

ORIGINAL RESEARCH

An epidemiological study of prevalence of anemia in adolescent girls and its association with demographic variables in Dehradun Uttarakhand

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ABSTRACT

Background: Adolescents constitute over 21.4% of the population in India and adolescent girls constitute about 10 percent of the Indian population. This age group needs special attention because of the turmoil of adolescence which they face due to the different stages of development that they undergo, different circumstances that they come across, their different needs and diverse problems. The objectives of the study were to determine the prevalence of anemia in the study population and to assess the socio-demographic risk factors associated with the anemia. **Methods:** Community based cross sectional study conducted in adolescent girls aged 10 to 19 years, permanently residing in the rural field practice area of Department of Community Medicine, SGRRIH&HS Dehradun from April 2019 to September 2020.

Results: the mean age of the respondents was 13.8+ 2.68 years. In rural area 13.42+ 2.47 years while 14.28+ 2.81 years in urban area. Majority of participants belongs to nuclear family majority (59.3%) and (64.4%) of adolescent girls belonged to lower middle class in both rural and urban setting respectively. prevalence of anemia among adolescent girls was (63.5%) whereas in Rural area 70.2% and in Urban area prevalence was 56.7%. Prevalence of mild, moderate and severe anemia in Rural area (53.9%), (44.0%), (4%) and in Urban area and (46.8%), (52.6%), (0.6%) respectively. the prevalence of anemia was higher (76.2%) among adolescent girls who belonged to the age group of (14-16 years)

Conclusions: Prevalence of anemia was 63.5% with majority of study subjects having mild to moderate anemia. Prevalence of anemia in these girls had a significant association with socioeconomic status of the family.

Keywords: Prevalence, Anemia, Adolescent girls, Demography

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INTRODUCTION

Anemia is a serious public health challenge in India with more than 50% prevalence among the vulnerable groups such as pregnant women, infants, young children and adolescents. Iron deficiency being the most common form nutritional anemia¹.

'Adolescence' comes from the Latin term, 'Adolescere' means to grow up or to mature. Adolescent is defined by WHO as a period of life spanning to ages between 10-19 year which is a period where both physical as well as psychological changes occur. Anemia is a manifestation of under

nutrition and poor dietary intake of iron is serious public health problem. The prevalence of anemia in adolescents is disproportionately high in developing countries. The other major responsible factors behind this scenario are poor dietary intake of iron, high rate of infection, poverty, certain disease, worm infestation as well as the social norm of early marriage, adolescent pregnancy and poor access to health services. India is a home to nearly 113 million adolescent girls². As many as 56 % are suffering from anemia and of these 17% suffer from moderate to severe anemia. Iron deficiency is thought to be the

most common cause of anemia globally, although other conditions, such as folate, vitamin B12 deficiencies, chronic inflammation, parasitic infections and inherited disorders can all cause anemia. Girls iron requirements increase dramatically during adolescence as a result of the expansion of the lean body mass, total blood volume and the onset of menstruation. Anemia can result in diminished physical growth, impaired cognitive and reproductive development among adolescent females, besides leading to increase morbidity from infectious disease. Anemia during adolescence limits growth and delay the onset of menarche, which in turn may later lead to Cephalo-pelvic disproportion. The State of the World's Children 2011" report from UNICEF states that more than half (56%) of adolescent girls in India are suffering from Anemia. In addition to health problem, anemia is the world's second foremost reason of disability and is accountable for about 1 million deaths a year, of which three-quarters occur in Africa and south-east Asia. In terms of lost year, of healthy life, Iron deficiency anemia causes 25 million cases of disability adjusted life years (DALYs); this accounts for 2.4% of total DALYs worldwide. In India, it is common that girls get married and pregnant before growth phase is completed; therefore the risk of anemia increases³. NFHS-4 states that 41.4% of non-pregnant women in age group of 15-49 years are anemic in Uttarakhand after adjusting the hemoglobin levels for altitude and smoking status⁴. The reduction of anemia is one of the important objectives of the National Nutritional Mission Abhiyan launched in March 2018. Complying with the targets of POSHAN Abhiyan and National Nutrition Strategy by NITI Ayog, accordingly, the Anemia Mukht Bharat Strategy has been designed to reduce prevalence of anemia of reproductive age group(15-49years), between the year 2018 and 2022⁵. In response to the problem, the national Ministry of Health and Family Welfare (MHFW) launched a nationwide Weekly Iron and Folic Acid Supplementation (WIFS) programme in January 2013-14 UNICEF India has been the partner of choice in supporting the universal roll-out of the programme in 14 major states in India⁶. Being a significant public health challenge in India ($\geq 40\%$ prevalence) too, it is translating into substantial morbidities, particularly among the vulnerable adolescent girls affecting their physical growth, cognitive development, performance in school, work capacity and reproductive functions⁷. Anemic girls become the next generation of anemic mothers, thus perpetuating this vicious cycle of malnutrition. So adolescent age provides a best prospect for combating anemia if appropriately intervened, as iron deficiency and other nutritional deficiencies which are supposed to be most common cause. The aim of this study was to assess the prevalence of anemia among adolescent girls residing in urban & rural field practice areas of Community Medicine Department of SGRRIM&HS. And the objective of this study was 1) To study the

