Contributing Factors of Iron Deficiency Anemia among Children under Two Years Attending Family Health Centers in Alexandria.

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Abstract: Iron deficiency is one of the biggest contributing factors to the global burden of anemia. It is an indicator of both poor nutrition and poor health. Iron deficiency is considered as one of the ten leading global risk factors in terms of its attributable disease burden. Hence, the aim of the present study was to investigate the contributing factors of iron deficiency anemia among children under 2 years attending family health centers in Alex. Exploratory descriptive study design was adopted to carry out this study. The study was conducted at four family health centers in Alexandria chosen randomly from seven zones .Total sample was 400 healthy children aged 12 to 24 months and their mothers. Two tools were developed and used by the researcher in order to collect the necessary data. The findings of the present study revealed that, the prevalence of anemia was 77% among children under 2 years. Minimum to maximum age was 12-21months for not anemic infants with a mean age of 15.3±3.1 and 12-24 months for anemic infants with a mean of 17±2.6. male infants constitute more than half (54.3%) not anemic and 50.3% anemic infants, while, female infants constitute 45.7% of not anemic infants, and 49.7% of anemic infants. Statistically significant differences was found between two groups regarding level of father & mother education ,residence, weight ,height ,hemoglobin% of children and intake of iron. About 50% of not anemic mothers' practices regarding weaning practices were scored as good (correct) practices (which means correct time &types of food) compared to only11.7% of anemic mothers' practices. The study concluded that the socio economic factors, faulty weaning and feeding practices are the main contributing factors of anemia among children under 2 years. It is recommended that all efforts should be directed to promote nutrition well-being of young children. As the nutritional well of young children reflects household, community, and national investments in family health and contributes in both direct and indirect ways to the country's development.

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1. Introduction:

Anemia is a medical condition characterized by abnormal decrease of blood capability for gas and nutrient exchange .It is a worldwide health problem for all ages and both sexes [1]. Anemia, defined as hemoglobin concentration below established cut-off levels [2], it is a widespread public health problem with major consequences for human health as well as social and economic development [3,4]. Although estimates of the prevalence of anemia vary widely and accurate data are often lacking, it can be assumed that in resource-poor areas significant proportions of young children and women of childbearing age are anemic. Iron deficiency anemia is the most frequently hematological disease of infancy and childhood [5]. WHO estimates the number of anemic people worldwide to be a staggering two billion and that approximately 50% of all anemia can be attributed to iron deficiency [6]. While, more than 75% of Indian toddlers are anemic [7,8] . Moreover, more than 100 million African children are thought to be anemic [8]. In Egypt the Demographic Health Survey 2008 reported that about 48.5% of children under 2 years had iron deficiency anemia (IDA) [9]. where the study done in Côte d'Ivoire demonstrated that 40–50% of children and adult women were anemic and that IDA accounted for about 50% of the anemia in schoolchildren and women, and 80% in preschool children (2–5 years old) [10].

The body of the newborn contains about 0.5 gram iron, where as the adult content is 5gram. In order to make up this 4.5g difference, 0.8-1.5mg of iron must be absorbed each day to fill the stores and to fulfill the growth requirements [11]. This is essential during the first stages of life. Since less than 10% of iron in diet is absorbed, a diet containing 8-15 mg iron is necessary each day. This is difficult to obtain in the first year if the infant depends mainly on breast milk. For this reason, the diet should include infant cereals starting from 6 months [12]. There are two forms of dietary iron: heme and non heme. Heme iron is derived from hemoglobin, the protein in red blood cells that delivers oxygen to cells. Heme iron is found in animal foods that originally contain hemoglobin,

such as red meats, fish, and poultry. Iron in plant foods such as lentils and beans is arranged in a chemical structure called nonheme iron [13]. This is the form of iron added to iron-enriched and iron-fortified foods. Heme iron is absorbed better than nonheme iron, but most dietary iron is nonheme iron [13]. The highest risk of ID occurs during times of rapid growth and nutritional demand, during infancy (ages 6-24 months), early childhood, adolescence, and pregnancy [14]. Moreover, the second half of an infant's first year is an especially vulnerable time because infants are learning to eat and if nutritional intake is inadequate, the consequences persist throughout life [15, 16].

Iron deficiency leads to reduced oxygen-carrying capacity and can impact immunity, growth, and development [17]. Iron has multiple roles in neurotransmitter systems and may affect behavior through its effects on dopamine metabolism [18]. The association between ID and dopamine metabolism is highly relevant to children's cognitive development as dopamine clearance has strong effects on attention, perception, memory, motivation, and motor control .The etiology of iron deficiency anemia among children is one of multiple and interacting causes [19].

