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Bioscience Research Print ISSN: 1811-9506 Online ISSN: 2218-3973

**RESEARCH ARTICLE** 

Journal by Innovative Scientific Information & Services Network BIOSCIENCE RESEARCH, 2022 19(4): 1993-1999.



**OPEN ACCESS** 

# Anemia and its association with young children feeding practices, a cross-sectional study at Khyber teaching hospital, Peshawar, Pakistan

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Anemia is a worldwide public health issue that is linked to an elevated risk of morbidity and mortality in people of all ages, but young children are more vulnerable due to their increasing demand and growing size. The main goal of this study is to assess the association between anemia and feeding practices of young children. This was a cross-sectional study which is conducted at Khyber teaching hospital, Peshawar. The association was tested by using the Chi-square test. A significant association was described as a P-Value of < 0.05.It was found that 173(57.7%) of the infants and young children were anemic. Anemia was found in 65.3% of infants exclusively breastfed for >6 months, followed by 62.5% with EBF for 6 months, and 47.8% for < 6 months. Times of Initiation of breastfeeding, duration of exclusive breastfeeding, and late initiation of complementary feeding were associated with anemia significantly. Results suggest there is a relationship between the duration of EBF and late initiation of CF with anemia. However, the findings of this study are insufficient to justify any modifications to the existing feeding practice guidelines. Further longitudinal studies in different populations, with inflammation controlled, will help put these findings in perspective.

Keywords: Anemia, Breastfeeding, Complementary feeding

#### INTRODUCTION

Anemia is the most prevalent and serious public health issue, affecting nearly 2.2 billion people in the world, particularly children and women in underdeveloped countries (Sailaja et al.2017). Anemia has a direct effect on health and nutritional status, as well as major consequences for community socioeconomic development. The most frequent cause of anemia is iron deficiency, which is responsible for about half of anemia all cases worldwide. Iron deficiency anemia (IDA) can strike anybody at any time and affect people of all ages, but in children and pregnant women, it is the most common. Anemia affects about 47.4% of under five years children worldwide. Similarly, 46-66 % of under five years of age children in developing countries are affected, and 56% of women during pregnancy are anemic in developing countries (Woldie et al.2015).

Nutritional anemia has been recognized in Pakistan to be the most common form of malnutrition in children. According to the 1988 National Nutrition Survey of Pakistan, anemia was observed in 65% of children aged 7-60 months (Akhtar et al.2017). Research carried out in 3 urban slums in Karachi, Pakistan, found that 70% of children in the age group of 6-60 months were anemic(4). In Pakistan, another local study reported that the anemia prevalence was 78 percent in the same age group (Pasricha, 2012). Anemia incidence often varies by geographic area. In 2010, the highest anemia prevalence was found in Africa, the Caribbean, South Asia, and Oceania, among both genders and all age groups. Progress in reducing anemia has been sluggish and uneven in general. Anemia is estimated to have decreased by about 7 percent between 1990 and 2016, from 40 percent to 33 percent for all age groups and both sexes (Chaparro and Suchdev, 2019).

In vulnerable populations, IDA causes numerous deaths, maternal postpartum hemorrhage, and decreased school performance, which reduced productivity and is particularly damaging during pregnancy, especially in developing countries. Anemia complications in pregnant women include mortality and morbidity, as well as low birth weight and a higher infant and child mortality rate(Akhtar et al.2013).

The most common causes of anemia are the deficiencies of essential micronutrients, lack of awareness in the mother, worm infestation in children, repeated pregnancy in women, socio-economic conditions, and low literacy rate have all been described as determinants for

the etiology of anemia in the underdeveloped world( Ullah et al.2018).

Feeding practices are one aspect of this situation that is of particular interest. The association between anemia and children's feeding practices is of major policy concern because feeding patterns are more easily influenced by policy interventions than more permanent socioeconomic status like educational status or family income( Anjali et al .2019).

During the first six months of life full-term and a normal birth weight baby, regarding their iron requirement, infants are practically self-sufficient( Domellöf,2011). After which the needs rapidly increase as the hepatic iron stores acquired during pregnancy are depleted ( Gollomp and Lambert,2018). Studies have found that higher nutritional requirements have been linked to a negative nutrient balance during the growth spurt. Prolonged exclusive breastfeeding (>6 months) is generally related to a reduction in the intake of iron from additional sources of iron which is lead to iron deficiency anemia( Kim et al.2013).

