



cells [6]. HIV is a virus that goes through many steps during its' life cycle figure 2. Once HIV infects a human cell, the virus uses proteins and chemicals inside that cell to make more copies of it. Protease figure1 is a chemical, known as an enzyme that HIV needs in order to make new viruses [6].

If untreated, eventually most HIV-infected individuals develop AIDS (Acquired Immunodeficiency Syndrome) and die; however, about one in ten remains healthy for many years with no noticeable symptoms [7]. Treatment with anti-retroviral, where available, increases the life expectancy of people infected with HIV. Protease inhibitors (PIs) block the protease enzyme. When protease is blocked, HIV makes copies of itself that can't infect new cells [8]. Studies have shown that protease inhibitors can reduce the amount of virus in the blood and increase CD4 cell counts. In some cases these drugs have improved CD4 cell counts, even when they were very low or zero [9] [10].

### **1.1 Justification**

Most HIV patients commonly experience greater degrees of blood glucose fluctuations and are at a greater risk for the secondary complications associated with abnormal blood glucose, including infection due to the medications and the therapies used to treat them, but little or no information is available in this part of the country on these complications.

### **1.2 Aims And Objectives**

1. To estimate the level of serum glucose in HIV patients on medication (Protease Inhibitor)
2. To estimate the level of serum glucose in HIV patients without medication (Protease Inhibitor).
3. To compare the levels of glucose in patients on medication with patients not on medication.

## **II. Material And Method**

### **2.1 Sample Collection**

A total of 200 samples were collected from Faith Alive Foundation, Jos Plateau State. The samples were collected from both sexes within age 20-60 out of this number, 100 was collected from HIV patient on medication (Protease Inhibitors) and 100 from HIV patient not on medications. 2ml of venous blood was collected by venipuncture after sterilizing the Cubital Fossa with methylated spirit and avoiding venous stasis. Each sample was transferred into an appropriately labeled clean dry sample bottles. This was allowed to stand for 30minutes for it to clot and retract. It was then centrifuge at 3000 revolution per minute (rpm) for 5minutes. The serum was estimated immediately and the absorbance reading was taken at 500nm.

### **2.2 Inclusion criteria**

HIV patients only  
HIV patients on protease inhibitor only  
HIV patients who has not developed AIDS  
HIV patients on protease inhibitor from two weeks and above.  
HIV patients with CD4+ count of two hundred and fifty and above

### **2.3 Exclusion criteria**

Non HIV positive patients  
HIV patients on drugs other than protease inhibitor  
HIV patients who has developed AIDS  
HIV patients less than two weeks on protease inhibitor  
HIV patients with CD4+ count of less than two hundred and fifty

### **2.2 Method: Estimation Of Serum Glucose Using Dialab Liquid Reagent.**

#### **2.2.1 Procedure**

1000µl of the reagent was pipetted into dried cleaned test tubes labeled Sample, Blank and Standard each. 100µl of the sample and standard was added to the reagents and distilled water was used for the blank to make up the volume. It was mixed and incubated for 10minutes at 37°C and absorbance reading was taken at 500nm.

#### **Calculation:**

Glucose concentration =  $\frac{\text{Abs. of Test} \times \text{Conc. of Std.}}{\text{Abs. of Std.}}$

### III. Result

**Table 1 Comparison Of Serum Glucose Level Between Sex For Both Tests And Controls.**

	N	Mean	S/Deviation	p-value	Remark
Male (test)	47	4.9702	1.4104	0.22	not significant
Female (test)	53	5.4302	1.5289		
Male (Control)	23	4.9435	1.5678		
Female (Control)	77	4.8403	1.7959		
<b>TOTAL</b>	<b>200</b>	<b>5.0390</b>	<b>1.6225</b>		

**Table 2 Comparison Of Serum Glucose Level Between Ages Of The Test.**

	N	Mean	S/Deviation	p-value	Remark
21-30	31	5.2355	1.4084	0.57	not significant
31-40	36	5.0361	1.5143		
41-50	17	5.6471	1.6838		
51-60	16	5.1125	1.3827		
<b>TOTAL</b>	<b>100</b>	<b>5.2140</b>	<b>1.4850</b>		