Among the numerous factors that contribute to the onset of anemia especially, iron deficiency anemia are, both nutritional such as vitamins and mineral deficiencies, suboptimal breastfeeding practices, poor quality complementary foods and non-nutritional such as infection, contamination of complementary food and feeding utensils [20].

Basically there are three types of interventions to increase the iron status of populations; improvement of diet in terms of bioavailable iron, fortification of foods, and medicinal iron supplements [21]. Although anemia has been recognized as a public health problem for many years, little progress has been reported and the global prevalence of anemia remains unacceptably high [21]. WHO, UNICEF and Ministry of Health and Population therefore reemphasize the urgent to combat anemia and stress the importance of recognizing its multi factorial etiology for developing effective control program [22]. As a result of that, The ministry of health is conducting and implementing a national preventive program that aims at child's health welfare such as program for prevention of anemia among children under 2 years (This was done through estimation of blood hemoglobin level of infants at 12 &18 months during immunization and follow up of infants or children and giving the recommended iron supplementation for anemic children according to the schedule of WHO of iron supplementation) [23]. But the prevalence of iron deficiency anemia is still high.

So, a complete study of maternal knowledge and practices in our community is essential to identify malpractices toward feeding, weaning of infants which in turns, will reflect the causes of iron deficiency anemia and malnutrition among infants and young children.

Aim of the study was to investigate the contributing factors of iron deficiency anemia among children under 2 years attending at family health centers in Alexandria.

Research questions:

- What are the contributing factors of anemia among children under 2 years?
- Dose the feeding & weaning practices affect the level of hemoglobin %?
- Dose the socio-economic factors affect the level of hemoglobin %?

2. Materials and Methods

I - Materials

Design:

Exploratory descriptive study design was adopted to carry out this study.

Setting

The study was conducted at four family health centers in Alexandria chosen randomly from seven zones, namely; El montaza from El montaza zone, Bacau's from east zone, El Hadara from middle zone and EL Laban from EL Gomrok zone .

Subjects

On hundred of mothers and their infants or young children were selected randomly from the well baby clinic affiliated to the previously mentioned settings s were included in the study. Total sample was 400 healthy children aged 12 to 24 months and their mothers.

The criteria of selection: Children aged 12 to 24 months - Healthy children (free from any diseases- Attended clinic for immunization and \or follow up.

Tools

Two tools were developed and used by the researcher in order to collect the necessary data.

Tool I Structured interview questionnaire:

It included the following parts.

First part – was concerned with socio-demographic data such as child's age, sex, birth order, mothers and father's age, level of education, occupation and income.

Second part was concerned with information related to feeding patterns such as time& pattern of breast feeding, and age of introducing food, age of stop breast feeding.

-Mothers practices of weaning which includes correct time and types of weaning food, food that increases /or decreases absorption of iron.

-Feeding during sickness and the nutritional problems facing the mothers during feeding her infant.
- 24 recall method (sheet to recall last 24 hours received food).

Third part– Health care data: This part was developed based on child health record in order to obtain information which could influence the infants nutritional state, such as use of vitamin supplementations, iron, calcium, or any prescribed medication -Result of blood investigation especially level of blood hemoglobin. (HB% was done as a routine during follow up of infant aged 12 months and 18 months according to the protocol of ministry of health & population for early detection and treatment of iron deficiency anemia during childhood).

Tool II

Anthropometric measurements:

Weight and length were measured for all studied children

II- Methods

- Permission was adopted to collect the data from the selected family health centers. The researcher explained to the director of selected centers the purpose of the research to insure their cooperation and proper communication.
- The tools were submitted to 5 juries who were expert in the field of community health nursing for its content validity; the validity for the various questions varied between 80-100% .The tools were also tested for its reliability where alpha reliability was 0.74.
- A pilot study was conducted for 30 children and their mothers from another setting (they were not including in the study). The revised form was used in this study.
- Every mother was interviewed individually in previously mentioned settings when she came for follow up or immunization of their infants.
- The children's weight and length were measured and recorded :

(a) Weight – was measured for each child using a baby beam scale. The weight was recorded based on the formula of normal weight = age in years×2+8 [(24)]

(b) Length – The recumbent (crown-heel) length was measured, using a wooden length board. The infant was laid on the examination table with this head positioned firmly against the fixed head board. The knees were stretched. Length =age in years ×5+80[(24)]

Hemoglobin estimation was done by lab technicians {a sample of blood from finger tip was collected from children by using a sterilized blood lancet).

