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"A Study to Assess the Accuracy of Nail Shade Device for Detecting and Grading Anaemia among the Pregnant Women"

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Assess, Accuracy, Nail shade device, Detecting and Grading Anaemia, Analyzer, Diagnostic accuracy.

Abstract

Background- Approximately a third of the world's population has anaemia, making it the most prevalent blood condition. About a billion individuals have anaemia due to a lack of iron. There is mounting evidence that maternal anaemia increases the risk of both maternal or foetal mortality and morbidity.

Methodology- Quantitative research approach and comparative descriptive design was used on 290 pregnant women, at Krishna hospital, Karad. Pregnant women undergone haemoglobin estimation was included in the study by using convenient sampling technique. Data was collected by using interview technique. The nail blade of pregnant women was observed at first visit before hemoglobin estimation and grading was done as below 15, below 11, below 7 and compared with the findings of hemoglobin done by analyzer, the schedule was continued till completion of 165 anaemic pregnant women. Analysis was done by using descriptive and inferential statistics.

Results- According to nail shade device, Majority of pregnant women 210 (72.41%) were having Hb level below 11 gm/dl, 77 (26.55%) were having Hb level below15 gm/dl, 3 (1.03%) were having Hb below 7 gm/dl. According to analyzer (lab reports) majority of pregnant women 208 (71.72) were having Hb level between 7 to 11 gm/dl, 79 (27.24%) were having Hb between 11 to 15 gm/dl and 3 (1.03%) were having Hb below 7 gm/dl. Spearman correlation coefficient i.e. r value was 1.000 whose one tailed p value was 0.1667 considered as significant. Non-parametric spearman correlation coefficient values and one tailed p value, found significant difference between mean ± SD Hb level of nail shade device and analyzer ($p < 0.0001$)

Conclusion- The study concluded that the nail shade has the potential to be the appropriate tool for the detection and grading of anaemia (mild, moderate, severe) and it would help the community people to develop an understanding and in preventing anaemia.

1. Introduction:

Approximately a third of the world's population has anaemia, making it the most prevalent blood condition. Nearly a billion individuals worldwide have iron-deficiency anaemia. The haemoglobin level is under 9 gm/dl, requiring thorough examinations and the right therapy, since that's when the plasma volume swells the most during pregnancy, at approximately the 32nd week. Using this lower threshold, the prevalence of anaemia during pregnancy in the tropics varies significantly from 40% to 80%, whereas in the industrialised world it ranges from 10% to 20% and accounts for 20% of the deaths of mothers.

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Pregnancy-related anaemia is the world's leading public health problem. According to the World Health Organisation, anaemia affects over half of all pregnant women worldwide (with a prevalence of 56–61 percent in underdeveloped nations).[5] There are several degrees of anaemia. According to the World Health Organisation (WHO), a haemoglobin level of 10.0–10.9 g/dl indicates mild anaemia, 7–9.9 g/dl indicates moderate anaemia, and less than 7 g/dl indicates severe anaemia during pregnancy. In low-income nations, 61 percent of expecting mothers suffer from anaemia. Foetal health is significantly affected by maternal anaemia.

During pregnancy iron needs to vary with the pre-pregnancy hemoglobin, body weight of the mother, and the size and maturity of the fetus. There is conservation of 240-480 mg of iron due to amenorrhea and thus 700-1200 (average 1000 mg) of iron is required during pregnancy. Hence, daily iron requirement is 4 mg/day (on an average) throughout varying from 2.5 mg/ day in early pregnancy, in mid pregnancy its 5.5 mg and from 32 weeks of gestation onwards its 6.6 mg. The absorption of iron is 10% which requires 40- 60 mg of iron to be available in the diet to achieve 4-6 mg of absorption daily. This is not available in the average Indian diet hence, there is the need to add supplement. 100 tablet containing 100 mg iron and 0.5 mg folic acid, each one tablet daily from second trimester onwards during normal pregnancy is given in Government of India's anemia prevention program. In cases where the pregnant woman is anemic, double dose of prevention program i.e (200 tablets) is recommended in the National program.[7]

Anemia is global problem having a wide range of prevalence, severity and etiology in various countries. It is mainly challenging for the obstetricians as it is responsible for a major chunk of maternal mortality (40% -60%). Above 25% of the people in the world are anemic, the cause of more than half of it is iron deficiency.

