

## HAEMOGLOBIN VALUES IN PREGNANCY— A SURVEY OF 1,000 CONSECUTIVE NORMAL MOTHERS

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In normal pregnancy there is a gradual and progressive fall in the haemoglobin level up till the 32nd.-36th. week after which the level shows a gradual rise up till term. This initial fall in the haemoglobin has been attributed to the greater increase in the plasma volume compared to the increase in the red cell volume. Many workers consider this to be a purely physiological phenomena, hence the term "physiological anaemia" of pregnancy. Others, however, consider this fall to be abnormal and have shown that some, if not all, of this fall can be prevented by the administration of iron supplements during pregnancy, Benstead and Theobald, 1952; Davis and Jennison, 1954; Fisher and Biggs, 1955.

The haemoglobin levels in the normal pregnant women have not been recorded in Singapore previously. This paper reports on a survey carried out from July 1965 to February 1966 on 1,000 consecutive mothers making their first visit to a maternal and child health clinic (M.C.H. Clinic) for antenatal check up. The aim of the investigation was to define the haemoglobin levels, haematocrit and mean corpuscular haemoglobin concentration (MCHC) of normal pregnant mothers at different stages of pregnancy; to determine the frequency and degree of anaemia in the community and to demonstrate ethnic differences, if any, among the 3 major ethnic groups, Chinese, Malays and Indians, that make up the community.

### METHODS AND MATERIALS

1,000 consecutive mothers making their first attendance at the Alexandra Road Maternal and Child Health Clinic were included in the survey. The clinic although situated within city limits, serves an urban as well as a rural community. From each patient basic data recorded included the age, ethnic group, total family income, and parity. The period of gestation was determined from the date of onset of last menstrual period. Where this was not known, the

clinical assessment by abdominal palpation was recorded as the period of gestation. The patients were then clinically assessed by a medical officer after an examination of the urine and blood pressure. Those found to be normal after this examination had their haemoglobin and haematocrit determined. Haemoglobin was estimated on capillary blood by the cyanmethaemoglobin-method with an EEL haemoglobin meter standardised against reagents obtained from Diagnostic Reagents Limited, Thames, Oxon. Haematocrit was estimated by the micro capillary technique.

### RESULTS

Of the 1,000 mothers investigated 3 were Eurasians and have been excluded from the analysis because of the small number. This report covers the remaining patients of whom 542 (54%) were Chinese, 349 (35%) were Malays and 106 (11%) were Indians. There was a greater proportion of Malays in the series compared to the ethnic distribution in the Singapore population because of the larger number of Malays living in the vicinity of the Clinic.

Analysis of the age distribution of the patients, showed the majority (63%) to be between the ages of 20-29 years. 23% of mothers were between the ages of 30-39 years, 11% below 19 years and 3% above 40 years.

The economic status of the patients was generally poor. 67% of the series had a total monthly income of between \$100-\$200 per month. Approximately 6% had a total monthly income of less than \$100 per month whilst the remaining 27% had a total monthly income of over \$200 per month.

22% of the series were primigravidae, whilst 18%, 14% and 13% were para 2, 3 and 4 respectively. Approximately one-third of the patients were para 5 and above.

Tables I, II and III show the mean haemoglobin haematocrit and MCHC values and standard

TABLE I  
SHOWING INITIAL MEAN HAEMOGLOBIN VALUES  
AND STANDARD DEVIATION OF MOTHERS AT  
DIFFERENT STAGES OF PREGNANCY

GESTATION IN WEEKS	CHINESE			INDIANS			MALAYS		
	No. of Patients	Mean Hb. Gm. %	S.D.	No. of Patients	Mean Hb. Gm. %	S.D.	No. of Patients	Mean Hb. Gm. %	S.D.
5-8	1	11.0	-	-	-	-	-	-	-
9-12	4	10.9	1.4	2	11.5	0.1	2	10.9	0.7
13-16	9	10.5	1.3	2	10.5	0.2	18	11.2	1.2
17-20	41	11.0	0.9	13	9.8	2.1	39	10.4	1.0
21-24	97	10.7	1.1	20	10.4	1.2	63	10.2	1.3
25-28	156	10.5	1.0	39	9.8	1.7	107	10.0	1.3
29-32	116	10.5	0.9	20	9.6	1.5	68	10.0	1.2
33-36	92	10.3	1.2	8	9.6	1.6	40	9.9	1.3
37-40	26	11.1	1.0	2	10.4	0.7	12	10.4	1.2

