

SHORT ARTICLE

Relationship of anaemia and morbidities among children aged 5-14 years in a resettlement area, DelhiPankaj Motilal Kasdekar¹, Josyula Prasuna², Anika Sulania³, Sanjeev Kumar Rasania⁴, Nidhi Dwivedi⁵¹Taluka health officer, Amravati, Maharashtra, India, ²Professor, Department of Community Medicine, Lady Hardinge Medical College, New Delhi, India, ³Senior Resident, Department of Community Medicine, North MCD Medical College, New Delhi, India, ⁴Director Professor and Head, Department of Community Medicine, Lady Hardinge Medical College, New Delhi, India, ⁵Assistant Professor, Department of Community Medicine, North MCD Medical College, New Delhi, India.

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Corresponding Author

Address for Correspondence: Dr Anika Sulania, Senior Resident, Department of Community Medicine, North MCD Medical College, New Delhi, India.
E Mail ID: ani.sulania@gmail.com

Citation

Kasdekar PM, Prasuna JG, Sulania A, Rasania SK, Dwivedi N. Relationship of anaemia and morbidities among children aged 5-14 years in a resettlement area, Delhi. Indian J Comm Health. 2015; 27, 2: 270-275.

Source of Funding : Nil **Conflict of Interest:** None declared

Article Cycle

Submission: 05/03/2015; **Revision:** 10/06/2015; **Acceptance:** 11/06/2015; **Publication:** 30/06/2015

Abstract

Background - The future of any nation rests on its children -it's would be citizens. In India total numbers of children (Below 18 years) are about 400 million. The WHO Global Burden of Disease Project estimates that malnutrition, which includes micronutrient deficiencies including anaemia also, is the leading risk factor for child mortality in low-income and middle-income countries including India. **Aims & Objectives:** To find the prevalence of anaemia and relationship of anaemia and various common morbidities among children aged 5-14 years in Khichripur, Delhi. **Methods:** A Community based cross-sectional study. Expected number of children in the age group of 5-14 years in Khichripur were 7000, and 10% of the expected 5-14 years children was decided as sample size. Ten percent of the houses in each block were covered by probability proportionate sampling .The first house in each block was located randomly and then subsequent houses were taken by systematic random sampling. Haemocue photometer was used to assess the anaemia. **Results:** Prevalence of anaemia was found to be 64%. Proportion of children having mild, moderate and severe anemia was found to be 49.3%, 13.4% and 1.3% respectively. Morbidities are increasing proportionality with the severity of anaemia. **Conclusion:** Anaemia among school age children requires attention as this has long term implications on the child's physical growth, scholastic performance and further developmental progress into Adolescents, hence correcting micronutrient deficiency requires a multidimensional approach.

Key Words

Anaemia; Comorbidities; Physical growth; micronutrient deficiency; Underweight

Introduction

The success of child survival programs and the expansion of basic education coverage have resulted in a greater number of children reaching school-age with a higher proportion actually attending primary school. However, there is increasing evidence, resulting international concern, that the high level of nutritional deprivation combined with the heavy

burden of disease in this age group has negative consequences for a child's long term development. This has prompted an increased focus on the diverse needs of the school-age child. While a better picture of the health and nutrition status of this age group is being built, the true extent of the burden of ill health and malnutrition is still not fully known (1). The main nutritional problems facing the school-age child include stunting, underweight, anaemia and iodine

deficiency and, on the basis of information from recent surveys, vitamin A deficiency.

World Health Organization (WHO), has defined Anaemia as “a condition in which the number of red blood cells (RBCs) or their oxygen-carrying capacity is inadequate to meet physiologic demands of the body, which vary by sex, age, altitude, smoking, and pregnancy status” (WHO, 2010) (2).

The Global Database on Anemia has estimated anemia affects approximately 1.62 billion people worldwide, which corresponds to 24.8% of the world’s population (WHO, 2008a) (3). Iron deficiency anemia (IDA) is the most widespread micronutrient deficiency in the Western Pacific region, with prevalence of 23.1, 30.7 and 21.5% amongst preschool children, pregnant women and non-pregnant women, respectively (WHO, 2008b) (4).

According to National Family Health Survey, Indian children suffer from weight loss, stunted growth and wasting, which is higher than any other country in the world, and 7 out of every 10 young children are anemic (5).

For adolescent children, anemia is significant public health problems which cause harmful effect on physical growth, morbidity, cognition, and reproduction. Moreover, anaemia during adolescence influences women’s entire life cycle. Investing in health and nutrition of school age children, promoting their scholastic performance through healthy environment and lifestyle can bring the nations in alignment with the millennium development goals. Keeping this in mind the present study is planned

Aims & Objectives

To study the magnitude and pattern of morbidities among children aged 5-14 years and its relationship with Anemia in Khichripur, Delhi.