World health Organization (WHO) estimates 74.3% of Indian population is anemia; almost 58% of pregnant women in India have anemia, which is also the underlying cause for 40% (20% direct and 20% indirect) maternal deaths. That means, if we wipe out anemia from India almost half of our pregnant women will not die. This task not requires any major technical input. Diet and supplementation is all that is needed. The national /family Health Survey-3 has shown that anemia is widely present in all age groups, but is particularly high among the most vulnerable group, i.e. pregnant women (58%), non- pregnant and non-lactating (50%) women and adolescent girls(56%).[8]

The frequency of anaemia was still greater among pregnant women who were taking folic acid and iron supplements and routinely visiting prenatal clinics [9]. The causes of anemia should be associate to mainly nutritional deficiency, poor intake of iron rich food stuff, worm infestations, repeated pregnancies in a short interval of time, absence of replenishing of the iron stores lost due to menstrual loss, etc.[8,10] Maternal anemia is often associated with increased risk of maternal and fetal morbidity and mortality.[11] So, the only way to reduce these complications is early screening for anemia and giving proper, effective treatment and counseling about the same.

Shade According to Hb 15 gm/dl

Despite the ease with which anaemia may be diagnosed using a Sahli's haemoglobin metre or, more recently, an electronic cell counter, doctors and other medical professionals sometimes attempt to spot anaemia by looking for a pale appearance in the conjunctiva, tongue, palm or nail beds. Although doctors employ clinical evaluation of pallor is a screening tool, they nevertheless request a haemoglobin test if any indicators of pallor are found. Pallor of the conjunctiva, tongue, palms, and nail beds are all telltale symptoms of anaemia. Even if there is room for improvement in the clinical indicators for detecting anaemia, these signals may be chosen at the bedside with relative ease and no training. Nail bed searching is ingrained in clinical education and physical

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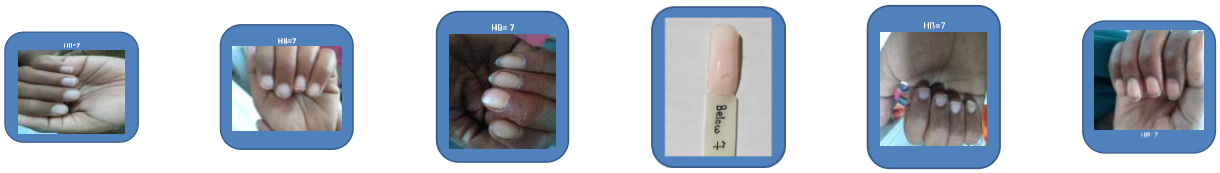
exams and isn't going to be abandoned despite its limitations.

Nail shade According to HB 11 gm/dl

It has been found that more than half of world's population will experience some form of anemia in their lifetime. Therefore, it is suggested that basic health care be reinforced, and that pregnant women be offered preventative measures, early detection, and treatment for anaemia. The nursing staff in the hospital and the community should implement health education programmes aimed at reducing the prevalence of anaemia and other risk factors and encouraging healthier lifestyle choices. Better foetal and maternal outcomes may result from the use of early identification and treatment techniques for anaemia in pregnancy.

Therefore the study was undertaken to know the accuracy of nail shade device in detecting anemia, and if positive what level of anemia clinical pallor can detect with confidence and for early screening of anemia and giving proper, effective treatment and counseling and to reduce the further complications among pregnant women.

Nail shade According to HB 7 gm/dl



Objectives of the study: (i) To find an accuracy of nail shade device for detecting and grading anemia (ii) To compare Hb level by nail shade device and analyzer for grading anemia

2. Material and Methods

The quantitative research approach and descriptive research design was used. The study was conducted in antenatal clinic at Krishna Hospital & Medical Research centre Karad. The population comprises all pregnant women attending antenatal clinic. Every consecutive pregnant woman was recruited according to the inclusion criteria with convenient sampling technique. The participants were included till completion of desired participants of 165 anemic pregnant women by nail shade device, so overall 290 pregnant women were included in the present study. The variables considered for was hemoglobin level of pregnant women with analyzer and nail shade device and detecting and grading of anemia.

