BLOOD INDICES IN EGYPTIAN INFANTS AND CHILDREN IN RURAL AND URBAN AREAS

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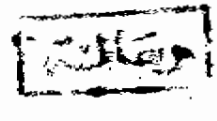

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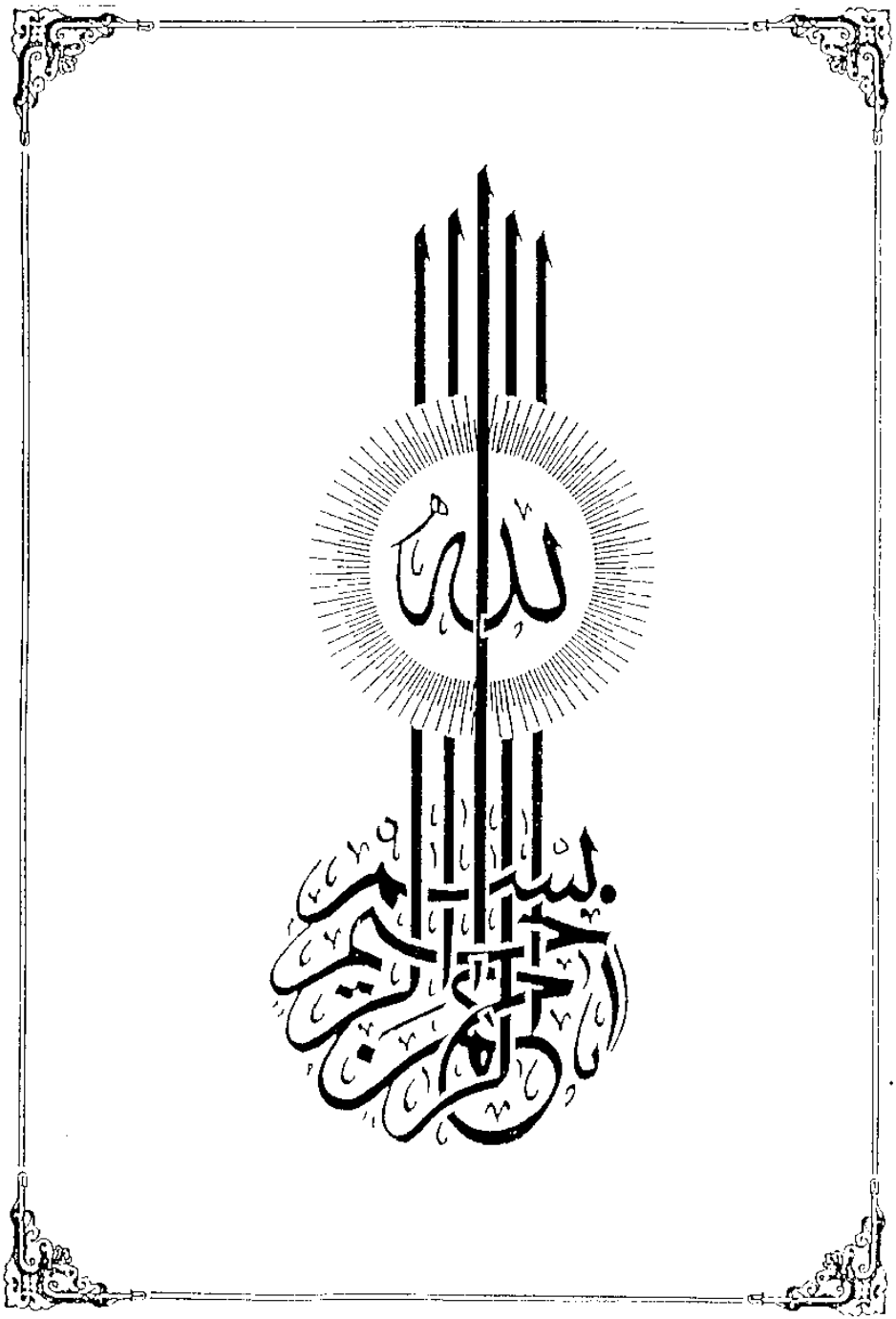

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CONTENTS

Introduction & Aim Of The Work

INTRODUCTION AND AIM OF THE WORK

Determination of haemoglobin concentration and red blood cell indices is used in prevalence studies and typing of anaemia in population surveys.