The data were collected during the period of three months (January 2011 to march 2011)

The collected data were coded, analyzed, tabulated and presented in percentage, mean, standard deviation and chi-square test & mann-whitnenty Z test at 5% level of significance by using the SPSS version 10 for windows.

A scoring system for mother's practices regarding weaning & feeding practices was adopted from the assessment sheet. The correct answers were predetermined according to the literature and based on Egyptian food table practices for children feeding. The dietary practices were answered either by "Good practice for correct time & types of food consumption, Fair practices for incorrect time or types of food consumption and Poor or dangerous for incorrect both time &types of food consumption". If (Good) answer it scored "two"; if (Fair) answer, it scored "one" and if (Poor) it scored "zero". All items were summed together to form a score as follows: The mothers feeding practices (by questioning them) total score equaled "26" -Good practices had a score "20-26".- Fair practices had a score "13- 19".- Poor practices had a score "< 13".

Calculation of percent predicted weight and length:

Percent predicted weight and length of the studied infants were calculated by dividing actual weight or length by their predicted weight or length multiplied by 100.

3. Results

The prevalence of iron deficiency anemia is 77% among children under2 years.

Table (1) presents parent's socio-demographic characteristics among normal and anemic infants &/young children. The vast majority 63% of not anemic and 67.2% of anemic infants had mother's aged between 20 and 30 years old. No Statistically significant difference was found between two groups as; (X^2= 4.47, P= 0.107). The table also shows that the vast majority of mothers of not anemic (31.5%) and anemic infants (28.6%) had secondary level of education. Statistically significant difference was found between two groups as (X^2= 21.8, P< 0.0001). About 17.4% of not anemic and 15.6% of anemic infants had working mothers, and the remaining 82.6% of not anemic and 84.4% of anemic infants had not working mothers (X^2=0.17, P=0.68). On the other hand, the vast majority, 38% of not anemic and 29.9% of anemic infants fathers' level of education was the preparatory one. Statistically significant difference was found between two groups (X^2= 20.054, P< 0.0001). All fathers (100%) of not anemic and 98.1% of anemic infants were working fathers.

No Statistically significant difference was found between two groups (X^2= 1.82, P=0.18). Table (1) also presents birth order of infants which was ranged from 1 to 5 of not anemic with a mean 2.3 ± 1.1SD, and 1-5 of anemic with a mean 2.1±1.1SD (Z=1.81, P=0.07). Monthly income of most parents (73.7%) of anemic infants was not enough compared to only 19.6% of not anemic parents. No Statistically significant difference was found between two groups as (X^2= 1.751, P=0.417). More than three quarters (77.2%) and (61%) of not anemic and anemic infants reside urban areas.

Table (2) presents personal and medical characteristics among normal and anemic infants. The table shows that male infants constituted more than half (54.3%) of not anemic and 50.3% of anemic infants, while, female infants constituted 45.7% of not anemic infants, and 49.7% of anemic infants. Minimum to maximum age was 12-21months for not anemic infants with a mean age of 15.3±3.1 and 12-24 months for anemic infants with a mean of 17±2.6. (Z=4.631, P<0.0001) Minimum to maximum hemoglobin level of infants was 11.0-12.6 gm/dl with mean±SD 11.4±0.4 for not anemic infants, and 7.5-10.9 gm/dl with mean±SD 9.9±0.6 for anemic children. Statistically significant difference was found between two groups (Z=14.667, P<0.0001). Presence of previous health problems were found in 22.8% of not anemic infants and in17.9% for anemic infants (X^2=1.14, P=0.286). Anemia was the most common health problem 14.1% for not anemic, and 9.4% for anemic infants followed by GIT, congenital anomalies & respiratory problems (respectively 5.4%, 2.2% & 1.1%) for not anemic, and (respectively 4.5%, 0.3% & 3.6%) for anemic infants. The table also shows that only 37% of not anemic, and 26.3% of anemic infants took medication (appetizers, vitamins, calcium). Statistically significant difference was found between two groups (X^2=3.928, P=0.047). Regarding, iron intake, it was observed that, 67.4% % of not anemic and only 20.5% anemic infants were not taking iron. Statistically significant difference was found between two groups (X^2=5.86, P=0.015).

