The effect of nutritional educational intervention to mothers on improving the hemoglobin level of their nine month old children attending Ahmed Ali Kanoo Health Center in the Kingdom of Bahrain

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Abstract

Background: **Anemia is a public health problem that affects the population of both rich and poor countries. The WHO's Global Database considers the prevalence of anemia in Bahrain as moderate, ranging between 20%-39.9% in all age groups (5). On the other hand, the prevalence of anemia is reaching 48.3% in those who are 6-59 months of age.**

Diverse methods of intervention have been designed to prevent and correct iron deficiency anemia including the following:
1. Education,
2. Dietary improvement,
3. Fortification of foods with iron,
4. Iron supplementation and,
5. Other public health measures, such as helminthic control.

The aim of this study is to observe the effect of maternal nutritional educational intervention on correcting iron deficiency anemia of their children who presented at the health center for the nine month screening program.

Methodology:
• Mothers and their children at 9 months of age who attended Ahmed Ali Kanoo health center MCH department for regular screening from August 2010 until July 2011 were included in the study.
• Booklets were checked for Hb level at 9 months and later at 18 months, gender, duration of pregnancy, and hemoglobinopathies of the children. Moreover, mother's age, educational level and occupation were also recorded.
• Mothers of anemic children were contacted by telephone and asked whether they received any of the nutritional educational intervention, and whether they gave their children the iron supplement or not.

Results:
• The total number of children included in the study was 448. The Total number of females was 211 (47.1%) and males 237 (52.9%). The majority of the babies were delivered full term 426 (95.1%), while 22 (4.9%) were premature.
• The percentage of anemia in infants at the age of nine months was 198 (45.7%) while at the age of 18 months it decreased to 136 (31.9%).
• Seventy-five (19.3%) who had a low Hb level at 9 months of age improved to a normal Hb level at 18 months of age. However, 44 (11.3%) of the infants who were anemic at 9 months of age continued to be anemic at 18 months of age.

• Change in Hb level from 9 months to 18 months of age is not statistically significant in relation to:
o gender (P=0.086),
o mode of delivery (P=0.142),
o mother occupation (p=0.58),
o mother education (p= 0.468),
o mother age (p=0.141),
o presence of alpha thalassemia (0.264),
o SCD (p=0.375) and,
o whether iron supplementation was given to child (p= 0.15)
The study showed that nutritional educational intervention that includes educating the mother (by doctors, nurses and/or educational material) was statistically significant (p= 0.025) in improving anemia from 9 to 18 months of age.

Conclusion: This study showed a statistically significant relationship between providing nutritional educational intervention and improving the iron deficiency anemia outcome in nine months old children.

Key words: nutritional, educational, intervention, anemia, children, Bahrain.

Background

Iron status in the human body can be grouped into normal level, iron depletion, iron deficiency without anemia and iron deficiency with anemia. Iron depletion refers to the earliest stage of diminishing iron stores in the setting of insufficient iron supply as a result of insufficient intake or excessive loss of iron. Iron deficiency (without anemia) develops as these iron stores are depleted further and begin to impair hemoglobin synthesis. Finally iron deficiency anemia results when the supply is insufficient to maintain normal levels of hemoglobin and represents the latest spectrum of iron deficiency. (1, 2)

The World Health Organization defines Iron deficiency Anemia (IDA) as a hemoglobin (Hb) concentration of 2 SDs below the mean Hb concentration for a normal population of the same gender, age range and altitude (2, 3). In the age group between 6-59 months, anemia is considered to be present when the hemoglobin level is below 11 g/dl. (4)

Anemia is a public health problem that affects the population of both rich and poor countries. The WHO Global Database considers the prevalence of anemia in Bahrain as moderate, ranging between 20%-39.9% in all age groups (5). On the other hand, the prevalence of anemia is reaching 48.3% in those who are 6-59 months of age. (6)

In Saudi Arabia the prevalence of anemia in the same age group (preschool) ranges between 20%-67% (7). A study done in Riyadh showed that 37.2% of healthy Saudi infants between 6-24 months of age who were attending the Well Baby Clinic at King Khalid University were found to be anemic, while the prevalence of anemia in Jeddah on children of the same age group was 37.7%. (8) In Western Saudi Arabia, 34% of the Bedouin children below five years of age were found to be anemic. (8)

In 2003 the Palestinian Central Bureau of statistics reported that 37.9% of children aged 6-59 months were anemic.(9) In a study done in Southwest Iran for children aged 6-59 months, anemia was found in 43.9% of children and 29.1% were due to iron deficiency anemia. The study also shows that the highest prevalence of iron deficiency anemia was in the 12-24 months age group.(10) When it comes to Eastern Mediterranean Region, Yemen has the highest prevalence of anemia in preschool age group where the prevalence is about 73.5%, followed by Pakistan with 60% and Palestine with 52% prevalence of anemia. (6)

Globally, Africa has the highest prevalence of anemia in preschool age children with 67.6%, followed by South East Asia 65.5%, Eastern Mediterranean 46.7%, America 29.3% and Western Pacific 23.1%. (5)

The least prevalence of anemia was found in Europe with a prevalence of 21.7 % in preschool children. (5)

Diverse methods of interventions exist that are designed to prevent and correct iron deficiency anemia. These include education, dietary improvement, fortification of foods with iron, iron supplementation, and other public health measures, such as helminthic control (11).