prevalence of anemia among adolescent girls. 2) To study the severity of anemia among adolescent girls. 3) To study the Socio-demographic and other correlates of anemia among adolescent girls.

MATERIAL AND METHODS

STUDY DESIGN

A community- based cross- sectional study was conducted in field practice areas of Department of Community Medicine, SGRRIM&HS

STUDY SUBJECT

Adolescent girls aged 10-19 years residing in the rural and urban field practice areas

STUDY PERIOD

study was carried out from April 2019 to September 2020. Total study period was of 18 months.

INCLUSION CRITERIA

- All the adolescent girls (10-19years) as per WHO criteria) present in the enlisted house were included in the study.
- Where there was more than one adolescent girl in the house then only one adolescent girl was selected by lottery method

EXCLUSION CRITERIA

- Migratory households
- Those who did not give consent
- Those who were seriously ill.

SAMPLING

SAMPLE SIZE

Sample size was calculated by applying the following

$$\text{formula. } n = z^2 pq/L^2 \text{ or } 4pq/L^2$$

Where, n =sample size, $z=1.96$ at 95% confidence interval ($n=1.96 \approx 2$), p = prevalence_{SEP}, $q=(1-p)$ _{SEP}, L =allowable sampling error at 10% of p

According to NFHS-4 done in 2018 the prevalence of anemia among adolescent girls (15-19 years) in Uttarakhand was reported as 42.4%⁸. So we have taken the prevalence as 42.4% at 10% allowable error and 95% confidence interval, the sample size is calculated by the above formula as follows: $(2)^2 \times 42.4(100-42.4) \div (10\% \text{ of } 42.4)^2 = 546$. Therefore a total of 550 study subjects were taken. Equally divided from both rural and urban.

SAMPLING TECHNIQUE

275 individuals each were interviewed from the different localities and villages of UHTC and RHTC, respectively. The population of area under RHTC was 15595 and under UHTC were 15190. The list of villages under both areas was taken and PPS (Probability Proportional to Size sampling was done in each village/subunit in both areas. In each area or village houses were selected randomly. SI (sampling

Interval) was calculated by dividing the population of the village/locality by the sample intended. Then every nth house was visited to interview the adolescent for the study

A house to house survey of the families registered with RHTC, Mothrowala and UHTC, Khurbura, Department of Community Medicine, SGRRIM&HS Dehradun was undertaken.

- First house was visited and selected randomly by the direction indicated by spinning object (pen /bottle).
- If more than one adolescent girl (between 10 -19 years) was there in household then one of them was selected by lottery method.
- If adolescent girl was not present in that household then next household or previous household with adolescent girl was selected. Informed consent was taken from guardian/adolescent girl in the selected household.
- If the selected adolescent’s guardian didn’t give consent then adjacent household was visited.
- After obtaining the consent, the information was collected in a predesigned & pretested proforma. Information was included about socio-demographic details, history, examination and

estimation of hemoglobin.

DATA ANALYSIS

Data entry was done using MS Excel 2011. Collected data was entered in the master sheet and analysis was carried out by using SPSS 23rd version. Proportions, percentages and Chi square test was applied to find out significant association between independent and dependent variables. A p value of less than 0.05 was considered significant.

TOOLS OF DATA COLLECTION

A pre-designed semi structured schedule was used to elicit the necessary information. **Body weight done by weight machine at the level of floor**, Then BMI was calculated as ratio of weight in kg/height (in meter²). Hemoglobin estimation was done by digital hemoglobin meter (AccuSure Hb Model No. HB101), Which is based on azide method , It is rapid and easy test for field study purpose.

