

Original Research Article

Knowledge, attitude and practice toward anemia among mothers of adolescent girls in Puducherry, South India: a community-based cross-sectional study

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ABSTRACT

Background: Anemia remains a major public health problem among adolescent girls in India, with adverse effects on growth, cognitive development, and future maternal health. Mothers play a key role in influencing adolescents' dietary and health behaviors. This study assessed the knowledge, attitude, and practice (KAP) regarding anemia among mothers of adolescent girls in Puducherry and examined their association with selected demographic variables.

Methods: A community-based descriptive cross-sectional study was conducted among 160 mothers of adolescent girls selected through convenience sampling. Data were collected using a structured knowledge questionnaire, attitude scale, and practice checklist. Descriptive statistics and Chi-square tests were used for data analysis. A p value <0.05 was considered statistically significant.

Results: Adequate knowledge regarding anemia was observed in 42.5% of mothers, while 38.8% had moderate knowledge. Most mothers (83.8%) demonstrated a positive attitude toward anemia prevention. Moderate preventive practices were reported by 68.8% of mothers, and 25.0% exhibited good practices. The mean±SD scores for knowledge, attitude, and practice were 12.22±4.60, 36.02±6.90, and 6.22±1.71, respectively. Maternal age was significantly associated with knowledge (p=0.014) and practice (p=0.010). Educational level was significantly associated with knowledge and practice (p<0.001). Monthly family income (p=0.016) and place of residence (p=0.036) were also significantly associated with practice.

Conclusions: Despite positive attitudes, gaps in maternal knowledge and preventive practices persist. Targeted educational interventions focusing on socio-demographic determinants may strengthen anemia prevention among adolescent girls.

Keywords: Adolescent girls, Anemia, Attitude and practice, Community-based study, India, Maternal knowledge, Puducherry

INTRODUCTION

Anemia is a major public health problem worldwide, disproportionately affecting adolescent girls and women of reproductive age, particularly in low and middle-income countries.¹ In India, the burden of anemia remains

substantial, with prevalence estimates of 67.1% among children aged 6-59 months and 57.0% among women aged 15-49 years, as reported in the National Family Health Survey-5 (NFHS-5).^{1,2} This concern is especially pronounced during adolescence, a critical developmental period characterized by rapid physical growth, increased

nutritional requirements, and the onset of menstruation, all of which increase susceptibility to iron deficiency anemia.³

The consequences of anemia during adolescence extend beyond immediate hematological impairment. Persistent anemia at this stage is associated with delayed physical growth, reduced cognitive performance, and increased vulnerability to infections, with long-term implications for educational attainment, productivity, and future maternal health outcomes.⁴⁻⁶ Despite the implementation of national nutrition and supplementation programs, micronutrient deficiencies, particularly iron deficiency anemia, continue to be highly prevalent among Indian adolescents.⁷

Limited awareness and understanding of anemia remain key barriers to its prevention. Adolescent girls, especially those who have not been exposed to pregnancy or motherhood related health education, often lack adequate knowledge regarding the causes, consequences, and preventive measures for anemia.⁸ Inadequate awareness of iron-rich foods and appropriate dietary practices further exacerbates this problem, underscoring the need for targeted, context-specific educational strategies.⁹ Addressing these gaps requires engagement with adolescents as well as influential household members.

Mothers play a pivotal role in shaping dietary behaviors, health-seeking practices, and adherence to preventive interventions among adolescent girls. Maternal knowledge, attitudes, and practices related to anemia influence food choices, dietary diversity, and compliance with iron supplementation.^{10,11} Evidence indicates that inadequate parental understanding of anemia and its long-term consequences contribute to poor adherence to iron supplementation programs among adolescent girls.^{12,13} Therefore, strengthening maternal awareness and practices is critical for improving anemia prevention and management at the community level.

Although several studies in India have examined anemia among adolescents, evidence focusing specifically on maternal knowledge, attitudes, and practices in community settings remains limited. Puducherry, a union territory in south India with a mixed urban-rural population, represents a setting where localized community-based data are essential to inform culturally appropriate public health interventions. In this context, assessing maternal knowledge, attitudes, and practices regarding anemia, along with their association with selected demographic characteristics, can provide valuable insights into strengthening community-based and public health strategies aimed at preventing anemia among adolescent girls.

METHODS

A quantitative research approach with a community-based descriptive cross-sectional design was employed to

assess the knowledge, attitudes, and practices regarding anemia among mothers of adolescent girls. The study was conducted in selected community areas of Puducherry, a Union Territory in South India, between September 2025 and December 2025. The study population comprised mothers of adolescent girls residing in the selected communities. A total of 160 mothers who met the eligibility criteria and were available during the data collection period were included using a convenience sampling technique.