Pregnant women attending antenatal clinic and ready for blood investigations, (ANC package) during their ANC visit were included in the study. Pregnant women diagnosed as anemia, having bleeding or receiving a blood transfusion at the time of enrolment and women who had mhendi's and nail paints on their nails were excluded from the study. Sample size was calculaded,

Formula used to calculate sample size was,

$$n = \frac{4 \times p \times q}{L^2}$$

By the Findings of study conducted by, Kalantri A, Karambelkar M. [12]

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p = Percentage of confirmed anemia amongst Predicted anemia by nail shade = 72%. L =Allowed error considered 7%.

q = 100-p = 28%

$$n = \frac{4x72x28}{49} = 165$$

The study has conducted on 290 pregnant women till getting 165 anemic women by nail shade device. Structured interview schedule was prepared to collect data. It was prepared in English and it was translated in Marathi.

The tool contain: Section A: Socio demographic data which includes, (Age, Residence, Educational status, Occupation, Family size, Types of food, Green vegetables consumption, Fruits consumption, Habit of drinking tea) **Section B**: Obstetrics data which includes, (Trimester, Gravidity, Number of ANC Visit, Inter-pregnancy interval, Having number of children, History of Postpartum Hemorrhage, History of Abortion, Bleeding during present pregnancy, History of excess menstrual bleeding, Iron foliate supplementation during present pregnancy, Gestational age at the time of data collection) and HB level according to nail shade device and HB according to analyzer.

Procedure of Nail Shade Device: The nurse investigator assessed nail blades of pregnant women who were attending antenatal OPD. The nail blade and hemoglobin level was observed i.e. below 15, below 11, and below 7 and as per Hb level, and nail blade photographs were taken and based on photographs the nail shade device was prepared and matched with color of nail blade. The nurse investigator used the polygel nail kit for preparing nail shade device. The prepared nail shade was matched with nail blade photographs of pregnant women according to Hb level. The prepared nail shade device was modified again and again till the nails will match with nail blade of pregnant women as per Hb level. Article used for preparation of nail shade was UVLED. (Nail lamp for drying nails after polishing.), Nail bounder, Merge gel, Nail thinner, Color polish gel, Fake nails, and Nail stick.

Ethical consideration: Ethical permission from Ethical committee of KIMSDU, was obtained, permission from Medical director, Nursing authorities, and head of departments of obstetrics and gynecology department of Krishna Hospital, Karad was obtained. Purpose of study was explained to participants and informed consent was obtained from all participants.

Data Collection Procedure: The data was collected from 10 August to10 October in 3 phases: Phase 1: The pregnant women who came for antenatal assessment and who was ready for hemoglobin estimation were enrolled in the study. The data was collected by using interview technique it took 15 to 20 min along with socio demographic data. Phase 2: The maternal data was collected and the nail blade of pregnant women was observed and graded at first visit before hemoglobin estimation. So the grading was done Below 15, 11 and 7. Phase 3: Findings of nail shade device were compared with the analyzer findings.

Data Analysis: The obtained data was analyzed in the terms of the objective of the study using descriptive (frequency, percentages, mean, SD) and inferential statistics (Wilcoxon matched pair test, Spearman Correlation coefficient) The plan for data analysis was developed under the guidance of guide and the statistician.

3. Results

According to nail shade device 3 (1.03%) pregnant women had Hb level <7 gm/dl, 210 (72.14%) had Hb level between 7 to 11 gm/dl, and 77(26.55%) had Hb level between 11 to 15 gm/dl. According to analyzer 3 (1.03%) pregnant women had Hb level <7 gm/dl, 208(71.72%) had Hb level between 7 to 11 gm/dl, and 79 (27.24%) had Hb level between 11 to 15 gm/dl. Wilcoxon matched pairs test was used, there was no significant difference found between Hb level of nail shade device and analyzer for detecting and grading anemia (p=0.9999).

Spearman correlation coefficient test was used to find correlation between Hb level of nail shade device and analyzer, there was significance correlation found between Hb level of nail shade device and analyzer for detecting and grading anemia, (r=1.000) and one tailed (p=0.1667).

