A cross-sectional study to assess the metabolic syndrome prevalence and cardiovascular disease risk factors in HIV-positive men

abstract number : 1005

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Specific aim:

To evaluate the risk factors associated with metabolic syndrome (MS) CVDs in HIV-positive men to improve future HIV management.

Results:

A total of 200 patients' data were collected with a mean age of 32.9 and patients were divided into two groups: group-1 contains 45 treatment-naive participants and group-2 includes 155 HAART treatment-experienced participants. MS prevalence between group-1 and group-2 were 18% and 31%, respectively. The Framingham Risk Score (FRS) for the naive and experienced groups were 4.7±4.2 and 3.87±5.92, respectively. High triglyceride (TG>150 mg/dl) in group-1 and group-2 were 15.6% and 36.6% ($p<0.05$), whereas lower HDL (< 39 mg/dl) in group-1 and group-2 presented as 76.7% versus 51% ($p<0.05$), respectively. In group-2, treatment with protease inhibitors (PIs) resulted in higher triglyceride levels when compared with non-nucleotide reverse transcriptase inhibitors (NNRTIs) and integrase inhibitors (IIs).

Conclusion:

- MS prevalence in the treatment-naive group was lower than that of the treatment-experienced group
- High triglyceride level resulted in higher MS prevalence in the treatment-experienced group.
- The cardiovascular risk of FRS in the naive group was higher than that of the experienced group, which may result from the low HDL level.
- In group-2, an increasing triglyceride level of PIs indicated higher CVDs risk when compared with NNRTIs and IIs.

Table 1. Characteristics of HIV-infective patients (N=200).

Demographics		Total n=200	Group-1 n=45	Group-2 n=155	*p* value
Gender	Male	200 (100%)	45 (22.5%)	155 (77.5%)	
Age (yr) ±SD		32.9±8.2	30.5±7.6	33.6±8.2	**0.024***
	20-30	81 (40.5%)	24 (53.3%)	57 (36.8%)	0.134
	31-40	94 (47.0%)	17 (37.8%)	77 (49.7%)	
	≧41	25 (12.5%)	4 (8.9%)	21 (13.5%)	
Student	No	181 (90.5%)	37 (82.2%)	144 (92.9%)	**0.031***
	Yes	19 (9.5%)	8 (17.8%)	11 (7.1%)	
Education	High school	68 (34.0%)	15 (33.3%)	53 (34.2%)	0.915
	College	132 (66.0%)	30 (66.7%)	102 (65.8%)	
Marital status	No	190 (95.0%)	44 (97.8%)	146 (94.2%)	0.331
	Yes	10 (5.0%)	1 (2.2%)	9 (5.8%)	
Occupation	Full-time	155 (77.5%)	32 (71.1%)	123 (79.4%)	0.379
	Part-time	21 (10.5%)	5 (11.1%)	16 (10.3%)	
	Jobless	24 (12.0%)	8 (17.8%)	16 (10.3%)	
Smoking	No	102 (51.0)	20 (44.4)	82 (52.9)	0.159
	Quit	23 (11.5)	3 (6.7)	20 (12.9)	
	Yes	75 (37.5)	22 (48.9)	53 (34.2)	
Drinking	No	82 (41.0)	15 (33.3)	67 (43.2)	0.421
	Quit	32 (16.0)	7 (15.6)	25 (16.1)	
	Yes	86 (42.0)	23 (51.1)	63 (40.6)	
Regular exercise	No	108 (54.0)	24 (53.3)	84 (54.2)	0.919
	Yes	92 (46.0)	21 (46.7)	71 (45.8)	

The level of statistical significance* was established at a *p*-value of <0.05

Group-1: Naïve; Group-2: HAART

During the period from June 2014 to April 2016, a total of 200 HIV infected men in the hospital signed the consent form. After evaluating their HIV therapy, patients were divided into group-1 (n=45) that not taking cocktail therapy (Naïve), and group-2 (n=155) those taking HAART (Experienced), respectively (Table 1).

