Accuracy of Clinical Pallor in the Diagnosis of Moderate and Severe Anemia in Children 6 Months to 5 Years

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ABSTRACT

Introduction: The global prevalence of anemia is estimated to be 2.2 million, which is about 30% of the worldwide population (1). Anemia is related to impaired physical growth, mental development and poor scholastic performance (2). It is therefore important to make a timely and accurate diagnosis. The study aimed to evaluate the sensitivity and specificity of clinical pallor of the palms, nail beds, conjunctiva and buccal mucosa or tongue in the identification of moderate and severe anemia.

Material and Methods: 1000 children attending the outpatient department were assessed for clinical pallor by two physicians independently. All children were then subjected to hemoglobin estimation by cyanmethemoglobin method. The results were studied for concordance and efficacy for detecting anemia.

Results: Total prevalence of anemia was 62%. Moderate anemia (Hb – 8 to 11 gm %) was best detected by palmar pallor (sensitivity of 92% and specificity of 61.4%) followed by pallor of nail bed (sensitivity of 90% and specificity of 65.6%). Severe anemia was detected by clinical severe pallor of any site in 50 to 55 % of the cases.

Conclusion: Clinical pallor of palms can best pickup more than 90% of children with moderate anemia.

Keywords: Anemia, Pallor, Cyanmethemoglobin method, sensitivity, specificity.

INTRODUCTION

Anemia is by far the most frequent hematologic disease of infancy and childhood.[1-3] Anemia is defined as a reduction of the hemoglobin concentration or red blood cell volume below the range of value occurring in healthy person.[4] Moderate anemia among children is very common in India.[5] Most of the cases are of the iron deficiency type and many factors are responsible for this.

1. Diet
2. Low birth weight
3. Various infections
4. Bowel disorders interfering with the dietary intake and intestinal absorption of iron
5. Hemolytic anemia like Thalassemia and other hemoglobinopathies.

The integrated Management of Childhood Illness (IMCI) strategy developed by the WHO recommends the use of palmar pallor as the initial screening tool.[6] This recommendation is based mainly on the interpretation of the results of studies performed in the Gambia, Kenya and Malawi.

MATERIAL AND METHODS

Descriptive prospective study was conducted in Department of Pediatrics in an urban tertiary care hospital in Chennai from 2010 to 2011. Ethics committee approval and informed consent from the parents were obtained. 1000 children were enrolled in

the study in age group from 6 months to 60 months (5 years) of both sex who presented at the outpatient department of Paediatrics in the morning hour of the day were enrolled for this study. Enrolled children had a detailed history and clinical examination done by the study physician. Pallor was noted at 4 anatomical sites – palms, nail beds, conjunctiva and buccal mucosa or tongue. It was categorized into No pallor, Pallor, Severe pallor. After clinical examination was completed by the first physician, a second physician re-examined the children who had been enrolled and documented his decision on pallor at the four anatomical sites (conjunctiva, palm, nail beds, buccal mucosa or tongue). He similarly like the first physician categorized the clinical finding into no pallor, pallor or severe pallor without any information from the first examination. An observation by the second physician was made within 30 minutes of the first examination.

Assessment of pallor: The four anatomical sites were examined under good natural light.

Conjunctival Pallor: To say pallor of the conjunctiva, there was neither clearly red nor clearly pale anterior rim or those with one conjunctiva pale and the other normal. Severe pale conjunctiva was those with very little or no evidence of red color on the anterior rim, which matched the fleshy colour of the posterior aspect of the palpebral conjunctiva. Conjunctiva that was normal had full or nearly full redness of the anterior rim. Palmar pallor: The child's palm was held open by grasping it gently from

	Percentage agreement
Conjunctival pallor	80.6%
Severe conjunctival pallor	87.3%
Palmar pallor	72%
Severe palmar pallor	85.6%
Mucosal pallor	79.2%
Severe mucosal pallor	85%
Nail bed pallor	74.4%
Severe nail bed pallor	86.3%
Table-1: Concordance of detection of pallor at different anatomic sites by first and second physicians	