Data were collected using data collection tools. Socio-demographic information was obtained using a questionnaire that included the mother's age, educational qualification, type of family, monthly family income, place of residence, number of family members, food habits, history of menstrual disorders in the adolescent daughter, and occupation.

Maternal knowledge of anemia was assessed using a 20-item knowledge questionnaire, with each correct response scored as 1 and incorrect responses scored as 0. Knowledge scores ranged from 0 to 20 and were categorized as poor (<7), moderate (7-14), and adequate (>14). Maternal attitude toward anemia was assessed using a 5-point Likert scale comprising 10 statements, with response options ranging from strongly disagree (1) to strongly agree (5). Total attitude scores ranged from 10 to 50 and were classified as negative (<16), neutral (17-32), and positive (>33). Maternal practices related to anemia prevention were evaluated using a 10-item checklist with yes/no responses to the questions. Each appropriate practice was scored as one and inappropriate practice as zero, with total practice scores categorized as poor (<4), moderate (4-7), or good (>7).

Data collection was carried out through direct interaction with participants after explaining the purpose of the study and obtaining informed consent. Ethical approval was obtained from the institutional ethics committee, and confidentiality and anonymity were ensured throughout the study period. Data were coded, entered, and analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to summarize demographic characteristics and KAP scores, and the chi-square test was applied to examine associations between selected demographic variables and levels of knowledge, attitude, and practice regarding anemia. Statistical significance was set at $p < 0.05$.

RESULTS

Socio-demographic characteristics of the participants

A total of 160 mothers of adolescent girls participated in the study. Half of the mothers (50.0%) were aged 40-45 years, while 21.3% were aged 35-40 years and 28.7% were above 45 years. Nearly half of the adolescent girls (48.8%) were aged 15-19 years. With regard to educational status, 41.3% of mothers had primary

education, 32.5% had higher education, and 26.3% were illiterate.

More than half of the participants belonged to nuclear families (52.5%), and the majority reported a monthly family income between INR 1,000 and 5,000 (48.8%). A greater proportion of mothers resided in semi-urban areas

(40.0%), followed by rural (32.5%) and urban areas (27.5%). Almost half of the families (46.3%) had more than three family members. Most mothers followed non-vegetarian food habits (90.0%). One-quarter of the adolescent girls (25.0%) had a history of menstrual disorders. Regarding occupation, 46.3% of mothers were workers and 43.8% were homemakers (Table 1).

Table 1: Demographic characteristics of mothers of adolescent girls (n=160).

Variables	Categories	N	%
Age of mother (years)	35-40	34	21.3
	40-45	80	50.0
	>45	46	28.7
Age of daughter (years)	10-12	30	18.8
	13-15	38	23.8
	15-19	78	48.8
	>19	14	8.8
Educational level	Illiterate	42	26.3
	Primary education	66	41.3
	Higher education	52	32.5
Type of family	Nuclear	84	52.5
	Joint	60	37.5
	Extended	16	10.0
Monthly family income (INR)	<1,000	14	8.8
	1,000-5,000	78	48.8
	5,000-10,000	32	20.0
	>10,000	36	22.5
Place of residence	Urban	44	27.5
	Rural	52	32.5
	Semi-urban	64	40.0
Family members (number)	1	04	2.5
	2	32	20.0
	3	50	31.3
	>3	74	46.3
Food habits	Vegetarian	08	5.0
	Non-vegetarian	144	90.0
	Eggetarian	08	5.0
History of menstrual disorder of daughter	Yes	40	25.0
	No	120	75.0
Occupation of mother	Homemaker	70	43.8
	Worker	74	46.3
	Government employee	08	5.0
	Self-employed	08	5.0

Table 2: Distribution of knowledge, attitude, and practice levels regarding anemia (n=160).

Level	Knowledge (%)	Attitude (%)	Practice (%)
Poor/negative	30 (18.7)	04 (2.5)	10 (6.2)
Moderate/neutral	62 (38.8)	22 (13.7)	110 (68.8)
Adequate/positive/good	68 (42.5)	134 (83.8)	40 (25.0)

Knowledge, attitude, and practice regarding anemia

The distribution of knowledge, attitude, and practice levels regarding anemia and the corresponding summary

statistics are presented in Tables 2 and 3. With respect to knowledge, 42.5% of mothers demonstrated adequate knowledge, while 38.8% had moderate knowledge and 18.7% had poor knowledge. The mean knowledge score

was 12.22 ± 4.60 , indicating an overall moderate level of knowledge.

