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Diabetes Mellitus in HIV Infected Individuals

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OBJECTIVE

To determine Diabetes Mellitus (DM) incidence rates in individuals infected with HIV and perform comparisons to DM incidence rates in non-infected individuals.

BACKGROUND

Metabolic disorders in individuals infected with Human Immunodeficiency Virus (HIV) are a topic of current concern and discussion. Metabolic complications (hyperlipidemia, insulin resistance, and fat redistribution) have been associated with HIV infection and antiretroviral (ARV) treatment. Several studies have demonstrated a direct link between exposure to protease inhibitors (PIs) and the development of insulin resistance both in vitro and in vivo[i,ii,iii]. However, there is limited knowledge of the epidemiology and pathogenesis of DM in this population. As people with HIV experience increased survival, an understanding of the incidence, risk factors (both treatment related and non-treatment related) and management of chronic diseases, such as DM, is essential.

METHODS

The data source for this study was the Medi-Cal (California Medicaid) administrative claims database. Medi-Cal claims from July 1994 to June 2000 were examined for DM rates in men and women over age 18 with and without evidence of HIV diagnoses. Individuals were included in the HIV-infected group if a claim used ICD-9 codes 042-Human Immuno deficiency Virus,

METHODS cont'd

V08-asymptomatic HIV infection or 795.71-nonspecific serologic evidence of HIV. An HIV diagnosis served as the index date. Individuals were defined as having DM if a claim used ICD-9 codes 250.0 through 250.9 which includes both Type 1 and Type 2 DM (see Table 1) or had a pharmacy claim for an oral anti-diabetic medication. To be included in the non-HIV group, individuals had to free of HIV related diagnoses and without ARV agent claims. To assess only incident cases of DM diagnoses, individuals had to be free of DM related diagnoses and oral anti-diabetic pharmacy claims for at least one year prior to study inclusion. Incidence rates of DM, determined per 100 person-years, and relative risks (RR) of DM were determined via log-linear regression.

RESULTS

Of patients with claims, 7,219 (61% male) individuals with HIV and 2,792,971 (30% male) individuals without HIV were included in the study. A total of 7,101,180 person-years were examined. Overall incidence of DM per 100 person-years in HIV infected individuals is 10.68 (95% CI 10.15-11.23) and 2.91 (95% CI 2.89-2.92) in non-HIV infected individuals, odds ratio 3.32 ($p<0.0001$) (See Table 2 & Graph 1). Age and gender specific DM incidence rates per 100 person-years for each group are shown in Table 2 & Graph 2, 3, 4. Age-specific relative risks for DM in individuals with HIV compared to those without HIV range from 7.74 (95% CI 3.94-9.27) for individuals aged 18-24 years to 2.16 (95% CI 6.32-14.32) in individuals 65 and older (See Graph 5).

RESULTS

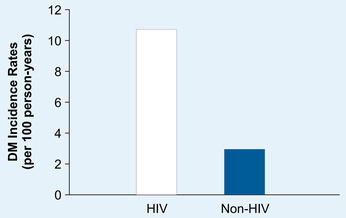
Table 1 — ICD-9 Identification Diagnoses

ICD-9 Code	Diagnosis
250	Diabetes Mellitus
250.0	Diabetes Mellitus without mention of complication
250.1	Diabetes Mellitus with ketoacidosis
250.2	Diabetes with hyperosmolarity
250.3	Diabetes with other coma
250.4	Diabetes with renal manifestations
250.5	Diabetes with opthalmic manifestations
250.6	Diabetes with neurological manifestations
250.7	Diabetes with peripheral circulatory disorders
250.8	Diabetes with other specified manifestations
250.9	Diabetes with unspecified complication

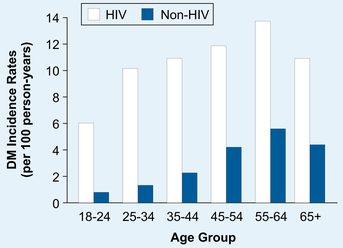
Table 2 — Diabetes Mellitus Incidence Rates (per 100 person-years)

Age Groups	HIV+	95% Confidence Intervals	Non-HIV	95% Confidence Intervals
18-24	6.06	(4.73, 7.78)	0.82	(0.80, 0.84)
25-34	10.16	(9.20, 11.22)	1.36	(1.34, 1.38)
35-44	10.92	(10.09, 11.83)	2.3	(2.28, 2.33)
45-54	11.84	(10.54, 13.30)	4.21	(4.17, 4.26)
55-64	13.72	(11.39, 16.53)	5.58	(5.51, 5.64)
65+	10.88	(8.29, 14.28)	4.37	(4.34, 4.40)
Overall	10.68	(10.15, 11.23)	2.91	(2.89, 2.92)

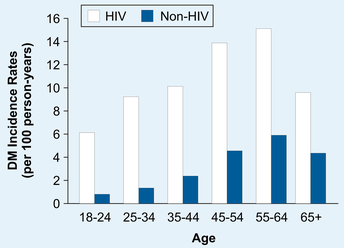
Graph 1 — Diabetes Mellitus Incidence Rates



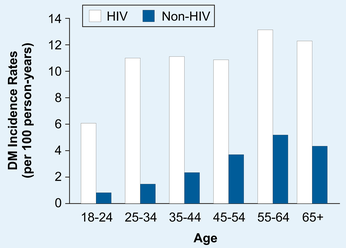
Graph 2 — Diabetes Mellitus Age-Specific Incidence Rates



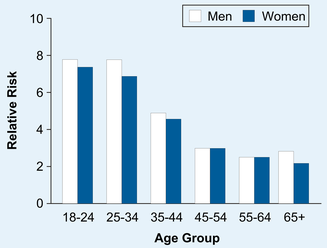
Graph 3 — Diabetes Mellitus Incidence Rates for Women



Graph 4 — Diabetes Mellitus Incidence Rates for Men



Graph 5 — Gender Specific Relative Risk of DM for HIV vs. Non-HIV



DISCUSSION

Studies to date examining DM in HIV have focused on the possible exclusive association with PIs[iv,v,ii]. It has been estimated that 1-6% of patients with HIV infection who receive PI therapy may be at risk for developing DM[vi]. Many papers suggest the PIs are involved in the pathogenesis of lipodystrophy, hyper-lipidemia and insulin resistance, but the relationship between these associations and DM is unknown. The evidence is unclear as to whether ARV treatment alone is responsible for this increase in DM[vii]. Due to the absence of data on other important risk factors for DM such as obesity and family history, further investigations are clearly needed. Nonetheless, modification, where possible, of DM risk factors should be considered in individuals with HIV.

CONCLUSION

These data suggest an association between diabetes mellitus and HIV infection. Further analyses of this dataset will attempt to explore the relationship between exposure to HIV therapies and the risk of diabetes.

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