e-ISSN: 0975-9506, p-ISSN: 2961-6093

Available online on www.ijpqa.com

International Journal of Pharmaceutical Quality Assurance 2026; 17(6); 410-415

Original Research Article

Socio-demographic and Household Determinants of Severe Anaemia in Children Aged 5–12 Years: A Hospital-based Prospective Study from South Gujarat, India

Akash Talikoti[1], Irappa S. Lamani[2], Sridhara Venkappa Badiger[3]

[1]Senior Resident, Department of Paediatrics, S Nijalingappa Medical College, Bagalkot, Karnataka, India
[2]Senior Resident, Department of General Surgery, S Nijalingappa Medical College, Bagalkot, Karnataka, India
[3]Assistant Professor, Department of Orthopaedics, K H Patil Institute of Medical Sciences Gadag, Karnataka, India

Received: 05-05-2026 / Revised: 23-05-2026 / Accepted: 16-06-2026
Corresponding Author: Dr. Sridhara Venkappa Badiger
Conflict of interest: Nil

Abstract:

Background: Anaemia remains a major public-health problem among Indian children, yet school-age children (5–12 years) receive less attention than under-fives. Household and social factors that drive anaemia to its severe form in this age group are poorly described for South Gujarat.

Objectives: To estimate the hospital prevalence of severe anaemia among admitted children and to describe the socio-demographic, household and preventive-care profile of children aged 5–12 years admitted with severe anaemia.

Methods: A prospective observational study was conducted in the paediatric in-patient department of a tertiary care hospital in Surat from March 2023 to June 2024. Of 3,803 admissions, 644 children had anaemia; 80 children aged 5–12 years with newly diagnosed severe anaemia (haemoglobin ≤7 g/dL) were enrolled after informed consent. Data on age, sex, socio-economic class (modified Kuppuswamy scale), residence, family size, parental education, parental knowledge–attitude–practice (KAP), preventive measures, diet, and immunisation, past history and body mass index were recorded on a pre-designed proforma. Data were analysed with SPSS version 23 using descriptive statistics and the chi-square test.

Results: Anaemia was present in 16.91% of admissions, and 12.42% of anaemic children had severe anaemia. Among the 80 cases, 47.5% were aged 7–8 years and 61.25% were girls. Ninety per cent belonged to lower socio-economic classes (IV–V), 76.25% lived in rural areas and 63.75% lived in families of more than three members. Only 15% of parents had college education and only 10% showed adequate knowledge, attitude and practice regarding anaemia. Thirty-two point five per cent had taken no preventive measure, and only 10% received weekly iron–folic acid. Most children were vegetarian (76.25%), 75% were partially immunised or unimmunised, and 31.25% were thin or severely thin. Lower socio-economic status was significantly more frequent among girls than boys ($\chi^2 = 8.90$, $p = 0.003$).

Conclusion: Severe anaemia in school-age children in South Gujarat clusters among girls, rural and tribal families, low-income households, larger families and children of parents with limited education and poor anaemia-related practice. Strengthening school-age iron–folic acid supplementation, biannual deworming and parental nutrition counselling should be prioritised for these groups.

Keywords: Severe anaemia; School-age children; Socio-economic status; Iron deficiency; Risk factors; India.
DOI: 10.25258/ijpqa.17.6.94

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Anaemia is defined as a reduction in haemoglobin concentration, haematocrit or red cell count below the range expected for healthy individuals of the same age and sex. For children aged 5–11 years, the World Health Organization (WHO) uses a haemoglobin threshold of 11.5 g/dL, and 12 g/dL for those aged 12–14 years [1]. Anaemia is one of the most widespread nutritional disorders in the world. Global burden estimates suggest that nearly one-third of the world's population is anaemic, with the heaviest burden in South Asia and sub-Saharan Africa, and iron deficiency accounts for about half of all cases [2]. India carries a disproportionate share of this burden. The fifth National Family Health Survey (NFHS-5, 2019–21) reported that 67.1% of children aged 6–59 months were

anaemic, up from 58.6% in NFHS-4 despite long-running national programmes [3]. The Comprehensive National Nutrition Survey (CNNS 2016–18) extended these observations to school-age children and adolescents. It showed that roughly one in four children aged 5–9 years and nearly three in ten adolescents were anaemic, and that iron, folate and vitamin B12 deficiencies were common [4]. In response, the Government of India launched the Anemia Mukt Bharat strategy in 2018. It prescribes biweekly iron–folic acid (IFA) supplementation for children aged 5–9 years, weekly IFA for adolescents, biannual deworming and behaviour-change communication [5].