Many studies have been conducted showing the various effects of education on preventing and treating iron deficiency anemia.(12-15) A pilot study in Tehran in 2001 showed an increase in ferritin levels in those children whose mothers received nutrition education as compared to the control and dietary modification groups.(12)

A randomized trial conducted in Delhi, India in 2003 suggested that nutrition education did have a positive effect on the iron status possibly by improving the dietary iron intake.(13) Another study in UAE in 2005 showed highly significant increases in the levels of hemoglobin and hematocrit of children of mothers who received a face to face health education program.(14) A recent study in 2013 in Iran showed that education based on health belief model can improve knowledge of parents towards supplemental iron. (15)

On the other hand, a Randomized Clinical Trial (RCT) in west and south Birmingham, in 1997 showed no reduction in anemia using a targeted nutritional program and have highlighted the difficulties in conducting health education programs within the scope of current health resources. (16) In 2012 a study in Brazil, on maternal dietary counseling covering breastfeeding and healthy complementary feeding on the prevalence of iron deficiency, anemia and iron deficiency anemia in children aged 12 to 16 months showed no effect of dietary counseling on the prevalence of anemia, iron deficiency or iron deficiency anemia.(17)

The aim of this study is to observe the effect of maternal education on correcting iron deficiency anemia.

Methods

In the Kingdom of Bahrain, the primary health care services are provided through 25 health centers distributed all over the kingdom.(18) Ahmed Ali Kanoo health center is one of those health centers that provide primary health services to a population of around 35,000. Maternal and child health department (MCH) in the health center is providing all the health care services to mothers and children.(18) Child screening is one of the major services provided that include anemia screening at 9 months of age. Mothers and their children at 9 months of age who attended the MCH department in Ahmed Ali Kanoo Health Center for regular screening program in the period from August 2010 to July 2011 were included in the study.

According to the MCH guidelines, mothers and care givers of children with low Hb (below 11 at 9 months) are supposed to receive nutritional educational intervention including advice from nurses, doctors and/or receiving educational leaflets regarding diet and iron supplementation. (19) They should also be given iron supplementation according to the weight of the child. Booklets were checked for Hb level at 9 and later at 18 months, gender, duration of pregnancy, and heamoglobinopathies of the children. Moreover, mother age, educational level and occupation were recorded.

Mothers of anemic children were contacted then by telephone and asked whether they received any of the nutritional educational intervention, and whether they gave their children the iron supplement or not. Data were entered in excel and transferred to SPSS. Continuous variables were presented as means and standard deviation and categorical variables were presented as percentages. Chi square test was used for association testing.

Results

- The total number of children included in the study was 448. (Table 1)
- The total number of females was 211 (47.1%) and the males were 237 (52.9%).
- Most of the babies were delivered full term 426 (95.1%), and only 22 (4.9%) were premature. (Table 1)
- Our sample showed a total of 95 (21.1%) infants carry the alpha thalassemia gene, 8 (1.8%) had sickle cell disease, and 2 (0.4%) had beta thalassemia trait. (Table 1)
- Most of the mothers were housewives 304 (68.2%), and only 142 (31.8%) were working. (Table 1)
- Around half of the mothers 226 (50.8%) had a higher education level, 171 (38.4%) had a secondary level, and only 48 (10.8%) had an intermediate level and below. (Table 1)
- The majority of mothers were aged between 30-39 years with a total number of 243 (54.2%); those who were 30 years and below represent 153 (34.2%), and those who were above 40 years of age represent 52 (11.6%). (Table 1)
- Most of the infants 121 (92.4%) were not given iron supplemental therapy by their mothers, while only 10 (7.6%) were given iron therapy for a duration of one month and more. (Table 2)
- For a hundred and twenty-five (80.1 %) of those who were anemic, their mothers received the nutritional educational intervention, while 31 (19.9 %) mothers denied receiving any kind of intervention. (Table 2)
- The percentage of anemia in infants at the age of nine months was 198 (45.7%) while at the age of 18 month it decreased to 136 (31.9%). (Table 3)
- Regardless of being anemic or not, a total of 256 (62.1%) infants had an increase in their Hb level from nine to 18 months of age, while141 (34.2%) had a decrease in their Hb level, and only 15 (3.6%) had the same Hb level. (Table 3)
- Most of the infants who had a normal Hb level at 9 months of age continued to have a normal Hb level at 18 months of age with a total number of 236 (61%). However, 34 (8.7%) who had a normal Hb level at 9 months of age had a drop in their Hb level at 18 months of age. (Table 3)
- Seventy-five (19.3%) who had a low Hb level at 9 months of age improved to a normal Hb level at 18 months of age. However, 44 (11.3%) of the infants who were anemic at 9 months of age continued to be anemic at 18 months of age. (Table 3)
- Change in Hb level from 9 months to 18 months of age is not statistically significant in relation to gender (P=0.086), mode of delivery (P=0.142), mother occupation (p=0.58), mother education (p=0.468), mother age (p=0.141). (Table 4)
- The presence of alpha thalassemia was (0.264), SCD (P=0.375), and whether iron therapy was given to child (P= 0.15) was not statistically significant in relation to improving the Hb level from 9 to 18 months of age. (Table 5)
- The study showed that nutritional educational intervention was statistically significant (P= 0.025) in improving anemia from 9 to 18 months of age. (Table 5)

