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RESEARCH

Self-efficacy, medication beliefs and adherence to antiretroviral therapy by patients attending a health facility in Pretoria

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Background: Self-efficacy and medication beliefs are known factors that influence adherence to treatment in chronic medical conditions. We carried out a cross-sectional study on human immunodeficiency virus (HIV)-infected patients with the aim of determining the predictive relationship between these two variables and adherence to antiretroviral therapy (ART) at a health facility in Pretoria.
Method: Participants' medication beliefs were assessed using the Beliefs about Medicines Questionnaire. Self-efficacy was evaluated using the HIV Adherence Self-Efficacy Scale, and adherence to ART determined using the AIDS Clinical Trial Group questionnaire.
Results: The mean age of the 232 participants was 40 years (standard deviation 15.6). Seventy per cent were females. Most had been on ART for over two years (87%), and 81.5% were adherent to at least 95% of the prescribed antiretroviral drugs. Nonadherence was highest in those on ART for more than three years (63%). The mean HIV Adherence Self-Efficacy score was 6.45 out of a possible 10. Beliefs held by the participants about the importance of (necessity) and concerns about ART in the management of HIV infection were generally positive. There was a mean score of 4.05 out of 5, indicating a strong belief in the use of ART. There was a strong association between adherence self-efficacy and ART adherence ($p < 0.001$) in the nonadherent participants. Regression analysis showed significance for adherence self-efficacy on ART nonadherence ($p < 0.041$), with adherence self-efficacy explaining 9.8% of the variance.
Conclusion: Patients' adherence self-efficacy explained a significant portion of variation in the nonadherence to ART, which suggests that low adherence self-efficacy is influential in ART nonadherence. Interventions aimed at improving adherence to ART should address adherence self-efficacy.

Keywords: adherence self-efficacy, antiretroviral therapy adherence, beliefs about medicines

Introduction

There is no doubt that antiretroviral therapy (ART) has dramatically improved survival in human immunodeficiency virus (HIV)-infected patients by improving their quality of life and reducing the associated morbidity and mortality of the disease.[1–3] But the earlier optimism generated by its efficacy has dissipated in the face of the enormous challenge of maintaining nearly perfect adherence, without which patients risk adverse outcomes.[4] A major review of studies on ART adherence estimate it to be 77% in sub-Saharan Africa and nonadherence in the adult population to be 33–88%, depending on the measure of adherence employed.[5] ART adherence varies widely from 25–56% in other studies across sub-Saharan Africa.[6–9] Low adherence leads to the development of resistant strains of the virus, rapid disease progression, poor quality of life and premature mortality.[3,10,11] Understanding the cognitive processes that influence health behaviour, such as medication adherence, is helpful when trying to identify barriers and promote treatment adherence.[12–14] The cognitive perspective of health behaviour provides a good framework in which to understand some of these processes. This perspective assumes that attitudes and beliefs, as well as expectations and outcomes, determine patients' health behaviour.[15,16] Using this perspective, self-efficacy and beliefs about medications are cognitive variables,[13] as well as being constructs that are influential in terms of task choice, performance, effort and perseverance, as they pertain to the ability to successfully engage in behaviour leading to desired outcomes.[14,17,18]

These cognitive variables have been shown to be associated with medication adherence in chronic medical conditions.[19–24] Adherence self-efficacy is a known predictor of a wide range of health behaviour by patients on chronic medication, including medication adherence.[21,25] There is strong evidence that cognitive variables, such as self-efficacy, have an influence on adherence in HIV-infected patients.[24,25] Having positive or negative beliefs about medicine is another variable that influences the cognitive perspective of health behaviour. It describes a person's beliefs about the potential costs and benefits of taking medication, and it is an important factor that has influence on medication use behaviour.[26] Various studies across a range of chronic medical conditions have identified similarities in belief that influence medication adherence. These studies have found low rates of adherence to consistently relate to doubts about the personal need for medication.[19,20,27] To further explore a specific correlation that might explain significant factors behind the phenomena of nonadherence in HIV-infected patients, this study aimed to identify the predictive relationship between self-efficacy and beliefs about medicine, and ART adherence, and to explore cognitive factors strongly associated with adherence to ART adherence in HIV-infected patients.

