Prevalence and determinants of Anaemia among Adolescent Girls in slums of Kanpur Nagar: A community-based cross-sectional study

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Abstract

Introduction: Adolescence is very crucial phase of life because these are those formative years of the life of an individual when marked physical, psychological and behavioural changes takes place. More than 243 million adolescents reside in India, which account for one fourth of the country's total population. In UP there are 12.9% adolescents in age group of 10-14 years and 11.5% in 15-19 years, among which the majority are girls. Anaemia account for one of the leading causes of morbidity and mortality among the adolescent girls.

Objectives: 1. To find out the prevalence of anaemia among adolescent girls.
2. To study the bio-social and other determinants of anaemia.

Materials and Method: A community based cross-sectional study was carried out among adolescent girls (10-19 years) in slums of Kanpur Nagar, using 30 cluster sampling technique. From each slum, 13 subjects were studied, thus giving a total sample size of 390. A pre-designed and pre-tested questionnaire was used to elicit the required information from the study subjects. Haemoglobin estimation by Sahli's method was done. Percentages, Chi square test and SPSS software was used for the analysis of data.

Results: The mean age of study population was 13±2years. Anaemia was found in 71.79% of adolescent girls. About 64.1% of anaemic girls belonged to early adolescent (10-14 years) age group whereas 41.1% of the anaemic girls were in late adolescent (15-19 years) age group. Mild anaemia was the most prevalent type in the study subjects i.e. 41.28% while moderate and severe anaemia was present in 23.59% and 6.92% respectively. Prevalence of anaemia was most common (73.82%) in the Social class V. Association of anaemia with social class was statistically significant. Anaemia was higher in adolescents who have attained menarche. Anaemia was also found significantly associated with dietary habits.

Conclusion: 71.79% of adolescent girls were found to be anaemic, with mild anaemia being most common followed by moderate and severe anaemia. Prevalence of anaemia was more in study subjects belonging to early adolescent age group, joint families and lower social class.

Keywords: Anaemia; Prevalence; Adolescent girls; Early adolescents; Late adolescent; Slum.

Introduction

Disease and life has almost gone hand in hand ever since the advent of human civilization. A disease is a particular abnormal condition, a disorder of a structure or function that affects part or all of an organism. Disease is often constructed as a medical condition associated with specific symptoms and signs. Disease can broadly be classified as communicable and non-communicable. Among the burden of non-communicable diseases in the society ANAEMIA is a major contributor especially among adolescent girls.

Anaemia is defined as "a condition in which the number and size of red blood cells, or the haemoglobin concentration, falls below an established cut-off value, thereby impairing the capacity of the blood to transport oxygen inside the body. It is an indicator of both poor nutrition and poor health".[1]

Iron deficiency which leads to anaemia reduces individuals' well-being, leads to fatigue and lethargy, and hampers the physical and working capacity. Median losses in physical productivity of an individual due to iron deficiency are important.

Among the Worlds' leading risk factors for death and disability adjusted life year (DALY) anaemia stands on the nineteenth position and is a remarkable indicator of poor nutrition with major consequences for health, social and economic development of a country.[2] Nutritional anaemia, which is one of the major public health problem in India affects almost 90% poor children, adolescent girls and women, and is considered as "female disease" "causing red alert for Indian women".[3]

Anaemia in adolescents is a significant health problem in developing countries and is one of the main cause of increased maternal mortality rate in India. Anaemia, which is manifested as frequent episodes of fatigue and decrease in working efficiency of an individual, is the most widely prevalent form of malnutrition among adolescents.

Adolescent girls are highly susceptible to anaemia on account of biases against females, inadequate diet, and practice of early marriage. In families with financial constraints, the female child is more likely to be neglected. The increasing magnitude of anaemia in adolescent girls may also be due to poor iron intake or diet which is typically cereal based having poor bio-availability of iron. It may also be attributed to infections like malaria, hookworm infestation and blood loss during menstruation.

Anaemia in adolescent girls, is responsible for irregular periods, miscarriages, stillbirths, premature births, low birth weight babies and death of the mother during child birth. When these adolescents become future mothers, anaemia leads to slow foetal growth and low birth weight.

