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Prevalence and Morphological Types of Anemia Among Children 6 to 59 Months in an Urban Hospital of Sudurpaschim, Nepal

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ABSTRACT

Introduction: Anemia remains a significant global and national health issue, particularly in Nepal's Sudurpaschim province due to geographical challenges limiting healthcare access. Children under five face severe health risks, with Nepal's anemia prevalence at 43%.

Objectives: The objectives were to determine the prevalence and morphological types of anemia among children aged 6 to 59 months in Urban hospital of Sudurpashchim, Nepal.

Methodology: A retrospective cross-sectional descriptive study, conducted in Lal Ratna Hospital between 14th February 2023 to 13th February 2024. A total of 364 children aged 6 to 59 months were included in the study following ethical approval from the Nepal Health Research Council (NHRC). Convenience sampling method was used. Children whose complete blood count (CBC) reports available was included and details were collected.

Results: The prevalence of anemia was 249(68.40%) with a higher proportion among males 164 (65.86%). The highest prevalence 76 (30.5%) was noted in children aged 12 to 23 months, half 125(50.2%) of the children had mild anemia. Microcytic hypochromic anemia was the predominant morphological type, in 159 (63%) children. A higher prevalence of anemia 152 cases, 61.05%) was found among children who had not undergone deworming.

Conclusions: Anemia is highly prevalent among children aged 6 to 59 months, particularly in males and younger age groups. Microcytic hypochromic anemia is the most common type, with higher rates seen in those not dewormed, highlighting the need for early intervention and deworming programs.

Introduction

Anemia is the major health concern worldwide and children less than 5 years are the most vulnerable groups. Globally,47.4% (293 million) preschool aged children less than 5 years people were anemic. Burden of anemia in Nepal is also high among children 6 to 59 months (43%) with prevalence of 45% in Sudurpashchim province.

Anemia is the major cause of under 5 morbidity and mortality and also have negative affect on cognitive, psychomotor and behavioural development of children. It is one of the key indicators of nutritional status, with poor nutrition contributing to reduced productivity and long-term economic consequences.. While iron deficiency is the most common cause, other nutritional deficiencies, socioeconomic factors limited healthcare access also play a significant role to its prevalence.[1]

In Sudurpashchim Province, many families face economic hardship, low literacy levels, and inadequate access to health services. These challenges increase the risk of anemia among young children.[2]

Given these challenges, it is essential to assess the local burden of anemia to inform targeted public health interventions. Identifying high-risk groups will enable local governments to implement focused strategies such as nutritional education, iron supplementation, deworming, and improved healthcare services. Moreover, understanding the prevalent morphological types of anemia will assist healthcare providers in diagnosing and managing cases more effectively, avoiding unnecessary investigations and ensuring efficient use of resources.

Therefore, the objective of this study was to determine the prevalence, morphological types, and severity of anemia among children aged 6 to 59 months in a hospital setting in Sudurpashchim, Nepal.

Methodology

The retrospective cross-sectional descriptive study conducted in Lal Ratna Hospital (LRH) between 14thFebruary 2023 to 13thFebruary 2024. Ethical approval was obtained from Nepal Health Research Council (NHRC) (Reg. no.19/2024). Sample size was calculated using the formula N= Z2(pq)/e2

Prevalence (p): 43% (0.43) of anemia among the children aged 6-59 months[3]

Confidence interval (Z): 95% (Z=1.96)

Margin of error (e): 6% (0.06)

Calculated sample size was 261, meanwhile we included 364 children using convenience sampling. In this study, all the children between 6 months to 59 months who visited to Lal Ratna Hospital between 14th Feb 2023 to 13th Feb 2024 with complete details and complete blood counts (CBC) reports were collected from hospital records. Children with known case of hemoglobinopathies, recent blood transfusion, active bleeding and under iron supplements were excluded. Total 364 children were included in this study.