Table 3: Mean and standard deviation of knowledge, attitude, and practice scores (n=160).

Variables	Mean $\pm$ SD
Knowledge score	12.22 $\pm$ 4.60
Attitude score	36.02 $\pm$ 6.90
Practice score	6.22 $\pm$ 1.71

Assessment of attitude revealed that the majority of mothers (83.8%) exhibited a positive attitude toward anemia prevention and management. Neutral and negative attitudes were observed in 13.7% and 2.5% of mothers, respectively. The mean attitude score was 36.02 ± 6.90 , reflecting a predominantly positive attitudinal orientation.

In terms of practice, most mothers (68.8%) demonstrated moderate practices related to anemia prevention, followed

by 25.0% who reported good practices and 6.2% who exhibited poor practices. The mean practice score was 6.22 ± 1.71 , suggesting that the translation of knowledge and attitude into optimal preventive practices remained limited.

Association between demographic variables and knowledge, attitude, and practice levels

Associations between selected demographic variables and levels of knowledge, attitude, and practice regarding anemia were examined using the Chi-square test (Table 4). A statistically significant association was observed between the age of the mother and knowledge level ($\chi^2=12.52$, $p=0.014$) as well as practice level ($\chi^2=17.54$, $p=0.010$). Educational level showed a highly significant association with both knowledge level ($\chi^2=68.36$, $p<0.001$) and practice level ($\chi^2=27.97$, $p<0.001$).

Table 4: Association between demographic variables and knowledge, attitude, and practice levels regarding anemia.

Demographic variables	Knowledge χ^2 value (p value)	Attitude χ^2 value (p value)	Practice χ^2 value (p value)
Age of mother	12.52 (0.014)*	2.89 (0.577)	17.54 (0.010) *
Age of daughter	6.84 (0.145)	3.11 (0.540)	5.92 (0.204)
Educational level	68.36 (<0.001)*	2.10 (0.718)	27.97 (<0.001)*
Type of family	4.92 (0.296)	1.94 (0.746)	4.41 (0.353)
Monthly family income	7.18 (0.304)	4.03 (0.673)	18.62 (0.016) *
Place of residence	4.16 (0.655)	4.69 (0.585)	13.07 (0.036) *
Number of family members	6.02 (0.421)	3.27 (0.775)	6.77 (0.341)
Food habits	2.14 (0.710)	1.82 (0.873)	3.58 (0.466)
Menstrual disorder history	3.62 (0.164)	0.94 (0.624)	2.31 (0.315)
Occupation	10.90 (0.092)	3.47 (0.748)	6.64 (0.356)

*Statistically significant at $p<0.05$ (Chi-square test)

Practice level was also significantly associated with monthly family income ($\chi^2=18.62$, $p=0.016$) and place of residence ($\chi^2=13.07$, $p=0.036$). No statistically significant association was found between any of the demographic variables and attitude level ($p>0.05$).

Other demographic variables, including age of the daughter, type of family, number of family members, food habits, history of menstrual disorders, and occupation, did not show statistically significant associations with knowledge, attitude, or practice levels ($p>0.05$).

DISCUSSION

This community-based cross-sectional study assessed the knowledge, attitudes, and practices regarding anemia among mothers of adolescent girls in selected areas of Puducherry and examined their association with selected demographic variables. The findings provide context-

specific insights into maternal perspectives on anemia prevention and reveal a clear mismatch between awareness, favorable attitudes, and consistent adoption of preventive practices. Maternal knowledge of anemia was predominantly moderate, with fewer than half of the mothers demonstrating adequate knowledge. This pattern is consistent with earlier community-based studies from India and other low- and middle-income settings, which have reported partial awareness of anemia, accompanied by gaps in understanding its causes, dietary prevention, and long-term health consequences.^{14,15} Although many mothers were aware of anemia as a health condition, limited knowledge regarding iron-rich foods, enhancers of iron absorption, and preventive strategies may restrict their ability to implement effective preventive measures for their adolescent daughters. Given the increased nutritional demands during adolescence, such gaps in knowledge may contribute to delayed or inadequate prevention.^{16,17} Previous research has similarly reported low recognition of anemia symptoms and underestimation of its prevalence among children and adolescents.¹⁸

In contrast, the attitudes toward anemia prevention were overwhelmingly positive. Most mothers acknowledged the importance of preventing anemia, consistent with previous studies showing that caregivers often perceive anemia as a significant health concern, even when detailed knowledge is lacking.^{19,20} However, these favorable attitudes did not proportionately translate into optimal preventive practices. This disconnect highlights a commonly observed gap between cognitive awareness and behavioral implementation, indicating that positive perceptions alone may be insufficient to drive sustained health-promoting behavior in the presence of contextual and structural constraints.

