PREVALENCE AND DETERMINANTS OF ANAEMIA IN THIRD TRIMESTER PREGNANCY IN FAYOUM GOVERNORATE-EGYPT

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ABSTRACT

***Background**: It is estimated that prevalence of anaemia by the third trimester of pregnancy is higher than that in early pregnancy despite routine intake of iron supplementation with higher incidence of low birth weight and preterm delivery. The aim of the current study is to measure the prevalence of anaemia in third trimester of pregnancy and identify its risk factors.*

***Materials and methods**: This study is a cross-sectional design carried out in antenatal clinic at Fayoum teaching Hospital. A total of 381 pregnant women in third trimester pregnancy were enrolled in the study. All enrolled subjects were interviewed using a structured questionnaire inquiring about age, education level, occupation, family income, pregnancy history, medical history, vitamin intake and nutritional history. A blood sample was examined for haemoglobin concentration from each enrolled woman and anaemia was diagnosed with haemoglobin level below 11g/dl.*

***Results**: Prevalence of anaemia in third trimester was 67% in the current study. Among many risk factors identified, yet the main independent predictors of anaemia in third trimester of pregnancy were multiparity, infrequent antenatal visits, irregular intake of iron supplement, low weekly intake of meat and fruits and frequent daily tea consumption.*

***Conclusion**: Anaemia by third trimester of pregnancy represents major health problem in this geographical area of Egypt. Its risk factors include personal, dietary and some aspects related to outcome healthcare delivered at this stage. Further researches are recommended to be carried out to study quality and compliance of antenatal services as well innovative approaches for iron supplementation.*

***Key words**: Anaemia, pregnancy, third trimester, Fayoum, Egypt.*

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Introduction

Anaemia is the decreasing of ability of the red blood cells to provide adequate oxygen to body tissues. It may be due to a decreased number of red blood cells, a decreased amount of substance in red blood cells which transport oxygen (haemoglobin) or a decreased volume of red blood cells themselves[1]. The World Health Organization defined anaemia in pregnancy as haemoglobin concentration of less than 11 g/dl[2].

Globally, the World Health Organization estimated that anaemia among pregnant women is 69.0%. In developing countries the prevalence of anaemia among pregnant women is estimated to vary between 53% and 90% while it is estimated to be 8.3% in the developed countries[3].

The prevalence rate of anaemia in pregnancy in Egypt was reported to be around 45% with mild and moderate degrees mainly[3].

The most common cause of anaemia in pregnancy is iron deficiency. Although the causes underlying iron deficiency in pregnancy may be diverse, yet the main reason imposing increased risk in pregnancy is the increased demand for iron for fetus as well maternal tissues[4].

Consequences of anaemia on pregnant woman and fetus include increasing maternal mortality and morbidity[5], increasing fetal morbidity and mortality, increasing perinatal risks for mothers and neonates, increasing incidence of low birth weight [LBW] and preterm baby, reducing work capacity, physical activity and productivity[6].

It is estimated that prevalence of anaemia by the third trimester of pregnancy is higher than that in early pregnancy with higher incidence of low birth weight and preterm delivery[7].

Prevalence studies were recommended by WHO both for monitoring the progress in reproductive health and to determine the severity of anaemia

since national iron supplementation program were planned according to the severity[8, 9].

Although Multivitamins supplementation is a common standard of practice by the beginning and all through the pregnancy, its effect on anaemia by end of pregnancy is still understudied especially in Egypt. This study was carried out in Fayoum governorate; one of the poorest governorates of Egypt[10]; an aspect greatly linked to anaemia and nutritional disorders.

The aim of the current study is to measure the prevalence of anaemia in third trimester of pregnancy and identify its risk factors.

Methods and methods

Study settings: Obstetric clinic (antenatal clinic) in Fayoum teaching Hospital.

Study design: A cross sectional study design

Eligible subjects: All third trimester pregnant women in the age group (15-49) years, who attend antenatal clinic at Fayoum teaching Hospital.

Sample size: was estimated to be 384 subjects to detect prevalence of anaemia of 50% ±5% with 95% confidence interval. The haemoglobin level could not be done for 3 subjects for problems in the blood sample, thus a total of 381 subjects were enrolled in the study.

