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Research Article

Evaluation of CD4 Count in HIV Infected Pregnant Women at Kibagabaga Level Two Teaching Hospital

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Abstract

CD4 count measures the degree of immunosuppression in HIV-positive patients and is used to monitor HIV infection progression in human body. HIV is a virus that attacks the body's immune system and if not treated, can lead to AIDS The rate of CD4 cells destruction is directly proportional to progressive replication of HIV. Pregnant women infected with HIV have high risk of mother to child transmission of HIV infection and are prone to excessive immunosuppression and increased viral load if their CD4 cell count is not properly maintained. Pregnancy may influence CD4 cells count reduction or don't, that's why this study focused on evaluation of CD4 count in HIV infected pregnant women. The objectives of this study were to determine the association between pregnancy trimesters and CD4 count among HIV infected pregnant women at KDH. The study was a cross sectional study which included 46 patients who visited kibagabaga level two teaching hospital in 5 months. Data were obtained by collecting venous blood of patients, testing their CD4 count and use of a questionnaire to evaluate the risk factors associated with changes in CD4 count. Data collected were analysed using statistical package for social sciences (SPSS) software version 22.0 and Microsoft word, the presentation of results was done using tables. Variables with p-value less than or equal to 0.05 were considered statistically significant. The study showed that there is an association between pregnancy trimesters and CD4 count among HIV infected pregnant women where 21(45.6%) women were in third trimester and had the highest CD4 count compared to women in the 2nd trimester 14(30.4%) followed by women in 1st trimester 11(24%) with p-value of 0.04 which is statistically significant. In evaluated CD4 count changes, associated risk factors were, antiretroviral treatment intake, diet intake, education level, pregnancy trimester, and closely spaced pregnancies. Which were found to have p-values 0.00, 0.00, 0.04, 0.04 and 0.01 that were statistically significant respectively.

Keywords: HIV, CD4 Count, Pregnant women

INTRODUCTION

The human immunodeficiency viruses (HIV) are two species of *Lent virus* (a subgroup of retrovirus) that infect humans.[1] Over time, they cause acquired immunodeficiency syndrome (AIDS) if not treated, a condition in which progressive failure of the immune system allows life-threatening opportunistic infections(LTOI) and cancers to thrive.[2] An HIV-positive mother can transmit HIV to her baby any time during pregnancy, childbirth, or breastfeeding. If you are a woman with HIV and you are pregnant, treatment with a combination of HIV medicines (called antiretroviral therapy or ART) can prepared prevent transmission of HIV to your baby and protect your health.[3]

Pregnancy and motherhood force young women into adulthood, whether or not they are emotionally, cognitively or physically.[4] Young mothers, both living with HIV and HIV free, have the right to correct information, quality support and respectful health services(HS) that are responsive to their needs, including offering multiple services, either directly or through linkages and referrals.[5] It is unlikely that global goals to eliminate HIV and AIDS and secure women reproductive health and well-being will be reached unless these tailored services and support are provided.[6]

In pregnancy, immune function is suppressed in both HIV-infected and uninfected women. There is a decrease in immunoglobulin (Ig), reduced complement levels (RCL) in early pregnancy and a more significant decrease in cell-mediated immunity (CMI) during pregnancy.[7] These normal changes during pregnancy have led to concern that the effect of pregnancy in HIV disease could be to accelerate the progression of the infection.[8] CD4 count measures the degree of immunosuppression in HIV-positive patients. There is an inverse relationship between CD4 count and degree of immunosuppression. CD4 count is used in monitoring disease progression, deciding when to commence therapy, staging the disease, determining treatment failure, and defining the risk for mother-to-child transmission (MTCT).[9]

CD4-receptors containing cells are the portal of entry of human immunodeficiency virus (HIV), and the rate of CD4 cell destruction is directly proportional to progressive replication of HIV. Immune system destruction is inevitable if the rate of HIV replications outstrips the CD4 cells available. The mechanism of CD4 cell destruction is dependent on whether HIV infection is in acute or chronic phase.[10] Destruction of CD4 cells is affected by cytotoxic T cells and apoptosis in the acute phase, while inability of the immune system to produce new T cells and generalized immune activation accounts for the CD4 cell depletion in chronic phase.[11]

METHODOLOGY

Study area

This study was conducted in the CD4 department of Kibagabaga level two teaching hospital laboratory located in Kigali city, Gasabo district.

