

HAEMOGLOBIN LEVELS IN A GROUP OF ELDERLY PERSONS LIVING AT HOME ALONE OR WITH SPOUSE

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Wintrobe (1951a) stated, "there are few satisfactory data for the blood in old age." Some studies of haemoglobin levels—for example, by Olbrich (1947) and Howell (1950)—have been carried out on old persons living in hospitals or institutions or under especially favourable conditions. Relatively little similar work, however, appears to have been done on adequate numbers of old people living under natural conditions in their own homes. A medical survey of old persons living alone or with spouse in Sheffield enabled us to carry out such a study.

Methods

1. Selection of Group.—The sample drawn in March, 1948, was a 1:30 random selection from the food office register in Sheffield of men and women who had reached pensionable age (65 in men and 60 in women). Only those living alone or with spouse were included in the medical survey. The haematological investigations were not carried out until at least one year later. Those eligible for inclusion were interviewed by a social worker, who invited their co-operation. Subjects who were willing were then medically examined in their homes and samples of blood were taken. The final group consisted of 177 men between the ages of 66 and 85, and 246 women between the ages of 61 and 87.

2. Dietary Survey.—Information was collected on the food and drink consumption of each subject for a period of one week. A spring balance and standard tablespoons and tea-

spoons were provided (Widdowson, 1936; Beltram and Bransby, 1950). During the dietary survey the subject was visited three or four times by a field worker to ensure that the records were being properly kept. From these records the average daily intake of the various nutrient principles was calculated. The dietary survey was satisfactorily completed by 56% of the group.

3. Samples of Blood.—To a suitable quantity of dry ammonium and potassium oxalate (Heller and Paul, 1934) 5 ml. of venous blood was added, the whole being gently agitated. From the blood sample the following investigations were carried out.

(a) *Haemoglobin Levels.*—Between September, 1949, and May, 1950, these were determined by the Haldane method (Whitby and Britton, 1950a), using N.P.L. calibrated pipettes and comparator (100% Hb=14.7 g./100 ml.). Over the next and last 12 months the determinations were made in an M.R.C. photometer (King *et al.*, 1948), using oxyhaemoglobin (100% Hb=14.8 g./100 ml.). Approximately the same number of haemoglobin determinations were made by each of the two methods. The variances of the determinations made by the Haldane method and of those made in the M.R.C. photometer were 2.22 and 2.10 respectively. As there was no significant difference between the variances of results obtained by the two methods, all the determinations were pooled to facilitate analysis.

(b) *Red cells* were counted by a standard method in an improved Neubauer counting chamber (Wintrobe, 1951b).

(c) *Absolute values* (P.C.V., M.C.V., M.C.H.C.) were determined by the Wintrobe (1951c) method in those samples showing less than 11.7 g./100 ml. of haemoglobin.

(d) *Blood smears* were stained by the Leishman method (Whitby and Britton, 1950b).

4. Emphysema.—A diagnosis of pulmonary emphysema was made on the appearance of chest x-ray films by Dr. J. L. A. Grout, consultant radiologist—182 females and 138 males whose haemoglobin had been estimated were examined radiologically.

Results

Haemoglobin in Relation to Age and Sex.—The mean haemoglobin levels of the 177 males and of the 246 females were calculated, giving values of 14.4 g./100 ml. for the males and 13.8 g./100 ml. for the females. Using the large sample method (Fisher, 1941) for testing the significance of the difference between two means, the standard error of the difference was calculated (0.16), and the difference (0.6) was found to be significant. Thus the females had a signifi-

Haemoglobin G/100ml.