Table (3) shows anthropometric measures among normal and anemic infants &/ young children. The table shows minimum to maximum weight was 7 to 15 kg with a mean±SD 10.6±1.7 for not anemic infants and 6.5 to 15 kg with mean±SD 10.2±1 for anemic infants (Z=2.076, P=0.038). Height was 60 to 87 cm with a mean±SD 76.8±6.1 for not anemic, and 59 to 88 cm with a mean±SD 75.9±5.7 for anemic infants (Z=1.416, P=0.157). The percentage of predicted weight was 55.6 to 133.3 with a mean±SD 88.4±15.6 for not anemic, and 48.2 to 128.6 with a mean±SD 79.3±14.4. Statistically significant difference was found between two groups (Z=4.883, P=0.001). Finally, the percentage of predicted height was 68.6 to 99.4 with a mean±SD 88.9±6.5for not anemic and 68.3 to 100.6 with a mean±SD 87.1±6.3 for anemic infants. Statistically significant difference was found between two groups (Z=2.38, P=0.018).

Table (4) shows feeding practices among normal and anemic infants. The table shows that the vast majority (75%) of not anemic, and (62.3%) of anemic infants were breastfed. statistically significant difference was found between two groups (X^2=5.01, P=0.025). Most (60.9 %) of not anemic, and (60.4%) of anemic infants started breast feeding within 12 hours, followed by immediately after delivery and after 24 hours [respectively, 21.7%& 17.4% for not anemic & 19.3% & 20.3% for anemic infants]. No statically significant differences was found between two groups (X^2=0.38, P=0.828). Means of duration of breast feeding [Age of stop breast feeding (months)] were 19.0±3.7 for not anemic and 17.7±4.2 for anemic infants. Statistically significant difference was found between two groups (P=0.007) .On the other hand, minimum to maximum age of introducing food was 1 to 10 with mean±SD of 5.7±1.8 for both anemic and not anemic infants (Z=0.377, P=0.706). Regarding problems occurred as a result of weaning& feeding; this table portrays that the majority of anemic (90.9%) and not anemic (95.7%) children had no problems. Concerning feeding of children during illness it appears from this tables that the majority (87.0%) of not anemic children was breast feeding and soft diet compared to only 26.3% of anemic children . No significance was noticed [X2=2.819, P=0.093].

The 24 hour food recall is a simple tool for dietary assessment. Interviewees were asked to recall the exact contents of their child's diet over the previous 24 hours, using standardised cups, bowls and spoons for estimation of food volume. The nutritional content of each dish was then calculated using standardized tables[3,25]. Table (5) shows the distribution of the mothers of anemic and not anemic children by their practices of complementary feeding during the last 24 hours. (24hours recall of food quality). Animal milk consumption was reported by 71.4% of anemic children and 70.4% of not anemic, yogurt and cheese by 66.2% of the anemic children and 66.3%. of not anemic. Animal source of proteins was consumed by 71.7% of not anemic sample compared to 30.2% of anemic children. Regarding eggs, they were consumed nearly by the same percent among anemic and not anemic sample (78.6% and 79.3% respectively). Among the plant source of proteins (beans- legumes), they contributed to the diets of 79.9% of the anemic ample and 80.4% of not anemic. The table also, reveals that the majority of

mothers of anemic children (82.5%) and of not anemic (83.7%) reported giving carbohydrates (any food prepared from grains, maize, and flour). Dark green leafy vegetables were used only by 6.5% of the anemic sample, and 38.3% of them (anemic children) consumed any raw fruits juice.

Table (6) presents weaning practices among normal and anemic infants. The good weaning practices which means that correct time of introducing foods and correct types of food according to the age of infants was observed in half (50%) of the not anemic and for 11.7% of anemic infants. Significant difference was observed between two groups (X^2=6.69, P=0.035).

Table (7) shows feeding practices which affect iron absorption among normal and anemic infants &/young children. Regarding, receiving iron rich foods (Recommended Daily Allowance of iron) (as red meat, liver, apple) it was reported by 78.3% of mothers of not anemic infants and by 6.2% of anemic infants. Statistically significant difference was found between two groups (X^2=19.41, P=0.0001). The table also, shows food increases absorption of iron such as food rich in vitamin C as orange, lemon, guava juices was reported by the majority (92.4%) of not anemic and only 6.5% in anemic infants. No statistically significant difference was found between two groups (P=0.708). And finally, food decreases absorption of iron (as tea, phytate, calcium) was received by the majority (94.2%) of anemic infants. Compared to only 13.1% of not anemic, there was a significant differences between two groups (X^2=5.29, P=0.021).

Table (1): Parents socio-demographic characteristics among normal and anemic infants and young children.