**Table 3 Comparison Of Serum Glucose Level Between Age Group Of The Test.**

	N	Mean	S/Deviation	p-value	Remark
21-30	55	4.8218	1.7104	0.03	significant
31-40	26	4.5308	1.6240		
41-50	15	5.9200	1.7514		
51-60	4	3.6500	1.5199		
<b>TOTAL</b>	<b>100</b>	<b>4.8640</b>	<b>1.7390</b>		

**Table 4**

**Multiple Comparisons**

Dependent Variable: GLUCOSE

LSD

(I) SEX	(J) SEX	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
male (test)	female (test)	-.4600	.32391	.157	-1.0988	.1788
	male (control)	.0267	.41139	.948	-.7846	.8380
	female (control)	.1300	.29925	.665	-.4602	.7201
female (test)	male (test)	.4600	.32391	.157	-.1788	1.0988
	male (control)	.4867	.40366	.229	-.3094	1.2828
	female (control)	.5899*	.28854	.042	.0209	1.1590
male (control)	male (test)	-.0267	.41139	.948	-.8380	.7846
	female (test)	-.4867	.40366	.229	-1.2828	.3094
	female (control)	.1032	.38415	.788	-.6544	.8608
female (control)	male (test)	-.1300	.29925	.665	-.7201	.4602
	female (test)	-.5899*	.28854	.042	-1.1590	-.0209
	male (control)	-.1032	.38415	.788	-.8608	.6544

\*. The mean difference is significant at the .05 level.

Post Hoc Test

Table 5

Multiple Comparisons

Dependent Variable: GLUCOSE

LSD

(I) Age group	(J) Age group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
20-30	31-40	.2910	.40192	.471	-.5068	1.0889
	41-50	-1.0982*	.49191	.028	-2.0746	-.1217
	51-above	1.1718	.87455	.183	-.5641	2.9078
31-40	20-30	-.2910	.40192	.471	-1.0889	.5068
	41-50	-1.3892*	.54755	.013	-2.4761	-.3023
	51-above	.8808	.90701	.334	-.9196	2.6812
41-50	20-30	1.0982*	.49191	.028	.1217	2.0746
	31-40	1.3892*	.54755	.013	.3023	2.4761
	51-above	2.2700*	.95032	.019	.3836	4.1564
51-above	20-30	-1.1718	.87455	.183	-2.9078	.5641
	31-40	-.8808	.90701	.334	-2.6812	.9196
	41-50	-2.2700*	.95032	.019	-4.1564	-.3836

\*. The mean difference is significant at the .05 level.

IV. Discussion

The result obtained from the work done shows that the glucose level of the HIV patients that are positive and on medication was higher than those not on medication. The average glucose level of the male test and control were 4.97 and 4.94 respectively and the female test and control were 5.43 and 4.84 respectively. The glucose level in test male and female were therefore higher than control. This is in agreement with the study carried out by [11][12][13][14] [15] [16] which states that there was relatively rapid development of insulin resistance after the initiation of protease inhibitor therapy and when evaluated, fasting insulin and glucose levels as well as insulin resistance increased significantly. Also in another work done by [17][18]. first-generation protease inhibitors, including the drug ritonavir, block GLUT4, a protein that transports glucose from the blood into the cells where it is needed. This raises blood sugar levels — a hallmark of diabetes.

In table 1, it was observed that comparison of mean serum glucose between the male and female test against male and female controls was not significant. This may probably be due to the fact that the side effect of the drug on the patients have not begun to show and genetic factors have also been implicated in the way an individual responds to side effect of any drug *visa vis*: absorption, distribution and elimination of the drug[19]. This was also observed in table 2 in which comparison based on age group was seen to be generally not significant  $p > 0.05$ . But comparison within the age group of the tests showed that age group 41-50 with mean (5.647) was higher than the other age group and significant  $p < 0.05$ .