RESULT

Total prevalence of anemia among adolescent girls [table 1] was (63.5%) whereas in rural area 70.2% and in urban area prevalence was 56.7%.

Table 1: Demographic Distribution of participants

Age in years	Area of Residence					
	Rural		Urban		Total	
	No.	(%)	No.	(%)	No.	(%)
10-13	165	60.0%	132	48.0%	297	54.0%
14-16	71	25.8%	76	27.6%	147	26.7%
17-19	39	14.2%	67	24.4%	106	19.3%
Religion						
Hindu	253	92.0%	222	80.7%	475	86.4%
Muslim	22	8.0%	53	19.3%	75	13.6%
Type of family						
Nuclear	225	81.8%	217	78.9%	442	80.4%
Joint	50	18.2%	58	21.1%	108	19.6%
socio-Economic Status						
I	10	3.6%	2	0.7%	12	2.2%
II	28	10.2%	20	7.3%	48	8.7%
III	63	22.9%	67	24.4%	130	23.6%
IV	163	59.3%	177	64.4%	340	61.8%
V	11	4.0%	9	3.3%	20	3.6%

Father's Education Level						
Illiterate	98	35.6%	47	17.1%	145	26.3%
Primary	41	14.9%	37	13.4%	78	14.1%
Middle	50	18.1%	82	29.8%	132	24%
High School	50	18.1%	64	23.2%	114	20.7%
Intermediate	26	9.4%	28	10.1%	54	9.8%
Graduates	10	3.5%	17	6.1%	27	4.8%
Mother's Education Level						
Illiterate	144	52.3%	79	28.7%	223	40.5%
Primary	49	17.8%	78	28.3%	127	23.1%

Middle	23	8.3%	54	19.6%	77	14%
High School	24	8.7%	38	13.8%	62	11.3%
Intermediate	21	7.6%	16	5.8%	37	5.6%
Graduates /Postgraduates	14	5.1%	10	3.6%	24	5.5%

Anemia was seen higher among adolescent girls residing in rural area as compared to urban area. Prevalence of mild, moderate and severe anemia in rural area (53.9%), (44.0%), (4%) and in urban area and (46.8%), (52.6%), (0.6%) respectively.

Association of anemia [table 2] with age of adolescent girls: the prevalence of anemia was higher (76.2%) among adolescent girls who belonged to the age group of (14-16 years) as compared to (71.7%) among (17-19) years and (54.2%) among (10-13) years, statistically significant association was found between age groups and prevalence of anemia(p=0.0001).

Table 2: Distribution of adolescent girls as per prevalence of anemia in Rural and Urban area

Prevalence of anaemia	Rural		Urban		Total	
	N	%	n	%	n	%
Anaemic	193	70.2%	156	56.7%	349	63.5%
Non-anaemic	82	29.8%	119	43.3%	201	36.5%
Total	275	100%	275	100%	550	100%
severity of anemia						
Mild	104	53.9%	73	46.8%	177	50.7%
Moderate	85	44.0%	82	52.6%	167	47.9%
Severe	4	2.1%	1	0.6%	5	1.4%
Total	193	100.0%	156	100.0%	349	100.0%

The prevalence of anemia was seen higher (65.6%) among adolescent girls who belonged to nuclear family as compared to the joint family (54.6%) and this was found statistically significant(p=0.03). Prevalence of anemia was seen higher (66.6%) among adolescent girls who belonged to upper/ upper middle class.

Table no.[3] shows there was statistically significant association in between father’s education and prevalence of anemia (p=0.001), i.e. higher prevalence was seen among adolescent girls whose fathers were illiterate (82%) , (70%) among those whose fathers were educated up to primary this may be due to better awareness of educated parents.

