

Prevalence of Low Hemoglobin and its Correlation with Maternal Factors and Pregnancy Outcomes in Pregnant Women in Health Centers of Sanandaj in 2009

Fariba Ranaei¹, Roonak Shahoei^{2*}, Farzaneh Zaheri¹

¹MSc of Midwifery, Kurdistan University of Medical Sciences, Sanandaj, Iran

^{2*}Assistant Professor of Midwifery, Kurdistan University of Medical Sciences, Sanandaj, Iran

*Corresponding Author: rshaho@yahoo.com

Abstract: This study was conducted to determine the prevalence of low hemoglobin and its correlation with maternal factors and pregnancy complication in pregnant women. In this cross-sectional study, 12 urban health centers were selected randomly from different areas of Sanandaj. Results showed that the prevalence of low hemoglobin was significantly higher in mothers with lower level of education ($P=0.03$), pregnancies and childbirths more than 3 times ($P=0.001$), a history of anemia ($P=0.001$), and irregular prenatal care ($P=0.001$). Furthermore, mothers with low hemoglobin encountered with more pregnancy complications ($P<0.01$). The most prevalent complications included low Apgar score at birth, premature birth, and low birth weight. Trainings before and during pregnancy for mothers who are medically prone to anemia can also be an effective step to decrease the incidence of anemia and its complications in pregnant women. [Fariba Ranaei, Roonak Shahoei, Farzaneh Zaheri. **Prevalence of Low Hemoglobin and its Correlation with Maternal Factors and Pregnancy Outcomes in Pregnant Women in Health Centers of Sanandaj in 2009.** *Life Sci J* 2013;10(2s):298-303] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 51

Keywords: Low hemoglobin, Pregnancy, Pregnancy complication, Risk factors

Introduction

Pregnancy can cause physiological changes in the hematological system as the mother's blood volume increases during their term by 40-45% on average (Cunningham et al., 2008). This increase in the second trimester occurs faster (Cunningham et al., 2008; Shahriyari et al., 2008) so that the level of HB near the term increases to 10 g/100 in pregnant women who did not take supplemental iron (Cunningham et al., 2008; Gharekhani & Sadatian., 2001; Davari Tanha et al., 2005). References in this regard define anemia in pregnant women as the HB lower than 11 g/100 during the first and the third trimesters and HB lower than 10.5 g/100 during the second trimester. Iron deficiency is the cause of more than 90-95% of anemia during pregnancy (Cunningham et al., 2008; Gharekhani & Sadatian., 2001; Davari Tanha et al., 2005). Anemia is an important prevalent and preventable disease which may have considerable complications for mothers and fetuses. It is more prevalent in developing countries due to inappropriate nutrition and lack of iron supplement (Davari Tanha et al., 2005). The prevalence of anemia during pregnancy depends mainly on taking iron supplements as it may increase to 20-30% without iron supplementation (Gharekhani & Sadatian, 2001; Cunningham et al., 2010). Xiong et al. point out that more than half of the women in the world experience anemia during pregnancy (Cunningham et al., 2010). Anemia has been known as a main public health problem in the world that

largely involves women of reproductive age and children (Xiong et al., 2003; Rahbar et al., 2000).

Anemia is the most prevalent medical disorder during pregnancy that has different levels of severity, prevalence, and etiology among different populations as it is more prevalent in developing countries (Malhotra et al., 2002). Shabeiri et al. (2006) explains that 50% of pregnant women in developing countries, 18% of pregnant women in industrial countries, and up to 80% of them in South Asia suffer iron deficiency anemia. Iron deficiency is the common cause of anemia in women that affect 5-10% of reproductive age women (Hamalainen et al., 2003). Anemia during pregnancy is a global problem (Levy et al., 2005). WHO estimated that the global prevalence of iron deficiency anemia in pregnant women is almost 55.8% (Yekta et al., 2008). Pregnancy anemia is one the most common problems in developing countries (Karasahin et al., 2007). Incidence of anemia depends on various factors including economical and social conditions, life style, number of childbirths, medical problems, and regular prenatal care (Bakhtiar et al., 2007). Results of different studies performed in Iran showed that the rate of iron deficiency anemia in pregnant women is 4.5% up to more than 50%. Navidian et al (2006). found that the prevalence of iron deficiency anemia in pregnant women in Zahedan, Iran, was 12.9%. Davari Tanha et al. (2005) in their study in a prenatal clinic in Tehran, Iran, concluded that the prevalence of anemia in pregnant women was 8.6% and increased among women with a history of anemia,

