



ABSTRACT

Background

Recent data suggest that HIV positive obese patients may be at a decreased risk for acquisition of *Mycobacterium tuberculosis*. Data regarding obesity and the risk of other opportunistic infections (OIs) in HIV positive patients are lacking. The objective of this study was to define if an association exists between obesity and the development of OIs in HIV positive female patients.

Methods

This was a retrospective observational study of HIV positive female patients under care at the University of Louisville HIV Program from January 2006 to December 2012. Patients with a T cell count (CD4) <200 cells/mm³ at any point during study period were included in the study. OIs were defined according to CDC criteria. Baseline demographic data on non-obese (BMI <30) and obese (BMI ≥30) patients and development of opportunistic infections were collected and compared using Chi-Squared tests.

Results

A total of 91 non-obese and 60 obese HIV positive female patients were evaluated. The average CD4 count across the study period was 352 (SD=476) for non-obese and 374 (SD=241) for obese patients (P=0.707). A total of 28 OIs were identified, 20 (22%) occurring in non-obese patients and 8 (13%) occurring in obese patients (P=0.248).

Conclusions

Although not statistically significant, this study suggests that obesity may reduce the risk of developing opportunistic infections in HIV positive female patients. Further research defining the molecular mechanisms by which obesity may influence the risk of OIs in HIV positive patients may help to develop novel therapeutic strategies.

INTRODUCTION

The interactions between obesity and infectious diseases have recently received increasing recognition. Several articles have shown increase risk of infections such as urinary tract infections and nosocomial infections in obese patients.¹ However less is known regarding the association between obesity and clinical outcomes. It has been documented during the H1N1 pandemic influenza that obesity increased mortality in this population.¹

In general 54% of HIV infected patients are overweight /obese at the time of HIV diagnosis. Women are more frequently affected by obesity and undernourishment than men with HIV infection.² Recent data suggest that HIV positive obese patients may be at a decreased risk for acquisition of *Mycobacterium tuberculosis*.² Data regarding obesity and the risk of other opportunistic infections (OIs) in HIV positive patients are lacking.

The objective of this study was to define if an association exists between obesity and the development of OIs in HIV positive female patients.

MATERIALS AND METHODS

Study design

This was a retrospective observational study of HIV-positive female patients under care at the University of Louisville HIV Program from January 2006 to December 2012. Institutional Review Board approval was obtained from the University of Louisville Human Subjects Protection Program. Informed consent was waived.

Study definitions

Inclusion criteria

- HIV infection: defined as a positive ELISA test with a confirmatory Western Blot document in the chart.
- Risk for development of OIs: defined as a T cell count (CD4) <200 cells/mm³ at any point during study period.
- OIs were defined according to CDC criteria.³

Study groups

Patients were classified in study groups based on the body mass index (BMI)

Obese: patients with a BMI ≥30

Non-obese: patients with a BMI between 25 and 30

Statistical analysis

Baseline demographic data on non-obese and obese patients were compared. Dichotomous variables were described using Chi-Squared or Fisher's exact tests when appropriated. Continuous variables were summarized as frequencies and interquartile range and differences between groups were analyzed by Wilcoxon-Mann-Whitney test. To define the adjusted impact of obesity on the acquisition of opportunistic infections in subjects with HIV disease, a log binomial regression model was used. This model adjusted for an indicator of prophylactic therapy for Mycobacterium Avium Complex (MAC) and Pneumocystis jirovecii. The predicted probability of an OI from this model was plotted against the subjects BMI to define the adjusted association between the two variables.

RESULTS

A total of 91 non-obese and 60 obese HIV positive female patients were evaluated.

Patients' characteristics are shown in Table 1.

A total of 28 OIs were identified, 20 (22%) occurring in non-obese patients and 8 (13%) occurring in obese patients (P=0.248).

The percent probability of developing an opportunistic infection based on BMI is shown in figure1

Table 1: Patients' characteristics for both study groups

Variable	Obese	Not Obese	P-value
African American, n (%)	39 (65)	54 (59)	0.5
Age, Median (IQR)	42 (13)	46 (13.5)	0.016
American Indian/Alaskan Native, n (%)	0 (0)	1 (1)	>0.999
Current Alcohol Use, n (%)	15 (25)	33 (36)	0.158
Cardiovascular Event, n (%)	3 (5)	3 (3)	0.682
Absolute CD4, Median (IQR)	333.6 (215.5)	279 (208.8)	0.181
Percent CD4, Median (IQR)	17.6 (12.4)	19.8 (11)	0.635
Diabetes, n (%)	11 (18)	12 (13)	0.489
Current Illicit Drug User, n (%)	8 (13)	27 (30)	0.029
Current ART Therapy, n (%)	58 (97)	90 (99)	0.563
Hispanic, n (%)	4 (7)	6 (7)	>0.999
Hypertension, n (%)	38 (63)	34 (37)	0.003
Hyperlipidemia, n (%)	19 (32)	17 (19)	0.08
Current Smoker, n (%)	28 (47)	55 (60)	0.132
Hypertriglyceridemia, n (%)	19 (32)	37 (41)	0.304
Viral Load, Median (IQR)	12120.5 (44416.9)	13726.1 (64625.8)	0.377
Caucasian, n (%)	20 (33)	30 (33)	>0.999