TABLE II  
SHOWING INITIAL MEAN HAEMATOCRIT VALUES  
AND STANDARD DEVIATION OF MOTHERS AT  
DIFFERENT STAGES OF PREGNANCY

GESTATION IN WEEKS	CHINESE			INDIANS			MALAYS		
	No. of Patients	Mean PCV. %	S.D.	No. of Patients	Mean PCV. %	S.D.	No. of Patients	Mean PCV. %	S.D.
5-8	1	36.0	-	-	-	-	-	-	-
9-12	4	35.8	3.0	2	35.5	2.5	2	35.5	4.5
13-16	9	34.0	2.8	2	31.5	0.5	18	36.0	3.2
17-20	41	35.2	2.8	13	33.5	5.7	39	33.6	2.9
21-24	97	34.2	3.0	20	34.4	2.2	63	33.4	3.5
25-28	156	33.9	3.0	39	32.6	4.3	107	33.1	3.1
29-32	116	34.3	2.6	20	32.6	3.8	68	32.8	3.1
33-36	92	34.0	3.2	8	32.0	2.7	40	33.2	3.4
37-40	26	35.7	2.3	2	35.0	0	12	34.0	2.7

TABLE III  
SHOWING INITIAL MEAN MCHC VALUES AND  
STANDARD DEVIATION OF MOTHERS AT  
DIFFERENT STAGES OF PREGNANCY

GESTATION IN WEEKS	CHINESE			INDIANS			MALAYS		
	No. of Patients	Mean MCHC %	S.D.	No. of Patients	Mean MCHC %	S.D.	No. of Patients	Mean MCHC %	S.D.
1-4	-	-	-	-	-	-	-	-	-
5-8	1	31.0	-	-	-	-	-	-	-
9-12	4	31.0	1.6	2	33.0	2.0	2	31.5	1.5
13-16	9	31.7	2.1	2	33.5	0.5	18	31.5	1.5
17-20	41	31.7	1.7	13	29.5	2.4	39	31.2	1.8
21-24	97	31.7	2.0	20	30.5	2.3	63	30.9	1.9
25-28	156	31.3	1.7	39	30.3	2.5	107	30.4	2.4
29-32	116	31.1	1.9	20	29.8	2.3	68	30.5	3.0
33-36	92	30.6	1.9	8	31.0	2.6	40	30.4	1.8
37-40	26	31.5	1.9	2	30.0	2.0	12	31.1	2.4

deviations for the 3 ethnic groups at different stages of pregnancy. The results have been arranged into 4-weekly groups according to the stage of pregnancy at which the investigations were carried out.

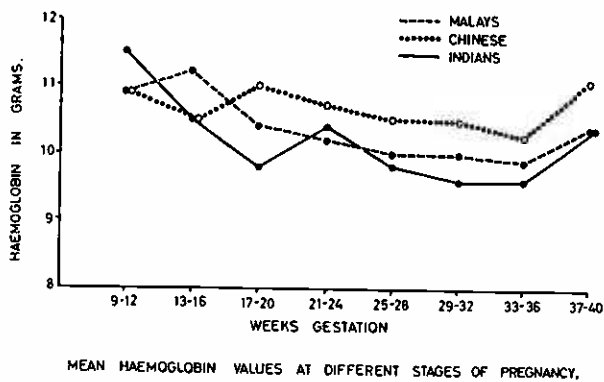


Fig. 1.

Fig. 1 shows graphically the mean haemoglobin levels of the 3 ethnic groups at different stages of pregnancy. It will be seen that there is a progressive fall in the mean haemoglobin level from the 9th. week up to the 33rd.-36th. week after which there is a gradual rise up till term. The lowest mean haemoglobin level reached was 10.2 gm.% for Chinese compared to 9.9 gm.% for Malays and 9.6 gm.% for Indians. The mean haemoglobin levels from the 17th. week onwards was highest for Chinese and lowest for the Indians. The haemoglobin values between the 5th.-16th. week may not be entirely significant because of the very small numbers.