Preventive practices related to anemia were largely moderate, with only one-quarter of mothers reporting good practice. The gap between positive attitudes and suboptimal practices may be influenced by multiple interrelated factors, including limited dietary diversity, economic constraints, cultural food preferences, time limitations, and misconceptions about iron supplementation.^{21,22} These findings suggest that interventions focusing solely on information dissemination may be inadequate. Addressing practical barriers at the household and community levels, such as promoting affordable iron-rich foods, correcting misconceptions, and reinforcing supplementation messages, may support better translation of knowledge and attitudes into practice.

Association analysis identified maternal education level as a key determinant of knowledge and practices related to anemia. Mothers with higher educational attainment demonstrated significantly better understanding and more appropriate preventive practices, reinforcing existing evidence that education enhances health literacy, access to information, and informed decision-making regarding nutrition and preventive care.²³⁻²⁵ A significant association between maternal age and knowledge level was also observed, possibly reflecting accumulated life experience and repeated exposure to the health services. Together, maternal age and education appear to function as reinforcing determinants shaping both awareness and the ability to apply preventive measures effectively. Attitudes toward anemia prevention did not vary significantly across demographic groups, suggesting that positive perceptions may be relatively widespread, potentially reflecting the reach of national nutrition initiatives and public health messages.²⁶ The relative homogeneity of the study population may have limited the detection of nuanced differences across subgroups. Overall, the findings indicate that while mothers of adolescent girls in Puducherry generally hold positive attitudes toward anemia prevention, gaps in knowledge and inconsistent preventive practices persist in the community. Maternal education emerged as a critical factor influencing both understanding and behavior, underscoring the importance of educational empowerment in preventing anemia. The persistent gap between attitudes and practices highlights the need for

community-level public health approaches that extend beyond awareness creation to address practical constraints and support sustained behavioral changes.

This study provides community-level evidence on maternal knowledge, attitudes, and practices regarding anemia among mothers of adolescent girls in Puducherry, where such data are limited. By focusing on mothers as key influencers of adolescent health behaviors, this study offers relevant insights into anemia prevention at the household level. However, the cross-sectional design limits the causal interpretation of these associations. Information on practices was self-reported and may be subject to recall or social desirability bias. In addition, as the study was conducted in selected community areas, the findings may not be generalizable to other settings with different sociocultural or health system contexts.

CONCLUSION

This study demonstrates that although mothers of adolescent girls exhibit favorable attitudes toward anemia prevention, their knowledge and preventive practices are only moderate. Maternal education emerged as a key determinant influencing both knowledge and practice, emphasizing its role in strengthening anemia prevention efforts in the future. Context-specific evidence, such as this, is essential for informing community-based and public health strategies aimed at reducing the burden of anemia among adolescent girls.

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REFERENCES

1. Jeevan J, Karun KM, Puranik A, Chandrashekararajah D, Mk L, Barvaliya M. Prevalence of anemia in India: a systematic review, meta-analysis and geospatial analysis. *BMC Public Health*. BioMed Central. 2025;25(1).
2. Preethi V, Hemalatha VT, Arlappa N, Thomas MG, Jaleel A. Trends and predictors of severe and moderate anaemia among children aged 6-59 months in India: an analysis of three rounds of National Family Health Survey (NFHS) data. *BMC Public Health*. 2024;24(1):2824.
3. Chakrabarty M, Singh A, Singh S, Chowdhury S. Is the burden of anaemia among Indian adolescent women increasing? Evidence from Indian Demographic and Health Surveys (2015-21). *PLoS Global Public Health*. 2023;3(9).

