

Proficiency of Pallor in Predicting Anemia

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ABSTRACT

Introduction: Anemia is one of the most commonly encountered hematologic disease of infancy and childhood. More than 75% of Indian children under 36 months of age are found to be anemic. Iron-deficiency anemia (IDA) has been found to be correlated with decreased cognitive performance in many studies, hence prompt diagnosis and treatment are necessary. Pallor is a clinical sign in the diagnosis of anemia. Current research aimed to study about the predictive value of pallor in various sites and its relation to anemia.

Material and methods: 500 children attending the outpatient department of pediatrics were evaluated for clinical pallor and Hemoglobin was estimated by cyanmethemoglobin method.

Results: When the various parameters were compared between conjunctival, palmar, mucosal and nail bed pallor; it has been observed that sensitivity was highest for nail bed pallor in the evaluation of anemia. Specificity was highest for conjunctival pallor. The positive predictive value and negative predictive value were both highest for conjunctival pallor and least for palmar pallor. However, when all the evaluated parameters were compared in patients with severe anemia, highest sensitivity and specificity was observed for palmar pallor. The positive predictive value was highest for palmar pallor and least for nail bed pallor. The negative predictive value was highest for conjunctival pallor and least for nail bed pallor.

Conclusion: Clinical pallor of the nailbeds had highest sensitivity for detection of moderate anemia while palmar pallor had the highest sensitivity for the detection of severe anemia. These are simple clinical signs which can be read even by non doctors and can thus be taught to various personnel like health workers and school teachers for early detection and prompt management of anemia in children below 5 years.

Keywords: Anemia, Conjunctival Pallor, Nail Bed Pallor, Mucosal Pallor, Palmar Pallor

INTRODUCTION

Anemia is characterized by a decreased quantity of red blood cells, often accompanied by diminished hemoglobin levels or altered red blood cell morphology. Anemia is pathophysiologically diverse and often multifactorial.¹ Anemia is one of the most commonly encountered hematologic disease of infancy and childhood.² More than 75% of Indian children under 36 months of age are found to be anemic.³

Iron-deficiency anemia is a global health problems and a common medical condition seen in everyday clinical practice. Although the prevalence of iron-deficiency anemia has recently declined, iron deficiency continues to be the top-ranking cause of anemia worldwide, and iron-deficiency anemia has a substantial effect on the lives of young children

in both low-income and developed countries.⁴ Most of the cases are of the iron deficiency type and many factors are responsible for this.⁵

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.

Iron-deficiency anemia (IDA) has been found to be correlated with decreased cognitive performance in many studies⁶, Hence prompt diagnosis and treatment are necessary.

The Integrated Management of Childhood Illness (IMCI) strategy developed by the World Health Organization recommends the use of palmar pallor as the initial screening tool.⁷ This recommendation is based mainly on the interpretation of results of studies performed in the Gambia, Kenya, and Malawi. None of these studies showed in fact a clear superiority of palmar pallor. Only the Kenya study showed that palmar pallor performed better than conjunctival pallor when used by health workers but not by study physicians.⁸ Current research aimed to study about the predictive value of pallor in various sites and its relation to anemia.

MATERIAL AND METHODS

Current prospective descriptive study was done in November 2018 to August 2019 on 500 children between the age group of 6 months to 60 months (6 years) attending the out patient department of the Department Of Paediatrics at a tertiary care centre in South India. Informed consent was taken from the parents of all the children enrolled in the study. Enrolled children had a detailed history and clinical examination done by the physician.

Assesment of pallor: The patients were examined under good natural light.

Pallor was noted at 4 anatomical sites – palms, nail beds, conjunctiva and buccal mucosa or tongue. It was categorized

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into No pallor, Pallor, Severe 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).⁹

Guidelines for assessment of pallor in different sites⁸:

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 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.

Buccal mucosal pallor: To check the oral mucosa, the patient's cheek is exposed with a tongue depressor and the tissues inspected with a penlight. Healthy tissue appears moist, smooth, shiny and pink. Any pallor present was noted.

Nail Bed pallor: The child was asked to present their outstretched hands with the dorsal aspect facing upwards and color of the nail beds was noted. Emphasis was given to other tell tale signs of anemia like flat nails and koilonychia.

STATISTICAL ANALYSIS

All the results were tabulated in a Microsoft Excel spreadsheet and analysed using mean and percentages.

RESULTS

Among all the 500 patients examined, 69% of the children (345/500) were found to be anemic, diagnosed by the estimation of hemoglobin by Cynmeth method. Highest incidence of anemia was noted in children below 3 years.

Anemia detected was categorised into mild moderate and severe anemia. Mild anemia (Hb 8-11 mg/dl) was seen in 213 patients (42.6%). Moderate anemia (Hb 5-8 mg/dl) was seen in 108 patients (21.6). Severe anemia (Hb <5mg/dl) was seen in 24 patients (4.8%) (table-1).

