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RESEARCH ARTICLE

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Changes in some haematological profile in hypertensive pregnant Wistar rats

J.A. Tende[1], Z. Muhammad[2] and O.A. Daikwo[1]

[1]*Department of Human Physiology, Faculty of Medicine, Ahmadu Bello University, Zaria, Nigeria*

[2]*Department of Applied Science, College of Science and Technology, Kaduna Polytechnic, Kaduna, Nigeria*
[*]*Corresponding email: tendejoshua@gmail.com*

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ABSTRACT

This study was designed to evaluate changes in some haematological indices in hypertensive pregnant Wistar rats. Female rats were made hypertensive by mixing 8% sodium chloride with their regular diet for eight (8) weeks. Fertile males were placed in the female cages to mate by polygamous mating system in the ratio of 1:2. Copulation was confirmed by the presence of vaginal plugs which depicts first day of gestation. Animals were divided into three groups as follows: Group 1: Normotensive (non-hypertensive) non-pregnant rats; Group 2: Normotensive (non-hypertensive) pregnant rats and Group 3: Hypertensive pregnant rats. Blood sample was obtained near term for investigation of some hematological parameters. Results obtained from the study showed a statistical significant ($P < 0.05$) increase in the mean red cell count, packed cell volume; lymphocyte and platelets count in the hypertensive pregnant rats when compared with non-hypertensive pregnant and non-hypertensive non-pregnant animals respectively.

Key words: Hypertension, pregnancy, red cell count, packed cell volume, platelets count

INTRODUCTION

Pregnancy induced hypertension (PIH) is defined as hypertension that occurs in pregnancy for the first time after 20 weeks of gestation (and most frequently, near term) and disappears following delivery. PIH is classified as 1; Mild PIH 2; Pre-eclampsia 3 and eclampsia. Mild PIH is characterized by blood pressure 140/90mm Hg which returns to normal by 12 weeks of postpartum. Pre-eclampsia is the presence of hypertension (blood pressure >140/90mm Hg), significant proteinuria (>300 mg per 24hours) pedal edema and, at times, coagulation abnormalities. Eclampsia is the occurrence of convulsion or coma unrelated to other cerebral condition with signs and symptoms of pre-eclampsia, [1]-[2]. Hence, a pregnant woman with diastolic blood pressure of ≥ 90mmHg on two occasions more than 4hours apart or a single value of ≥ 110mmHg is considered hypertensive. The worldwide prevalence of pre-eclampsia is 9%. However, incidence of 14.1% has been reported in the primigravidas compared with 5.7% in multigravidas [3]. Maternal health and pregnancy outcome are noticeably affected when pre-eclampsia or more complicated conditions such as eclampsia develop. The pregnancy induced hypertensive mothers are at greater risk for intrauterine growth restriction (IUGR) and intrauterine death of foetus (IUD) [4]. These syndromes substantially contribute to maternal morbidity and mortality [5]. Because pre-eclampsia can rapidly progress to a convulsive phase called eclampsia, it is regarded a major cause of feotal and maternal morbidity and mortality [1]. During pregnancy several hemodynamic, biochemical and hematological modifications occur as part of the physiological adaptation of the body to this condition. Neonates may also have a spectrum of hematological changes which may add to the existing morbidity in them [6]. With respect to blood analysis, only slight changes in the amount of different white cells, platelets, hemoglobin and creatinine have been described [7]. This study was designed to evaluate changes in some haematological indices in hypertensive pregnant Wistar rats.

MATERIALS AND METHODS

Materials

These include: Tail cuff platysmograph, (Ugo Basile -SRL, Biological Research Apparatus, and Comerio VA, Italy with (Model- 58000-850, Ser No- 1048A10), Sodium chloride and Automated Blood Analyzer (Audicom USA, Model-AC9900).

Experimental animals

Twenty four (18 females + 6 males) adult Wistar rats weighing between 180 – 190 g obtained from the Animal House of the Department of Human Physiology, Faculty of Medicine, Ahmadu Bello University, Zaria-Nigeria, were used for the study. They were housed in well-ventilated plastic cages, with free access to food and water.

METHODS

Experimental Protocol

In the present study, eighteen (18) female Wistar rats divided into three groups were used. Each group consisted of six Wistar rats (n=6) as follows:

Group 1: Normotensive (non-hypertensive) non-pregnant rats
Group 2: Normotensive (non-hypertensive) pregnant rats
Group 3: Hypertensive pregnant rats

The remaining six (6) male Wistar rats were only involved in mating with the female Wistar rats in the groups where pregnancy was needed.