Study design

This study was a cross-sectional study design. Data collected and checked for competence, entered in Microsoft excel spread sheet and was analysed with descriptive statistical analysis approach with social science (SPSS version 22.0) chi-square was used to evaluate the risk factors associated with changes in CD4 count in HIV infected pregnant women at kibagabaga level two teaching hospital.

Data collection and processing

Request forms were verified and contained patient identification, age, laboratory service, sex, and clinical information. Personal protective equipment was also prepared along with well EDTA tubes, needles, marker for labelling the tubes, tourniquet, alcohol swabs, and plasters. 4 ml of venous blood was collected, checked for proper labelling and were transferred to the CD4 count room to be analysed. The samples were analysed using PIMA analyser after running the machine controls. The patient identification was first properly put in the machine, blood sample was gently mixed and 25ul of blood was pipetted into a cartridge and put in the PIMA analyser. After 20 minutes the results were printed containing the CD4 count of the patient and recorded in the Microsoft excel spread sheet.

Study population and sample size

The study included all HIV infected pregnant women who attended Kibagabaga district hospital during the study period in the CD4 department. Sample size (N) of 46 patients was used in this study.

Data analysis

Data were entered into Microsoft excel spread sheet and analysed using statistical package for social studies software (SPSS) version 22.0. P-value < 0.05 was considered statistically significant. The findings of this research were explained in figures and tables.

RESULTS AND DISCUSSION

Social demographic characteristics of the participants

The social demographic characteristics of HIV infected pregnant women are in table1. The total participants used for the study were 46 women. Most of the participants were in the age range of 15-25 years followed by 26-35 years. Most of the participants had cd4 cells count above 800cells/mm3 followed by participants with cd4 cells count between 500-800cells/mm3.Most participants had received antiretroviral treatment from the infection diagnosis time to 5 months which greatly helped in the maintenance of healthy cd4 cells count. More participants had an education history at least to primary school where as a few participants had no education.

Table 1: Demographic characteristics of HIV infected pregnant women at Kibagabaga district hospital according to age and frequencies.

Age range	Frequency	percentage
[15-25]	21	45.6%
[26-35]	16	34.8%
[36-45]	9	19.6%
Total	46	100%

3 classes were classified, class1 from 15 to 25 years, class 2 from 26 to 35 years, and class 3 from 36 to 45 years. Where by 21(45.6%) of participants were between the age group of 15 to 25 years indicating that the high frequency of pregnant women infected with HIV at kibagabaga district hospital are young adults, followed by women in the age range from 26 to 36 with 16(34.8%) and the lowest frequency are women between the age range of 36 to 45(19.6%) who are close to menopause.

Presentation of the participants according to CD4 cells count

Table 2. Frequency and percentages of participants according to cd4 count.

Cd4 cells count	Frequency	Percentage
200-500cells/mm3	2	4.4%
500-800cells/mm3	18	39.1%
Above 800cells/mm3	26	56.5%
Total	46	100%

Cd4 cells count among HIV infected pregnant women have always been an arguable topic. From table 2 it shows that the highest frequency of pregnant women 26(56.5%) had cd4 cells count above 800 cells/mm3 indicating that most participants were healthy and had healthy cd4 cells count. Several studies agreed to table 2 indicating that there is an increase of cd4 cells count with pregnancy. A study conducted by Brettle *et al;* reported that pregnancy have a high influence on the cd4 cells count of pregnant mothers with HIV by increasing the level of the mother's cd4 count. 18(39.1%) of participants had cd4 cells count between 500-800cella/mm3 which is in normal ranges for pregnant women. 2(4.4%) of participants had cd4 cells count between 200-500 cells/mm3.[12] This is mainly influenced by the time the participants started taking antiretroviral treatment drugs, feeding habits, stress, habitation, and the knowledge they have about pregnancy and HIV where these 2 participants had no education background.