Worldwide, the prevalence of anaemia fell by 12% between 1995 and 2011. It decreased from 33% to 29% in non-pregnant women and from 43% to 38% in pregnant women. The above data shows that progress is possible but at present it is insufficient to meet the set goals. It is therefore of utmost need that all the countries review their national programmes and policies, infrastructure and resources and try to implement steps and strategies for the prevention and control of anaemia. The World Health Organization (WHO) has published recently revised guidelines that support programmes and policies for the prevention and control of anaemia.[4]

India is home to more than 243 million adolescents, who account for a quarter of the country's population. Population of adolescents between 10-14 years & 15-19 years comprises of 10.5% and 10.3% respectively of the total population of India, out of which the female adolescents account for 10.3% and 9.8% respectively.[5]

A programme of weekly iron-folic acid supplementation for adolescent girls was piloted in 52 districts of 13 states in India. The programme catered to both school-attending and non-attending girls of adolescent age group (10-19 years). Analysis and evaluation of the pilot programmes showed a 24% decrease in the magnitude of anaemia after 1 year of its implementation.[6]

The urban poors who mainly reside in slums, constitute about a quarter of India's 285 million total urban population. Uttar Pradesh, the most populous Indian state, with nearly 11 million urban poor, houses the largest number of urban poor in a single state. United Nation Development Program's (UNDP) Urban Poverty Report, 2009 has pegged the number of slum dwellers in Uttar Pradesh at 44 lakhs.[7]

Further, the prevailing economic situation in the slums dwellers force them to be on poor quality diet, thereby predisposing them to anaemia. Therefore the current study was carried out to assess the prevalence of anaemia and study the bio-social and other factors associated with anaemia among Adolescent girls of slum area of Kanpur Nagar.

Material and Method

Research setting: The study was done in Kanpur city, which is located in Central-East part of Uttar Pradesh. The population of the city is 4.6 million (Census 2011). There are 380 identified slums in Kanpur city.

Study design: The present study was a Community based, Cross sectional study.

Study Population: Adolescent girls in the age group of 10-19 years residing in selected slums of Kanpur.

Inclusion criteria: All the study subjects not less than 10 years and not more than 19 years of age were included in the present study.

Exclusion criteria: Adolescent girls who were not willing to participate in the study.

Approval for the study was taken from the Institute's ethical committee. All the study subjects were explained the purpose of study and their consent was taken for the same.

Study period: The study was carried out in a period of one year from November 2014 to November 2015.

Sample size- The minimum sample size was calculated as 379 using the formula

(n) = $Z^2_{\alpha/2}$ P Q / d^2, taking the value of "P" i.e. prevalence of anaemia in adolescent girls[15] 56%, an allowable error of 5% and level of significance as 5%. Sample size was rounded off to obtain a number completely divisible by 30, thus giving a sample size of 390.

Sampling technique: 30 cluster sampling technique of WHO was used to carry out the current study. The study was undertaken in 30 slums, selected from 380 identified slums of District Kanpur. From each slum, 13 subjects were studied thus giving a total sample size of 390. The first house in a cluster was selected by going to the centre of a cluster, spinning a pencil, and selecting the first house in the direction of the pencil. Each next household was selected sequentially until a total of 13 eligible study candidates in the age group 10-19 years were covered. During the survey if there were more than one adolescent girl found in a house, then the youngest girl was taken for the study.

Tools of data collection: Data was collected from adolescent girls using predesigned and pretested questionnaire including questions on general information and specific information required for the study.

Blood samples of the study subjects from the field was collected and the haemoglobin estimation was done using Sahli's Haemoglobinometer. Anaemia was graded using WHO classification.[8]

WHO* Classification of Anaemia

Grades of anaemia*	Hb Range (gm%)
Mild	10-11.9
Moderate	7-9.9
Severe	<7
Total	

* according to WHO (2011)

Data Processing and Analysis: The information gathered from the study subjects was tabulated according to pre-designed classified tables. Data was analysed on the basis of defined aims and objectives.

Quantitative analysis of data was done using percentages and Chi-square tests. And SPSS 20 version was also used for drawing out conclusions.

