To Evaluate the Effect of Second-Line Anti-Retroviral Therapy on Blood Sugar in Patients with Human Immunodeficiency Virus (HIV) - Acquired Immune Deficiency Syndrome (AIDS)

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Abstract

Background: To evaluate the effect of second-line anti-retroviral therapy on blood sugar in patients with human immunodeficiency virus (HIV) - acquired immune deficiency syndrome (AIDS).

Methods: This prospective study was carried out at a tertiary care hospital among 100 HIV infected patients who had failed on First line and started on Second-line HAART, formed the cases of the study and registered at ART centre. Ethical approval was obtained from the Institutional Ethical Committee of this institution.

Results: Average FBS of the study population was 89.95mg/dl at the baseline. However, it increased with the course of treatment over the time. It was observed that the mean FBS raised to 103.18mg/dl in 6 months and 115.28mg/dl in 12 months. This difference was statistically significant (P<0.0001). Average HBA1c of the studied subjects was 5.65% at the baseline. However, it increased with the course of treatment over the time. It was observed that the mean HBA1c raised to 6.02% in 6 months and 6.46% in 12 months. This difference was found to be statistically significant (P<0.0001).

Conclusion: In our study it was found that second line ART along with its duration is a significant risk factor for development of Hyperglycemia. Hence timely screening should be done for FBS in patient who are on second line ART so that we can prevent and timely manage the Metabolic complications.

Keywords: Blood sugar, HIV, ART.

Introduction

The risk of CVD, including myocardial infarction and stroke, is increased 2.2 times in PLWH compared to people without HIV infection. [1] The Strategies for Management of Antiretroviral Therapy (SMART) study demonstrated that interruption of ART resulted in an increased risk of myocardial infarction, possibly due to rebound viraemia and

subsequent inflammation. [2] Cardiometabolic side effects differ by ART class and sometimes even by individual drug. A comprehensive overview of metabolic side effects by ART drugs has been described by Hsue *et al* [3] and by Dominick *et al.* [4]

HbA1c has the potential to reflect the history of mean insulin sensitivity over the preceding weeks or months, and it serves as a marker of insulin sensitivity in children who have a normal glucose tolerance[14]. HbA1c levels can be used as a diagnostic tool for the early detection of insulin resistance. Since we found a positive correlation between HbA1c and HOMA-IR levels only in the obese group, we suggest using HbA1c levels as a simple and cheaper marker only in obese children with relatively high insulin sensitivity. Insulin resistance can be evaluated by screening HOMA-IR levels in obese children. But in higher HbA1c levels within the ranges of 5.5-6 %, we determined a correlation between HOMA-IR and HbA1c levels. We suggest firstly screening HbA1c levels, a cheaper and easy method (no need to fasting) in order to evaluate insulin sensitivity in obese children. Comprehensive studies that include more subjects can be used to confirm this assertion in the future. Insulin resistance, which is the component of metabolic syndrome, is more commonly seen in obese children, compared to non-obese ones. It is important to identify insulin resistance at an early stage. HbA1c screening can be used as a cheaper and simple (no need to fasting) method in order to evaluate insulin resistance in obese children.

Material and Methods

Study Location: ART Centre, JLN Hospital, Ajmer, Rajasthan.

Study Population: This prospective study was carried out at a tertiary care hospital among 100 HIV infected patients who had failed on First-line and started on Second-line HAART, formed the cases of the study and registered at ART centre. Ethical approval was obtained from the Institutional Ethical Committee of this institution.

Study Duration: October 2020 to September 2021.

Study design: Observation study [It was a retrospective analysis with prospective follow-up].

Inclusion Criteria:

1. HIV-infected individuals >18 years of age who are having first-line ART failure and on second-line ART therapy

Exclusion Criteria:

1. Patients having dyslipidemia prior to start of second-line ART or on treatment. (eg. Statins fibrates etc.).
2. FBS >100 mg/dL and HbA1c ≥ 6.5 gm% prior to start of second-line ART or on antidiabetic drugs (eg. Metformin, Glimepiride etc.)
3. AIDS-defining events or severe illness within 1 month of evaluation
4. The HIV positive hypertensive patients.
5. Patient not giving consent for the study.
6. Patients taking drugs altering lipid profile.