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Table 1: Accuracy of nail shade device and analyzer for detecting and grading Anempia (n=290)

Hb Level	According to Nail shade device.	According to Analyzer.	Wilcoxon matched pair test P Value (two- tailed)	Speaman Correlation coefficient	
	No (%)	No (%)		r value	P Value (one tailed)
< 7gm/dl.	3 (1.03%)	3 (1.03%)	0.9999	1.000	0.1667
7 to 11 gm/dl.	210 (72.41%)	208(71.72%)			
>11 to 15 gm/dl	77 (26.55%)	79 (27.24%)			

The Wilcoxon matched pairs test was used to find comparison between Mean ± SD Hb level of nail shade and analyzer (lab reports). There was no significant difference found between Mean ± SD Hb gm/dl of nail shade device and analyzer according to age, residence, educational status, occupation and socio-economic status ($p>0.05$).

The spearman correlation coefficient test was used to find correlation between Mean ±SD Hb level of nail shade device and analyzer (lab reports). There was significant correlation found between Mean ± SD Hb level of nail shade device and analyzer (lab reports) according to age, residence, educational status, occupation and socio-economic status ($p < 0.0001$).

Table 2: Comparison between Mean ± SD Hb level of Nail shade device and Analyzer According to Demographic variables (n=290)

Demographic Variables	Frequency & Percentage (%)	Hb Level		Wilcoxon matched pair test P value (two tailed)	Spearman Correlation coefficient	
		Mean ± SD of Hb gm/dl (Nail shade)	Mean ± SD of Hb gm/dl (Analyzer)		r value	P value (one tailed)
Age:						
19 to 24 years	157 (54.14%)	1.694 ± 0.4759	1.687 ± 0.4748	0.7500	0.9570	< 0.0001
25 to 30 years	107 (36.90%)	1.803 ± 0.4220	1.803 ± 0.4220	0.9999	0.9458	< 0.0001
31 to 36 years	26 (8.9%)	1.807 ± 0.4915	1.769 ± 0.5144	0.9999	0.9186	< 0.0001
Residence:						
Rural.	257 (88.63%)	1.747 ± 0.4617	1.743 ± 0.4637	0.8125	0.9529	< 0.0001
Urban.	33(11.38%)	1.727 ± 0.4523	1.696 ± 0.4667	0.9999	0.9287	< 0.0001

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Demographic Variables	Frequency & Percentage (%)	Hb Level		Wilcoxon matched pair test P value (two tailed)	Spearman Correlation coefficient	
		Mean ± SD of Hb gm/dl (Nail shade)	Mean ± SD of Hb gm/dl (Analyzer)		r value	P value (one tailed)
Educational status:						
Ill-literate.	4 (1.38%)	2 ± 0.000	2 ± 0.000	--------	---------	-----
Primary Education.	19 (6.56%)	1.789 ± 0.5353	1.789 ± 0.5353	--------	--------	-----
Secondary Education.	125 (43.11%)	1.752 ± 0.4518	1.76 ± 0.4472	0.9999	0.9799	< 0.0001
Graduation & Above.	142 (48.96%)	1.725 ± 0.4635	1.704 ± 0.4732	0.3125	0.9187	< 0.0001
Occupation:						
Housewife	269 (92.76%)	1.736 ± 0.4662	1.724 ± 0.4718	0.3125	0.9566	< 0.0001
Government Employee	1 (0.35%)	2 ± 0.000	2 ± 0.000	---------	---------	-----
Self-Employee	20 (6.90%)	1.85 ± 0.3663	1.9 ± 0.3078	0.9999	0.7935	< 0.0001
Socio-economic status:						
Upper Middle	101(34.83%)	1.792 ± 0.4078	1.772 ± 0.4215	0.3750	0.8853	< 0.0001
Lower Middle	177 (61.04%)	1.700 ± 0.4834	1.700 ± 0.4834	0.9999	0.9748	< 0.0001
Upper lower	12 (4.14%)	2 ± 0.4264	2 ± 0.4264	--------	--------	< 0.0001

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Table no 3: Comparison between Mean ± SD Hb level of Nail shade device and Analyzer According to Habits and number of family members (n=290)