The consequences of anaemia during the school years are serious. Anaemia impairs physical growth, cognitive performance, attention and school achievement, reduces work capacity and lowers resistance to infection. When it becomes severe, it can precipitate congestive cardiac failure and may require blood transfusion.

Severe anaemia is rarely a purely biological event. It usually represents the end point of a chain of social disadvantage: inadequate household income, low parental literacy, poor dietary diversity, recurrent infections, intestinal parasites and limited access to preventive services [6,7]. Community-based studies in India have linked childhood anaemia to lower wealth quintile, rural residence, maternal education, birth order and household size [6,7]. Among adolescents, determinants also include pubertal growth spurt, menstrual blood loss and poor dietary habits [8,9].

Gujarat presents a particular challenge. Despite relatively strong economic growth, NFHS-5 recorded anaemia in nearly 80% of children aged 6–59 months in the state, one of the highest proportions in the country [3]. South Gujarat has a large tribal and migrant population with high rates of undernutrition. Hospital-based studies from Gujarat and elsewhere in India have described the clinical picture of severe anaemia, mostly in children under five [10]. Far fewer have focused on the 5–12-year age group [11,12]. The socio-demographic and household context of these children is seldom reported in detail. Such information is essential to target screening, supplementation and education programmes at the families most at risk.

We therefore conducted a prospective study in a tertiary care teaching hospital in Surat. Our aims were to estimate the hospital prevalence of anaemia and severe anaemia among paediatric admissions, and to describe the socio-demographic, household, parental and preventive-care profile of children aged 5–12 years admitted with severe anaemia.

Materials and Methods

Study Design and Setting: This was a prospective, hospital-based observational study conducted in the paediatric in-patient department of Government Medical College and New Civil Hospital, Surat, a tertiary care teaching hospital serving urban Surat and the largely rural and tribal districts of South Gujarat. Data were collected from March 2023 to June 2024 after approval from the Institutional Ethics Committee. Written informed consent was obtained from a parent or legal guardian of every child.

Study Population: All children admitted to the paediatric wards during the study period were screened for anaemia using haemoglobin values on admission. Children aged 5 to 12 years with newly diagnosed severe anaemia were eligible. Severe anaemia was operationally defined as haemoglobin ≤7 g/dL. Exclusion criteria were: (i) refusal of consent; (ii) children receiving chronic regular transfusions for leukaemia, bleeding disorders or known haemolytic anaemia; (iii) mild or moderate anaemia; and (iv) children not followed until discharge, including those leaving against medical advice.

Sample Size: The sample size was calculated using the formula $n = 4pq/l^2$. Taking the prevalence of anaemia in a reference study as 72.7% ($p = 72.7$, $q = 27.3$) and an absolute allowable error (l) of 10%, the minimum sample size was 80. Consecutive eligible children were enrolled by convenience sampling until 80 children had been recruited.

Data Collection: A trained investigator interviewed parents and examined each child using a pre-tested, structured proforma. The following variables were recorded:

Demographic: age (grouped as 5–6, 7–8, 9–10 and 11–12 years), sex and residence (urban or rural).

Socio-economic: socio-economic class according to the modified Kuppuswamy scale (2018 update), based on education and occupation of the head of family and monthly family income; family size (≤3 or >3 members).

Parental factors: highest education of the parents (none, primary, secondary, college) and parental knowledge, attitude and practice (KAP) about anaemia. KAP was graded as knowledge only, knowledge with a favourable attitude, or knowledge, attitude and correct preventive practice.

Preventive and dietary factors: biannual deworming, weekly IFA supplementation, regular intake of iron-rich foods, and dietary pattern (vegetarian or non-vegetarian).

Immunisation status: complete, partial or unimmunised for age as per the national schedule,

verified from the immunisation card where available.

Past history: previous blood transfusion, surgery, parasitic infection or chronic disease.

Nutritional status: weight and height were measured with standard equipment and body mass index (BMI) was calculated; children were categorised as severely thin, thin or normal.

