Iron Deficiency Anemia among Children during Weaning

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Abstract

Background: Iron-deficiency anemia (IDA) presents a significant burden in infancy and childhood. Also in infancy and early childhood is causally associated with growth and developmental delay. **Aim:** Assess iron deficiency anemia among children during weaning. **Study design**: A descriptive analytical study was utilized in study. **Setting:** the study conducted at three maternal and child health centers in Shoubra El Khemia (Begam MCH, Osman MCH, Nopar MCH). **Sampling:** 500 mother and their children were selected randomly from maternal and child health centers .**Tools:** *First tool;* an interviewing questionnaire to assess. demographic data, mothers' knowledge, mothers' practice risk factors of iron deficiency anemia during weaning among children .and health needs among children with iron deficiency anemia during weaning. *Second tool;* Medical follow up record to assess health status of the children with iron deficiency anemia. *Third tool;* Assessment of children according to Denver Developmental Screening Test (Denver scale). **Results:** there were more four fifth of the studied mothers had unsatisfactory knowledge about iron deficiency anemia during weaning among their children, and had inadequate practices toward prevention, above half of children suffered from diarrheal disease. and had respiratory tract infection. Also more than three fifth of them had poor level of health needs achievement. **Conclusion:** There was a highly statistical significant relation between mothers' knowledge and practices about iron deficiency anemia during weaning. Also, there was statistically significant relation between mothers' practices and their socio-demographic characteristics as mothers' age and educational level. **Recommendations:** Further research studies are needed for ongoing assessment of children including large sample for generalization of results.

Key words: Iron Deficiency Anemia, Weaning. Children.

Introduction

Iron deficiency anemia (IDA) is a decrease in the total hemoglobin levels caused by a lack of sufficient iron **(Goldenring, 2014).** It is the most common cause of anemia worldwide. According to the World Health Organization (WHO), children are especially vulnerable and exhibit high rates of anemia **(WHO, 2016).**

Iron is a very important element for most living organisms. It is inevitable for all cells and has several vital functions in humans such as a carrier of oxygen from the lungs to tissues in the form of hemoglobin (Hb), a facilitator of oxygen utilization in muscle tissues as myoglobin, a transport medium for electrons within the cells in the cytochromes, and an integral part of heme (a protoporphyrin ring that contains an iron atom) an enzymes that catalyses fundamental chemical reaction in

different tissues **(Conrad & Umbreit, 2015).**

A major etiological factor in iron deficiency is early introduction of cow's milk, which is very low in iron content. From the age of 4 months, children must obtain iron from exogenous sources and are at risk if not provided with the additional dietary supplies. Pediatricians and nutritionists recommend a healthy weaning diet consisting of home prepared iron rich foods, but the reality is different. Not only do parents start weaning earlier than the recommended 4-6 months, but the foods they choose to give their children are of low iron content. The reasons for such a poor diet include poverty, lack of access to cheap food, lack of cooking skills and equipment, and a chaotic home environment where there are no fixed mealtimes **(Murye, 2014)**.

Nurses have a vital role in preventing and treating iron deficiency anemia in children such as education regarding the nature of the condition. The elements of a good diet, with advice on foods containing iron. The dose, route, duration and side effects of ferrous sulphate. Details of further investigations, date and times **(Nursing times, 2018)**.

Significance of the study

It is generally estimated that 50% of anemia are caused by iron deficiency**.** IDA is the most common micronutrient deficiency in the developing world. It is considered to be the main cause of anemia which has a negative impact on human health and productivity **(Ahmed et al., 2015)**.

Unfortunately iron in breast milk is poorly absorbed. The baby has to depend much on its iron stores which last only 6 months and thereafter, supplement from diet. Poor weaning practices and

inadequate feeding during childhood contribute to the development of iron deficiency **(Murye, 2014).**

Therefore, assessment of iron deficiency anemia among children during weaning 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:

This study aims to assess iron deficiency anemia among children during weaning, through:-

1.Assessing mothers' knowledge about iron deficiency anemia during weaning of their children.

2.Assessing mothers practices regarding prevention of iron deficiency anemia during weaning of their children.

Assessing health problems and needs related to iron deficiency anemia in the children under 5 years

Subjects and Methods

Research Question:

1. Is there a relation between mothers' knowledge and practices about iron deficiency anemia?

2. Is there a relation between mothers' knowledge and children health problems related to iron deficiency anemia?

3. Is there a relation between mothers practices and children health problems related to iron deficiency anemia?

4. Is there a relation between socio demography of mothers and their practices?

Research Design:

A descriptive analytical study design was utilized in order to assess iron deficiency anemia among children during weaning.

Technical Design:

Setting:

This study was conducted at 3 maternal and child health center (MCH) in Shoubra El Khemia which had been chosen randomly from total 14 MCH centers as (Begam MCH, Osman MCH, Nopar MCH).

Shoubra El Khemia is the fourth largest city in Egypt. It is located in the Qalyubia Governorate and characterized by high population density and low socioeconomic status. Those selected MCH centers are characterized by high flow rate where cover large numbers of families and produce preventive and curative health services for mothers and under five children.

