ANEMIA IN PRE-SCHOOL CHILDREN-DOES TIME CHANGE ANYTHING?

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ABSTRACT

Background and Objectives: Anemia in preschool children remains a major health problem in developing countries. It impacts adversely on child's health and cognitive development. This study was conducted to reiterate the existing status of anemia in Pakistani preschool children, to compare the results with the previous studies and to discuss strategies for eradication of anemia in this age group.

Methodology: A total of 1029 complete blood counts (CBCs) of children from 6 months to 5 years of age were performed on Sysmex XS 500i (using EDTA anticoagulated blood)from January to June 2017. We then analyzed the CBCs to determine the frequency and severity of anemia.

Results: Anemia was present in 557 (54.1%) children. Among them, 350 (62.8%) were males and 207 (37.1%) were females.

Conclusion: Pakistan still has an alarming proportion of anemic preschool children-a fact that is completely unacceptable especially when we have spent billions on health to achieve millennium development goals. It is important to address anemia particularly in this age group because of its occurrence at such a crucial stage of development.

Keywords: Anemia, preschool children.

INTRODUCTION

Anemia is one of the most frequent global health problems and Pakistan is a major contributor to its prevalence.[1] WHO defines anemia for children under 5 years of age as having a hemoglobin <11g/dl. Anemia in the early years of life has adverse consequences on brain development and growth of the children, and these disabilities could persist even after the treatment.[2] It is a critical factor for child's morbidity and mortality, hence a crucial concern for preschool children in Pakistan.

Globally 1.62 billion people are reported to be the victim of anemia whilst among the preschool children prevalence of anemia is estimated to be 47.4% which is very alarming.[3,4] Literature shows that the major proportion of anemia in this age group is attributed to iron deficiency.[2] Iron deficiency could be due to poor intake or low bioavailability[5].In developing countries, in addition to nutritional factors socioeconomical reasons such as low parental education, low household incomes and demographic factors such as age, gender, large family size do contribute to anemia in children.[6]

A number of studies can be found in the literature addressing the extent of anemia in different populations of Pakistan and the strategies to reduce the burden. We, however, still witness a lot of cases of anemia in children in our routine practice. Current study was performed to reiterate the existing status of anemia in preschool children because of its detrimental effects at such a crucial stage in the development of a child.

PARTICIPANTS AND METHODS

This cross sectional study was carried out in the Pathology Department of Shalamar Hospital, Lahore from January to June 2017. The approval of ethical committee was taken before the start of the study. All the children aged 6months to 5 years, whose CBCs were performed in the Pathology lab during the study period were included in the study. Known cases of thalassemia and bleeding disorders (according to the hospital records) and admitted patients were excluded. For Complete blood counts (CBCs), venous samples were collected in Ethylene Diamine Tetra acetic Acid (EDTA) vial and were performed on Sysmex XS 500i. CBCs were analyzed to determine the frequency and severity of anemia. Anemia was defined as a hemoglobin value of < 11.0 g/dl (according to WHO, 2011 criteria). Anemia was classified as follows:

Severe = < 7.0 g/dl
Moderate = 7.1 – 9.9 g/dl
Mild = 10 – 10.9 g/dl
(As per WHO, 2011 criteria)

Normal range for MCV was taken as 75-81 femtolitres (fl) and for MCH it was 24-30 picograms (pg).

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Microcytosis was defined as red cells having MCV < 75 fl. Red cells having MCH < 24 pg were defined as having hypochromia.[7]

Data were recorded with the help of a proforma which included demographics and findings of CBC of the patients. The data was analyzed by using the software statistical package of social sciences (SPSS v21). Results were expressed as mean, standard deviation, range, frequency and percentages.

RESULTS

A total of 1029 CBCs of children from 6 months to 5 years of age were performed during the study period. Mean age of our patients was 3.05 ± 1.28 years. Out of them, 643 (62.5%) were males while 386 (37.5%) were females.

Anemia was present in 557 (54.1%) children. Among them, 350 (62.8%) were males and 207 (37.1%) were females. Age wise distribution of study cases according to the severity of anemia is shown in Table. 1 which reveals that the highest prevalence of anemia was seen in the children up to 3 years of age (*n* = 408, 73.2%).The maximum number of anemic children (*n* = 279, 50%) fell in the category of moderate anemia, i-e, hemoglobin between 7.1-9.9 g/dl.

Out of non-anemic children (having Hb > 11.0 g/dl), microcytosis was seen in 107 (22.6%) cases while hypochromia was present in 72 (15.2%) children.

DISCUSSION

Anemia is a global health concern in the preschool children worldwide.[2,8,9] Burden of this problem is especially grave among the children of developing countries. It is a well-known fact that anemia has adverse effects on child's psychomotor development; cognitive functions as well as behavior[10]. Importance of anemia in early age group cannot be under estimated. Its prevention, early detection and treatment are all crucial so that the development of permanent intellectual disabilities resulting from anemia can be prevented. This study included 1029 preschool children aged 6 months to 5 years from Lahore. We analyzed the CBCs of the study population to determine the frequency of anemia which was found in 557 (54.1%) of the cases.

