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Effects of Bad Nutritional Habits on Health of Pregnant Women

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Abstract: The objective of the present study is to over view multiple micronutrient deficiency during pregnancy and factors affecting that. The subjects studied constituted 640 Egyptian pregnant women representing different socio-economic districts who were attending routine antenatal clinic at the department of obstetrics and Gynecology, Manshiet El Bakry Hospital, Cairo-Egypt. The study was carried out from 2007 to 2009. The subjects were divided into two groups, one (n=420) were anemic pregnant women, group two (n=220) non anemic pregnant women and considered as the control group. A pretested self reported questionnaire was administered to all women including socio-economic data and questions related to her nutritional habits. Dietary intake which was assessed by 24 hours dietary recall for 3 days. Dietary Reference Intakes (DRI) was used to assess the adequacy of micro nutrients intake. Complete examination was done for all women and investigation included blood picture for assessment of iron, Hb level, ferritin, zinc, folic acid and B_{12} The mean age of the study sample was25±3.9 and mean married age was 22.5±2.9. Most of diseased pregnant women of low socio-economic class compared to the control group with significant difference ($P< 0.01$). Our results showed the majority of the diseased pregnant women do not practice healthy eating habits like the irregularity of meals and infrequency of breakfast with low consumption of red meat, vegetables and fruits as well as the beans and mushrooms which are rich sources of folic acid. Our study revealed that most of the diseased pregnant women suffering from dyspnea (66.6 %), palpitation (56.6%),easily fatigue (40.6%) and recurrent fainting (40.4%) , the clinical and laboratory investigation supported that most of diseased pregnant women have significantly lower Hb level, iron, firritin as well as zinc and folic in plasma. A negative correlation was found between serum level of the micronutrient (iron, zinc and folic acid) and manifestation of deficiency of this micronutrient, positive correlation was found between dietary intake and the level of serum iron, zinc and folic. Our study revealed that most of diseased group (33.4%) with past history of difficult labor followed by low birth weight (19.5%), abortion (4.8%), fetal loss (3.5%) and spina bifida (0.2%) with statistically significant difference compared to control group ($P<0.05$). Based on the recommendation of the committee on dietary reference intake DRI, most of diseased women have low intake of iron, zinc and folic acid. The clinical and laboratory investigation support that and most of diseased pregnant women have significantly lower HB, iron, ferritin as well zinc and folic in plasma with statistically significant difference compared to control group ($P< 0.05$). Association between trace elements deficiency and different predisposing factor, the most predisposing factor for micronutrient deficiency was low iron intake (odd's ratio 4.3) followed by low vegetables and fruits intake (odd's ratio 3.5), low zinc intake (odd's ratio 2.9), negative history of elements supplementation (odd's ratio 2.4) and low socio-economic status (odd's ratio 2.3).

Key words: Pregnant women · Nutritional habits · Hb level · Dietary intake · Zinc and folic acid

INTRODUCTION

Pregnancy is a period of increased requirements need for micronutrients and that to fulfill demands for physiological changes of mother and the fetus. During this period, the micronutrients such as iron, zinc and folic are the major marker that affects both the fetus and the pregnant women [1]. Deficiencies of

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micronutrients (Iron, Zinc, folic and B12) during pregnancy are known to be causes of low birth weight [2]. Various studies have documented that micronutrient deficiency affect growth and lead to low birth weight and pregnancy complication [2, 3]. Iron is the most extensively investigated micronutrients that are considered lacking in the diets of pregnant women. This because anemia, attributable to iron deficiency is a major problem in developing countries and even in developed countries like the United States of America [4] and iron deficiency with or without anemia is reported to affect about 25% of the poorer pregnant women. Unique to iron is also other micronutrients such as zinc or folic acid. Adequate nutrition is critical for pregnant women because both the fetus and an infant are dependant on adequate maternal stores of micronutrients [5]. Utilization of one nutrient is often dependent on the adequate supply of some other nutrient deficiency of any one of them affects biochemical functions of the other but all the metabolic machinery [6]. Multiple micronutrients occur when the diet is poor. Most attention was focused on one or two micronutrients [7]. The objective of this study is to overview multiple micronutrients deficiency during pregnancy.

