EVALUATION OF ACTIVATED PARTIAL THROMBOPLASTIN TIME AND PROTHROMBIN TIME IN HIV AND TB PATIENTS IN OWERRI METROPOLIS

ABSTRACT

Background: HIV and TB are the leading infectious diseases with high morbidity and mortality in the developing countries; it has been known to be associated with some coagulation abnormalities especially as the disease progresses.

Aim: The study was aimed at evaluating the effect of HIV infection, Tuberculosis and IIIV-Tuberculosis co- infection on some haemostatic parameters (APTT & PT). It was carried out at Federal Medical Centre Owerri, Imo state.

Materials and methods: Sixty (60) subjects were sampled comprising fifteen (15) HIV positive subjects, fifteen (15) TB positive subjects, fifteen (15) HIV-TB co-infected subjects and fifteen (15) HIV and TB negative subjects (Control). APTT and PT were analyzed using standard techniques.

Results: The results showed that HIV positive subjects showed a significant higher PT value (15.45±1.44sec, P < 0.05) when compared with control subjects (12.45 + 1.23) and a non-statistically significant higher APTT value, (33.33± 6.27sec, P > 0.05) when compared with the control subjects (29.05+2.19). TB subjects showed a statistical significant higher PT values (15.84±0.98scc, P < 0.05) when compared with control subjects (12.45 + 1.23) and non- statistical significant higher APTT values (33.55+5.26 sec P > 0.05) when compared with the control subjects (29.05+2.19 sec). Both the PT and APTT of HIV- tuberculosis Co-infected subjects was significantly higher (17.03±1.46sec; 37.59±4.69sec, P < 0.05) when compared with the control subjects (12.45+ 1.23sec; 29.05+2.19). One way analysis of variance showed that a PT of TB patient (15.84+0.98) was not significantly higher than PT of HIV patients (15.45+1.44 sec). PT of HIV- TB co-infected subjects was significantly (P< 0.05) higher when compared with HIV patients but not significantly (P> 0.05) higher than compared with TB patients. Also there is a significant increase in APTT of TB patients (P<0.05) when compared with HIV patients. APTT of I HIV-TB Co-infected subjects was not significantly higher when compared with HIV and TB patients (P> 0.05).

Conclusion: HIV infections have been shown to affect both the Activated partial thromboplastin time and prothromin time. There is significant alteration in coagulation parameters (particularly PT and APTT) on tuberculosis, lesions as a result of the mycobacterial infection can induce pro-cagulant tissue factor expression which can lead to coagulation defects.

***Keywords**: activated partial thromboplastin time, prothrombin time, HIV, TB*

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INTRODUCTION

The human immunodeficiency virus (HIV) is a lentivirus (a subgroup of retrovirus) that causes HIV infection and over time acquired immunodeficiency syndrome [1]. AIDS is a condition in humans in which progressive failure of the immune system allows life-threatening opportunistic infections and cancers to thrive. Without treatment, average survival time after infection with HIV is estimated to be 9 to 11 years, depending on ~~the~~ HIV subtype [2]. Infection with HIV occurs by ~~the~~ transfer of blood, pre-ejaculate, semen, vaginal fluids, or breast milk. Within these bodily fluids, HIV is present as both free virus particles and virus within infected immune cells.

One-third of the world's population is thought to be infected with TB. New infections occur in about *1%* of the population each year [3]. In 2014, there were 9.6 million cases of active TB which resulted in 1.5 million deaths. More than 95% of deaths occurred in developing countries. The number of new cases each year has decreased since 2000.About 80% of people in many Asian and African countries test positive while 5-10% of people in the United States population tests positive by the tuberculin test [4]. Tuberculosis has been present in humans since ancient times [5].

Pulmonary TB causes bleeding disorders. Hematologic abnormalities have been described in association with mycobacteria infections for almost 100 years. Also activation of coagulation and fibrinogtic pathways in response to various bacterial infections are critical component elicited by both pathways [6]. Experimental studies also confirmed impairment in coagulation parameters in patience with alcoholic pulmonary TB.

MATERIALS AND METHODS

Study Area

This research was conducted at HIV and TB clinics of Federal Medical Centre, Owerri with co-ordinate location of latitude 5°28 '59 "N and 7° OF 49' E longitude and 159metres above sea level.

Study Population

This study was carried out on both male and female alreadyestablished to be HIV and TB patients attending Federal Medical Centre, Owerri, Imo State Nigeria for treatment and check-up. People of the same age group and sex was used as control who prior to this research have not been diagnosed of HIV and TB.

Ethnical Consideration

Ethnical consideration for this research was obtained from the federal medical centre Owerri, Imo State.

