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REVIEW

Analysis of Pallor Examination for the Identification of Anemia Among Pregnant Women: A Scoping Review

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Abstract: Anemia affects more than 1.9 billion people globally, with pregnant women being among the most vulnerable. Pallor, a visible sign of reduced hemoglobin levels, is frequently used as a low-cost screening tool, particularly in resource-limited settings. This study aimed to assess the validity of clinical pallor signs for detecting anemia among pregnant women. A scoping review was conducted utilizing multiple databases, including PubMed, ScienceDirect, and Google Scholar. The review followed the PRISMA-ScR reporting guidelines and was systematically structured according to the PEO framework. Out of 812 articles identified, seven selected studies published between 2010 and 2025 were included in the review. The selected studies involved 1,847 participants from countries including India, Indonesia, Pakistan, Ethiopia, and Sri Lanka. This review found a significant association between physical pallor examination of the conjunctiva, buccal mucosa or tongue, and palms with anemia in both pregnant women and women of reproductive age ($p<0.001$). This review reported that conjunctival, nailbed, tongue/buccal mucosa, palm pallor, and pallor at any site demonstrated a broad range sensitivity and specificity values ranging from above 0% to 100%. However, the combined pallor examination of the conjunctiva, buccal mucosa or tongue, nail beds, and palms tends to demonstrate high sensitivity and specificity (≥70%) in detecting anemia. Therefore, combined pallor assessment is recommended for future research. Nonetheless, further studies are needed to standardize examiner skills, lighting conditions, skin pigmentation considerations, pallor grading systems, and inter-rater reliability analysis. Pallor examination remains a useful initial screening method for detecting moderate to severe anemia in pregnant women in resource-limited settings.

Keywords: anemia, pallor examination, diagnostic, validity, pregnant women

Introduction

Globally an estimated 1.9 billion people are affected by anemia including 32 million (37%) pregnant women.[1,2] Iron deficiency anemia in pregnant women accounted for 22% of maternal deaths worldwide in 2019.[3–5] According to the results of the Basic Health Research (Riskesdas) and the Indonesian Health Survey (SKI) the prevalence of anemia in pregnant women in Indonesia was estimated at 37.1% in 2013, 48.9% in 2018, and 27.7% in 2023.[6–9] The highest prevalence of anemia in pregnant women was found in the 25–34 year age group at 31.4% followed by the 35–44 year age group at 39.6% in 2023.[9]

During pregnancy, hemodilution leads to reduced hemoglobin concentration and increases the risk of iron deficiency anemia (IDA).[10] It refers to a dilution of red blood cells while maintaining normal circulating blood volume to preserve homeostasis. Concurrently, elevated erythropoietin (EPO) levels stimulate erythropoiesis and gradually raise iron

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requirements.[11,12] Maternal metabolic adaptation results in greater nutritional needs during pregnancy.[13] Insufficient iron supply and increased nutrient demands under these conditions may result in anemia.[13,14]

Anemia during pregnancy has a range of adverse consequences for both maternal and neonatal health, including increased morbidity, low birth weight, preterm birth, intrauterine growth restriction (IUGR), and potentially maternal and neonatal mortality.[1,13,15] Pregnant women with anemia are at a higher risk of delivering infants with anemia.[16,17] According to the 2020, Integrated Antenatal Care guidelines issued by the Ministry of Health of the Republic of Indonesia, efforts to reduce the prevalence of anemia include mandatory hemoglobin status testing for pregnant women during the first and third trimesters at healthcare facilities.[18]

However, the observed reduction in anemia rates remains insufficient to meet established targets.[4] Screening remains a vital component of preventive care, enabling more effective and less invasive treatment.[19,20] Several countries have developed national screening programs that have led to increased disease detection rates, while also contributing to improved disease prevention.[19] Implementing screening may support better health outcomes and help reduce the risk of complications associated with delayed diagnosis.[21] Health screening is widely recognized as a key preventive strategy that supports early diagnosis and treatment, enhances quality of life, and helps reduce the risk of premature mortality.[20]

