Original Article

Impact of Iron-Folic Acid Supplementation on Nutritional Anaemia and Associated Infective Morbidities Among Children Under Five Years: A Field Study in Hazratbal, Srinagar.

Umar Nazir, Shazia Benazir , Rouf Hussain Rather, S M Salim Khan, Feroz Ahmad Wani·

Abstract

Background

Anaemia is a significant public health concern worldwide, particularly in developing countries. Despite the existence of policies and programs to combat anaemia, its prevalence among young children in India and Asia remains alarmingly high, exceeding 60% in many regions.

Objectives

This study aimed to:

1.Estimate the prevalence of nutritional anaemia among children under five years of age before and after six months of Iron Folic Acid (IFA) therapeutic supplementation, as per IMNCI guidelines, in the Hazratbal block, District Srinagar.

2.Assess the reduction in associated infective diseases in these children following IFA supplementation.

Materials and Methods

This observational pre- and post-interventional field study was conducted in the Medical Block of Hazratbal from March 1, 2021, to August 31, 2021, over a period of six months. A total of 243 children aged 6 months to 5 years, who attended their respective Anganwadi Centers (AWCs) on Village Health and Nutrition Days (VHNDs) and Sub-Centers on immunization days, were screened for nutritional anaemia by healthcare workers.

Results

Before IFA therapeutic supplementation, 77.5% of the children had moderate anaemia, and 18.6% had mild anaemia. After six months of IFA intervention, the prevalence of all forms of anaemia was reduced to just 2%.

Conclusion

The study highlights the effectiveness of addressing nutritional anaemia through primary prevention measures and secondary prevention strategies, including early detection and timely therapeutic interventions.

JK-Practitioner2024;29(4):34-39.

Author Affiliations

Umar Nazir, Rouf Hussain Rather, Consultants, Community Medicine; **Feroz Ahmad Wani**, Medical Officer; Directorate of Health Services, Kashmir: **Shazia Benazir**,Assistant Professor, Department of Microbiology; **S M Salim Khan**, Professor & Head, Department of Community Medicine: Govt. Medical College, Srinagar

Correspondence

Dr. Shazia Benazir, Assistant Professor, Department of Microbiology, Govt. Medical College, Anantnag.
Email: shazia.benazir@yahoo.com
(M) 9419032862

Indexed

EMBASE , SCOPUS ,IndMED ,ESBCO, Google Scholar bedides other national and International Databases.

Cite this article as

Nazir U, Benazir S , Rather RH, Khan SMS, Wani FA.Impact of Iron-Folic Acid Supplementation on Nutritional Anaemia and Associated Infective Morbidities Among Children Under Five Years: A Field Study in Hazratbal, Srinagar.
JK Pract2024;29(4):34-39.

Full-length article is available at **jkpractitioiner.com** one month after publication.

Keywords

AWC (Anganwadi Centre), VHND (Village health Nutritional Day), IFA (Iron folic acid), HCW (Health Care Worker), IMNCI (Integrated Management of Neonatal and Child illness),NIPI (National Iron Plus Initiative

Introduction

Anaemia is a significant public health issue globally, particularly in developing countries and despite longstanding policies aimed at mitigation, the prevalence of anaemia among young children remains alarmingly high, exceeding 60% in many parts of India and Asia [1]. The irreversible damage that childhood anaemia inflicts, especially on cognitive and developmental growth, coupled with the available knowledge and tools for its prevention, renders this condition intolerable in contemporary times which is particularly relevant in the context of global efforts such as the Millennium Development Goal 4 and subsequently, Sustainable Development Goal 3 [1].

Among the various causes of anaemia (nutritional deficiencies, haemolytic disorders, chronic infections, parasitic infestations, and lymphoreticular malignancies), nutritional anaemia constitutes the predominant cause and globally it affects an estimated one billion individuals, primarily due to iron, folic acid, and vitamin B12deficiency [2]. In India, anaemia is a critical health challenge, especially in children, where its effects include impaired cognitive function, delayed behavioural and language development, and reduced academic performance. Furthermore, it is associated with heightened mortality and morbidity related to infectious diseases like acute respiratory infections(ARI) and acute gastroenteritis (AGE) [3].