SUBJECTS AND METHODS

The subject studied constituted 640 Egyptian pregnant women representing different socio-economic districts who were attending routine antenatal clinic at the department of obstetrics and Gynecology, Manshiet Al-Bakry Hospital Cairo, Egypt. This hospital provides health services and medication to multiple areas Elzeitoun, Kobry Elkobba, Hamamt Elkobba and Manshiet El-Bakry. These clinics were selected for this study due to their cooperation and the availability of comprehensive health file system. Age group with mean age 25.65±1.09. The study was carried out from the beginning of October 2007 to the end of April 2009. The subjects were divided into two groups: group one (n=420) were the diseased pregnant women who were recorded and already diagnosed anemic; group two (n=220) represented non anemic pregnant women and considered as the control group.

Methods: A pretested self reported questionnaire was administered to all women including personal and socio-economic data, questions related to her nutritional habits: included questions on regularity of meals and frequency of breakfast; also questions on their consumption of animal meat, vegetables and fruits, etc, associated symptoms of micronutrient deficiency, duration of elements supplementation.

Dietary intake which was assessed by 24 hours dietary recall for 3 days. DRI was used to assess the adequacy of micro nutrients intake [8].

Health History: A -Questions related to any manifestation of anemia as feeling of exhaustion, fainting, dyspnea and palpitation, etc. B-Past history of low birth weight and complication.

Examination: was done for all women including chest, abdomen,ultrasonic of uterus and anthropometry record about height andweight. The body mass index (B.M.I) was calculated: weight/height2 in kg/m^2 [9].

Investigation: Complete blood picture for assessment of iron, ferritin zinc and folic acid were done. Blood samples were collected and were analyzed by atomic absorption spectrophotometry (AAS) [10]. For iron status, serum ferritin levels were assessed by Enzyme Linked Immuno Sorbent Assay (ELISA) method [11].

Statistical Analysis: Data were expressed as mean ± SD and were analyzed statistically using SPSS package. collected data was statistically analyzed using suitable statistical tests (chi square, T-test, correlation coefficient, odd's ratio). The P value was considered significant at (P=0.05) [12].

RESULTS

The maternal characteristics of the studied sample were presented in Table 1. The mean age of the sample (25.5±3.09) with mean married age (22.5±2.9) and there was no statistically significant difference between two group as regards age and married age as well as B.M.I (before and after pregnancy) it was observed from the table that there was significant difference ($p<0.05$) as regards inter pregnancy interval and history of elements supplements. Socio demo graphic characteristics of the study sample were presented in Table 2. It was noticed from the table that mostly of diseased pregnant women (60 .7%) have more than 4 member compared to (39.5%) of control pregnant women, also the table showed high percent of illiterate diseased

Table 1: Maternal characteristics of the studied sample.

Characteristics	Diseased pregnant	Control	*P*
Mean age	25.5±3.09	--	--
Married age	22.5±2.9	--	--
Inter pregnancy interval months	18.7±9.9	21.1±8.7	p=0.05
B.M.I (kg / m^2) before pregnancy[	22±2.1	21±5.9	P =0.05
B.M.I (kg / m^2) after pregnancy	25±1.3	25±3.6	P =0.05
Elements supplement(n)	90 ±2	119±1	p=0.05

Table 2: Socio- economic characteristics of studied group

	Diseased pregnant (420)		Control pregnant (220)		
Variable	No	%	No	%	Chi square p
Family size					
≤4 member	165	39.3	133	60.5	chi square 130.8P 0.000
> 4 member	255	60.7	87	39.5	
Education of the women					
Illiterate	189	45	33	15	chi square 204.3P 0.0000
Preparatory and Secondary	144	34.2	71	32.3	
University and Postgraduate	87	20.7	116	52.7	
Women occupation					
Working	163	38.8	153	69.5	chi square 165.8P 0.000
Non working	257	61.2	67	30.4	
Family income					
Sufficient and saving	99	23.5	131	59.5	chi square 122.7P 0.000
Sufficient	83	20	69	31.4	
Insufficient	218	52	20	9	