Anemia screening is a tool used to assess the likelihood of an individual without symptoms having anemia with the goal of preventing morbidity or mortality due to the condition.[22] Previous studies have indicated that anemia screening can be conducted through pallor assessment.[23] Pallor is defined as a reduction in skin color and tone resulting from decreased blood supply to the skin and mucous membranes as well as a decrease in red blood cell count.[24] Pallor can be detected in several non-cutaneous tissues including the conjunctiva, tongue, palms, nails, lip mucosa, and through a history of previous medical conditions.[23,25–28]

According to the WHO Antenatal Care guidelines (2015), physical examination for pallor to detect anemia is required at every antenatal visit.[29] The use of pallor examination is important for the initial screening of anemia, particularly in resource-limited settings where laboratory-based hemoglobin measurement may not be feasible due to financial, logistical, or infrastructural limitations.[30] Pallor examination is recognized as an initial screening method for anemia that is simple, safe, non-invasive, cost-effective, and easy to perform.[31] At present, there is a lack of research investigating the validity of pallor signs associated with anemia among pregnant women and women of reproductive age.

Methods

This literature analysis utilizes the scoping review methodology, a systematic and rigorous approach used to synthesize key concepts, evidence types, and research dimensions on a topic, with the aim of identifying definitions, gaps, and directions for future systematic reviews.[32] We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines and applied the PRISMA flowchart for the search process.[33]

Research Question

This study aimed to assess the validity of clinical pallor signs for detecting anemia among pregnant women. Accordingly, the research question was formulated as follows: *Does pallor examination have the capacity to detect anemia?*

Search Strategy

Following the formulation of the research question, the PEO framework was utilized and relevant Medical Subject Headings (MeSH) terms were identified to guide the literature search in alignment with the study objectives. These terms were combined using Boolean operators to form the following search string: “pallor” OR “physical examination” AND “anemia”. The search for relevant articles was carried out between February and March 2025.

Selection of Studies

We conducted a literature search using the PubMed, ScienceDirect, and Google Scholar databases. The study selection process for this scoping review was carefully conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines and adopted the search stages outlined in the PRISMA flowchart. The flowchart consists of three stages: identification, screening, and inclusion. In the identification stage,