Induction and Confirmation of Hypertension

Hypertension was induced using the method described by Limas and Goldmam [8]. 8% sodium chloride was added to the regular diet of the female Wistar rats for 8weeks. Subsequently, the elevated blood pressure was then confirmed with a tail cuff platysmograph, (Ugo Basile -SRL, Biological Research Apparatus, Comerio VA, Italy. Model:58000-850; Ser No: 1048A10). Rats that had a blood pressure of ≥ 140/90 were considered hypertensive.

Figure 1: The tail cuff platysmograph and the recorder

Mating of Animals and Pregnancy

All female rats (18 in number) divided into six (6) groups of two (2) animals each, had their estrous cycle monitored by taking vaginal smear from each rat [9]. During pro-estrous phase of the estrous cycle, fertile males were placed in the female cages to mate by polygamous mating system, 2 female to 1 male in each cage. The day that copulation

occurred (as demonstrated by the presence of vaginal plugs) was depicted as first day of gestation; hence pregnancy and the male rats were then separated from the female rats.

Collection of Blood Samples and Determination of Haematological Parameters

About 19 days after establishment of pregnancy, the rats were sacrificed under chloroform anaesthesia and blood samples collected. Haematological parameters were analysed immediately after blood collection using Automated Blood Analyzer (Audicom USA, Model-AC9900).

Statistical Analysis

Values obtained were expressed as Mean ± SEM. The data were analyzed using one-way analysis of variance (ANOVA) and Tukey's post hoc test was used to determine the level of significance between control and the experimental groups. All statistical analysis was done using SPSS version 21.0software. The value of $P<0.05$ were considered statistically significant.

Table 1: Changes in Some Haematological Indices in Non-Hypertensive Non-Pregnant Rats, Non-Hypertensive Pregnant Rats and Hypertensive Pregnant Rats

Treatment Groups	RBC ($X10^{12}$/L)	Hb (g/dL)	PCV (%)	Platelets ($X10^{9}$/L)	WBC ($X10^{9}$/L)	Lymphocytes (%)	Neutrophil (%)
NHNPP	6.04±0.22[a]	13.20±0.50[a]	40.96±0.99[a]	604.00±47.30[a]	5.56. ±0.55[a]	3.02±0.83[a]	25.04±1.62[a]
NHPR	6.63±0.18[a]	13.60±0.31[a]	41.74±0.39[a]	610.80±55.70[a]	6.56±1.16[a]	3.38±0.98[a]	25.40±1.32[a]
HPR	7.04±0.24[b]	14.02±0.41[a]	46.52±1.60[b]	675.00±98.48[b]	8.68±2.14[a]	6.36±1.47[a]	18.62±4.03[a]

Values with different superscript letters (a, b) are significantly (P < 0.05) different when compared to control group
NHNPR = Non-Hypertensive Non-Pregnant Rats (control); NHPR = Non-Hypertensive Pregnant Rats; HPR = Hypertensive Pregnant Rats

RESULTS AND DISCUSSION

Results obtained from the study showed a statistical significant ($P < 0.05$) increase in the mean red cell count, packed cell volume; lymphocyte and platelets count in the hypertensive pregnant rats when compared with non-hypertensive pregnant and non-hypertensive non-pregnant animals respectively. Red cell mass driven by an increase in maternal erythropoietin production increases during pregnancy, but relatively less, compared with the increase in plasma volume and thus, there is dilution anaemia [10]. The increase in total red blood cell count and packed cell volume may be attributed to the increase in oxygen requirement due to increased metabolic activity during hypertension in pregnancy. This was consistent with the results of Hill and Pickinpaugh [11] who observed some physiologic changes during hypertension in pregnancy. Also the increase in mean platelet volume in hypertensive pregnant rats is in agreement with that reported by Arch [12]. However, the mean white blood cell count, lymphocyte, neutrophil and platelet count did not differ significantly when compared with non-hypertensive pregnant and non-hypertensive non-pregnant rats respectively. This finding contradicts observation by Whittaker *et al.* [13].

CONCLUSION

It can be concluded, that red cell count, packed cell volume and platelets count increased significantly in hypertensive pregnant rats, with a non-significant change observed in white blood cell, lymphocyte and neutrophil count when compared with non-hypertensive pregnant and non-hypertensive non-pregnant rats.

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