Table 3: Association of anemia with demographic profile

Age Groups	Anaemic N(%)	NoAnaemic n(%)	Total n(%)	P Value
10-13	161(54.2)	136(45.8)	297(54.0)	<0.0001
14-16	112(76.2)	35 (23.8)	147(26.7)	
17-19	76(71.7)	30(28.3)	106(19.3)	
Religion				
Hindu	309 (65.5)	163(34.5)	472 (85.8%)	<0.001
Muslim/Sikh	40 (51.3)	38 (48.7)	78 (14.2)	
Type of family				
Nuclear	290 (65.6)	152 (34.4)	442 (80.4)	0.03
Joint	59 (54.6)	49 (45.4)	108 (19.6)	
SES				
Upper/Upper middle class	40 (66.6)	20 (33.3)	60 (11.0)	0.4
Middle class	86 (66.2)	44 (33.8)	130 (23.6)	
Lower middle/lower class	223 (61.9)	137 (38.1)	360 (61.8)	
Father's Education Level				
Illiterate	119 (82.0)	26 (17.9)	145 (26.4)	<0.001
Primary	55 (70.5)	23 (29.5)	78 (14.2)	
Middle	77 (58.3)	55 (41.7)	132 (24)	
High School	62 (54.4)	52 (45.6)	114 (20.7)	
Graduate And Above	36 (51.9)	45 (48.1)	81(14.7)	
Mother's Education Level				
Illiterate	183 (82.1)	40 (17.9)	223 (40.5)	<0.001

Primary	82 (64.6)	45 (35.4)	127 (23.1)	
Middle	45 (58.4)	32 (41.5)	77 (14)	
High School	39 (37.1)	84 (62.9)	123(22.4)	
Symptoms of anaemia				
Yes	207 (69.9)	89 (30.0)	296 (53.8)	<0.0001
No	142 (55.9)	112 (44.0)	254 (46.2)	
Total	349 (63.5)	201 (36.5)	550 (100)	
Type of diet				
Vegetarian	107 (66.5)	54 (33.5)	161 (29.3)	0.34
Non vegetarian	242 (62.2)	147 (37.8)	389 (70.7)	
Age of menarche/menses				
<14	224 (77.8)	64 (22.2)	288 (88.9)	0.01
≥14	21 (58.3)	15 (41.7)	36 (11.1)	
Menstruation bleeding (in days)				
<5	97 (65.5)	51 (34.5)	148 (45.7)	<0.001
≥5	148 (84)	28 (15.9)	176 (54.3)	
BMI				
Underweight (<18.5)	194 (64.9)	105 (35.1)	299 (54.4)	
Normal (18.5-24.9)	147 (63.9)	83 (36.0)	230 (41.8)	
Overweight	8 (38.0)	13 (61.9)	21 (3.8)	

Association of anemia with mother's education: it was seen that a statistically significant association was found between mothers education and prevalence of anemia ($p=0.001$), highest prevalence of anemia was seen among adolescent girls whose mothers were illiterate (82.1%) and whose mothers were educated up to primary(64.6%). association of anemia with symptoms, it was seen that highly statistically significant association was found between them. The prevalence of anemia was seen higher among adolescent girls who were having symptoms of anemia (69.9%) as compared to who did not have symptoms (55.9%). Prevalence of anemia was higher among who were vegetarian by diet (66.5%) as compared to non vegetarian by diet (62%) which was not significant. This may be because in India poor bioavailability of dietary iron along with low intake of heme iron from animal food is the major cause for anemia. Significant association of prevalence of anemia with age of menarche was found ($p=0.01$), prevalence of anemia was found in adolescent girls whose age of menarche was <14 years (77.8%) as compared to >14 years. Prevalence of anemia was seen higher (84%) among adolescent girls who had menstrual bleeding days of >5 as compared to <5day (65.5%) and it was seen statistically significant ($p=<0.001$). Significant association of prevalence of anemia with BMI was seen among adolescent girls who were underweight (64.9%) as well as who had normal BMI (63.9%)

Discussion

The prevalence of Anemia was seen higher among adolescent girls residing in rural area (70.2 %) as compared to urban area (56.7%) whereas the total prevalence found to be 63.5% in this study. A study conducted by **Srivastava A et al (2016)**⁹ at Amroha, Uttarpradesh found a prevalence of (69.2%) which is slightly higher than the prevalence in our study. In