Sampling:

A purposive sample was used in this study which consisted of 500 children with iron deficiency anemia and their mothers these sample represent 10% of total number of children attended MCH centers during (2014, 2015) in previous mentioned setting male or female which divided as; Begam center where the 10% of 2,800 children is 280, Osman center the 10% of 900 children is 90 and lastly Nopar center the 10% of 800 children is 80 and 50 mothers of pilot study included the sample were chosen by using a simple

random technique as the following inclusion criteria

Inclusion Criteria:

The Children were selected according to the following criteria:

1.Children were diagnosed with iron deficiency anemia.

2.The children's age was from 6 months to 2 years.

Technical design

Tools of data collection:

The data were collected using the three following tools:

It was developed by the investigator, based on reviewing related literatures, magazines and experts opinions, written in Arabic language to assess iron deficiency anemia among children during weaning

1. **First tool: An interviewing questionnaire:** This included the following parts.

Part (I): This part included: Questions to assess demographic characteristics of the study sample of children with iron deficiency anemia and socio-demographic characteristics of their mothers. This part included 15 closed ended questions (Question 1: question 15): such as age, gender, and child birth order for children and father'/mothers' age, educational level, and their job, family type and income also home status such as residence and crowding index.

Family Crowding Index equation adopted from **(American Association of Public Opinion Research, 2007):** The family crowding index (FCI) was defined

as the total number of co-residents per household, excluding the newborn infant, divided by the total number of rooms, excluding the kitchen and bathrooms. The continuous variable was re-grouped into three distinct categories:

Scoring Design:

Not Crowded Family (< 1)

Crowded Family (> 1)

Severely Crowded Family (> 1.5).

Part (II): It was used to assess mothers' knowledge about iron deficiency anemia which included 8 closed ended questions (question 1: question 8) regarding meaning of iron deficiency anemia, causes, symptoms, food rich in iron, complications of iron deficiency anemia, diagnostic measures, treatment, and the preventive measures .

Scoring system of knowledge:

The score ranged from zero to one, for non selected (unsatisfactory knowledge) take "(0)" and for selected items (satisfactory knowledge) take "(1)". The total score for all items related to knowledge was 36 point and categorized into two levels as followings <50% (0: <18 grads) is considered unsatisfactory and > 50 % (18: 36 grads) is considered satisfactory knowledge.

Part (III): This part for mothers to assess their practices about prevention of iron deficiency anemia among children during weaning which consisted of 27 open and closed ended questions**.**

Scoring system of practices:

A scoring system for each of practical items as reported by mothers correctly was scored "1", and each item not reported or incorrectly scored "zero". All items of practices were summed and changed into percentage. The total items = 27 questions take 44 grads (100%) which categorized into two levels as follow:

- Inadequate practices = >50%; (0: >20)

- Adequate practices = <50% (20: 44).

Part (IV): This part designed to assess the health needs among children with iron deficiency anemia during weaning which consisted of 20 closed ended questions divided into four sections; first section includes (1- 9 questions) about nutrition pattern, second section (10- 12 questions) for fluid needs, third section (13- 16) sleeping needs, and fourth section (17- 20 questions) personal hygienic needs for children**.**

Scoring system:

The total score of the questionnaire responses was three score levels were made accordingly. It consists of 20 statements, were rated with likert rating scale rarely, scored (0), sometimes, scored (1) and always, scored (2). The total degree of rating scale ranged from 0 – 40 (100%). The degree of child health needs achievement was categorized into 3 levels.

Poor achieved= Less than <50%; (0: <20)

Moderate achieved = 50: 75% (20:< 30)

Good achieved = more than 75% (> 30)

2-The Second Tool: **Medical follow up record (Appendix V):**

For assessing the health status of the Children with Iron deficiency anemia.

Scoring System of growth:

Weight: weight was measured by a baby scale. The child was in minimal clothing and without heavy blanket. The child clothes were removed except under pants, including diapers then the child was put in straight position carefully on baby scale. The investigator hand was kept close to but not touching the child to prevent accident falling. Weight is recorded to the nearest 0.1 Kg.   Also the calibrated pediatric scales were used to estimate category of weight as, Under weight, Normal, and Overweight according to WHO growth charts for children ages 0–24 months adopted by **(CDC, 2008).**

Length: Gently stretch out the baby's leg to get the most accurate measurement. Ask the mother to place the baby on the length board herself and then help to hold the baby's head in place while the investigator takes the measurement. Place the baby's head (against the fixed headboard). While holding the knees, pull the footboard against the child's feet. The soles of the feet should be flat against the footboard, toes pointing upwards. Mark the sheet and record it and determine Short, Normal, and Tall according to WHO growth charts for children ages 0–24 months adopted by **(CDC, 2008).**

3-The Third Tool: Assessment of Children According to Denver Developmental Screening Test (Denver scale), (Berman and Snyder, 2012) (Appendix VI):

The development assessment tool (An observational check list): this tool used to assess the developmental state of the children at 6, 9, 12 ,18 and 24 months and every item take one grade if found and zero for not found.

Each of the items summed up and the total items = 17 item for 6 months. 19 items for 9 months, 28 for 12months, 24 items for 18months, and 27 for 24 months converted into percentage. The total items were categorized to each different age to determine the developmental level as the following category:

➢   Poor   developmental level= Less than <60%

➢   Moderate developmental level = 60: 85%

➢   Good   developmental level = more than 85%

Validity and Reliability:

Content and face validity were performed by 3 professors of the community health nursing department and 2 professors from the Pediatric specialty of Faculty of Medicine, all experts were affiliated to Ain Shams University, Egypt who reviewed the tools for content accuracy. The developed tools were tested for reliability on a sample of 50 subjects. The reliability test of translated version was established by using the Cronbach alpha and Pearson correlation which showed good internal consistency construct validity Cronbach alpha = (0.887).