RESULTS

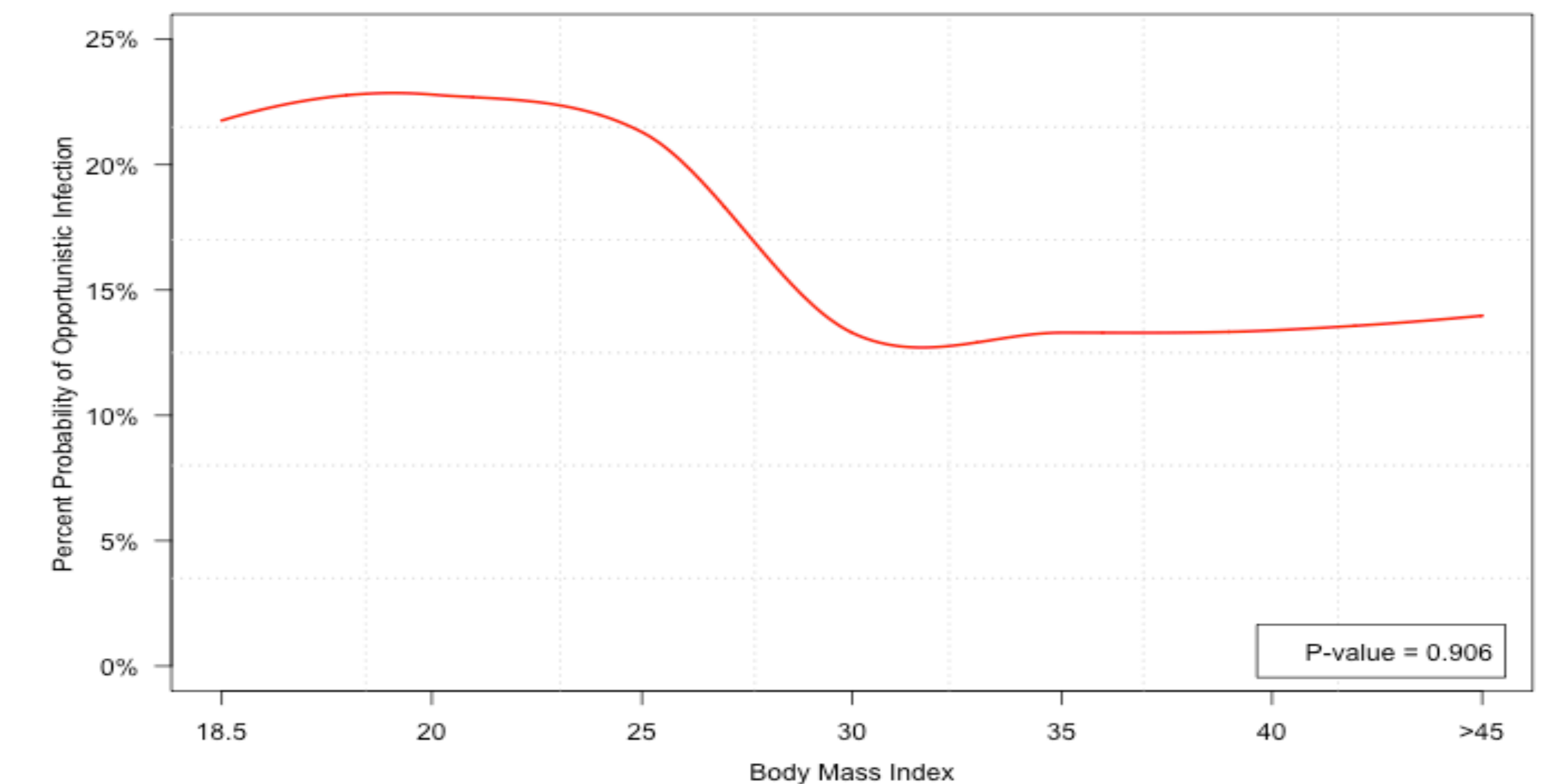


Figure 1 The percent probability of developing an opportunistic infection based on BMI.

CONCLUSIONS

- Although not statistically significant, this study suggests that obesity may reduce the risk of developing opportunistic infections in HIV positive female patients.
- There are different reasons that could explain the results found in our study.
- Individuals with increased BMI may have higher daily protein and energy intake, which could result in more robust immune function and drive a reduction in both mortality and TB.⁴
- Differences in micronutrient intake could also be implicated in the associations shown here, as many micronutrient deficiencies have been described among those with TB as well as HIV.¹
- Vitamin D deficiency has been implicated as a risk factor for the development of TB, though a recent supplementation trial showed no clinical impact. Although apparently protective against TB and all-cause mortality, a high proportion of these HIV-infected adults were overweight, raising concerns about current and future risks of metabolic and cardiovascular adverse health consequences, particularly those which may be exacerbated by long-term HAART use.¹
- Further research defining the molecular mechanisms by which obesity may influence the risk of OIs in HIV positive patients may help to develop novel therapeutic strategies.

REFERENCES

1. Huttunen R, & Syrjänen J. (2013). Obesity and the risk and outcome of infection. *International Journal Of Obesity* (2005), 37(3), 333-40. doi:10.1038/ijo.2012.62
2. De Senna AF, De Oliveira SA, Velarde LG, & Setúbal S. (2014). Nutritional status of HIV-positive patients in Niterói, Rio de Janeiro, Brazil. *Journal Of Health, Population, And Nutrition*, 32(4), 595-9.
3. Amorosa, Valerianna MD*; Synnestvedt, Marie MScEd†; Gross, Robert MD, MSCE*†; Friedman, Harvey MD*; MacGregor, Rob Roy MD*; Gudonis, Debbie LPN*; Frank, Ian MD*; Tebas, Pablo MD*
4. Hanrahan CF¹, Golub JE, Mohapi L, Tshabangu N, Modisenyane T, Chaisson RE, Gray GE, McIntyre JA, Martinson NA. Body mass index and risk of tuberculosis and death.(2010).