The estimated global prevalence of anemic preschool-age children was reported to be 47.4% by WHO[3] while prevalence of anemia in Pakistani children ranges from 33 to 83% by various studies.[1,11,12]

Table 1: *Age wise distribution of the children according to severity of anemia.*

Age	*Severe Anemia Hb <7.0 g/dl n (%)*	*Moderate Anemia Hb 7.1--9.9 g/dl n (%)*	*Mild Anemia Hb 10.0--10.9 g/dl n (%)*	*Total Number of Children n (%)*
6months -1 year	08 (1.4)	36 (6.4)	30 (5.38)	74 (13.2)
> 1 – 2 years	24 (4.3)	96 (17.2)	54 (9.7)	174 (31.2)
> 2 – 3 years	18 (3.23)	86 (15.4)	56 (10.0)	160 (29.0)
> 3 – 4 years	04 (0.7)	35 (6.28)	45 (8.0)	84 (15.0)
> 4 – 5 years	01 (0.17)	26 (4.6)	38 (6.8)	65 (11.6)
Total	55 (10)	279 (50)	223 (40)	557

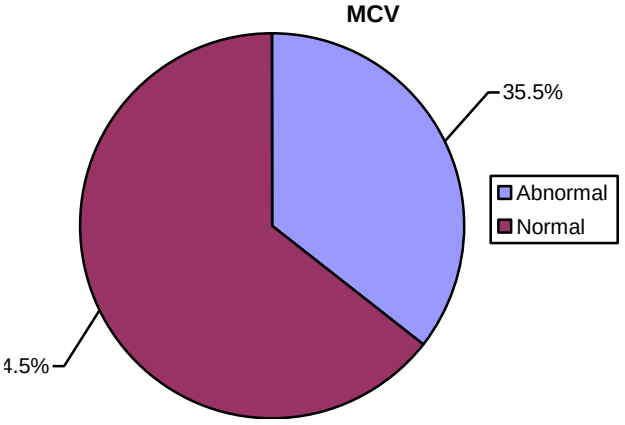

Fig. 1: *Distribution of study population according to MCV. (Abnormal MCV<75 fl. Normal MCV =/> 75fl).*

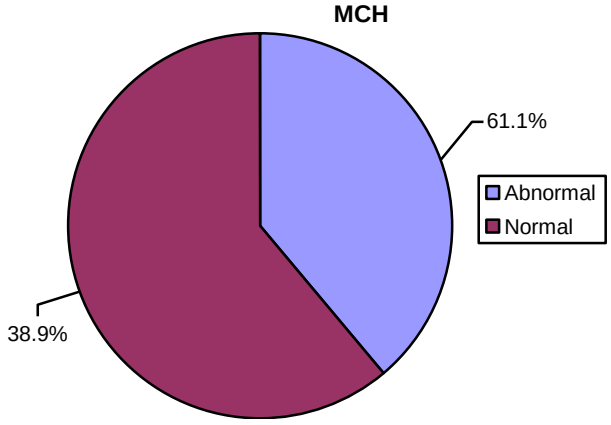

Fig. 2: *Distribution of study population according to MCH (Abnormal MCH <24 pg, Normal MCH =/<24 pg).*

In the national nutrition survey (NNS) 1985-1987, anemia was reported in 65% of the children under5 years of age. In NNS 2011, anemia was detected in 61.9% children under 5 years of age and severe anemia was found in 5.0% of the children.[1] The report from the NNS represents national level data in which significant regional differences for prevalence were documented. Our study is merely confined to a specific clinical setting and the difference in severity of anemia between the NNS and our study cannot be ascertained. Though overall prevalence of anemia seems to have declined as compared to few previous reports, but still the magnitude is very high as compared to some of the other developing countries .Moreover data from NNS shows that from 1985 to 2011, national prevalence of anemia remained quite consistent. This proves failure of current and past anemia control strategies, both at individual and government level.

In present study, the highest prevalence of anemia was seen in children up to three years of age. This finding is consistent with previously published national and international studies.[2,10,13] Up to 3 years of child's life, there is maximum demand for iron because this is a period of rapid growth. Moreover, factors such as limited access to iron rich foods in our population, inadequate feeding practices to young children including lack of exclusive breast feeding, prolonged breast feeding and inadequate/imbalanced weaning practices, large family size and recurrent illnesses during first three years of life increase the chances of this age group to develop iron deficiency anemia (IDA) more readily.[14]

In the current study, out of 557 (54.1%) anemic children, 350 (62.8%) were males and 207 (37.1%) were females. Data are conflicting regarding the relationship between anemia and gender in preschool children. A previous study from India found males to be more at risk for developinganemia[2] while contrary to our study, Robles et al found a higher prevalence of anemia in girls than boys.[10]

In this study we observed that out of non- anemic children (having Hb > 11.0 g/dl), microcytosis was seen in 107 (22.6%) cases while hypochromia was present in 72 (15.2%) children. Previous literature shows that microcytosis can develop either along with iron deficiency or can be a prior finding.[15] Incidental finding of abnormal red cell indices may be an indicator of latent iron deficiency which is mostly overlooked by the clinicians. It can be inferred from the data that there is a significant number of cases that could be candidates of latent iron deficiency in our population.