Demographic Variables	Frequency & Percentage (%)	Hb Level		Wilcoxon matched pair test P value (two tailed)	Spearman Correlation coefficient	
		Mean ± SD of Hb gm/dl (Nail shade)	Mean ± SD of Hb gm/dl (Analyzer)		r value	P value (one tailed)
No of Family Members:						
2 to 7	238(82.07%)	1.726 ± 0.4740	1.722 ± 0.4760	0.8125	0.9516	< 0.0001
8 to 13	45(15.52%)	1.866 ± 0.3438	1.844 ± 0.3665	0.9999	0.9139	< 0.0001
14 to 19	7 (2.42%)	1.571 ± 0.5345	1.571 ± 0.5345	----------	----------	---------
Types of food:						
Mixed.	249(85.87%)	1.734 ± 0.4601	1.730 ± 0.4622	0.8125	0.9515	< 0.0001
Vegetarian	41(14.14%)	1.804 ± 0.4593	1.780 ± 0.4750	0.9999	0.9415	< 0.0001
Consumption of green leafy vegetables, (Weekly):						
Yes(How often)	290(100%)	1.744 ± 0.4599	1.7379 ± 0.4635	0.5625	0.9500	< 0.0001
1 to 3.times	174 (60%)	1.712 ± 0.4786	1.718 ± 0.4760	0.7500	0.9607	< 0.0001
4 to 5 times	116 (40%)	1.793 ±0.4277	1.767 ± 0.4444	0.2500	0.9323	< 0.0001
Consumption of fruits. (weekly):						
Yes (how often)	290(99.66%)	1.743 ± 0.4604	1.737 ± 0.4640	0.5625	0.9499	< 0.0001
1 to 3	133(46.03%)	1.691 ± 0.4951	1.699 ± 0.4921	0.7500	0.9513	< 0.0001
4 to 5	156(53.98%)	1.788 ± 0.4252	1.769 ± 0.4377	0.2500	0.9485	< 0.0001
No	1 (0.35%)	2 ± 0.000	2 ± 0.00	--------	---------	---------
Habit of Drinking Tea (In a day):						
Yes (how often)	219(75.52%)	1.726 ± 0.4671	1.712 ± 0.4735	0.3125	0.9473	< 0.0001
Once in a day	73(33.34%)	1.712 ± 0.4853	1.684 ± 0.4966	0.3750	0.8818	< 0.0001

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Demographic Variables	Frequency & Percentage (%)	Hb Level		Wilcoxon matched pair test P value (two tailed)	Spearman Correlation coefficient	
		Mean ± SD of Hb gm/dl (Nail shade)	Mean ± SD of Hb gm/dl (Analyzer)		r value	P value (one tailed)
Twice in a day	140(63.93%)	1.728 ± 0.4621	1.721 ± 0.4656	0.9999	0.9831	< 0.0001
Thrice in a day.	6(2.74%)	1.833 ± 0.4082	1.833 ± 0.4082	---------	------	-------
No.	71(24.49%)	1.802 ± 0.4349	1.816 ± 0.4246	0.9999	0.9609	< 0.0001

The Wilcoxon matched pairs test was used to find comparison between Mean ± SD Hb level of nail shade and analyzer (lab reports). There was no significant difference was found between Mean ± SD Hb gm/dl of nail shade device and analyzer according to number of family members, types of food, consumption of green leafy vegetables, consumption of fruits, habit of drinking tea ($p>0.05$).

The Wilcoxon matched pairs test was used to find comparison between Mean ± SD Hb level of nail shade and analyzer (lab reports). According to Obstetric Variables there was no significant difference found between Mean ± SD Hb gm/dl of nail shade device and analyzer such as gravidity, ANC visits, inter-pregnancy Interval, number of children, and history of PPH ($p>0.05$).

The spearman correlation coefficient test was used to find correlation between Mean ± SD Hb level of nail shade device and analyzer (lab reports). There was significant correlation found between Mean ± SD Hb level of nail shade device and analyzer (lab reports) according number of family members, types of food, consumption of green leafy vegetables, consumption of fruits, habit of drinking tea ($p < 0.0001$).

The spearman correlation coefficient test was used to find correlation between Mean ± SD Hb level of nail shade device and analyzer (lab reports). According to Obstetric variables there was significant correlation found between Mean ± SD Hb level of nail shade device and analyzer (lab reports) such as gravidity, ANC visits, inter-pregnancy Interval, number of children, and history of PPH ($p < 0.0001$).