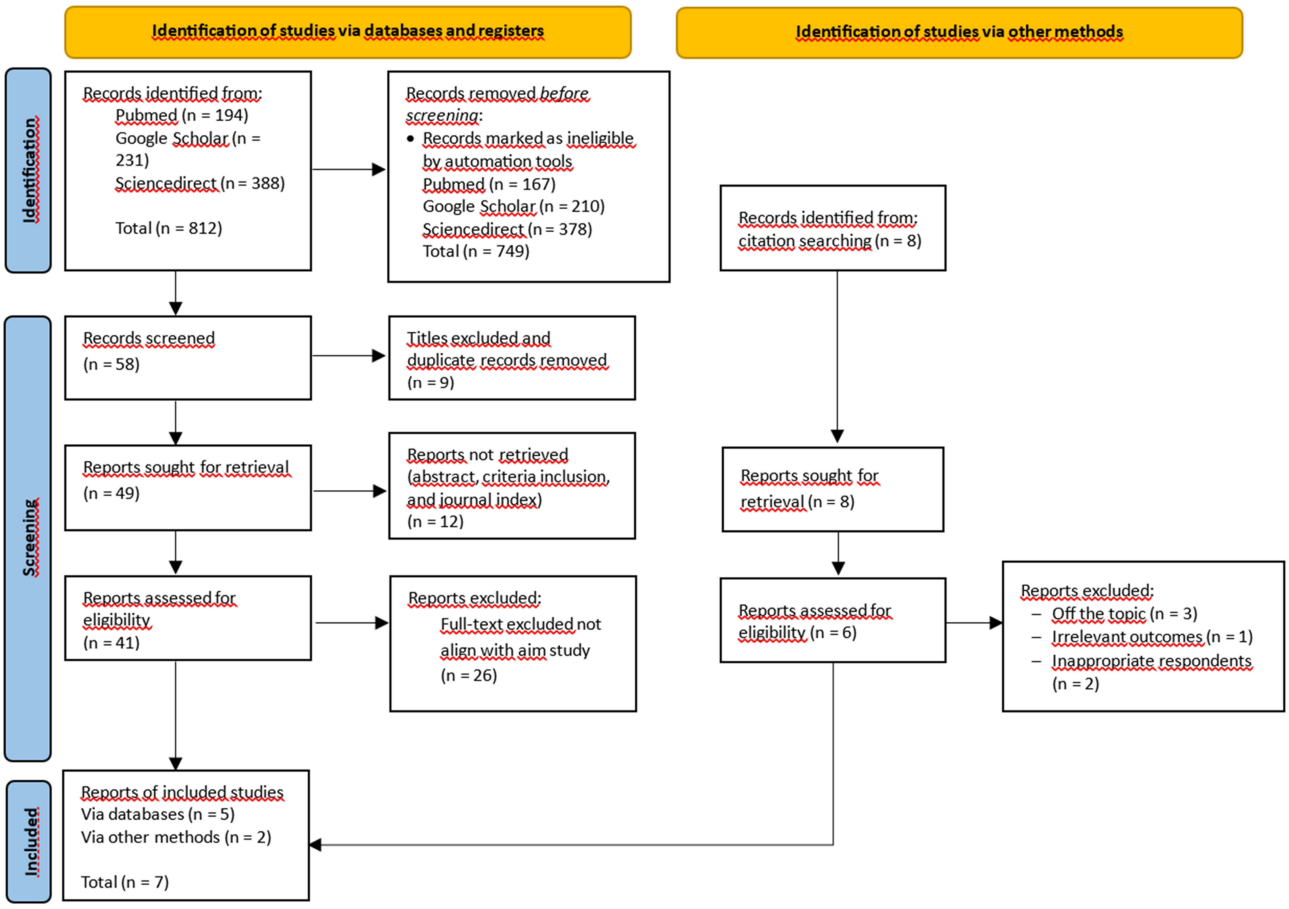

Figure 1 PRISMA flow diagram.

articles were collected from databases, and duplicates were removed using Zotero. Automation tools were used to filter articles by language, full-text availability, article type, and open access status. During the screening stage, titles, abstracts, and keywords were reviewed based on the research criteria. The literature sources considered for inclusion were required to be peer-reviewed and published in indexed journals, possess an ISSN, and clearly indicate the journal's volume and issue numbers. Only those that met these standards were included in the final stage of the review (Figure 1).

Inclusion Criteria and Study Eligibility

The inclusion criteria for this review were: 1) original research (quantitative, qualitative, observational, or experimental); 2) full-text accessibility; and 3) publication between 2010 and 2025. Articles meeting any of the following exclusion criteria were omitted: 1) review articles 2) presented as books; 3) not fully accessible; or 4) articles that did not specifically address the aim study.

Data Extraction

A standardized Microsoft Excel form was utilized for data extraction from the included studies. The PEOs framework (Population, Exposure, Outcome, and Study Design) guided the development of the search strategy and review focus (Table 1).

Table 1 PEO Framework

Population	Exposure	Outcome
Pregnant women and women of reproductive age (15–49 years)	Pallor signs OR Physical examination	Anemia OR anaemia

Synthesis Methods

A convergent integrated approach was employed for mixed-methods data synthesis, converting quantitative data into qualitative descriptions. This method facilitated a cohesive synthesis, combining quantitative and qualitative insights to provide a comprehensive understanding of the findings.