Results

A total of 390 Adolescent girls (10-19 years) were studied. Out of these, 317 (81.28%) belonged to early adolescent (10-14 years) age group and 73(18.72%) belonged to late adolescent (15-19 years) age group. As per WHO classification, 280 (71.79%) subjects had Anaemia. Of the 280 study subjects mild anemia was the most prevalent type in the study subjects i.e. 41.28% while moderate and severe anemia was present in 23.59% and 6.92% respectively. **(Table 1)**

Table 1: Distribution of study participants according to grades of anaemia

Grades of anaemia*	Study participants	
	Number	%
Mild	161	41.28
Moderate	92	23.59
Severe	27	6.92
Total	280	71.79

*according to WHO (2011)

Adolescent girls in the 10-14 years age group constituted higher number of anaemic cases i.e. 250 followed by 30 in the 15-19 years age groups. The prevalence of anemia was more in the age group 10-14 years (64.1%) as compared to 15-19 years (41.1%). And this difference was statistically significant.**(Table 2)**

Anaemia was found to be more common in joint type of families i.e. 90.48% compared to nuclear families (59.75%) and this association was also found to be statistically significant.**(Table 2)**

Prevalence of anaemia was maximum in social class V, with 73.82% girls being anaemic and minimum in social class II, with only 57.15% girls being anaemic. And in social class IV and III prevalence of anaemia was found to be 70.27% and 66.66% respectively. There were no study subjects who belonged to social class I. Prevalence of anaemia decreased as the economic condition of the study subjects improved. **(Table 2)**

Table 2: Socio-demographic correlates of anaemia

Age (years)	Total	Anemia	
	No.	No.	%
10 to 14	317	250	64.1
15 to 19	73	30	41.1
Total	390	280	71.79
$\chi^2 = 34.632$, C.I. = 95%, d.f. = 1, $p < 0.05$.			

Type of family	Total	Anaemia	
	No.	No.	%
Nuclear	246	147	59.75
Joint	144	133	90.48
Total	390	280	71.79
$\chi^2 = 46.088$, C.I. = 95%, d.f.= 1, $p < 0.05$.			
Social Class*	Total	Anaemia	
	No.	No.	%
II	7	4	57.15
III	39	26	66.66
IV	111	78	70.27
V	233	172	73.82
Total	390	280	71.79
$\chi^2 = 1.848$, C.I. = 95%, d.f.= 3, $p < 0.05$			

*According to modified B.G. Prasad socio-economic classification

In our study out of the 201 study subjects who have attained menarche 79.6% were anaemic and of the 189 study subjects who didn't attained menarche only 63.49% were anaemic and this association was found to be statistically significant. **(Table 3)**

Of all 183 study subjects were on vegetarian diet and 207 took mixed diet. Anaemia was more prevalent on study subjects on vegetarian diet i.e. 79.23% compared to those on mixed diet i.e. 65.22%. Thus anemia was significantly associated with dietary habits. **(Table 3)**

Table 3: Association of anaemia with menarche and dietary habits

Menarche	Total	Anaemia	
		Present	Total
Attained	201	160	79.6
Not attained	189	120	63.49
Total	390	280	71.79
$\chi^2 = 8.316$, C.I.= 95%, d.f.= 1, $p < 0.05$			
Dietary habits		Anaemia	
	Total	Present	Total
Vegetarian	183	145	79.23
Mixed diet	207	135	65.22
Total	390	280	71.79
$\chi^2 = 8.745$, C.I. = 95%, d.f. = 1, $p < 0.05$			

Finally multivariate logistic regression model showed that the important correlates of anaemia among the bio-social factors were early adolescent age group and joint type of families as the findings were found to be statistically significant. But the social-class was not statistically related with anaemia. Among other factors, attainment of menarche and vegetarian dietary habits were also found to be statistically related to prevalence of anaemia as they were also found to be statistically significant. **(Table 4)**

Table 4: Correlates of anaemia among adolescent girls-a multivariate logistic regression model

Variables		Odds Ratio	95% confidence interval for Odds ratio		Significance
			Lower bound	Upper bound	
Age (years)	10 to 14	4.5	2.4	8.5	p<0.05
	15 to 19	1	-	-	
Type of family	Nuclear	1	-	-	p<0.05
	Joint	7.1	3.4	14.9	
Social Class	II	0.3	0.1	2.2	p>0.05
	III	0.9	0.4	2.1	
	IV	0.9	0.5	1.7	
	V	1	-	-	
Menarche	Attained	4.7	1.8	11.8	p<0.05
	Not attained	1	-	-	
Dietary habits	Vegetarian	0.3	0.1	0.9	p<0.05
	Mixed diet	1	-	-	