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	Conjunctival pallor	Palmar pallor	Mucosal pallor	Nail bed pallor
Pallor present	309	499	401	462
True positive	169	195	178	191
False positive	140	304	223	271
Sensitivity	80%	92%	84%	90%
Specificity	82%	61.4%	71.7%	65.6%
Table-2: Sensitivity and specificity of clinical pallor in moderate anemia				

	Severe Conjunctival pallor	Severe Palmar pallor	Severe Mucosal pallor	Severe Nail bed pallor
Severe Pallor present	70	50	50	47
True positive	10	11	11	10
False positive	60	39	39	37
Sensitivity	50%	55%	55%	50%
Specificity	93.8%	96%	96%	96.2%
Table-3: Sensitivity and specificity of clinical severe pallor in severe anemia				

the sides. The fingers were not stretched backwards because stretching may cause pallor by blocking the blood supply. The colour of the child's palm was compared with the palm of the examiner and / or with that of other normal children. If the child's palm was pale, the child was considered to have palmar pallor. If the palm was very pale or so pale that it looks white or when the palm creases were pale, the child was considered to have severe palmar pallor. All children after completion of clinical examination by both physicians were subjected to laboratory investigation. Blood was drawn by venepuncture and hemoglobin estimation was done by cyanmethemoglobin method. Anemia was diagnosed when hemoglobin was less than 11g/dl (WHO standard). Total number of pallor or severe pallor cases (concordance) were noted down based on the agreement between the first and second physician over the clinical finding in a particular patient. Based on the concordant number of cases, sensitivity and specificity were calculated.

STATISTICAL ANALYSIS

Data was entered in the Microsoft excel and analyzed descriptively using mean and percentages.

RESULTS

Total prevalence of anemia was 62% (621 of 1000 children). Anemia prevalence was highest in the age group 12 to 24 months. Mild anemia with a hemoglobin level of 8 – 11g/dl was found in 39% (389 children). Anemia of moderate degree with a hemoglobin level of 5-8g/dl was found in 21.2% (212 children). Severe anemia was found in 2% (20 children) of all children. Severe anemia was found most frequent in the age group 12 to 24 months.

The concordance of detecting pallor and severe pallor between the first physician and the second physician is shown in the table. For detecting any pallor, simple agreement was highest for conjunctival pallor (80.6%) and lowest for palmar pallor (72%). The concordance for severe pallor was better than for any pallor at all sites with an agreement of over 85%, the highest being for nail bed and conjunctiva with 86.3% and 87.3% agreement respectively.

Of the 309 cases with conjunctival pallor, 169 were diagnosed as moderately anemic with hemoglobin 5-8g/dl. 43 children were moderately anemic but did not have conjunctival pallor. Hence the sensitivity was 80% with a specificity of 82%. Moderate

anemia was best detected by palmar pallor (sensitivity of 92% and specificity of 62%) and pallor of nail bed (sensitivity of 90% and specificity of 66%).Conjunctival pallor had the highest specificity of 82% in detecting moderate anemia.

Severe anemia was detected by clinical examination as severe pallor of any of the sites examined in 50% to 55% of the cases. The specificity for severe pallor range from 93% to 96%. The high odds ratio and the highly significant P value indicate the high predictive value in moderate and severe anemia. Odds ratio for severe anemia was even higher than moderate anemia.

DISCUSSION

This study shows that anemia is a major health problem in urban children. The prevalence of anemia in the present study was 62%. Moderate anemia was best detected by using palmar pallor (sensitivity of 92%) followed by pallor of the nail beds, while conjunctival pallor was least useful. This may be due to the fact that children presenting with viral fever have conjunctival congestion as well as in a small proportion of cases due to associated conjunctivitis. A similar trend is also shown for severe pallor, even though the sensitivity values are low for severe pallor.[7] Our study demonstrates that clinical pallor can be used to identify children with anemia of moderate degree who need treatment with iron. Our study has also shown that clinical pallor is reproducible as shown by high agreement results.[8]

CONCLUSION

Clinical pallor of palms is more accurate than pallor at other sites (buccal mucosa, nail bed and conjunctiva) in the diagnosis of moderate and severe anemia in children. Detection of clinical pallor is reproducible (concordance between observers) and hence can be taught to lower level health workers

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