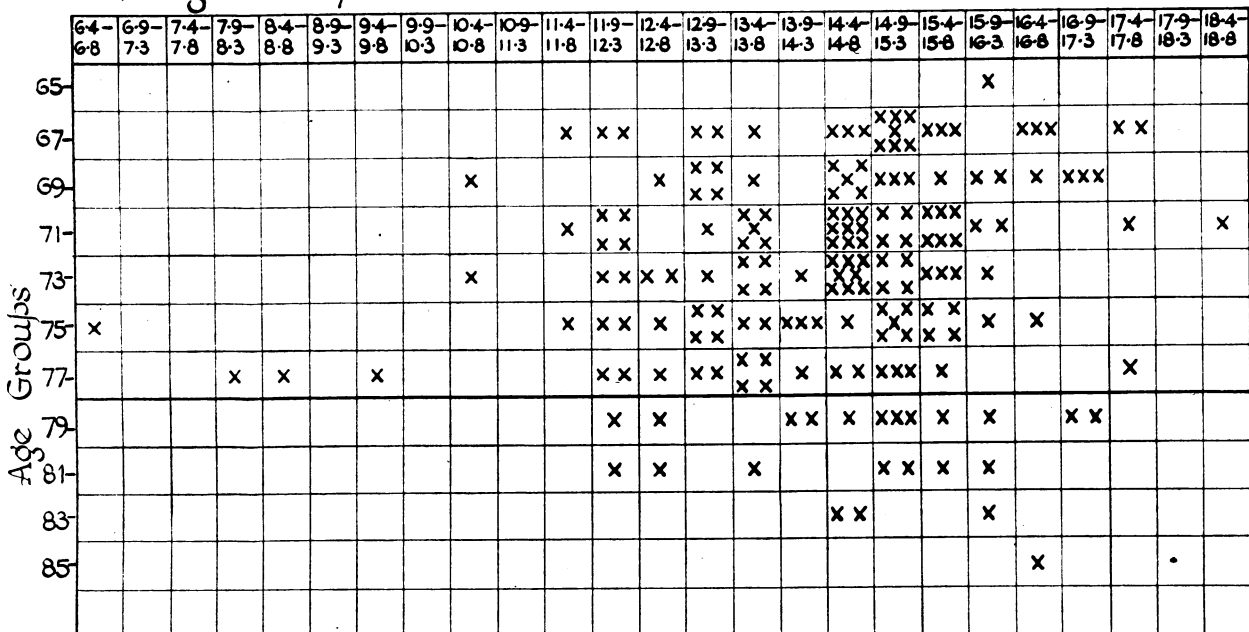
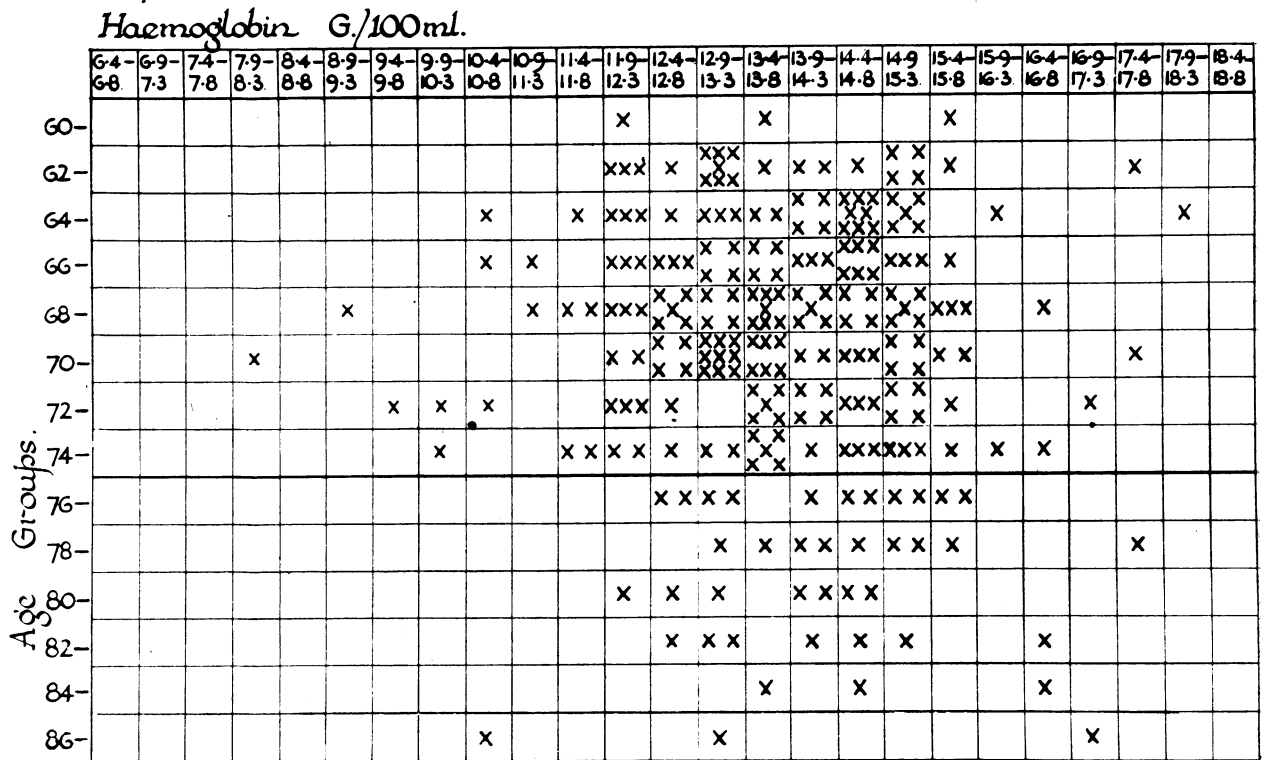


