

HAEMATOLOGICAL INDICES IN HEALTHY CHINESE (A Survey of 3,983 Students in Hong Kong)

By John Grant, M.B., B.S. (Lond.), M.R.C.S., D.T.M.H., D. Path., F.I.C.S.
(Lecturer, Department of Pathology, University of Hong Kong)

INTRODUCTION

High parasite endemicity rates (Hou *et al.*, 1964) coupled with elevated incidences of infectious diseases within a geographical region constitute a formidable obstacle to the establishment of firm concepts regarding "normal" and "control" values of all kinds. This problem justly deserves priority at a time when increasingly refined clinical decisions are required, and more sophisticated diagnostic techniques are available in the laboratory.

Hong Kong is one example of this difficulty. However, Ma (1962) was able to establish adequate biochemical normal ranges when compiling indices from 300 healthy Chinese adults.

An extension into the coexisting haematological field is particularly opportune, since previous pitfalls concerning normal ranges have been principally related to technical error, in cell counting or provision of standards. These doubts can now be bypassed by group-comparisons involving the use of electronic cell counting techniques as well as recognised reference standards.

This article aims at establishing adequate normal haematological ranges for healthy Chinese, by a study of over 3,000 selected students in Hong Kong.

METHODS

All examinations were performed on venous blood anticoagulated by E.D.T.A. ("sequestrine") in sterile containers. Leucocyte counts (WBC) were performed according to orthodox techniques (Wintrobe, 1961) or using the electronic cell counter, Coulter Model D(ECC). The counts in the latter case were corrected for coincidence following the Poisson distribution chart specific for the aperture volume, when a count exceeded 10,000/cu. mm. All erythrocyte counts (RBC) were performed by this means.

Haemoglobin (Hb) was measured by the cyanmethaemoglobin technique on a spectrophotometer standardised against recognised reference standards (Ortho). The haematocrit was assessed by means of the Hawkesley micro-

haematocrit centrifuge. Mean corpuscular haemoglobin concentration (MCHC) and mean corpuscular volume (MCV) were obtained by calculation. All investigations were completed in Hong Kong between 1960 and 1967.

SELECTION OF INDIVIDUALS

All university students included in the series were of Chinese origin, the majority group being Cantonese. In each case the individual was subjected to a clinical examination. Chest X-ray, urinalysis and direct-smear screening for intestinal parasites completed the examination. Those not fulfilling all health requirements were deleted from the survey. 3,275 students comprised the main group, of which 1,132 were female. A second group was used to provide more detailed indices, and numbered 494 males and 214 females, an additional total of 708.

RESULTS

The erythrocyte indices of 708 students examined in 1967 are summarised in Table I. Figs. 1 and 2 depict the Hb distributions in 3,251 students investigated between 1960 and 1966 in this Division. Table II offers a comparison between two groups of healthy students. The first comprises 3,275 whose WBC's were enumerated by orthodox counting techniques; those studied using the ECC method alone constitute the second. Fig. 3 shows WBC distribution in the larger group. In both Tables, "range" is calculated from the formula: mean \pm (2 s.d.).

DISCUSSION

The values for healthy Chinese differ from figures given for other populations. This series yields a mean Hb value significantly different from Wintrobe's (1961). In every group, the value is less by at least 1 gramme per cent, though the ranges are of similar width. RBC estimates are also reduced by comparison, though in this instance the ranges are wider. PCV values are proportionately lower in both sexes than in other populations (Watson, 1950). MCHC means, on the other hand, accord well with those of Hurtado

TABLE I
ERYTHROCYTE INDICES IN HEALTHY CHINESE

| Investigation | 494 Males | | | 214 Females | | |
|---------------------|-----------|-------|------------|-------------|-------|------------|
| | Mean | S. D. | Range | Mean | S. D. | Range |
| Hb (Gms %) - | 14.8 | 1.0 | 12.7-16.9 | 12.9 | 0.87 | 11.1-14.6 |
| MCHC (%) - | 33.9 | 1.8 | 30.3-37.5 | 32.6 | 1.5 | 29.6-35.6 |
| PCV (ml %) - | 43.5 | 2.6 | 38.3-48.7 | 39.0 | 2.6 | 33.8-44.2 |
| RBC (m./cu. mm) - | 5.3 | 0.74 | 3.8-6.8 | 4.6 | 0.63 | 3.3-5.9 |
| MCV (cu. microns) - | 84 | 11.1 | 61.8-106.2 | 86 | 10.2 | 65.6-106.4 |

TABLE II
WBC IN HEALTHY CHINESE

| | Number | Sex | WBC mean | S. D. | Range |
|-----------------|--------|-------|----------|-------|----------|
| By microscopy - | 2,143 | M | 6.9 | 1.8 | 3.3-10.5 |
| | 1,132 | F | 7.4 | 1.9 | 3.6-11.2 |
| Total | 3,275 | M + F | 7.14 | 1.8 | 3.5-10.7 |
| By ECC - - | 268 | M | 6.6 | 1.5 | 3.6-9.6 |
| | 175 | F | 7.0 | 1.6 | 3.8-10.2 |
| Total | 443 | M + F | 6.7 | 1.5 | 3.7-10.7 |

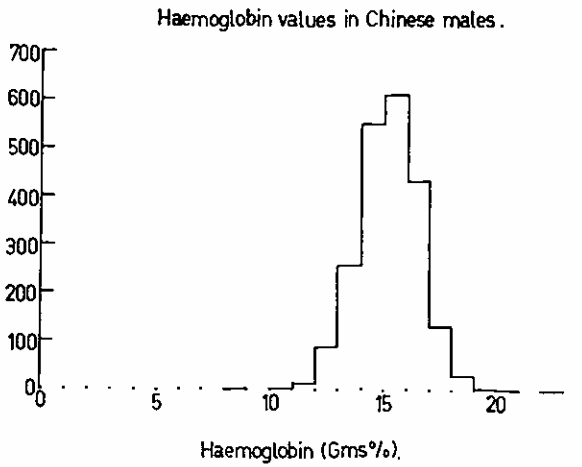


Fig. 1.