The fifth National Family Health Survey (NFHS-5; 2019-20) revealed that the prevalence of anaemia among children under five years of age in Jammu and Kashmir stands at a staggering 72.7%, despite the existence of a national anaemia control program for many years [4]. In young children, iron deficiency anaemia (IDA) can be attributed to three primary factors:

a) Poor bioavailability of dietary iron, influenced by limited consumption of enhancers and excessive intake of inhibitors of iron absorption in the second year of life.

b) Insufficient dietary iron intake relative to physiological requirements.

c) Elevated iron demands during periods of rapid growth, particularly between 6 and 23 months of age.

While folic acid deficiency is less prevalent and often coincides with iron deficiency, vitamin B12 deficiency is rare and predominantly observed in vegetarian populations []5]. Numerous studies have assessed the prevalence of iron deficiency anaemia in pediatric populations within India and other developing countries [6, 7,8]. However, there remains a paucity of research employing laboratory-based diagnostics to determine the precise etiology of nutritional anaemia in the Indian context.

This study, therefore, aims to address this gap by evaluating the prevalence of nutritional anaemia among children under five years of age in a primary care setting. It also investigates the impact of therapeutic IFA supplementation, complemented by focused counselling for caregivers on dietary diversity.

Materials and Methods

This observational pre- and post-interventional study was conducted in the Medical Block of Hazratbal from March 1, 2021, to August 31, 2021, over six months.

a) Ethical Considerations

The study was conducted in adherence to the Declaration of Helsinki, and all procedures involving human participants were approved by the institutional ethics committee. Written informed consent was obtained from the parents or caregivers of all participating children.

b) Study Population

The study included 243 children aged 6 months to 5 years who visited their respective Anganwadi Centers (AWCs) during Village Health and Nutrition Days (VHNDs) and Sub-Centers on immunization days. Screening for nutritional anaemia was performed using the Integrated Management of Neonatal and Childhood Illness (IMNCI) classification at four sub-centers: Theed, Dhara, Darbagh, and Syedpora. Sampling was performed using a convenient sampling method.

c) Screening and Diagnosis

Out of the 243 children screened, 204 were identified as anaemic by healthcare workers (HCWs). Further investigation was conducted using a haemoglobinometer to estimate haemoglobin (Hb) concentration. Anaemia was classified based on the World Health Organization (WHO) criteria, with Hb levels below 11 g/dL considered anaemic for children aged 6 months to 6 years [9].

- **Severe anaemia (<7 g/dL):** These children were referred to the First Referral Unit (FRU) at Hazratbal for further evaluation and management.
- **Mild-to-moderate anaemia (7–10.9 g/dL):** Children were enrolled in the study for therapeutic intervention.

d) Therapeutic Intervention

Children with mild or moderate anaemia were treated with Iron and Folic Acid (IFA) supplementation according to their age and severity as per the National Iron Plus Initiative (NIPI) guidelines. Treatment details included:

- **Mild anaemia (Hb 10–10.9 g/dL):** Treated with 3 mg of iron/kg/day for 2 months, extendable to 6 months based on Hb improvement. Follow-up was conducted every 14 days by the Auxiliary Nurse Midwife (ANM) for compliance and health status assessment. Hb levels were reassessed after 2, 4, and 6 months.
- **Moderate anaemia (Hb 7–9.9 g/dL):** Treated similarly with 3 mg of iron/kg/day, with follow-up and reassessment protocols identical to mild anaemia.

Children who achieved Hb >11 g/dL after treatment were transitioned to prophylactic biweekly IFA supplementation as per NIPI guidelines.

e) Special Considerations

- **Severe Anaemia and Non-Responders:** Children with severe anaemia or those not responding to 2 months of IFA treatment were referred to FRU/District Hospital (DH) for evaluation by trained medical officers or specialists.

- **Exclusions:** Treatment was withheld during acute illness, severe acute malnutrition, or known haemoglobinopathies, and these cases were managed as per standard guidelines by attending physicians.

f) Data Collection and Analysis

Data included Hb concentration measurements and infection indicators such as recent diarrheal episodes or Acute Respiratory Infections (ARI) in the preceding four weeks. Age was categorized into three subgroups:

1. 6–12 months
2. 13–36 months
3. 37–59 months

The primary outcome was the prevalence of anaemia before and after intervention. Data analysis was performed using **SPSS version 20.0**. Descriptive statistics were calculated, and statistical significance was set at $p < 0.05$. Pearson's chi-square test and Student's *t*-test were employed to identify associations between anaemia and its potential correlates.