Method

Design

This cross-sectional study was conducted on HIV-infected patients receiving ART at the Hope for Life Centre, a non-governmental organisation supported by the South African government in delivering HIV/acquired immune deficiency syndrome services to HIV-infected patients in the northern suburb of Pretoria. Potential participants were informed during their recruitment that the study aimed to explore the cognitive variables of adherence self-efficacy and beliefs about medicine that influence adherence in patients on ART. The risks, benefits, time commitment and eligibility for the study were explained. Inclusion criteria for the study were being 18 years and older, free of severe opportunistic infection, and without cognitive impairment, as determined by the mini-mental state examination, as well as having the ability to understand English or any of the South African official languages, and to have been on ART for at least a year. Two hundred and thirty-two HIV-infected persons were enrolled in the study, i.e. 10% of the total 2 312 eligible participants. A systematic sampling method was employed to collect the data. All 2 312 eligible participants were serially numbered, and every tenth person was chosen to participate in the study. In the event of a selected participant declining to participate, the intention was to invite the next person on the list, but everyone agreed to take part. Written informed consent was obtained from the participants. They were not offered any incentives. The questionnaires were in English and administered by trained research assistants. The research findings presented in this article form a component of the research approved by the Higher Degrees Committee of the Department of Health Studies (Ethical Committee), at the University of South Africa (HSHDC 62/2011). Permission was obtained from the management of Hope for Life Centre. The research instruments were tested at a separate clinic on randomly selected participants (30), who had similar characteristics to those of the sample selected for this study. This was carried out to ensure the clarity of the contents before administration of the questionnaire.

Measurement

HIV treatment adherence self-efficacy

HIV treatment adherence self-efficacy was measured using the 12-item HIV Treatment Adherence Self-Efficacy Scale (HIV-ASES)[24] without modification. The scale has an 11-point Likert response format, with a possible range of scores from 0 ("cannot do at all") to 10 ("completely certain can do"). The psychometric properties of the instrument, including content validity, construct validity and internal consistency and stability, were established.[24] Participants were asked: "How confident are you that you can do the following?" Participants who scored 5 and higher for each of the 12 items on the HIV-ASES scale were categorised as having a high score and those who scored 4 and below, a low score. A composite adherence self-efficacy score for each participant was calculated by averaging the 12 scores to produce a composite score out of 10 as an index of overall confidence in complying with the treatment schedule.

Beliefs about medicines

Medication beliefs were assessed using the Beliefs about Medicines Questionnaire (BMQ) without modification, an 18-item scale designed to measure the cognitive representations of medication in patients on chronic therapy.[26] The BMQ is made up of two sections, namely the BMQ-Specific (BMQ-S), which assesses the representation of specific medications prescribed for personal use, and the BMQ-General (BMQ-G) which assesses beliefs about medication in general. The instrument has demonstrated robust construct validity and internal consistency.[26,28] The response options for this instrument are rated on a 5-point Likert scale of "strongly agree", "agree", "uncertain", "disagree" and "strongly disagree". A higher score indicates a stronger belief about the corresponding concepts in each subscale. The composite score for each participant for the BMQ-S scale was calculated by averaging the 10 scores to produce a composite score out of 5 as an index of positive beliefs about medicines specifically prescribed. Higher scores indicated a strong belief in the necessity of, and concerns about, specific medicines prescribed for use in ART. The composite score for the BMQ-G was calculated by averaging the eight scores to produce a composite score out of 5 as an index of measure of beliefs about medicines used generally. Higher scores indicated a stronger belief in overuse and harm associated with medicines prescribed for use in medical conditions, i.e. strong negative beliefs about medicines.