The best and ideal age to introduce complementary feedings to children is a major subject of debate. IYCF proposes the initiation of complementary feeding (soft foods, semisolids, and solids) timely at six months of age(1). One randomized study found infants who were initiated complementary foods at 3-4 months of age had higher mean iron intake as compared to those who were initiated at six months of age (Wang et al.2017). The contradictory findings of several studies on the length of exclusive breastfeeding and timing of complementary food initiation, and the likelihood of anemia in infants rationalize the need for further studies. Hence, the goal of this study is to observe the association between anemia and feeding practices of children aged 6 to 24 months.

# MATERIALS AND METHODS

# Study design, setting, and participants

This was a descriptive cross-sectional study conducted at Khyber teaching hospital(KTH) Peshawar. The population of this study included all patients, infants, and children aged 6-24 months, who visited the KTH, Peshawar. The data were taken directly from the parents who brought their children to the hospital for seeking medical care. The data about the feeding Practices collected are primary. The study was conducted from Sep 15, 2020, to Feb 16, 2021.

# Sample size calculation

The total sample size was drawn by using Cochran's formula for sample size. The proportion of the population (P), which is taken from the study done in Lahore reported the anemia prevalence is 74% among 6-59 months of age children. The confidence level taken was 95% and a 5% margin of error was used for the estimation of the

population sample size. After the calculation, the obtained sample size was 300.

# Sampling technique

The overall population of this study was unknown and not easily accessible, therefore we used the nonprobability base sampling technique, to identify the association between anemia and feeding practices., we used the purposive sampling technique in this study.

#### Inclusion criteria

A total of 300 subjects were admitted during the study period due to any illness that is acute and chronic infections (gastroenteritis, respiratory tract infection, measles), breastfed, mothers with only one child between the age of 6 to 24 months, and mothers whose were willing to participate in the study.

# **Exclusion criteria**

Infants and children suffering from hemolytic anemia (sickle cell anemia and thalassemia), and other hematological issues like coagulopathy, bleeding, bone marrow disorders (idiopathic thrombocytopenic purpura, Haemophilia), hematological malignancies, children on hematinic, and mothers who were not willing to participate in the study.

# Data collection method, tools, and procedure

The personal survey method was used as a method of data collection in this study. Necessary data on Socio demographics characteristics and feeding practices that contain age, sex, residential area, parent's education background, parent's occupation background, income condition of the family, duration of exclusive breastfeeding (EBF), and details of complementary feeding (CF) were collected through interviewing the mother of the child by using a pre-structured questionnaire

# Variables

The educational status was classified as illiterate, primary education, secondary education, and higher education according to the international standard of education classification (KILM14).

EBF was based on maternal recall on whether the baby and children were given only breast milk or received both breastfeeding and CF or only received any non-breast milk liquids or CF. The length of EBF was classified as follows based on current WHO recommendations for feeding practices: less than 6 months, up to 6 months, and above 6 months. CF was defined as any soft solid, semisolid, or solid food (yogurt, mashed vegetables, potatoes, and fruits), infant formula, and cow milk.

A complete blood count was done in all study populations for hemoglobin (Hb) measurement.

According to WHO classification, Subjects were categorized into two groups Children which have hemoglobin levels less than 11gm/dl were considered

anemic. Anemia was classified as mild (Hb level 10-10.9gm/dl), moderate (Hb level 7-9.9gm/dl), or severe (Hb level less than 7 gm/dl).

# Data analysis

IBM-SPSS version 26 was used for data analyses. Continuous. Categorical variables reported as frequencies and percentages were used to evaluate the descriptive statistics. Chi-square and Fisher's exact test was used to see the association of each independent variable with the outcome variable (anemia status). In the analysis, independent variables with P value  $\leq 0.05$  were considered significant.

# RESULTS

Table.1 shows the demographic profiles of the research participants. A total of 300 infants and children between the ages of 6 to 24 months were included in this study. There were 182(60.7%) males and 118(39.3%) children were females.

There were 221(73.7%) subjects who belonged to the rural area, while the remaining 79(26.3%) belonged to the urban area. Figure.1 shows the education level of the patient's parents where most of the patient's mothers 214(71.3%) were illiterate, followed by 49(16.3%) who completed their primary school, 22(7.3%) completed their secondary school, and only 15(5.0%) studied their higher education.