Sampling method: Consecutive sample was adopted for selection of pregnant women till reaching the required sample size.

Study tools

• Interview Questionnaire was designed to include the following items: age, education level, occupation, family income, pregnancy history, medical history, vitamin intake and nutritional history.

• Blood sample: A 2ml venous EDTA anticoagulated blood sample was collected from all pregnant females to test haemoglobin level using Automated Haematology Cell Counter [Sysmex xs-800i] . This laboratory test was done routinely for all pregnant women attending the antenatal clinic.

Definitions used in this study[2]

Anaemia in pregnancy: Haemoglobin level (Hb) < 11g/dl

- Mild anaemia [Hb 10-10.9 g/dl]
- Moderate anaemia [Hb 7-9.9 g/dl]
- Sever anaemia [Hb <7 g/dl]

Ethical consideration:

Informed consent was obtained from each pregnant woman enrolled in the study. The consent included the aim of study, methods carried out in research, as well the subject right to be withdrawn from research anytime. The subject was informed with results of heamoglobin test.Data were confidentially anonymously managed and used only for research purpose.

Data Management and Analysis

Data were analysed using Statistical Program for Social Sciences (SPSS program) version 15 SPSS Inc. in Chicago.

Quantitative data were presented in mean and standard deviation. Qualitative data were presented in frequency and related percentage. Comparison of qualitative variables was done using the Chi-square test. Odds ratio with 95% confidence interval was calculated for the different risk factors. All factors with P value <0.25 by univariate analysis were included in logistic regression analysis using backward likelihood ratio method. By examining collinearity diagnostics, early age at marriage and early age at pregnancy were correlated. Accordingly, only early age at pregnancy, which seems more plausible, was included in the model. Adjusted odds ratio with 95% confidence interval was estimated for significant factors revealed by logistic regression.

A 'P' value of 0.05 was chosen as the level of statistical significance.

Results

As shown in table 1, the mean age of the study subjects was 25 years with 58% of them living in rural areas. Most of the study subjects were not working and 74% of them were living with income less than 1000 EP.

Figure 1 shows that the prevalence of anaemia in the third trimester in the study subjects was 67%. Anaemia was further sub-classified into 33%with mild anaemia and 34% with moderate anaemia. No cases with severe anaemia were noted. Figure 2 shows that the prevalence of anaemia was more in age group younger than 20 years and has another peak by the beginning of thirties.

Regarding the risk factors of anaemia, rural residence (OR=1.87), Maternal age younger than 20 or older than 30 (OR=1.93), younger age at marriage and age at first pregnancy below 20 years (OR=1.570 &2 respectively), low level of education(OR=3.4), non working or manual worker (OR=2.27 & 4.2 respectively), and lower family

income were identified as risk factors by univariate analysis.

	Study group
	381
Age (M± SD)	25.395 ± 4.7
Age of marriage(M± SD)	20.7 ± 3.4315
Age of first pregnancy(M± SD)	21.325 ± 3.5585
Residence [no (%)]	
Urban	160(42.0%)
Rural	221(58.0%)
Education [no (%)]	
Illiterate	53(13.9%)
Read and Write	59(15.5%)
Primary	13(3.4%)
Preparatory	28(7.3%)
Secondary	122(23.0%)
Faculty	106(27.8%)
Occupation type [no (%)]	
Not working	282(74%)
employee	62(16.3%)
Manual worker	37(9.7%)
Family income [no (%)]	
<500	119 (31.2)
500- 1000	163(42.8%)
>1000	99(26%)
Parity [no (%)]	
≤2 time	243(82.5%)
>2 time	138 (17.6%)

Table 1: Personal and Family characteristics of the study group.

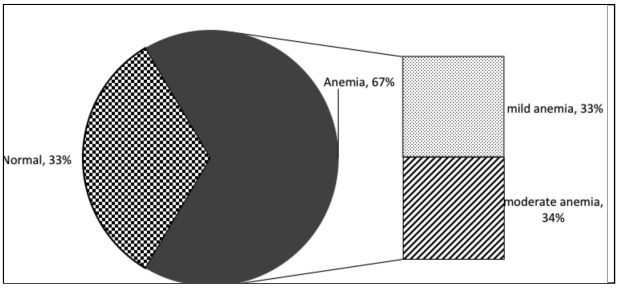

Fig. 1: Prevalence of anaemia in the study group (total no.= 381).