Laboratory Confirmation: About 3 mL of venous blood was drawn from the median cubital vein under aseptic precautions into EDTA tubes.

Haemoglobin and red cell indices were measured on an automated haematology analyser, and haemoglobin was cross-checked by the Sahli method. Hospital prevalence of anaemia and of its grades (mild, moderate, severe) was derived from all admissions during the study period.

Management: All enrolled children were stabilised and treated according to WHO and national (F-IMNCI) guidelines. Treatment included blood transfusion, parenteral or oral haematinics and nutritional rehabilitation as indicated, and children were followed until discharge or death.

Statistical Analysis: Data were entered in Microsoft Excel and analysed using SPSS version 23 (IBM Corp., Armonk, NY). Categorical variables are presented as frequencies and percentages. The association between sex and socio-economic class was tested with Pearson's chi-square test; Fisher's exact test was applied when expected cell counts were below five. A p-value <0.05 was considered statistically significant.

Results

During the study period, 3,803 children were admitted to the paediatric wards. Of these, 644 (16.91%) had anaemia, and 80 (12.42% of anaemic children) had severe anaemia and formed the study cohort (Table 1).

Table 1: Hospital prevalence and severity of anaemia among paediatric admissions

Parameter	n	Percentage (%)
Total admissions	3,803	—
Children with anaemia (of all admissions)	644	16.91
Mild anaemia (of anaemic children)	412	63.97
Moderate anaemia (of anaemic children)	152	23.60
Severe anaemia (of anaemic children)	80	12.42

Mild anaemia accounted for nearly two-thirds of anaemic admissions. One in eight anaemic children had severe anaemia requiring detailed evaluation.

Table 2. Age and sex distribution of children with severe anaemia (n = 80)

Variable	Category	n	Percentage (%)
Age group	5–6 years	20	25.00
	7–8 years	38	47.50
	9–10 years	12	15.00
	11–12 years	10	12.50
Sex	Male	31	38.75
	Female	49	61.25

Nearly half the children were aged 7–8 years. Girls outnumbered boys, with a female-to-male ratio of 1.6:1.

Table 3. Socio-economic and household characteristics (n = 80)

Variable	Category	n	Percentage (%)
Socio-economic class (modified Kuppuswamy)	Upper (I)	0	0
	Upper middle (II)	0	0
	Lower middle (III)	8	10.00
	Upper lower (IV)	15	18.75
	Lower (V)	57	71.25
Residence	Rural	61	76.25
	Urban	19	23.75
Family size	≤3 members	29	36.25
	>3 members	51	63.75

No child came from the upper or upper-middle classes. Ninety per cent (72/80) belonged to classes IV and V. Three-quarters lived in rural areas, and almost two-thirds lived in families of more than three members.

Table 4: Parental education and knowledge, attitude and practice (KAP) regarding anaemia (n = 80)

Variable	Category	n	Percentage (%)
Parental education	No formal schooling	10	12.50
	Primary	36	45.00
	Secondary	22	27.50
	College	12	15.00
Parental KAP	Knowledge only	52	65.00
	Knowledge + attitude	20	25.00
	Knowledge + attitude + practice	8	10.00

More than half the parents (57.5%) had no schooling or only primary education. Although most parents had heard of anaemia, only 10% translated this knowledge into correct preventive practice.

Table 5: Preventive measures, dietary pattern and immunisation status (n = 80)

Variable	Category	n	Percentage (%)
Preventive measures	Biannual deworming	24	30.00
	Weekly iron–folic acid	8	10.00
	Regular iron-rich food	22	27.50
	No preventive measure	26	32.50
Diet	Vegetarian	61	76.25
	Non-vegetarian	19	23.75
Immunisation	Complete for age	20	25.00
	Partial	55	68.75
	Unimmunised	5	6.25

One-third of children had received no preventive measure at all, and only one in ten had received weekly IFA. Three-quarters were vegetarian, and three-quarters were incompletely immunised or unimmunised.

