

USE OF THE WHO HEMOGLOBIN COLOR SCALE IN FAMILY WELFARE CLINICS IN INDIA

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Abstract. A situation is reported for the use of the WHO color scale for the measurement of hemoglobin, which was introduced into India in 1996. Charity family welfare clinics held at a medical college hospital in North India offer free sterilization by tubal ligation under local anesthetic to women following a preliminary screening. An obligatory test of the hemoglobin level is required and must be above 7.0 g/dl for the operation. Some clinics attract large numbers, and the card gives a cheap, rapid and reasonably accurate test, adding to the smooth running and reduction of waiting time. It has proved satisfactory over a 2-year period; 2.3% of participants were shown to have a hemoglobin level of 7g/dl or less.

INTRODUCTION

The WHO hemoglobin color scale was developed by Stott and Lewis, and was introduced in 1995 (Stott and Lewis, 1995). The principle was to compare the color of a fresh drop of blood on an absorbent test strip with a scale showing a range of colors representing blood at various hemoglobin concentrations between 4 and 14 g/dl. Although based on the same idea as the now obsolete and discredited Tallqvist method, Stott and Lewis applied modern dye, print and paper technology to produce an appropriate set of printed colors on a card and to identify a special chromatography paper as the absorbent matrix for the test strips. Evaluation of the WHO device has been reported (Munster *et al*, 1997; Lewis *et al*, 1998) concluding that most health workers should be able to obtain reliable readings of hemoglobin within 1 g/dl, if strict adherence to the procedure is observed. The trials also compared Hb levels obtained with the clinical assessment of anemia showing it to be clearly more reliable (Montessoro *et al*, 2000). The method is particularly suited where laboratory facilities are not available.

A number of the devices were made avail-

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able for use in India in 1996. One of the authors (RPB) carried out training sessions as, per the protocol provided, in 4 clinics associated with charity NGOs in Delhi, Ludhiana and Mathura. The routine use of the device has mainly been in slum and rural antenatal clinics (Kumar *et al*, 1999). It has also found use in medical camps run in more remote rural areas and the screening of village teenage schedule caste females.

This paper describes its use for screening in family planning camps where there is a demand for large numbers to be tested in a short time.

MATERIALS AND METHODS

For some years at Christian Medical College (CMC) Ludhiana, Punjab, government supported family planning camps have been held at regular intervals. These have more recently been renamed "Family Welfare Clinics", though female sterilization remains the objective. A special event takes place every few months. The basic publicity and administration is undertaken by a local charity (Lions or Rotary Club) or a wealthy local industrialist. Publicity is carried out in an area where low-income families live, offering free sterilization to married women with children. The camps are arranged to commence early in the day at the hospital and the number attending varies from 30 to 200 participants. The regulations governing the program require the follow-

ing screening to be carried out on those attending: 1. urine check for sugar and albumin, 2. Hemoglobin levels, 3. history and examination carried out by a gynecologist.

The presence of significant glycosuria, albuminuria, a hemoglobin of 7.0 g/dl or lower, or the presence of a significant gynecological problem excludes the person from proceeding. Those meeting the necessary criteria have a laparoscopic tubal ligation carried out the same day under sedation and local anesthetic. Provision is available for admission should complications arise, though this has been necessary in less than 0.1% of women in a survey covering several years. Around 90% of those attending proceed to sterilization. The hemoglobin check, for some years previously, had been carried out using a grey wedge photometer method. This required a pre-diluted blood sample and at that time this was done by mouth pipetting. When the laboratory technicians responsible for the clinics learnt of the new WHO color scale being used in other areas, they were keen to adopt the method in place of the more time consuming photometric test. In the larger clinics, attended by up to 200 women accompanied by relatives and children, jostling and queue jumping was difficult to control. The rapid hemoglobin method carried out directly on finger prick blood proved satisfactory and helped to improve the efficiency of the screening. A measure of quality control for the hemoglobin measurement was established. Where possible, hemoglobin levels of 7.0 g/dl or lower were checked either with a Hemocue apparatus in the clinic or with a venous sample which was then tested in the hospital main laboratory by the cyanmethemoglobin method using a dedicated colorimeter. There was a reasonable correlation in the small number tested in this way. A senior member of the laboratory staff made spot checks during the course of clinics to ensure that the protocol for the use of the hemoglobin color chart was being followed by the staff.

