Prevalence of Anemia and Associated Risk Factors among Pregnant Women, What is the Role of Antenatal Care in Prevention? A Cross-sectional Study

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ABSTRACT

Objective: To determine the prevalence of anemia with the associated factors in pregnant women and the effect of family medicine practice and antenatal care services provided by family physicians on the prevention of anemia during pregnancy.
Study Design: Community-based cross-sectional study.
Place and Duration of Study: Family Health Centres in the Elazig region, Turkey from January to June 2019.
Methodology: A total of 495 pregnant women, attending the family health centres, were included. Women were administered a questionnaire related with the anemia and related factors; and hemoglobin values were drawn. Hemoglobin concentration <11 g/dl was classified as anaemic. Sociodemographic, individual dietary diversity and obstetric characteristics of the participants were obtained from structured questionnaire form. Binary logistic regression model was employed to determine the effect of explanatory variables on dependent variable anemia.
Results: The prevalence of anemia during pregnancy was 27.9% (Hb<11.0 gr/dl). Prevalence of anemia was found lower in participants with higher education levels (p=0.005) and having nutrition education (p=0.004). Income status (OR=0.017 [95%-Cl:0.002-0.15, p<0.001]), dark tea preference (OR=87.127 [95%Cl:17.68-429.36, p<0.001]), and iron supplementation time (OR=0.945 [95%Cl: 0.91-0.98, p=0.002]) were determined as the independent predictors of anemia in pregnancy.
Conclusion: Low income, insufficient iron supplementation treatment and dark tea preference were the main predictors of anemia. Most of the factors that cause anemia during pregnancy can be prevented with patient education and supportive treatments. Therefore, the authors recommend applying effective and quality prenatal care and patient education programs to reduce anemia during pregnancy.

Key Words: Pregnant women, Anemia, Prenatal care, Family practice, Turkey.

INTRODUCTION

Anemia during pregnancy is a major public health problem and remains high prevalence in many countries such as Turkey. Anemia during pregnancy is the problem of both developed and developing countries. Anemia affects 16-62% of women in developing countries and 16-29% in developed countries.[1] The burden of anemia during pregnancy is highest in Africa and South-East Asia with estimated prevalence of 57.1% and 48.2%, respectively; and lowest in America and Europe with prevalence of 24.1% and 25.1%, respectively.[2]

The World Health Organization reported anemia rate of 28% among pregnant women in Turkey.[2] Anemia during pregnancy is a serious problem and risk for both maternal and perinatal mortality. Maternal complications include early delivery, intrauterine death, premature rupture of membranes, infections, cardiovascular diseases, reduced physical and mental strength and weakened immun system, while the some embryonic complications include prenatal anemia, preterm birth and low birth weight.[3,4]

Previous studies have reported significant associations among anemia during pregnancy and early age pregnancy, birth intervals, grand multiparity, low socioeconomic status, lifestyle and eating behaviors, use of iron supplementation, low educational level, and cultural differences.[5,6] Therefore, the World Health Organization (WHO) gathered experts to discuss how prenatal care could potentially have a positive impact on maternal and child health outcomes, where the experts overwhelmingly agreed with this proposal.[7] Previous studies have also high-

lighted the need for a prenatal nutritional care system that emphasises better use of essential nutrients, including iron, minerals, and vitamins with high biological value, and emphasises the conduct of modified interventions to control the prevalence and severity of anemia among pregnant women.[8,9]

Understanding the prevalence, associated factors, applications to prevent anemia such as antenatal care and their complex interaction may ease the interventions to lessen the case burden of anemia during pregnancy.

The first aim of this study was to determine the prevalence of anemia and related factors in pregnant women; as well as to investigate the effect of family practice and antenatal care services provided by family physicians on the prevention of anemia during pregnancy.

