

Reliability of an Icterometer in Black Neonates with Hyperbilirubinaemia

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SUMMARY

A perspex icterometer previously graded for White neonates was evaluated in an unselected Black newborn population. Grades of icterus showed a close correlation with levels of total serum bilirubin (TSB) as determined colorimetrically in a bilirubinometer. Previously reported data on White babies follow the same pattern, but are slightly higher for each grade.

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In 1960, Gosset,¹ as well as Culley *et al.*,² published evidence indicating the usefulness of assessing the depth of cutaneous icterus as an objective clinical sign in the prediction of the degree of serum hyperbilirubinaemia. On the basis of this data an icterometer (Thomas A. Ingram & Co. Ltd, Birmingham) was devised, utilising 5 areas of different yellow intensity which could be compared objectively to the yellow skin colour of the icteric neonate. The mean predicted indirect serum bilirubin level + 2 standard deviations was indicated on a scale at appropriate sites on the meter. This icterometer represents a further development of the transparent tongue depressor as used by Davidson *et al.*³ and of the polished lucite recommended by Allen⁴ in 1958. To date it has proved to be a useful tool for screening purposes, particularly in small or peripheral community hospitals, where serum bilirubin determinations are not always readily available.¹

Although the pigmentation of Black neonates probably does not reach its final intensity until after the first week of life, there is usually a distinct difference in skin darkness during that first week, in comparison with matched White babies. As many Black babies are born outside teaching hospital settings, and as the use of the icterometer in Black babies has not been described to date, it was decided to investigate the usefulness of this mechanical indicator as a clinical screening test in jaundiced Black babies.

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PATIENTS AND METHODS

From 19 November 1973 to 11 December 1973 a total of 125 icterometer gradings were done on 55 unselected Black neonates who were clinically jaundiced. The gradings were matched with total serum bilirubin (TSB) determinations as done on capillary blood, using a standard bilirubinometer (American Optical Company). Birthweight ranged from 1050 to 3925 g, and age at testing varied from 2 to 24 days. All readings were done by one person, who was unaware of the infants' serum bilirubin levels, and all TSB determinations were performed by the same laboratory technician each day.

RESULTS

The mean figures for each icterometer grading are shown in Table I, and the graphic representation of the mean figures, as well as the linear regression line shown in Fig. 1, indicate a highly significant linear correlation between icterometer gradings and serum bilirubin values. If one compares the groups of bilirubin results of each 2 neighbouring icterometer gradings (i.e. the results of 3 and 3,5 or 3,5 and 4, etc.) the differences are all statistically significant, with the exception of the first 2 gradings (1,5 and 2,0).

TABLE I. MEAN SERUM BILIRUBIN LEVELS + 2 SD FOR EACH ICTEROMETER GRADING

Icterometer grade	A* (mg/100 ml)		B† (mg/100 ml)	
	Mean	+ 2 SD	Mean	+ 2 SD
1½	—	—	3,37	7,71
2	5,55	8,7	3,71	6,79
2½	7,57	12,11	6,92	10,70
3	10,03	14,58	10,18	15,34
3½	12,31	17,31	11,58	16,72
4	15,73	21,8	13,60	18,58
4½	19,06	26,8	21,53	31,67

* A—predicted levels on icterometer, based on measurements of indirect serum bilirubin as reported by Culley *et al.*²

† B—levels obtained in present series in Black neonates, using total serum bilirubin.

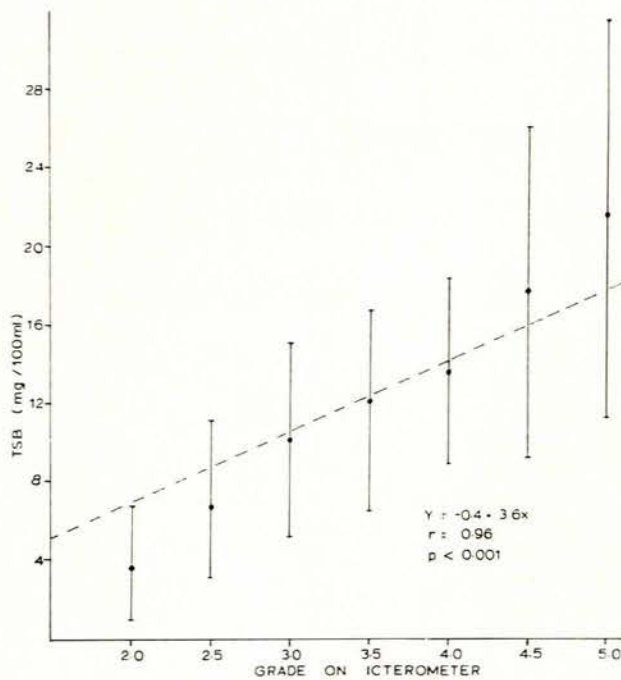


Fig. 1. Graphic representation of results shown in Table I (column B). The dotted line is the linear regression line based on the calculation of all individual values. The ranges shown represent ± 2 SD.

DISCUSSION

The results of this study indicate that a close linear relationship exists between icterometer gradings and TSB levels in Black neonates. These results are in close agreement with the study done by Culley *et al.*² on White babies.

A comparison of the mean serum bilirubin levels for each icterometer grading found in this study to those of Culley *et al.* shows a difference of 1-2 mg/100 ml. Since Culley *et al.* determined unconjugated serum bilirubin only, while we measured total serum bilirubin, one would have expected our serum values to be higher than theirs, but the contrary was found to be true. Thus it is likely that the darker skin of Black neonates masks part of the icterus, a fact experienced by all clinicians taking care of Black neonates.

Gosset¹ pointed out the drawbacks associated with the use of this type of bilirubinometer. The most important is that the icterometer cannot be relied upon in rapidly rising hyperbilirubinaemic states, e.g. due to haemolytic disease, since in these babies the rate of cutaneous bilirubin deposition does not correspond to the rate of rise in serum bilirubin. Hence, falsely low icterometer readings may occur. This applies equally to Black and White babies.

While there are obvious limitations to any simple skin icterometer, the present data support the contention that this device may well be useful in the busy peripheral African nursery, where screening for hyperbilirubinaemia, particularly in relation to the necessity for exchange transfusion, requires to be performed repeatedly. Its use may be particularly indicated to gauge decreasing or changing hyperbilirubinaemia where serum bilirubin levels and icterometer gradings have previously been performed.

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