FIG. 1.—Scatter diagram relating age to haemoglobin levels of the blood in males.



cantly lower haemoglobin level than the males. The relationship between haemoglobin content of the blood and age is shown in the scatter diagrams (Figs. 1 and 2). Although from these diagrams there does not appear to be an overall correlation between haemoglobin levels and age, a negative correlation over the age range 65.5-77.5 years for the males and over the age range 60.5-74.5 years for the females is apparent.

The correlation coefficient between haemoglobin level and age for the males within the age range 65.5-75.5 years was calculated and found to be significant ($r = -0.2799$, $n = 154$, $P < 5\%$), whilst the correlation coefficient over the complete age range was not significant ($r = 0.1077$, $n = 177$, $P > 5\%$). Similarly for the females, the correlation coefficient over the age range 60.5-74.5 years was significant ($r = -0.262$, $n = 204$, $P < 5\%$), whilst that over the complete range was not significant ($r = 0.068$, $n = 244$, $P > 5\%$). Thus over a certain age range there was a significant decrease in the haemoglobin content of the blood with increasing age in both sexes, but beyond this age range the haemoglobin levels were narrowly scattered round the mean level for each respective sex group.

Haemoglobin and Social Class.—Based on the classification of occupational status of the Registrar-General, the subjects were divided into three groups: professional and managerial (Class I and II of the R.-G.), skilled workers (Class III of the R.-G.), and semi-skilled and unskilled workers (Class IV and V of the R.-G.). There was no significant difference between the haemoglobin levels in either men or women in the different occupational groups.

Haemoglobin Levels in Those Living Alone compared with Those Living with Spouse.—The mean haemoglobin level of the 46 males living alone was 13.9 g./100 ml. compared with a mean level of 14.5 g./100 ml. in the 131 males who were living with their wives. This difference was significant at the 5% level of probability ($t = 2.06$). There was no significant difference between the mean haemoglobin levels of the females who lived alone (13.9 g./100 ml.) and those who were living with their husbands (13.8 g./100 ml.). Thus living alone seems to be aetiologically significant for the males but not for the females.

Haemoglobin Level and Emphysema.—It is often taught that patients with emphysema show a high haemoglobin content of the blood. The mean haemoglobin level of the 45 females showing radiological evidence of emphysema was found to be lower than the mean level in 137 females showing no emphysema. The mean haemoglobin level of the 32 males with radiological evidence of emphysema was slightly higher than that of 106 males showing no emphysema. These differences were not significant. Hence this study does not lend any support to the thesis that in old people with emphysema there is a high haemoglobin content of the blood.

Causes of Anaemia in this Group

Any person with a haemoglobin level of 11.7 g./100 ml. (80% Haldane) or less was arbitrarily considered to have anaemia. Absolute values were estimated in these cases. The incidence of anaemia was as follows: men, 9 cases (5.1%); women, 16 cases (6.5%). It was possible to obtain dietary figures for only the more co-operative cases with anaemia—namely, five men and eight women.

In addition, information on the social and clinical condition of the subjects was available. Eight out of the nine male cases had microcytic anaemia of the iron-deficiency type. The other had macrocytic anaemia associated with Paget's disease. Three out of the 16 female cases suffered from macrocytic anaemia; the rest had microcytic anaemia of iron-deficiency type.

Under the conditions of our survey it was not possible to carry out other investigations—for example, fractional test meals.

In at least 11 out of the 25 cases of anaemia a poor diet seems to have been a contributory factor. Apathy and a low income were the chief reasons for inadequate diets. On the other hand, at least four cases appeared to have had adequate diets.

Another contributory factor was rheumatoid arthritis in seven cases, particularly in women (six cases). Chronic haemorrhage was not detected clinically in any case.

Syphilis in one woman, scurvy in another, and chronic alcoholism in one man were the only other recognizable potential contributory conditions.

Discussion

As different methods have been used for haemoglobin determinations, and as varying standards have been set from time to time for the 100% level, using the same technique, comparison of our results with those of previous workers is feasible only if the results are expressed in grammes per 100 ml. The figures obtained in this survey of old people living in their own homes (14.4 g./100 ml. for males and 13.8 g./100 ml. for females) are in close agreement with those found by Olbrich (1947) for people living in institutions (13.9 g./100 ml. for males and 13.2 g./100 ml. for females).