Table 6: Past medical history and nutritional status (n = 80)

Variable	Category	n	Percentage (%)
Past history	Previous blood transfusion	12	15.00
	Parasitic infection	10	12.50
	Surgery	5	6.25
	Chronic disease	1	1.25
	No significant history	52	65.00
Nutritional status (BMI category)	Severely thin	14	17.50
	Thin	11	13.75
	Normal	55	68.75
	Overweight / obese	0	0

Fifteen per cent had received a blood transfusion before, suggesting recurrent or long-standing anaemia. Overall, 25 children (31.25%) were thin or severely thin, and none was overweight.

Table 7: Association of socio-economic class with sex (n = 80)

Socio-economic class	Male (n = 31)	Female (n = 49)	Total	Test statistic	p-value
Lower middle (III)	7 (22.6%)	1 (2.0%)	8	$\chi^2 = 8.90$, df = 1	0.003*
Lower (IV–V)	24 (77.4%)	48 (98.0%)	72	Fisher's exact	0.005*

***Statistically significant ($p < 0.05$).**

Nearly all girls with severe anaemia (98%) came from the lowest socio-economic classes, compared with 77% of boys. This difference was statistically significant.

Discussion

This study shows that severe anaemia in school-age children admitted to a South Gujarat tertiary hospital is concentrated among girls, rural families, the lowest socio-economic classes and households with low parental education and poor preventive practice. Anaemia affected 16.91% of all paediatric admissions, and 12.42% of anaemic children had severe disease. These hospital figures understate the community burden, because NFHS-5 reported anaemia in nearly four of every five young children in Gujarat [3]. They do, however, reflect the share of children whose anaemia had progressed far enough to need admission.

The largest age group was 7–8 years (47.5%). Ramana Sastry reported a similar peak (54.25%) in the same age band in rural Telangana [11], and Janjale et al. also found most severe cases in middle childhood [12].

Children in this age range have rising iron needs for growth. They have often moved to a cereal-based family diet low in bioavailable iron and are exposed to soil-transmitted helminths at school age. Many will also have entered school age with iron stores already depleted in early childhood [7].

Girls formed 61.25% of our cohort. This agrees with Ramana Sastry (63.6%) [11], Suresh and Thota (54.28%) [13] and Kubavat et al. (58.5%) [10], although Janjale et al. found a male predominance [12]. The significant clustering of girls in the lowest socio-economic classes (98% vs 77% of boys; p = 0.003) suggests that gender interacts with poverty. Within poor households, girls may receive less food, less animal-source protein and delayed health care. In older girls, the pubertal growth spurt and the onset of menstruation add to iron loss [8,9].

Ninety per cent of children belonged to Kuppuswamy classes IV–V. This is comparable to Muoneke et al. (81.4%) [14] and Ogunlesi et al. (75%) [15]. Low income limits access to iron-rich foods, safe water and sanitation, and increases exposure to recurrent diarrhoea, respiratory infections and parasites. Each of these factors depletes iron or suppresses erythropoiesis [6]. Rural residence (76.25%) and larger family size (63.75%) point the same way. Kubavat et al. likewise reported that 62% of severely anaemic children in Kutch lived in joint families [10]. In our setting, many referrals came from tribal and migrant communities in remote districts, where health facilities and health education are limited.

Parental education was low: 57.5% of parents had no schooling or only primary schooling. In contrast, Manoj et al. in Kerala [16] and Ogunlesi et al. [15] found most parents had secondary or higher education. The difference probably reflects the lower literacy of our catchment population. More striking was the gap between knowledge and practice. Although 65% of parents knew about anaemia, only 10% followed appropriate preventive practice. Population-level surveys show that maternal education is one of the strongest independent predictors of childhood anaemia in India [6,7].

Coverage of preventive interventions was poor. Only 10% of children had received weekly IFA, 30% had been dewormed biannually, and 32.5% had received no preventive measure. This falls well short of the Anemia Mukt Bharat targets for the 5–9 and 10–19-year age groups [5]. A predominantly vegetarian diet (76.25%) further limits intake of haem iron and vitamin B12 and increases the risk of combined deficiencies [17]. Partial or absent immunisation (75%) and a history of parasitic infection (12.5%) suggest repeated infections and weak contact with preventive services. Intestinal parasites are known to be associated with anaemia in Indian schoolchildren [18]. Thinness affected 31.25% of children, higher than reported by Goswami and Das (15.8%) [6] and Muoneke et al. (23.6%) [14]. This underscores the overlap between anaemia and broader undernutrition in tribal South Gujarat.