Table 2. Basic physiological data of the participants (N=200).

Variables		Total N=200	Group-1 n=45	Group-2 n=155	*p* value
Mean waist circumference	(cm)	80.9±6.1	80.3±10.2	81.1±10.0	0.635
Mean height	(cm)	171.8±6.1	172.3±4.7	171.6±6.5	0.427
Mean weight	(kg)	67.5±12.6	68.7±13.0	67.2±12.5	0.502
BMI	≤17	12 (6.0%)	3 (6.7%)	9 (5.8%)	0.903
	18-24	125 (62.5%)	29 (64.4%)	96 (61.9%)	
	≥25	63 (31.5%)	13 (28.9%)	50 (32.3%)	
Mean BMI		22.8±3.8	23.1±4.3	22.7±3.7	0.539
Systolic blood pressure	≤130 mmHg	146 (73.0%)	31 (68.9%)	115 (74.2%)	0.480
	≥131 mmHg	54 (27.0%)	14 (31.1%)	40 (25.8%)	
Mean SBP	(mmHg)	122.4±17.8	122.4±14.3	122.3±13.6	0.980
Diastolic blood pressure	≤80 mmHg	122 (61.0%)	25 (55.6%)	97 (62.6%)	0.395
	≥81 mmHg	78 (39.0%)	20 (44.4%)	58 (37.4%)	
Mean DBP	(mmHg)	78.7±10.0	79.0±10.7	78.6±9.8	0.839
Mean Heartbeat	(beat /min)	82.5±12.2	84.8±12.0	81.8±12.3	0.148

The level of statistical significance* was established at the *p*-value of <0.05

Group-1: Naïve; Group-2: HAART

There were no significant differences in BMI, average SBP, DBP and heartbeat in the two groups.

Table 3. Laboratory variables of the participants (N=200).

Variables		Total	Group-1	Group-2	*p* value
TG median	mg/dl	108.5	92.0	115.0	0.078
	95% C.I.	(69.8, 165.3)	(67.0, 132.5)	(70.0, 181.0)	
TG level (n=198)	≤150 mg/dl	135 (68.2%)	38 (84.4%)	97 (63.4%)	**0.008***
	≥151 mg/dl	63 (31.8%)	7 (15.6%)	56 (36.6%)	
HDL median	mg/dl	38.4	34.3	39.8	**0.005***
	95% C.I.	(31.8, 45.2)	(28.6, 39.8)	(32.5, 47.1)	
HDL level (n=196)	<39 mg/dl	111 (56.6%)	33 (76.7%)	78 (51.0%)	**0.003***
	≥40 mg/dl	85 (43.4%)	10 (23.3%)	75 (49.0%)	
CHO median	mg/dl	164.0	167.0	164.0	0.892
	95% C.I.	(140. 8,185.0)	(143.5, 186.0)	(140.0, 184.0)	
CHO level (n=198)	≤200 mg/dl	169 (85.4%)	39 (86.7%)	130 (85.0%)	0.777
	≥201 mg/dl	29 (14.6%)	6 (13.3%)	23 (15.0%)	
LDL median	mg/dl	96.0	101.0	93.0	0.074
	95% C.I.	(79.3, 116.0)	(78.0, 127.0)	(79.5, 114.0)	
LDL level (n=196)	≤100 mg/dl	114 (58.2%)	20 (46.5%)	94 (61.4%)	0.080
	≥101 mg/dl	82 (41.8%)	23 (53.5%)	59 (38.6%)	
Glucose median (n=196)	mg/dl	98	97	99	0.471
	95% C.I.	(73,325)	(77,135)	(73,325)	
CD4+ median	cells/mm^3	472.5	442.0	479.0	0.391
	95% C.I.	(342.0, 633.8)	(338.5, 601.0)	(351.0, 642.0)	
CD4+ level	<200 cells/mm^3	15 (7.5%)	2 (4.4%)	13 (8.4%)	
	200-500 cells/mm^3	96 (48.0%)	26 (57.8%)	70 (45.2%)	0.291
	>500 cells/mm^3	89 (44.5%)	17 (37.8%)	72 (46.5%)	
VL median	copies/ml	22.0	20535.0	20	**0.000***
	95% C.I.	(20. 9156)	(7813, 50567)	(20, 96)	
VL level	≤20 copies/ml	98 (49.0%)	0	98 (63.2%)	**0.000***
	21-1000 copies/ml	36 (18.0%)	4 (8.9%)	32 (20.6%)	
	>1000 copies/ml	66 (33.0%)	41 (91.1%)	25 (16.1%)	