METHODOLOGY

Community based cross-sectional study was conducted in Elazig district, Eastern Turkey from January-June 2019, in accordance with the Helsinki Declaration and after the Ethical Research Committee approval (22.03.2018, IRB Number: 06/04). Informed consents were obtained from all patients.

At the beginning of the study, there were 142 family physicians in 55 family health centres in the city centre of Elazig. The total population registered to family physicians was 449185, of which 3228 were pregnant women. The formula "$n=Nt^2pq/d^2(N-1)+t^2pq$" was used to calculate the sample size. The prevalence of anemia in pregnancy has been reported by the WHO as 28% in Turkey. The minimum sample size was found 282 pregnant women (N=3228, t=1.96, p=28%, q=72%, and d=0.05). The number of pregnant women to be taken from the family health centres were calculated according to the total number of pregnant women in each family health centres. Pregnant women were included in the study by simple random sampling method, according to the number of pregnant women to be taken from each family health centres. In this study of 495 pregnant women, inclusion criteria for enrollment included; pregnancy, being over 18 years and volunteering. Exclusion criteria for the study were diagnosed eclampsia, pre-eclampsia, diabetes mellitus, hypertension, sickle cell disease, any congenital hemoglobin disorders, with hearing and vision problems as well as mental disorder.

Data were collected using pretested structured questionnaire by face-to-face interview. Sociodemographic, nutrition, antenatal care and pregnancy characteristics of the participants were questioned with the questionnaire forms. Hemoglobulin values of pregnant women were obtained from examinations performed during routine pregnancy follow-up of family physicians. According to the WHO categories for hemoglobin concentration values, pregnant women were grouped into one of two categories: no anemia (≥11.0 g/dl) and anemia (Hb<11.0 g/dl).[2]

The minimum wage is 2400 Turkish lira (TL) in Turkey during study time. Household income was grouped lower than 2000 TL as bad, between 2000-4000 TL as medium and over than 4000 TL as good. In our study, participants were asked to group household income as low, medium and good. Women dietary diversity scores were computed based on quide for Turkish dieticians patient follow-up.[10] The patient follow-up guide for dieticians recommends the consumption of 3 main meals and 3 snacks for the need for increased energy and nutrients in pregnant women. Therefore, the number of daily meals of the participants was first questioned. Five types of food (i-meat and fish, ii-eggs, iii-cereals, iv-vegetables, v-fresh and dried fruits) that participants should eat for daily iron needs were questioned. All participants were told about the portion amounts of five groups of food and the portion amounts of each group of foods in the last week were questioned. Participants were asked to identify the food portions they consumed. The amount of tea consumption, prepared by hot brewing method, was calculated as the specified cups. Tea preferences of the participants were evaluated in two groups as light or dark tea. The consumed tea was recorded as light or dark tea, according to the participants' own perceptions. A previous study shows that tea consumed simultaneously with an iron-containing porridge meal leads to decreased nonheme iron absorption and that a 1-h time interval between a meal and tea consumption attenuates the inhibitory effect, resulting in increased nonheme iron absorption. So we asked the participants tea consumption time as "within 1 hour after meals" or "at least 2 hours after meals".[11]

Statistical analysis of the data was performed using IBM SPSS 22 statistical package programme. Shapiro-Wilk test was used to determine whether the data showed normal distribution. Descriptive statistics of the data are indicated as Mean ± S.D and [Median (quartile 1-quartile 3) for continuous data, as frequency and percentage [n (%)] for categorical variables. Chi-square test was used for categorical data. Mann-Whitney U-test was used to compare two independent groups for non-normally distributed continuous data. In order to determine the effect of independent variables on dependent variable, the binary logistic regression model with backward stepwise were used. Significance level was α=0.05.

