The National Ribat University

Faculty of Medicine

Department of Physiology

Postgraduate Master Program

Title:

Effect of pregnancy on packed cell volume and Total white blood cells count among Sudanese pregnant women attending antenatal care at Ribat university hospital

Khartoum state 2017

Submitted by:

Wafa Mubarak Mohamed Ahmed

In partial fulfillment of requirements for the degree of MSc in human physiology

Supervisor:

Prof: Omer Abdel Aziz Musa

Co. supervisor

Dr. Abdelrahman Khalid
## Contents

Contents..............................................................................................2  
Background..........................................................................................3  
Justification..........................................................................................5  
Objectives..............................................................................................6  
Methodology..........................................................................................7  
Work plan..............................................................................................9  
Budget.................................................................................................10  
References............................................................................................11  
Annexes...............................................................................................13
Background

Introduction:
Pregnancy is the period from conception to birth which usually lasts 40 ± 2 weeks, beginning from the first day of the woman's last menstrual period, and is divided into three trimesters, each lasting three months.\(^1\) It is a state characterized by many physiological hematological changes, which may appear to be pathological in the non-pregnant state.\(^{1,2}\) Many studies have identified the hematological profile of the pregnant woman as one of the factors affecting pregnancy and its outcome.\(^{2,3}\) During pregnancy, plasma expansion and haemodilution contribute to the majority of these changes, there is increase in plasma volume as well as in red cells and white blood cells count.\(^{4-7}\) The total blood volume increases in order to supply the demands of the new vascular bed and also to compensate for blood loss occurring at delivery.\(^{1,6,8}\) Modifications in the production of red cells and changes in plasma volume has some effect on some of the hematological indices such as red blood cells count, packed cell volume, hemoglobin concentration, platelet count, and white blood cell count.\(^{4,6,9}\) Some of these are decreased like RBC and PLT counts partly as a result of the physiological haemodilution that occurs in pregnancy, while others are increased, such as the WBC count.\(^{4,5}\)

Plasma Volume:
Plasma volume found to be increased by about 10–15% at 6–12 weeks of gestation then expands rapidly until 30–34 weeks. The total gain of plasma volume at term is about 1100–1600 mL (Average of 1.5L) and results in a plasma volume of 4700–5200 mL, 30–50% above the non-pregnant women plasma.\(^{10-13}\)
**Blood Cells:**

During pregnancy the total volume of circulating blood increases.\(^7\) Red blood cell mass was reported to be increased by about 20–30% above non-pregnant levels by the end of pregnancy which is mainly driven by the increase in erythropoietin production.\(^{10,12,14}\)

So as the increase in plasma volume is more than the increase in the red blood cells

Consequently, the packed cell volume decreases due to the haemodilution.\(^{2,15,16,17}\)


Regarding the white blood cells, many studies reported that pregnancy is usually associated with leukocytosis.\(^{3,12,18}\) Arising mainly from neutrophilia, which is attributed to physiologic stress and it is known to increase with gestational age.\(^{2,10,19,20}\)

So during pregnancy the mean white blood cells counts of 10,000–16,000 cells/uL with an upper level as high as 29,000 cells/uL at labor\(^2\). The count falls to reach the normal non-pregnant range by the sixth day postpartum.\(^{10,11}\) Some researchers report that in a woman with normal pregnancy, there is no change in the absolute lymphocyte count .\(^{10,20}\) The monocyte count tended to increase, while the basophil and eosinophil count may slightly decrease .\(^{20}\) Also women with normal pregnancies can have a small number of immature cells in the peripheral circulation.\(^{2,10,12}\)

Some studies conducted in Khartoum/ Sudan reported a normal values of white blood cells count and differential with significant decrease in the packed cell volume during the second trimester of pregnancy in relation to the standard values.\(^{15}\)
Justification:

As pregnancy is considered as one of the most important periods in women’s lives that lead to great stress as a part of the different physiological and structural changes, many of these physiological hematological changes does not affect pregnancy or pregnancy outcome but drug supplements and antibiotics are usually prescribed depending on these values. Taking into account the increased plasma volume then the heamodilution should be considered as a factor affecting the normal values.
Objectives

General objectives:
To assess the effect of pregnancy on packed cell volume and white blood cells among Sudanese pregnant women attending antenatal care at the Ribat university hospital.

Specific objectives:
1- To assess the change of packed cell volume in Sudanese pregnant women and compare them with non-pregnant women.
2- To assess the change of white blood cells count in Sudanese pregnant and compare them with non-pregnant women.
3- To derive a formula for the normal values in pregnant women in relation to the plasma volume.
Methodology

Study design:
Analytical case control study

Study area:
The National Ribat University and the Ribat university hospital, Buri sector, Khartoum district, Khartoum city, Sudan.

Study population:
- Sudanese Pregnant women on second and third trimester attending the Ribat university hospital.
- Control group of Sudanese non-pregnant women at the National Ribat University and the Ribat university hospital.

Inclusion and exclusion criteria:

Inclusion criteria:
1- Age: 18--40 years old
2- Pregnant and non-pregnant women

Exclusion criteria:
1- Acute infection (malaria, chest infection, urinary tract infection)
2- History of anemia
**Sampling:**
Random sampling technique from the referred clinic of the Ribat University hospital.