The limitation of this study is that we just analyzed complete blood count (CBC) data of the study population and did not perform tests to confirm iron deficiency and to exclude beta thalassemia trait and the cases that have coexistence of IDA and beta thalassemia trait causing microcytic hypochromic blood picture. This can be explained on the basis of the fact that many studies, national and international, have shown that iron deficiency is the leading cause of anemia worldwide especially hypochromic microcytic anemia.[1,16] Secondly, in Pakistan,frequency of beta thalassemia trait is reported to be 5-7% in general population.[17] So even excluding 5-7% of the anemic children from our results, we still get high prevalence of iron deficiency anemia in our preschool children.

The data of this study provides valuable insight into the prevalence of anemia in preschool children of Pakistan, a problem that has remained fairly consistent over last few decades. Considering such a high burden of the anemia, it is essential that interventions should be started to reduce the severity of the problem. IDA in developing countries is attributed to several important reasons that include early marriages, poor diet, low literacy rate, poor socio economical setup, and consumption of foods such as cereals/ legumes and plant based food.[18] Repeated pregnancies also increase the risk of anemia especially where balanced diets and supplementations are also not reachable. Undernourishment during conception, and early childhood adversely affects cognitive development and individual's learning ability. In this way anemia also imposes a financial burden on our country for spending more than required on individual's health, productivity, education and development. Moreover, children having anemia are more prone to severe illness and death. In this way, indirect cost on health care and disease control becomes much more than the direct cost. Anemia in childhood is typically reflected as reduced wages in adulthood.[19]

Regarding strategies to combat anemia and particularly iron deficiency anemia, we can divide them into two main categories. First, at government level and second at individual/community level. None of them can work effectively when practiced alone and both should go hand in hand. At national level iron fortification of food comes top of the list. Wheat being the staple diet of Pakistani population has consequential effect as compared to other food vehicles for iron fortification. Moreover, fortified wheat leads to much better bioavailability of iron as compared to other diets.[20]

Other strategies include supplementation, de-worming, dietary diversification and maternal education. Currently iron supplementation is a successful strategy being used worldwide. There is evidence to support that iron supplementation increases hemoglobin level and reduces the prevalence of IDA[21.] Previously published Pakistani literature also supports the idea of iron supplementation.[22]

One of the major public health problems in children of developing countries is worm infestation. It is attributed to poor socioeconomic conditions, low education level of the mothers and lack of good hygiene. Along with nutritional deficiencies, worm infestations

also cause anemia. In a study conducted at Karachi by Sikandar et al, 77.31% of school going children were found to have various helminthic infestations. The highest frequency (53.29%) comprises of those children that have *Ascaris lumbricoides*, while *Hymenolepsis nana* was found in 20% children[23].We suggest that effective and continuous de-worming should be a component of health care programs for children as proved by previous literature.[24] An integrated and concreted approach from the doctors especially pediatricians and school teachers are a dire need of the time in educating the children and their mothers about importance of simple measures like hand washing and good sanitation setups for prevention of worm infestation.

Current study ***concludes*** that time has changed nothing! The results of almost all the studies at national and regional levels prove fairly consistent prevalence of iron deficiency in children over the vast time span of around 30 years, pointing towards inefficacy of all government level programs to combat the problem in Pakistan. It seems quite rational that now we need a holistic approach to overcome the problem rather than merely relying on long term horizontal programs at the government level. The situation warrants a multi pronged approach from the community of health professionals to encourage, educate and counsel the masses about addition of this essential component to food for meeting nutritional requirements of the population especially the most vulnerable group of young children. Huge responsibility comes on the shoulders of hematologists, pediatricians and obstetricians to convince the public about regular hand washing and good hygiene, to give them awareness about iron deficiency and its detrimental effects on their child's development and cognitive abilities, and to educate them about dietary modifications and incorporation of iron rich foods in their diet for prevention of IDA in their family members. We should also educate our patients regarding the food groups enhancing and reducing iron absorption from the gut while prescribing iron supplementation. We also suggest more research work to ascertain the role of cost effective food groups to control IDA in low socio economic counties like Pakistan.

Conflict of Interest

None.

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Authors' Contribution

AS: Principal investigator, topic selection, Data analysis and interpretation. SNB: Co-investigator, drafting the manuscript. NA: Co-investigator, revision of manuscript for important intellectual content. HTQ: Co-investigator, statistical analysis of data. SJUDA: Co-investigator, drafting the manuscript.

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