Evaluation of Adherence and Factors Affecting Adherence to Combination Antiretroviral Therapy among White, Hispanic, and Black Men in the MACS Cohort

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Abstract

This study investigated levels of adherence to antiretroviral therapy in White, Hispanic and Black men, and isolated factors associated with adherence among each racial group. Data were collected from 1102 men enrolled in the Multicenter AIDS Cohort Study (MACS) followed between April 2002 and October 2006. Self-reported 100% adherence was defined as taking all doses and pills over the previous four-day period, reporting not typically skipping any medications, and reporting always following the medication schedule. Variables associated with adherence were determined by multi-level logistic regression for each racial group. Adherence was also analyzed by ethnicity within racial groups. After controlling for confounders, we found that Hispanics were 2.16 times and Blacks were 1.37 more likely than Whites to not report 100% adherence (95% CI (1.47, 3.18), (1.05, 1.79)). Hispanics with ethnic backgrounds from Central and South America and the Caribbean had lower rates of adherence. Blacks with ethnic backgrounds from the Caribbean had lower rates of adherence than those from other regions.

Keywords

antiretroviral therapy; adherence; ethnicity

INTRODUCTION

The advent of combination antiretroviral therapy has resulted in great advances in treatment of HIV infection, with a subsequent and dramatic drop in morbidity and mortality from HIV infection.[1, 2] A complex set of factors, including socioeconomic status, health status, side effects, and drug use, all influence an individual's ability to comply with an antiretroviral drug regimen. Previous studies point to lower adherence in racial minorities.[3–5] Few studies, however, have investigated specific factors associated with lower rates of adherence in Blacks and Hispanics in the United States. Although Blacks and Hispanics are often treated as separate uniform categories, each represents a wide diversity of cultures and genetics that overlap in some areas.

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Current usage of racial categories masks rich differences within groups. Ethnicity is frequently used interchangeably with race, though there are subtle differences that make them distinct concepts. Race is often socially imposed and dependent on one's biology. Ethnicity, however, is more closely related to culture and with which group an individual identifies. This distinction is important to note, as race and ethnicity may affect health behaviors in different ways.

Hispanics and Blacks have been disproportionately affected by the HIV epidemic. While only 13% of the U.S. population is Black, they account for about half (49%) of new infections.[6] Similarly, although only 15% of the U.S. population is Hispanic, this group comprises 17% of all new HIV infections.[7] Thus, it is very important to address the specific needs of these populations. Herein we investigate how adherence differs by race and what factors are associated with adherence in each racial group. We also investigate how ethnicity affects adherence.

METHODS

Population and Data Collection

The Multicenter AIDS Cohort Study is an ongoing prospective study of HIV infection among homosexual and bisexual men conducted in four study sites: Baltimore, Chicago, Pittsburgh, and Los Angeles.[8–10] The men are followed every six months with interviews, physical examinations, quality-of-life assessments, neuropsychological testing, and blood sample collections. An interviewer-administered questionnaire to assess self-reported adherence to antiretroviral medication was incorporated into the protocol in October 1998.[3] The institutional review board of each center approved the study protocols, and informed consent was obtained from each participant.

Statistical Analysis

Participants in the original cohort were enrolled in 1984–85 and 1987–90. Recruitment to include more minorities (specifically Blacks and Hispanics) in the MACS began in October 1, 2001 and ended April 8, 2003. Data for this study were taken from the newly recruited participants, as well as the participants already enrolled in the MACS. Over 90% of the new cohort was recruited after April 1, 2002. Thus, analysis was limited to subjects who: 1) came in for an assessment between April 2002 and October 2006; and 2) had been administered the adherence questionnaire within that period of time. Only participants who had started antiretroviral therapy were given the adherence questionnaire. Subjects who were first given the adherence questionnaire after October 2005 were excluded, due to insufficient follow-up time.

To collect information on race, participants were asked "Which of the following best describes your racial background?" Participants were able to choose from one of the following options: White Non-Hispanic, White Hispanic, Black Hispanic, Black Non-Hispanic, American Indian or Alaskan Native, Asian or Pacific Islander, Other Hispanic or Other. For analysis, these categories were collapsed into four categories: 1) White, 2) Hispanic, 3) Black and 4) Other.