more deliveries, and a previous pregnancy and decreased in those women who took supplemental iron. In Sukrat's and Sirichotiyakul's study. (2006), the prevalence of anemia in pregnant women in a prenatal clinic was 20%. The main reason of anemia these women was thalassemia and iron deficiency anemia. WHO stresses that 20% of maternal deaths arises from anemia (Navidian et al., 2006). There are controversies on the effect of maternal anemia on pregnancy complications. Numerous studies have been done in developing countries and also developed countries that showed adverse fetal outcomes especially low birth weight and preterm delivery while some other studies found no correlation between maternal anemia and pregnancy adverse complications (Levy et al., 2005). In study on the correlation between mother's HB and pregnancy complications in pregnant women in Pakistan, Bakhtiar et al. (2007) concluded that the risk for preterm delivery, low birth weight, intrauterine growth retardation, prenatal death, and low Apgar at 1 min in anemic women (HB < 11gr/100) was higher than others. Studies performed in Iran pointed out the correlation between mother's HB and infant's weight, placental ratio, and infant's HB (Ramazanali et al., 2006; Azargoon & Dabaghi., 2006; Emam Ghoreishi et al., 2003).

Considering the high prevalence of anemia during pregnancy, this study was conducted to determine the prevalence of low hemoglobin (HB) and its correlation with maternal factors and pregnancy complication in pregnant women in Health centers in Sanandaj, Iran, in 2009.

Materials and Methods

In this cross-sectional study, all singleton pregnant women who received care and had records in urban clinics were included in the study upon their agreement. Women with HB lower than 11 mg/dl in the first and third trimesters and those with HB lower than 10.5 mg/dl in the second trimester were considered anemic. Twelve (12) urban health centers were selected randomly from different areas of the city. Then, all the records of pregnant women (totally 1137 files) were examined. In total, 92 women were anemic (8%). In the next step, 164 mothers with normal HB were selected randomly and the maternal factors in the two groups were compared. At the time of sampling, 216 women had delivered, so that the pregnancy outcomes in low HB group and normal HB group were compared. In order to determine the correlation between low HB and pregnancy outcomes in women who had delivered, women with diseases in their current pregnancy were excluded from the study. Therefore, in low HB group and normal HB group, pregnancy complications of 179 mothers who

had delivered and had no current disease were compared. The required information was collected using a questionnaire containing questions related to demographic specifications, medical and obstetric records, and pregnancy results. The data were analyzed using K^2 test and SPSS software.

Results

Among the 12 studied health centers, the highest and the lowest prevalence of low HB were determined as 11.5% (Velayat-e-Faqih Clinic) and 5% (Ebn-e-Sina Clinic), respectively. In general, the prevalence of low HB was 8%. The age, occupation, body mass index, current medication, the interval since the last childbirth, and level of mothers' HB in the two groups did not correlate with low and normal HB. The prevalence of low HB was significantly higher in mothers with lower level of education ($P=0.03$) (Table 1), pregnancies and childbirths more than 3 times ($P=0.001$) (Table 2), a history of anemia ($P=0.001$) (Table 3), irregular prenatal care ($P=0.001$) (Table 4), and irregular use or non-use of iron ($P=0.000$). Once the women who were sick in their current pregnancy were excluded from the study, pregnancy complications of 179 mothers who had delivered and had no current disease were compared in low HB group and normal HB group in order to determine the correlation between low HB and pregnancy complications in mothers with low HB encountered with more pregnancy complications ($P<0.01$) (Table 5,6). The most prevalent complications included low Apgar score at birth, low birth weight and preterm birth.

Table 1: Distribution of the studied participants in terms of the correlation between anemia and the level of education

Anemia Education level	Positive	Negative	Total
Illiterate	22 61.1%	14 38.9%	36 100%
School education	45 36.3%	79 63.7%	124 100%
Diploma	27 34.6%	51 65.4%	78 100%
Higher education	13 39.4%	20 60.6%	33 100%
Total	107 39.5%	164 60.5%	271 100%

$$P v = 0.001 \quad df=3 \quad K^2 = 8.35$$

Table 2: Distribution of the participants in terms of the correlation between anemia and number of pregnancies

Anemia / Number of pregnancies	Positive	Negative	Total
1	56 41.8%	78 58.2%	134 100%
2-3	38 31.7%	82 63.3%	120 100%
>3	13 76.5%	4 23.5%	17 100%
Total	107 39.5%	164 23.5%	271 100%

$P v=0.001$ $K^2 =13.1$ $df = 2$

Table 3: Distribution of the participants in terms of the correlation between anemia and a history of anemia