Operational Design:

Preparatory Phase:

A review of literature was done regarding current and past available literature, covering the various aspects of the problem, using text books, articles, magazines and internet sites through research gate. This was necessary for the investigator to get aquatinted with, and oriented about aspects of the research problems, as well as to assist in development of data collection tools.

Ethical consideration:

All ethical considerations were considered for ensuring the mothers' privacy and confidentiality of the collected data during the study. Firstly the study protocol take agreement of Ethical Committee affiliated to Faculty of Nursing Ain Shams University. Secondly the purpose and nature of the study were explained for the participants and oral consent was taken to gain their participation after explaining the purpose of the study and being informed that each study subject is free to withdraw at any time through the study. Finally all selected study sample agreed to participate in the study and they were assured that the study would posed no risks or hazards on their social, psychological or physical health.

Pilot Study:

A pilot study was conducted at the beginning of the study for 50 cases (10% of the total sample) to investigate the feasibility of data collection tools, their content, validity, clarity and simplicity. It took about one month from beginning of January 2018 to the end January 2018. Subjects included in the pilot study were included in the actual study sample.

Field work:

The actual process of data collection was carried out in the period from the beginning of January 2018 until the end of June 2018, four days /weekly nearly about 5 hours /day at 8am: 1pm (Saturdays, Tuesdays, Wednesdays and Thursday) in order to collect the total sample. The investigator introduced herself to the three previous mentioned MCH centers' director and the nurse supervisors and the other health team workers that will help her in data collection to save the time and to also gain the trust of mothers.

Administrative Design:

Formal letter from the Dean of the Faculty of Nursing, Ain Shams University directed to the directors of Medical affairs in Shobra Elkheima city, requesting their approval for conducting this study in these MCH centers

Statistical design:

Data was analyzed using the Statistical Package for Social Science (SPSS) version 19. Qualitative data was presented as number and percent. Relations between different qualitative variables were tested using Chi-square test (X^2). Probability (p-value) < 0.05 was considered significant and < 0.001 was considered highly significant.

Results

This study is mainly concerned with assessing iron deficiency anemia among children during weaning, through the following parts.

Part (I): This part represents demographic characteristics of the study sample of children with iron deficiency anemia during weaning, and their parents.

Table (1): Distribution of demographic characteristics of the study sample of children with iron deficiency anemia during weaning, (n=500).

Items	No	%
Age (years):		
6 : < 12 months	158	31.6
12 < 18 months	111	22.2
18 : 24 months	231	46.2
Mean = 15.58 Std. Deviation ± 6.192		
Minimum = 6 Maximum = 24		
Gender:		
Male	262	52.4
Female	238	47.6
Child birth order:		
First	158	31.6
Second	174	34.8
Third	120	24.0
Fourth	40	8.0
Fifth	8	1.6

Table (1): shows that, the highest percentage of the study sample of children46.2% were in the age group 18: 24 months; their mean age was 15.58 ± 6.192months. Also 52.4% of studied children were male and 31.6 and 34.8 % of them study their birth order were the first and second child respectively while only 1.6% of all study samples was fifth child rank.

Table (2): Distribution of socio-demographic characteristics for parents of children with iron deficiency anemia during weaning, according to (n=500).

Items	No	%
Father's age		
< 20 years	2	0.4
20: < 30 years	228	45.6
30: < 40 years	222	44.4
+ 40 years	48	9.6
Father's educational level		
Illiterate	20	4.0
Read and write	82	16.4
Average education	310	62.0
University education	88	17.6
Father's job		
Technician	20	4.0
Worker	126	25.2
Professional	76	15.2
Employee	224	44.8
Other	54	10.8
Mother's age		
< 20 years	52	10.4
20: < 30 years	344	68.8
30: < 40 years	88	17.6
≥ 40years	16	3.2
Mother's educational level		
Illiterate	44	8.8
Read and write	138	27.6
Average education	240	48.0
University education	78	15.6
Mother's job		
Employee	142	28.4
Housewife	358	71.6
Family type		
Nuclear	356	71.2
Extended	144	28.8
The family income		
Not enough	260	52.0
Enough	224	44.8
Enough and save	16	3.2
Home status		
Residence		
Rural	98	19.6
Urban	402	80.4
Family size:		
2: 4	320	64.0
5:8	180	36.0
Number of home rooms		
One room	0	0.0
Two rooms	192	38.4
Three rooms	288	57.6
More than three rooms	20	4.0
Crowding index		
Not crowded (< 1)	6	1.2
Crowded (> 1)	192	38.4
Over Crowded (> 1.5)	302	60.4

Table (2): reveals that, 45.6% of children's fathers and 68.8% of their mothers were in the age group 20 - < 30 years, Regarding to educational level 62.0% of fathers were average level and 48.0% for mothers compared with 4.0% of fathers and 8.8% of mothers were illiterate in which 4.0%, 25.2%, 15.2%, and 44.8% of fathers were technicians, workers, professionals, and employees respectively.