Adherence to antiretroviral therapy

Adherence to ART using the first section of the adult AIDS Clinical Trial Group (ACTG) follow-up questionnaire[29] was calculated as the total number of doses taken divided by the total number of doses prescribed over four days and expressed as a percentage. The tool has been used in various studies and found to be a reliable and valid measure of self-reported adherence to ART.[9,30–32] HIV-infected persons who reported taking at least 95% of their prescribed medication were classified as adherent, and those who took less than 95% were classified as nonadherent.

Data analysis

SPSS® programme (version 19) was used for data processing and analysis. Descriptive statistics, including means, percentages and frequency distribution, were applied to the variables for data summation. ART adherence was determined on the basis of whether or not participants were able to adhere to at least 95% of the prescribed antiretroviral (ARV) drug doses. The sample was divided into two groups to separately examine predictors of ART adherence in adherent and nonadherent persons. Pearson's product-moment correlation coefficient analysis was used to assess the bivariate association between adherence self-efficacy, beliefs about specific medicines and beliefs about medicines generally, and ART adherence in both groups. A multivariate model was created for each group of adherent and nonadherent persons. All of the predictors were initially entered into the model and then eliminated one by one using the backward method (backward deletion) based on how insignificant they were (level of significance alpha 0.05).

Results

Table 1 shows the demographic characteristics of the participants. Of the 232 participants, 163 (70%) were females. The mean age was 40 years [(standard deviation (SD) 15.6]. Participants' ages ranged from 18–65 years (a median age of 41.5 years), with 43% aged 35–44 years. The majority of the participants had at least secondary education (70%). Only 7% had no formal education. More than 60% had never married. Most of the participants had been on ART for more than two years (87%). Nonadherence was highest in those who had been on it for more than three years (63%) and least in those who had been on it for approximately one year (14%). Mean adherence for the participants was 95% (SD 13.2). In total, 189 (81.5%) were adherent to at least 95% of their prescribed ARV drugs. The mean composite adherence self-efficacy score was 6.45 (SD 2.47). The scores ranged from

Table 1: Socio-demographic characteristics of the participants

Characteristics	Frequency (%)
Age (years)	
18–24	6 (2.6)
25–34	50 (21.6)
35–44	100 (43.0)
45–54	58 (25.0)
> 55	18 (7.8)
Sex	
Female	163 (70.0)
Marital status	
Never married	141 (61.0)
Married	60 (26.0)
Cohabiting	2 (1.0)
Widowed	12 (5.0)
Separated	12 (5.0)
Divorced	5 (2.0)
Highest level of education	
No schooling	15 (7.0)
Primary education	54 (23.0)
Secondary education	140 (60.0)
Tertiary education	23 (10.0)
Employment status	
Employed	101 (43.5)
Unemployed	131 (56.5)
Duration of antiretroviral therapy use	
1–2 years	30 (13.0)
2–3 years	74 (32.0)
More than 3 years	128 (55.0)

Table 2: Correlation matrix for the HIV Adherence Self-Efficacy Scale, the Beliefs about Medicines Questionnaire-Specific, the Beliefs about Medicines Questionnaire-General and AIDS Clinical Trial Group questionnaire

Descriptor	BMQ-S	BMQ-G	Adherence
HIV-ASES	$r = 0.171$ $t = 2.626$ $p = 0.009$	$r = 0.037$ $t = 0.564$ $p = 0.573$	$r = 0.036$ $t = 0.539$ $p = 0.590$
BMQ-S	–	$r = 0.419$ $t = 7.004$ $p < 0.001$	$r = 0.040$ $t = 0.606$ $p = 0.545$
BMQ-G	–	–	$r = 0.219$ $t = 3.403$ $p < 0.001$

BMG-G: Beliefs about Medicines Questionnaire-General, BMQ-S: Beliefs about Medicines Questionnaire-Specific, HIV-ASES: HIV Adherence Self-Efficacy Scale Number of valid cases = 232, *r* = Pearson's product-moment correlation coefficient, *t* = Student's *t*-statistic, *p* = probability