Anemia / History of anemia	Positive	Negative	Total
Yes	12 80%	3 20%	15 100%
No	95 37.1%	161 62.9%	256 100%
Total	107 39.5%	164 60.5%	271 100%

$P v=0.001$ $K^2 =10.9$ $df = 1$

Table 4: Distribution of the participants in terms of the correlation between anemia and the mode of care

Anemia / Mode of Prenatal care	Positive	Negative	Total
Regular	68 34.9%	127 65.1%	195 100%
Irregular	39 51.3%	37 48.7%	76 100%
Total	107 39.5%	164 60.5%	271 100%

$P v = 0.01$ $K^2 = 6.189$ $df =1$

Table 5: Distribution of the participants in terms of the correlation between anemia and pregnancy complications

anemia / outcome	Positive	Negative	Total
Low Apgar	4 30.8%	9 69.2%	13 100%
LBW	23 55.6%	105 44.4%	9 100%
Preterm labor	3 37.5%	5 62.5%	8 100%
Perinatal mortality	4 80%	1 20%	5 100%
Preeclampsia	2 40%	3 60%	5 100%
IUFD	0 0%	1 100%	1 100%
Without outcome	33 23.9%	105 76.1%	138 100%
Total	51 28.5%	128 71.5%	179 100%

$P v=0.057$ $K^2=12.24$ $df= 6$

Table6: Distribution of the participants in terms of the correlation between anemia and pregnancy complications

Complication / anemia	Positive	Negative	Total
Positive	18 43.9%	33 23.9%	51 100%
Negative	23 56.1%	105 76.1%	128 100%
Total	41 100%	138 100%	179 100%

$P v= 0.01$ $K^2= 6.19$ $df=1$

Discussion

In this study, the prevalence of low HB in pregnant women referring to health centers in Sanandaj was 8%. This result was similar to that of Davari Tanha et al.'s study. (2005) in Tehran. They also reported the prevalence of anemia as 8.6% with respect to the defined levels of HB. Navidian et al. (2006), explain that anemia is a serious problem for Iranian pregnant women's health and varies between 2.4% and 27.8% in different areas. The prevalence of anemia varies among different countries and even among different areas of a country within a range of 12-43% (Navidian et al., 2006). A wide cohort retrospective study on prenatal records of hospitals in China found the prevalence of anemia as 26.6%

(Xiong et al., 2003). It was reported that when the iron supplement is not taken during pregnancy, the prevalence of anemia would be 10-20% (Gharekhani & Sadatian., 2001). Another report determined the prevalence of anemia in Indian pregnant women as 50-90% that was mainly attributed to poor nutritional (Shobeiri et al., 2006). In this study, anemia ranged from 5% to 11.5% that was lower than that of other Iranian studies showing more favorable health condition of these pregnant women than women in other studies and emphasizing the program for routine administration of iron supplement which is currently performed in prenatal care for pregnant women. The difference in the prevalence of anemia in different areas is probably due to social economical conditions of those areas. Thus, although iron supplementation program has been successful in pregnant women, more attention should be paid to those areas which are of weaker social economical status. In these areas, the prevalence of anemia may be reduced by performing trainings on better nutrition and providing supplementary services for pregnant women's nutrition. In Hong Kong, major reason of iron deficiency prevalence in pregnant women was found to be poverty and frequent deliveries (Emam Ghoreishi et al., 2003).

Age, occupation, body mass index, current medication, and the interval since the last childbirth did not show any correlation with maternal anemia in this study. However, the level of education, mothers' any current disease, number of pregnancies and childbirths, a history of anemia, prenatal care regularity and start time, and the mode of taking iron pills in low HB group showed a significant difference with those in the normal HB group. In this study, the prevalence of anemia in mothers with high school education or higher education (e.g. 39.4% v 60.6% for those with higher education) was significantly lower than that of illiterate mothers (61.1% v 38.9%) (P=0.03). This result was similar to that in Navidian el al.'s study. (2006) in Zahedan, Iran, in which, the prevalence of anemia in illiterate mothers was higher than that in mothers with high school education or higher education. According to references in this regard, the prevalence of iron deficiency differs on the basis of geographical location, social-economical conditions, and age (Shahriyari et al., 2008). In the present study, the prevalence of anemia was somewhat different in different parts of the city. The prevalence of anemia in mothers with 3 pregnancies or more was significantly higher than mothers who were experiencing their first pregnancy (76.5% v 41.8%) (P=0.001). This result has been also mentioned in other studies including Emam Ghoreishi et al.'s study. (2003), in which, increased number of pregnancies had a direct and significant