Details of the patients, presenting complains, provisional diagnosis, deworming in last 6 months, iron supplementation, hemoglobin level in gram/deciliter(gm/dl), mean corpuscular volume (MCV) in femtoliter (fl), mean corpuscular hemoglobin (MCH) in Picogram (pg) and mean corpuscular hemoglobin concentration (MCHC) in gm/dl were recorded for hospital records. Anemia was diagnosed by WHO criteria for Hemoglobin (Hb) threshold in different age group and Hb less than 11.0 gm/dl for age group of 6 months to 59 months was considered as anemia. According to WHO criteria, severity of anemia is classified as severe anemia if Hb <7.0 gm/dl, moderate anemia if Hb 7.0-9.9gm/dl and mild anemia if Hb 10.0-10.9 gm/dl.[6]

Red blood cell (RBC) indices determine average size and Hb content of RBC. It consists of MCV, MCH and MCHC. Morphologically Anemia was classified on basis of MCV and MCH. MCV, which measures the average size of red blood cells, can be categorized as normocytic, microcytic, or macrocytic, indicating normal, decreased, or increased cell size, respectively. MCH reflects the average hemoglobin content in red blood cells and is classified as normochromic when normal, or hypochromic when hemoglobin levels are reduced.

As RBC had physical limit for content of Hb so there was no hyperchromic category. The normal reference ranges for the various RBC indices are shown in table 1.

Table 1: Normal ranges of RBC indices

RBC indices	Normal range
MCV	80-100 fl
MCH	27- 31 pg
MCHC	31-36 gm/dl

Patients were categorized by age into 4 groups as follows: 6 – 11 months, 12 - 23 months, 24 – 35 months and ≥ 36 months. Further children were divided into 2 group, children less than 2 years and above and equals to 2 years.

Data was analyzed using SPSS (Statistical package for social sciences) version 25. Descriptive analysis was done to determine the prevalence of anemia, severity of anemia, morphological types of anemia and characteristics of anemic children.

Results

Among 364 children, 249 (68.40%) of the children were anemic, with higher prevalence among the male (n=164, 65.86%) compared to females (n=85, 34.14%. The mean Hemoglobin level among the anemic children was 9.88± 0.69 g/dl (95% CI: 9.79- 9.96).

Anemia was most prevalent in children under 24 months (n=144, 57.83%), 12-23 months (n=76, 30.50%) and 6-11 months (n=68, 27.30%) as shown in Figure 1. The mean age of anemic children was 24.37± 15.82 months (95% CI: 22.40-26.35).

Mild anemia accounted for n=125, (50.20%) of cases, followed by moderate anemia (n=124, 49.80%). No severe anemia cases were reported.

The average RBC indices were MCV 73.35 ± 6.48fl (95% CI: 72.54 - 74.16 fl), MCH 25.68 ± 3.15pg (95% CI: 25.29 - 26.08 pg) and MCHC 33.20 ± 2.27 gm/dl (95% CI: 32.92 – 33.48 gm/dl). As shown in Table 1, the majority one anemic children exhibited microcytic hypochromic anemia (63.90%, n=159), followed by microcytic normochromic (n=57, 22.90%) and normocytic normochromic (n=30, 12%). Children with microcytic RBC was 215 (86.34%), while 34 (13.66%) were normocytic. No macrocytic cases were observed. Hypochromia was prevalent in 163 (67.91%) of children.

Fever was present in 236 (94.77%) children of anemic children, with viral fever as the leading provisional diagnosis (n=72, 28.90%) followed by Urinary tract infection (UTI) (n=30, 20.10%) and Upper respiratory tract infection (n=36, 14.50%). Anemia was more common in children not dewormed in last 6 months (n=152, 82.20%) compared to dewormed children (n=97, 54.20%).

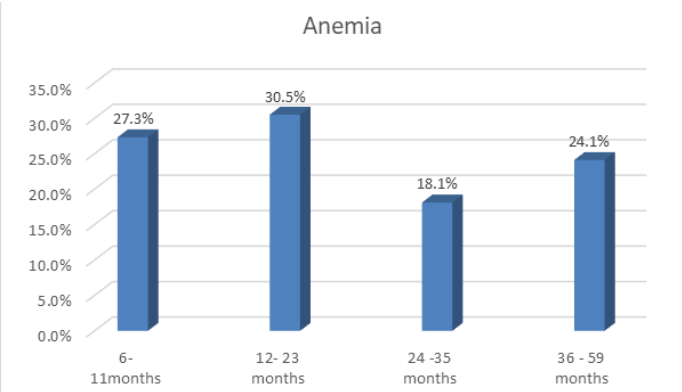

Figure 1: Anemia among different age groups (n=249)

Table 1: Characteristics of anemic children between 6 months to 59 months (n=249)