The level of statistical significance* was established at the *p*-value of <0.05

Group-1: Naïve; Group-2: HAART

Two participants lacked TG and CHO data and four participants had no HDL, LDL and glucose data.

In group-1, 15.6% of participants had a high TG level (≧151 mg/dl), whereas, in group-2, 36.6% of patients presented a high level, resulting in a significant difference (Table 3). Although no significant differences were found in cholesterol (CHO), low-density lipoprotein (LDL) and fasting blood glucose (Glucose), there was a significant difference in the high-density lipoprotein (HDL) levels between the two groups.

Table 4. Metabolic syndrome among naive and HAART patients by age (N=199).

Range of age	Group-1	Metabolic syndrome	%	Group-2	Metabolic syndrome	%
20-30	24	2	8%	57	15	26%
31-40	15	5	33%	78	20	26%
41-50	3	1	33%	14	7	50%
>50	2	0	--	6	6	100%
Total	44	8	18%	155	48	31%

Group-1: Naïve; Group-2: HAART

18% of participants in group-1 had metabolic syndrome and the prevalence was 31% in group-2.

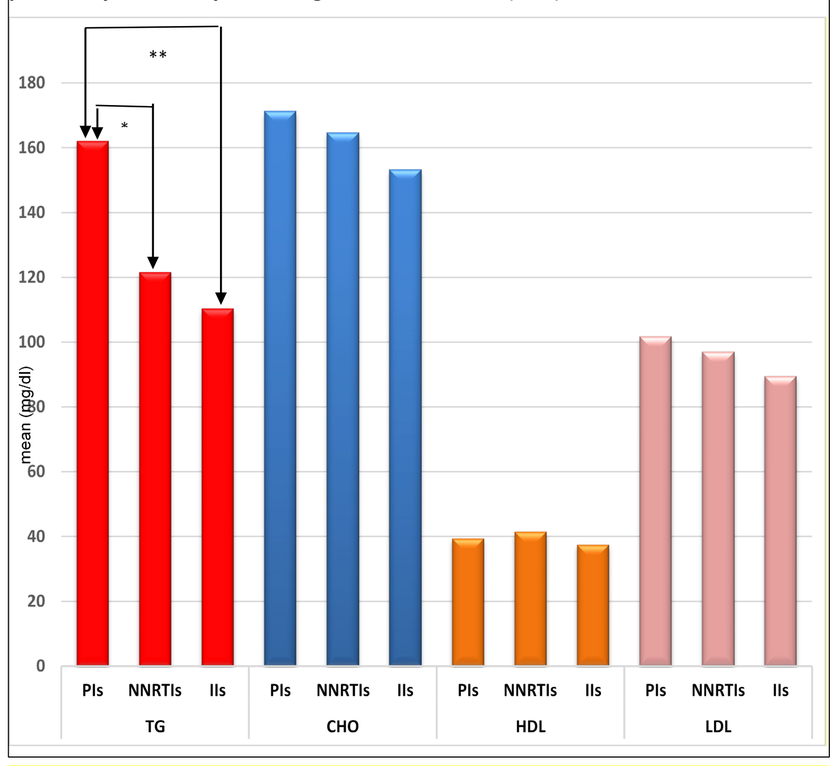
Table 5 Cardiovascular risk among naïve and HAART (N=196)