Table 1: Characteristics of children at 9 months of age and their mothers who attended Ahmed Ali Kanoo health centers during August 2010 to July 2011

DESCRIPTIVE DEMOGRAPHIC			
VARIABLE		NUMBER	PERCENT
GENDER			
	FEMALE	211	47.10%
	MALE	237	52.90%
	TOTAL	448	100%
DISEASE			
	ALPHA THAL	95	21.10%
	BETA THAL	2	0.40%
	SCD	8	1.80%
MODE OF DELIVERY			
	FULL TERM	426	95.10%
	PREMATURE	22	4.90%
	TOTAL	448	100%
MOTHER OCCUPATION			
	HOUSE WIFE	304	68.20%
	WORKING	142	31.80%
	TOTAL	446	100%
MOTHER EDUCATION			
	INTERMEDIATE AND BELOW	48	10.80%
	SECONDARY	171	38.40%
	HIGHER EDUCATION	226	50.80%
	TOTAL	445	100%
MOTHER AGE			
	BELOW 30	153	34.20%
	30-39	243	54.20%
	40 AND ABOVE	52	11.60%
	TOTAL	448	100%

Table 2: Clinical description of Iron supplementation and nutritional educational intervention to mothers of anemic 9 month old children who attended Ahmed Ali Kanoo health center during August 2010 to July 2011

TABLE 2			
DESCRIPTIVE CLINICAL			
VARIABLE		NUMBER	PERCENT
IRON SUPPLEMENTED TO CHILD			
	NO	121	92.40%
	YES	10	7.60%
	TOTAL	131	100.00%
NUTRITIONAL EDUCATIONAL INTERVENTION GIVEN TO MOTHER			
	YES	125	80.10%
	NO	31	19.90%
	TOTAL	156	100%

Table 3: Hb Status of children at 9 and 18 months who attended Ahmed Ali Kanoo health centers during August 2010 to July 2011

HB LEVEL AT 9 MONTHS		
LESS THAN 11	198	45.70%
MORE THAN 11	235	54.30%
TOTAL	433	100.00%
HB LEVEL AT 18 MONTHS		
LESS THAN 11	136	31.90%
MORE THAN 11	290	68.10%
TOTAL	426	100%
CHANGE OF HB LEVEL		
HB DECREASED	141	34.20%
NO CHANGE IN HB LEVEL	15	3.60%
HB INCREASED	256	62.10%
TOTAL	412	100%
CHANGE OF HB FROM 9 TO 18 MONTHS		
ANEMIA AT 9 - ANEMIA AT 18	44	11.30%
NORMAL AT 9 - ANEMIA AT 18	34	8.70%
ANEMIA AT 9 - NORMAL AT 18	75	19.30%
NORMAL AT 9 - NORMAL AT 18	236	61%
TOTAL	389	100

Table 4: Effect of demographic variables on the Hb status of children at 9 and 18 months who attended Ahmed Ali Kanoo health centers during August 2010 to July 2011