Out of all the patients examined, pallor in the conjunctiva was

	Hemoglobin (mg/dl)	Patients	Percentage
Mild Anemia	8-11	213	42.6%
Moderate Anemia	5-8	108	21.6%
Severe Anemia	<5	24	4.8%

Table-1: Classification of patients with anemia into mild, moderate and severe

Pallor	Number of cases	Percentage
Conjunctival pallor	178	35.6%
Severe conjunctival pallor	36	7.2%
Palmar pallor	269	53.8%
Severe palmar pallor	26	5.2%
Mucosal pallor	205	41%
Severe mucosal pallor	27	5.4%
Nail bed pallor	247	49.4%
Severe nail bed pallor	32	6.4%

Table-2: Various sites and percentage of patients with pallor

	Patients	True positive	False positive	Sensitivity	Specificity	PPV	NPV
Conjunctival pallor	178	110	68	82.3%	84.1%	61.7%	73.1%
Palmar pallor	269	104	165	90.7%	58.7%	38.7%	40.1%
Mucosal pallor	205	92	113	86.1%	73.2%	44.8%	63.2%
Nail bed pallor	247	118	129	91.1%	68.3%	47.7%	57.2%

Table-3: Sensitivity, specificity, PPV, NPV of clinical pallor in moderate anemia

	Patients	True positive	False positive	Sensitivity	Specificity	PPV	NPV
Conjunctival pallor	36	8	28	62.1%	92.1%	22.2%	71.3%
Palmar pallor	26	7	19	71.7%	94.8%	26.9%	62.1%
Mucosal pallor	27	7	20	64.2%	94.1%	25.9%	60.3%
Nail bed pallor	32	4	28	58.3%	86.2%	12.5%	51.9%

Table-4: Sensitivity, specificity, PPV, NPV of severe clinical pallor in severe anemia

seen among 269 patients with 36 having severe conjunctival pallor. Sensitivity was 82.3% and specificity was about 84.1%. The positive and negative predictive values were 61.7% and 73.1% (table-2).

When the statistics of palmar pallor were evaluated, the sensitivity, specificity, PPV and NPV were 90.7%, 58.7%, 38.7% and 40.1% respectively. A total of 269 patients had palmar pallor among the 500 patients examined (table-3).

Mucosal pallor was observed in 205 patients among whom the sensitivity was 86.1% specificity was 73.2% PPV was 44.8% and NPV was 63.2%.

Among the 500 patients examined, 247 had nail bed pallor with a sensitivity of 91.3% and specificity of 68.3%. The positive predictive and negative predictive values were 44.7% and 57.2% respectively.

When the various parameters were compared between conjunctival, palmar, mucosal and nail bed pallor; it has been observed that sensitivity was highest for nail bed pallor in the evaluation of anemia. Specificity was highest for conjunctival pallor. The positive predictive value and negative predictive value were both highest for conjunctival pallor and least for palmar pallor.

Severe anemia was detected clinically by clinical examination of any one of the sites. Severe anemia and severe pallor were then correlated and tabulated.

36 patients had severe conjunctival pallor with a sensitivity of 62.1% and specificity of 92.1%. The positive and negative predictive values were 22.2% and 71.3% (table-4).

When parameters of palmar pallor were evaluated, there were 26 patients with severe pallor, the sensitivity was 71.7% and specificity was 94.8%. The positive predictive value was 26.9% and negative predictive value was 62.1%.

27 patients presented with severe mucosal pallor. The sensitivity of severe mucosal pallor in the diagnosis of severe anemia was 64.2%, specificity 94.1%, PPV 25.9% NPV 60.3%.

Severe nail bed pallor was seen in 32 patients with anemia. The sensitivity was 58.3%, specificity 86.2%, PPV 12.5% and NPV 51.9%.

When all the evaluated parameters were compared, highest sensitivity and specificity was observed for palmar pallor. The positive predictive value was highest for palmar pallor and least for nail bed pallor. The negative predictive value was highest for conjunctival pallor and least for nail bed pallor.

DISCUSSION

Anemia is a major global health problem, especially in developing countries. This fundamental health issue still has not been solved and continues to exist affecting the health, quality of life, and capacity in billions of children throughout the world.¹⁰ Our study showed 72.4% (362/500) of children to be anemic. A high percentage of children were found to be anemic in previous studies.^{11,12}

There were various studies conducted in the past on the accuracy of clinical pallor in the detection of anemia. A meta analysis of the studies shows that none of the individual

sites of detection of clinical pallor were more effective in the diagnosis of anemia.¹³ A detailed clinical examination involving all the sites were more accurate than any one sign individually.

In this study, nail bed pallor had the maximum sensitivity while conjunctival pallor had the highest specificity. However when it came to diagnosing severe anemia, palmar pallor had the highest sensitivity and specificity. This goes on to prove the fact stated above that cumulative examination of all sites will be more accurate in the diagnosis than a single site, usually the conjunctiva.

It has been established that when compared with nonanemic preschoolers, preschoolers with IDA displayed less social looking toward their mothers, moved close to their mothers more quickly, and were slower to display positive affect and touch novel toys for the first time. This indicates that IDA in the preschool period has affective and behavioral effects similar to those reported for IDA in infancy.¹⁴

As more than 3/4 th of the anemic children live in developing countries, in the absence of readily available equipment for hemoglobin estimation, the usage of clinical signs of anemia like pallor can be used for the detection and diagnosis of anemia thus initial earlier intervention before more permanent damage sets in.

CONCLUSION

Clinical pallor of the nailbeds had highest sensitivity for detection of moderate anemia while palmar pallor had the highest sensitivity for the detection of severe anemia. These are simple clinical signs which can be read even by non doctors and can thus be taught to various personnel like health workers and school teachers for early detection and prompt management of anemia in children below 5 years.

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