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The effect of pregnancy state on white blood cells count

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Abstract
The objective of this study was to investigate the changes in white blood cells and differential counts in pregnant women at kosti city (Sudan). Blood specimens were collected from 100 pregnant women and 100 non pregnant women as control. The Samples were analyzed immediately by using hemacytometer and thin blood film technique. The obtained results showed significant increase in white blood cells count in pregnant group (mean 7.3×10^3µl) compared with (5.7×10^3µl mean) in the non-pregnant group. In the pregnant group the white blood cells count was markedly increased at the third trimester (9.1×10^3µl) compared to (5.4×10^3µl) in the first trimester and (7.3×10^3µl) in the second. In the differential count, neutrophils were significantly increased (63%). The esinophils, monocytes and basophils were not affected, whereas the lymphocytes were slightly reduced (27%). In the non-pregnant group (control), the white blood cells count was found to be (5.7×10^3µl), whereas the differential counts showed, neutrophils (45%), esinophils, (2%), monocytes (11%), basophils (0%), and lymphocytes (40%).

Keywords: hemacytometer, thin blood film, differential count, pregnancy, neutrophils, esinophils

1. Introduction
The white blood cells (leucocytes) are the cellular components of blood mediating the body's immune system [3]. Leucocytes originate form pluripotent stem cells in the bone marrow [5. Pregnancy is normally associated with alterations in many hematological parameters, e.g the increase in white blood cells count (leucocytosis), which has been attributed to physiological stress and increased inflammatory response [2, 3]. Leucocytosis is mainly due to neutrophilia and immature forms like metamyelocytes and myelocytes (neutrophils left shift) that may be present in the peripheral blood film [4]. Several changes have been reported in neutrophils during pregnancy time, including; impairment of apoptosis (due to the increased inflammatory response), and reduced chemo taxis [6]. It was also reported that, peripheral blood neutrophils in normal pregnancy are activated [9, 10] and the total blood volume increases by about 1.5 liters, to compensate for blood loss occurring at delivery [11]. One liter of blood is contained within the uterus and maternal blood spaces of the placenta. Therefore increase in blood volume is more marked in multiple pregnancies and in iron deficient states [12]. Expansion of plasma volume occurs by 10-15 % at 6-12 weeks of gestation [13]. During pregnancy, plasma rennin activity tends to increase and atrial natriuretic peptide levels tend to be slightly reduced. In pregnant state, the elevation in plasma volume is in response to an under filled vascular system resulting from systemic vasodilatation and increase in vascular capacitance, rather than actual blood volume expansion, which would produce the opposite hormonal profile instead (i.e., low plasma renin and elevated atrial natriuretic peptide levels) [14, 15]. White blood cells count may increase during pregnancy, with the lower limit, of the reference range being typically 6,000/cumm. Leucocytosis, occurring may be due to physiological stress induced by the pregnant state [16]. Neutrophils are considered to be the major type of leucocytes on differential counts [17, 18]. During pregnancy, humoral immunity is said to be intact, and cell mediated immunity is markedly depressed. Up regulation of innate immunity has been theorized to be a compensatory mechanism [23, 24]. The major noted change in innate immunity is an increase in white blood cell count which is mainly due to neutrophilia [19-22]. The objective of this study was to investigate the changes in white blood cells and differential counts in pregnant women at kosti city (Sudan).

2. Materials and Methods
This study was conducted in Kosti teaching hospital. White blood cells and differential counts were carried for hundred pregnant women and hundred non- pregnant ones.
2.5ml of venous blood specimens was taken from each participant using sterile syringes. Each sample was transferred to EDTA anticoagulant container and then analyzed for white blood cells and differential count using hemacytometer and thin blood film. The measured values of white blood cells count were statistically analyzed using SPSS program.

3. Results and Discussion
The results showed marked increase in white blood cells during pregnancy (mean 7.3×10^3µl). the non- pregnant group specimens showed WBCs mean value of (5.7×10^3µl). According to Surabhi chandra *et al.*, (2012), white blood cell count is increased in pregnancy with the lower limit of the reference range 6000cumm. Pughikumo OC1, *et al.*, (2010), and Maged M. Costantine, (2014) reported significant increase in leucocytes in pregnant women compared to non-pregnant controls. In the differential count result, Neutrophils were significantly increased (63%); the esinophils, monocytes, basophils were not affected (1%, 8%, and 0% respectively). The lymphocytes were slightly reduced (27%) (Fig.1). In control group the differential counts were found to be 45% for Neutrophils, esinophils (2%), monocytes (11%), basophils (0%), and lymphocytes (40%) (Fig.2). Left shift and toxic granulations were not detected in pregnant group. It was reported that, sometimes the increases of WBCs count indicate

the infection diagnosis, when, the Left shift or toxic granulations were found [29, 30].

