Literacy, Social Stigma, and HIV Medication Adherence

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BACKGROUND: Prior studies have linked limited literacy to poorer HIV medication adherence, although the precise causal pathways of this relationship have only been initially investigated.

OBJECTIVE: To examine whether social stigma is a possible mediator to the relationship between literacy and self-reported HIV medication adherence.

DESIGN: Structured patient interviews with a literacy assessment, supplemented by medical chart review, were conducted among patients receiving care at infectious disease clinics in Shreveport, Louisiana and Chicago, Illinois. Literacy was measured using the Rapid Estimate of Adult Literacy in Medicine (REALM), while stigma was measured using items taken from the Patient Medication Adherence Questionnaire (PMAQ).

PARTICIPANTS: Two hundred and four consecutive patients participated.

RESULTS: Approximately one-third of the patients (30.4%) were less than 100% adherent to their regimen, and 31.4% had marginal (7th–8th grade) or low (≤ 6th grade) literacy. In multivariate analyses, patients with low literacy were 3.3 times more likely to be non-adherent to antiretroviral regimens (95% CI 1.3–8.7; p <0.001). Perceived social stigma was found to mediate the relationship between literacy and medication adherence (AOR 3.1, 95% CI 1.3–7.7).

CONCLUSIONS: While low literacy was a significant risk factor for improper adherence to HIV medication regimens in our study, perceived social stigma mediated this relationship. Low literacy HIV intervention strategies may also need to incorporate more comprehensive psychosocial approaches to overcome stigma barriers.

KEY WORDS: literacy; stigma; HIV; medication; adherence.

INTRODUCTION

Several studies have identified limited literacy as a risk factor for poor HIV medication adherence, despite evidence that questions this association.[1–4] Conceptually, whether this relationship is construed as intuitive is controversial, as the actual causal pathways linking literacy to health outcomes remain unclear.[5–7] Nonetheless, it is important to understand the nature of the literacy-adherence relationship and what specific factors might plausibly explain it.

A possible mediating variable that might partially explain the association between literacy and medication adherence, specifically in the context of HIV/AIDS, could be concern for social stigma. Stigma has been labeled as the most formidable social and psychological aspect of the HIV experience.[8,9] HIV stigma includes "prejudice, discounting, discrediting, and discrimination directed at people perceived to have AIDS or HIV, and the individuals, groups, and communities with which they are associated."[10] Large segments of the public remain uneducated about HIV and how it is transmitted, which promotes fear and antipathy toward those infected with the virus.[11] These sentiments may often translate into biased and discriminatory actions. Concern for such stigma is widely reported among people living with HIV, which subsequently affects their social, psychological, and physical well-being.[12,13] Concern for and experience with stigma has been linked to elevated stress, depression, impaired immune response, and high suicide rates among those living with HIV.[14–20] It can also lead people to hide their serostatus from others, and avoid healthcare or forego their antiretroviral medications.[21–23] Specifically, patients may miss doses of their regimen if their schedule requires them to take the medicine at inopportune times and in public environments.[22,24,25] Rintamaki and colleagues found that a greater concern for social stigma was a significant independent predictor of HIV medication adherence.[23]

It is possible that patients with limited literacy skills may be more sensitive to matters of shame and stigma as a result of their co-existing concern for social stigma related to their limited reading proficiency, among other psychosocial issues.[2,26–29] In earlier studies, HIV-infected patients with inadequate health literacy were found to be significantly more likely to report negative health care perceptions and experiences, and to be less confident in their ability to self manage their disease than those with adequate health literacy.[2,30]

No study to our knowledge has directly investigated the relationship between concern for social stigma and literacy level or, specifically, whether perceived stigma mediates the relationship between literacy and medication adherence. We

sought to investigate the relationship between literacy, social stigma concerns and HIV medication adherence among a diverse cohort of patients.