To collect information on ethnicity, all participants were asked "Please tell us which of the following best describes your family's national origins or ethnic background." Ethnicity data were collected in 19 different categories: Western European, Eastern European Jewish, Eastern European Non-Jewish, Mediterranean, Middle Eastern, Central or South American, Central or South Asian, Southeastern Asian, Chinese, Japanese, Pacific Islander, Haitian, Jamaican, Cuban, Other Caribbean, East African, Zairian, Other African, and Other. For analyses, these categories were collapsed into seven categories: 1) European; 2) Middle

Eastern; 3) Central/South American; 4) Asian/Pacific Islander; 5) Caribbean; 6) African; and 7) Other.

Self-reported adherence was dichotomized as 100% adherence and less than 100% adherence. Inclusion in the <100% adherence group for a visit resulted when at least one of the following criteria was met: 1) the participant reported taking less medication than prescribed in the past four days; 2) the participant reported taking all prescribed doses in the past four days, but not in a typical pattern; 3) the participant reported taking fewer pills per dose than were prescribed; 4) the participant reported ever skipping any medications; or 5) the participant reported ever not following their medication schedule.

From the information collected on clinical symptoms, prescription drug use, socioeconomic status, behavioral characteristics, recreational drug use, and biological markers, a subset of variables with a theoretical relationship with adherence were chosen for analysis. Variables with missing data, no correlation to adherence, low variability, or that duplicated other variables were excluded from the analysis. Viral load was chosen for analysis over CD4 because impact of adherence on change in CD4 count tends to be delayed.[11]

Multi-level logistic regression using generalized estimating equations was used to analyze the longitudinal clustered data. Similar models were then separately built for Whites, Hispanics, and Blacks. Rates of adherence within Hispanic and Black sub-populations were next examined to determine whether ethnic and cultural differences within race affect adherence.

RESULTS

A total of 1102 men participated in this study, comprising 6203 visits for analysis. There were 655 White men (58.4%), 151 Hispanic men (13.7%), 289 Black men (26.2%), and 18 men of other racial backgrounds (1.6%). Racial breakdown was different for the cohort recruited before April 2001 and that recruited after April 2001. The older cohort had 509 White men (82.8%), 36 Hispanic men (5.9%), 63 Black men (10.2%), and 7 men of other racial backgrounds (1.1%). The newer cohort had 135 White men (27.7%), 115 Hispanic men (23.6%), 226 Black men (46.4%), and 11 men of other racial backgrounds (2.3%).

The most obvious differences between racial groups were in socioeconomic status. The proportion of men who reported individual gross income less than $10,000 a year at a visit was 10.2% for Whites, 31.3% for Hispanics and 43.5% for Blacks. The proportion of men reporting financial difficulty meeting expenses at a visit was 14.0% for Whites, 37.6% for Hispanics and 48.1% for Blacks. Substantial differences were also found in illicit drug use. Hash or marijuana use was similar in Whites and Blacks (36.5% and 34.8%, respectively), but lower in Hispanics (25.0%). Whites had a higher proportion of popper use (33.8%) than Hispanics and Blacks (19.1% and 14.3%, respectively). Blacks had a higher proportion of crack use (21.8%) compared to Whites and Hispanics (3.9% and 7.7%, respectively).

Whites had the highest percentage of visits with self-reported 100% adherence (44.2%). Hispanics had 31.8% adherent visits, Blacks had 28.1% adherent visits, and all others had 21.9% adherent visits.

All variables included in the multivariate analysis were significantly associated with non-adherence in the univariate analysis. After controlling for center, age, financial difficulties, popper use, crack use, and viral load, Whites had the least reported non-adherence. Hispanics had 2.16 ($p<0.001$) and Blacks had 1.37 times more non-adherence ($p=0.020$) compared to Whites. Viral load was significantly associated with adherence ($p<0.001$).