Table 3: Correlation matrix for HIV Adherence Self-Efficacy Scale, the Beliefs about Medicines Questionnaire-Specific, the Beliefs about Medicines Questionnaire-General and AIDS Clinical Trial Group questionnaire for adherence < 95%

Descriptor	BMQ-S	BMQ-G	Adherence
HIV-ASES	$r = 0.711$ $t = 6.483$ $p = 0.000$	$r = 0.373$ $t = 2.575$ $p = 0.014$	$r = 0.313$ $t = 2.107$ $p = 0.041$
BMQ-S	–	$r = 0.459$ $t = 3.304$ $p = 0.002$	$r = 0.130$ $t = 0.838$ $p = 0.407$
BMQ-G	–	–	$r = 0.145$ $t = 0.937$ $p = 0.354$

BMG-G: Beliefs about Medicines Questionnaire-General, BMQ-Specific: Beliefs about Medicines Questionnaire-S, HIV-ASES: HIV Adherence Self-Efficacy Scale Number of valid cases = 43, *r* = Pearson's product-moment correlation coefficient, *t* = Student's *t*-statistic, *p* = probability

0.17–10 (a median of 7.08). Only one participant scored a perfect score of 10, with a high score indicating greater self-efficacy. The participants' composite scores on the BMQ-S ranged from 2.9–4.9, with both a median and mean of 4.05 (SD 0.42). Higher scores indicated stronger beliefs in the ARV drugs prescribed. The BMQ-G mean composite score was 3.18 (SD 0.5). The scores ranged from 1.87–4.62, with a median of 3.18. Higher scores indicated stronger beliefs in overuse and harm associated with medicines prescribed for use in medical conditions, i.e. strong negative beliefs about medicine.

Table 2 shows the correlation matrix of HIV-ASES, BMQ-S, BMQ-G and ACTG when tested for significant relationships using Pearson's product-moment correlation coefficient. Analyses for the participants showed that general beliefs about medicines and adherence to ART were correlated. The two subscales of BMQ, i.e. the BMQ-S and the BMQ-G, also demonstrated correlation. When the scores of the 43 nonadherent participants were isolated and independently correlated with the HIV-ASES, BMQ-S and BMQ-G measures (Table 3), there was a weak positive correlation between HIV-ASES and ACTG ($r = 0.313$, $t = 2.107$, $p = 0.041$). There was also a weak positive correlation between HIV-ASES and BMQ-G ($r = 0.373$, $t = 2.575$, $p = 0.014$), a moderate positive correlation between BMQ-S and BMQ-G ($r = 0.459$, $t = 3.304$, $p = 0.002$) and a strong positive correlation between HIV-ASES and BMQ-S ($r = 0.711$, $t = 6.483$, $p < 0.001$). The predictors were initially entered into the model and then eliminated one by one using the backward method (backward deletion) based on how insignificant they were (level of significance alpha 0.05). A backward stepwise regression of all patient scores indicated significance for BMQ-G using the ACTG questionnaire [F (1, 231) = 11 583, $p < 0.001$], with BMQ-G explaining 4.8% of the variance. When regression analysis was run on only those 43 patients who were 95% or less adherent, HIV-ASES (self efficacy) had significant influence on adherence to ART (on ACTG) [F (1, 41) = 4.440, $p = 0.041$], with HIV-ASES explaining 9.8% of the variance.