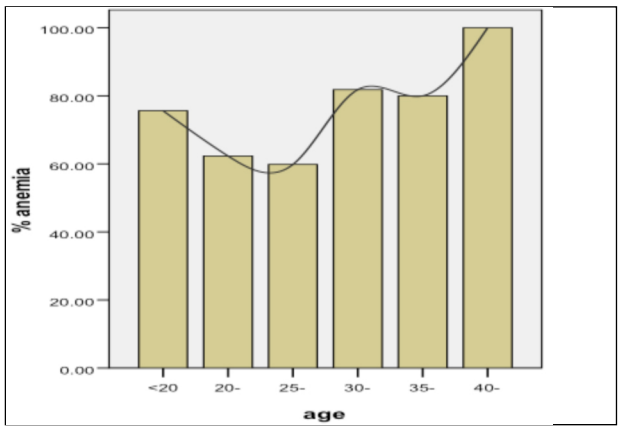

Fig. 2: Distribution of anaemia according to age group.

	No anaemia		anaemia		P value	OR (95%CI)
	No.	%	No.	%		
Residence						
Urban	65	52.40%	95	37%	0.004	1
Rural	59	47.60%	162	63%		1.879 (1.217-2.900)
Age						
<20 or >30	27	21.80%	90	35%	0.009	1.936 (1.177-3.184)
20-30	97	78.20%	167	65%		1
Age at marriage						
≥20	62	50.00%	100	38.90%	0.04	1
<20	62	50.00%	157	61.10%		1.570 (1.019-2.419)
Age at first pregnancy						
≥20	79	63.70%	119	46.30%	0.001	1
<20	54	36.30%	138	53.70%		2 (1.310-3.163)
Education						
Illiterate/read &write	18	14.60%	94	36.50%	<0.001	3.4(1.89-5.9)
School or University	106	85.50%	163	63.40%		1
Occupation						
Not working	86	69.90%	196	76.30%	0.002	2.27 (1.29-3.99)
employee	31	25.60%	31	12.10%		1
Manual worker	7	5.60%	30	11.70%		4.22 (1.67-11.7)
Family income (in Egyptian pound)						
<500	40	32.30%	79	30.70%	0.001	1.65 (0.95-2.85)
500 -	39	31.50%	124	48.20%		2.65 (1.55 – 4.53)
≥1000	45	36.30%	54	21.10%		1

Table 2: Personal risk factors of anaemia in the study group.

Regarding factors related to history of pregnancy, high parity (more than 2), infrequent antenatal visits (less than 5) and irregular daily intake of iron supplement were found significantly related to anaemia in third trimester with odds ratio of 2.27, 2.36 and 3.9 respectively (table 3).

	No anaemia		anaemia		P	OR (95%CI)
	No.	%	No.	%	value	
Parity						
≤2	94	75.80%	149	58%	0.001	1
>2	30	24.20%	108	42%		2.27 (1.4-3.7)
Interval between current & last pregnancy						
≤ 2years	31	42.20%	67	39.20%	0.632	1.146(0.657-1.999)
>2 years	42	57.50%	104	60.80%		1
Haemorrhage during pregnancy						
Yes	17	13.70%	29	11.30%	0.496	1.249(0.658-2.372)
No	107	86.30%	228	88.70%		1
Frequency of antenatal visits						
<5visits	24	19.40%	166	36.20%	<0.001	2.36 (1.42-3.99)
≥5visits	0	80.60%	164	63.80%		1
Taking iron supplement						
YES	102	82.30%	208	80.90%	0.756	1
NO	22	17.70%	49	19.10%		1.092(0.626-1.904)
Regular intake of Iron						
Regular daily intake	72	70.60%	79	38.20%	<0.001	1
Irregular daily intake	30	29.40%	128	61.80%		3.889 (2.335-6.475)

Table 3: Pregnancy related risk factors of anaemia in the study group.

Concerning the dietary risk factors, deficient weekly intake of meat, chicken, fish, vegetables, fruits and excess daily consumption of tea were associated with anaemia (table 4).