In developing countries malnutrition and parasitism result in significantly higher incidence of anaemia than in the developed parts of the world (Khalifa, 1981).

The objective of this work is to determine haemoglobin level and red blood cell indices; MCV, MCH, MCHC, in the paediatric age group (up to 12 years of age) and to compare these indices in two Egyptian populations. An urban area from Cairo and a rural area from Sharkieh governorate are selected.

The various socio-cultural and economic factors and their influence on these indices will be studied.

REVIEW OF LITERATURE

Anaemia is responsible for a great deal of ill-health, lack of energy and productivity and also for deaths in child birth in many countries (WHO, 1963). In detecting and evaluating an anaemia problem in a community reference standards are necessary, even though they may be somewhat arbitrary (WHO, 1968). Prevalence studies of varying extent and degree of precision were carried out in nine countries of the Eastern Mediterranean Region including Egypt. Although the numbers of people covered were sometimes small and the methods and diagnostic criteria varied, the results leave no doubt that nutritional anaemias are the most serious and widespread nutritional disorders in the Region, and that iron deficiency anaemia is the predominant type (WHO,1974).

HAEMATOLOGIC PICTURE AT BIRTH AND NEONATAL PERIOD

Factors affecting the values of haemoglobin, haematocrit, red cell count, and red cell indices:

Several variables influence the interpretation of what might be considered normal values. These variables include:

1. The gestational age of the infant.
2. The conduct of labour and time of cord clamping.
3. The site of sampling.
4. The time of sampling.
5. Foetal-maternal and maternal-foetal transfusions.
6. Foetal to foetal transfusions.

These factors primarily affect haemoglobin and haematocrit values and the red cell count. (Nathan and Oski, 1981).

1. The gestational age of the infant:

To summarize the changes in the haematologic values in relation to the gestational age, Zaizov and Matoth (1976) gave the following table which shows the red cell values on the first postnatal day:

Gestational age (weeks)	RBC X 10^6	Hb (gm./dl.)	PCV (vol. %)	MCV (fl.)
24-25	4.65	19.4	63	135
26-27	4.73	19.0	62	132
28-29	4.62	19.3	60	131
30-31	4.79	19.1	60	125
32-33	5.00	18.5	60	123
34-35	5.09	19.6	61	122
36-37	5.27	19.2	64	121
Term	5.14	19.3	61	119

(Modified from Zaizov and Matoth, 1976).

2. The conduct of labour and time of cord clamping:

At birth, the blood volume of the infant can be increased by as much as 61 per cent by allowing complete

emptying of the placental vessels before the cord is clamped. It has been estimated that the placental vessel contain 75 to 125 ml. of blood at birth - or one-quarter to one-third of the foetal blood volume. Under normal circumstances, about one-quarter of the placental transfusion takes place within 15 seconds of birth and one-half by the end of the first minute (Usher et al., 1963; Yao et al., 1969). The placental transfusion occurs more rapidly in women who receive ergotamine derivatives at the onset of the third stage of labour (Yao et al., 1968). The umbilical arteries generally constrict shortly after birth, so that no blood flows from the infant to the mother, although the umbilical vein remains dilated, permitting blood to flow in the direction of gravity. Infants held below the level of the placenta will continue to gain blood; infants held above the placenta may bleed into it (Gunther, 1957). Yao and co-workers (1969) demonstrated that hydrostatic pressure produced by placing the infant 40 cm. below the mother's introitus hastened placental transfusion to virtual completion in 30 seconds.

