

Estimation of hemoglobin by Sahli's and Drabkin's method.

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Abstract

Aim: The study estimated the hemoglobin concentration by Sahil's and Drabkin's methods.

Materials and Methods: The study included 500 patients in the age group of 10- 70 years, attending the OPD in the tertiary center. Blood was collected by venipuncture and hemoglobin concentration was estimated using Sahil's and Drabkin's method. The results were analyzed using statistical z test and paired t test and were expressed as mean \pm standard deviation.

Results: The mean values of hemoglobin estimated by Drabkin's method were higher compared to that of Sahil's method. The values were found to be statistically significant in younger age group.

Conclusion: Sahil's can be used as a screening method in rural areas or in large surveys but critical values need to be confirmed by automated analyzer.

Key words: Sahil's hemoglobinometer, Drabkin's method, hemoglobin

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I. Introduction

Anemia is the most common problem in medical clinics and is of major public health importance. It is an important cause of chronic debility and thus affects the social and economic wellbeing as well. Although many causes of anemia have been identified, nutritional anemia due to deficiency of iron accounts for more than half the total cases. Reducing anemia by 50% in women of reproductive age (WRA) is a 2025 World Health Assembly Global Nutrition Target (WHO, 2014), and accurate assessment of hemoglobin is a global priority.(1)

Anemia is diagnosed by measuring the concentration of hemoglobin in the blood. Various methods are used for hemoglobin estimation which may have error of $\pm 20\%$. (2) When such an error is compounded the test would not be reliable. The management of patients may be poor if tests are not reliable. The International Nutritional Anemia consultative group and the International Committee for Standardization in Hematology have recommended the Drabkin's cyanmethemoglobin method as the reference method for calibrating other methods used to measure hemoglobin. Sahil's method is an inexpensive method used in screening for large population especially in rural areas having poor infrastructure and less resources. The aim of the present study is to measure hemoglobin by Sahil's method and Drabkin's method and compare the values.

II. Material and Method:

The study was conducted in a tertiary teaching hospital in Mumbai. Before proceeding for the study, institutional ethics committee approval was obtained.

Study population comprised of 500 patients (268 males & 232 females) in age group 10-70 years, attending the pathology OPD for investigations. A fasting blood sample was collected by venipuncture using EDTA as anticoagulant. (1.5mg/ml). All samples were subjected to hemoglobin estimation by Sahil's and Drabkin's method and distributed according to age.

Study Design: Observational study

Study Location: This was a tertiary care teaching hospital based study done in Department of Physiology and Pathology, at Seth G.S Medical College, Mumbai.

Study Duration: August 2000 to August 2001.

Sample size: 500 patients.

Subjects & selection method : Random sampling from pathology laboratory. Patients in age group 18 -70 years who came for blood investigations were randomly labelled for estimating hemoglobin by both Sahil's and Drabkin's method.

III. Procedure methodology

Standardized hemoglobin pipettes were used in both methods. Drabkin's solution containing potassium ferricyanide, potassium cyanide and sodium bicarbonate was prepared. 20 microliter of blood was added to 5ml of Drabkin's solution. Hb is converted into methemoglobin, which is then converted into cyanmethemoglobin. This is done by adding both potassium cyanide and ferricyanide whose absorbance is then measured at 540 nm using a photoelectric colorimeter against a standard quality control solution. The hemoglobin concentration is then determined by the result produced by the photoelectric colorimeter.

In Sahli's method, the graduated tube was filled up to lowest mark with N/ 10 HCL solution. Blood from the EDTA bulb was drawn into the pipette up to the mark 20cmm and transferred into the graduated tube immediately to be mixed with HCL with a stirrer. After 10 minutes, acid haematin formed as indicated by dark brown was diluted with distil water till color matched the standard plates and reading on the graduated tube was noted. Average of 3 readings was taken.

Statistical analysis

Student's paired *t*-test was used to ascertain the significance of differences between mean values of two variables. The observation was taken as significant at $p < 0.05$.