By logistic regression, the following factors were found as independent risk factors for anaemia in pregnancy: multiparity (>2), antenatal visits (<5 visits), meat intake (<1/week), tea intake (>1/day), low intake of fruits and irregular intake of iron supplementation (table 5).

Discussion

The demographic characteristics of the study subjects are comparable to that of an Upper Egypt sample of women in reproductive age group. Most women were illiterate or have low level of education and were not working[11].

	No anaemia		anaemia		P value	OR (95%CI)
	No.	%	No.	%		
Meat /week						
0-1	60	48.40%	181	70.40%	<0.001	2.540(1.632-3.954)
>1	64	51.60%	76	29.60%		1
Chicken/week						
0-1	65	52.40%	174	67.70%	0.004	1.903(1.227-2.951)
>1	59	47.60%	83	32.30%		1
Fish /week						
0-1	95	76.60%	227	88.30%	0.003	2.310(1.314-4.059)
>1	29	23.40%	30	11.70%		1
Fruits /week						
<4	40	32.20%	170	66.10%	<0.001	4.103(2.599-6.478)
≥4	84	67.70%	87	33.80%		1
Vegetables/week						
<4	50	40.30%	174	67.70%	<0.001	3.103(1.990- 4.837)
≥4	74	59.60%	83	32.20%		1
Tea/ day						
0-1	93	75.00%	112	43.80%	<0.001	1
>1	31	25.60%	144	56.30%		3.857(2.397-6.206)

Table 4: Dietary risk factors for anaemia in the study group.

	β	P value	OR (95% CI)
Parity >2	0.722	0.02	2.06 (1.12 – 3.8)
Antenatal visits (<5)	0.943	0.012	2.6 (1.23 – 5.4)
Meat (less than once /week)	0.754	0.008	2.13 (1.2 – 3.7)
Tea (more than once /day)	1.012	0.001	2.8 (1.54 – 4.9)
Fruit (less than four times/week)	0.671	0.02	1.9(1.1 – 3.4)
Irregular iron supplement intake	0.693	0.023	2 (1.1 – 3.6)

Table 5: Independent risk factors for anaemia of third trimester pregnancy in the study group.

Prevalence of anaemia

The current study revealed that the prevalence of anaemia among pregnant women in the third trimester of pregnancy was 67.4%; equally divided between mild and moderate anaemia (Figure 1).

Previous studies in Egypt reported that the prevalence of anaemia among pregnant women was 45.4% up to 56%[1]. In Sharkia Governorate in

Egypt, the prevalence of anaemia among pregnant women was reported to be around 55%[12].

The prevalence of anaemia with pregnancy in Egypt seems higher than other neighboring countries. Anaemia with pregnancy was reported to be 44.9% and 31.1% in the Gaza Strip and the West Bank, respectively[13], 42% in Northern Jordan[14]. However, according to Demographic Health survey Data, Egypt is ranked for prevalence of anaemia with pregnancy someway in the middle when compared with other developing countries in Africa and Asia[1].

The prevalence of anaemia across the different trimesters of pregnancy showed some variability. Most studies pointed to the progressive decrease of haemoglobin level with progress of pregnancy, so that prevalence of anaemia is highest in third pregnancy[15,16]. Although plasma expansion may explain the great decline in haemoglobin level in second trimester, yet increase iron demand for fetus and placenta is the main explanation of anaemia in third trimester[4]. A large study in the United States confirmed the deficiency of total body iron in third trimester more than the first and second trimester[16].

Infants born to pregnant women with third trimester anaemia showed a significantly lower mental development index at 12, 18, and 24 months of age compared to those born to prenatally non-anemic mothers[17]. Other studies reported 6.5% increase in the incidence of low birth weight babies and 11.5% increase in preterm deliveries in mothers who were anemic in their third trimester[15].

Despite the fact that most pregnant women take iron-containing supplements, iron deficiency and iron-deficiency anaemia were frequent in third-trimester women. The World Health Organization regards this as a moderate public health problem[18].

To authors' knowledge, no researches in the literature targeted anaemia in third trimester pregnancy in Egypt. However, the results of the current study revealed higher prevalence of anaemia in third pregnancy than that reported in Algeria[19], China[20] which was 46 and 45% respectively. Developed countries reported much lower prevalence of anaemia in third trimester: 10% in the United States[16] and 21% in Belgium[18], up to 37% in Turkey[21].