Parents socio-demographic characteristics	Studied infants (n=400)				Significance
	Not anemic (n=92)		Anemic (n=308)		
	No.	%	No.	%	
Mother age (years)					
Less than 20	5	5.4	32	10.4	**X^2=4.47**
20-	58	63.0	207	67.2	**P=0.107**
30-	29	31.6	69	22.4	
Level of mother education					
Illiterate	8	8.7	99	32.1	
Read and write	15	16.3	39	12.7	**X^2=21.775**
Preparatory education	22	23.9	46	14.9	**P<0.0001***
Secondary education	29	31.5	88	28.6	
University education	18	19.6	36	11.7	
Mother occupation					
Working	16	17.4	48	15.6	**X^2=0.172**
Not working	76	82.6	260	84.4	**P=0.678**
Level of father education					
Illiterate	8	8.7	81	26.3	
Read and write	6	6.5	42	13.6	**X^2=20.054**
Preparatory education	35	38.0	92	29.9	**P<0.0001***
Secondary education	27	29.4	59	19.2	
University education	16	17.4	34	11.0	
Father occupation					
Working	92	100.0	302	98.1	**X^2=1.82**
Not working	0	0.0	6	1.9	**P=0.177**
Birth order					
Min-Max	1-5		1-5		**Z=1.807**
Mean±SD	2.3±1.1		2.1±1.1		**P=0.071**
Monthly income					
Not enough	18	19.6	227	73.7	**X^2=1.751**
Enough	69	75.0	72	23.4	**P=0.417**
More than enough	5	5.4	9	2.9	
Residence					
Rural	21	22.8	120	39.0	**X^2=8.08**
Urban	71	77.2	188	61.0	**P=0.004***

X^2: Chi-Square test Z: Mann Whitney test *significant at P≤0.05

Table (2): Personal and medical characteristics among normal and anemic infants and young children.

Personal and medical characteristics	Studied children (n=400)	Significance

of infants	Not anemic (n=92)		Anemic (n=308)		
	No.	%	No.	%	
Gender					
Male	50	54.3	155	50.3	**X^2=0.459**
Female	42	45.7	153	49.7	**P=0.498**
Age (months)					
12-	47	51.1	68	22.1	
16-	41	44.6	229	74.3	
20-	4	4.3	11	3.6	
Min-Max	12-21		12-24		**Z=4.631**
Mean±SD	15.3±3.1		17.0±2.6		**P<0.0001***
Hemoglobin level (gm/dl)					
Min-Max	11.0-12.6		7.5-10.9		**Z=14.667**
Mean±SD	11.4±0.4		9.9±0.6		**P<0.0001***
Previous health problems					
None	71	77.2	253	82.1	**X^2=1.14**
Present	21	22.8	55	17.9	**P=0.286**
Respiratory problems	1	1.1	11	3.6	
GIT(diarrheal	5	5.4	14	4.5	
Anemia	13	14.1	29	9.4	
Infectious disease	2	2.2	1	0.3	
Medication intake					
Yes (appetizer, Vit.,& calcium)	34	37.0	81	26.3	**X^2=3.928**
No	58	63.0	227	73.7	**P=0.047***
Iron intake					
Yes	30	32.6	245	79.5	**X^2=5.86**
No	62	67.4	63	20.5	**P=0.015***

X^2: Chi-Square test Z: Mann Whitney test *significant at P≤0.05

Table (3): Anthropometric measures among normal and anemic infants &/ young children.

Anthropometric measures of infants	Studied children (n=400)				Significance
	Not anemic (n=92)		Anemic (n=308)		
	No.	%	No.	%	
Weight (Kg)					
Min-Max	7-15		6.5-15		**Z=2.076**
Mean±SD	10.6±1.7		10.2±1.7		**P=0.038***
Height (cm)					
Min-Max	60-87		59-88		**Z=1.416**
Mean±SD	76.8±6.1		75.9±5.7		**P=0.157**
Percentage of predicted weight					
Min-Max	55.6-133.3		48.2-128.6		**Z=4.883**
Mean±SD	88.4±15.6		79.3±14.4		**P<0.0001***
Percentage of predicted height					
Min-Max	68.6-99.4		68.3-100.6		**t=2.38**
Mean±SD	88.9±6.5		87.1±6.3		**P=0.018***

Z: Mann Whitney test t: T-test *significant at P≤0.05

Table (4): Feeding practices among normal and anemic infants &/ young children.