Regarding to the mothers' job, there were 71.6% of them were housewives while, 28.4% were employed which reflects that, there were 52.0% of family hadn't enough income. As well as, 80.4% of that family lived in urban area and 60.4% of them lived in overcrowded homes.

Figure (1): Distribution of mothers' total knowledge about iron deficiency anemia during weaning among their children (n=500).
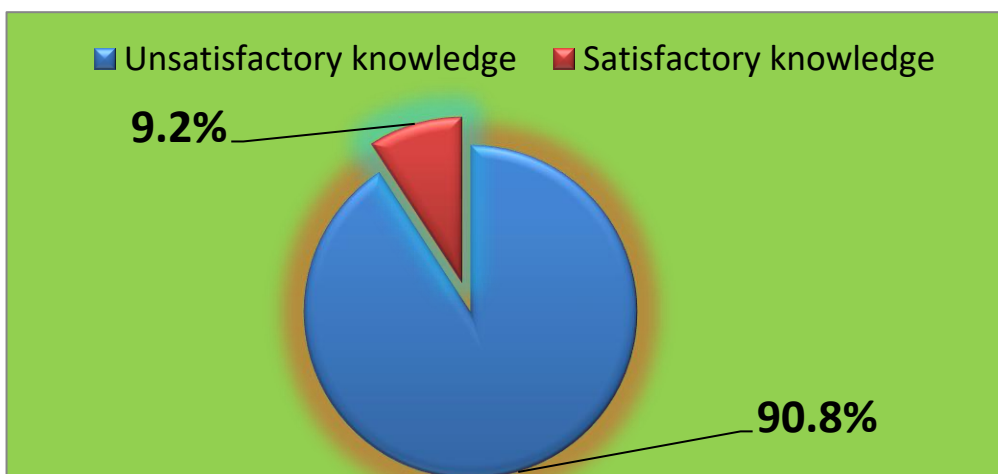

Figure (1): this figure illustrates that 9.2% of the mothers had satisfactory knowledge and 90.8% of them had unsatisfactory knowledge about iron deficiency anemia during weaning among their children.

Figure (2): Distribution of mothers' total practices toward prevention of iron deficiency anemia during weaning among their children (n=500).
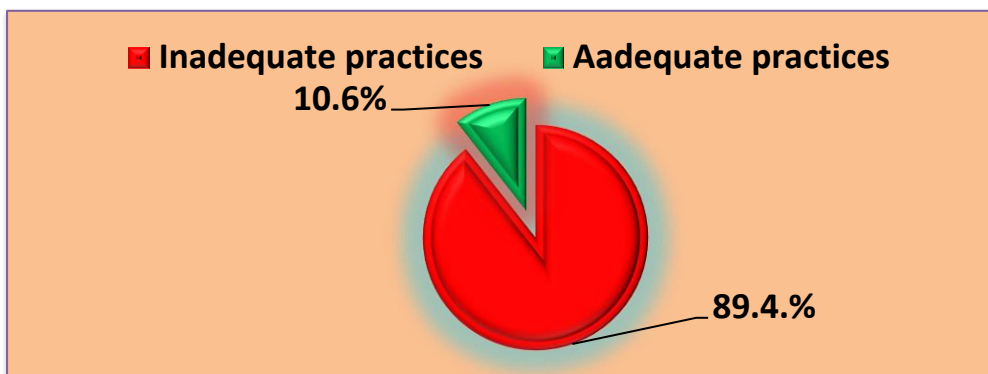
Figure (2): this figure illustrates that 89.4% of the total sample of mothers had inadequate practices toward prevention of iron deficiency anemia among their children during weaning.

Figure (3): Distribution of study sample of children with iron deficiency anemia according to their medical history (n=500).
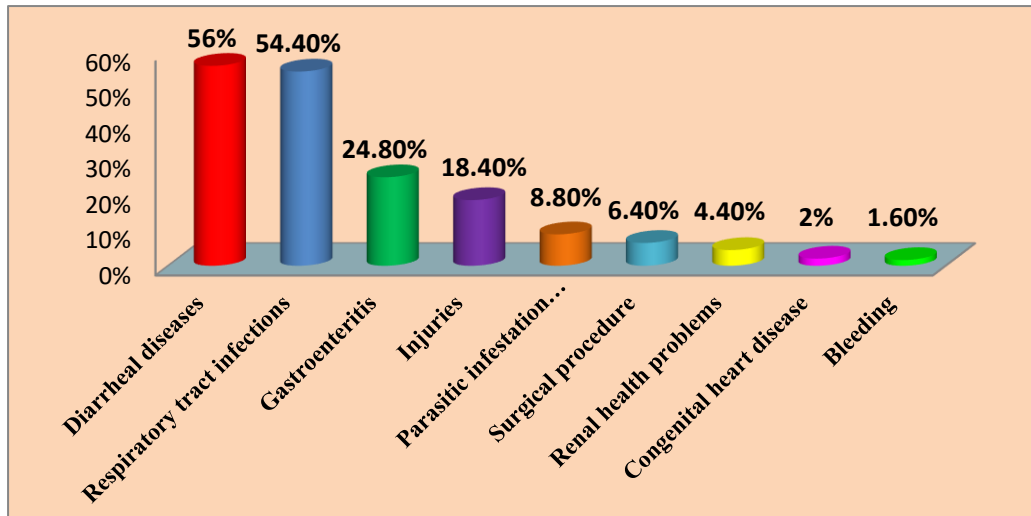

Figure (3): illustrates that, 56% of children suffered from diarrheal diseases and 54.4%of them for respiratory tract infection, as well 1.6%, 2%, and 4.4% of children suffered from bleeding, congenital heart diseases, and renal health problems respectively.