Material and Methods

The study was community based cross-sectional study conducted in children in the age group of 5-14 years in Khichripur, a resettlement colony of East Delhi in India. The study was carried out between November 2010 to March 2012 with data collection period from January 2011 to December 2011. Sample size came out to be 869 after taking 65% of prevalence based on review of literature, and taking allowable error 5% and confidence interval 95%.

The area consists of ten blocks numbered 1 to 10. Study subjects in each block were covered by probability proportionate sampling to obtain the

desired sample size for the study purpose. The first house in each block was located randomly and then subsequent houses were taken by systematic random sampling. All blocks were covered. When more than one child was found in a house all children were enrolled for the study. A semi-structured interview schedule was designed, pretested for data collection. Detailed sociodemographic information was collected, which includes-Number of members, their age and sex, literacy of parents, socio-economic status of family, type of family, and their religion and general information about child includes age and sex of the child, schooling status, nutritional status parameters like height, weight, body mass index were collected and calculated. A detailed examination of the children was done and Haemoglobin was ascertained by Haemocue Photometer after taking informed consent from the parents or the guardian of the child. The readings were recorded, and grading of haemoglobin status was done using WHO criteria for grading of anaemia (6) in children. The study was cleared by the ethical committee of the institution.

Results

Of total 869 children were screened out of which only 830 subjects were finally included in the study because 8 boys and 31 girls did not give consent. The proportion of boys and girls in the study population were found to be almost equal, 50.5% and 49.5% respectively. Proportion of children in each age group varies from 18.9% to 21.3%. Proportion of children in the age group of 5-9 years is 48.3% (pre-adolescent) compared to the proportion of children in the age group of 10-14 years which is 51.7% (early-adolescent) almost equal ([Table 1](#)).

Prevalence of anaemia with grading: Prevalence of anaemia was found to be 64%. Proportion of children having mild and moderate anaemia was 49.3% and 13.4% respectively. 11 children (1.3%) were found to be having severe anemia. All grades of anaemia mild, moderate and severe were higher in girls compared to that of boys. Proportion of girls having mild anaemia was 63.6% compared to 36.4% boys. Proportion of girls having moderate anaemia was 81% compared to 19% in boys. All the cases of severe anaemia were girls. This difference was found to be statistically significant ($p < 0.05$) as shown ([Table 2](#)). When the mean haemoglobin was studied in relation with the age and sex it was observed that mean haemoglobin varies from 12.16 ± 0.76 gm% to $12.37 \pm$

0.65 gm% in boys and 10.47 ± 1.31 gm% to 11.08 ± 0.63 gm % in girls. Whereas the grand mean haemoglobin for considered age group of boys and girls was observed to be 12.29 ± 0.77 and 10.69 ± 1.07 gm% respectively as shown by error bars diagrams ([Figure 1](#)).

Changes in anaemia status: ANOVA test analysis ([Table 3](#)) shows the significant effect of the study [$F(814, 2) = 437.75$, $p < 0.05$] and that is variation between the anaemia statuses is statistically significant. The Variation between normal and mild [$F(294,408) = 0.87$, $P\text{-value} = 0.19$, $95\% \text{ CI} = 0.71\text{-}1.08$] is not statistically significant. However variation is found to be significant between normal and moderate (including severe group) anaemia status with $F[294,109] = 0.4885$, $P\text{-value} = 0.0002$, $95\% \text{ CI} = 0.71\text{-}1.08$. And finally the variance between moderate (Severe is included) and mild with $F[109,408] = 1.78$, $P\text{-value} = 0.0006$, $95\% \text{ CI} = 1.34\text{-}2.44$ is also found to be statistically significant.

Relationship of Anaemia with other morbidities: On observing anaemia with other morbidities it was found that as the severity of anaemia is increasing the proportion of morbidity seen is also increasing. All children with severe anaemia had other morbidities. The difference was found to be highly significant ($p < 0.0001$) ([Table 4](#)) Anaemia is taking the highest proportion of morbidity in girls while it was malnutrition in boys. Dental caries, Diarrhoea and injury is higher in boys as compared to girls ([Figure 2](#)).

Discussion

The success of child survival programmes and the expansion of basic education coverage resulted in a greater number of children reaching school age with a higher proportion actually attending primary school. However, there is increasing evidence, with resulting international concern, that the high level of nutritional deprivation combined with the heavy burden of disease in this age group has negative consequences for a child's long term development. This has prompted an increased focus on the diverse needs of the school-age child. The study of anaemia and other morbidity pattern may provide a clear and in depth idea about the problems in childhood age group. An attempt to paint a picture of nutritional status and morbidity status in school aged children in Delhi has been made in this study.

