

Haemoglobin Values in Bantu Schoolgirls

BY

J. K. HOWARD,
M.B., CH.B. (Edin.), B.D. (Lond.)

Christian Missions in Many Lands, Kasania, Zambia.

Anaemias are well known to be widespread among the Bantu peoples of central and southern Africa, especially among the rural and semi-urban populations, and the severity of the anaemia is invariably more marked among the women than among the men. It is possible that anaemia may be one of the factors producing the inanition for which the Bantu is noted. A wide variety of contributory factors have been suggested as lying at the root of the trouble, and Gelfand (1957) believed that a multiple pathogenicity lay behind most of the anaemias among the Bantu races. It is possible, however, to reduce these various factors into three or four main groups, namely, dietary deficiencies of haematinic substances, poor absorption of these substances from the gut, parasitism and genetic factors. For many years parasitism has been suggested as a dominant factor in the production of anaemia, and the three groups of parasites most commonly indicted are *Plasmodium* spp. (especially *P. falciparum* in central Africa), *Schistosoma* spp. and the hookworm, *Ankylostoma duodenale*. All are common, especially in rural communities, and it is probable that something like 90 per cent. of rural Bantu living in Zambia have suffered from malaria and harbour the parasite in their bodies. We have, however, for long been unconvinced that parasitism *per se* represents the major factor in the causation of anaemia which it is commonly made out to be. Beet (1949) found no significant difference between the haemoglobin levels of children with multiple parasitic infestation and those without, and accordingly we believe that it is secondary to dietary deficiencies of the various haematinic factors, and in particular deficiency of iron, which latter deficiency will be made more apparent through the normal menstrual loss of the female in the child-bearing period of life. This is not to suggest that parasitism is unimportant, however, since it represents a major cause of morbidity among these people, with consequent loss of working efficiency and at times may even be a cause of death. In view of what has been suggested with respect to dietary deficiencies, the purpose of this paper is to demonstrate the importance of normal

menstrual loss as a factor in the production of anaemia among the rural and semi-urban Bantu women.

METHOD

A representative group of 98 schoolgirls from a government secondary school were investigated. Their ages ranged from 12½ to 17½ years, and although their home background varied considerably, in most cases they came from what might be termed better class families, their fathers being teachers, government clerks, ministers of the Gospel and the like. In this respect it is interesting to note, incidentally, that similar factors operate here as elsewhere in the selection of children for higher education. The diet of these girls would thus be expected to be better than that of the average villager, whose diet is often little above subsistence level, and consequently the girls would have been less likely to suffer from a gross iron deficiency. The haemoglobin levels of the girls were estimated by the use of the gray-wedge photometer, which King *et al.* (1951) have recommended as a simple but reliable method. All those whose haemoglobin fell below 13 gm. per 100 ml. were investigated in more detail with peripheral blood examinations. It was not, unfortunately, possible to perform marrow examinations due to the lack of facilities. Urine, stool and peripheral blood specimens were examined for the presence of parasites. The average Bantu girl tends to reach the menarche slightly earlier than her European counterpart, and we accordingly divided the girls into pre- and post-pubertal groups at the somewhat arbitrary age of 13½. Although this is an arbitrary division, it does reflect the average age of the onset of puberty. Of all the girls questioned as to menstrual habit, none gave a history of abnormally high loss, although incidentally varying degrees of dysmenorrhoea were found to be very common.

RESULTS

The results of these investigations may be set out in tabular form.

DISCUSSION

It will readily be seen from the figures given in the tables that only mild degrees of anaemia were found among these girls, and although 47 per cent. had haemoglobin values of lower than 13.0 Gm. per 100 ml., only 2.1 per cent. had haemoglobins lower than 11.0 Gm. per 100 ml. The mean haemoglobin value for the whole group was 12.9 Gm. per 100 ml. Investigation of the peripheral blood revealed microcytic hypo-

Table I
HAEMOGLOBIN VALUES ACCORDING TO AGE

Age	No. of Subjects	Mean Hb.	Lowest Hb.		Highest Hb.
			(Values in Gm. per 100 ml.)		
12½	3	13.6	11.9		15.5
13	4	13.9	12.6		14.7
13½	5	13.9	13.6		14.4
14	10	12.0	11.0		15.3
14½	18	12.9	11.1		14.7
15	19	12.6	10.5		15.0
15½	15	12.9	11.0		14.5
16	12	12.7	11.3		14.7
16½	6	12.2	11.1		13.0
17	3	12.5	11.6		13.3
17½	3	12.6	11.9		13.3

chronic anaemia in the majority of those examined, with the remainder being of a normocytic type. Examination of the peripheral blood showed no evidence of macrocytosis, but marrow investigations would be required to completely confirm this. An interesting observation was that there was no evidence of sickling in any of the subjects, which would seem to be somewhat unusual if the figure of English (1945) for this area of 17.5 per cent. of the population is correct, and also from the fact that sickle cell anaemia is apparently more common in females than males (Raper, 1949). The possible explanation is twofold: firstly, the age group investigated, since the majority of cases do not survive the first decade of life (Trowell *et al.*, 1957); and secondly, those with the disease would be likely to have been set back in their schooling and thus not have reached the standard for secondary selection. This does not, however, explain why it was that no example of sickle cell trait, the heterozygous condition, was found.