Results

Study Characteristics

A total of 7 studies were included in this scoping review. These studies were conducted in countries such as India, Pakistan, Indonesia, Ethiopia, and Sri Lanka (Table 2). Altogether, the studies involved 1,847 participants. Pallor was assessed at several anatomical sites, including the conjunctiva, nailbeds, tongue or buccal mucosa, and palms (Table 3).

Most of the included studies employed a prospective approach with a cross-sectional design. Hemoglobin measurement was consistently used as the reference standard for defining anemia across all studies. In studies involving pregnant women and childbearing women, anemia was most commonly defined as a hemoglobin level below 11 g/dL. The majority reference standard test of studies was used Sahli's method, portable hemoglobin analyzer, HemoCue, Cyanmethemoglobin method, and complete blood count (CBC) test (Figure 2).

Validity of Pallor Examination in Identifying Anemia

A good screening tool must demonstrate sensitivity and specificity of at least 70% to ensure the reliable detection of true positives and true negatives.[40] The review findings (Table 4) indicated that pallor examination of the conjunctiva, buccal mucosa or tongue, and nail bed was significantly associated with anemia ($p < 0.001$).[25,34,37] The conjunctiva has low sensitivity for detecting mild anemia (<69%) but high sensitivity for detecting moderate and severe anemia (≥70%).[36,38] The buccal mucosa or tongue, palms, and nail bed show low sensitivity in detecting mild, moderate, and severe anemia (0–69%).[36] However, the combined pallor examination of the conjunctiva, buccal mucosa or tongue, nail bed, and palms demonstrates high sensitivity in detecting anemia (≥70%).[35,37,39]

Table 2 Characteristics of Selected Articles by Country (n = 7)

Country	Frequencies
India	2
Indonesia	2
Pakistan	1
Ethiopia	1
Sri Lanka	1

Table 3 Data Extraction

Author(s)	Country	Title	Objectives	Participation	Methods	Results	Main Finding
Shetty et al (2024)[34]	India	To Assess the Accuracy and Reliability of Pallor in the Oral Cavity and Palpebral Conjunctiva To Clinically Diagnose Anaemia In Middle Aged Female Patients	To correlate pallor with different grades of anemia according to WHO criteria.	100 female patients aged 40 to 65 years presenting with pallor.	The prospective study defined anemia as Hb <12 g/dL. **Reference Standard**: Sahli's hemoglobinometer **Observer**: Doctor and haematology division	**Correlation**: Conjunctival and/or tongue pallor showed a statistically significant association with anemia severity *(p = 0.00)*. **Distribution** Conjunctival pallor was predominantly associated with moderate anemia (69.4%), whereas tongue pallor (25.6%) and combined conjunctival–tongue pallor (14.6%) were more common in severe anemia (95.2% and 41.7%, respectively). **Comparison** Tukey's post hoc test showed significant differences in mean hemoglobin levels across pallor sites ($p < 0.001$), with higher hemoglobin in conjunctival pallor compared to tongue pallor (mean difference = 3.14 g/dL) and combined conjunctival–tongue pallor (mean difference = 1.80 g/dL).	The extent of pallor was inversely correlated with hemoglobin levels. Conjunctival pallor tended to appear in moderate anemia, whereas tongue pallor was more common in severe anemia.
Bashir et al (2022)[35]	Pakistan	Diagnostic Accuracy of Clinical Pallor to Detect Anemia among Pregnant Females Seeking Antenatal Care in a Tertiary Care Hospital	To investigate the usefulness of clinical pallor in identifying anemia in pregnant women	393 pregnant women attending antenatal care.	The prospective study used peripheral vein blood samples to assess iron deficiency anemia, with hemoglobin cut-off <11.5 g/dL. **Reference Standard**: Complete Blood Count (CBC) **Observer**: Doctor (OB/GYN) and laboratory technicians	Combined clinical pallor examination (conjunctiva, nailbed, buccal mucosa, and palm) showed: **Sensitivity**: 94.1% **Specificity** 51.9% **PPV**: 40.7% **NPV**: 96.2% **Accuracy**: 62.8%	This examination is still performed. The pallor site of the palms is superior to the buccal mucosa, nail bed, and conjunctiva for diagnosing mild and severe anemia. This article shows multiple angles to detect anemia.