Feeding practices	Studied children (n=400)	Chi-Square test

	Not anemic (n=92)		Anemic (n=308)		
	No.	%	No.	%	
Breast feeding					
Yes	69	75.0	192	62.3	**X^2=5.01**
No	23	25.0	116	37.7	**P=0.025***
Start of breast feeding	(n=69)		(n=192)		
Immediately after delivery	15	21.7	37	19.3	X^2=0.38
Within 12 hours	42	60.9	116	60.4	P=0.828
After 24 hours	12	17.4	39	20.3	
Duration of breast feeding [(Age of stop breast feeding (months)]					
Min-Max	**10-24**		**6-24**		**X2 Z=2.693**
Mean±SD	**19.0±3.7**		**17.7±4.2**		**P=0.007***
Age of introducing food (months)					
Less than 2	2	2.2	12	3.9	
2-	9	9.8	23	7.5	
4-	26	28.3	77	25.0	
6-	43	46.7	153	49.7	
8-	12	13.0	43	13.9	
Min-Max	1-10		1-10		Z=0.377
Mean±SD	5.7±1.7		5.7±1.8		P=0.706
Problems occurred during feeding					
Yes diarrhea	4	4.3	28	9.1	**X^2=2.17**
No	88	95.7	280	90.9	**P=0.141**
Feeding of children during illness					
- Breast feeding +fluid, vegetables soup, soft food.	80	87.0	81	26.3	**X^2=2.819**
-Breast feeding only.	2	2.2	200	64.9	**P=0.093**
-Usual feeding.	10	10.8	27	8.8	

*significant at P≤0.05

Table (5): Feeding practices among normal and anemic infants &/young children.

Food consumed in the last 24 hours *	**Studied children (n=400)**							
	Anemic (n=308)				**Not anemic (n=92)**			
	No		**Yes**		**No**		**Yes**	
	No.	%	No.	%	No.	%	No.	%
Animal milk	88	28.6	220	71.4	27	29.3	65	70.7
Cheese-yogurt	104	33.8	204	66.2	31	33.7	61	66.3
Fruit juice	260	84.4	48	15.6	15	16.3	77	83.7
Animal source of proteins (meat, poultry, fish, liver)	215	69.8	93	30.2	26	28.3	66	71.7
Eggs	66	21.4	242	78.6	19	20.7	73	79.3
Plant source of proteins (beans, lentils, legumes)	62	20.1	246	79.9	18	19.6	74	80.4
Carbohydrates (bread, rice, macaroni, cakes, biscuits, cerelac,….)	54	17.5	254	82.5	15	16.3	77	83.7
Red-orange or yellow vegetables	251	81.5	57	18.5	12	13.0	80	87.0
Dark green vegetables (spinach, kale, amaranth leaves)	288	93.5	20	6.5	7	7.6	85	92.4
Any raw fruits	190	61.7	118	38.3	32	34.8	60	65.2

***according to standardized servings & Recommended Daily Allowance (RDA) of food groups according to children's age** [3,25].

Table (6): Weaning practices among normal and anemic infants and/ young children.

Weaning practices	**Studied infants (n=400)**	**Significance**

	Not anemic (n=92)		Anemic (n=308)		
	No.	%	No.	%	
Good(Correct time and type)	**46**	**50.0**	**36**	**11.7**	
Fair (Correct type only)	**20**	**21.7**	**158**	**51.3**	
Poor (Incorrect time and type)	**26**	**28.3**	**114**	**37.0**	

- X^2: Chi-Square test *significant at P≤0.05
- According to standardized servings & Recommended Daily Allowance (RDA) of food groups according to children's age [3,25].

Table (7): Feeding practices affect iron absorption among normal and anemic children.

Feeding practices affect iron absorption	Studied children (n=400)				Chi-Square test
	Not anemic (n=92)		Anemic (n=308)		
	No.	%	No.	%	
Food increase absorption of iron					
Yes	85	92.4	20	6.5	**X^2=0.14**
No	7	7.6	288	93.5	**P=0.708**
Receive (RDA of iron)iron rich food					
Yes	72	78.3	19	6.2	**X^2=19.41**
No	20	21.7	289	93.8	**P<0.0001***
Food decrease absorption of iron					
Yes	12	13.1	290	94.2	**X^2=5.29**
No	80	86.9	18	5.8	**P=0.021***

RDA of iron = Recommended Daily Allowance of iron according to the report of National Nutritional Institute 2004[25]. *significant at P≤0.05

4. Discussion

The development of optimal nutrition among children during the first two years of life is continuum that results from a series of breast feeding and complementary feeding practices and behaviors as well as access to the appropriate mix of food [26]. From the age of six months onwards when breast milk alone is no longer sufficient to meet all nutritional requirements, infants enter a particularly vulnerable period of complementary feeding during which they make a gradual transition to eat ordinary family food [27].The incidence of malnutrition rises sharply during the period from 6 to 18 months of age in most countries and the deficits acquired at this age are difficult to compensate for later in childhood [28,29].