Results

a) Age Distribution and Prevalence of Anaemia

The study included 204 children aged 6 months to 5 years from the urban field practice area of Block Hazratbal, under the administrative control of the Department of Community Medicine, Government Medical College, Srinagar. The majority of the children (49%) were in the 13–36 months age group, followed by 34.8% in the 37–59 months group. Moderate anaemia was most prevalent in the 6–12 months group (87.9%), followed by the 13–36 months group (81%) and the 37–59 months group (67.6%). Gender-wise, moderate anaemia was observed in 61.5% of males and 91.7% of females.(Table 1)

Table 2 highlights the comparison of Baseline Anaemia with Risk Factors as follows:

Breastfeeding: 98.1% of children who were not breastfed within one hour of birth had moderate/severe anaemia, compared to 60.4% of those who were breastfed. This difference was statistically significant (p < 0.0001).

Complementary Feeding: All children (100%) who did not receive complementary feeding at 6 months had moderate/severe anaemia, compared to 66.7% of those who did ($p < 0.0001$).

Vaccination: Moderate/severe anaemia was present in 100% of children with partial vaccination, compared to 75% with complete vaccination ($p = 0.002$). (Table 2)

The overall mean haemoglobin improved significantly from 9.16 g/dL to 12.35 g/dL after 6 months of IFA therapy ($p < 0.0001$).Male children showed an increase from 9.82 g/dL to 12.68 g/dL, while female children improved from 8.58 g/dL to 12.06 g/dL, both statistically significant.(Table 3)

Reduction in ARI and AGE Episodes: After IFA therapy, the proportion of children with no ARI episodes increased significantly from 55.4% to 93.6% ($p < 0.001$).(Table 4). Before IFA Intervention 45.1% had no episode of AGE, followed by 1 episode of AGE in 34.8% and 2 episodes of AGE in 20.1% while after 6 months of IFA Intervention 97.1% had zero episode of AGE, followed by 2.0% had 1 episode of AGE and 1.0% had 2 episodes of AGE and the difference was found statistically significant. (Table 4)

Table 1: Prevalence of Anaemia at Baseline Based on Age and Gender

		Hb at Baseline				Total
		>=11 g/dl (No Anemia)	10.0-10.9 g/dl (Mild Anemia)	7.0-9.9 g/dl (Moderate Anemia)	<7 g/dl (Severe Anemia)	
Age	6-12 Months 13-36 Months 37-60 Months	0 (0.00%) 1(1.00%) 3(4.20%)	3(9.10%) 15(15.00%) 20(28.20%)	29(87.90%) 81(81.00%) 48(67.60%)	1 (3.00%) 3(3.00%) 0(0.00%)	33 (16.2%) 100(49.0%) 71 (34.8%)
Gender	Male Female	3(3.1 %) 1(0.90%)	34(35.40%) 4(3.70%)	59(61.50%) 99(91.70%)	0(0.00%) 4(3.70%)	96(47.1%) 108(52.9%)
Total		4(2.00%)	38(18.60%)	158(77.50%)	4(2.00%)	204(100.0%)

Discussion

This study provides compelling evidence regarding the effectiveness of IFA (Iron and Folic Acid) therapeutic intervention in addressing anaemia among children under five years of age when administered continuously over six months. A significant proportion of the study cohort, 49.0%, fell within the 13–36 months age group, followed by 34.8% in the 37–59 months category. Efforts were made to ensure a balanced representation of genders, avoiding any disproportionate distribution among the study subjects (Table 1).

Before the IFA intervention, the prevalence of moderate anaemia was observed to be 87.9% in children aged 6–

Table 2: Comparison of Baseline Anaemia Based on Risk Factors

Variable		Hb at Baseline		Total	Odds Ratio (95% CI)	P-Value
		< 10 g/dl (Moderate/Severe Anemia) N=162	≥ 10 g/dl (Mild/No Anemia) N=42			
Breast feeding within 1hour	No	101(98.1%)	2 (1.9%)	103 (100.0%)	33.115 (7.727-141.916)	<0.0001
	Yes	61(60.4%	40 (39.6%)	101 (100.0%)		
Complimentary Feeding started at 6months of age	No	78 (100.0%)	0 (0.0%)	78 (100.0%)	1.500 (1.326-1.697)	<0.0001
	Yes	84 (66.7%)	42 (33.3%)	126 (100.0%)		
Vaccination Status	Partial	36 (100.0%)	0 (0.0%)	36 (100.0%)	1.333 (1.222-1.455)	0.002
	Complete	126 (75.0%)	42 (25.0%)	168 (100.0%)		