Numerous clinical studies have also shown that there is always an increase in CD4 cells count among HIV infected pregnant women, where they have also reported that pregnancies will not form in HIV patients with cd4 cells count below 200cells/mm3 that is below the cd4 cells count normal range. This indicates that all pregnant HIV infected women are at least to have cd4 cells count above 200cells/mm3. This report compliments table 2, where all participants had cd4 cells count above 200cells/mm3.

Association between pregnancy trimesters and cd4 cells count

In the present study, the association of pregnancy trimesters and cd4 cells count was established where p value less than or equal to 0.05 was considered statistically significant.

Table 3: Association between pregnancy trimesters and cd4 count.

	Pregnancy trimesters							
	Frequency				percentage			
Cd4 cells count	1st trimester	2nd trimester	3rd trimester	Total	1st trimester %	2nd trimester %	3rd trimester %	P-value
200-500cells/mm3	2	0	0	2	18.2%	0%	0%	0.04
500-800cells/mm3	7	9	2	18	63.6%	64.3%	9.5%	
Above 800cells/mm3	2	5	19	26	18.2%	35.7%	90.5%	
Total	11	14	21	46	100%	100%	100%	
Total percentage	24%	30.4%	45.6%	100%				

Results in table 3 show that a high number of pregnant women 21(45.6%) were in third trimester of their pregnancy. Participants who were in 2nd trimester of their pregnancy were 14(30.4%) and participants in 1st trimester were 11(24%). Table3 shows that cd4 cells count increase with the pregnancy trimesters, from 1st, 2nd and 3rd trimester cd4 count increases. Contrary to the report done by a researcher, which reported that cd4 cells count remain the same during pregnancy.[13] Whoever, according to Lindgren *et al*., 1996 cd4 cells count increase in the first and second semester but remain constant in the third trimester of pregnancy and approximately 6 months after pregnancy there is a decrease in cd4 count.[14] Cd4 cells count increases or decreases in pregnancy also due to external living factors including feeding habits and proper intake of antiretroviral drugs.

The association between pregnancy trimesters and cd4 cells count was statistically significant for p-value was less than 0.05(0.00). Similar findings were obtained by the study conducted in south Africa which showed that pregnant women should have higher cd4 count at least above 500cells/mm3.[15]

Risk factors associated with changes in CD4 count among HVI infected pregnant women at kibagabaga district hospital

During this study, several risk factors associated with changes in cd4 count among HIV infected pregnant women at kibagabaga district hospital were reported. Cd4 cells count changes in HIV infected pregnant women is influenced by risk factors including, antiretroviral drugs intake, diet, education, closely spaced pregnancies and pregnancy trimesters. This study frequencies, percentages, df, chi-square (χ^2), and p-value for considered risk factors were calculated and reported in table4.

Table 4: Risk factors associated with changes in cd4 count in HIV infected pregnant women at kibagabaga district hospital.

Risk factors		Cd4 count		Chi square	Df	p-value
		Frequency	percentage			
ART (antiretroviral treatment)	Initial infection diagnosis-5 months	26	56.5%	0.23	4	0.00
	5months- 1year	15	32.6%			
	Above 1 year	5	10.9%			
Total		46	100%			
Diet	Rich	30	65.2%	0.32	2	0.00
	Poor	16	34.8%			
Total		46	100%			
Education	None	8	17.4%	0.27	6	0.04
	Primary school	4	8.7%			
	Secondary school	18	39.1%			
	Others	16	34.8%			
Total		46	100%			
Trimester	1st trimester	11	24%	0.23	4	0.04
	2nd trimester	14	30.4%			
	3rd trimester	21	45.6%			
Total		46	100%			
Closely spaced pregnancies	Yes	8	17.4%	0.18	2	0.01
	No	38	82.6%			
Total		46	100%			

The prevention of drastic cd4 changes is bases on the associated risk factors. The risk factors that influence changes in cd4 cells count in HIV infected pregnant women at kibagabaga district hospital are, the initial and continuous intake of ARTD (antiretroviral treatment drugs), diet intake, education background, pregnancy trimesters, and closely spaced pregnancy. According to the study done in Lagos Nigeria, maternal age and gestation age lead to the high prevalence of cd4 cells count in HIV pregnant women.[16] Mostad et *al*., 1997 showed that hormonal contraception, vitamin A deficiency cause drastic drop in cd4 cells count.[17]