Discussion

The prevalence of anaemia in our study was found to be 71.89%. A very high prevalence of anaemia in this study could be attributed to lower socio-economic status and nutritional deficiencies found in adolescent girls of slum areas. Similar results were corroborated in the studies of Lamba R et al,[9] SWACH Foundation,[10] ICMR (Toteja et al),[11] Kotecha et al[12] and Srinivas V et al[13] who reported the prevalence of anaemia to be 65.3%, 81%, 90.1%, 74.7% and 78.3% respectively. Among the adolescent girls having anaemia 41.28% had mild anaemia, 23.59% had moderate anaemia and 6.92% had severe anaemia. Study from Tamil Nadu by Rajaratnam et al[14] reported prevalence of mild, moderate and severe anaemia to be 36.5%, 6.3% and 2.1% respectively. Similarly Kotecha et al[12] in their study in Vadodara district reported the prevalence of mild anaemia to be 58%, moderate anaemia to be 15.1% and severe anaemia to be 1.6% in adolescent. Also NFHS 3 (2005-06)[15] reported mild anaemia being the most common (39.1%) among adolescent girls with moderate anaemia being 14.9%.

In our study, the prevalence of anaemia was highest (64.1%) in the age group of 10-14 years compared to 41.1% in age group of 15-19 years, and this difference was found to be statistically significant both on univariate and multivariate logistic regression. This may be due to the reason that adolescent girls in the age of early adolescence experience onset of menarche and the menstrual cycles are irregular and more amount of blood is lost during this period while cycles get periodic in later ages, and also due to high prevalence of under-nourishment in early adolescent girls. A similar finding was observed in ICDS Impact Study PMPSU SPC 2009[16] where the prevalence of anaemia was more in early adolescents compared to late adolescents.

Whereas in a study on Prevalence of Anaemia among Adolescent Girls by Shilpa S et al[17] the prevalence of anaemia among the late adolescents came out to be 60%, as compared to 38.9% among the early adolescents.

In our study a significant association between anaemia and socio-economic classes was found in univariate analysis, with anaemia being more prevalent in lower socio-economic class (73.82%). This finding is corroborated in the study of Shilpa S et al,[17] Muzammil K. et al[18] and Kaur S. et al.[19] But multinvariate logistic regression model showed that there was no statistically significant association between anaemia and socio-economic classes.

Anaemia was found more prevalent in joint families in our study. It may be due to lack of resources and financial constraints, which put them on poor quality diet.

Anaemia was also significantly associated with the attainment of menarche both in univariate and multivariate logistic regression in our study. Study by Chaudhary SM. et al[20] also showed similar statistical significant association. However in a study by Gupta A et al[21] statistical significant association between anaemia and attainment of menarche was found only in univariate analysis and not in multivariate logistic regression.

In our study anaemia was more common in subjects on vegetarian diet (92.77%) than on mixed diet (65.23%). This may be due to presence of rich iron stores in mixed diet. And this association between type of diet and anaemia was found statistically significant both in univariate and multivariate logistic regression.

Conclusion

Prevalence of anaemia was 71.79%. It was more in early adolescents (10-14 years) as compared to late adolescent (15-19 years) girls. Prevalence of anaemia was also more in study subjects belonging to joint families and lower social class. Anaemia was also

associated significantly with vegetarian diet and attainment of menarche.

Recommendations

Here in through our study we have tried to bring to light the statistical analysis of distribution of anaemia in adolescent girl on basis of which we can but forth certain recommendations. Programmes being currently run to combat iron deficiency anaemia like weekly iron and folic acid supplementation should be properly monitored and strengthened. Aggressive involvement of teachers, parents, NGO's, social activists for the planning and implementation of welfare programmes for adolescent girls is needed. Education regarding adequate nutrition of adolescent girls and proper diet should be reinforced. PPP (public private partnership) should be involved in health sector to bring marked improvement in health status of adolescent girls.

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