Since nutritional anemia, especially iron deficiency anemia, is by far the most prevalent and since it constitutes a real public health challenge amenable to preventive interventions, more emphasis should be given to this type of anemia at the national or international level [30,31]. So, the aim of this research is to investigate the contributing factors of iron deficiency anemia among children under two years attending at family health centers in Alexandria.

The present study found that the prevalence of anemia is 77% among children under two years. This is in agreement with a study conducted in Brasilia at 2002 which found a high prevalence (63%) of anemia associated with age, weight and height deficit [32]. The etiology of iron deficiency anemia is multi factorial. The dietary inadequacy of absorbable iron and other relevant nutrition, is the main immediate cause of iron deficiency anemia [33].

The results illustrated in table (1) indicated that the incidence of anemia among infant of mothers less than 20 years was 10.4%. On the other hand, the Egypt Demographic Health Survey 2005, found that the incidence of anemia among infants of mothers less than 20 years was 65.9% [34].

The present study indicated that about one third of the illiterate mothers had anemic infants more than the highly educated one (11.7%). Also the finding of Egypt Demographic Health Survey 2005, found that the anemia among infant of illiterate mother was 55.5% [34] .This results is in accordance with the study done by Hussein, 2006 who found that with lower levels of education of the family, there is lowered quantity and quality of the diet [26]. Anemia among infant living in urban area was greater than to those living at rural area (61%), these results are opposing to the study done by Pasricha et al. (2010) who found that, anemia among rural Indian infants was (72%)[35]. This may be returned to that the majority of urban mothers in our country are working mothers and they leave their infants after only three months of age at nursery centers for long time of the day which in turn affect on their feeding practices. Whereas, children living in rural areas are exclusively

breast fed for a longer time and completely weaned at a later age, compared to urban children. These differences suggest that among rural and urban mothers, traditional patterns remain influential beside the availability of weaning foods, either actual or in terms of cost is less [36]. Studies have found maternal educational level to be positively related to better nutritional status of children. Maternal education is usually connected with greater use of health services, lower fertility and more centered care giving behaviors [37].

Regarding income, it denotes (from table 1) that, there was no significant difference between anemic and not anemic children as more than enough income constituted only 2.9% and 5.4% respectively. This finding is supported by the report of world bank atlas method of Country classification in which Egypt is classified as lower middle income country (gross national income per capita ranged from $ 976 to $ 3.855) based on 2008 gross national income per Capita [38,39] .

In Egypt iron supplementation is a routine activity of family health centers and MCH. It follows the WHO schedule for daily use of iron "60-120 mg given to pregnant mothers, as one tablet for mild anemia, two tablets for moderate to severe anemia, in addition to 2mg/kg body weight given to infant and Preschool for 6 months [31].The current study revealed that, there was a significant association between iron intake among anemic and not anemic children (table 2

It is apparent from the findings of this study regarding the anthropometrics measurement that there was a significant difference in weight and height among anemic and not anemic child table (3). This is in agreement with a research done, in Brasilia by Brunken et al. (2002) who found that the prevalence of malnutrition (Z score < -2) was 0.8% according to weight-for-height, 5.0% according to weight-for-age, and 10.3% according to height-for-age [32].

Throughout infancy, the weaning period is particularly critical. At the same time as breast milk with its nutritional and immunological properties gradually diminishes with age of the child, the weaning food is generally inadequate in poor societies. The main concerns with weaning food lie not only on its nutritional quality, but also on the risk of contamination and its effect on the household budget [40,41].

Regarding the practice of complementary feeding, finding of this study showed that only 2.2 % of not anemic & 3.9% of anemic children of the present sample started in the first month, while 9.8% and 7.5% of not anemic and anemic children respectively started in second & third months (table 4), which is lower than corresponding figures in Ismailia, Egypt (2004) where they were 19.2 and 41% respectively. The reported figures for Riyadh, Kingdom Saudi Arabia (2004) were 11.2% and 22.4% respectively[42].In a study done in Latin American countries it was found that early introduction of complementary feeding is associated with lower maternal educational level [43].

