



Estimation of prevalence of anemia using WHO hemoglobin color scale among non pregnant females of urban slum

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ABSTRACT

Background: Nutritional anemia is a major public health problem worldwide particularly in developing countries among women of reproductive age. WHO Hemoglobin Color Scale is easy, quick and handy technique to estimate hemoglobin level at field.

Objective: To find out prevalence of anemia using WHO hemoglobin color scale among the females of reproductive age group. To find out the most common signs and symptoms associated with anemia. To find out the causes associated with anemia among females.

Material & Methods: A cross sectional study with written informed consent was conducted in 400 females of an urban slum area of Indore city. Females were selected using systematic random sampling method. All the females of reproductive age group were included in study. Level of hemoglobin was obtained using WHO Hemoglobin color scale. A questionnaire was used during interpersonal interview of all the anemic females which was followed by clinical examination to assess signs and symptoms associated with anemia. The data was analyzed using Microsoft office excel sheet.

Results: 61% of females of reproductive age group were found to be anemic by hemoglobin color scale. 54 % complained of frequent headache, 50 % of difficulty in breathing during normal work and 49.18% of reduced appetite.

Conclusion: Anemia is found more in females of reproductive age group in urban slum. Most common symptoms associated with anemia are frequent headache, difficulty in breathing, weakness throughout day.

Key words: Hemoglobin color scale, Iron deficiency Anemia, Prevalence, Urban slum, Palmer pallor

INTRODUCTION

Anemia is a significant public health challenge in India. It has devastating effects on health and physical and mental productivity affecting quality of life particularly among the vulnerable.

India is among the countries with high prevalence of anemia in the world. It is widely prevalent in all age groups, being particularly high among the most vulnerable; nearly 58.7 per cent in pregnant women, 56.2 per cent among non-pregnant non-lactating

women, 55.8 per cent among adolescent girls.^[1] According to NFHS III, in urban slum of Indore, 42.9%, 32.7%, 9.4%, 0.8% was the anemia prevalence of mild, moderate and severe anemia respectively in urban slum of Indore.^[2]

The commonest causes of anemia in developing countries, particularly among the most vulnerable groups (pregnant women and non pregnant non lactating women), are nutritional disorders and non nutritional. Nutritional causes are iron deficiency,



vitamin B12 deficiency and folic acid deficiency. Non-nutritional causes include helminthes infestation, Malaria, sickle cell disease, thalassemia, chronic disease such as cancer, HIV/ AIDS, rheumatoid arthritis, crohn's disease and other chronic inflammatory diseases.³

Deficiency is a result of deficient iron intake, low bioavailability of ingested iron or its poor absorption. Additionally, in women of the reproductive age group, extra iron is required to compensate for menstrual loss. Moreover, parasitic infestation and recurrent malaria, which are the one of the major endemic problem in our country, further compound the problem⁴

It is estimated that anemia directly causes 20 per cent of maternal deaths in India and indirectly accounts for another 20 per cent of maternal deaths.³ India contributes to about 80 per cent of the maternal deaths due to anemia in South Asia.^[5]

Various factors like poverty, lower literacy, poor living conditions, repeated births, and limited access to health care facilities, which are commonly encountered in urban slum areas, contribute to the problem.^[3] Anemia affects physical and mental development of an individual leading to decreased work capacity which in turn affects the development of the country.^[6] There is no laboratory set up in rural areas and most of the anemia cases are diagnosed clinically which has been shown to be inaccurate.^{7]}

World Health Organization (WHO) has introduced hemoglobin color scale (HCS) which is simple and relatively inexpensive alternative of hemoglobin estimation, especially in areas where there is minimal laboratory set up.^[8] HCS is a device for providing a reliable, indicator of the presence and severity of anemia.^[9]

The hemoglobin color scale (HCS), a simple, rapid and cheap method for estimating hemoglobin concentration with a finger prick blood sample, has been developed for use in resource-poor settings where there is no laboratory. The method relies on comparing the color of a drop of blood absorbed onto a filter paper with standard colors on a laminated

card, varying from pink to dark red. These colors correspond to hemoglobin levels of 4, 6, 8, 10, 12, and 14 g/dl. Intermediate shades can be identified, allowing hemoglobin levels to be judged to 1 g/dl. This is the only method currently available that is affordable for widespread primary care use by the most impoverished countries.^[10, 11]