Table 3: Comparison of Mean Haemoglobin Based on Age and Gender Before and After IFA Intervention

		HB% at BL (Mean ± SD)	**HB% at 6m (Mean ± SD)**	**p-value**
Age Group	6-12 Months (N=33)	8.70 ±1.052	12.10 ±1.315	<0.0001
	13-36 Months (N=100)	9.16 ±0.934	12.31 ±0.982	<0.0001
	37-60 Months (N=71)	9.38 ±0.928	12.51 ±0.606	<0.0001
Gender	Male (96)	9.82 ± 0.627	12.68 ± 0.744	<0.0001
	Female (104)	8.58 ± 0.854	12.06 ± 1.005	<0.0001
Over all (N=204)		9.165686 ±0.974	12.35 ±0.943	<0.0001

12 months, 81% in those aged 13–36 months, and 67.6% in children over 36 months. These findings underscore the persistent nutritional deficiencies in this region despite the presence of longstanding nutritional programs (Table 1). The notably high prevalence of anaemia in children under three years of age, particularly in urban areas, is alarming. Possible contributing factors include: a) insufficient iron content in breast milk to meet the infant's daily requirements post-6 months [10]; b) widespread maternal micronutrient deficiencies leading to poor iron, zinc, vitamin A, B12, and folate stores in newborns [11-13]; c) inappropriate introduction of complementary foods during a critical period of rapid physical growth and diminishing maternal iron stores [13]; and d) increased susceptibility to infections, which impairs nutrition and iron absorption [14].

The study further revealed gender disparities in anaemia prevalence, with 91.6% of female children exhibiting moderate anaemia compared to 61.5% of male children prior to IFA intervention. This observation raises concerns regarding the implementation of initiatives like *Beti Bachao Beti Padhao* and *Ladli Beti* schemes, suggesting gaps in their reach at the grassroots level (Table 1).

Table 4: Comparison of AGE Episodes Before and After IFA Intervention

Episodes of AGE	**Before Intervention**	**After Intervention**	**p-value**
0	92 (45.1%)	198 (97.1%)	<0.001
1	71 (34.8%)	4 (2.0%)	
2	41 (20.1%)	2 (1.0%)	

Regarding breastfeeding practices, 98.1% of children who were not breastfed within the first hour of birth exhibited moderate to severe anaemia, compared to 60.4% of those breastfed within the first hour. The odds ratio for moderate/severe anaemia in children breastfed after one hour was 33.115 (95% CI = 7.727–141.916), a statistically significant difference ($p < 0.0001$). Similarly, all children who did not receive timely complementary feeding at six months had moderate/severe anaemia, compared to 66.7% among those who received it on time ($p < 0.0001$; odds ratio = 1.50, 95% CI = 1.326–1.697). Additionally, children with incomplete immunization schedules uniformly exhibited moderate/severe anaemia, whereas only 75% of fully immunized children experienced moderate/severe anaemia ($p = 0.002$; odds ratio = 1.333, 95% CI = 1.222–1.455) (Table 2).

Post-intervention, the mean haemoglobin levels increased significantly from 9.16 g/dl to 12.35 g/dl ($p < 0.001$), highlighting the efficacy of the *Anaemia Mukht Bharat* program in reducing anaemia prevalence. This program gains particular relevance as the prevalence of anaemia in Jammu and Kashmir increased from 53.8% (NFHS-4) to 72.7% (NFHS-5) [4]. A Cochrane review of 33 studies similarly demonstrated that intermittent iron supplementation in children under two years reduced anaemia risk by 49% and iron deficiency risk by 76%, underscoring its potential as a viable public health intervention in regions lacking daily supplementation [10].

The gender-wise analysis in this study demonstrated an increase in mean haemoglobin levels from 9.82 g/dl to 12.68 g/dl in male children and from 8.58 g/dl to 12.06 g/dl in female children after six months of IFA therapy, with statistically significant differences in both groups ($p < 0.001$) (Table 3).

Furthermore, the study observed a notable reduction in episodes of acute respiratory infection (ARI) and acute gastroenteritis (AGE) post-intervention. Before IFA therapy, 28.4% of children experienced a single ARI episode in the preceding month, and 16.2% had two episodes. After six months, 93.6% reported no ARI episodes, with only 4.9% and 1.5% experiencing one and two episodes, respectively, a statistically significant improvement (Table 4). Similarly, the proportion of children experiencing AGE episodes decreased dramatically from 34.8% (one episode) and 20.1% (two episodes) before intervention to 97.1% reporting no episodes post-intervention, with statistically significant differences.