IX

Sample Size and Sampling Techniques

A total sample size of 60 was collected 45 test subjects (15 patients with HIV only, 15 patients with TB only and 15 TB patients with. HIV {Co-infection}) and 15 control subjects

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(Non HIV and TB). The test population comprised of individuals who are within the age bracket of 20 and 50. While the control group was made up of individuals who have been tested and confirmed to be non-HIV and non-TB as at the time this research was carried out who are within the afore mentioned age bracket.
Subjects were recruited by random sampling techniques.

Subject Recruitment
All consenting HIV and TB patients were recruited for the study in their clinic during their clinic days through the help of the nurses and physicians after a well and elaborate explanation of the importance of the study, as well as the harmless nature of the procedure for the sample collection. An informed consent of individual patient was obtained before recruitment. The same was applied to the control group.

Inclusion Criteria
The criteria for selecting test subjects for this research included: willingness to participate, subject could be male or female, must be up to 20years and not more than 80years of age, must have been diagnosed of HIV and TB according to WHO standard.

Exclusion Criteria
Criteria for excluding test subjects includes: people with established coagulation problems, those not diagnosed of HIV and TB according to WHO standard, those below 20years of age and above 50years of age, those with other complications of HIV and TB.

Sample Collection, Preparation and Storage
Nine (9) ml of various blood was collected from every participant into 1 ml of 3.8% sodium citrate anticoagulant both, well mixed and centrifuged at 1200g for 15mins to obtain platelet poor plasma. The plasma was then separated to a plain container, labeled properly and the test performed immediately. Some of the test sample that could not be analysed immediately was stored at 4-8°c and the test performed within 1 hour of storage.
Questionnaire was issued to the participants to obtain other vital information about them.

METHODOLOGY
Activated Partial Thromboplastin Time Estimation
Method: Kaolin platelet substitute mixture
~~**Procedure**~~
In a small glass tube, 0.2ml of well mixed Kaolin/platelet substitute was pipetted 0.1ml of the separated plasma was added, mixed and incubated at 37 c for exactly 2minutes. The tube was tilted at intervals.
0.1ml of 0.025 mol/L calcium chloride was added, mixed and the stop watch started.
The tube was held in water bath and the mixture tilted back and forth looking out for clot formation. The stop-watch was stopped immediately clot formation was observed and the time recorded.

Prothrombin Time Estimation
Method: Diagen Rabbit Brain capillary reagent
~~**Procedure**~~
1. 0.25ml of the thromboplastin/calcium reagent was pipetted into a small glass tube and placed in a 37°c water bath for 2mintues.
2. 50ul (0.05ml) of plasma was added using delivery pipette, mixed and the stop watch started.
3. The tube was held in the water bath and the mixture tilted back and forth looking out for

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clot formation. The stop-watch is stopped when clot begins to from.

4. The control sample was also run with the test sample using the same procedure

Calculation

The result gotten in seconds was converted into INR (International Normalised Ratio) as follows:

$$INR = \left(\frac{PT\ patient}{PT\ control}\right) IsI$$

IsI = International Sensitivity Index which is provided by the manufacturer of the thromboplastin reagent.

STATISTICAL ANALYSIS

The results were expressed as mean± standard deviation.The student t-test was used to compare the parameters(at level of significance 0.05) $p < 0.05$ was considered as statistical significant and $p > 0.05$ was considered not statistical significant.

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RESULT AND ANALYSIS

Table 1: Mean and Standard deviation of PT and APTT of control and HIV patients.

Parameters	Control (n=15)	HIV patients (n=15)	p-value
PT (sec)	12.45 ± 1.23	15.45 ± 1.44*`	P< 0.05
APTT (sec)	29.05 ± 2.19	33.33 ± 6.27	P< 0.05

Key: *: Statistically significant when compared with control
PT: Prothrombin time.
APTT: Activated partial thrombaplastin time.
N: Sample size

From the table 1 above, PT of HIV patients (15.45+.144sec) was statistically significantly ($p<0.05$) higher when compared with the control (12.45 + 1,23sec).
APTT of HIV patients (33.33+6.27sec) was not statistically higher ($p>0.05$) than the control (29.05+2.19sec).

Table 2: Mean ad Standard deviation of PT APTT of TB patients and control

Parameters	Control (n=15)	TB patients (n=15)	p-value
PT (sec)	12.45 ± 1.23	15.45 ± 1.44*`	P< 0.05
APTT (sec)	29.05 ± 2.19	33.33 ± 6.27	P< 0.05

Key *: Statistically significant (P< 0.05) when compared with the control.
Comparism between the PT mean of TB patient (15.84+0.98scc) and control (12.45 +1.28sec) shows a statistical significantly ($p<0.05$) higher value in TB patient. The APTT value of TB patient was not significantly ($p>0.05$) higher in TB (33.55+5.26sec) patients when compared with the control subjects. (29.05±2.19sec).