TABLE 4						
CROSSTAB						
VARIABLES		CHANGE OF HB LEVEL FROM 9 TO 18 MONTHS				
		ANEMIA AT 9-ANEMIA AT 18	NORMAL AT 9-ANEMIA AT 18	ANEMIA AT 9-NORMAL AT 18	NORMAL AT 9-NORMAL AT 18	P VALUE
GENDER	FEMALE	22 (11.4%)	16 (8.3%)	47 (24.4%)	108 (56.0%)	0.086
	MALE	22 (11.2%)	18 (9.2%)	28 (14.3%)	128 (65.3%)	
MODE OF DELIVERY	FULL TERM	44 (11.9%)	30 (8.1%)	71 (19.2%)	224 (60.7%)	0.142
	PREMATURE	0 (0.0%)	4 (20.0%)	4 (20.0%)	12 (60.0%)	
MOTHER OCCUPATION	HOUSE WIFE	31 (11.7%)	26 (9.8%)	52 (19.7%)	155 (58.7%)	0.58
	WORKING	12 (9.8%)	8 (6.5%)	23 (18.7%)	80 (65.0%)	
MOTHER EDUCATION	INTERMEDIATE AND BELOW	4 (10.5%)	5 (13.2%)	6 (15.8%)	23 (60.5%)	0.468
	SECONDARY	21 (14.0%)	16 (10.7%)	27 (18.0%)	86 (57.3%)	
	HIGHER EDUCATION	18 (9.1%)	13 (6.6%)	42 (21.2%)	125 (63.1%)	
MOTHER AGE	BELOW 30	12 (8.6%)	9 (6.5%)	32 (23.0%)	86 (61.9%)	0.141
	30-39	27 (13.1%)	17 (8.3%)	34 (16.5%)	128 (62.1%)	
	40 AND ABOVE	5 (11.4%)	8 (18.2%)	9 (20.5%)	22 (50.0%)	

Table 5: Effect of diseases, iron supplement and nutritional educational intervention on the Hb status of children at 9 and 18 months who attended Ahmed Ali Kanoo health centers during August 2010 to July 2011

TABLE 5

CROSSTAB

VARIABLES		CHANGE OF HB LEVEL FROM 9 TO 18 MONTHS				
		ANEMIA AT 9-ANEMIA AT 18	NORMAL AT 9-ANEMIA AT 18	ANEMIA AT 9-NORMAL AT 18	NORMAL AT 9-NORMAL AT 18	P VALUE
ALPHA THAL	NO	34 (11.1%)	26 (8.5%)	53 (17.4%)	192 (63.0%)	0.264
	YES	10 (11.9%)	8 (9.5%)	22 (26.2%)	44 (52.4%)	
SCD	NO	43 (11.3%)	34 (8.9%)	72 (18.8%)	233 (61.0%)	0.375
	YES	1 (14.3%)	0 (0.0%)	3 (42.9%)	3 (42.9%)	
IRON SUPPLEMENTED TO CHILD	YES	28 (27.5%)	9 (8.8%)	29 (28.4%)	36 (35.3%)	0.15
	NO	3(33.3%)	1 (11.1%)	5 (55.6%)	0 (0.0%)	
EDUCATION GIVEN TO MOTHER	NO	4 (17.4%)	1 (4.3%)	5 (21.7%)	13 (56.5%)	0.025
	YES	30 (25.6%)	11 (9.4%)	47 (40.2%)	29 (24.8%)	

Discussion

The study showed the percentage of anemia in infants aged 9 months was 45.7%, which is in concordance with The WHO Global Database that estimated the prevalence of anemia in Bahrain to be 48.3% in those who are 6-59 months of age.(5)

In 2007, a Ministry of Health report showed that 26% of individuals attending for the premarital counseling service had an alpha thalassemia gene, and our study also showed that there is a high percentage of alpha thalassemia reaching 21.1% in 9 month old infants.(20)

A neonatal screening study done in Bahrain in 1984-1985 showed that the prevalence of sickle cell disease was 2.1% and decreased to 0.9% in another study done in 2002(20). In our study, the percentage of sickle cell disease was high reaching 1.8 %. This could be due to the high rate of sickle cell disease in the area of the study population.

Presence of alpha thalassemia gene and sickle cell disease were not related to the improvement of Hb level between 9 and 18 months of age as expected in these diseases. (21-23)

There were a small percentage of mothers who used the iron supplement for more than one month to treat anemia in their infants. This is largely due to the fact that mothers are worried about the side effect of iron syrup, such as dental discoloration, dental carries and constipation. (24, 25) Moreover it has an un-pleasant taste.

Our study showed that the nutritional educational intervention of the mother had a statistically significant role in improving the Hb level in children between 9 and 18 months of age. This result is supported by many other studies done in different regions like UAE, India and Iran which showed that maternal education significantly increases the level of hemoglobin in their children(12-14). Based on the results of the study, we recommended strengthening the nutritional educational intervention provided by doctors, nurses and/or other health professionals in order to improve the uptake of iron and decrease the prevalence iron deficiency anemia among children in Bahrain.

Conclusion

This study showed a statistically significant relationship between providing nutritional educational intervention and improving iron deficiency anemia.

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