Table 3: comparison between diseased pregnant women and controls for some dietary habits

		pregnant women		Control		
Variables	levels	No.	%	No.	%	Chi square p
Do you take your meals regularly?	-Always regular	165	39.3	149	67.7	Chi square 155P 0.000
	- irregular	255	60.7	71	32.2	
Do you take breakfast?	- Daily	88	21	124	56.3	Chi square 110.3 P 0.0000
	- 3 or 4 / week	139	33	38	17.2	
	- Once or 2 / week	119	28.3	32	14.5	
	- rarely	74	17.8	26	11.8	Chi square 124.2P 0.0000
How often to eat snacks?	- Daily	64	15.2	16	7.2	Chi square 103 P 0.000
	- 3 time /week	159	38	32	14.5	
	- 2times /week	109	26	48	21.8	
	- rarely	88	21	134	60.9	
How often do you eat meat?	- Daily	80	19	130	59	Chi square 210 P 0.0000
	- 3 time /week	109	26	40	18.1	
	- 2times /week	171	40.7	30	13.6	
	- rarely	70	16.6	20	9	
How often do you eat vegetable and fruits?	- Daily	66	15.7	120	54.5	Chi square 195.9 P 0.0000
	- 3 time /week	128	30.5	50	22.7	
	- 2times /week	176	42	35	15.9	
	- rarely	50	12	15	6.8	
How often do you eat mushrooms?	- Daily	70	16.6	40	18.1	Chi square 110 P 0.000
	- 3 or 4 / week	80	19	30	13.6	
	- Once or 2 / week	109	25.9	130	59	
	- rarely	171	40.7	20	9	
How often do you eat yeast?	- Daily	60	14.2	150	68.1	Chi square 90.78 P 0.000
	- 3 or 4 / week	110	26.1	40	18.1	
	- Once or 2 / week	190	45.2	20	9	
	- rarely	80	19	10	4.5	
How often do you eat beans?	- Daily	84	20	119	54	Chi square 123.99 P 0.000
	- 3 or 4 / week	130	30.9	40	18.1	
	- Once or 2 / week	150	35.7	41	18.6	
	- rarely	56	13.3	20	9	

Table 4: Distribution of the studied group according to manifestation (420)

Clinical data	No.	%
Dyspnea	280	66.6
palpitation	237	56.6
Easy fatigue	179	40.6
Recurrent fainting	170	40.4
Feeling exhausted	152	36.1
Loss of hair Irritability	82	18.6
	30	7.1

Table 5: Distribution of the studied group according to past history Clinical data

	Cases	%	Control	%	Chi square p
Low birth weight	86	19.5	3	1.4	< 0.001
Fetal loss	15	3.5	2	1	< 0.001
Abortion	21	4.8	5	2.2	< 0.001
History of spina bifida	1	0. 2	0	0	< 0.05
Difficult labor	147	33.4	10	4.4	< 0.001
-ve history of complication	150	38.6	200	91	< 0.001
Total	420	100	220	100	

Table 6: Distribution of the studied sample according to blood analysis

	Diseased preg. women		control		
Items	No.	%	No.	%	Chi square p
Hb					
≤ 11 gm/dl	279	66.5	91	41.3	chi square80.31 P 0.000
> 11 gm/dl	141	33.5	129	58.6	
Iron					
≤ 50 µg %	288	68.5	92	41.8	Chi square110.75 P 0.000 %
> 50 µg	132	31.5	128	58.2	
Ferritin					
≤ 12 µg /ml	286	68	83	37.7	chi square30.24 P 0.000
>12 µg /ml	134	32	137	62.2	
Zinc					
≤ 70 mg/dl	280	66.6	82	37.2	chi square60.46 P 0.000
> 70 mg/dl	140	33.3	138	62.7	
Folic					
≤ 3ng/ml	240	47.6	70	31.8	chi square62.75 P 0.000
>3ng /ml	200	57.1	150	68.1	
B12					
≤ 200-500 mg/ml	327	77.8	60	27.2	chi square76.83 P 0.000
> 500 mg/ml	113	27	160	72.7	

