Relationship Between Hemoglobin Level and Feeding Pattern in Apparently Healthy Children Below Two Years

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ABSTRACT

Background and Objectives: Anemia is still one of the most common problems in the world even in developed countries, but its evaluation is still underestimated especially in developing countries like our, so it needs further planning, screening and management. This study was done in 12 primary health care centers PHCC in Erbil city – Kurdistan region/Iraq during period fro 1st Feb - 31st Jul 2008. The main objectives were to determine the hemoglobin value in our children , to estimate the prevalence of anemia and correlating it with feeding pattern .

Methods: This prospective study was conducted in 500 apparently healthy children collected randomly, visiting the vaccination centers routinely during 5 months period. Feeding. pattern were studied in relation to hemoglobin (Hb) level only.

Results: From total 500 children conducted in this study, the mean Hb. of them was 10.4 g/dl. Those with normal Hb were 196 (39.2%), while 304 (60.4%) of them were anemic. Those with mild anemia were 145 (29.0%) and 159 (31.8%) of them had moderate anemia. The sex had no effect on Hb level. The anemia was lesser in children below one year Children on breast feeding had lower percent of anemia (51.9%),those on exclusive breast feeding only 6 (33.4%) while those on adult milk (74.9%) of them were anemic.

Conclusions: There was a high prevalence of anemia among the investigated children and less common in children with breast feedin.

Key words: Anemia; Breast Feeding; childhood anemia.

INTRODUCTION

Anemia is defined as a reduction of the red blood cell (RBC) volume or hemoglobin concentration below the range of values occurring in healthy persons[1]. There are racial differences in hemoglobin levels [2]. The lower limit of the normal range is set somewhat arbitrarily at two standard deviations below the mean at any given age [3]. Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development [4]. It occurs at all stages of the life cycle , but is more prevalent in pregnant woman and young children[5].In 2002 , anemia was considered to be among the most important contributing factors to the global burden of disease[6]. Anemia resulting from lack of sufficient iron for synthesis of hemoglobin is the most common hematologic disease of infancy and childhood. It is estimated that 30% of the global population suffers from iron-deficiency anemia; most of those affected live in developing countries [1]. Nutritional anemia is the most common cause of anemia in pediatrics [5]. Iron deficiency may develop because of a delay in the introduction of mixed feeding beyond 4-6 months of age or to a diet with insufficient iron-rich foods, especially if it contains a large amount of cow's milk[7]. Infants should not be fed unmodified cow's milk as its iron content is low and poorly absorbed [8]. Iron-deficiency anemia is associated with numerous deleterious health conditions [1]. Primary prevention of iron deficiency should be done through diet for

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infants and preschool children. Among the control of disease centre(CDC) recommendations are: breastfeeding for the first 6 to 12 months of age; if using formula, use only iron-fortified formula[9-11.]

The aim of the study: In this study we tried to determine the prevalence of low Hb level among 500 apparently healthy children in correlation with feeding pattern in Erbil city.

PATIENTS & METHODS

This prospective study was conducted among 500 apparently healthy children taken randomly, aged 6 -24 months ,of both sexes, who attended the vaccination centers in the primary health care centers "PHCC" in the Erbil city to receive the routine vaccinations, all of them from urban areas, during the period of February- July, 2008. Personal data of the children; name, age, gender and residence, type of the feeding. Cases with history of prematurity, history of low birth weight, history of present illness or chronic diseases, history of drug intake and family history of blood diseases were excluded. The center of disease control (CDC) recommends using the Hemoglobin (Hb) Concentration and Hematocrit (Hct) to screen for anemia because it is of low cost, and the ease and speed with which the test can be performed[12]. After taking permission from the parents hemoglobin level was measured using Sahli-Hellige hemoglobin meter which is a rapid and accurate method for screening., by the author. In this study the Hb. levels were classified into four groups, according to the WHO and CDC cut off value for anemia according to the age that consider Hb. <11 g/dl, for children (6 – 24) months as anemia which is classified into mild anemia Hb. 10-11 g/dl, moderate anemia Hb. 7-10 g/dl and sever anemia Hb. < 7 g/dl, [1,12].the collected were entered into SPSS program version 16 to get the general characteristics of the study. Parametric tests used for normally distributed and non-parametric tests for skewed data. P value less than (0.05) was considered significant.

RESULT

Regarding ,the mean Hb level of all studied group was 10.4 g/dl, 304(60.8%) of them were anemic (Hb<11.0 g/dl), and 145 (29.0%) of those had mild anemia (Hb 10.0 - <11.0 g/dl) with mean value (10.44 gm/dl), and 159(31.8%) moderately anemic (Hb) between (7.0 and <10.0 g/dl) with mean value (8.53 gm/dl), but no one with severe anemia (Hb <7.0 g/dl) was found in the study.