The proportion of boys and girls in the study population were found to be equal, 50.5% and 49.5%

respectively Proportion of children in each age group varies from 18.9% to 21.3%.

Prevalence of anaemia was found to be 64 % ([Table 2](#)). The prevalence of anaemia in the other studies Rema N. *et al* (7), Bhoite R. *et al.* (8), Handa R. *et al* (9), Verma A *et al* (10), Al-Othaimen A, *et al* (11), Ananthkrishnan S *et al* (12), varies from 26% to 81.8%. The prevalence of anaemia is higher in girls as compared to boys in all of the studies, this finding was similar to the findings in present study, the prevalence of anaemia was higher in girls (83.9%) compared to boys (38.7%). But the proportion of anaemic children in the present study was 64%, this was found to be lesser than some studies and higher than some studies. Grand mean haemoglobin of boys and girls was observed to be 12.29 ± 0.77 and 10.69 ± 1.07 gm. % Proportion of children having mild and moderate anaemia was 49.3% and 13.4% respectively. 11 children (1.3%) were found to be having severe anaemia. ([Table 2](#)). Chakma T *et al* (13) reported in a school based study among school going children (6-14 years) of Baiga, Abuihmadia and Bharia tribes of Jabalpur Madhya Pradesh observed that 30.3% of the children had severe anaemia ($\text{Hb} < 7\text{g/dl}$). The variation could be due to the difference in the settings, age group studied and diagnostic criteria applied and investigations done in these studies.

The relation between anaemia and morbidities was studied. It was found that as the severity of anaemia increase the proportion of morbidity also increases. All children with severe anaemia had other co-morbidities. This may be due to the fact that anaemic children become susceptible to secondary infections. ([Table 4](#), [Figure 2](#))

The top six morbidities in boys were malnutrition (50.3%) followed by anaemia (38.7%), injury (38.6%), and diarrhoea (38.5%), and worm infestations (27.1) and caries (28.9%) in that order. The top six morbidity found in girls was anaemia (83.9%), malnutrition (66.7%), diarrhoea (33.7%), injury (33.3%), worm infestation (29.1%) and refractive errors (28.8%). The proportion of girls having morbidity when anaemia excluded was reduced by 29.2% and the proportion of boys having morbidities excluding anaemia was reduced by 10.8%. The pattern of morbidities as seen in boys and girls was that the proportion of girls with one or more than one morbidities was nearly double compared to that of boys. This indicates that there is a significant association between morbidities among boys and

girls. (Table 4). Findings of our studies are comparable to other studies Dambhare D G *et al* (14), in a study among the school going adolescents (10-19) in peri-urban area of Wardha, found 51.7% was underweight, 28.45% anaemic, with girls suffering significantly more, dental caries was found in 35.3%, 13.8% were suffering from refractive error. 7.7% with worm infestation. 6.9% had skin problems. 2.5% had tonsillitis and 2.5% had wax in the ear. Shakya S R *et al* (15) in a cross-sectional study among five primary school children in eastern Nepal observed that the most common morbidity was parasitic infestation 65.8% followed by malnutrition (61%), anaemia (58%), and other disorders were skin diseases (20%), dental caries (19.8%) and lymphadenopathy (10.5%).

In the present study the spectrum of morbidity is wider, includes all systems. Most of the morbidities are preventable and treatable, if neglected can lead to chronic diseases which in turn may lead to irreversible disabilities.

Conclusion

Prevalence of anaemia was found to be more in boys and was slightly lesser amongst girls leading to increase in prevalence of morbidities. The measures to combat anaemia which is more among the girls at all age groups and also seen to increase in prevalence with increasing age should be undertaken. Although the WIFS (Weekly Iron Folic acid supplementation) Programme started recently by Govt. of India indicates that the government is sensitive to the issue but still there is need to monitor the programme closely to see the impact in future. Also the higher malnutrition observed among the boys is surprising; measures for nutritional supplementation are needed. Anti-helminthic should be given to all children once in 6 months.

Recommendation

1. Locally available diet rich in Iron should be consumed.
2. Health Education sessions should be arranged in schools on topics of Environmental hygiene, Personal hygiene and Food and Water hygiene.

Limitation of the study

The diagnosis of some morbidity was history based; the prevalence of such morbidities could have been clearer, if relevant investigations were have been performed.

Authors Contribution

All authors have contributed equally in the study.

Acknowledgement

I would like to thanks all the families who welcomed me into their homes and made this study possible.