There was a significant difference between pair wise comparison as well as post hoc tests of female test and female control while male test and male control had no such significant difference  $p > 0.05$  tables 3, 4, and 5 which may be due to the fact that men demonstrated an increased rate of insulin clearance and increased peripheral tissue sensitivity to insulin when compared to non HIV- infected controls[20] In addition diabetes mellitus is associated with such long-term complications as retinopathy figure 3, nephropathy, and neuropathy. It currently accounts for more cases of loss of vision, renal failure, and amputation figure 4 than any other disease [21]. However, even more importantly, persons with diabetes mellitus have two to five times the risk of cardiovascular disease than persons without the disease and the majority of patients with diabetes mellitus die of cardiovascular disease. Furthermore the Food and Drug Administration warned doctors to closely monitor patients on protease inhibitors because of reports of hyperglycemia and diabetes mellitus associated with protease inhibitors. After this warning, physicians continued to report cases of hyperglycemia and diabetes mellitus in association with protease inhibitors. Two retrospective studies suggested that the incidence of new-onset diabetes mellitus after initiation of protease inhibitor therapy is between 6% and 7%[ 13][22] found that HIV-infected persons taking the protease inhibitor indinavir for only a few weeks developed fasting hyperglycemia and decreased insulin sensitivity, typical predictors of future diabetes mellitus[23]

## V. Conclusion

From the results obtained, the glucose level of the HIV patients on medication (protease inhibitor) was higher than of the HIV patients not on medication and this could result to metabolic disorders such as diabetes mellitus, ketoacidosis, atherosclerosis and other preventable diseases.

## VI. Recommendation

We therefore recommend that glucose levels of HIV patients on protease inhibitors should be closely monitored.

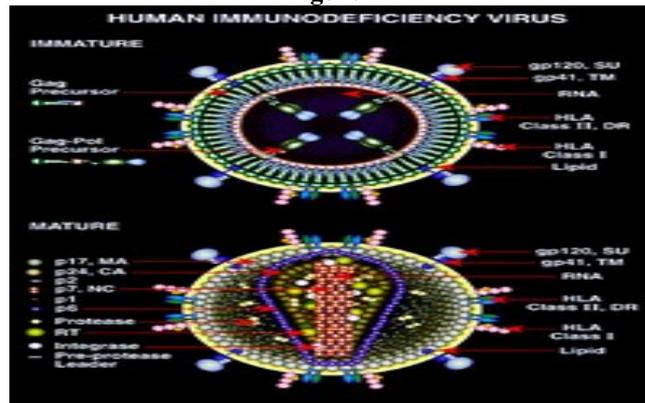
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## Reference

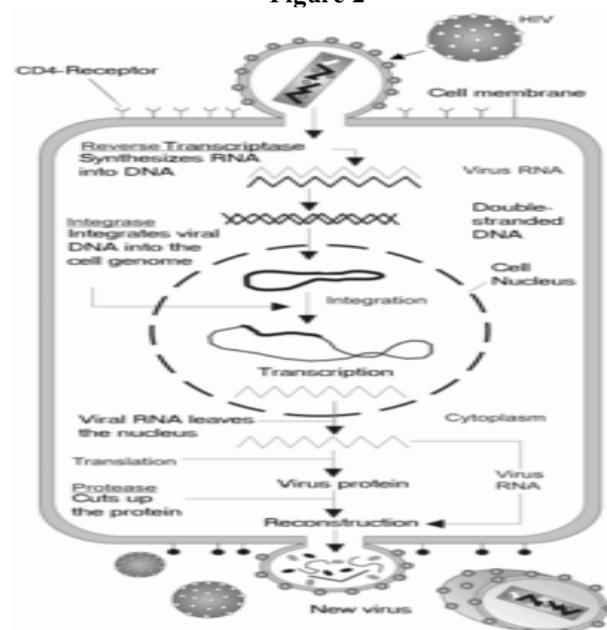
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Figure 1



The immature and mature forms of HIV

Figure 2



The HIV replication cycle

Figure 3



Image of fundus showing scatter laser surgery for diabetic retinopathy

**Figure 4**



Foot ulcers are a common complication of diabetes and can lead to amputation. This ulcer is further complicated by both wet and dry gangrene.