(*Continued*)

Table 3 (Continued).

Author(s)	Country	Title	Objectives	Participation	Methods	Results	Main Finding
Getahun (2015)[36]	Ethiopia	Validity of Pallor for Detecting Anemia and Factors Associated with Anemia Among Pregnant Women Attending Antenatal Care in Butajira General Hospital, Southern Ethiopia	To assess the validity of pallor for detecting anemia and identify factors associated with anemia among pregnant women.	217 pregnant women attending antenatal care.	A cross-sectional study to determine the validity of pallor in detecting anemia (Hb <11 g/dL). **Reference Standard**: HemoCue 301 **Observer**: Trained clinical nurses and laboratory technicians	Validity of pallor in detecting severity anemia: **Sensitivity**: Conjungtiva = mild (10%), moderate (96%), and severe (100%) Nailbed = mild (6.6%), moderate (22%), and severe (66%) Palmar = mild (3.3%), moderate (7.4%), and severe (33%) Tongue = mild (10%), moderate (62%), and severe (66%) **Specificity**: Conjungtiva = mild (99%), moderate (97%), and severe (99%) Nailbed = mild (98%), moderate (97%), and severe (99%) Palmar = mild (98%), moderate (98%), and severe (99%) Tongue = mild (96%), moderate (95%), and severe (99%)	Although pallor is a useful screening method for detecting anemia in pregnant women, particularly where severe anemia is prevalent, it should primarily be used to identify cases of moderate and severe anemia.
Bala et al (2012)[37]	India	Validity and Reliability of Haemoglobin Colour Scale and Its Comparison with Clinical Signs in Diagnosing Anaemia in Pregnancy in Ahmedabad, India	To compare the validity and reliability of the haemoglobin colour scale (HCS) with clinical signs for diagnosing anaemia in pregnant women, using Sahli's haemoglobinometer as the gold standard.	129 pregnant women attending urban health centres in Ahmedabad.	Cross-sectional study comparing methods for diagnosing anaemia (<11 g/dL). **Reference Standard**: haemoglobin colour scale (HCS) and Sahli's method **Observer**: Medical officer and laboratory technician	**Correlation**: There was a significant difference (P = 0.0001) between the proportions diagnosed by Sahli's method and by clinical signs (conjunctiva, tongue, and palms). **Sensitivity**: 91.11% (mild 69.01%, moderate 47.06%, and severe 100%) **Specificity**: 12.82% **PPV**: 74.26% **NPV**: 46.43%, **Accuracy**: 68.2%	Clinical signs are better than HCS for diagnosing anemia. This study assessed pallor across multiple sites simultaneously, making it impossible to determine the validity of each individual site.