**Sample size:**
20 pregnant women + 20 non-pregnant women as a control.

**Data collection:**
- Sociodemographic data will be collected by self-administered questionnaire.
- Samples will be taken from case and control groups, 5ml of venous blood that will be taken by a disposable syringe and collected in a container containing EDTA. Complete blood count (CBC) will measure using automated cell counter Sysmex.

**Data analysis:**
Data will be analyzed using the statistical software Statistical package for social science (SPSS) version 20.

**Ethical considerations:**
- Ethical clearance will be approved from the ethical committee at The National Ribat University
- A written consent will be taken from all the participants in the study
**Work plan:**

The duration is suggested to be 3 months from August to October 2017

<table>
<thead>
<tr>
<th>Activity</th>
<th>Done by</th>
<th>September</th>
<th>October</th>
<th>November</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting with supervisor</td>
<td>Researcher</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Designing questionnaire</td>
<td>Researcher &amp; supervisor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data collection</td>
<td>Researcher</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data analysis</td>
<td>Researcher &amp; Statistician</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report writing and printing</td>
<td>Researcher</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Budget:

<table>
<thead>
<tr>
<th>Item</th>
<th>Calculation</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Personnel:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statisticians</td>
<td>data entry and analysis</td>
<td>700</td>
</tr>
<tr>
<td></td>
<td>500×1month</td>
<td></td>
</tr>
<tr>
<td>3-Labrotary coast:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBC test</td>
<td>80/sample</td>
<td>3200</td>
</tr>
<tr>
<td></td>
<td>80×40</td>
<td></td>
</tr>
<tr>
<td>3-A4 papers</td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>4-Writing and printing of report</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>5500</td>
</tr>
</tbody>
</table>
References


4-Sara Anberbir (BSc), Advisors Mintwab Hussein (MSc, BSc), MelatworkTibebu (MSc, BSc). Hematological Profile of Pregnant Women Attending Antenatal Care at Dilla University Referral Hospital, Dilla, Ethiopia: Comparative Cross Sectional Study. MSc research. October, 2016.


Annexes (1):

The National Ribat University
Faculty of Medicine
Department of Physiology
Postgraduate Master Program

Research on:

Effect of pregnancy on packed cell volume and total white blood cells count

Questionnaire

1-No. of volunteer (  )

2-Name of volunteer (optional)…………………………………………………………

3-Phone NO……………………………………………………………………

4-Age:  18----25 (  )  26----32 (  )  33----40 (  )

5-Oc
cupation:……………………………………………………………………

6- Husband occupation:…………………………………………………………

7-Residence: Khartoum (  )  Omdurman (  )  Bahri (  )

Gynecological review
8-Menarch: 8----12 ( )  13----16 ( )  ≥16 ( )

9-Menstrual cycle:    Regular ( ) Irregular ( )

10-Days of menstrual cycle:

- Less than 21 ( )
- From 21 to 35 ( )
- Above 35 ( )

11-Menstruation duration:

- ≤ 5 days ( )
- 5----8 days ( )
- ≥ 8 days ( )

Obstetrical review:

12-Pregnancy status:    Primigravida ( ) Multipara ( )

13- Are you pregnant?              Yes ( ) No ( )

If yes, what trimester:

- 1st ( )
- 2nd ( )
- 3rd ( )

14- Past history of Abortion:    Yes ( ) No ( )

If yes:

- ≤ 6 months ( )
- ≥ 6 months ( )

15-Number of abortions: …………………………………………………………………………..

16-Past history of bleeding:    Yes ( ) No ( )

17-Family history of chronic disease:    Yes ( ) No ( )

If yes specify: …………………………………………………………………………………….
Annexes (2):

بسم الله الرحمن الرحيم

جامعة الرباط الوطني

كلية الطب

كلية الدراسات العليا – قسم وظائف الأعضاء

قرار بالمشاركة في البحث

أنا %.................................................. أوافق بطواعيتي و كامل قواي العقلية على المشاركة في هذا البحث.

شرح الموضوع

يهدف البحث إلى معرفة النسبة المئوية لحجم الخلايا المضغوط وعدد كريات الدم البيضاء عند الحوامل السودانيات مقارنة بغير الحوامل بمستشفى الرباط الجامعي.

ستقوم المشارك بثبوطة التوقيع على هذا الإقرار بعد الموافقة والتوقيع على هذا الإقرار قبل إنجاب إستيبان يتضمن معلومات عامة ومعلومات عن التاريخ المرضي ومن ثم ستؤخذ عينة دم لفحص الدم الكامل.

نتيجة الفحوصات ومعلومات الاستبيان ستكون في سرية تامة و سيتم التعامل معها في البحث كنتيجة رقمية - إحصائيًا فقط - ولن يذكر اسم المشارك ولا أي معلومة تخصها.

شكر حسن تعاونك وجزاكم الله خيرا

موافقة المشارك:

أوافق ( )

لا أوافق ( )

رقم الهاتف: %..................................................

توقيع: %..................................................