The majority of the patient's mothers 292(97.3%) were housewives. Most of the patient's fathers 164(54.7%)were laborers, 84(28.0%) were their businesses, and only 39(13%) were employed. Table 1 also shows the monthly income level of the patient's family, where the highest number of patients 149(49.7%) belongs to the poor class, 101(33.7%) belongs to the lower middle class, 27(9.0%)belonged to the middle class, 17(7.3%) belonged to the upper-middle class, and only 6(2.0%) belonged to the upper class.

Table	1:	Descriptive	statistics	of	demographic
variabl	es				

		Frequencies	Percentages	
Gender	Male	182	60.7%	
Gender	Female	118	39.3%	
Posidontial area	Rural	221	73.7%	
Residential alea	Urban	79	26.3%	
	Illiterate	214	71.3%	
Education level	primary school	49	16.3%	
child-mother	Secondary school	22	7.3%	
	Higher	15	5.0%	
	poor class	149	49.7%	
Monthlyincomo	lower middle class	101	33.7%	
level	middle class	27	9.0%	
	upper- middle	17	5.7%	
	upper	6	2.0%	

	class		
Wark status	Labour	164	54.7%
work status	Employed	39	13.0%
child's father	Business	84	28.0%
child S fatter	Jobless	12	4.0%



# Figure 1: Education level of the patient parents

The result also shows that the feeding practices of the study population in which 83(27.7%) mothers started breastfeeding their child within the first hour of birth and 217(72.3%) initiated breastfeeding to their child after 1 hour of birth. The majority of mothers 243(81%) had given their baby colostrum.

Figure 2 shows that 123 (41%) mothers were given exclusive breastfeeding (EBF) for less than 6 months, 102 (34%) for 6 months, and 75 (25%) for more than 6 months. Overall 270(90%) mothers had given complementary feeding to their children of which 88(31%) started at the recommended age of 6 months, 123(44.9%) at the age of 6 months, and 66(24.1%) stated later than 6 months. Of those who had started complementary feeding in which 175(58.3%) used infant formula, 49(16.3%) used cow and goat milk, and 222(74%) used other semi-solids and solids foods (yogurts, eggs, and mashed potatoes, juices).

Table 2 shows that 173(57.7%) were anemic and 127(42.3%) were nonanemic. Anemia was graded based on the severity of anemia by hemoglobin levels. Of those who were anemic 81(46.6%) had mild anemia, 76(43.7%) had moderate and only 17(9.8%) had severe anemia.

		Count	Column N %			
Anomio	yes	173	57.7%			
Anemia	no	127	42.3%			
	mild	81	46.6%			
Anemia	moderate	76	43.7%			
classification	severe	17	9.8%			

#### Table 2: Descriptive statistics of anemia

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# Figure 2: Distribution of participants according to exclusive breastfeeding

As shown in table no.3 when the relationship between anemia level and demographic characteristics of the children was assessed, it was found that the highest number of cases 61.1% (n= 58) were from the 6 to 8 months age group. Followed by 58 %( n=41) were from the 9 to 11 months age group, and 55.1% were from the 12 to 24 months age group. Although, the relationship was statistically not significant. A more number of cases (58.00%) were found in male subjects whereas the number of cases was 55.9% among females. In terms of parents' background characteristics, 62.6% of children anemic whose mothers were illiterate, 36.4%, 52%, and 42.8% were anemic whose mothers were studied primary school, secondary school, and higher education respectively.

Anemia was found more in children who belonged to poor families compared to children who were from middle and higher-income class families. The results of both the chi-square and fisher exact test revealed that the age of the children, sex of the children, mother's work status, and father's work status were not associated with anemia significantly. The results also show that the education level of the mother and the income status of the children's family were associated with anemia significantly.

Table.4 shows the association between infants' and children's feeding practices with anemia. Anemia was found in 47.1% of children, whose mothers had started breastfeeding within the first hour of childbirth. On the other hand, 61.9% of children were anemic, whose Mothers had started breastfeeding after the first hour of childbirth. 56.4% of children had anemia who fed colostrum and 63.2% had anemia who did not feed colostrum however, the P-value shows that there was no present statistically significant association between colostrum-fed and anemia.