The blood volume in infants with early cord

clamping averages 78 ml. per kg. at 30 minutes of age, as contrasted with a value of 98.6 ml. per kg. in infants with late-clamped cords. By 72 hours of age these differences are not as great; infants with early clamping average 82 ml. per kg., whereas late-clamped infants average 93 ml. per kg. (Usher, 1963).

Although the total blood volume may be only slightly altered by the timing of the cord clamping, more significant differences can be observed in haemoglobin concentration, packed cell volume and red cell count. Late clamping of the cord results in an increase in red cell count by 0.5 to 1.5 million cells per cubic mm., a rise in haemoglobin by 1 to 4 gm./dl. and a higher packed cell volume by 3 to 12 vol. % (Moss et al., 1967). Nathan and Oski (1981) gave the following table of the results of other investigators on the effect of cord clamping on haemoglobin concentration:

Author(s)	Early (gm./dl.)	Delayed (gm./dl.)	Time of study
Phillips (1941)	15.6	19.3	20-30 hours of age
De Marsh et al. (1948)	17.4	20.8	3rd day
Colozzi (1954)	14.7	17.3	72 hours
Lanzkowsky (1960)	18.1	19.7	72-96 hours
	11.1	11.1	3 months of age

It has been emphasized that the technique of delayed cord clamping does not result in a significant increase in red cell volume unless the cord is initially stripped or milked (Whipple et al., 1957).

3. The site of sampling:

Capillary samples obtained by skin prick, generally from the heel or toe, have a higher haemoglobin concentration than do simultaneously collected venous samples (Nathan and Oski, 1981). During the first hours of life haemoglobin concentration of capillary samples averaged 20.3 gm./dl. while that of venous samples averaged 16.7 gm./dl. (Ottinger and Mills, 1949). Vahlquist (1941) observed that haemoglobin concentration of capillary samples was about 10 % greater than that of venous samples. Mollison (1961) observed only a 5 % difference. On the fifth day of life, Ottinger and Mills (1949) found a 12 % difference, although Vahlquist (1941) could only demonstrate a 2.5 % difference on the sixth day of life.

Capillary haematocrit is higher than venous haematocrit. When paired venous and capillary blood samples

were drawn from 75 neonates under 1 week of age, the mean capillary haematocrit level, 57.8 vol. % (± 2.4), was significantly higher than the mean venous haematocrit level, 55.8 vol. % (± 2.0) (Gatti, 1967).

Stasis of blood in the peripheral vessels, because of sluggish circulation with resultant transudation of plasma, is believed to be responsible for the discrepancy in the samples obtained from the different sites, which results in the higher capillary levels (Oski and Naiman, 1972).

4. The time of sampling:

During the first few hours after birth, an increase in haemoglobin concentration takes place. This rise may be as great as 6 gm./dl. This is partially a result of the placental transfusion that occurs at the time of delivery. The total blood volume of the infant rapidly adjusts after birth, decreasing in plasma volume while red cell volume remains essentially unchanged (Usher et al., 1963). This results in an increase in red cell count, haematocrit, and haemoglobin concentration. Gairdner et al. (1958)

have shown that an increase in haemoglobin concentration occurs shortly after birth even when the cord was clamped "as soon as conveniently possible". They noted that the haemoglobin increased from 16.6 to 19.1 gm./dl. during a period of eight hours. Although this increase in haemoglobin concentration appears to be a relatively uniform phenomenon, the magnitude of the increase depends on the amount of placental transfusion (Oh and Lind, 1966).

5. Foetal-maternal and maternal-foetal transfusions:

In tabulating normal haematologic data for the newborn, most investigators encounter a great range of variability. Cord blood haemoglobin values in apparently normal infants have ranged from 13 to 22 gm./dl. (Guest et al., 1938). It is now recognized that in as many as 50 % of pregnancies some foetal cells pass into the maternal circulation at some time during gestation or during the birth process. In 8 % of pregnancies these trans-placental losses range from 0.5 to 40 ml. of blood and in about 1 % the losses are even greater and may approximate 100 ml. (Cohen et al., 1964).