Conclusion

Our study underscores the alarmingly high prevalence of nutritional anaemia among children under five in the Hazratbal block of Srinagar district, with certain sub-groups demonstrating a particularly critical need for intervention. Notably, the highest prevalence (87.9%) was observed in children aged 6 months to 1 year. This finding highlights the urgency of early identification and targeted interventions in this vulnerable demographic. Nutritional anaemia was addressed through a dual approach comprising primary and secondary prevention strategies.

Primary prevention focused on population-wide benefits by mitigating the onset of anaemia. In line with WHO guidelines, prophylactic IFA therapy was administered bi-weekly, accompanied by dietary interventions such as promoting breastfeeding or fortifying formula milk where breastfeeding was not feasible. Secondary prevention efforts involved the early identification of anaemic children through mass screening, an integral aspect of our study. The effectiveness of this approach hinged on the accurate detection of anaemia and the efficacy of subsequent IFA therapy.

While existing studies have highlighted challenges associated with routine screening—such as low follow-up rates, spontaneous resolution of anaemia, and shifting patterns of its prevalence—we ensured sustained engagement by maintaining follow-up for six months of IFA therapeutic intervention, significantly minimizing attrition. Alongside therapeutic measures, families of anaemic children were counselled on dietary practices to combat anaemia. Guidance included limiting excessive milk intake, incorporating iron-rich foods and vitamin C-rich items to enhance iron absorption, and avoiding inhibitors of iron absorption such as tea, junk foods, and fried foods.

Nutritional anaemia remains a significant public health concern in Jammu and Kashmir, particularly among certain high-risk child populations. Its association with adverse developmental outcomes in children necessitates urgent attention. Although the broader implications of nutritional anaemia are less well-documented, the pressing need for mass screening of vulnerable groups is evident. Early identification and timely interventions in these children could markedly reduce the prevalence of nutritional anaemia in the region, yielding substantial long-term benefits.

Funding: None.

Conflict of Interest: None

References

1. Kotecha PV. Nutritional anaemia in young children with focus on Asia and India. Indian J Community Med. 2011;36(1):8–16.
2. United Nations Administrative Committee on Coordination. Subcommittee on nutrition. Second report on the world nutrition situation. Geneva. 1992:40–8.
3. Sethi V, Goindi G, Kapil U. Prevalence of anaemia amongst primary school age children (6–11 years) in National Capital Territory of Delhi. Indian J Pediatr. 2003;70:519–20.
4. National Family Health Survey (NFHS-5), 2019-20.
5. Antony AC. Vegetarianism and vitamin B12 (cobalamin) deficiency. Am J Clin Nutr. 2003;78:3–6.
6. Basu S, Basu S, Hazarika R. Prevalence of anemia among school-going adolescents of Chandigarh. Indian Pediatr. 2005;42:593–7.
7. Gomber S, Bhawna, Nishi M. Prevalence and etiology of nutritional anemia among school children of urban slum. Indian J Med Res. 2003;118:169–71.
8. Singh P, Toteja GS. Micronutrient profile of Indian children and women: Summary of available data for iron and vitamin A. Indian Pediatr. 2003;40:477–9.
9. World Health Organization/United Nations Children’s Fund/United Nations University. Iron deficiency anemia: Assessment,

prevention, and control. A guide for programme managers. Geneva: WHO; 2001. Available from: http://www.who.int/nut/documents/idaassessment_prevention_control. Accessed May 26, 2003.

10. De-Regil LM, Jefferds MED, Sylvetsky AC, Dowswell T. Intermittent iron supplementation for improving nutrition and development in children under 12 years of age. Cochrane Database Syst Rev. 2011;12.
11. Villalpando S, Shamah-Levy T, Ramírez-Silva CI, Mejía-Rodríguez F, Rivera JA. Prevalence of anemia in children 1 to 12 years of age: results from a nationwide probabilistic survey in Mexico. Int J Epidemiol. 2003;45:490–8.
12. Neumann CG, Gewa C, Bwibo NO. Child nutrition in developing countries. Pediatr Ann. 2004;33(10):658.
13. United Nations Children’s Fund. The State of the World’s Children. New York: UNICEF; 2000.
14. Osorio MM, Lira PI, Batista-Filho M, Ashworth A. Prevalence of anemia in children 6–59 months old in the state of Pernambuco, Brazil. Rev Panam Salud Publica. 2001;10(2):101–7.