Table No 4: Comparison between Mean ± SD Hb level of Nail shade device and Analyzer According to Obstetrical Variables (N=290)

Obstetric Variables	Frequency & Percentage (%)	Hb Level		Wilcoxon matched pairs test P value (two tailed)	Spearman Correlation coefficient	
		Mean ± SD of Hb gm/dl (Nail shade	Mean ± SD of Hb gm/dl (Analyzer)		r value	P value (one tailed)
Gravidity:						
Primigravid.	142(48.97%)	1.732 ± 0.4600	1.739 ± 0.456	0.7500	0.9484	< 0.0001
Multigravida	148(51.04%)	1.756 ±0.4610	1.736 ± 0.4718	0.2500	0.9526	< 0.0001

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Obstetric Variables	Frequency & Percentage (%)	Hb Level		Wilcoxon matched pairs test P value (two tailed)	Spearman Correlation coefficient	
		Mean ± SD of Hb gm/dl (Nail shade	Mean ± SD of Hb gm/dl (Analyzer)		r value	P value (one tailed)
2^{nd}gravida.	89(60.14%)	1.741 ± 0.4403	1.730 ± 0.4463	0.9999	0.9715	< 0.0001
3^{rd}gravida.	45(30.41%)	1.688 ± 0.4682	1.666 ± 0.4767	0.9999	0.9504	< 0.0001
4^{th}gravida	13(8.76%)	2.076 ± 0.4935	2 ± 0.5774	0.9999	0.8794	< 0.0001
5^{th}gravida	1(0.68%)	2 ± 0.000	2 ±0.000	----------	--------	---------
ANC Visits:						
1 to 3	206(71.04%)	1.694 ± 0.4825	1.689 ± 0.4845	0.8125	0.9463	< 0.0001
4 to 6	48(16.56%)	1.875 ± 0.3342	1.854 ± 0.3567	0.9999	0.9147	< 0.0001
7 to 10	36(12.42%)	1.861 ± 0.4245	1.861 ± 0.4245	---------	---------	-------
Inter-pregnancy interval:						
Yes	148 (51.04%)	1.756 ± 0.4610	1.736 ± 0.4718	0.2500	0.9526	< 0.0001
1 to 4 years	115 (77.70%)	1.739 ± 0.4605	1.713 ± 0.4732	0.2500	0.9400	< 0.0001
5 to 8 years	28 (18.91%)	1.821 ± 0.4756	1.821 ± 0.4758	-------	-----	-------
9 to12 years	5 (3.37%)	1.8 ± 0.4472	1.8 ± 0.4472	--------	---------	--------
No(Primi)	142 (48.97%)	1.732 ± 0.4600	1.739 ± 0.4563	0.7500	0.9484	< 0.0001
Number of children:						
Yes	118 (40.68%)	1.805 ± 0.4387	1.779 ± 0.4555	0.2500	0.9356	< 0.0001
1	94 (79.66%)	1.797 ± 0.4037	1.776 ± 0.4188	0.5000	0.9384	< 0.0001
2	21 (17.79%)	1.857 ± 0.5732	1.809 ± 0.6016	0.9999	0.9230	< 0.0001
3	3 (2.54%)	1.666 ± 0.5774	1.666 ± 0.5774	--------	--------	------

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Obstetric Variables	Frequency & Percentage (%)	Hb Level		Wilcoxon matched pairs test P value (two tailed)	Spearman Correlation coefficient	
		Mean ± SD of Hb gm/dl (Nail shade	Mean ± SD of Hb gm/dl (Analyzer)		r value	P value (one tailed)
No	172 (59.31%)	1.703 ± 0.4706	1.709 ± 0.4681	0.7500	0.9595	< 0.0001
History of PPH:						
Yes.	----------	----------	----------	---------	-------	-------
No.	290(100%)	1.744 ± 0.4599	1.737 ± 0.4635	0.5625	0.9500	< 0.0001

The Wilcoxon matched pairs test was used to find comparison between Mean ± SD Hb level of nail shade and analyzer (lab reports). There was no significant difference found between Mean ± SD Hb gm/dl of nail shade device and analyzer according to trimester, history of abortion, bleeding during present pregnancy, history of excessive menstrual bleeding, Iron-foliate supplementation taken during pregnancy, gestational age at the time of data collection.($p>0.05$).