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Tables

TABLE 1 DISTRIBUTION OF STUDY SUBJECTS BY THEIR AGE AND SEX (N=869)

(in completed years)	Children		Total (%)
	Boys (%)	Girls (%)	
5-6	84 (19.0)	80 (18.5)	164 (19.0)
7-8	90 (20.5)	81 (19.0)	171 (20.0)
9-10	96 (22.0)	87 (20.0)	183 (21.0)
11-12	86 (19.5)	80 (18.5)	166 (19.5)
13-14	83 (19.0)	102 (24.0)	185 (21.5)

TABLE 2 PREVALENCE OF ANEMIA IN BOYS AND GIRLS (N=830)

Anemia	Children		
	Boys (%)	Girls (%)	Total (%)
No Anemia (n=299)	261 (87.3)	38 (12.7)	299 (36.0)
Mild Anemia (n=409)	149 (36.4)	260 (63.6)	409 (49.3)
Moderate Anemia (n=111)	21 (19)	90 (81)	111 (13.4)
Severe Anemia (n=11)	-	11 (100)	11 (1.3)
Total (N=830)	431 (100)	399 (100)	830 (100)

$\chi^2 = 489.41, df = 4, p < 0.05$

* Hemoglobin estimation was done in 830 children (95%) who gave consent. 8 boys and 31 girls did not give consent.

TABLE 3 ANOVA ANALYSIS OF HAEMOGLOBIN STATUS

Groups (Mean+/-SD)	Degree of freedom	SS	F-Value*
Normal (12.4+/-0.67)	294	4582312	437.75
Moderate# (9.5+/-1.05)	109	10929.04	
Mild (10.9+/-0.52)	408	53577.04	

TABLE 4 PATTERN OF ANAEMIA AND MORBIDITY STATUS IN CHILDREN (N= 830)

Anaemia status	Morbidity	
	Morbidity %	No morbidity (%)
No anaemia (n=299)	190 (63.5)	109 (36.5)
Mild anaemia (n=409)	229 (55.9)	180 (44.1)
Moderate anaemia (n=111)	98 (88.3)	13 (11.7)
Severe anaemia (n=11)	11 (100)	-
Total (N=830)	528 (63.6)	302 (36.4)

$\chi^2 = 45.759, df = 3, p < 0.0001$

Figures

FIGURE 1 MEAN HAEMOGLOBIN OF CHILDREN BY AGE AND SEX (N=830)

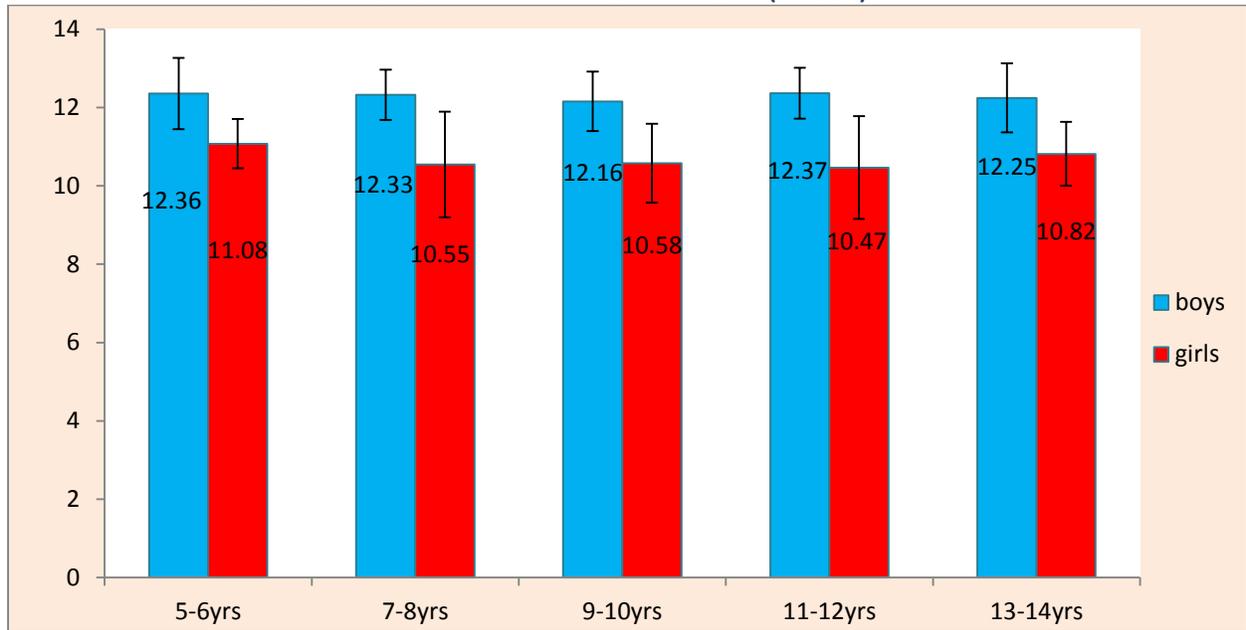


FIGURE 2 PATTERN OF MORBIDITIES IN BOYS AND GIRLS (N=869)