Table 7: Energy and micronutrient intake of the studied groups

Nutrient intake mean ± S.D	Diseased pregnant	DRI	Control pregnant	t-testp
Energy (k cal)				
1st trimester	2411±4.4a	2403	2455± 8.2 a	p>0.05
2nd trimester	2822±3.1 a	2743	2901± 5.1 a	p>0.05
3rd trimester	3377±2.2 a	2800	3390±1.1 a	p>0.05
Protein (g)	59.3 ± 17.9 a	71	76.0 ± 33.4 b	p< 0.001
Vitamin				
Vit. B12 (µg)	1.5 ±0.8 a	2.6	2.4 ± 1.5 b	p< 0.001
Folic (µg)	376.6 ± 68.0 a	600	559.6 ± 85.9 b	p< 0.001
Minerals				
Zinc (mg)	7.6 ± 1.3 a	11	11.8 ± 1.5 b	p< 0.001
Iron intake (mg)	8.6 ± a	27	20.4 ± 1.2 b	p< 0.001

Table 8: Distribution of diseased pregnant women according to their micronutrient status.

Micronutrient leve	Deficient intake Of thediseased p.w 420	%	Deficient intake Of the control 220	%	Chi square p
Iron ≤27	294	70%	33	15%	p≤0.05
Zink ≤11	294	70%	26	12%	p≤0.05
Folic ≤600	291	69.50%	28	13%	p≤0.05
B12 ≤2.6	273	65%	26	12%	p≤0.05

pregnant women (45%) compared to 15% only in control group, most of diseased women (61.2%) without work, as regards family income the majority of diseased pregnant women with insufficient income (52%) compared to (9%) only in control group. There was highly statistically significant difference between the diseased pregnant women and control group ($p < 0.0001$).

Table 3 showed comparison between diseased pregnant and control for some dietary habits. As regards the regularity of taken meals results showed that 60.7% of the diseased pregnant took irregular meals compared to 32.2% of the control, also 33% of diseased group took breakfast 3-4times/week while most the control group(56.3%) took breakfast daily, also diseased group often eat snacks 3 time/week (38%) compared to (21.8%)for control group. As regards questions about their food consumption most of diseased pregnant consumed meat, vegetable, yeast and beans 2 time/week (40.7%, 42%, 45.2% and 35.7%) respectively compared to daily consumption of same food in control group (59%, 54.5%, 68.1% and 54%) ,respectively. It was observed from the table, most the diseased group rarely consumed mushrooms 40.7% compared to 9% only of control group. There was highly statistically significant difference for all items of the tables between two groups.

Table 4 showed distribution of studied group according to their manifestation the dyspnea (66.6 %), palpitation (56.6%), easily fatigue (40.6%)and recurrent fainting (40.4%), feeling of exhaustion (36.1%), loss of hair (18.6%), and lastly irritability (7.1%).The distribution of studied group according to past history presented in Table 5, show most of diseased group (33.4%) with past history of difficult labor followed by low birth weight (19.5%), abortion (4.8%), fetal loss (3.5%) and spina bifida (0.2%), this is high percent compared to control group with significance difference between two group ($p < 0.05$).

Table 6 showed distribution of studied sample according to blood analysis (66.5%) of diseased group had Hb level less than 11 gm/dl compared to (41.3%) in control group, also 68.5% of diseased pregnant women had serum iron level = 50 µg % compared to 41.8% in control group. According to serum ferritin level (68%) of diseased group had serum ferritin less than 12 µg/ml compared to (37.7) in control group. As regards the level

Table 9: Correlation coefficient between manifestation of micro-nutrient deficiency and hematological parameters of the studied groups

Variable	Correlation coefficient	P
Hb	-0.62	< 0.05
Iron	-0.8	< 0.05
Ferritin	-0.3	< 0.05
Folate	-0.4	< 0.05
Zinc	-0.2	< 0.05
B12	-0.1	< 0.05

of red blood cells in the serum, 59.5% of diseased group had R.B.C less than 4 million/mm^3 compared to 36% in control group. The table show majority of diseased group had less serum level of zinc, folic and B_{12} (66.6, 47.1and 77.8%) respectively compared to (37.2, 31.8 and 27.2%) in control group and there was highly significant difference between the two groups as regards blood analysis ($p<0.00$).