A similar trend towards a progressive fall in the haematocrit and MCHC values as pregnancy progresses may be seen in all 3 ethnic groups. The low haematocrit values reached by all 3 ethnic groups accompanied by a corresponding fall in the MCHC to 29.8% for Indians, 30.4% for Malays and 30.6% for Chinese suggests the prevalence of mild degrees of anaemia of the hypochromic variety among the patients attending the clinic.

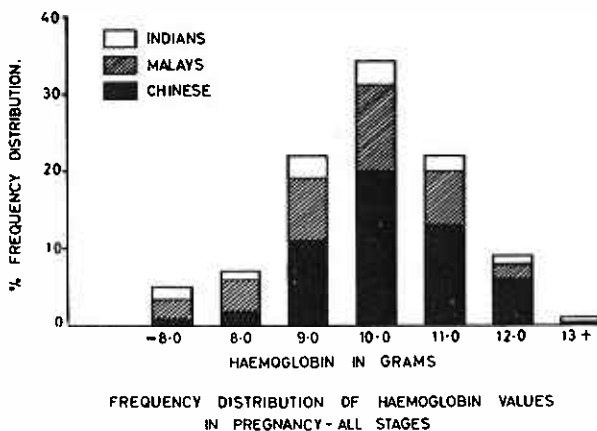


Fig. 2.

Fig. 2 shows the frequency distribution of the initial haemoglobin levels of the patients at various stages of pregnancy. A total of 335 patients, approximately one-third of the series, were found to have haemoglobin levels of below 10.0 gm.% at some stage of pregnancy. Of these 335 patients, 146 were Chinese, 141 were Malays and 48 were Indians. No less than 46 patients had haemoglobin levels of below 8 gm.% at their first attendance at the Clinic. The slightly larger proportion of Malays and Indians with haemoglobin levels of less than 10.0 gm.% compared to the Chinese is to be noted.

Analysis of the 335 patients with haemoglobin levels of less than 10.0 gm.% according to parity groups showed that 14% were primigravidae, 15% para 2, 17% para 3, 16% para 4 and 38% para 5 and above, thus showing the increased liability to develop anaemia with increasing parity. There was no evidence to suggest an increased liability to develop anaemia with increasing age.

### DISCUSSION

The changes in the haemoglobin, haematocrit and MCHC values in this series of patients are generally similar to that observed by the majority of other workers, Walsh et al, 1953; Hytten and Duncan, 1956. However, the minimum haemoglobin values reached were generally much lower than that reported by these workers suggesting the greater prevalence of anaemia and a generally poorer iron status of our mothers. Although workers are still not agreed upon the level of haemoglobin concentration at which anaemia is considered to be present, it is generally accepted that treatment should always be applied if the haemoglobin falls below 10.0 gm.%, Lancet, 1963. The incidence of anaemia at the first visit is 1 in 2.4 for Indians and Malays, compared to 1 in 3.7 for Chinese.

It is now generally agreed that supplemental iron therapy should be given to all pregnant mothers. That one-third of the mothers in this survey were shown to have a haemoglobin of less than 10.0 gm.% associated with a low MCHC demonstrates the urgent need to initiate iron supplementation early in pregnancy. This should be given orally in the form of ferrous sulphate or ferrous gluconate in doses sufficient to provide 100-200 mgm. of elemental iron daily.

At this clinic all mothers were routinely prescribed with oral iron, ferrous sulphate gr. 3, three times daily. In spite of this, there were 70 mothers who developed anaemia with haemo-

globin levels of less than 10.0 gm. % at subsequent visits.

The number subsequently developing anaemia would probably be higher because many mothers did not come for further follow up after their first visit, whilst others were not followed for the full course of pregnancy. Thus, the true incidence of anaemia in pregnancy would be more than the 1 in 3 recorded if allowance was made for the many other mothers who may develop anaemia at subsequent visits.

### SUMMARY

The changes in the haemoglobin, haematocrit and MCHC were studied in 1,000 consecutive mothers attending the antenatal Clinic for the first time. The average haemoglobin levels of Chinese mothers were generally higher than that of the Malays or Indians at corresponding stages of pregnancy. Haemoglobin levels were lowest for Indians at all stages of pregnancy. The incidence of anaemia below 10.0 gm. % among the series of patients at their first visit to the Clinic was 1 in 3.

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