Chathurani et al (2012)[38]	Sri Lanka	Anaemia in pregnancy in the district of Anuradhapura, Sri Lanka–need for updating prevalence data and screening strategies	To determine the prevalence of anaemia during pregnancy in Anuradhapura district and evaluate present screening methods for anaemia.	900 Pregnant Females Mean Age 27 years (SD: 5.5 years)	Cross-sectional study on conjunctival examination to identify anemia (<11 g/dL). **Reference Standard**: Cyanmethemoglobin test **Observer**: Field clinic and trained nurse	**Distribution**: Proportion of not pale (81.2%), Mild (17.6%), dan moderate (1.2%) pallor dibandingkan dengan Hb<11 g/dL. **Sensitivity**: 18.8% **Specificity**: 69.3%	Conjunctival screening should not be used as a singular measure for diagnosis of anemia due to its low validity.
Rahmawati and Suparti (2024)[25]	Indo-nesia	Screening Anemia Pada Kelompok Wanita di Desa Cikidang	To assess anemia screening in women and examine the relationship between age, fertility status, conjunctiva, lip mucosa, BMI, and medical history with anemia risk.	94 women aged 19 years and older from Cikidang Village.	Descriptive cross-sectional study to identify anemia (Hb <12 g/dL). **Reference Standard**: Portable hemoglobin analyzer **Observer**: The Research team	**Correlation**: There was a significant association between conjunctival and lip mucosal pallor and the risk of anemia (p = 0.001). **Proportion**: The proportion of anemia was 66.7% among women with pale conjunctiva and 43.5% among those with pale lip mucosa.	This study did not assess the validity of pallor examination; however, it provided an overview of the proportion of anemia risk associated with pallor.
Hidayati et al (2019)[39]	Indonesia	Penilaian Uji Validitas Instrumen Skrining Anemia pada Siswa Madrasah Aliyah Islamic Center Baiturahman Banyuwangi	To assess the validity of anemia screening tools for early detection of anemia in adolescents.	15 female students aged 16–18 years.	A cross-sectional study to identify anemia using a symptom checklist, including pale conjunctiva, pale tongue, pale nails, brittle nails, blurred vision, dizziness, weakness, and fatigue. Anemia was defined as Hb <12 g/dL **Reference Standard**: Portable hemoglobin analyzer **Observer**: The researcher and laboratory technician	Distribution: This study showed that the proportions of pallor were 60% for conjunctiva, 0% for tongue, and 20% for nailbed. The symptom checklist questionnaire demonstrated: **Sensitivity**: 100% **Specificity**: 71.4% **PPV**: 20% **NPV**: 100%.	The small sample size in this study resulted in relatively homogeneous data, limiting generalizability and the robustness of the findings.

Abbreviations: Sn, sensitivity; Sp, specificity; PPV, positive predictive value; NPV, negative predictive value.

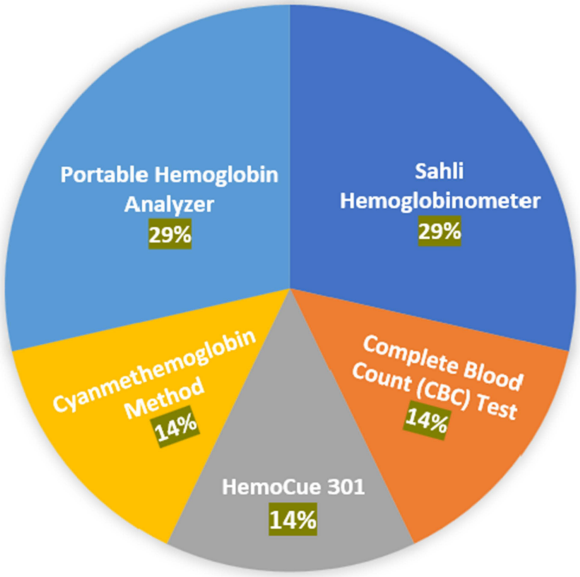

Figure 2 Hemoglobin measured as a reference standard.

According to Regina and Chathurani, the conjunctiva has low specificity in detecting anemia.[38,41] In contrast, the examination of the conjunctiva, nail bed, buccal mucosa or tongue, and palms—as well as their combination—has high specificity for detecting mild, moderate, and severe anemia (≥70%).[36,39] Nevertheless, other studies by Bashir and Bala reported differing results, showing that the combination of pallor examinations has low specificity (0–69%).[35,37]

Table 4 Summary of the Findings (n = 7)