contrast to this study, **Kumari C et al (2019)**¹⁰ found a lower prevalence (48.63 %) among adolescents girls in Tamilnadu. According to **NFHS-4**¹¹, the overall prevalence of anemia in 15-19 years age group is (46.4%). The study of **Mohan CR et al (2019)**¹² in rural area of Tumkur among adolescent girls showed prevalence of (74.52%) which is higher than our study. Comparing the severity of anemia, the prevalence were (53.9%), (44.0%) & (4%) for mild, moderate and severe anemia in rural adolescent girls and it was found to be (46.8%), (52.6%), (0.6%) for urban areas respectively. A study conducted by **Goyal N et al (2018)**¹³ in rural and urban school adolescent girls Haldwani found that 34.53% of adolescent girls were mild anemic, 10.3% were moderate anemic and 3.52% were severe anemic. Similar finding was found by study done by **Shedole DT et al (2017)**¹⁴, Devangere, Karnataka and **Arya A K et al (2017)**¹⁵ in urban slum of Kanpur. Prevalence of anemia in our study was higher as compared to other study, it may be because socio-cultural factor and different types of diagnostic tools.

There is a deep impact of socio-demographic characteristics on anemic status of adolescent girls. The prevalence of anemia were significantly higher (76.2%) among adolescent girls who belonged to the age group of 14-16 years as compared to (71.7%) among 17-19 years and (54.2%) among 10-13 years ($p=0.0001$). Similar results were seen in the study conducted by **Sharma ML et al (2017)**¹⁶ in Punjab, **Melwani et al (2018)**¹⁷ in urban slums of Bhopal city and **Gupta V et al (2017)**¹⁸ in rural population of Rajnandgaon, Chhattisgarh.

In our study the prevalence of anemia was higher (65.5%) among Hindu. Similar study were conducted by **Bhise JD et al (2017)**¹⁹ in rural area of Maharashtra and **Arya AK et al (2017)**¹⁵ in an Urban slum of Kanpur UP. The prevalence of anemia was

seen higher (65.6%) among adolescent girls who belonged to nuclear family as compared to the joint family (54.6%) and this was found statistically significant ($p=0.03$). Similar results were seen in study conducted by **Gupta V et al (2017)**¹⁸ in rural population of Rajnandgaon, Chattisgarh. **Arya AK et al (2017)**¹⁵ in Urban slum of Kanpur U.P, **Bhise JD et al (2017)**¹⁹ in a rural adolescent girls of Maharashtra.

Prevalence of anemia was seen higher (66.6%) among adolescent girls who belonged to upper/ upper middle class. A study done by **Gupta V et al (2017)**¹⁸ in rural population of Rajnandgaon, Chhattisgarh, **Nair AS et al (2019)**²⁰ et al rural area Tamil Nadu. **Kulkarni VM et al (2012)**²¹ in urban slum of Nagpur. The contrasting results in the present study with other studies may be as most of the studies conducted in various parts of India show the higher prevalence in lower socio-economic categories compared to upper categories. But in our study prevalence is comparatively lesser in lower socio-economic group this may be due to iron and folic acid supplementation through peripheral health institutions and in govt. schools which were better utilized by lower socio-economic groups than higher socio-economic groups. Father's education has a beneficial effect on adolescent anemia as it was revealed from the study that the prevalence were lower (70%) in educated father than illiterate father (82%), which was also found to be statistically significant. ($p<0.001$). This may be due to better awareness of educated parents. Similar study conducted by **Arya AK et al (2017)**¹⁵ in urban slums of Kanpur found majority (79%) of adolescent girls were anemic whose fathers were illiterate, then primary (78.8%), which was not statistically significant. The study conducted by **Shrivastava A et al (2016)**⁹ rural field practice area of Amroha U.P found significant association between father's education of adolescent girls and prevalence of anemia. Prevalence of anemia was seen higher (74%) among adolescent girls whose fathers were educated up to primary. Mother's education has a positive impact too on adolescent anemia. It was seen that a statistically significant association was found between mothers education and prevalence of anemia ($p=0.001$), with highest prevalence of anemia was seen among adolescent girls whose mothers were illiterate (82.1%) and whose mothers were educated up to primary (64.6%). Similarly the study conducted by **Bhise JD et al (2017)**¹⁹, in rural area of Maharashtra, found prevalence of anemia was higher (88.8%) among adolescent girls whose mothers were Illiterate or who studied till primary but it was not statistically significant. In other the study conducted by **Shinde M et al (2015)**²² in urban area of Madhya Pradesh found significant association with anemia prevalence was found higher (68.9%) among adolescent girls whose mothers were illiterate.

