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Original Research Article

A Prospective Assessment of Dietary Predictor of Anaemia among Children Aged 6 Months to 3 Years: Randomized Study

Mohammad Asghar Ali[1], Anjum Equebal[2], N. P. Gupta[3]

[1]Senior Resident, Department of Pediatrics, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

[2]Senior Resident, Department of Paediatrics, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

[3]Associate Professor, Department of Paediatrics, Darbhanga Medical College & Hospital, Darbhanga, Bihar, India

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Corresponding author: Dr. Anjum Equebal

Conflict of interest: Nil

Abstract

Aim: To record anemia and dietary predictor of anemia in 6 month to 3 years children.

Methodology: The present study was conducted in the department of Pediatrics, DMCH, Darbhanga, Bihar for 10 months (December 2021 – September 2022). It comprised of 100 children age ranged 6 months to 3 years of both genders. Demographic profile of children such as name, age, gender etc. was recorded. Socioeconomic and demographic characteristics of parents/family, including education level, marital status and occupation were recorded. Children were screened for anemia using the Hemo Cue photometer. Children with Hb level <11 g/dL were considered anemic, and graded as mild (10–10.9 g/dL), moderate (7–9.9 g/dL), and severe (<7 g/dL). Analysis of data was done using the Statistical Package for Social Sciences. P value less than 0.05 was considered significant.

Results: Out of 100 children, 54% were males and 46% were females out of which 19% males and 24% females were anaemic. Out of 26 patients with age of 6-12 months, 9% were anaemic. Out of children with age of 1-2 years (34%) and 2-3 years (40%), 15% and 19% were anaemic respectively. 29 patients out of 53 patients had birth weight less than 2.5 Kg and 14 out of 47 children had weight more than 2.5 Kg. Out of anaemic children, 25 were not breastfed while 18 were on exclusive breastfeed.

Conclusion: The prevalence of anemia in our finding was within the range of major public health problems. It was found low birth weight, female gender, children not breastfed, not taking vegetables and meat were at high risk.

Keywords: Anaemia, Breast-feeding, Haemoglobin.

Introduction

Anaemia, which is identified as a condition in which the blood haemoglobin concentration is lower than normal [1], and leads to poor cognitive and motor development in children and loss of work productivity in adulthood [2, 3], is a global health problem, particularly in developing countries [4, 5]. Iron deficiency anaemia has been found to be the major cause of anaemia, accounting for about 50% of all

anaemia cases [3]. This proportion, however, may vary substantially across regions and countries [6]. In addition, anaemia could also be attributable to the effects of infectious diseases (particularly HIV, malaria, and helminth infections) [7] and genetic disorders of haemoglobin as well as other micronutrient deficiencies such as folic acid, vitamin A and vitamin B12 deficiencies [2].

Anaemia can affect a person at any time and at all stages of life. However, in most parts of the world, children aged 6–23 months are at particularly higher risk. It primarily affects infants and young children because of their higher iron requirements related to growth, and women of childbearing age due to menstrual loss and pregnancy [8]. If left untreated, anemia can adversely affect the health, cognitive development, school achievement, and work performance of individuals. Low oxygen supply to brain tissues, a consequence of anemia, may lead to impaired cognitive function, growth and psychomotor development in children.

Children under 5-year-old and pregnant women have greater susceptibility to anemia because of their increased iron requirements for rapid body growth and expansion of red blood cells [9]. During childhood period, anemia is strongly associated with poor health and physical development [10, 11], mild and moderate mental retardation [12], and poor motor development and its control [13]. Iron deficiency anemia leads to reduced academic achievement and work capacity which in turn reduces the earning potential of individuals and hence damages national economic growth at large [11]. It also increases the risks of mortality and morbidity which come from other diseases [10, 14].

Childhood anemia is mostly caused by dietary iron deficiency, infectious and genetic diseases, and other nutrient deficiencies [15]. While more than half of the anemia burden in children is attributed to iron deficiency, only very small fraction is due to genetic causes [16]. In early childhood, bad feeding habits, especially during the weaning period as breast milk is replaced by foods that are poor in iron, vitamin B12 and folic acid, are main contributors for anemia [17].

Various conceptual models have been developed to illustrate the pathways between proximal and distal determinants of anemia including a framework that is specific to the Biomarkers Reflecting Inflammation and Nutritional Determinants of Anemia (BRINDA) project. Many potential causes of anemia are biologically interrelated, such as infections and nutritional status, and may also be driven by the same environmental and household characteristics, such as low socioeconomic status (SES), sanitation, and education [18]. The present study aimed to record anemia and predictor of anemia in 6 month to 3 years children.

Methodology

The present study was conducted in the department of Pediatrics, DMCH, Darbhanga, Bihar for 10 months (December 2021 – September 2022). It comprised of 100 children age ranged 6 months to 3 years of both genders. All parents of children were informed regarding the study and their written consent was obtained. Ethical clearance was taken before starting the study.

Demographic profile of children such as name, age, gender etc. was recorded. Socioeconomic and demographic characteristics of parents/family, including education level, marital status and occupation were recorded. Children were screened for anemia using the HemoCue photometer. Safety lancets were used to obtain the finger prick blood, which was collected in the microcuvettes. Alcohol swabs were used to clean the fingers before pricking. The first drop of blood was wiped off with a cotton wool, while

the second drop was collected using a microcuvette.