Beta blockers: Atenolol, Metoprolol etc.

Diuretics: Hydrochlorothiazide, Furosemide, Torsemide etc.

Anticonvulsants: Carbamazepine, Phenobarbital etc.

Antipsychotics: Olanzapine, Quetiapine etc.

Steroids: Prednisone etc.

7. Patients taking drugs altering blood sugar.

Diuretics: Furosemide, Torsemide etc.

Anticonvulsants: Phenytoin, Mannitol etc.

Steroids:- Prednisone etc.

Methodology:

The patient was enrolled in the study after obtaining their written informed consents. This study was approved by institutional ethics committee. After the second-line ART was started, they was followed up to look for the metabolic changes in response to the treatment. The immunological and virological assessment was done at 6 & 12 months by CD 4 count and viral load. All the patients was subjected to investigations for fasting blood glucose, lipid profile and HbA1c. The relevant data was collected by using a pre tested semi questionnaire which was devised, based on a pilot study and on the discussion with experts who was worked in this field. The questionnaire included: the demographic details, duration of the HIV infection, duration of the treatment and the ART regimen which was used and a history of smoking and alcohol consumption. The clinical criteria for the metabolic syndrome like the mid arm circumference, was measured at the mid-point of the acromian process of the clavicle and at the olecranon process of the ulna. The assessment of lipodystrophy was done by measuring the waist circumference and the waist to hip ratio. The waist circumference was measured at the point's bare midriff after the patient exhaled, while standing without his/her shoes and with both his/her feet touching and the arms hanging freely. The measuring tape was of a material that could not be easily stretched. It was measured at the midpoint between the lowest rib and the iliac crest. The laboratory investigation which was done, included the fasting lipid profile and the fasting blood sugar.

Statistical Analysis

Statistical analysis was performed using (Statistical package for social science) SPSS 20 software and the analyzed data was expressed in percentages. P-value equal to or less than 0.05 was considered to be significant.

Results

Table 1. Socio-demographic profile

Age in yrs	43.35±11.36
Male : Female	51:49

Table 2: Otcome

	Baseline	6months	12months	p-value
Weight in kg	57.70±15.68	59.19±15.68	61.06±15.34	0.211
FBS(mg/dl)	89.95±8.22	103.18±16.51	115.28±24.63	0.01
HbA1c(%)	5.65±0.49	6.02±0.52	6.46±0.83	0.211
CD4 Cells (cells/µL)	297.57±177.94	384.44±153.21	404.55±211.93	0.002
Viral Load (Copies/mL)	189643.8±559078.9	16070.99±38764.92	7436.55±26761.91	0.001

Table 3: Percentage of patients with hyperglycemia at 6 months and 12 months:

Parameter	Number of cases		
	0 months	6months	12 months
Fasting Blood Sugar Levels (>100mg/dl)	0	40(40%)	75(75%)
HbA1c(>6.5gm%)	0	17(17%)	40(40%)

Discussion

In India, very few studies are available on the metabolic effects of second-line ART treatment and hence our study aimed to evaluate the effect of second line anti-retroviral therapy on metabolic parameters in patients with HIV-AIDS. Earlier, similar studies have been done in south India by Idiculla et al (2011) [5] and in north India by Meena DS et al (2020) [6].

In our study FBS was 89.95 mg/dl at the base line which was however, it increased with the course of treatment over the time. It was observed that the mean FBS raised to 103.18mg/dl in 6 months and 115.28mg/dl in 12 months. This difference was statistically significant ($P<0.0001$).

In study done by Meena DS et al (2020) [6] average FBS was significantly increase 6 month after initiation of second line ART ($p<0.002$) which is comparable to our study.

Another study done by Alalade BA et al., [7] average FBS after 6 month of initiation of ART was found to be statistically significant ($p<0.001$). [8]

In this study average HBA1c at the base line was found to be 5.65%. It was observed that the mean HBA1c raised to 6.02% in 6 months and 6.46% in 12 months initiation of second line ART. This difference was found to be statistically significant ($P<0.0001$).

Conclusion

In our study it was found that second line ART along with its duration is a significant risk factor for development of Hyperglycemia. Hence timely screening should be done for FBS in patient who are on second line ART so that we can prevent and timely manage the Metabolic complications.

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