Dutt R et al (2009)²³ in rural area of Raigad District, Maharashtra found higher prevalence in adolescent girls who had symptoms of anemia but it was not

statistically significant. Similar results were observed in our study with statistically significant higher prevalence (69.9%) in symptomatic anemic than asymptomatic adolescent girls (55.9%). The bioavailability of non-haem iron is poor owing to the presence of phytates, oxalates, carbonates, phosphates and dietary fiber which interfere with iron absorption [park]²⁴. This truly reflected by higher prevalence among study subjects with vegetarian diet (66.5%) as compared to non vegetarian diet (62%) but it was statically insignificant. In presence of poor bioavailability of dietary iron, low intake of haem iron from animal food results in more cases of anemia. Studies conducted by **Goyal N. et al (2018)**¹³ and **Agrawal A et al (2018)**²⁵ in Adolescent Girls showed higher prevalence of anemia in vegetarians (52.6% and 56.3% respectively) compared to non-vegetarians, however the results were statically insignificant. Significant association ($p=0.01$) of prevalence of anemia (77.8%) was found in girls with menarche age less than 14 years. This is in accordance with the study conducted by **Kulkarni VM et al (2012)**²¹ in urban slum of Nagpur who found prevalence of anemia was higher (92.2%) among adolescent girls who had attained menarche before 14 years.

Prevalence of anemia was seen higher (84%) among adolescent girls who had menstrual bleeding days of >5 as compared to <5 day (65.5%) and it was seen statistically significant ($p=<0.001$). This may be due to excessive blood loss due to increased bleeding days. Similar results were found in a study conducted by **Mengistu G EL AL (2019)**²⁶ in Rural area of North Ethiopia where they found 2.4 times more anemia among adolescents with >5 days of menstruation. The study conducted by **Pattnaik et al (2015)**²⁷ in rural area of Odisha, found prevalence of anemia was higher (89.4%) among adolescent girls who had heavy menstrual flow.

Our study showed significant association of prevalence of anemia with BMI among adolescent girls who were underweight (64.9%) as well as who had normal BMI (63.9%) however **Melwani V et al (2018)**¹⁷ and **Srinivas V et al (2015)**²⁸ did not reported significant association between the prevalence of anemia and BMI in their study.

CONCLUSION

A descriptive cross sectional study carried out in field practice areas of Department of Community Medicine, S.G.R.R.I.M.& H.S. The study was undertaken to find out the prevalence of anemia, severity of anaemia and other correlates of anaemia among adolescent girls.

PREVALENCE OF ANAEMIA AMONG ADOLESCENT GIRLS

- Overall prevalence of anaemia among adolescent girls was (63.5%). In rural area the prevalence was (70.2%) and in urban area (56.7%).
- In rural area the prevalence of mild anaemia

(53.9%), moderate anaemia (44%) and severe anaemia (2.1%) whereas in urban area the prevalence of mild anaemia was 46.8%, moderate anaemia (52.6%) and severe anaemia (0.6%)

- Prevalence of anaemia was seen higher among adolescent girls who was in the age group of 14-16 years (76.2%) , 17 -19 years (71.7%) and 10-13 years (54.2%).
- Maximum adolescent girls were anaemic who belonged to Hindu religion (65.5%) and who belonged to the nuclear family(65.6%).
- Maximum of girls were anaemic who had family size <4 (76.9%).
- Most of the girls were anaemic who belonged to upper/upper middle class and middle class (66.6%) and (66.2%) respectively.
- Most of the adolescent girl were anaemic whose fathers were illiterate (82%) and educated upto primary (70.5%).
- Maximum of adolescent girls were anaemic whose fathers were unemployed workers (76%), whose mothers were illiterate(82.1%).
- Majority of the adolescent girls were anaemic who were vegetarian by diet (66.5%) , whose age of menarche was <14 years (77.8%). were having menstrual bleeding days >5 (84%), who were underweight (BMI <18.5) (64.9%).

RECOMMENDATION

The study concludes that the prevalence of anemia among adolescent girls were high in India as well as in Uttarakhand which requires concerted efforts by all the stakeholders, policy makers, planners involved in National Health Policy. Special emphasis on proper implementation of intervention programs such as iron and folic acid supplementation, prevention and control of worm infestation and health education about prevention of anemia. Specific information, education and communication to improve the knowledge on anemia among adolescent girls in community regarding healthy nutritional practices can also contribute towards reducing the prevalence of anemia.

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