Studies have shown it to be less accurate than the laboratory methods of measuring hemoglobin [such as the hemiglobincyanide (HCN) and HemoCue methods] which measure hemoglobin levels to the nearest 0.1 g/dl. Interpretation of HCS results is highly variable depending on the context. Opinions vary regarding the recognition of the HCS as an accurate method for diagnosis of Anemia in resource-poor settings.^[12]

The present study principally aims to find out prevalence of anemia using WHO hemoglobin color scale among the females of reproductive age group, most common signs and symptoms associated with anemia and also find out causes associated with anemia among them.

MATERIAL AND METHODS

A Cross-sectional study was conducted in urban slum of Indore. By using simple random sampling method, Juni Indore slum was selected from all the slums. Households were selected by systematic random sampling as every fifth house was selected and all the non pregnant married females of reproductive age group were selected. If fifth household was closed or not responded in three consecutive visits then next house was selected without disturbing allocation of next household.

Sample Size was calculated using formula $N = Z^2 [P(1-P)]/d^2$, d (width of confidence interval) was determine to be 5%, Z = 1.96 (5% precision), P (Prevalence of ever married women) = 56.2% (NFHS III 2005 - 06). Sample size comes out to be 372 which were rounded off as 400. All Non pregnant married Females of Reproductive age group ranging between 15 yrs to 49 yrs were included. Female members below 15 years and above 49 years of age, those not responding and diagnosed case of anemia were excluded from study.

Level of hemoglobin was obtained using WHO Hemoglobin color scale. For HCS commercial kit was



used (COPAC, Germany). After cleaning with 70% alcohol, blood drops were taken after puncturing the ring finger with a sterile lancet. First two drops were discarded and the third drop was used for hemoglobin estimation. HCS comprises of a small card with six shades of red that represents hemoglobin levels of 4,6,8,10,12 and 14gm/dl respectively. The test strips were kept dry, clean and protected from direct sunlight at all times. A 5cm length of test-strip was torn off for the use. A single drop of the blood was taken at one end of the test-strip, so that it formed a stain large enough to spread beyond the area of an aperture in the color scale (about 1 cm in diameter) and after 30 seconds the blood spot is put against one of the hues on the scale for color matching. A predesigned semi structured questionnaire was used during interpersonal interview of all the anemic females which was followed by clinical examination to assess signs and symptoms associated with anemia. This questionnaire also included question for exploring causes of Anemia.

The anemia was defined when hemoglobin levels were less than 11.9 gm/dl. Hemoglobin levels

between 11 – 11.9 gm/dl were classified as mild anemia, 8 – 10.9 gm/dl as moderate and less than 8gm/dl as severe anemia.^[13]

The study was conducted in between September 2012 to February 2013. Observer had three days training of testing in Pathology department. Hemoglobin level was observed by single observer so that chances of inter observer bias was nil. Ethical permission was obtained from Institutional Review Board of the institution. Written informed consent was obtained from all the participants. The data was analyzed using appropriate statistical software (MS excel).

RESULTS

In this Study 176 (44%) females were belong to 21 – 30 years age group, 156 (39%) females were 31 – 40 years age group, (Table 1) 219 (54.75%) females were illiterate or educated up to primary school, 89 (22.25%) were educated Up to 8th standard, 40 (10%) were educated up to Higher secondary or above, 143(35.75%) females were Housewife, 122 (30.5%) were laborers, 122 (30.5%) were house maid. (Table 2, 3) 43% females had more than 2 issues.