Different factors were associated with non-adherence in the multivariate analysis within each separate racial group. For Whites, younger age, joint pain and viral load were all significantly associated with non-adherence. For Hispanics, younger age and viral load were associated with non-adherence. Determining variables associated with non-adherence in Blacks was complex. Surprisingly, age and viral load were not associated with adherence. A new skin rash, doubling the cost of personal expenditure for prescription medication, financial difficulty meeting expenses, and crack use were all significantly associated with non-adherence. Conversely, a numbness in feet/legs and crystal/methamphetamine use were significantly associated with lower rates of non-adherence.

Among Hispanics, participants primarily reported European, Central/South American and Caribbean ethnicity. Those reporting European descent had the highest rates of adherence (44.6%). Those of Central/South American and Caribbean descent had much lower rates of adherence (27.5% and 22.2%, respectively). Among Blacks, participants primarily reported European, Caribbean, and African ethnicity. There may have been some confusion as to how to classify ethnicity, as approximately one-third of participants had no response or listed 'Other'. Highest rates of adherence were again reported in those of European descent (37.5%). Lower rates were reported in those of African descent (28.2%), but the lowest rates were reported in those of Caribbean descent (13.2%) (Table 1).

DISCUSSION

Overall, rates of adherence were relatively low. This is due in part to our strict definition of 100% adherence, which was similar to the definition used by Kleeberger et al. [3, 4], but additionally required participants to report never skipping medications on the adherence questionnaire and to report following their medication schedule closely all of the time. A lack of standardization of adherence makes it difficult to make direct comparisons with other studies. However, in a review of studies employing self-reported measures of adherence, the most common cutoff for optimal adherence was 100%, appearing in 44% of the studies.[12] Even so, data collection methods and definitions vary and can greatly affect presentation of results.

The higher rates of non-adherence in Black and Hispanics observed in our study has been found by others.[3, 5, 13, 14] However, few studies have investigated differences within these broad racial categories. We found that Hispanics of Central or South American descent had much lower rates of adherence than those of European descent. Also, Hispanics and Blacks from the Caribbean both had very low rates of adherence. At the same time, self-reported racial and ethnic data is often difficult to interpret as individuals often have complex family histories which do not neatly fit into questionnaire response categories.

There were not enough participants or follow-up time in this study to do an appropriate analysis of factors affecting each ethnic subpopulation. Furthermore, more specific information on acculturation was not collected. Prior work has shown that an individual's degree of acculturation can strongly affect their health-related behaviors. This is true for both Hispanic and Black populations.[15, 16] Although a question on native language was included in the MACS questionnaire, less than 12% of participants reported their native language. Regardless, proxy measures alone such as language and numbers of years spent in the U.S. may not be enough to determine degree of acculturation, especially in the Black population.

One major strength of this study is that data were taken from a large prospective study, and over four years of follow-up data were used for the analysis. Multiple data points were recorded for a large number of participants, including Hispanic and Black men. At the same

time, since many of the participants have a long history of participation with the MACS, these individuals are more likely to be highly motivated and to have higher adherence to antiretroviral therapy. In addition, the MACS cohort does not include women and children. Thus, our findings might not be generalizable to all HIV-infected persons.

Another weakness of this study is that only self-reported data were used. Individuals are more likely to over-report adherence; thus, rate of adherence represents the maximum true rate. However, since the data collection was not done by their primary physicians, participants were less likely to over-report for social desirability. The significant association of viral load with adherence supports the reliability of self-report.

We conclude that adherence is multi-factorial and varies significantly by race and ethnicity. We found that Blacks and Hispanics are more likely to be non-adherent, and that individuals from Central and South America and the Caribbean are especially at risk for non-adherence. Future adherence research and interventions should focus not solely on racial groups, but also the ethnic differences within groups.

Acknowledgments

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Table 1

Hispanic and Black adherence by ethnicity

	HISPANIC		BLACK	
	Number of Vvisits	% Adherent visits	Number of visits	% Adherent visits
No response	29	44.8	101	26.7
European	175	44.6	104	37.5
Middle Eastern	5	20.0	0	-
Central/South American	429	27.5	13	23.1
Asian/Pacific Islander	9	33.3	24	16.7
Caribbean	54	22.2	68	13.2
African	18	22.2	709	28.2
Other	2	100.0	435	29.2
TOTAL	**721**		**1454**	