNutr 2000; 71: 956-961.
- 9-United Nations Administrative Committee on Coordination/Sub-committee on Nutrition. The third report on the world nutrition situation. Geneva: World Health Organization,1997.
- 10- Ma A G, Schouten E, Wang Y, et al. Anemia prevalence among pregnant women and birthweight in five areas in China.Med Princ Pract 2009; 18: 368-372.
- 11-Martí-Carvajal A, Peña-Martí G, Comunian G, Muñoz S. Prevalence of anemia during pregnancy: results of Valencia (Venezuela) anemia during pregnancy study. Arch Latinoam Nutr 2002; 52: 5-11.
- 12-Göker A, Yanıkerem E, Birge Ö. Manisa'da Bir Eğitim Araştırma Hastanesine Başvuran Gebelerde Anemi Prevalansının Retrospektif İncelenmesi. Sted 2012; 21(3): 102-109.
- 13-Karaoglu L, Pehlivan E, Egri M, Deprem C, Gunes G, Genc MF, Temel I. The prevalence of nutritional anemia in pregnancy in an east Anatolian province, Turkey. BMC Public Health 2010, 10:329
- 14- Milman N, Agger A O, Nielsen O J. Iron supplementation during pregnancy. Effect on iron status markers, serum erythropoietin and human placental lactogen. A placebo controlled study in 207 Danish women. Dan Med Bull 1991; 38: 471-476.
- 15- Allen LH. Anemia and iron deficiency: effects on pregnancy outcome. Am J Clin Nutr 2000;71(suppl):1280S-4S.
- 16-Sloan N L, Jordan E, Winikoff B. Effects of iron supplementation on maternal hematologic status in pregnancy. Am J Public Health 2002; 92: 288-293.
- 17-Stoltzfus R J, Dreyfuss M L. Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anemia. Washington, DC: International Nutritional Anemia Consultative Group, International Life Sciences Institute; 1998.
- 18-Adam I, Khamis A H, Elbashir M I. Prevalence and risk factors for anaemia in pregnant women of eastern Sudan.Trans R Soc Trop Med Hyg 2005; 99: 739-743.
- 19- Jin L, Yeung L F, Cogswell M E, et al. Prevalence of anaemia among pregnant women in South-East China, 1993-2005. Public Health Nutr 2010; 13: 1511-1518.
- 20- Topsakal M, Akın Y, Cömert S, Vitrinel A. Bölgemizdeki sağlıklı yenidoğanların ortalama hemoglobin ve hematokrit değerleri. [The average hemoglobin and hematocrit parameters of healthy newborns in our region]. Taksim Training and Research Hospital Medical Journal 2001; 31: 44-49.
- 21-Massawe S N, Urassa E N, Nyström L, Lindmark G. Effectiveness of primary level antenatal care in decreasing anemia at term in Tanzania. Acta Obstet Gynecol Scand 1999; 78: 573-579.