Table 1: Distribution of females according to age group

Age Group	Number	Percentage
15 – 20 Years	2	0.5
21 – 30 Years	176	44
31 – 40 Years	156	39
41 – 49 Years	66	16.5
Total	400	100

* 44% females belong to age group of 21 – 30 years

Table 2: Distribution of Females according to their Education (N=400)

Education Status	Number	Percentage
Illiterate	95	23.75
Up to primary School (5 th Standard)	124	31
Middle School (8 th Standard)	89	22.25
High School	52	13
Higher Secondary or Above	40	10
Total	400	100

*31 % females in study were educated up to primary standard

**Table 3: Distribution of Females According to their Occupation (N=400)**

Occupational status	Number	Percentage
Housewife	143	35.75
Labour	122	30.5
House maid	112	28
Teacher	9	2.25
Government servant	14	3.5
Total	400	100

*35.75% females were housewife

With the help of Hemoglobin color scale (HCS) anemia prevalence was found 61% in ever married non pregnant females of reproductive age group. According to HCS 133 (33.25%) were mild anemic, 99

(24.75%) were moderate and 12 (3%) were severely anemic females. On observation of Clinical sign anemia prevalence were found 52% with Conjunctiva paleness and 49% with Palmer Pallor. (Table 4)

Table 4: Distribution of Anemia among Non-married non pregnant Females (N= 400)

Criteria of Anemia in Women of 15 to 49 years:	Hemoglobin Scale	Color	Paleness of lower conjunctiva	Palmer Pallor
	Number (%)		Number (%)	Number (%)
No Anemia (> 12 gm/dl)	156 (39)		192 (48)	204 (51)
Mild Anemia (11 – 11.9 gm/dl)	133 (33.25)		108 (27)	101 (25.25)
Moderate Anemia (8 – 10.9 gm/dl)	99 (24.75)		88 (22)	83 (20.75)
Severe Anemia (< 8 gm/dl)	12 (3)		12 (3)	12 (3)
Total	400 (100)		400 (100)	400 (100)

*61% females were found anemic by using WHO hemoglobin color scale, while 52% and 49% were found anemic by using conjunctival paleness and palmer pallor respectively

All anemic females were further observed for sign and symptoms associated with anemia. 28 (11.48%) females had spooning of nails, 124 (50.81%) had tiredness, 133 (54.51%) had frequent headache, 68

(27.87%) had giddiness, 108 (44.26%) had tingling sensation in finger and toes, 124 (50.81%) had difficulty on breathing during normal work and 120 (49.19%) had decrease appetite. (Table 5)

Table 5: Distribution of Sign/Symptoms among Anemic Females (N= 244)

Sign/Symptoms	Present	Absent	Total
	Number (%)	Number (%)	Number (%)
Spooning of Nails	28 (11.48)	216 (88.52)	244 (100)
Tiredness during Normal Work or whole days	124 (50.81)	120 (49.19)	244 (100)
Frequently headache	133 (54.51)	111(45.49)	244 (100)
Fainting or Giddiness	68 (27.87)	176 (72.13)	244 (100)
Tingling Sensation in finger and toes	108 (44.26)	136 (55.74)	244 (100)
Difficulty in breathing during Normal work	124 (50.81)	120 (49.19)	244 (100)
Palpitation	60 (24.59)	184 (75.41)	244 (100)
Decrease Appetite	120 (49.19)	124 (50.81)	244 (100)



On exploring the causes associated with anemia 8 (3.28%) females had complaining of bleeding in stool, 44 (18.03%) complaining of bleeding gums, 26 (10.66%) females were suffering from malaria in last one year, 23 (9.43%) females are diagnosed case of chronic inflammatory disease. (Table 6)

Table 6: Distribution of history reflecting causes of Anemia in Females (N= 244)

	Present	Absent	No. (%)
	Number (%)	Number (%)	
Bleeding in Stool	8 (3.28)	236 (96.72)	244 (100)
Bleeding Gums	44 (18.03)	200 (81.97)	244 (100)
Heavy bleeding during Menstruation	32 (13.11)	212 (86.89)	244 (100)
History of Malaria infection in past one year	26 (10.66)	218 (89.34)	244 (100)
History of Delivery during past one year	16 (6.56)	228 (93.44)	244 (100)
History of chronic inflammatory disease in past one year	23 (9.43)	221 (90.57)	244 (100)