Figure (4): Distribution of study sample of children with iron deficiency anemia according to their total health needs achievement (n=500).
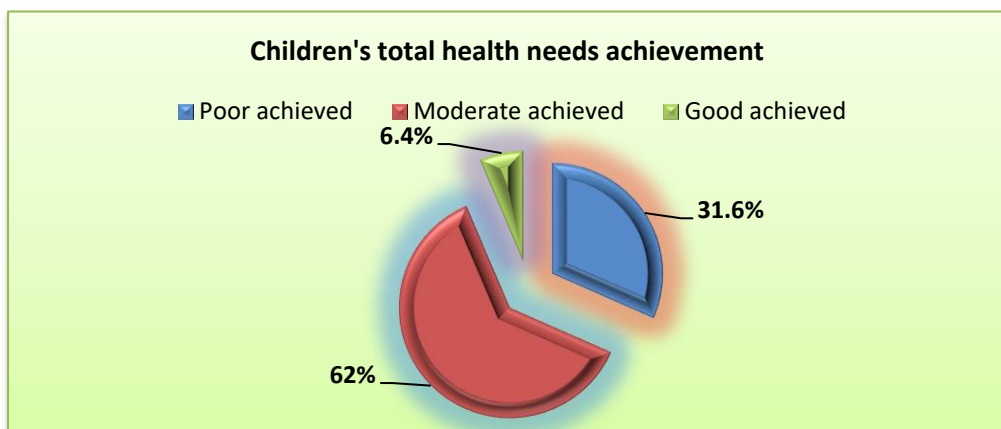

Figure (4): illustrates that, there was 6.4% of study sample of children with iron deficiency anemia had good level of health needs achievement and 62% of them had poor level of health needs achievement.

Figure (5): Distribution of study sample of children with iron deficiency **anemia** according to their total level of development as Denver Developmental Screening Scale, (n=500).
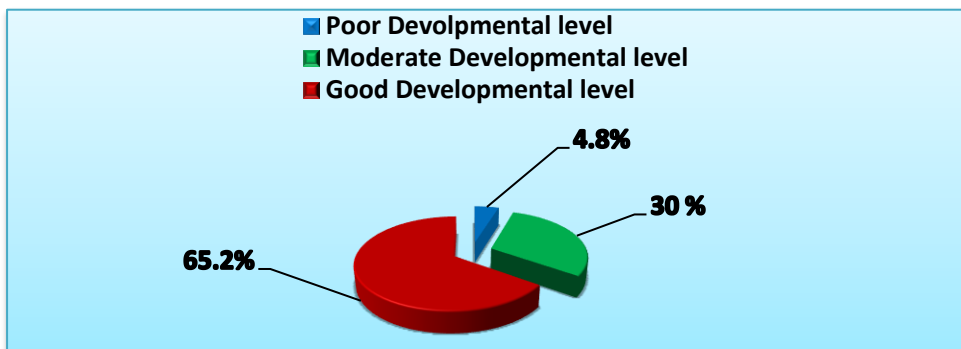

Figure (5): illustrates that, 65.2% of study sample of children with iron deficiency anemia had good level of development and 30% of them had moderate level while 4.8% of them had poor level.

Part (VI): This part represents the answers of research questions:

The first question: Is there a relation between the mothers' knowledge and practices about iron deficiency anemia?

Table (3): The relation between the mothers' knowledge and practices about iron deficiency anemia (n=500).

Total mothers' practices	Total mothers' knowledge						Chi-Square X^2	P value
	Unsatisfactory knowledge		satisfactory knowledge		Total			
	No	%	No	%	No	%		
Inadequate practices	415	83.0	32	6.4	447	89,4		**<0.001 HS**
Adequate practices	39	7.8	14	2.8%	53	10.6	21.032	
Total	454	90.8	46	9.2	500	100.0		

Table (3): demonstrates that, there was a highly statistical significant relation between the mothers' knowledge and practices about iron deficiency anemia with X^2 = 21.032 and P value < 0.001.

The Second question: Is there a relation between the mothers' knowledge and children health problems related to iron deficiency anemia?

Table (4): The relation between the mothers' knowledge and children's level of development (n=500).

children's level of development	Total mothers' knowledge						Chi-Square X^2	P value
	Unsatisfactory knowledge		Satisfactory knowledge		Total			
	No	%	No	%	No	%		
Poor Developmental level	24	4.8	0	0.0	24	4.8		
Moderate Developmental level	136	27.2	14	2.8	150	30.0	2.583	0.275 NS
Good Developmental level	204	58.8	32	0.4	326	65.2		
Total	454	90.8	46	9.2	500	100.0		

Table (4): shows that, there was no one of study sample of mothers had satisfactory knowledge had children with poor developmental level but there was statistically insignificant relation between the mothers' knowledge and children's level of development with X^2 = 2.583 and P value >0.05

The Third question: Is there a relation between the mothers practices and children health problems related to iron deficiency anemia?