Indicator	Analysis Correlation (Significant)	Validity Analysis of Pallor Examination and Anemia			
		Sensitivity		Specificity	
		(Sn 0–69%)	(Sn ≥70%)	(Sp 0–69%)	(Sp ≥70%)
Conjungtiva	Shetty et al (2024)[34] Rahmawati and Suparti (2024)[25] Bala et al (2012)[37]	Regina et al (2016)[41] Chathurani et al (2012)[38]	Moderate and severe anemia: Getahun (2015)[36]	Regina et al (2016)[41] Chathurani et al (2012)[38]	Mild, moderate, and severe anemia: Getahun (2015)[36]
Nailbed		Mild, moderate, and severe anemia: Getahun (2015)[36]			Mild, moderate, and severe anemia: Getahun (2015)[36]
Buccal mucose or tongue	Shetty et al (2024)[34] Bala et al (2012)[37] Rahmawati and Suparti (2024)[25]	Mild, moderate, and severe anemia: Getahun (2015)[36]			Mild, moderate, and severe anemia: Getahun (2015)[36]
Palm	Bala et al (2012)[37]	Mild, moderate, and severe anemia: Getahun (2015)[36]			Mild, moderate, and severe anemia: Getahun (2015)[36]
Combination of pallor			Bashir et al (2022)[35] Bala et al (2012)[37] Hidayati et al (2019)[39]	Bashir et al (2022)[35] Bala et al (2012)[37]	Iswana Zahraa Hidayati et al (2019)[39]

Discussion

According to the World Health Organization (WHO), anemia during pregnancy is defined as a hemoglobin level of less than 11 g/dL. Anemia is classified as mild (hemoglobin 10–<11 g/dL), moderate (hemoglobin 7–<10 g/dL), and severe (hemoglobin <7 g/dL).[42] Anemia in pregnant women is caused by multiple factors. According to the conceptual framework of anemia developed by the World Health Organization (WHO, 2023), anemia is attributed to direct causes (obstetric and gynecological conditions, micronutrient deficiencies, infections, and hereditary factors) as well as risk factors, which include immediate, underlying, and basic determinants.[43]

Pallor examination can reflect anemia in pregnant women, as it results from a reduction in hemoglobin concentration and healthy red blood cells.[44,45] This condition becomes visible in exposed tissues such as the conjunctiva, fingernail beds, palms, skin, and tongue.[23] These sites are suitable for pallor assessment due to two primary factors: (1) the minimal presence of connective tissue between the outer mucous membrane and blood vessels, and (2) the absence of dermis, epidermis, melanin, or subcutaneous tissue.[46] This is further supported by Bala et al (2012), who reported that the assessment of pallor demonstrated greater accuracy in detecting anemia compared to the use of the WHO hemoglobin color scale.[37]

This study demonstrated a significant association between physical pallor examination of the conjunctiva, buccal mucosa or tongue, and palms with anemia in both pregnant women and women of reproductive age ($p<0.001$). This finding is consistent with previous studies suggesting that the evaluation of conjunctival pallor can be performed by examining the correlation between conjunctival color and hemoglobin concentration.[47,48] Conjunctival pallor can effectively identify cases with hemoglobin levels below 11 g/dL.[47,48] The conjunctiva demonstrates high sensitivity (≥70%) for detecting moderate and severe anemia but shows low specificity for diagnosing anemia.[36,38,41]

The conjunctiva is a mucous membrane that lines the eyeball and the inner surface of the eyelids, with the anterior portion rich in blood vessels and the posterior portion containing abundant lymphoid tissue.[49] Due to these histological differences, the anterior palpebral conjunctiva normally appears redder, and pallor in this area is considered the most clinically predictive sign of anemia.[50,51] Under microscopic observation, anemia results in a granular or interrupted appearance of blood flow in the perilimbal conjunctival vessels, particularly in small arterioles, as decreased hemoconcentration increases the distance between erythrocytes.[52]