Conclusion

Severe anaemia accounted for one in eight anaemic paediatric admissions. Among children aged 5–12 years, it was concentrated in girls, children aged 7–8 years, rural and low-income families, larger households and children whose parents had little education and poor preventive practice. Coverage of IFA supplementation and deworming was low, and vegetarian diets, incomplete immunisation and thinness were common. These findings support targeted school- and community-based interventions for low-income, rural and tribal families: supervised IFA supplementation, biannual deworming, dietary counselling on iron- and vitamin B12-rich foods, and parental education that turns awareness into practice. Larger community-based case–control studies are needed to quantify these risk factors.

References

1. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva: World Health Organization; 2011 (WHO/NMH/NHD/MNM/11.1).
2. Kassebaum NJ, Jasrasaria R, Naghavi M, Wulf SK, Johns N, Lozano R, et al. A systematic analysis of global anemia burden from 1990 to 2010. Blood. 2014;123(5):615-24.
3. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-5), 2019–21: India. Mumbai: IIPS; 2021.
4. Ministry of Health and Family Welfare, Government of India; UNICEF; Population Council. Comprehensive National Nutrition Survey (CNNS) national report. New Delhi: Ministry of Health and Family Welfare; 2019.
5. Ministry of Health and Family Welfare, Government of India. Anemia Mukt Bharat: Intensified National Iron Plus Initiative (I-NIPI). Operational guidelines for programme managers. New Delhi: Ministry of Health and Family Welfare; 2018.
6. Goswami S, Das KK. Socio-economic and demographic determinants of childhood anemia. J Pediatr (Rio J). 2015;91(5):471-7.
7. Dutta M, Bhise M, Prashad L, Chaurasia H, Debnath P. Prevalence and risk factors of anemia among children 6–59 months in India:

a multilevel analysis. Clin Epidemiol Glob Health. 2020;8(3):868-78.
8. Thomas D, Chandra J, Sharma S, Jain A, Pemde HK. Determinants of nutritional anemia in adolescents. Indian Pediatr. 2015; 52(10):867-9.
9. Siva PM, Sobha A, Manjula VD. Prevalence of anaemia and its associated risk factors among adolescent girls of central Kerala. J Clin Diagn Res. 2016;10(11):LC19-23.
10. Kubavat KB, Bharadva NA, Mehta SR. Clinicopathological correlation of severe anemia in children below 5 years of age in the region of Kutch district, Gujarat. Int J Med Sci Public Health. 2016;5(11):2279-82.
11. Ramana Sastry CPV. Study on clinical and hematological profile of anemia in children aged 5 to 12 years in rural Telangana. Int J Pediatr Res. 2017;4(7):488-94.
12. Janjale A, Pande S, Sonawane R, Ahire N, Sonawane S. A study of severe anemia in children in a tertiary care institute. MVP J Med Sci. 2018;5(1):33-8.
13. Suresh NS, Thota UR. Etiological profile of severe nutritional anaemia in children: a hospital based study. Paripex Indian J Res. 2018;7(9):28-9.
14. Muoneke VU, Ibekwe RC, Nebe-Agumadu HU, Ibe BC. Factors associated with mortality in under-five children with severe anemia in Ebonyi, Nigeria. Indian Pediatr. 2012;49(2):119-23.
15. Ogunlesi T, Fetuga B, Olowonyo M, Adekoya A, Adetola O, Ajetunmobi A. Severe childhood anaemia and blood transfusion in a Nigerian secondary level facility. J Trop Pediatr. 2016;62(2):107-15.
16. Manoj S, Meppadath IM. Anaemia in 6–59 months children in rural Kerala and its association with age, gender, nutritional status and dietary habits. J Evol Med Dent Sci. 2017;6(29):2358-61.
17. Pawlak R, Parrott SJ, Raj S, Cullum-Dugan D, Lucus D. How prevalent is vitamin B12 deficiency among vegetarians? Nutr Rev. 2013;71(2):110-7.
18. Gopalakrishnan S, Eashwar VMA, Muthulakshmi M, Geetha A. Intestinal parasitic infestations and anemia among urban female school children in Kancheepuram district, Tamil Nadu. J Family Med Prim Care. 2018;7(6):1395-400.