METHODS

Sample

The study sample and methods have been previously described in detail.[2,31,32] From June to September 2001, we enrolled a total of 204 consecutive HIV-infected patients receiving medical care who were prescribed one or more antiretroviral medications and received medical care through outpatient infectious disease clinics at the Northwestern Memorial Hospital (Chicago site) and the Louisiana State University Health Sciences Center at Shreveport (LSUHSC). Patients who were on their regimen for less than two weeks were excluded from participation, as well as those having any of the following conditions: (1) dementia; (2) blindness or severely impaired vision not correctable with eyeglasses; (3) deafness or hearing problems uncorrectable with a hearing aid; (4) too ill to participate in the survey. Approval for human subjects research was obtained from institutional review boards at both study sites prior to consenting patients to the study.

Data and Procedure

Trained research assistants received referrals of interested and eligible patients from clinic health providers, gathered informed consent, and conducted a structured interview with recruited patients in a private room. Information collected at this time included literacy level, stigma concerns, and HIV medication adherence.

Medication Adherence

Patients were given the low literacy accessible version of the Patient Medication Adherence Questionnaire (PMAQ) and asked to identify the medications in their current regimen, as well as self-report any recent missed doses using pages that contained names and color photographs of common HIV medications.[33,34] This version of the PMAQ had been revised to simplify the test by limiting the recall period for missed doses and adding visual cues to aid in medication identification. Information on patient antiretroviral agents, comorbidities, and non-HIV prescriptions was obtained through medical chart reviews. Four questions were asked pertaining to any missed doses over the past four days. Proper adherence was determined if patients reported no skipped doses over the past four days, whereas non-adherence was determined if any doses in the patient's regimen were missed during the past four day interval.[1,2,23,31,32]

Measurement

HIV-Related Social Stigma. Patients' concern with HIV-related stigma was measured using three items from the PMAQ, which is a 25-item scale that assesses psychosocial barriers to adherence.[33] Items included statements related to problems associated with adhering to HAART regimens. Three state-

ments were presented to patients that addressed internalized stigma issues: "I am embarrassed to get my medicines from a drug store;" "I don't want people to see me take my HIV medicines;" and "Taking my medicines reminds me that I have HIV." Patients were asked to respond to each statement by endorsing the item on a three-point scale (agree, not sure, disagree).

Conceptually, the first two statements speak to participants' sensitivity to exposing their medications and, potentially, their HIV status. The dilemmas these statements represent have been detailed in earlier work regarding HIV patients' stigma concerns for being seen using antiretroviral medications or accessing HIV-related services.[21,22] The first and third statements also speak to people who may have internalized HIV stigma, whose embarrassment and heightened identity salience around their medications is hypothesized to correlate with high concerns for HIV stigma and discrimination.[35–38]

A total score of social stigma concern was calculated (range 3 to 9), and perceived HIV-related stigma concern was categorized as either low (3–5), moderate (6–7), or high (8–9). These items have previously been found to demonstrate high internal consistency (> 0.85), loading on a single stigma factor (Eigenvalue=1.60; factor loadings 0.73, 0.76, and 0.80, respectively).[23]

Literacy. Patient literacy was assessed using the Rapid Estimate of Adult Literacy in Medicine (REALM).[39] For this literacy assessment, patients are asked to read aloud 66 medical terms while a trained research assistant scores the REALM based on number of words pronounced correctly. Classification of literacy are as follows: third grade or less (0–18), fourth to sixth grade (19–44), seventh to eighth grade (45–60), and ninth grade and above (61–66). In health care studies where patients need only be categorized as low (scores 0–44), marginal (scores 45–60) or adequate (scores 61–66) readers, the information provided by the REALM is generally sufficient. The REALM is highly correlated with standardized reading tests and the Test of Functional Health Literacy in Adults (TOFHLA).[40,41]

Analysis Plan

Statistical Analysis. Chi-square and student's t-tests were used to evaluate the association between patient literacy, demographic (age, gender, race, insurance coverage, employment, monthly income, site) and clinical (number of HIV and non-HIV medications currently taken, comorbidity, treatment in the past 6 months for mental illness or illicit drug use) characteristics, social stigma concerns, and self-reported adherence to HAART regimens (100% adherence vs. < 100% adherence, past four days). Patient literacy was classified either as low (6th grade and below), marginal (7th–8th grade) or adequate (9th grade and higher). Multivariate logistic regression models were used to estimate the independent relationship between low literacy and the outcomes of associated concerns of social stigma and medication adherence while controlling for potential confounding variables (age, gender, race, site) and additional risk factors for medication non-adherence (number of HIV medications in regimen, other medications taken, comorbidity, history of mental illness and/or illicit drug use).