IV. Results

Hemoglobin was estimated by Drabkin's and Sahli's method. Hemoglobin values of 268 males and 232 females obtained by the two methods were compared in different age groups. The statistical significance was determined by the Student's paired "*t*" test. Higher values were obtained by Drabkin's method compared to Sahli's. There was a significant difference in values in different age groups in males and females. (Table 1, 2)

Table -1- Hemoglobin estimation in males.

Age group Years	No of samples	Sahli's Mean \pm SD (gms/dl)	Drabkin's Mean \pm SD (gms/dl)	P value	Significance
10-20	48	13.091 \pm 1.464	13.762 \pm 1.695	P < 0.05	Significant
21-30	82	13.231 \pm 1.779	14.029 \pm 1.842	P <0.01	Significant
31-40	64	12.593 \pm 1.901	13.69 \pm 1.768	P <0.01	Significant
41-50	32	12.140 \pm 1.841	13.187 \pm 2.265	P <0.05	Significant
51-60	28	12.287 \pm 2.034	13.371 \pm 2.265	NS	Not Significant
61-70	14	13.178 \pm 1.647	14.230 \pm 1.720	NS	Not Significant

Table -2- Hemoglobin estimation in females.

Age group Years	No of samples	Sahli's Mean \pm SD (gms/dl)	Drabkin's Mean \pm SD (gms/dl)	P value	Significance
10-20	60	11.176 \pm 1.658	11.915 \pm 2.020	P < 0.05	Significant
21-30	80	11.268 \pm 1.655	11.875 \pm 1.755	P < 0.05	Significant
31-40	40	11.287 \pm 1.319	12.027 \pm 1.535	P < 0.05	Significant
41-50	23	11.717 \pm 1.259	12.439 \pm 1.625	NS	Not Significant
51-60	20	11.875 \pm 1.413	12.270 \pm 1.570	NS	Not Significant
61-70	9	11.72 \pm 1.697	12.422 \pm 2.245	NS	Not Significant

V. Discussion

Any method of screening or monitoring individuals for anemia at primary care level should be cheap, simple to operate, sturdy enough for field use, dependent neither on mains electricity nor batteries, and reasonably accurate. It should also use a minimum of materials that requires regular replacement and should give immediate results.

The Drabkin's cyanmethemoglobin method although more precise and reliable, requires laboratory set up and so cannot be used for field work to give immediate results. The preparation of reagent requires materials which are toxic and require license for procuring potassium cyanide. The technique can be carried out by relatively skilled personal working in laboratories. Its use in surveys in remote areas is limited as it requires accurate dilution of blood sample and electrical power for the spectrophotometer. The diluted blood has to stand for a period of time to ensure complete conversion of the hemoglobin to cyanmethemoglobin. Abnormal plasma proteins or high leucocyte count may result in turbidity when the blood is diluted with the cyanide ferricyanide

reagent. So a simple method of hemoglobin estimation which can be applied by rural health workers to screen people for anemia is desirable.

The Sahli's method of hemoglobin satisfies the requirements of being a simple, reliable, and cheap. It can be used by health care workers in the field. It can also be used in primary health care centers where sophisticated techniques are not available.

In the present study values of hemoglobin obtained by Sahli's were lower than those obtained by Drabkin's. This finding is consistent with that found by P Balasubramaniam and A Malthi. (3)

There is a high prevalence of nutritional anemia, especially in certain vulnerable groups such as pregnant women, children and elderly people. Usually the symptoms of anemia are vague. There is evidence that women with normal hemoglobin levels may benefit with increased iron intake (4). This general prophylactic measures would benefit a greater part of the population than merely those with overt anemia.

VI. Conclusion

Different methods are available for estimating hemoglobin with their own advantages and disadvantages. In this study Sahli's was compared with Drabkin's method. Sahli's can be used in rural settings with poor resources and infrastructure. For prevention and diagnosis a simple and rapid method like Sahli's can be used.

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