Items	Total	Group-1(±SD)	Group-2 (±SD)
Numbers	196	42	154
FRS (%)	4.53	4.70 (±4.20)	3.87 (±5.92)
Age (mean)	32.9	29.95 (±7.18)	33.70 (±8.32)
Heart age/vascular age (mean)	38	36.00 (±12.14)	38.00 (±13.80)

Group-1: Naïve; Group-2: HAART

The results indicate that group-1 participants without HAART treatment have a higher risk of developing CVDs.

Figure 1. Multiple comparison between every two HAART regimens based on lipid profiles by the Turkeyhonest significant difference (HSD) test



The TG was significantly higher among users of PIs than among users of NNRTIs (p=0.010*); whereas TG was significantly lower among IIs users than among users of PIs (p=0.010**) according to Tukey HSD calculation.

METHODS

Study design

This was a prospective cross-sectional study of metabolic syndrome and cardiovascular disease risk factors in HIV-positive men attending a tertiary care hospital in central Taiwan. The study protocol was reviewed and approved by the Hospital's Research and Ethics Committee (IRB approval number CS14034).

Study population

The study population was made up of male adult patients and was diagnosed as HIV-1 positive by western blot or polymerase chain reaction analysis at the hospital.

Data collection

In this study, a survey was used to collect 200 copies of case reports from the HIV-infected patients. The research analyzed the compliance of medication, metabolic syndrome, cardiovascular disease, and treatment of viral resistance through systematic follow-up of medical guidance cases. The inclusion criteria were: (1) Age greater than or equal to 20 years old; (2) Diagnosis of AIDS confirmed (ICD9 042); (3) Only cases in this hospital and patients who have been treated for more than 6 months; and (4) Cases of HIV-infected patients taking either HAART (Experienced) or not taking cocktail therapy (Naïve) who are willing to accept the investigation and service. The exclusion criteria were: (1) Male patient younger than 20 years old; (2)When the subject, legal representative or person with consent is unable to read; (3) Incomplete data, or unable to assess efficacy; (4) Patient is tracked for less than 6 months in the hospital. This is a non-invasive treatment plan, so no withdrawal or rescue treatment conditions were included. Questionnaires were introduced to the subjects to obtain basic demographic data and history of education, occupation, HAART type and duration, cigarette smoking, alcohol drinking, exercise, antihypertensive and diabetic medication. Thereafter, blood pressure was taken in the sitting position after five minutes of rest. Weight, height and waist circumference were measured to calculate body mass index (BMI). MS was defined as the presence of 3 or more of the following 5 abnormalities for men: (1) Waist ≥ 90 cm, (2) Systolic blood pressure (SBP) ≥ 131 mmHg or Diastolic blood pressure (DBP) ≥ 81 mmHg, (3) HDL < 40 mg/dl, (4) Fasting glucose ≥ 100 mg/dl, and (5) Triglyceride (TG) ≥ 150 mg/dl.

Statistical analysis

Data from the completed questionnaires and laboratory results were categorized as HIV-positive naïve (group-1) and HIV-positive treatment-experienced (group-2). Ten-year risk assessment for CVD was performed by the Framingham risk score (FRS) calculator [32] using age, diabetes, smoking, SBP, total cholesterol (TC) and HDL as predictors. Statistical analyses were performed using SPSS version 18 (Chicago IL, USA). Continuous variables were compared using the Mann-Whitney U test for non-normally distributed variables. The chi-squared test is used to determine whether there is a significant difference between one or more categories with numbers indicated. The level of statistical significance was established at the p-value of <0.05. One-way ANOVA was used to compare the mean values between the three subgroups and calculated by the Tukey honest significant difference test (HSD).