Howell (1950) obtained very high values (18.3 g./100 ml. for men and 16.6 g./100 ml. for women) in a group of elderly patients in a hospital for the chronic sick. On the basis of these results he was unable to agree with statements made by earlier workers that "old people are anaemic." Exclusion of cases of anaemia and malignant disease, a higher standard of diet than in many cases found in our survey, and use of the Sahli method on the ward may all have played a part in determining his high results.

So far as we are aware, all observers agree that the level is higher in men than in women for all age groups. The present study confirms this observation so far as the elderly are concerned. The Committee on Haemoglobin Surveys (1945) found that in men the mean level tends to fall in later life; the information provided in our study confirms this view. They found, however, that the haemoglobin level in women falls slightly between the ages of 30 and 49, but rises again after that; this fall and rise may be associated with the occurrence and cessation of menstruation respectively. It would appear, however, that in women over 60 the cessation of menstruation no longer plays a part in causing a rise in haemoglobin. The fall in haemoglobin with age in both sexes may be partly due to decreasing ability to absorb haemopoietic substances. Thus Pollard (1933) has shown that the incidence of achlorhydria increases with age. The decrease may also be due to diminished intake of iron, since our survey showed that the intake of iron diminished in both sexes with age. The cessation of these trends in extreme old age is a phenomenon which we have found in other physiological estimations—for example, serum cholesterol, blood pressure. If a relatively low haemoglobin content of the blood gives a diminished risk of survival there may well be a selective removal of those with low haemoglobin levels, particularly in extreme old age, when the death rate is very high. In these circumstances the mean levels in these older age groups would tend to be higher. It would appear that the mean haemoglobin level falls with age in both sexes until extreme old age; this fall is interrupted in women by the cessation of menstruation, but ultimately resumes the downward trend.

The studies of Monroe (1951) on 7,941 patients over the age of 61 in a geriatric hospital revealed a much higher incidence of anaemia than in the present survey. He found that 15.5% of the men and 11.2% of the women had a haemoglobin level of below 70%. We are unable to make a strict comparison with our figures, as the method of haemoglobin estimation was not given. Monroe stated: "Loss of blood was the commonest cause of severe secondary anaemia in old age (522 cases). Malignant disease was the source of the blood loss in over half of them, closely followed by peptic ulcer and cirrhosis of the liver. Infection caused anaemia in 165 cases. Usually it was mild, but those due to the streptococcus occasionally produced so rapid a fall in blood counts as to suggest blood loss." Hence the idea that old people are anaemic may have arisen from hospital experience. These causes are very different from those found in the present study.

One of the most interesting findings of the survey was the lower haemoglobin level of the males living alone compared with those living with their wives.

The cases of anaemia in this group of elderly people living in their own homes were largely due to adverse social factors, such as apathy, a low income, or, in the case of males, living alone. A meals-on-wheels service would have helped considerably.

Anaemia seems to be a condition which is very easily missed in old people, as none of our cases were receiving any form of treatment for it. A simple haemoglobin estimation in all old people would be of great value for detecting a potentially remediable cause of ill-health.

Summary

The haemoglobin levels of 177 men between the ages of 66 and 85 years and of 246 women between the ages of 61 and 87 years were determined. All these old people were living in their own homes either alone or with spouse. In men and women there was a significant downward trend over a certain age range, and the males (mean haemoglobin level 14.4 g./100 ml.) had a significantly higher level than the females (mean haemoglobin level 13.8 g./100 ml.).

There was no significant social class difference in haemoglobin levels in either males or females.

Pulmonary emphysema was not associated with a high haemoglobin content of the blood.

Males living alone had significantly lower haemoglobin levels than those living with their wives. There was no difference in the case of females.

Nine men (5.1%) and 16 women (6.5%) had haemoglobin levels of 11.7 g./100 ml. or less. Eight of the men and 13 of the women had iron-deficiency anaemia, while one man and three women had macrocytic anaemia. None of the patients were having any form of treatment for their anaemia. The main contributory factors appeared to be poor diet (44%) and rheumatoid arthritis (28%). Apathy and a low income were the chief reasons for the poor diet. A simple haemoglobin estimation in all old people would be of considerable value for detecting a potentially remediable cause of ill-health. A meals-on-wheels service would have been of benefit.

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