Table(1) shows the distribution of the conducted children according to the gender, but the relation between the gender and Hb value was not significant statistically, (P = 0.983).

Table 1: Relation between the gender & Hb value.

Gender		Hb Grouping			
		Normal	Mild anemia	Moderate anemia	Total
Male	No.	102	74	82	258
	%	39.5%	28.8%	31.7%	51.6%
Female	No.	94	71	77	242
	%	38.8%	29.3%	31.8%	48.4%
Total	No.	196	145	159	500
	%	39.2%	29.0%	31.8%	100%

The gender distribution was not significant statistically (P value =0.983).

Table(2) shows the distribution of the examind children according to the age which shows that 234 (46.8%) of them were below one year of age, 131 (55.9%) of them were anemic, while 266 (53.2%) of the children were within the second year of life, 174 (65.4%) of them were anemic. From statistical view these results are highly significant (P = 0.000).

Table 2: Relationship between Hb and ages of the children.   From

Age groups by months		Hb groups				
		Normal	**Mild anemia**	**Moderate anemia**	**Total anemia**	**Total**
6 – 8	**No.**	43	32	29	61	104
	%	41.3	30.7%	27.8%	58.6%	20.8%
9 – 11	**No.**	53	27	38	65	118
	%	44.9	22.8%	32.2%	55.1%	23.6%
12 – 14	**No.**	25	25	23	48	73
	%	34.2%	34.2%	31.5%	65.7%	14.6%
15 – 17	**No.**	31	31	38	69	100
	%	31.0%	31.0%	38.0%	69.0%	20.0%
18 -20	**No.**	18	18	21	39	57
	%	31.5	31.5	36.8%	68.3%	11.4
21 – 24	**No.**	26	12	10	22	48
	%	54.1%	25.5	21.2%	46.9%	9.6
Total	**No.**	196	145	159	304	500
	%	39.2%	29.0%	31.8%	60.8%	100.0%

statistical view these results are highly significant (P = 0.000).

Table (3): shows the distribution of anemia in children with breast feeding, either exclusive or mixed, they were 231(46.2% from the 500 children),120(51.9%) of them were anemic the lowest percent for anemia were in exclusive breast feeding 6(33.4%), while the highest percent was for children who were on mixed breast and adult milk feeding 12(74.9%). From statistical view these results are highly significant (P = 0.000).

Table 3: Hb level in breast feeding children

Type of feeding	Hb Grouping				
	Normal	**Mild anemia**	**Moderate anemia**	**Total anemia**	**Total**
Exclusive Breast feeding	12 66.6%	5 27.7%	1 5.6%	6 33.4%	18 3.6%
Mixed Breast and formula	45 39.1%	41 35.6%	29 25.2%	70 60.8%	115 23.0%
mixed breast and adult milk	4 25.0%	3 18.7%	9 56.2%	12 74.9%	16 3.2%
Mixed breast and weaning foods	50 60.9%	21 25.6%	11 13.4%	32 39.1%	82 16.4%
Total	111 48.0%	70 30.3%	50 21.6%	120 51.9%	231 46.2%

From statistical view these results are highly significant (P = 0.000).

Table(4) shows the distribution of anemia among the conducted children who were on infant fortified formula , either exclusive or mixed, they were 266(53.2% from the 500 children), 66(62.4%) of them were anemic , the lowest percent were in children with exclusive formula feeding 10(58.8%), while the highest percent were in children with mixed formula and weaning foods . From statistical view these results are highly significant (P = 0.000)

Table 4: Hb level in adult formula feeding children.   From

Type of feeding	Normal	Mild anemia	Moderate anemia	Total anemia	Total
Exclusive formula	7 41.2	3 17.6%	7 41.2%	10 58.8%	17 3.4%
Mixed Breast and formula	45 39.1%	41 35.6%	29 25.2%	70 60.8%	115 23.0%
Mixed formula and weaning foods	48 35.8%	40 29.8%	46 34.3%	86 64.1%	134 26.8%
Total	100 37.5%	84 31.5%	82 30.9%	166 62.4%	266 53.2%

statistical view these results are highly significant (P = 0.000).

Table(5) shows the distribution of anemia in children with adult milk (unfortified formula), which is either exclusive or mixed, they were 105(21.0% of the 500 children), 86(82.0%) of them were anemic which is the highest percent of anemia among the conducted children. From statistical view these results are highly significant (P= 0.000).