Characteristics		Number (%)
Gender	Male	164 (65.86)
	Female	85 (34.14)
Age (months)	6 to 11	68 (27.30)
	12 to 23	76 (30.50)
	24 to 35	45 (18.00)
	36 to 59	60 (24.00)
Age	Less than 24 months	144 (57.83)
	24 to 59 months	105 (42.17)
Ethnicity	Brahmin/ Chettri	169 (67.87)
	Janajati	55 (22.08)
	Dalit	25 (10.05)
Deworming in last 6 months	Yes	97 (38.95)
	No	152 (61.05)
Severity of anemia	Mild	125 (50.20)
	Moderate	124 (49.80)
	Severe	0
Morphological types of anemia	Microcytic hypochromic	159 (63.90)
	Microcytic normochromic	57 (22.90)
	Normocytic normochromic	30 (12.00)
	Normocytic hypochromic	3 (1.20)

Discussion

This study shows that the prevalence of anemia among the children between 6 to 59 months in hospital of Sudurpaschim is 68.40% (249/364) which is higher than the prevalence of anemia among children between 6 to 59 months of Sudurpashchim(45.40%) and of overall Nepal (43%) according to NDHS 2022.[2] High burden of anemia in our study might be due to some illness in child for which child had visited to our hospital. Similarly, in study conducted in Kathmandu, lower prevalence of anemia was observed 46.0% and 42.3% among the children less than 5 years compared to our study as this study was done in Kathmandu, capital city, where child are receiving good nutritional and health facilities. In the study conducted in university of Ethiopia prevalence was 44.70% which was also lower compared to our study.However, our result was similar when compared to the study in volta hospital Ghana (55%)and India (69.50%).

In this study, most of the anemic children were less than 2 years (57.83%). There was significant association between age and anemia which explain that with increasing age the prevalence of anemia gradually decreases. Similarly, the multilevel study conducted in Nepal also showed higher prevalence of anemia in children less than 24 months.[5] Our study was also supported by the study conducted in Ethiopia, Ghana and other developing country.[11,12,] The high number of anemia in children less than 2 years might be due to rapid physical growth requiring high nutrient and iron intake which could not be fulfilled by daily diets.

There were no significant association of anemia with gender which was supported by study conducted in Nigeria, Ethiopia and Ghana,[11,12] though boys were more anemic compared to girls. The high prevalence of anemia in male child may be due to rapid growth of preschool male child requiring high iron diet which might not get fulfilled by regular diet alone.

Same number of the anemic children were mild (50.20%) and moderately anemia (49.80%). Same ratio of mild and moderate anemia were found in all the province of Nepal with slight higher rate of mild anemia.[2] None were with severe anemia which was similar to the finding of province 1, Bagmati and Gandaki province.[2] In contrast, moderate anemia was most common in study conducted in India (40.20%)[13] and Ghana (41.90%).[12]But Study in Ethiopia have highest number of mild anemia (67.50%) followed by moderate anemia (31.30%)[16] this might be due to different sampling technique and socioeconomic status.

As for the morphological types of anemia, microcytic hypochromic anemia was the highest among other types of anemia in this study. Similarly, this finding was supported by the study done in Hawassa university Ethiopia and volta regional hospital Ghana which both showed high number of microcytic hypochromic anemia.[11,12] This might be due to insufficient iron intake, which is the major cause of microcytic hypochromic anemia which is supported by study in Ethiopia as most of the anemic child were microcytic hypochromic and had Iron deficiency (54%).[11]

As for the limitation, this is hospital-based study which included the children visited to hospital with some illness which would have affected the anemia and would not reflect the exact anemic status of community. Another limitation is we could not explore various risk factors of the anemia. Due to financial constraint, we were not able to perform serum ferritin level, TIBC, folate level, Vitamin B^{12} level, thalassemia and other hemolytic work up which would have helped to determine the cause of anemia.

Conclusions

Anemia remain a critical public health challenge in Nepal, disproportionately affecting young children and perpetuating cycles of poverty and poor health. Multisectoral efforts-combining nutrition, infection control and education are urgently needed to mitigate its burden.

Recommendations

National anemia control program to prioritize iron and folic acid distribution and deworming in high risk region. Maternal and child nutrition with exclusive breastfeeding and iron-rich weaning food should be emphasized. Community based nutrition education for mother should be conducted. Longitudinal studies to assess long term impact of childhood anemia in Nepal should conducted.

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Conflict of Interest: None

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