WHO recommended that during children' illness fluid intake should be increased, including more frequent breastfeeding, and encouraging the child to eat soft, varied, appetizing, favorite foods. Moreover, the IMCI mother's care, recommended the same principles of child feeding during illness [23,44] . These principles are in agreement with the results of the present study, as the majority of not anemic children were following the recommendation of WHO regarding feeding of infant during illness (table 4) and with another study done by Hussein, 2006 as the study found that more than three quarter of the mothers sample reported that they didn't encourage their children to eat if they didn't want to but give them more fluids [26].

Although the incidence of intestinal diseases is on the decline, the intestinal infection exist allover Egypt. Diarrheal diseases also present one of the most important health problems among children as, insufficient refrigeration, presence of flies and improper disposal of wastes and refuse keep the incidence of this disease high [45].In this study, anemic child suffering from problem during feeding mainly diarrhea, more than the not anemic one (table IV) Child nutritional problems due to faulty feeding practice is widely observed in Egypt [46].

Animal protein is a sensitive indicator of quality of diet on which depends the bioavailability of iron[24].The finding drawn from the present study indicated that animal source of protein eaten only by one third of the anemic study sample, while plant source eaten by more than two third of the study sample (table 5). That also indicated a high prevalence of low intakes of Vitamin B12 & iron. Since vitamin B12 is present only in animal products, so vitamin deficiencies lead to a lot of risks [3]. In all cases the ever increasing food prices in relation to incomes are resulting in reduction in quality and quantity of diets which may explain why the nutritional status is not improving in spite of the government intervention in this regard. The results of the present study is in agreement with the study done by Utomo et al. (2000) which found that eggs were the most common sources of protein, while meat and fish were rarely consumed by young children [47].

Since weaning is a potential source of physical and psychological stress to the infant, it should be done gradually owing to the reduction in food

choices, it requires considerable knowledge and experience to ensure that the transition from nutritionally adequate mother's milk to solid food is achieved successfully .This has often proved to be difficult [18]. Finding drawn from the present study showed that only 11.7% of the mother's of anemic children had good practice regarding principles of weaning (correct time of introducing different types of foods (table 6). This means that the majority of anemic children didn't receive recommended daily allowance of different types of food groups. This result is in accordance with study done by Arimond and Ruel (2004), at Ethiopia which showed that in all age groups under nourished children received less nutrient than non under nourished children [48]. This may be attributed to the majority of parents of anemic children were illiterate with low income. While with increasing education, women have more power within the family to allocate resources on food and other expenditure for their children's health and welfare [24]. These results are opposing to the study done by Mohammed (2002) who found that most mothers either breast feeding or artificially feeds, had very high awareness regarding feeding & weaning practices [49].

It is surprising to find that only 6.5% of anemic children received iron rich food according to their RDA compared to 92.4% of not anemic children (Table 7). This result is opposite to the result reported by a research done by Rizkalla N.1999, which revealed that about one third of preschoolers get less than 90% of their RDA of iron [50]. This may be attributed to, in Egypt "baladi" or unrefined bread (85% extraction) is the most popular [51]. On one hand the presence of phytates and bran in bread inhibits the absorption of dietary iron from plant origin. On the other hand tea with biscuit is a wide spread habit among mothers of anemic children. Tea contains tannic acid which inhabits the absorption of dietary iron from plant origin [52]. As most of the dietary iron consumed by children is of plant origin which may particularly explain the wide spread prevalence of iron deficiency anemia.

Conclusion and Recommendations

Based on the findings of the present study, it could be concluded that, the prevalence of anemia was 77% among children under 2 years. About half of not anemic mothers' practices regarding weaning practices were scored as good (correct) practices (which means correct time &types of food) compared to only one tense of anemic mothers' practices. Moreover, the study concluded that the socio economic factors (as level of father & mother education, residence), faulty weaning and feeding practices are the main contributing factors of anemia among children under 2 years . It is a serious concern that, iron inadequately is severe among children's diet.

It is recommended that all efforts should be directed to ensure effectiveness and efficiency of intervention programs that target to pregnant, lactating women and preschool children to ensure their health and wellbeing. Also, encourage the private sector and media to have an active role especially in information, education and communication activities such as; increasing health awareness among population regarding exclusive breast feeding for 4-6 months for maintenance of the infant's iron status and all families should be empowered to increase the intake of bioavailability of iron-source foods and change their cooking and eating habits.

Establish dietary guidelines for healthy eating taking into consideration consumption of foods that are rich in iron, and reducing intake of that containing constituents that inhibit or interfere with iron absorption

In-service training programs to midwives and nurses regarding save delivery and stressed on the importance of delaying ligation of the umbilical cord until it has stopped pulsating (30-60 seconds),which is important in improving iron stores in infants born to anemic mothers.

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