Discussion

Studies on abnormal haemoglobins and some variants of normal haemoglobin in a wide variety of clinical conditions, particularly in haemolytic anaemias with or without hereditary predisposition have attracted the attention of many workers in this particular field and yielded quite useful and interesting results. Similar studies of haemoglobin in toxaemias of pregnancy have been very much lacking. The fairly high incidence of toxaemia in patients suffering from anaemias of later months of pregnancy (65) and in pregnant women belonging to hypertensive family (152) have led the present investigation to study the nature and behaviour of haemoglobin under these conditions. As most of the current theories on this pathological syndrome presupposes diminished oxygen supply to different organs viz., uterus, placenta (10, 15, 16), kidney (19, 22), liver (150) etc., it was of interest to study first the oxygen carrying capacity of haemoglobin and whether it is affected in this syndrome. It is also very likely that this oxygen carrying capacity related to the toxaemias of pregnancy through the mode of oxygen transport to different tissues of the body and any interference in that process may result in the primary biochemical lesion prior to any gross pathological lesion evident clinically or in routine laboratory investigations. The present work was therefore directed mainly to the study of the nature, function, components, composition and other characteristics of haemoglobin under normal and toxaemic
condition of human pregnancy. For that purpose a study of the non-functional pigment was first made according to Hellige's method. It was observed that the amount of the non-functional pigment was practically unaffected by either simple toxaemias of pregnancy or anaemias of pregnancy, complicated with toxaemia syndrome. It was then followed by the determination of the oxygen absorption capacity of haemoglobin by the manometric gas analysis method of Van Slyke. Oxygen dissociation curves obtained according to Allen et al. (92) have revealed certain important facts. The release of oxygen from haemoglobin becomes more difficult with the increasing severity of toxaemia syndrome as indicated by the hyperbolic nature of the curve. Toxaemias of pregnancy from hypertensive family and also study of the other members of hypertensive family with hereditary predisposition to hypertension also gave similar results. This indicates that the behaviour of haemoglobin with regard to oxygen dissociation mechanism is affected in some way by the toxaemias of pregnancy or by hypertensive condition alone or in association of both.

The biological position of oxygen in the need for energy has been amply stressed by Drabkin (79). According to him oxygen also maintains a balance of demand and supply during its transport to the various tissues in the body. A number of different factors are involved in this complicated process. Drabkin (151) has further shown recently that in this balanced and integrated process haemoglobin in the erythrocytes is poised to resist oxidation and to favour
oxygenation while cytochrome c in the tissues is poised to favour oxidation.

A study of the different factors influencing the oxygen transport by haemoglobin in normal and toxaemias of pregnancy indicates that with the increase in pH and salt concentration of haemoglobin solution the oxygen dissociation curve becomes hyperbolic. Strass (28) has also shown clinically that an increase in salt concentration in toxaemic patients aggravates their symptoms. So it is not quite unlikely that increase in salt concentration affects patients suffering from toxaemias of pregnancy through its effect on haemoglobin.

The oxygen dissociation curve obtained from some of the toxaemia cases, specially when it is attended with severe symptoms resembles in certain respects that given by foetal blood. Because of this resemblance the presence of alkali resistant Hb-F was suspected in the toxaemic group. But no alkali-resistant pigment in demonstrable amount has so far been found in any group of toxaemias of pregnancy cases.

The paper electrophoresis of haemoglobin from some of the toxaemia cases has indicated besides Hb-A the presence of other components which unfortunately could not be identified properly. This component of haemoglobin has also been detected in pre-eclampsia cases with a familial predisposition to hypertension. This study extended to the other members of the homozygous hypertensive family has also indicated presence of similar components in the haemoglobin hemolyzate. It therefore appears that apart from the normal
haemoglobin there is another component or components in some cases of pre-eclampsia with genetical factors involved. It would be highly interesting to characterize this haemoglobin component or components in more details by the electrophoretic analysis, preferably in a Tiselius apparatus which was unfortunately not available for the present study.

The amino acid composition of haemoglobin from normal and toxaemia cases has been found to be more or less same and as such cannot account for the difference in the rate of mobility observed in the paper electrophoretic separation of haemoglobin components in some of the toxaemia cases. Possibly the end group analysis of Porter and Sanger (130), using 1:2:4-fluorodinitrobenzene reagent might give more useful information on this point.

The specificity of the haemoglobin from toxaenic cases has been determined by the principles of "specificity of anaphylactic reaction", using Schultz-Dale method (138, 139). But this, however, could not be carried out in respect to haemoglobin components obtained in toxaemias of pregnancy.