Table 7 based on the recommendation of the Committee on Dietary reference intake (DRI) the mean daily intake of protein in diseased group below the recommended level and was statistically different ($p<0.01$) between the two groups. Similar the mean daily intake of both folic acid, zinc, iron as well as B_{12} in diseased group below the recommended level and was statistically different ($p<0.01$) between the two groups.

Table 8 showed the distribution of diseased pregnant women according to their micronutrient statues, 70% of the diseased pregnant women had deficient level of iron and zinc compared to 15%and 12% respectively in control group, also 69.5% and 65% of the diseased pregnant women had deficient level of folic and B_{12} compared to 13%and 12% respectively in control group, with significant difference between the two group ($p<0.05$).

Table 10: Correlation coefficient between micro-nutrient intake and levels of micro-nutrient in plasma of the studied groups

Variable	Correlation coefficient	P
Iron	0.511	< 0.05
Zinc	0.4	< 0.05
Folate	0.314	< 0.05
B12	0.221	< 0.05

Table 11: Association between trace elements deficiency and different Predisposing factor

Predisposing factor	Odd's ratio
Low meat intake	4.3
Low vegetables	3.5
Low zinc intake	2.9
-ve history of elements supplement	2.4
Mothers education	2.3
Family income	1.9
Family size	1.8

Table 9 showed correlation coefficient between manifestation of micro-nutrient deficiency and hematological parameters. A highly negative correlation coefficient was found between the level of hematological parameters and manifestation of deficiency of them ($p<0.05$).

Table 10 showed highly positive correlation coefficients were found between micronutrient intake and micro nutrient level in plasma ($p<0.05$).

Table 11 showed the most important predisposing factor for micronutrient deficiency was law meat intake (Odd's ratio 4.3) followed by low vegetables intake (Odd's ratio3.4), zinc intake (Odd's ratio 2.9)-ve history of elements supplementation (Odd's ratio 2.4) and low mother's education (Odd's ratio 2.3).

DISCUSSION

Minerals and vitamins referred to collectively as micronutrients have important influence on the health of pregnant women and the growing fetus. Iron deficiency results in anemia, which increases the risk of death from hemorrhage during delivery. Zinc deficiency has been associated in some studies with complication of pregnancy and delivery as well as with growth retardation, congenital abnormality in the fetus. Folic acid deficiency can lead to hematological consequences, pregnancy complication and congenital malformation [13]. The main characteristics of studied sample showed the mean age 25±3.9 with married age of 22.5±2.9 (Table 1). Most of diseased pregnant women of low socio-economic class compared to the control group with significant difference ($P< 0.01$) (Table2), These finding are supported by Belgnaoui and Belahsen [14] who reported that negative correlation between incidence of iron deficiency anemia and dietary intake as well as socio economic status especially family size and family income. This finding adds more support to the study of Abdel Megeid *et al.* [15] who revealed that most important predisposing factor for iron and zinc deficiency was low intake of them followed by low family income and increase family size.