The buccal mucosa or tongue, palms, and nail beds show low sensitivity (0–69%) in detecting mild, moderate, and severe anemia but demonstrate high specificity (≥70%) for these conditions.[36] According to the study by Irfan (2020), physical examination for pallor on the palms or nailbeds is more suitable for detecting moderate anemia in toddlers, with a sensitivity ranging from 92% to 95%.[53] Anemia leads to vasoconstriction, which reduces blood perfusion to the nailbed, resulting in a pale (whitish) discoloration. In some cases, changes in the nailbed may be incidental findings that provide clues to underlying conditions, highlighting the importance of consistently examining the nails as concrete supporting evidence.[54]

Pallor observed in the mucous membranes indicates a hemoglobin level of less than 9 g/dL.[55] The epithelial cells of the tongue papillae have a rapid turnover, making them highly sensitive to vitamin B12 and folate deficiency.[56] In iron deficiency or iron-deficiency anemia, reduced hemoglobin levels lower oxygen delivery and blood perfusion to the dorsal tongue mucosa, leading to visible pallor. Iron deficiency also thins the buccal epithelium, disrupts oral flora, and reduces mucosal oxygenation, ultimately causing mucosal atrophy.[57]

Study found that palmar pallor assessment had the highest pooled sensitivity (80.9%) for hemoglobin levels below 8 g/dL, while the pooled sensitivity was significantly lower (39.2%) for a hemoglobin threshold of less than 11 g/dL.[22] According to WHO (2015), the examination of palm pallor may serve as an initial screening method for anemia.[29] Anatomically, the palm's thick and translucent skin, limited melanin content, and rich superficial capillary network allow for the visual detection of pallor.[58] However, the accuracy of this method may be limited, potentially due to variations in skin pigmentation that influence the interpretation of pallor.[59]

The results of this review indicate a wide variation in the sensitivity and specificity of pallor examinations across different sites. As reported by Divya (2012), the diagnostic performance of individual pallor signs showed sensitivity ranging from 46.3% to 66.5%.[60] In contrast, this review found that the combined pallor examination of the conjunctiva,

buccal mucosa or tongue, nail bed, and palms tends to demonstrate high sensitivity and specificity (≥70%) in detecting anemia. Consistent with Divya (2012), the combined pallor assessment improved diagnostic accuracy, yielding a sensitivity of 72.6%, specificity of 77.2%, positive predictive value (PPV) of 79.3%, and negative predictive value (NPV) of 70%.[60] Another study utilizing community-based pallor observers showed that only a small proportion of individuals (18.3%) were aware of the body sites where pallor can be detected, suggesting the potential benefit of implementing pallor screening in community settings.[61]

Although hemoglobin measurement is widely used in clinical and field settings, it requires equipment and involves costs that limit its feasibility in low-resource environments with inadequate infrastructure or extreme conditions.[62] In Indonesia, hemoglobin testing is typically performed only in the first and third trimesters, leading to potential delays in detecting anemia that develops during the second trimester.[9] Pallor examination remains a useful initial screening method for detecting moderate to severe anemia in pregnant women in resource-limited settings, although additional diagnostic tests are required to confirm anemia.

Conclusion

Anemia in pregnant women causes vasoconstriction of small blood vessels, leading to pallor in specific anatomical sites. Pallor can be observed in areas with minimal connective tissue and lacking the dermis, epidermis, melanin, or subcutaneous tissue. In general, pallor examination is performed on the conjunctiva, buccal mucosa or tongue, nail beds, and palms. This review shows that each anatomical site exhibits varying sensitivity and specificity in detecting anemia. However, the combined pallor examination of the conjunctiva, buccal mucosa or tongue, nail beds, and palms tends to demonstrate high sensitivity and specificity (≥70%) in detecting anemia. Therefore, combined pallor assessment is recommended for future research. Nonetheless, further studies are needed to standardize examiner skills, lighting conditions, skin pigmentation considerations, and pallor grading systems. Pallor examination can be considered an initial screening method for anemia in extremely resource-limited settings and may also be used for periodic community-based monitoring because it is noninvasive and easy to perform.

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The authors declare that there are no conflicts of interest in the writing or publishing of this article.

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