Table 5: Hb level in adult milk feeding children.

Type of feeding	Normal	Mild anemia	Moderate anemia	Total anemia	Total
Exclusive Adult milk	0 0.0%	1 25.0%	3 75.0%	4 100.0%	4 0.8%
Mixed Adult and Breast feeding	4 25.0%	3 18.7%	9 56.2%	12 75.0%	16 3.2%
Mixed adult milk and weaning foods	15 17.6%	26 30.5%	44 51.7%	70 82.3%	85 17.0%
Total	19 18.0%	30 28.5%	56 53.3%	86 82.0%	105 21.1%

From statistical view these results are highly significant (P = 0.000).

Table(6) From total 500 children conducted in this study, the children with bottle feeding "infant formula and adult unfortified milk" were 373 (74.6%) those who were anemic 251(67.4%). Out of these 373 children 231 (61.9%) of them receiving appro– priately prepared milk, 134 (58.1%) of them were anemic, while 142 (35.9%) of them receiving diluted prepared milk 120 (84.4%) of them were anemic, statistically these results are highly significant, (P = 0.000).

Table 6: Hb. value in relation to the concentration of bottle milk.

Concentration of bottle feeding		Hb Grouping			
		Normal	Mild anemia	Moderate anemia	Total
Appropriate prepa-ration	No.	97	73	61	231
	%	41.9%	31.6%	26.4%	61.9%
Diluted	No.	21	39	74	134
	%	15.6%	29.1%	55.2%	35.9%
Concentrated	No.	3	2	3	8
	%	37.5%	25.0%	37.0%	2.1%
Total	No.	121	114	138	373
	%	32.5%	30.5%	37.0%	100.0%

From statistical view these results are highly significant (P = 0.000).

DISCUSSION

From the results of this study the prevalence of anemia in the conducted children was (60.8%), these result are in consistence with the results of other study done in India, which showed that anemia prevalence was (63.5%)[13]. The WHO estimation for anemia in the developing countries was (>60.0%)[11]. Regarding the results of this study there is no significant difference in the percentage of anemia between males 156 (60.5%) and females 148 (61.1%), these results are in consistence with other studies , that showed that there was no statistically significant differences between the sexes in term of anemia prevalence in this age group[13-17]. Regarding the age of the examined children the percent of anemia was less in the children who were below one year (56.85%), while this percent is higher in children above one year of age (62.47%) these results may be due to, in the small age groups there is higher percent of breast feeding and adult milk usually not started to be given by the families. These results are in consistence with other studies, anemia and iron deficiency "ID" increase strongly with age[18]. The oldest infants were three times likely to be anemic than the youngest one[19.] Regarding the type of the feeding strongly related to the Hb value, the lowest percent of anemia was among breast feeding children 120(51.9%), while the highest percent of anemia 86 (82.0%) was among children with adult unfortified milk feeding. This result could be explained by two reasons: first by the effect of this type of milk itself, chronic intestinal blood loss induced by exposure to a heat-labile protein in adult milk[15], although the iron content of human milk is somewhat low ,human milk iron is well absorbed[16] ,and secondly because most of the mothers prepare it in a diluted form because of wrong idea between most of them that this milk is more strong and concentrated. These results are in

consistence with other study conducted in Brazil, which showed the highest percent of anemia among children with adult and unmodified milk feeding, because this type of milk is poor in iron and does not contain hem iron, which is the form best absorbed in the body[17]. According to some experimental data, this milk also has the potential to inhibit the absorption of hem and non-hem iron present in other foods consumed by the child[18]. Highest hemoglobin concentrations were observed among exclusively breastfed children, followed by those predominantly breastfed. The mean hemoglobin levels of children fed according to the remaining patterns were significantly lower than those of exclusively breastfed children, and this was consistant with other studies[7]. Regarding the population conducted in this study there were 134 (26.8%) children receiving diluted prepared bottle feeding " either infant formula or adult and unmodified milk " , because most of the mothers had no any knowledge about the appropriate method for bottle feeding preparation or due to economic conditions. The anemic children of them were 113 (84.4%), most of them with moderate anemia , these results were in consistence, with other study conducted in india which showed that diluted milk serving , as a main diet is the important cause of anemia[13].

RECOMMENDATIONS

1. Health education programs for families through media channels and via specific rooms in the PHCC about feeding patterns and healthy dietary habits.

2. Encouragement of exclusive breast feeding and addition of fortified formula if needed.

3. Avoidance of adult unfortified milk in the feeding of children in the first 12 months of life.

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