Mediational Analysis. We used mediational analysis to analyze the pathways linking literacy and HIV medication adherence.[42] Mediating variables are those thought to lie in a causal pathway between the main predictor variable and the outcome. The independent relationship between literacy and medication adherence was revisited, adjusting for all exogenous covariates and potential interaction effects (baseline model). Next, the relationship between literacy and social stigma concerns were examined. Finally, social stigma was added to the baseline model as a mediator, and changes in odds ratios for patient literacy were analyzed. Model calibration and discrimination was estimated using the Hosmer-Lemeshow goodness-of-fit chi-square test and the c-statistic from receiver operating characteristic (ROC) curves. All statistical analyses were performed using STATA, version 8.0 (College Station, TX).

RESULTS

Sample Characteristics

The mean age of patients was 40.1 years, 45.1% were African American and 79.9% were male. Over half of respondents (55.9%) were unemployed, 39.7% had a household income of less than $800/month, and 27.5% did not carry any health insurance. More than 60% of patients reported at least some college education. Approximately one-third of patients had limited literacy skills; 11.3% were reading at or below a sixth grade level (low literacy) and 20.1% were reading at a seventh to eighth grade level (marginal literacy). More than half (52.5%) of patients were also being treated for a non-HIV related chronic illness. Nearly one-third reported receiving mental health services and 9.3% received treatment for alcohol or illicit drug use in the past six months. Significant differences in demographic and clinical characteristics were noted across literacy levels (see Table 1). Patients with low literacy were more likely to be African American, lower educated, male, employed but uninsured, and from the Shreveport site.

Social Stigma Concern and Medication Adherence

Over 70% of the patients were taking three or more antiretroviral medications in addition to a mean of 3 (SD=2.9) non-HIV prescription medications. Patients with low literacy had the highest reported rate of non-adherence (52.2%) and individuals with marginal literacy skills were the least likely to self-report missing any doses of antiretroviral medications (19.5%). Patients who reported moderate or high levels of social stigma concern were also more likely to be non-adherent compared to those with low levels of social stigma concern (high – 46.4%, moderate – 30.6%, and low – 22.5%, p=0.01).

Multiple logistic regression models that included social stigma concerns and medication adherence as dependent variables were analyzed using generalized estimating equations (GEE) for binomial data (Table 2). Low literacy (≤6th grade) was a significant independent predictor of high concern for social stigma (Adjusted Odds Ratio (AOR) 3.1, 95% confidence interval (CI) 1.8–9.7), and medication non-adherence in the past four days (AOR 3.3, 95% CI 1.3–8.7; Table 2).