Table 4 also shows that in the children who had been fed with exclusive breastfeeding for longer than 6 months, to 6 months, and for less than 6 months, in which anemia was observed in 65.3%, 62.5%, and 47.8% respectively.

		Anemia				
	yes		no			
	Count	Row N %	Count	Row N %	P value	
Gender	Male	107	58.8%	75	41.2%	.624
Gender	female	66	55.9%	52	44.1%	
	illiterate	129	62.6%	77	37.4%	
Mathematical lavel	primary school	20	36.4%	35	63.6%	000
Mother education level	secondary school	15	60.0%	10	40.0%	.006
	higher	9	64.3%	5	35.7%	
	illiterate	69	66.3%	35	33.7%	.105
Eather advection level	primary school	29	59.2%	20	40.8%	
Father education level	secondary school	43	49.4%	44	50.6%	
	higher	32	53.3%	28	46.7%	
	poor class	95	66.9%	47	33.1%	.036
Monthly income level	middle class	17	53.1%	15	46.9%	
	upper class	2	33.3%	4	66.7%	
	labour	2	100.0%	0	0.0%	.429
Mother work status	employed	4	66.7%	2	33.3%	
WOLLEL WOLK SLALUS	business	0	0.0%	0	0.0%	
	housewife	167	57.2%	125	42.8%	

# Table 3: Anemia level according to the demographic characteristics

Table 4: Association of anemia with feeding practices						
	Anemia					
		yes		No		
	Count	Row N %	Count	Row N %	P-value	
Initiation of breastfeeding	<1 hour	40	47.1%	45	52.9%	.019
	>1 hour	133	61.9%	82	38.1%	
Colostrum fed to the baby	yes	137	56.4%	106	43.6%	.351
	No	36	63.2%	21	36.8%	
EBF	< 6 months	54	47.8%	59	52.2%	.025
	6 months	70	62.5%	42	37.5%	
	> 6 months	49	65.3%	26	34.7%	
Times of introduction of CF	< 6months	60	48.8%	63	51.2%	.000
	6months	42	49.4%	43	50.6%	
	> 6 months	53	80.3%	13	19.7%	
Milk user	Yes	37	68.5%	17	31.5%	.075
	No	136	55.3%	110	44.7%	
Infant formula	Yes	89	51.7%	83	48.3%	.016
	No	84	65.6%	44	34.4%	
Semi-solid foods and solids	Yes	132	58.9%	92	41.1%	.448
	No	41	53.9%	35	46.1 %	

The association between the duration of exclusive breastfeeding and anemia was found statistically significant. Anemia is worsened by prolonged exclusive breastfeeding without CF. Late initiation of CF was found to have similar results. The highest number of anemia cases were found who started CF later than 6 months. Regarding the types of complementary feeds children who were on homemade preparation (semi-solids and solids) in which 58.9% were anemic as compared to the children who were on commercial preparation in which 51.7% were found anaemic.

# DISCUSSION

The prevalence of anemia varies greatly across countries. Anemia affects people of all genders, populations, and geographical classes, according to several research that has been conducted in the past. According to the study's findings, children aged 6 to 24 months had a prevalence of anemia of 57.7%, which was somewhat lower than in countries nearby. India had a prevalence of 74.3% in the 6-35months age, Nepal had a prevalence of 78% in 6-59 months age, and anemia incidence was found 73.7% in Kazakhstan in the 0-23 months age group( Oliveira et al.2004, Ghana Statistical Service, Ghana Demographic Health Survery. Ghana Demographic and Health Survey 2008). The same prevalence of anemia in this research was reported by Another study done by Santokh et al in which reported the anemia prevalence is 56% in hospitalized children(16) However, a study conducted in Bangladesh reported 40.9% of the anemia prevalence in 6-59 months of age( Mk et al.2010).

A maximum number of anemic cases 61.1%, 58%, and 55.1% were found in the age groups of 6 to 8 months, 9 to 11 months, and 12 to 24 months in this study. A study was conducted in India on children aged 6 to 60 months, in which the highest number of anemic cases 76.4% were from the age group of 6 to 24 months. After further distribution, the study found that 37.1% of children had anemia at the age of 6-12 months as compared to the 21% at the age of 12-18 months (Anjali et al.2019).