The spearman correlation coefficient test was used to find correlation between Mean ± SD Hb level of nail shade device and analyzer (lab reports). There was significant correlation found between Mean ± SD Hb level of nail shade device and analyzer (lab reports) according trimester, history of abortion, bleeding during present pregnancy, history of excessive menstrual bleeding, Iron-foliate supplementation taken during pregnancy, gestational age at the time of data collection ($p< 0.0001$).

Table No 5: Comparison between Mean ± SD Hb level of Nail shade Device and Analyzer According to Obstetrical Variables (N=290)

Obstetric Variables	Frequency & Percentage (%)	Hb Level		Wilcoxon matched pairs test P value (two tailed)	Spearman Correlation coefficient	
		Mean ± SD of Hb gm/dl (Nail shade)	Mean ± SD of Hb gm/dl (Analyzer)		r value	P value (one tailed)
Trimester:						
1st trimester.	44(15.18%)	1.454 ± 0.5037	1.477 ± 0.5053	0.9999	0.9554	< 0.0001
2nd trimester.	88(30.35%)	1.761 ± 0.4287	1.761 ± 0.4287	--------	--------	----------
3rd trimester.	158(54.49%)	1.816 ± 0.4348	1.797 ± 0.4481	0.3125	0.9161	< 0.0001
History of Abortion:						

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Obstetric Variables	Frequency & Percentage (%)	Hb Level		Wilcoxon matched pairs test P value (two tailed)	Spearman Correlation coefficient	
		Mean ± SD of Hb gm/dl (Nail shade)	Mean ± SD of Hb gm/dl (Analyzer)		r value	P value (one tailed)
Yes (How often)	72 (24.82%)	1.736 ± 0.5033	1.708 ± 0.5156	0.5000	0.9435	< 0.0001
Once.	64(88.88%)	1.734 ± 0.5115	1.703 ± 0.5249	0.9382	0.5000	< 0.0001
Twice.	6 (8.33%)	1.666 ± 0.5164	1.666 ± 0.5164	------	------	------
Thrice.	2 (2.77%)	2 ± 0.000	2 ± 0.000	------	------	------
No.	218(75.17%)	1.747 ± 0.4458	1.747 ± 0.4458	0.9999	0.9530	< 0.0001
Bleeding during present pregnancy:						
Yes.	1 (0.34%)	2 ± 0.000	2 ± 0.000	-----	-----	------
No.	289(99.65%)	1.743 ± 0.4458	1.737 ± 0.4660	0.5625	0.9499	< 0.0001
History of excessive menstrual bleeding:						
Yes	5(1.73%)	1.6 ± 0.5477	1.8 ± 0.4472	0.9999	0.6124	< 0.0001
No.	285(98.28%)	1.747 ± 0.4589	1.736 ± 0.4645	0.3125	0.9578	< 0.0001
Iron-Foliate supplementation taken during pregnancy:						
Yes.	226(77.94%)	1.765 ± 0.4550	1.761 ± 0.4575	0.8125	0.9448	< 0.0001
No.	64(22.07%)	1.671 ± 0.4732	1.656 ± 0.4787	0.9999	0.9656	< 0.0001
Gestational age at the time of data collection:						
4 to 15 Weeks.	35(12.07%)	1.514 ± 0.5071	1.542 ± 0.5054	0.9999	0.9443	< 0.0001
16 to 27weeks.	85(29.32%)	1.705 ± 0.4583	1.705 ± 0.4583	---------	-------	--------
28 to 38weeks.	170(58.63%)	1.811 ± 0.4350	1.794 ± 0.4472	0.3125	0.9220	< 0.0001

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4. Discussion

The present study was focused on the detection of anemia with the help of nail shade device for grading anemia among pregnant women. The study also focused on comparison between Mean Hb level of Nail shade device and analyzer according to demographic variables, obstetrical variables, and number of family members. The spearman correlation coefficient test was used to find correlation between Mean Hb level of nail shade device and analyzer (lab reports). There was significant correlation found between Mean Hb level of nail shade device and analyzer (lab reports) ($p < 0.0001$).