Table (5): The relation between the mothers' practices and children's level of development (n=500).

children's level of development	Total mothers' practices						Chi-Square X^2	P value
	Inadequate practices		Adequate practices		Total			
	No	%	No	%	No	%		
Poor Developmental level	23	4.6	1	0.2	24	4.8		
Moderate Developmental level	142	28.4	8	1.6	150	30.0	8.326	0.016 S
Good Developmental level	282	56.4	44	8.8	326	65.2		
Total	447	89.4	53	10.6	500	100.0		

Table (5): shows that, there was 0.2% of study sample of mothers had adequate practices had children with poor developmental level and there was statistically significant relation between the mothers' practices and children's level of development with X^2 = 8.326 and P value < 0.05.

The forth question: Is there a relation between socio demography of mothers and their practices?

Table (6): The relation between socio demography of mothers and their practices about prevention of Iron Deficiency Anemia (n=500).

	Total mothers' practices						Chi-Square X^2	P value
	Inadequate practices (447)		Adequate practices (53)		Total			
	No	%	No	%	No	%		
Father's age								
< 20 years	2	.4%	0	0.0	2	.4	**11.29**	**0.010** S
20: < 30 years	212	42.4	16	3.2	228	45.6		
30: < 40 years	196	39.2	26	5.2	222	44.4		
+ 40 years	37	7.4	11	2.2	48	9.6		
Father's educational level								
Illiterate	20	4.0	0	0.0	20	4.0	3.130	0.372 NS
Read and write	75	15.0	7	1.4	82	16.4		
Average education	274	54.8	36	7.2	310	62.0		
University education	78	15.6	10	2.0	88	17.6		
Father's job								
Technician	16	3.2	4	0.8	20	4.0	6.198	0.185 NS
Worker	117	23.4	9	1.8	126	25.2		
Professional	64	12.8	12	2.4%	76	15.2		
Employee	200	40.0	24	4.8%	224	44.8		
Other	50	10.0	4	0.8%	54	10.8		
Mother's age								
< 20 years	50	10.0	2	0.4	52	10.4	8.990	0.029 S
20: < 30 years	311	62.2	33	6.6	344	68.8		
30: < 40 years	74	14.8	14	2.8	88	17.6		
≥ 40years	12	2.4	4	0.8	16	3.2		
Mother's educational level								
Illiterate	42	8.4	2	0.4	44	8.8	12.37	0.006 S
Read and write	132	26.4	6	1.2	138	27.6		
Average education	204	40.8	36	7.2	240	48.0		
University education	69	13.8	9	1.8	78	15.6		
Mother's job								
Employee	123	24.6	19	3.8	142	28.4	1.618	²03 NS
Housewife	324	64.8	34	6.8	358	71.6		
Family type								
Nuclear	318	63.6	38	7.6	356	71.2	0.007	0.933 NS
Extended	129	25.8	15	3.0	144	28.8		
The family income level								
Not enough	230	46.0	30	6.0	260	52.0	2.165	0.339 NS
Enough	201	40.2	23	4.6	224	44.8		
Enough and save	16	3.2	0	0.0	16	3.2		
Home status								
Residence								
Rural	90	18.0	8	1.6	98	19.6	0.764	0.382 NS
Urban	357	71.4	45	9.0	402	80.4		
Family size:								
2: 4	298	59.6	22	4.4	320	64.0	13.02	0.000 HS
5:8	149	29.8	31	6.2	180	36.0		
Number of home rooms								
One room	0	0.0	0	0.0	0	0.0	1.891	0.388 NS
Two rooms	176	35.2	16	3.2	192	38.4		
Three rooms	254	50.8	34	6.8	288	57.6		
More than three rooms	17	3.4	3	.6	20	4.0		
Crowding index								
Not crowded (< 1)	5	1.0	1	0.2	6	1.2	0.240	0.887 NS
Crowded (> 1)	172	34.4	20	4.0	192	38.4		
Over Crowded (>1.5)	270	54.0	32	6.4	302	60.4		

Table (6): clarifies that, there was statistically significant relation between the mothers' practices and their socio demographic characteristics as Mother's age with $X^2 = 8.990$ and Mother's educational level with $X^2 = 12.37$ and P value < 0.05.

Discussion

Demographic characteristics of the study sample of children with iron deficiency anemia during weaning and parents.

The current study results revealed that, slightly less than half of the studied children were in the age group of 18: 24 months with mean and stander deviation 15.58 ± 6.192. More than half of them were male gender. In relation to childbirth order, more than two third of the studied children were represent first and second child rank **(Table 1)**. These findings agreed with **Sailaja et al. (2017)** who stated that, in their study on Iron deficiency anaemia in young children the children age from (6 to 23 months) in relation to complementary feeding practices in rural Telangana, India, more than one third of children were in the age group of 19-23 months, more than half of them were male gender and half of them were first child rank.

Regarding socio-demographic characteristics of parents. The present study results clarified that, less than half of fathers were in the age group of 20:< 30 years and 30: < 40 years. More than two thirds of them had average education. More than one third of them were employee **(Table 2)**. In the investigator's point of view, assessment of educational level of parents is important as there is clear evidence that level of education and knowledge influences health outcomes of children **(Miller, 2014)**.