Our results showed the majority of the diseased pregnant women do not practice healthy eating habits like the irregularity of meals and infrequency of breakfast with low consumption of red meat, vegetables and fruits as well as the beans and mushrooms which are rich source of folic acid (Table 3). Similar results were reported by Pathak *et al.* [2] and Farrag [16] in their cross sectional study who reported that majority of anemic pregnant women were infrequent consumption of vegetables, fruits, nuts, oil seed and animal foods. Our study revealed that most of the diseased pregnant womensufferingfrom dyspnea (66.6 %), palpitation (56.6%), easily fatigue (40.6%) and recurrent fainting (40.4%) (Table 4), iron deficiency anemia is always associated with these manifestation , the clinical and laboratory investigation supported that most of diseased pregnant women have significantly lower Hb level, iron, firritin as well as zinc and folic in plasma (Tables 4 and 6) . In our result negative correlation was found between serum level of the micronutrient (iron, zinc and folic) and manifestation of deficiency of this micronutrient, positive correlation was found between dietary intake and the level of serum iron, zinc and folic. It was observed from Table 5 show most of diseased group (33.4%) with past history of difficult labor followed by low birth weight (19.5%), abortion (4.8%), fetal loss (3.5%) and spina bifida (0.2%) and this is high percent compared to the control group with significant difference ($P< 0.05$). This result came in agreement with studies of Black [13] and Ramakrishanan [17] who found better nutritional state previously and during pregnancy are in change of more than 50 % of cases of low birth weight, birth weight is one of the best indicators of new born health [18]. Also Ceesay *et al.* [19] in rural Gambia found that prenatal mortality decreased 37 % when birth weight increased because of better nutritional state duringpregnancy course. In India, Florentino [20] reported that anemia affects an estimated 50 % of the population. In women, anemia may become the underlying cause of maternal and prenatal mortality with increase risk of premature delivery and low birth weight.Based on the recommendation of the committee on dietary reference intake [8] (Table 7), most of diseased women are low intake of iron, zinc and folic acid. The clinical and laboratory investigation support that and most of diseased pregnant women have significantly lower HB, iron, ferritin as well zinc and folic in plasma with

statistically significant difference compared to control group ($P< 0.05$). Similar finding were obtained by results of Farrag [16] which reported that the total average nutrient intake in protein, iron and zinc of pregnant women was less than RDA.

The present results are in agreement with the results reported by Yang *et al.* [21], Pena *et al.* [22] and Ma *et al.* [23]. They concluded that high percent of pregnant women did not reach recommendations for iron, zinc and folic. Subjects with an intake of lower iron and zincthan 50 % of the recommended values showed significantly lower serum iron and zinc levels than did those with higher intake. An inadequate intake of iron from the diet during pregnancy can lead to appearance of many manifestation of anemia and hematological statues of the neonate. Multiple vitamin deficiencies especially folic acid may be associated with anemia or iron deficiency in pregnant women [13]. This finding adds more support to the study of Pathak *et al.* [2] which was conducted in six villages of a rural area in Haryana State, India. He reported that all pregnant women aged more than 18 years were deficient in zinc , iron and folic acid in serum, their dietary intake data revealed an inadequate nutrient intake of them and over 19 % pregnant women were consuming less than 50 % of the recommended calories. According to Belgnaoui and Belahsen [14], their study of the prevalence of iron deficiency anemia in Moroccan pregnant women and the relation between iron status and diet in pregnancy. Their results show that anemia is affected mostly with poor diet.

Regarding association between trace elements deficiency and different predisposing factor, it was observed from Table 11 that the most predisposing factor for micronutrient deficiency was low iron intake, which reflects low red meat intake followed low zinc diet intake, low socio-economic status and negative history of element supplementation. Similar findings were obtained by other studies Farrag [16] and CAPMASIUNICEF [24], where their study revealed many risk factors for anemia in child bearing age indicating a multi-factorial nature of the disease. The most important revealed risk factors associated with the highest odd's ratio values were unsound dietary food habits as regard iron intake (not eating red meats at all with O.R=2.32. These findings are supported by Belgnaoui and Belahsen [14] who reported the incidence of iron deficiency anemia is affected mostly women with poor diet as well as low socio economic status especially large family size and low family income. This finding is to agreement with Haffz *et al.* [25] who reported that a positive correlation between the serum level of iron and dietary iron intake as well as socio economic level. In addition, the present study revealed that the negative history of elements supplementation was risk factor for anemia. Dietary supplements can play a great role in maternal dietary adequacy, which affect both pregnancy and lactation periods. Safe and efficient use of diet any supplements for nutrients that are limited in food in the diet is recommended in the maternal diet especially in cases that are at high risk of specific nutrient deficiency [6].

RECOMMENDATION AND CONCLUSION

From the results of our study we concluded that inadequate dietary intake of iron, zinc and folic during pregnancy leads to deficiency of these micronutrients. Factors affecting are low family income, increased family size as well as lack of nutritional awareness. Prevalence and severity of multiple micronutrient deficiency during pregnancy and their effect on the health of both pregnant and the growing fetus showed be the most important issue for researches and decision markers in developed countries.

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