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Table 3: Comparism of mean and standard deviation of PT and APTT of HIV & TB co-infected subjects and control.

Parameters	Control (n=15)	HIV/ TB patients (n=15)	p-value
PT (sec)	12.45 ± 1.23	15.45 ± 1.44*`	P< 0.05
APTT (sec)	29.05 ± 2.19	35.59 ± 4.69*	P< 0.05

Key *: statistically significantly higher when compared with the control.

From table 3 above, the PT of HIV & Tb co- infected subjects (17.03 ± 1.46sec) was significantly higher (P< 0.05) than the control (12.45 ± 1.23sec). APTT of HIV & TB co-infected patients (37.59 ± 4.69sec) was significantly higher than the control (29.05 ± 2.19sec).

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Table 4: Mean and standard deviation of prothrombin time (PT) and a activated partial thromoplastin time (APTT) of HIV, TB and co-infected

	HIV Group 2	TB Group 3	HIV/TB Group 4
PT (sec)	15.45 ± 1.44	15.48 ± 0.98*`	17.03 ± 1.46
APTT (sec)	33.33 ± 6.27	33.55 ± 5.26*	37.59 ± 4.69

Key *: Statistically significant when compared with HIV patient (P< 0.05).
PT: Prothromobin time
APTT: Activated partial thromboplastic time

The table below indicates mean and standard deviation of PT and APTT of HIV, TB and HIV/TB co-infected groups when compared among each other. From the table, one way analysis of variance shows that a PT of TB patient (15.84+0.98) was not significantly higher than HIV patients (15.45+1.44sec). PT of HIV and TB co- infection was significantly ($p<0.05$) higher when compared with HIV patients but not significantly ($p>0.05$) higher when compared with TB patients.

Comparism of APTT among HIV patient (33.33+6.27) TB patient (33.55±5.25) and HIV/TB co-infected patient (37.59+4.69) shows an increase in TB patients when compared with HIV patient. APTT level of FIIV & TB co-infected patient when compared with FIIV and TB patient shows a non-significant higher value in HIV and TB patients.

DISCUSSION

Both hematological and haemostatic disorders are known complications of HIV infection. HIV infection is associated with endothelial dysfunction and liver damage which can result in coagulation defects. It is therefore expected that as the HIV infection progresses the coagulation abnormalities will increase too [7]. In this study The PT and APTT were significantly higher in HIV-positive subjects (ART and non-ART) compared to the values obtained in the HIV-negative subjects (control). ($p<0.05$) and is in consonance with previous independent studies of Van Gorpet., *et al[8]* Omoregie *et* al [9] Obeagu and Obeagu [10]. These studies reported that PT and APTT were significantly higher in HIV-positive patients. Moreover, HIV infection results in liver derangement, immune dysregulation and presence of anticardiolopin antibodies (aCL) and Lupus anticoagulant (LA). These anomalies of clothing factors, liver derangement may account for higher PT and APTT values observed in HIV-positive subjects [11]. However, the differences in76 duration of ART and gender did not affect both parameters (PT and APTT) as observed in this study.

Tuberculosis is a chronic granulomatous infection caused by mycobacterium tuberculosis. Various inflammatory cells, cytokines and mediators arc involved in the formation of granulomatous lessons encountered in tuberculosis [12] of variety of cytokines. In the study, the PT of TB patients was shown to be increased significantly ($p<0.05$) while he APPT was

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not significantly increased ($p>0.05$) when compared with the control subjects. Also immune complexes and many other factors elaborated in various infectious diseases (e.g Mycobacterial infection) are shown to induce pro-coagulant tissue factor (TF) expression in monocytes/macrophages and the endothelium which under normal healthy state doesn't express TF [13-15]. This could be the reason for the significant increase in PT, since activation of TF leads to the pathway (extrinsic pathway) that involves prothromobin time (PT) estimation.

Lastly, there was also a significant increase in the PT and APT!' of HIV and TB- Coinfected subjects ($p<0.05$). when compared with the control subjects. The exact reason for this is not known because much research has not been done specifically involving APTT and PT. A research have shown Bacterial sepsis in association with activation of procoagulant responses, endothelial activation, inhibition of fibronysis and decreased anticoagulant response [16]. In the most extreme cases, these change lead to Disseminated intravascular Coagulation (DIC) and micro vascular thrombosis [16, 17]. Much less is known about hemostatic changes during severe HIV-tuberculosis infection.

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CONCLUSION

HIV infections have been shown to affect both the Activated partial thromboplastin time and prothromin time. There is significant alteration in coagulation parameters (particularly PT and APTT) on tuberculosis, lesions as a result of the mycobacterial infection can induce pro-cagulant tissue factor expression which can lead to coagulation defects. HIV-TB co-infection being a complex state can lead to complex alterations in coagulation pathways and even haemostasis generally in the individual involved.

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