In relation to mothers' age, more than two thirds of them were in the age group of 20: < 30 years. Less than half of them had average education. More than two thirds of them were housewives. In the

investigator's point of view, children are significantly affected by socio-economic dynamics in the family. Though it is argued that employment is a source of empowerment for mothers, this is only true if the mother has some control of her income **(Table 2)**.

More than two thirds of parents related to nuclear family. More than half of parents had not enough family income. The majority of parents lived in urban area. More than two thirds of them consisted of 2: 4 and more than half of them lived in overcrowded homes **(Table 2)**. These findings supported by **Ghwass et al. (2015)** who found that, in a study on Iron deficiency anemia in an Egyptian pediatric population: more than half of parents related to nuclear family. Moreover, these findings supported by the report of **World Bank Atlas Method of Country classification (2013)** which mentioned that, Egypt is classified as lower middle income country. Also, these findings supported by **Mohamed and Abo-donia (2014)** who revealed that, in a study on Contributing Factors of Iron Deficiency Anemia among Children under Two Years Attending Family Health Centers in Alexandria, Egypt, more than two thirds of the studied subjects were from urban area.

The present study results illustrated that, the most of the studied mothers had unsatisfactory knowledge about iron deficiency anemia during weaning among their children **(Figure 1)**. This finding contradicted with **Souganidis et al. (2014)** who indicated that, in a study on relationship of maternal knowledge of anemia with maternal and child anemia and health-related behaviors targeted at anemia among families in Indonesia, more than one third of women had satisfactory

knowledge about iron deficiency anemia during weaning among their children.

Regarding of mothers total practices toward prevention the present study results illustrated that, the majority of the studied mothers had inadequate practices toward prevention of iron deficiency anemia among their children during weaning **(Figure 2)**. This finding was in accordance with **Baş et al. (2017)** who reported that, more than half of mothers had inadequate practices toward prevention of iron deficiency anemia among their children during weaning. Also, **Nyaruhucha et al. (2014)** clarified that, feeding practices contribute to anaemia, generally and iron deficiency anaemia, specifically.

Our study revealed that, more than half of the children had diarrheal disease and respiratory tract infections **(Figure 3)**. These findings agreed with **Vieira et al. (2016)** who indicated that, deficiencies in iron contribute to the occurrence of damage to children's health, especially in children under the age of two, which can lead to diarrhea and respiratory morbidity.

Regarding total health needs achievement of the children with iron deficiency anemia during weaning the present study results indicated that, more than two thirds of the studied children had moderate level of health needs achievement **(Figure 4)**. In investigator's point of view, unsatisfactory knowledge and inadequate practice of mothers affect the child health needs.

Regarding total level of development as Denver developmental screening scale the current study results revealed that, more than two thirds of the children with iron deficiency anemia had good level of development **(Figure 5)**. These findings disagreed with **Vieira et al. (2016)** who stated that, iron deficiency anemia can lead to impaired infant growth

and development. Moreover, **Beard (2014)** stated that, in a review on iron biology in immune function, muscle metabolism and neuronal functioning, young children are at high risk for developing iron-deficiency anemia because of the poor bio-availability of and increased demand for iron in their diet. The timing of this deficiency during the most active period of brain development and the potential for irreversible brain damage adds to the concern in young children. Also, **Walter and Campos (2014)** who conduct study on; iron deficiency anemia: adverse effects on infant psychomotor development, contradicted with our study in that, iron deficiency can result in impaired cognition, decreased physical capacity, and reduced immunity as well as impaired psychomotor and cognitive development in children.

Research question

Part I: Relation between the mothers' knowledge and practices about iron deficiency anemia:

There was a highly statistical significant relation between the mothers' knowledge and practices about iron deficiency anemia **(Table 15) (Research question no. 1)**. This finding was in the same line with **Souganidis et al. (2015)** who reported that, in a study on Relationship of Maternal Knowledge of Anemia with Maternal and Child Anemia and Health-Related Behaviors Targeted at Anemia among Families in Indonesia. Mothers' knowledge of anaemia also influenced child anaemia and other related health practices.

As regards to relation between the mothers' knowledge and children's level of development:

There was statistically insignificant relation between the mothers' knowledge and children's level of development **(Table**

16). These findings contradicted with **Ngimbudzi et al. (2016)** who indicated that, significant relation were found between the mothers' knowledge and children's level of development.

As regards to relation between the mothers' practices and children's level of development:

There was statistically significant relation between the mothers' practices and children's level of development **(Table 19)**. These findings were consistent with **WHO (2015)** which stated that, in a study on iron deficiency anaemia assessment, prevention, and control a guide for programme managers, significant relation were found between the mothers' practices and child development.

As regards to relation between socio demography of mothers and their practices about prevention of iron deficiency anemia:

There was statistically significant relation between the mothers' practices and their socio-demographic characteristics (age and educational level) **(Table 22) (Research question no. 4)**. These findings agreed with **Yendaw (2014)** who found that, in a study on determinants of anemia among under five children in Ghana, statistically significant relations were found between mother's practices and their age and educational level.