Risk factors of anaemia

By univariate analysis, anaemia in third trimester was associated with certain personal characteristics; namely: rural residence, age below 20 or above 30 years, young age at marriage, young age at first pregnancy (below 20 years), low level of education, non-working or manual worker, and low family income (table 2).

Relation of anaemia with some aspects of lower socioeconomic class such as low level of education, rural residence, non-working or manual worker as well low reported income was noted in many studies over the world[20,22] Low socioeconomic status affects healthcare seeking behavior[1], nutrition as well other infestations and infections that may lead to anaemia[23].

Relation of anaemia with maternal age showed some discrepancies in the literature. The present study revealed bi-polar distribution of anaemia for women less than 20 years and above 30 years (Figure 2). Many studies in developing countries showed similar findings[24,25]. Other studies revealed higher prevalence in younger age group that decline continuously with progressive age[21,26]. Mei et al showed that total body iron stores in American pregnant women is lowest below 20 years and gradually increase by age[16]. This pattern may change among different populations. Early age at marriage and pregnancy is common in developing countries and is associated with increased morbidity and mortality for the newborn and mother[27]. Early pregnancies are associated with higher overall fertility rates, exhaustion of iron stores that are already low in the teenager, as well compromising the social status of women[28].

Multiparity is an important risk factor for maternal anaemia[20,21,26]. It may induce anaemia by reducing maternal iron reserves at every pregnancy and by causing blood loss at each delivery.

Regarding other pregnancy related factors, infrequent antenatal visits (< 5 visits) and irregular intake of iron supplement were independent risk factors for anaemia in late pregnancy (table 5). Many studies showed increased frequency of anaemia as well other maternal complications with poor attendance of antenatal visits[1,26,29]. Antenatal visit provides health education regarding nutrition, regular checking of haemoglobin concentration as well providing the iron and mineral supplement. Yet, frequent antenatal visits may be an indicator for better health attitude of the pregnant which in turn affects nutrition and other healthy lifestyle.

Meta-analysis revealed significant better haemoglobin concentration and reduced risk of anaemia at third trimester or near delivery with iron supplement in early pregnancy. Iron supplement

also reduces the risk of low birth weight and preterm labor. Exposure-response analysis indicated that for every 10 mg increase in iron dose/day, up to 66 mg/day, the relative risk of maternal anaemia was reduced in a linear trend[30]. The benefits of iron supplement usually occur within 3 months from the time it begins[7] showing the importance of early supplementation during pregnancy.

Dietary risk factors for anaemia include low intake of meat, fish and poultry, low intake of fruits and vegetables and excess intake of tea. By logistic regression, low intake of meat, excess intake of tea and low intake of fruit were found independent risk factors with estimated odd ratio of 2.13, 2.8 and 1.9 respectively (table 4,5).

Tea is a very common hot drink in Egypt and taking tea after the meal is a common unhealthy habit. On the other hand, Egypt is ranked among the poorest countries in consumption of animal protein compared to developed countries. Literature revealed that tea consumption and low intake of red meat were associated with anaemia[31-33]. Studies showed that tea reduces iron absorption but does not influence iron status in people with adequate iron stores[34]. On the other hand, Meat is a good source of heme iron as well high biological value protein. Absorption of iron is enhanced by fruits rich in ascorbic acid, meat, fish and poultry[35].

Meat consumption in Egypt was reported to be annually around 22 Kg per capita compared to 100 Kg for European countries[36].

The current study highlighted problem of anaemia by third trimester of pregnancy in Fayoum governorate. Prevalence of anaemia at this gestational age was 67%. Among many risk factors identified, yet the main independent predictors of anaemia in third trimester of pregnancy were multiparity, infrequent antenatal visits, irregular intake of iron supplement, low intake of weekly meat and fruits and frequent daily tea consumption.

Although intake of iron supplementation and health education are carried routinely in antenatal care, yet the revealed problem of anaemia by third trimester raises the issue of quality of health service, poor compliance and attitude of pregnant or both. This can be regarded as underperformance indicator of antenatal care. Further researches are recommended to be carried out to study quality and compliance of antenatal services as well innovative approaches for iron supplementation to overcome such problem.

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