Table 1. Characteristics of Sample, Stratified by Literacy Level

Variable	Literacy Level			P value
	Adequate (n=140)	Marginal (n=41)	Low (n=23)	
Age				0.91
< 40	57.9	63.4	56.5	
40–50	29.3	26.8	26.1	
> 50	12.8	9.8	17.4	
Gender				0.03
Male	78.3	65.9	84.3	
Race				<0.001
African American	31.4	68.3	86.9	
Education				<0.001
< High school	5.7	22.0	34.8	
High school graduate	17.9	43.9	43.5	
> High school	76.4	34.1	21.7	
Monthly income				.06
< $800	33.6	43.9	69.6	
$800–$999	24.3	24.4	13.0	
$1000–$1500	11.4	9.8	0.0	
> $1500	30.7	21.9	17.4	
Employment				<0.001
Unemployed	73.9	56.1	52.9	
Employed, part-time	13.0	17.1	15.0	
Employed, full-time	13.1	26.8	32.1	
Insurance				<0.001
Private	33.6	21.9	0.0	
Medicare	20.0	22.0	13.0	
Medicaid/free care	46.4	56.1	87.0	
Site				0.02
Shreveport	50.7	43.9	78.3	
Chicago	49.3	56.1	21.7	
Social stigma concerns				0.007
Low	43.6	56.1	21.7	
Moderate	38.6	26.8	30.4	
High	17.9	17.1	47.9	
No. of HIV medications in regimen				0.17
1– 2	25.9	35.5	45.0	
3 or more	74.1	64.5	55.0	
Non-adherence in past 4 days				0.01
1 or more missed doses	30.0	19.5	52.2	

Marginal literacy (7th–8th grade) was not significantly associated with social stigma concern or adherence. Multiple regression analyses were then repeated to examine the relationship between social stigma and HIV medication adherence, without literacy in the model. A high level of social stigma concern was also found to be a significant independent predictor of medication non-adherence in the past four days (AOR 3.7, 95% CI 1.5–9.1; Model 2, Table 3).

Mediational Analyses

The multivariate model for medication non-adherence was repeated in mediational analyses, including the hypothesized potential mediating factor of social stigma concern (Table 3). After concern for social stigma was entered into the model the relationship between literacy and adherence attenuated to a point of non-significance (AOR 2.1, 95% CI 0.7–6.5). High concern for social stigma was a significant independent

Table 2. Adjusted Odds Ratios (OR) for Social Stigma Concern and Medication Non-Adherence, by Literacy Level

Outcome	Literacy Level		
	Adequate (n=140)	Marginal (n=41)	Low (n=23)
High social stigma concern, %	17.9	17.1	47.9
Crude OR (95% CI)	1.0	0.9 (0.4–2.4)	4.2 (1.7–10.6)
Adjusted OR (95% CI) *,a	1.0	0.7 (0.1–6.3)	3.1 (1.8–9.7)
HIV medication adherence, %	70.0	80.5	47.8
Crude OR (95% CI)	1.0	0.5 (0.2–1.2)	2.9 (1.3–6.5)
Adjusted OR (95% CI)	1.0	2.1 (0.8–5.5)	3.3 (1.3–8.7)

Odds ratios adjusted for age, gender, site, insurance coverage, employment status, number of medications in HIV regimen, number of non-HIV prescription medications currently taken, presence of a comorbid chronic condition, treatment for a mental health condition in past six months, and treatment for alcohol or drug use in past six months.
CI – confidence interval

predictor of medication non-adherence in the final model (AOR 3.1, 95% CI 1.3–7.7). Interactions between literacy and social stigma concern were entered into the model; these were not found to be statistically significant.

DISCUSSION

In our study, we re-examined the relationship between literacy and adherence to HIV antiretroviral medications among a diverse sample of patients from two distinct regions of the United States. Approximately one-third of patients in our sample had missed one or more doses in their HAART regimen within the past four days, and low literacy was associated with more than a threefold greater likelihood of missed doses. In mediational analyses, the effect of literacy on medication adherence was reduced by nearly 40% after social stigma concern was included in the model. To our knowledge, this is the first study that documents the association between limited literacy, stigma, and medication adherence. As such, our research advances the national agenda to describe, in more detail, the likely causal pathways linking literacy to health outcomes.

Specifically, higher perceived social stigma mediated the relationship between limited literacy and worse antiretroviral medication adherence. This is not surprising, as it is plausible that stigma concerns might interfere with appropriate processing and understanding of health information, as well as sustained medication-taking behaviors that frequently occur in social situations. Yet stigma concern might impact adherence on a broader level, such as general acceptance of one's condition and the need for antiretroviral therapies.[43] Our findings suggest that patients with low literacy skills are more sensitive to these concerns. Unfortunately we did not assess patients' sense of shame related to domains other than HIV medication-taking behavior, as prior research has shown that patients with low literacy harbor a great amount of shame and stigma relating to their limited literacy skills.