RESULTS

The final total sample was 495 pregnant women. The mean age of participants was 30.06 ± 5.15 years. The prevalence of anemia during pregnancy was 27.9% (n=138). The prevalence of anemia in the third trimester was higher than the 1st and 2nd trimesters (p<0.001). The results of bivariate analyses showed that anemia was significantly associated with sociodemographic characteristics, such as lower educational level (p=0.005), housewife status (p=0.018), those who prefer dark tea (p<0.001) and drink tea within one hour after a meal (p<0.001), trimester period (p<0.001) and participants who do not receive nutrition education p=0.004, Table I.

Anemia was statistically associated with age (p=0.001), gravida (p<0.001), low number of meats portion (p<0.001), vegetables portions (p<0.001) and weekly total portions (p=0.006) (Table II).

Table I: Relation of socio-demographic, nutrition, antenatal care and pregnancy characteristics of participants with anemia.

Characteristics	Anemic		Non-anemic		Total		p-value
	n=138	%	n=357	%	n=495	%	
Educational status							
Primary education	27	19.6	36	10.1	63	12.7	*0.005*
Secondary education	22	15.9	59	16.5	81	16.4	
High school	51	37.0	114	31.9	165	33.3	
University	38	27.5	148	41.5	186	37.6	
Occupation							
House wife	107	77.5	231	64.7	338	68.3	*0.018*
Minimum wage employee	21	15.2	94	26.3	115	23.2	
Official	10	7.2	32	9.0	42	8.5	
Income perception							
Bad	13	9.4	20	5.6	33	6.7	*0.303*
Medium	101	73.2	269	75.4	370	74.7	
Good	24	17.4	68	19.0	92	18.6	
Tea or coffee consumption status							
Non-drinker	9	6.5	39	10.9	48	9.7	*0.138*
Drinker	129	93.5	318	89.1	447	90.3	
Tea preferences							
Light tea	34	26.4	294	92.5	328	73.4	*<0.001*
Dark tea	95	73.6	24	7.5	119	26.6	
Tea consumption time							
Only for breakfast	69	53.5	248	78.0	317	70.9	*<0.001*
Within 1 hour after meals	55	42.6	38	11.9	93	20.8	
At least 2 hours after meals	5	3.9	32	10.1	37	8.3	
Trimester							
1.trimester	15	10.9	82	23.0	97	19.6	*<0.001*
2.trimester	60	43.5	170	47.6	230	46.5	
3.trimester	63	45.7	105	29.4	168	33.9	
Iron pill usage status							
Use	50	36.2	146	40.9	196	39.6	*0.341*
Not use	88	63.8	211	59.1	299	60.4	
Nutrional education status							
Have	68	49.3	226	63.3	294	59.4	*0.004*
Have not	70	50.7	131	36.7	201	40.6	
* Pearson Chi square test statistic							

Table II: Relationship between number of pregnancy, iron supplementation time, number of portions with anemia.

Variables	Anemic		Non-anemic		p-value
	Median	(Q1-Q3)**	Median	(Q1-Q3)**	
Age	31	(26.75-35)	29	(26-32)	*0.001*
Gravida	3	(2-3)	2	(1-3)	*<0.001*
Number of prenatal care follow-up	3	(2-4)	2	(2-3)	*0.008*
Iron supplementation time (month)	4	(3-6)	3	(2-5)	*0.015*
Number of meals per day	3	(3-4)	3	(3-4)	*0.715*
Portion amounts of meat	1	(1-2)	3	(2-3)	*<0.001*
portion amounts of eggs	2	(1-2)	2	(1-2)	*0.924*
portion amounts of cereals	1	(1-2)	2	(2-3)	*0.107*
portion amounts of vegetables	3	(2-4)	7	(3-7)	*<0.001*
portion amounts of fruits	1	(1-2)	1	(1-2)	*0.172*
Total number of portion per week	17	(5-20)	18	(5-24)	*0.006*
*Mann-Whitney U-test statistic ** Q1: 1st quartile, Q3: 3rd quartile*					

Table III: Binary logistic regresyon results.