Conclusion

On light of the current study results & research question, it can be concluded that, there was a highly statistical significant relation between the mothers' knowledge and practices about iron deficiency anemia. Moreover, there was statistically significant relation between the mothers' practices and children's level of development. Also, there was statistically

significant relation between the mothers' practices and their socio demographic characteristics as mothers' age and educational level. Meanwhile, there was statistically insignificant relation between the mothers' knowledge and children's level of development. Also: there was statistically in significant relation between the mothers knowledge and practices about iron deficiency anemia "clinical manifestation ".

Recommendations

The following recommendations were inferred from the study:

✓   Encouragement of good breastfeeding and weaning practices. This can be done through awareness at health facilities and at the community level through different channels of communication.

✓   Educational programs should be designed and constructed for mothers regarding iron deficiency anemia during weaning to promote their knowledge and practice to prevent this health problem.

✓   Further research studies are needed for ongoing assessment of children and their mothers including large sample for generalization of results.

References:

Ahmed, F., Khan, M.R., Akhtaruzzaman, M., Karim, R., Marks, G.C., Banu, C.P., Nahar B., Williams, G. (2015): Efficacy of twice-weekly multiple micronutrient supplementation for improving the hemoglobin and micronutrient status of anemic adolescent schoolgirls in Bangladesh. Am J Clin Nutr; 82: 829–835.

American association of public opinion research (2007): Question wording Illinois: American associantion of public opinion reaserch Abailable at http://www.medscape.com/view collection 357.

Baş, N., Karatay, G., Arikan, D. (2017): Weaning practices of mothers in eastern Turkey. J Pediatr (Rio J); 1-6.

Beard, J. (2014): Iron biology in immune function, muscle metabolism and neuronal functioning. J Nutr; 131: 568S–580S.

Berman, A. and Snyder, A.S.J. (2012): Fundamentals of Nursing concept process and practice. 9th ed. New Jersey. Pearson Education INC. Upper Saddle River; pp. 379.

Centers for Disease Control and Prevention, (2008): National Center for Health Statistics. National Health and Nutrition Examination Survey. Available at: www.cdc.gov/nchs/ nhanes.htm. Accessed September 29: 2008

Conrad, M.E. & Umbreit, J.N. (2015): Iron absorption and transport-an update. American Journal of Hematology; 64: 287-298.

Ghwass., M., Halawa., E., Sabry, S., et al. (2015): Iron deficiency anemia in an Egyptian pediatric population: A cross-sectional study. Annals of African Medicine; 14(1): 25-31.

Goldenring, J. (2014): Iron deficiency anemia- children. Medline Plus Journal; 56(6): 152-156.

Miller, E.M. (2014): Maternal Health and Knowledge and Infant Health Outcomes in the Ariaal People of Northern Kenya. Social Science and Medicine; 73: 1266-1274.

Mohamed, A. & Abo-donia, A. (2014): Contributing Factors of Iron Deficiency Anemia among Children under Two Years Attending Family Health Centers in Alexandria. Life Science Journal; 8(4): 996-1007.

Murye, J.W. (2014): The prevalence of iron deficiency and the associated factors in children aged 6-59 months in central equatoria state, Juba-south Sudan. Master Thesis, University of Nairobi. p 7.

Ngimbudzi, E.B., Lukumay, A.M., Muriithi, A.W et al (2016): Mothers' Knowledge, Beliefs, and Practices on Causes and Prevention of Anaemia in Children Aged 6 - 59 Months: A Case Study at Mkuranga District Hospital, Tanzania. Open Journal of Nursing; 6: 342-352.

Nursing times (2018). Iron deficiency anaemia. Retrieved from https://www.nursingtimes.net, retrieved at 12/11/2018.

Nyaruhucha, C.N.M., Msuya, J.M., Mamiro, P.S. and Kerengi, A.J. (2014): Nutritional Status and Feeding Practices of Under-Five Children in Simanjiro District, Tanzania, Tanzanian. Health Research. Bulletin; 8: 162-167.

Sailaja, K., Reddy, K., Reddy, K., et al. (2017). Iron deficiency anaemia in young children (6 to 23 months) in relation to complementary feeding practices in rural Telangana, India. Int J Contemp Pediatr; 4(4): 1240-1244.

Souganidis, E., Sun, K., Pee, S., et al. (2014) who indicated that, in a study on relationship of maternal knowledge of

anemia with maternal and child anemia and health-related behaviors targeted at anemia among families in Indonesia, Matern Child Health J; 16(9): 1913–1925.

Vieira, D., Santos, N., Costa, D., et al. (2016): Recording actions to prevent child morbidity in children's health cards. Ciênc. Saúde Coletiva; 21(7): Rio de Janeiro.

Walter, E.A. & Campos, J.J. (2014): Infant language development is related to the acquisition of walking. Developmental Psychology; 50: pp. 336.

World Bank Atlas Method (2013): Country classification. Available at http:// world bank .org, at 20/9/2018.

World Health Organization (WHO), (2015): Iron deficiency anemia: assessment, prevention and control: a guide for program managers. Available at: www.who.int/ nutrition/ publications/en/ ida_ assessment_ prevention_control.pdf. Accessed February 3, 2015

World Health Organization (WHO), (2016): Iron deficiency anaemia: assessment, prevention, and control. A guide for programme managers. Geneva, World Health Organization. Retrieved from www.who.com, retrieved at 12/11/2018.

Yendaw, E (2014): Determinants of anemia among under five children in Ghana. International Journal of Development Research; 4(4): 858-867