correlation with iron deficiency anemia in mothers. Regarding the above results, it is necessary to pay more attention to mothers with several pregnancies and deliveries in prenatal care program. Evaluation of mothers' medical records showed a significant difference between the two groups in terms of a current disease and a history of anemia as the prevalence of anemia was higher in mothers who suffered an internal disease during their pregnancy or had a history of anemia (55.6% v 35.5%, P=0.006, & 80% v 37.1%, P=0.001). A study on anemia in pregnant women in Finland determined the chronic diseases including diabetes as a risk factor for anemia (Hamalainen et al., 2003). In the above study, 19.9% of the participants suffered a disease, the most prevalent of which was diabetes. Therefore, women with such condition should be paid more attention during prenatal care. Comparing the regularity and start date of prenatal care in the two groups with each other, 34.9% of anemic mothers received regular care while 65.1% of healthy mothers received regular care (P=0.01). The prenatal care in the low HB group started later than that in the normal group (P=0.005). A similar study on Chinese women showed higher prevalence of anemia in mothers who started the prenatal care later (after 12 weeks) and lower prevalence of anemia in mothers with more than 14 visits (Xiong et al., 2003). In this respect, raising awareness of mothers and their family on the prenatal care and its effect on health becomes very substantial.

In this study, there was a significant difference between the two groups in terms of the mode of taking iron pills (P=0.000). The prevalence of anemia in mothers who took iron pills regularly was significantly lower than that in mothers took it, if any, irregularly. It can be concluded that the mode of taking iron pills in the two groups was different with each other. Rahbar et al. (2000) studied the prevalence of anemia and its associated factors during the third trimester of pregnancy in Semnan, Iran, and found a significant correlation between anemia and mode of taking iron pills. They showed that 43% of non-use or irregular use of iron pills was due to ignorance or unawareness of mothers.

Safavi et al. (2006) studied iron supplementation and its associated factors in 11 provinces of Iran and concluded that iron supplementation, even irregularly, was effective in reducing the risk for anemia. In North Carolina, a group of researchers found that early initiation of prophylactic iron supplementation in low-income women may have other advantages like improving pregnancy complications besides reducing iron deficiency in pregnancy (Siega-Riz et al., 2006).

Considering the above results, more emphasis must be put on iron supplementation in

mothers. It seems necessary to hold appropriate educational programs for mothers about proper nutrition and how to take iron in prenatal visits. Numerous studies and references in this regard pointed out the impact of anemia on pregnancy complication and many of them mentioned some unfavorable complications.

In the present study, the correlation between low HB and pregnancy complication was determined after exclusion of participants who had an internal disease (hypertension, diabetes, heart disease, etc.) in their current pregnancy. The prevalence of pregnancy complications in mothers with low HB was significantly higher than that in mothers with normal HB (35.3% v 18%) (P<0.01). The most prevalent complications were low Apgar score at birth, preterm delivery, and low birth weight. Various studies performed in Iran or other countries refer to the association of anemia during pregnancy with low birth weight and preterm delivery (Davari Tanha et al., 2005; Rahbar et al., 2000; Shobeiri et al., 2006; Navidian et al., 2006; Ramazanali et al., 2006). In their study *maternal anemia and perinatal complication* in Ankara, Karasahin et al. (2007) compared 160 healthy pregnant women with 162 anemic pregnant women during the second trimester and concluded that the risk for preterm delivery, low birth weight, low Apgar score, and intrauterine death in anemic mothers was 4, 1.9, 1.8, and 3.7 times as those in healthy mothers. According to WHO, 20% of maternal death arise from anemia (Karasahin et al., 2007). It seems that normal concentration of HB in all trimesters largely affects the birth weight and normal HB is of special importance during the first trimester for recovery of pregnancy complication (Shobeiri et al., 2006).

Conclusion

Based on the results and a review of similar references and studies, the prevalence of anemia among pregnant mothers in Sanandaj, Iran, is not higher than that in other parts of Iran and the world. This may be due to the attention paid and the measures taken by the health centers in relation to the prenatal care. Comparison of anemia prevalence in different health centers revealed the necessity for paying more attention to areas with higher anemia prevalence.