DISCUSSION

In this Study Mean Age of females was 30.2 ± 4.8 years. Most of females (44%) belonged to age group of 21- 30 years and educated up to primary school (54.75%). Main occupation of females of urban slum was laborer (30.5%) and housemaid (28%). Most of females of slum belonged to lower socio economical class (Class V) on the basis of their family income (Modified Kuppaswamy Classification)

Prevalence of Anemia was found to be 61% with help of Hemoglobin color scale, while with the observation of clinical sign Lower conjunctiva paleness and palmer pallor prevalence was found to be 52% and 49% respectively which was much higher than NFHS III data for Indore slum. (42.9%).^[2] Similar prevalence (60.8%) was found in an urban slum of Bhuvneshwar, Orissa^[14] and in study of Kumar S et al^[15] (43.21%) and Joshi P et al^[16] (44.98%)

In the study mild anemia was found in 33.25% and moderate anemia in 24.75%, which is comparable to NFHS data of Indore slum (mild= 32.7% & moderate= 9.4%).^[2] Severe anemia was seen in 3% females, which was quite similar to study of Joshi P et al^[16] (2%) and Bentley et al^[17] (2.2%). In this study prevalence of severe anemia was more than found in NFHS data (0.8%) but less than study of Sharma et al^[18] (5.3%) and Toteja et al^[19] (13.1%). This slightly

higher percentage could be attributable to the fact that they had all pregnant females in their study.

In this study 3.28% females had bleeding per stool (not hemorrhoids) which may reflect parasitic infestation. 6.56% females had history of malaria and 13.11% females had heavy menstruation which may be a cause of anemia. 18.03% females had bleeding gum which reflects vitamin C deficiency. Unexplained part is dietary deficiency of iron and haem, which is more prevalent in urban slum and lower socioeconomic class. An important issue is that Iron deficiency anemia lead to decrease appetite which further increases risk of anemia. More than 2 childbirths in early age with less age difference is also a cause of anemia in slum.

The findings in the present study reiterate the need for re-enforcing health education in urban slum. While the health worker (ANM and ASHA) and AWW can plays a pivotal role in imparting health education, the use of multi-pronged methods such as films, group discussions, dramas, puppet shows and role-plays must be incorporated. There is a strong need that school education especially for adolescent girls must directly address disability effects of Anemia. All field health workers should undergo a short training on WHO hemoglobin color scale so that screening of anemia become easy. The Government should use



hemoglobin color scale in field under national program, for screening antenatal mothers for anemia, and it can also be used for screening children.

Study was concluded as prevalence of anemia was found to be 61% in non pregnant females of urban slum using hemoglobin color scale which was higher as compare to clinical signs. Most commonly associated symptoms were frequent headache, tiredness, difficulty in breathing during normal work, tingling sensation and decrease appetite. Nutrition anemia was most common type of anemia present in urban slum.

The HCS has the potential to be the most appropriate tool currently available for the detection of mild and moderate anemias, which are likely to be missed by clinical diagnosis alone, but which still require treatment. Contrasting statement of Bala DV et al^[20] that Clinical signs are better than HCB for diagnosing anemia.

WHO Hemoglobin Color Scale is easy, quick and handy technique to estimate hemoglobin level at field.

CONCLUSION

Most of females belonged to age group of 21- 30 years, educated up to primary school; main occupation of females of urban slum was laborer and housemaid and belonged to lower socio economical class (Class V) on the basis of their family income (Modified Kuppuswamy Classification). Prevalence of Anemia was found to be 61% with help of Hemoglobin color scale. Prevalence of Anemia was much higher than NFHS III data for Indore slum. In the study mild anemia was comparable to NFHS data of Indore slum but prevalence of severe anemia was more than found in NFHS data. In this study parasitic infestation, malaria and heavy menstruation were the major possible causes identified of anemia.

This study was carried out with 400 females who were not representative of all the females of Indore District, needs more sample size to be incorporated which unfortunately was not included due to time constraint. Also due to time constraint pregnant

females, adolescent girls and females of different socio economic strata were not incorporated. Sensitivity and specificity of hemoglobin color scale was not calculated because none of the gold standard was used.

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CONFLICT OF INTEREST

None

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