Additional study limitations should be mentioned. We assessed adherence via self-report rather than more objective measures, such as random pill counts, medication event monitoring system (MEMS) caps, or pharmacokinetic laboratory assessments. Although we utilized an existing, validated assessment tool to measure HIV medication adherence, patients may under-report missed doses through questionnaires.[33,34] In addition, our measure of concern for HIV-related stigma was a short, three-item scale derived from a previously validated instrument, which may lack the sensitivity of more in-depth stigma questionnaires. Further psychometric evaluation should be performed to determine the utility of this scale compared to other available tools that may not be so parsimonious and practical for use in clinical settings.[44] Our data is also derived from a cohort of HIV-infected patients interviewed five years ago, and may not directly reflect the experience of those currently on HAART regimens. While more recent advances offer the potential for simplified and less restrictive dosing schedules, adherence still remains a significant challenge for patients with the disease.[45,46] However, our study is one of the first to quantitatively report on the relationship between social stigma and HIV medication adherence among a sample of patients from both urban and rural settings. Therefore, we believe our findings to still be relevant in the present day. Finally, the relatively small sample size and modest number of individuals with low literacy skills further limits the generalizability of study findings.

Despite the limitations, this study suggests that high concern for social stigma is a significant independent predictor of poor medication adherence for those with low literacy. This finding is important, given that most low literacy strategies have focused mostly on simplifying health information without addressing the social circumstances of health care.[47–50] Interventions are needed that extend beyond the 'plain language' programs that have been developed. These methods have resulted in variable success and usually do not lead to improvements in health behaviors.[48,49] While improving health information is imperative, more comprehensive approaches

Table 3. Adjusted Odds Ratios (AOR) for Non-Adherence to HIV Medication Regimen, Past Four Days

Variable	Non-adherence to HAART Regimen		
	Model 1	Model 2	Model 3
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Literacy level			
Adequate (≥ 9th grade)	1.0		1.0
Marginal (7th–8th grade)	2.1 (0.8, 5.5)		0.7 (0.2, 1.8)
Low (≤ 6th grade)	3.3 (1.3, 8.7)		2.1 (0.7, 6.5)
Stigma concerns			
Low		1.0	1.0
Moderate		1.9 (0.8, 4.5)	1.4 (0.6, 3.2)
High		3.7 (1.5, 9.1)	3.1 (1.3, 7.7)

Odds ratios adjusted for age, gender, site, insurance coverage, employment status, number of medications in HIV regimen, number of non-HIV prescription medications currently taken, presence of a comorbid chronic condition, treatment for a mental health condition in past six months, and treatment for alcohol or drug use in past six months.
CI – confidence interval

should address psychosocial concerns by assessing not only patients' understanding, but also their self-efficacy and ability to perform the tasks necessary to promote health.[51] A prior study by Wolf and colleagues already underscores the value of self-efficacy in overcoming literacy barriers in HIV medication adherence.[2] Yet chronic disease self-management programs infrequently mention social stigma specifically as a potential barrier.[51–53] It is possible that social stigma concerns could be addressed through greater patient activation, but this requires further study. Limited evidence is currently available that demonstrates ways to remediate stigma concerns, although interventions targeting patient coping skills and self-efficacy have been cited.[54,55] These types of programs require further testing for use among lower literate HIV patients specifically.

Providers should also be included in the design of effective responses to address stigma and adherence issues for patients with low literacy. Communication skills training modules have already been developed that can aid physicians and other health professionals in discussing the specific implementation of medication schedules within patients' lifestyle and daily routine.[56,57] This allows for preventive problem-solving around potentially difficult scenarios that might lead to missed doses. Ultimately, stigma and literacy concerns should be addressed with strategies that target both patients and providers and have been tested in diverse clinical settings, including community health centers that serve low-income and minority patients who are at greater risk for literacy barriers and may have more challenging social environments.

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