The blood sample in the microcuvette was loaded in the calibrated HemoCue® photometer and Hb concentration read to the nearest 0.1 g/dL. Children with Hb level <11 g/dL were considered anemic, and graded as mild (10–10.9 g/dL), moderate (7–9.9 g/dL), and severe (<7 g/dL). Analysis of data was done using the Statistical Package for Social Sciences. P value less than 0.05 was considered significant.

Results

Out of 100 children, 54% were males and 46% were females out of which 19% males and 24% females were anaemic. Out of 26 patients with age of 6-12 months, 9% were anaemic. Out of children with age of 1-2 years (34%) and 2-3 years (40%), 15% and 19% were anaemic respectively.

Table 1: Demographic profile

Variables		Total number	Anaemic
Gender	Males	54	19
	Females	46	24
Age groups	6-12 months	26	9
	1-2 years	34	15
	2-3 years	40	19
Birth weight	<2.5 Kgs	53	29
	>2.5 Kgs	47	14
Exclusive Breastfeed	Yes	55	18
	No	45	25

29 patients out of 53 patients had birth weight less than 2.5 Kg and 14 out of 47 children had weight more than 2.5 Kg. Out of anaemic children, 25 were not breastfed while 18 were on exclusive breastfeed.

Table 2: Determinants of anemia

Variables		Number	P-value
Age group (in Years)	6-12 months	9	0.35
	1-2 years	15	
	2-3 years	19	
Birth weight	<2.5 Kgs	29	0.01
	>2.5 Kgs	14	
Exclusive Breastfeed	Yes	18	0.01
	No	25	
Vegetables	Consumed	24	0.01
	Not consumed	19	
Meat	Consumed	13	0.01
	Not consumed	30	
Gender	Males	19	0.05
	Females	24	

According to present study, determinants of anemia were low birth weight, female gender, children not on breastfeeding, meat non consumers, and vegetables non consumers (P< 0.05).

Discussion

Anemia has numerous potential etiologies. Followed by acute blood loss and heredity or acquired diseases, the most common cause of anemia in young children is low

consumption and absorption of iron-rich foods (ie, meat and meat products) [19]. These conditions most often lead to iron deficiency anemia, which accounts for approximately half of all anemia cases globally, with under-five children and women being the most affected [20]. Although relevant across the life span, anemia in under-five children is a special case given its significance to underpinning a range of morbidities and mortality within this population subset. Not only are these patterns concerning due to their highly preventable and treatable nature, but they also project potential long-term individual and social consequences [21]. At the individual level, childhood anemia contributes to poor motor and cognitive development, poor school performance, as well as increased morbidity and mortality. At the societal level, there are strong indicators that anemia impacts on the socioeconomic well-being and productivity of a country.

Iron deficiency anemia (IDA) commonly develops after 6 months of age if complementary foods during the weaning period do not provide sufficient absorbable iron. Breast milk is relatively low in iron, although the iron in breast milk is much better absorbed than that in cows' milk [22, 23]. Iron deficiency, in turn, is largely due to an inadequate dietary intake of bioavailable iron, inadequate dietary iron during periods of increased iron requirements in infancy, and increased blood loss due to hookworm infestation [24]. Iron supplementation during pregnancy, initiation of iron supplementation in infants at 4–6 months of age, effective counseling on supplementation, subsequent compliance, support of breastfeeding, and effective training of healthcare personnel are effective strategies for the prevention of anemia in the community [25,26].

Thus far, a number of studies have been conducted on the prevalence of anemia and associated factors indicating that the significance of the problem is at the level of major public health importance, particularly in developing countries, and most of the studies were addressing those under the age of 5 years. As the cognitive and physical impact of anemia is more critical during the first 2 years of life, it is of paramount importance to have extensive shreds of evidence of anemia and associated factors among this age group to mitigate this debilitating disease at the earliest possible stages [24,27,28].

The prevalence of anemia in our study was found to be 43%, which was at the level of major public health problem according to the WHO classification. We found that determinants of anemia were low birth weight, not breastfed, vegetables non-consumers and meat not consumers ($P< 0.05$). According to Heinrichs et al [29], a total of 7,324 children aged 6–23 months were included in the analysis, with prevalences of anaemia being 71% in 2005, 61% in 2011 and 72% in 2016. The following determinants were significantly associated with childhood anaemia throughout the entire period: children younger than 1 year, anaemic mothers and those growing up in pastoralist regions. Risk factors such as diet and infections were consistently not significantly associated with anaemia. Dey et al [30] found that the mean haemoglobin concentration in children aged 0-6 year(s) was found to be 11.85 g/dL, with a standard deviation of 5.61 g/dL. The multiple logistic regression analysis showed that rural children were at greater risk of severe and moderate anaemia. [31]

Conclusion

The prevalence of anemia in our finding was within the range of major public health problems. It was found low birth weight, female gender, children not on breastfeeding, meat non consumers, and vegetables non consumers. It is important to develop public health interventions with a holistic approach to mothers and children. Efforts to deliver the Sustainable

Development Goals meant to improve education for women and eradicate poverty also have the likelihood of leading to significant reductions in childhood iron deficiency anaemia.

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