References

1. Azargoon A., Dabaghi G., 2006. The correlation of different levels of maternal HB with Birth weight, placental weight and placental ratio, *Payesh* 1, pp. 41-46.
2. Bakhtiar U., Khan Y., Nasar R., 2007. Relationship between maternal hemoglobin and perinatal outcome. *The Journal of the Pakistan Medical Association*, 32(2), 102-104.
3. Cunningham et al., 2008. *Williams Obstetrics*, translated by Ghazi Jahani B., 22nd edition, volume 1, Golban Publications, Tehran, Iran, pp. 154-155.
4. Cunningham et al., 2010. *Williams Obstetrics*, translated by Ghazi Jahani B., 23rd edition, volume 1, Golban Publications, Tehran, Iran, pp. 1365-1367.
5. Davari Tanha F., Kaveh M., Salehi B., 2005. The Prevalence of anemia in pregnant women and its correlation with maternal factors and pregnancy complication. *Hayat quarterly*, 11th year, nos. 24 and 25, spring and summer, pp. 23-32.
6. Emam Ghoreishi F., Iran Mahboub E., Rezayi M., 2003. Iron status in mothers and its relation to the newborns. *Hormozgan Medical Journal*, 3, pp. 145-149.
7. Gharekhani P., and Sadatian S.A., 2001. *Principles of Obstetrics*, 1st edition, Samat Publications, Tehran, Iran, pp. 99-498.
8. Karasahin E., Ceyhan S.T., Goktolga U., Keskin U., Baser I., 2007. Maternal anemia and perinatal outcome. *Perinatal journal*, 15(30), 127-130.
9. Ramazanali F., Vahid Dastjerdi M., Beigi A., Moeini A., 2006. Study of the relationship between maternal hematocrit and birth weight and the risk of low birth weight. *Iranian Journal of Pediatrics*, 6(4), pp. 447-454.
10. Hamalainen H., Hakkarainen K., Heinonen S., 2003. Anaemia in the first but not in the second or third trimester is a risk factor for low birth weight. *Clinical Nutrition*, 22(3), 271-275.
11. Levy A., Fraster D., Katz M., Mazor M., Sheiner E., 2005. Maternal anemia during pregnancy is an independent risk factor for low birth weight and preterm delivery. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 122, 182-186.
12. Malhotra M., Sharma J.B., Batra S., Sharma S., Murthy N.S., Arora R., 2002. Maternal and perinatal outcome in varying degrees of anemia. *International Journal of Gynecology and Obstetrics* 79, 93-100.
13. Navidian A., Ebrahimi Tabas E., Sarani H., Ghalje M., Yaghobinia F., 2006. Study of the prevalence of iron deficiency anemia in pregnant women referring to health-treatment centers in Zahedan, Iran. *Fertility and Infertility Quarterly*, 2, pp. 132-138.
14. Rahbar N., Ghorbani R., Khan Soltani S., 2000. Study of anemia prevalence and certain related individual factors during the third

- trimester of pregnancy in women referring to clinics affiliated to Semnan University of Medical Sciences. *Koomesh scientific journal*, 1(4), pp. 31-36.
15. Shobeiri F., Begum KH., Nazari M., 2006. A prospective study of maternal hemoglobin status of Indian woman during pregnancy and pregnancy outcome. *Nutrition Research*, 26, 209-213.
 16. Safavi M., Shaikholeslam R., Abdolahi Z., Taghavi M., Sadeghian Sharif S., Sadeghzade E., Mohamadian S., 2006. Condition of iron taking and its associated factors in Iranian pregnant women. *Iranian Epidemiology Quarterly* 4, pp. 11-14.
 17. Siega-Riz A.M., Hartzema A.G., Turnbull C., Thorp J., McDonald T., Cogswell M.E., 2006. The effects of prophylactic iron given in prenatal supplements on iron status and birth outcomes: A randomized controlled trial. *American Journal of Obstetrics & Gynecology*, 194, 512-519.
 18. Shahriyari Ahmadi A., Kolivand M., Fakheri T., Aznab M., 2008. Hematological common problems in gynecology, *Obstetrics*, Paygan Publications, Kermanshah University of Medical Sciences, pp. 6-8.
 19. Sukrat B., Sirichotiyakul S., 2006. The prevalence and causes of anemia during pregnancy in maharaj nakorn chiang mai hospital. *J and Assoc thai*, 89(4), 142-145.
 20. Yekta Z., Ayatollahi H., Pourali R., Farzin A., 2008. Predictiong factors in Iran Supplement intake among pregnant woman in urban care setting. *J Res Health sci*, 8(1), 39-45.
 21. Xiong X., Buekens P., Fraser WD., Guo Z., 2003. Anemia during pregnancy in a Chinese population. *International journal of Gynecology and Obstetrics*, 83, 159-164.

1/17/2013