It may be observed, secondly, that parasitism *per se* did not figure as a significant factor in

the causation of anaemia. Indeed, the incidence of parasitism in this series was remarkably low—probably a reflection of the better social and economic conditions under which most of the girls were reared. Although the malarial parasite produced the lowest mean haemoglobin of

Table II
PERCENTAGE DISTRIBUTION OF HAEMOGLOBIN VALUES

Haemoglobin (Gm. per 100 ml.)	No. of Subjects	Percentage of Group
Over 15.0	4	4.1
14.0 to 14.9	17	17.3
13.0 to 13.9	31	31.6
12.0 to 12.9	23	23.5
11.0 to 11.9	21	21.4
Below 11.0	2	2.1
	98	100.0

Table III
INCIDENCE OF PARASITIC INFECTION AND ASSOCIATED HAEMOGLOBIN VALUES

Parasite	No. Infected	Per cent. of Group	Mean Hb.	Lowest Hb.		Highest Hb.
				(In Gm. per 100 ml.)		
<i>Plasmodium falciparum</i>	6	6.1	12.2	11.0		14.3
<i>Schistosoma haematobium</i>	7	7.2	13.3	10.7		15.1
<i>Schistosoma mansoni</i>	1	1.1	13.0	—		—
<i>Ankylostoma duodenale</i>	8	8.2	12.8	11.1		14.9

the four groups of parasitic infections, it should be noted that in fact only one of the six girls was under 15 years of age, and thus the additional factor of menstrual loss must also be taken into account in considering the cause of the low values in this group. Malaria did not therefore appear as a significant cause of anaemia in this investigation. The incidence of schistosomiasis was much lower than we had expected—under half that of Beet's (1949) series in a similar group of children and far below the 80 per cent. incidence reported from parts of neighbouring Tanzania (Jordan, 1963). Neither schistosomiasis nor hookworm infection could be looked upon as serious causes of anaemia among this group of girls. The latter fact is of interest, since hookworm infections are characteristically associated with anaemia, although the degree of anaemia will be related to the severity and duration of the infection. It should also be noted that *Ankylostoma duodenale*, the common hookworm of Africa, does not produce an anaemia as severe as the American hookworm, *Necator americanus* (Foy *et al.*, 1958). These results are in accord with those of Beet (1949), who also found that there were no significant differences in haemoglobin levels between those with parasitic infections and those without.

In view of the type of anaemia found among these girls, the explanation of its presence must lie in a source of blood loss common to all, associated with a dietary deficiency of iron (a matter which will be discussed in a separate communication). It will be observed that there is a definite drop of about 1.0 Gm. per 100 ml. in the mean haemoglobin level at around the menarche, and this is also reflected by a tendency towards lower upper values for the haemoglobins of girls after the age of 14 years. It is therefore suggested that menstrual loss is the main factor in inducing the anaemia found among post-pubertal Bantu girls; and further, when it is borne in mind that even a European type diet only supplies the bare minimum of iron which will meet the daily requirements of a woman in the reproductive period of life, it will be seen that menstrual loss, aggravated after marriage by continued child bearing, is an adequate explanation for the widespread anaemia found among Bantu women.

Finally, it is worth noting that the mean haemoglobin level for all age groups in this investigation (12.9 Gm. per 100 ml.) closely approximates to the figure Beet (1949) found as a mean value among European children (13.0 Gm. per 100 ml.), whereas his figures for rural

Bantu were considerably below those of this series (23 per cent. less than 12.0 Gm. per 100 ml. against his finding of 48 per cent. less than 12.3 Gm. per 100 ml.). This would seem to point to the importance of the economic factor and adds further weight to our suggestion that the primary factor in the production of anaemia among Bantu women is the physiological loss of blood through menstruation and child bearing, associated with a poor dietary intake of iron and consequent failure to make good these losses.

SUMMARY

(1) An account of an investigation of haemoglobin levels in 98 Bantu schoolgirls aged between 12½ and 17½ is given.

(2) The mean haemoglobin of the group was 12.9 Gm. per 100 ml., and 47 per cent. had haemoglobins less than 13.0 Gm. per 100 ml., but only 2.1 per cent. less than 11.0 Gm. per 100 ml.

(3) Parasitic infections did not appear as a major contributory cause of anaemia in this series.

(4) A drop of about 1.0 Gm. per 100 ml. was noted around the menarche, and it is therefore suggested that normal menstrual loss is the major factor in producing anaemia among Bantu women.

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