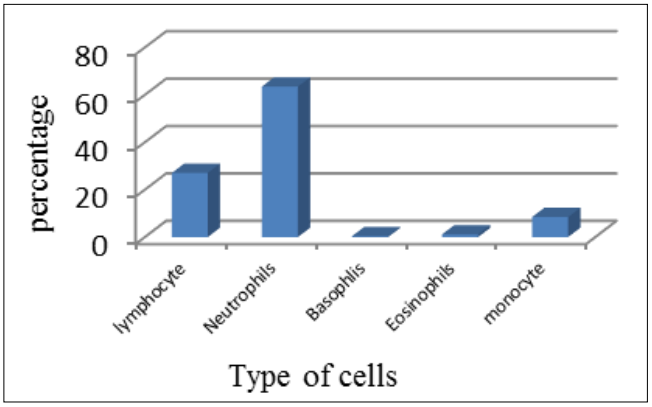

Fig 1: Differential count of white blood cells in pregnant group (mean)

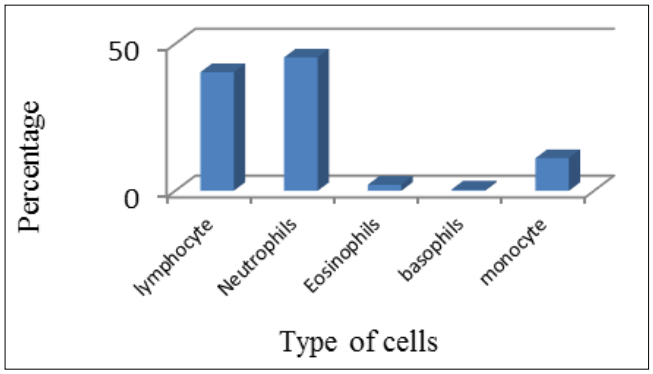

Fig 2: The white blood cells differential count in control group (mean)

In the pregnant group the white blood cells were markedly increased at the third trimester (9.1×10^3µl) compared to (5.4×10^3µl) in the first trimester and (7.3×10^3µl) in the second trimester (Fig. 3). This study shows a decrease in lymphocytes count during pregnancy, especially, at the third trimester. These findings may agree with, Valdimarsson H, Mulholland C, *et al.*, (1983), who reported that, the WBCs were increased in normal pregnancy, and considered the higher counts as an indication of haematologic malignancies, which may occur rarely (75,000 - 100,000) in pregnancy and may pose a problem for managing obstetricians [24]. This may indicate the need for a review of the complete blood count during antenatal care.

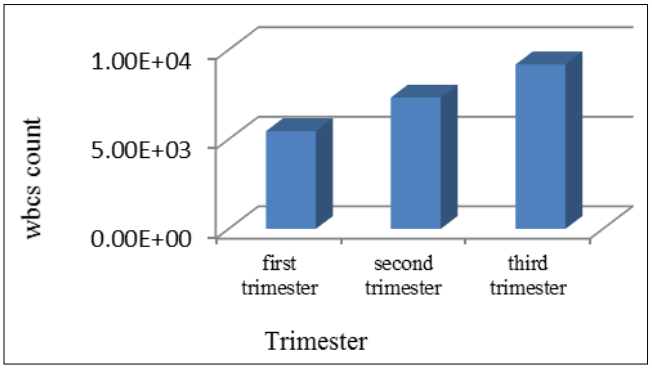

Fig 3: The white blood cells according to trimester

Table 1: The differential count of white blood cells in pregnant and control group (mean %)

Type of cell	Pregnant group	Control group
Lymphocyte	27.0790	40.3870
Neutrophils	63.4970	45.4100
Eosinophils	0.3600	2.0800
Basophils	1.1300	0.4700
Monocyte	8.4600	11.1120

The white blood cells count was significantly increased in pregnant group. It was found to be ranging from 2,900 to 15,900µl compared with a range of 2,000 to 11,400µl in non-pregnant group. Table (1) may conclude the clear differences in the differential count in the two groups. The increase in white blood cells count during pregnancy may be normal rather than a result of any infection. Further studies may be needed in this field to cover different areas in Sudan states.

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