Discussion

The mean adherence self-efficacy score of 6.45 out of a possible 10 compares well with a previous study by Berg et al[33] whereby the mean adherence self-efficacy was a moderate 1.81 on a scale of 0–3 in a study that sought to ascertain if self-efficacy and depression mediated the relationship between pain and adherence to ART in HIV-infected current and former drug users enrolled in a methadone programme in the USA. Within the context of adherence self-efficacy with respect to ART, patients who demonstrated sound confidence in carrying out the tasks were shown to adhere well to the treatment, and those with low confidence were shown to be nonadherent to treatment.[24] The use of medication is strongly influenced by patients' perceptions about the benefits of taking such medication.[16] Positive or negative medication beliefs influence medication use behaviour. Beliefs held by the respondents were generally positive about the importance (necessity) of ART and concerns about it in the management of HIV infection. The mean score of 4.05 out of 5 indicated a strong belief in the use of ART. Strong positive beliefs held by the participants about the necessity of, and concerns about, medication use were in line with findings from the literature. The research suggests that patients who are highly adherent hold positive beliefs about the use of medications for chronic medical conditions.[19,20,27] The mean score of the participants was 3.18 out of a possible 5 using the BMQ-G. The participants demonstrated strong beliefs (i.e. negative beliefs) about perceived overuse and harm associated with medications generally used in medical conditions. Perceived beliefs about general harm and the overuse of medicine have been shown to remain stable over time, irrespective of changes in health status.[27] The implication of this for patients on chronic medication is that the general beliefs that they held about medicine remained a useful variable for intervention in enhancing adherence over a prolonged period as they did not change quickly.

The correlation found between the two subscales of BMQ was similar to that found in an earlier study in which a positive correlation was reported between the two subscales used with respect to patients on chronic treatment.[19] The findings in this study differ slightly to those of Gauchet et al,[34] who in their French study, examined the extent to which medication adherence in HIV patients related to social and psychological variables. Although the authors found patient beliefs about medicine to relate to adherence, as found in the current study, their findings showed that the influence of beliefs about medicine on medication adherence was also mediated by the patient-provider relationship and by HIV illness or medication representation on the part of the patients. HIV adherence self-efficacy was a significant variable in the regression analysis predicting adherence to ART in patients who were nonadherent, indicating that HIV adherence self-efficacy is a weak predictor of ART adherence in patients who are nonadherent to therapy. This study failed to confirm beliefs about the necessity of medicine (BMQ-S) as a predictor of adherence to medication. Perceived necessity and associated beliefs have been shown to predict medication use behaviour with respect to other chronic illnesses.[19,20,27]

However, it is difficult to predict which patients will adhere to treatment as past adherence is the only predictor of future adherence.[35] The results of our study, although modest, suggest that adherence counselling in ART cannot assume that it is enough to explore only socio-demographic characteristics as potential barriers to ART adherence. The findings of this study support the premise that adherence intervention needs to address patients' beliefs about their medication. The results also demonstrate that adherence self-efficacy must be explored in patients who are to be initiated on ART as this cognitive variable is highly predictive of nonadherence to ART. It is well established that adherence levels change over time as a "moving target", and that the longer a patient stays on ART, the poorer adherence is likely to become.[35,36] The results of our study also confirm this statement as the majority (63%) of the nonadherent participants were those who had been taking ART for over three years. Therefore, the study indicates that a cognitive-behavioural factor, such as low adherence self-efficacy, influences adherence to ART, and is in agreement with the findings in the literature.

Limitations of the study

Interpretation of the findings presented here must be considered in the light of the study's strengths and limitations. The use of a cross-sectional design limited the degree to which causal inferences and generalisations could be made from the research findings. Systematic sampling also has its limitations. This study was conducted in a public health facility that provides free ART services and psycho-social support to patients on ART. Certain socio-economic factors which have been described as barriers to adherence may not have affected the participants in this study. The self-reporting questionnaire that was used was another limitation. Self-reporting can be affected by participant motivation, poor recall and social desirability in responding. Adherence to ART may have been overestimated by the participants and nonadherence may have been under-reported. To limit these, participants were told to respond honestly to the questionnaire as there were no punitive measures for nonadherence.

Conclusion

In conclusion, patients' adherence self-efficacy explained a significant portion of variation in nonadherence to ART. This suggests that patients with low adherence self-efficacy are at greater risk of nonadherence to ART. This finding is very important in ART adherence monitoring. Individuals with low self-efficacy who are at greater risk of nonadherence could be identified before the initiation of ART and subjected to focused interventions to address their low self-efficacy, which would subsequently enhance their adherence to medication.

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