Anemia was found in 58.8% of males and 55.9% of female children. The findings indicate that there is no significant association between sex and anemia (p value=0.624). This observation is consistent with research from Tanzania (Schellenberg et al.2003) and Brazil( Kawo et al.2018) which found no association between gender and anemia. The research done in Bangladesh also supports this finding( Mk et al.2010). In the opposite context, a study undertaken in Ethiopia found that male children were 3.1 times more probable to be anemic as compared to females (Woldie et al.2015).

Children born to illiterate mothers were significantly more anemic (62.6%) as compared to the children whose mothers have completed their primary, secondary, or higher education (46.8%). This result is close to a study conducted in Kenya( Ngesa and Mwambi 2014) and Bangladesh( Mk et al.2010). However, an Iranian study found that the mother's educational level had no impact on the iron status of her children( Monajemzadeh and Zarkesh,2009). On the opposite, a study conducted in Timor-Lest found that the mother's educational status was inversely related to the children's nutritional status ( Agho et al.2008 ). Anemia affected 66.9% of children from the

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lowest-income families, while 53.1% came from middleincome, and just 33.3% were anemic who came from higher-income. The present study's findings are consistent with those of Ethiopia (2), and the study of Brazil( Chaparro 2008). A lack of ability to purchase a diverse and nutrient-rich diet and ensure household per capita food supply can result from poor household economic status.

Anemia was found in 47.8% of children with EBF for < 6 months as compared to 65.5% of children with EBF for 6 months and more than 6 months. These results are close to the studies conducted in Mexico and the United States, which found that exclusively breastfeeding for 6 months was linked to a higher risk of child anemia (Chantry et al.2007, Meinzen-Derr et al.2006). This seems to be in contrast to the findings of an Icelandic study, which showed that babies with ID had a shorter overall exclusive breastfeeding period (5.3 months versus 7.9 months)(Thorsdottir et al.2003).

In this study, 48.8% of children were found anemic with the initiation of complementary feeding before the age of 6 months with a slight difference of 49.4% and with a big difference (80.3%), from those who started at 6 months and later than 6 months respectively. Research conducted in India found a similar result, stating that late CF initiation is significantly associated with anemia( Sailaja et al.2017). Most infant formulas are fortified with iron and other micronutrients so, formula feeding is associated with decreased occurrence of anemia and higher concentrations of Hb in infants. Several other studies have shown a negative relationship between formula feeding and anemia( Zlotkin et al.2005, Wang et al.2009).

It's important to acknowledge and recognize the study's limitations. The major limitation of this research is that this was a tertiary care hospital study, there might have been a possibility of statistical bias and the seriousness of the illness might have been underestimated.

Temporality cannot be evaluated because this was a cross-sectional study. Retrospective evaluations of mothers/caregivers about child feeding practices are vulnerable to recall bias. The haemoglobin level was used to assess the anemia status, rather than more recent test measures such as serum ferritin. The most significant limitation is that the participants in this study were hospitalized children, which did not adjust for other causes of anemia that are infection and chronic inflammation therefore, the outcome may be affected.

# CONCLUSION

Anemia was significantly associated with the education of the mother, the income quintiles, the length of EBF, and the initiation of CF. Well-integrated interventions to improve nutritional status and infant and young child feeding practices must be highlighted to prevent anemia in children under the age of 2 years. The findings, however, are insufficient to justify any modifications to the latest guidelines and current recommendations of 6 months of EBF and CF initiation periods. More studies in different cultures, while adjusting for the impact of inflammation, would help to put these findings into context.

# CONFLICT OF INTEREST

There are no conflicts of interest to declare with regard to this article.

# ACKNOWLEDGEMENT

We would like to thank everyone who participated in our study for generously sharing their views and experiences. We are also grateful to local clinical research teams, especially, Dr Rubeena Gul, and Muhammad Arif Khan for his worthy Guidance, valuable suggestion, instructions, and keen supervision in the preparation of this manuscript

# AUTHOR CONTRIBUTIONS

Farid ullah (FU), Anwar shah (AS), Ikram ullah (IU) conceived of the presented idea and data collection. FU contributed to the interpretation of the results and analysis of the data. Waqar ali (WA) verified the analytical methods and encouraged FU to investigate association of anemia with feeding practices and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

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