Grading was done according to ICMR [13] below 7 severe anemia, below 11 moderate anemia, and below 15 mild anemia. In our study according to nail shade device, majority of pregnant women 210 (72.41%) were having Hb level below 11gm/dl (moderate anemic). 77 (26.55%) were having Hb level below 15 gm/dl (mild anemic) and 3 (1.03%) were having Hb below 7 gm/dl (severe anemic). There was no significant difference found between accuracy of nail shade device and diagnostic analyzer for detecting and grading anemia. ($p= 0.9999$). These findings were supported the study conducted by Parveen Rasheed in 2008 noted that 192 (41.3%) of 464 pregnant women attending PHC facilities for antenatal care were anemic. 117 (25.2%) was Mild, 73 (15.7%) moderate and 2 (0.4%) women were severe anemia, and which was not statistically significant ($p>05$).[14]

In the present study, there was no significant difference found between mean Hb level of nail shade device and analyzer according to demographic variables and obstetric variables. These findings were supported by study conducted by Priyanka Kumara in 2018; she noted that demographic variables like age, occupation, types of food and obstetric variables like Gravidity, trimester, ANC visits, and number of child are not found significant.[16] Other researcher, Fekede Weldekidan in 2018 showed that consuming tea/coffee immediately after food has a negative association with anemia during pregnancy.[18]

Kim Lam Sohi observed that anaemia affected 73 of the 217 mothers (33%), defined as having a Hb level of less than 11.0 gm/dl. The results also revealed that characteristics including maternal education, employment, and household income impacted Hb levels in pregnant women. Pregnant women from poorer socioeconomic backgrounds and with lower levels of education were more likely to have anaemia.[19]

Another researcher by Idowu O.A, Mafiana C.F found that, three hundred and sixty five (76.5%) of the women were anemic. Two hundred and eleven women (57.8%) had moderate anemia while 147 (40.3%) had mild anemia and 7(1.9%) were severely anemic (5 (71.4%) of which were primi gravidae).[20] By ERLI AMEL IVAN noted high percentage of anemia was in women of higher age group (23–27 years), with multi–parity (55%) and low educational levels (100%) and in mothers of low socio–economic status (100%).[21] In spite of regular antenatal visits in third trimester, maternal anaemia was high and it is associated with low education status, socio-economic status and multi-parity. There was a need of adequate intake of iron rich diet during pregnancy, to be strengthened.[21] According to Adamu Kenea's research, 31.5% of expectant women had anaemic, with a greater risk for women who had larger families (AOR=2.97,95%CI(1.69,5.27)) or who lived in rural areas (AOR=2.74,95%CI(2.11,5.06)). Pregnancy-related anaemia was strongly linked to where a woman lived, the size of her family, and her nutritional status.

According to G. Aruna's research, factors such as maternal age, gravidity, family structure, maternal education, maternal employment, maternal income, and maternal education were not associated with anaemia in pregnancy at the 0.05 level of significance. The research team recommended implementing measures for early identification and care to reduce the prevalence of anaemia. Pregnant women have specific demands that should be studied. Changing people's habits should be the primary goal of scientific inquiry. Anaemia and the dissemination of hazards and lifestyle change may be prevented by health education programmes delivered by nursing staff in both hospitals and the community.[17]

5. Conclusion

There was no significant difference found between accuracy of nail shade device and diagnostic analyzer for detecting and grading anemia ($p= 0.9999$) and spearman correlation coefficient r value was 1.000 whose one tailed p value was 0.1667 considered as significant. Also it shows that there was no any significant difference found between mean ± SD Hb level of nail shade device

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and analyzer according to demographic and obstetric variables. Clinical diagnosis may overlook mild to moderate anaemia, but this condition still has to be treated, and the nail shade may be the most suitable instrument presently available for this purpose. Assessing its value in conjunction with clinical evaluation in real-world settings like ante-natal clinics in impoverished countries where there aren't any laboratory facilities accessible is the best approach to move towards widespread use.

Early detection and management strategy regarding anaemia should be helpful to prevent the further complication therefore we conducted this study to know the accuracy of nail shade device in detecting anaemia, if positive what level of anaemia clinical pallor can detect with confidence and for early screening and giving proper, effective treatment and counseling to reduce the further complications among pregnant women.

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