The frequency of the study participants during the evaluation of risk factors associated with cd4 count changes were ARTD (antiretroviral therapy drugs) intake: initial infection diagnosis-5months 26(56.5%), 5months-1year 15(32.6%) and above 1year 5(10.9%). In this study high frequency of participants started the antiretroviral treatment from the initial HIV infection diagnosis to 5 months with HIV infection. This helps to maintain healthy levels of cd4 cells count, where most of these participants have cd4 cells count above 800cell.mm3. Participants who took ARTD 5months- 1year 15(32.6%) followed by the lower frequency with participants that started ARTD above 1 year 5(10.9%) where their cd4 count was low to approximately 200-400cells/mm3. Chi-square (23%) and p-value <0.05(0.00) indicated that ART was statistically significant. Most of these participants had no education background and lived in rural areas which affected their ARTD intake hence decreasing their cd4 cells count.

Diet intake: rich diet 30(65.2%), poor diet 16(34.8%). Participants who had rich feeding habit had high frequency and cd4 cells count while participants with poor feeding had low frequency and most of them had less cd4 cells count compared to participants with rich diet. Chi-square (32%) and p-value < 0.05(0.00) proved that diet intake was statistically significant. Education: none 8(17.4%), primary school 4(8.7%), secondary school 18(39.1%), others 16(34.8%). High frequency participants (82.6%) were educated and 17.4% of participants had no education background. Most educated participants from primary, secondary, and others had high cd4 cells count because of the knowledge about HIV and pregnancy they acquired from education which helped them to take better care of themselves, whereas participants with no education mostly had low cd4 cells count of about 200-400cell/mm3. Education was statistically significant with p-value < 0.05(0.04) and chi-square (27%).

Pregnancy trimesters: 1st trimester 11(24%), 2nd trimester 14(30.4%), 3rd trimester 21(45.6%). Chi-square (23%) and p-value < 0.05(0.04) proved that pregnancy trimesters were statistically significant. From table 4 cd4 participants' frequency increase with the pregnancy trimesters, cd4 cell count also increases with the pregnancy trimesters. Closely spaced pregnancy: yes 8(17.4%), no 38(82.6%). High frequency of participants did not have close pregnancies which influenced the maintenance of a high cd4 cells count from500cells/mm3 and above. Whereas participants who had closely spaced pregnancies had low frequency and their cd4 cells count was between 200-500cells/mm3. Chi-square (18%) and p-value < 0.05(0.01) was statistically significant.

CONCLUSION

The study of the evaluation of CD4 cells count among HIV infected pregnant women at kibagabaga level two teaching hospital found that pregnant women had high CD4 cells count, and the level of CD4 cells count was greatly influenced by different risk factors mainly the initial intake of the antiretroviral treatment, diet intake, education background, pregnancy trimesters and closely spaced pregnancies. The association of pregnancy trimester and CD4 cells count was statistically significant as proved in the study. According to the obtained results, the objectives of the study were achieved and hypotheses verified. More researches should be conducted to evaluate the CD4 count among HIV infected pregnant women to propose more solutions for improvement. Recommending pregnant women infected with HIV to take good care of their health mainly by taking antiretroviral treatment accordingly and eating rich and healthy for it affects them individually and their baby. Hospitals should also closely monitor the CD4 count changes among HIV infected pregnant mothers and establish HIV testing in every pregnant woman in order to reduce bad outcomes.

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Author Contributions

All authors contributed equally for this study.

Conflict of interest

Authors declare no conflict of interest

Fundings

N/A

Ethical consideration

Prior to this study, official approval to conduct this study was obtained from Kibagabaga level two teaching Hospital by the Director of the Hospital. The principle of confidentiality and respect of patient privacy are the rule as the research was carried out in health sector and the results were only used for academic purpose. Laboratory numbers was used as unique identifiers in order to maintain confidentiality which was corresponding to the visit numbers of the Hospital Information System (HIS).

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