Variable	Odds Ratios	Confidence Interval (95.0%)	p-value
Income (medium)	0.017	0.002-0.15	*<0.001*
Income (good)	0.29	0.058-1.451	*0.132*
Tea preferences	87.127	17.68-429.36	*<0.001*
Iron supplementation time	0.945	0.912-0.980	*0.002*
Income level reference category: Bad, tea preference, Ref.: light tea. (Model: Anemic (Y)= 4.52 + 0.017 × income bad (x_1) + 87.127 × dark tea (x_2) + 0.945 × iron supp. time (x_3), Model p-value<0.001, Nagelkerke R^2=0.55).			

In the 9th step analysis of stepwise logistic regression analysis, which included all the factors associated with anemia, income status (p<0.001), dark tea preference (p<0.001) and duration of iron supplementation time (p=0.002) were found to be statistically associated with anemia (Table III).

DISCUSSION

The current study finding showed that the prevalence of anemia during pregnancy was 27.9%. The prevalence of anemia during pregnancy was reported 28% by WHO in Turkey.[2] The preva-

lence of anemia during pregnancy was reported as 28.8%, 28.6% and 32.1% in Turkey.[12-14] The findings were consistent with the data of authors' country.

Socio-demographic factors of gestational age, maternal age, income level, parity and occupation of the mother were associated with the risk of anemia during pregnancy. These findings are similar to the previously reported study data.[8,15] Various studies reported that poverty decreases, if women work and this positively affects their health status.[16] Unemployment and low education levels may affect household income negatively, so the effect of these factors on income should not be ignored. The findings of the authors and literature data suggest that anemia can be reduced by increasing socioeconomic status and income levels.

According to the the findings of this study, having nutritional education, iron supplementation time, tea consumption, portion amount of meat and vegetable consumption were determined as factors related to anemia during pregnancy. The two different meta-analyses reported that nutritional education status, iron supplementation time and nutritional variety were determinants of anemia in pregnancy.[17,18] Berhe et al. reported that pregnant women, who consumed low diversified diet, were at high risk of anemia; and drinking coffee or tea with a meal or immediately after a meal increases the development of anemia during pregnancy.[9] In this sense, the findings of this study support the data in the literature. Therefore, nutritional habits, knowledge levels and awareness of pregnant women were associated factors with anemia, except for sociodemographic characteristics.

In family medicine practice, prenatal care service is provided to pregnant women by family physicians four times in Turkey. Nutritional counselling, periodic health examination, and supportive therapy (iron and vitamin D supplement) are routinely offered. Pirincci et al. reported that 42.4% prevalence of anemia in pregnant women in their study before family medicine practice in Elazig.[19] In the current study, conducted in the same centre, the prevalence of anemia in pregnant women was found to be 27.9%. After the study of Pirincci et al., Family medicine practice and free iron supplementation treatment for pregnant women started in Turkey. Comparing the current study data with the study of Pirincci et al., it was thought that prenatal care services provided by family physicians could contribute to reducing the factors associated with anemia during pregnancy.[19] Although the effects of family physicians on socio-demographic factors causing anemia are limited, they may prevent other anemia related factors such a nutritional habits, awareness and supportive treatment with antenatal care service.

The first limitation of this study was that it was cross-sectional, and performed in only one region, as a result, it could not represent the whole country. In this study, the factors that could affect the anemia were the participants' own statements, which may have led to the failure to provide stan-

dardization in the portion evaluation of the foods consumed by the participants. Another limitation was that the authors did not measure the level of nutritional knowledge of the participants, but questioned whether they received nutritional education. This limited this research on the effect of antenatal care on participants' knowledge level.

CONCLUSION

In this study, low income, insufficient iron supplementation treatment, and dark tea preference were the main predictors of anemia. Adherence of supportive treatments and nutritional habits of patients are one of the most important determinants of anemia. At the same time, high education level and having nutrition education were found to have a protective effect from anemia. Based on all these findings, the authors recommend the administration antenatal care service and patient education programs to reduce anemia during pregnancy.

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