RESULTS

The system was used at 15 clinics held over a period of 2 years (Table 1). The numbers attending the clinic varied from 30 up to 189; 1,135

Table 1
Hemoglobin levels at Family Planning Clinics measured by the WHO color scale.

Date	No. tested	Hg \leq 7g/dl	Hg <10g/dl
19.03.00	35	0	2
28.02.00	77	0	3
13.03.00	30	1	8
22.03.00	152	1	27
15.05.00	35	1	5
19.10.00	95	0	9
16.01.01	58	1	10
15.02.01	120	4	22
31.05.01	50	1	9
21.09.01	80	0	4
30.10.01	40	1	12
07.02.02	189	5	23
16.02.02	52	1	2
07.03.02	67	7	9
16.03.02	55	3	17
Total	1,135	26 (2.2%)	162 (14.3%)

subjects were tested, of whom 26 (2.2%) were shown to have a hemoglobin of 7.0 g/dl or less. The lowest level recorded was 4.0 g/dl found in three of the women. One hundred sixty-two (14.3%) of the participants had hemoglobins of less than 10 g/dl.

Those participants refused sterilization on grounds of the low hemoglobin were given a free supply of iron and folic acid tablets and instructed to report back to a future clinic.

DISCUSSION

Our use of the system in both rural and urban antenatal clinics for the economically deprived has continued for a number of years since first reported (Kumar *et al*, 1999). We demonstrated a significantly higher level of anemia in rural clinics. The advantages of low cost, the simplicity and the absence of the need for reagents or fragile equipment is important for long-term use. Trained community health workers considered the test a valuable and interesting addition to the services they were providing. The color scale proved to be satisfactory in the particular situation of this clinic, and reduced the waiting

time for laboratory results. The more efficiently the clinic is run, the more will attend the clinic, and the better will be the support of local charities. Criticism could be levelled that one was forfeiting accuracy for speed by using this method but a hemoglobin level of plus or minus 1 g/dl was acceptable. Importance was stressed to those carrying out the hemoglobin estimations that strict adherence to the method must be observed. The trained technicians involved in the clinic initially requested the device should be tried, and they introduced its use with the approval of the head of pathology services. Quality control is increasing in Indian laboratory services, and although this is the simplest of tests, an opportunity was taken to try to maintain permanent involvement by a senior laboratory person. Ingram and Lewis (2000) observed that errors occurred due to incorrect use of the device. Our experience has shown that deviation from the standard operating procedure, even with such a simple device, occurred, and short cuts were taken emphasising the importance of continued monitoring.

The main deviations from the correct procedure were three. First, an inadequate flow of blood from the finger-prick resulted in too small a drop on the test paper. Second, taking up too much blood onto the test paper, giving too large a drop size, and third, reading the color scale before the "drying out" time of 30 seconds had passed.

Initially, the device was provided free of charge, but with wider usage, manufacture has been designated to a commercial organization in Germany (Copack am Knick 9 22113 Osterinbek, Germany. E-mail: info@copack-service.de). An agency may possibly be established in India (July 2004). The approximate cost

of the device with 200 test strips is around US\$9. Alternative supplies of the test strip material (Whatman Chromatography paper 3ETCHR) can be obtained from agents supplying Whatman products, but the large sheets then require cutting to appropriately sized strips.

The WHO hemoglobin color chart test has proved useful in a number of different situations in places where resources are limited and laboratory facilities are not readily available. Our experience with family welfare clinics has added another application where not only the low cost and the reasonable level of accuracy made it suitable but also the speed at which a result could be made available was satisfactory.

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