4. Samson KLI, Fischer JAJ, Roche M. Iron status, anemia, and iron interventions and their associations with cognitive and academic performance in adolescents: a systematic review. *Nutrients*. 2022;14(1):224.
5. Neve JD, Karlsson O, Kumar R, Kumar S, Vollmer S. Relationship between adolescent anemia and school attendance observed during a nationally representative survey in India. *Communications Medicine*. 2024;4(1):112.
6. Yeboah FA, Bioh J, Amoani B, Effah A, Senu E, Mensah OSO, et al. Iron deficiency anemia and its association with cognitive function among adolescents in the Ashanti Region- Ghana. *BMC Public Health*. 2024;24(1).
7. Daniel RA, Kalaivani M, Kant S, Gupta S. Prevalence of anaemia among adolescent girls (10-19 years) in India: a systematic review and meta-analysis. *Nat Med J India*. 2024;36(4):233.
8. Baruah A, Gautam S. Prevalence and predictors of iron deficiency anaemia in adolescent girls in India. *Int J Community Med Public Health*. 2023;10(10):3728.
9. Shiferaw M, Gashaw M, Bazezew A, Abebe W, Asmare Z, Getachew E, et al. Modifiable risk factors for anemia in pregnancy: an umbrella review of systematic reviews and meta-analyses. *BMC Pregnancy Childbirth*. 2025;26(1):26.
10. Septiana KS, Adnani QES, Susiarno H, Tarawan VM, Arya IFD, Anwar R. The influence of anemia education media on increasing self-awareness and compliance in consuming iron supplements in adolescent girls: a systematic review. *Int J Women's Health*. 2025;2277.
11. Parajuli J, Prangthip P. Adolescent nutrition and health: a critical period for nutritional intervention to prevent long term health consequences. *Curr Nutr Rep*. 2025;14(1):116.
12. Rahman MJ, Rahman MM, Sarker MHR, Kakehashi M, Tsunematsu M, Ali MD, et al. Prevalence and influencing factors with knowledge, attitude, and practice toward anemia among school-going adolescent girls in rural Bangladesh. *PLoS One*. 2024;19(11).
13. Efendi KA, Yuniastuti A, Zainafree I. Perceptions and beliefs of adolescent girls regarding adherence to iron supplementation: An analysis using the health belief model. *Nurs Health Sci J*. 2025;5(3):364.
14. Sappani M, Mani T, Asirvatham ES, Joy M, Babu M, Jeyaseelan L. Trends in prevalence and determinants of severe and moderate anaemia among women of reproductive age during the last 15 years in India. *PLoS One*. 2023;18(6).
15. Wiafe MA, Ayenu J, Eli-Cophie D. A review of the risk factors for iron deficiency anaemia among adolescents in developing countries. *Anemia*. Hindawi 2023;2023:1.
16. Beck KL, Conlon CA, Kruger R, Coad J. Dietary determinants of and possible solutions to iron deficiency for young women living in industrialized countries: a review. *Nutrients*. 2014;6(9):3747.
17. Cohen CT, Powers J. Nutritional strategies for managing iron deficiency in adolescents: approaches to a challenging but common problem. *Adv Nutr*. 2024;15(5):100215.
18. Mishra JP, Ramakrishnan J, Ramasubramani P, Banu Z, Sahoo SK. Adherence and barriers of prophylactic iron and folic acid supplementation in children: a community-based mixed method study. *Int J Community Med Public Health*. 2023;10(6):2138.
19. Stelle I, Kinshella MW, Moore SE. Caregiver perceptions of nutrition interventions in infants and children under 24 months of age: a systematic review. *Public Health Nutr*. 2023;26(9):1907.
20. Afshari G, Omidvar S, Kordbagheri M. The role of health literacy in the relationship between mothers' knowledge and practices of iron supplementation in children (aged 12 to 24 months): a structural equation model. *PLoS One*. 2025;20(4).
21. Lee S, Son Y, Hwang J, Kim MS, Shin JI, Yon DK, et al. Global, regional and national burden of dietary iron deficiency from 1990 to 2021: a Global Burden of Disease study. *Nat Med*. 2025;31(6):1809.
22. Alem AZ, Efendi F, McKenna L, Felipe-Dimog EB, Chilot D, Tonapa SI, et al. Prevalence and factors associated with anemia in women of reproductive age across low- and middle-income countries based on national data. *Sci Rep*. 2023;13(1):20335.
23. Yang J, Chen J, Xie Y, Liu Y, Wu J, Li Y, et al. Challenges in rural maternal health: how received public services and policy awareness affect health knowledge and practices. *Frontiers in Public Health*. 2025;12.
24. Chandrakar A, Ramasamy S, Galhotra A, Shenoy MS. Maternal health literacy (MHL) for improved maternal and child outcomes: a scoping review. *Indian J Community Med*. 2025;50(5):733.
25. Tezol Ö, Mammadova S. Mother's nutrition literacy and offspring anemia: a comparison study in a single center. *Turk Arch Pediatr*. 2023;58(6):638.
- Khatib AH, Joho AA. Prevalence of anaemia and caregivers' knowledge, practice and attitude towards its prevention among under-fives in Zanzibar, Tanzania: A cross-sectional study. *Int J Afr Nurs Sci*. 2022;16:100416.

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