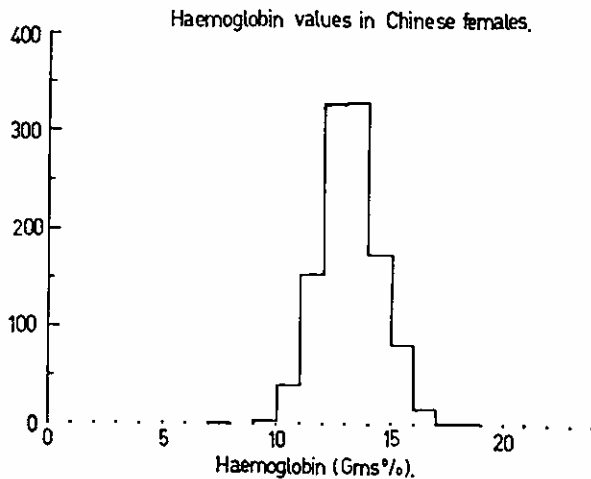


Fig. 2.

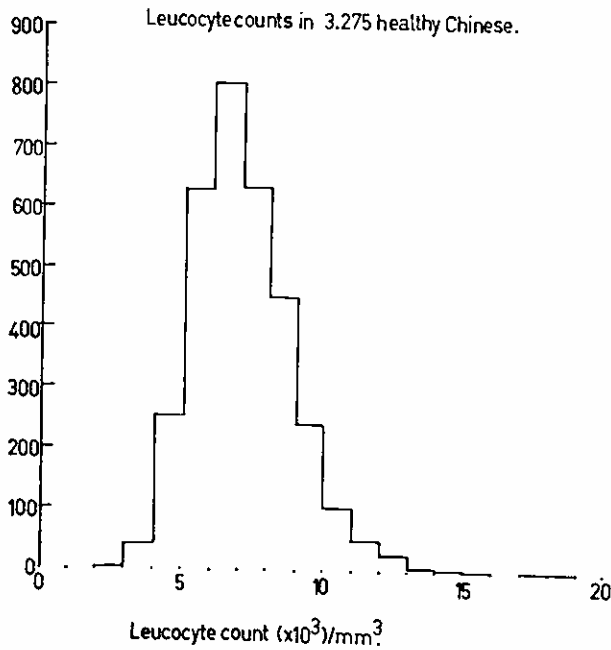


Fig. 3.

et al (1950) for populations resident at sea level, and the statistical range is almost identical. MCV values of Chinese students fall about the mean commonly regarded as normal in other populations, but the range (see Table II) is extended.

WBC is most often given (Wintrobe, 1961) as between 5,000 and 10,000/cu. mm. in health, with a mean about 7,000/cu. mm. In Chinese there is a statistically significant difference between male and female means, and a wider range in healthy women than in men, (see Table II). In addition, the overall range exceeds that of healthy Caucasians (Osgood *et al*, 1939).

SUMMARY

A haematological survey of 3,983 Chinese students classed as healthy after clinical and laboratory examination is reported, and statistical ranges of normals established for WBC, Hb, RBC, MCHC, PCV and MCV values. Significant deviations from accepted values were found in Hb, RBC and PCV means, and sex differences found. Total leucocyte counts have a sex bias at the mean, and are different from values in western populations.

ACKNOWLEDGEMENTS

The author wishes to thank Drs. L. Lee, H.C. Lai, and Y. T. Ho for their helpful advice and comments, and Dr. S. M. Bard for permission to use material from cases under examination.

REFERENCES

1. Hou, P.C. and Pang, S.C.L. (1964): "Clonorchis sinensis Infestation in Man in Hong Kong." *J. Path. Bact.*, 87; 245.
2. Hurtado, A., Merino, C. and Delgado, E. (1945): "Influence of Anoxemia on the Hemopoietic Activity." *Arch. intern. Med.*, 75; 284.
3. Ma, L. (1962): "A Survey of Blood Constituents of Healthy Chinese in Hong Kong." *Trans. Roy. Soc. Trop. Med. Hyg.*, 56; 222.
4. Osgood, E.E., Brownlee, I.E., Osgood, M.W., Ellis, D.M. and Cohen, W. (1939): "Total, Differential and absolute Leucocyte Counts and Sedimentation Rates." *Arch. intern. Med.*, 64; 105.
5. Watson, C.J. (1950): "The Erythrocyte Coproporphyrin." *Arch. intern. Med.*, 86; 797.
6. Wintrobe, M.M. (1961): in, "Clinical Haematology", (pub: Henry Kimpton, London).