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Perceived Family Support and Antiretroviral Adherence in HIV-Positive Individuals: Results from a Community-Based Positive Living With HIV Study

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Perceived Family Support and Antiretroviral Adherence in HIV-Positive Individuals: Results from a Community-Based Positive Living With HIV Study

Krishna C. Poudel, David R. Buchanan, Rachel M. Amiya, and Kalpana Poudel-Tandukar

Abstract

The purpose of this study was to examine the association between perceived family support, either positive or negative, and adherence to antiretroviral medication regimens among HIV-positive individuals in the Kathmandu Valley, Nepal. We measured past 3-month antiretroviral adherence among 233 HIV-positive individuals, in relation to perceived family support, both positive (in terms of emotional and instrumental support) and negative (in the form of negative interactions), using the 10-item Nepali Family Support and Difficulty Scale. Medium and high levels of perceived emotional support from family were associated with reduced risk of antiretroviral nonadherence, compared with low levels of perceived emotional support (adjusted odds ratio [AOR] = 0.37, 95% confidence interval [CI] [0.16, 0.88], and AOR = 0.23, 95% CI [0.08, 0.64], respectively). Conversely, higher levels of felt emotional distance (AOR = 1.46, 95% CI [1.00, 2.14]) and experienced physical harm (AOR = 2.04, 95% CI [1.07, 3.91]) were associated with increased risk of nonadherence. The results support the recommendation that service providers need to be aware of the significant role of family support in shaping antiretroviral adherence and to consider ways to strengthen positive family support while minimizing negative family interactions to increase adherence rates.

Keywords

family, social support, antiretroviral therapy, medication adherence, HIV or AIDS, Nepal

Background

Promoting and sustaining long-term medication adherence among HIV-positive individuals has become an important element of modern HIV care. Globally, the availability of antiretroviral therapy (ART) is associated with reduced rates of morbidity and mortality as well as improved quality of life for HIV-positive individuals.[1–4] To realize the full benefits of ART, however, it is important for HIV-positive individuals to maintain high levels of medication adherence.[5–8] Dramatic increases in viral load have been found within days of treatment withdrawal or missed antiretroviral doses.[9] Moreover, irregular adherence to medication can lead to treatment failure as well as to the development of drug-resistant strains of HIV.[10]

Family support has a potentially important role to play in promoting ART adherence among HIV-positive individuals. Studies have found a positive association between measures of family support and ART adherence.[11–14] Such results indicate that familial ties play an important role in health behaviors, through illness adaptation,[15] coping,[16] and medical or health care utilization.[17] Similarly, a supportive family environment has been found to decrease disease-related negative affect[18,19] among HIV-positive individuals, particularly for those harboring fears about the prospect of isolation and rejection by family members.[20–22]

Conversely, other studies have found nonsignificant[23] or negative effects of family interactions on ART adherence among HIV-positive individuals when there is a fear of stigma and discrimination.[24–26] In families with low levels of attachment, affected individuals may not discuss personal issues,[27] including HIV diagnosis, ART initiation, or use of antiretroviral medicines. Often, HIV-positive individuals may not disclose their health status to family members,[28] leading to a lack of family support to improve medication adherence and other health outcomes. These findings underscore the importance of investigating the influence of both positive and negative aspects of family support on ART adherence. Yet, few studies have examined the potential impacts of positive and negative interactions within familial relationships simultaneously.

To fill this gap, we explored the association between both perceived positive and perceived negative family support and ART nonadherence among HIV-positive individuals in the Kathmandu Valley, Nepal. The findings of this study will be useful in developing more carefully tailored interventions to promote ART adherence and, thereby, to maintain favorable treatment outcomes over the long term.

Methods

Design and Participants

This study is based on data from the Positive Living with HIV study, a longitudinal study conducted among HIV-positive individuals in the Kathmandu Valley, Nepal, details of which have been reported elsewhere.[29–33] The Kathmandu Valley consists of three districts (Kathmandu, Bhaktapur, and Lalitpur) with an estimated population of 2.5 million in 2011.[34] Nepal shares several common characteristics with other resource-limited countries in Asia, including a high burden of HIV among the high-risk populations but low prevalence in the general population, and low ART coverage.[35] Although overall HIV prevalence was 0.3% in 2011, with an estimated 50,200 adults (aged 15–49 years) living with HIV,[36] reported HIV prevalence was much higher among certain high-risk populations, including injection drug users (6.3%) and female sex workers (4.2%).[37] Regarding treatment coverage, free ART services were introduced in the country in 2004, but coverage of eligible individuals was only 23.7% in 2011.[37] Seven of the 44 total ART sites in the country are located in the Kathmandu Valley.[38] Several nongovernmental organizations (NGOs) have been assisting these sites by facilitating the hospital visits of HIV-positive individuals for consultation, ART initiation, CD4+ cell count monitoring, and other services.[32] As necessary, these NGOs also collect antiretroviral medicines for their registered members from the designated ART clinic and distribute them to their homes.

In February–March 2010, we recruited 322 participants through a network of five NGOs working with HIV-positive individuals in the Kathmandu Valley. The inclusion criteria for participants were as follows: aged 18 to 60 years, self-reported diagnosis of HIV-positive status, residence in the Kathmandu Valley, and willingness to participate in the study voluntarily. For this study, participants who were not under ART were excluded, resulting in a final study population of 233 HIV-positive individuals (122 men and 111 women).

Procedures

Data were collected by face-to-face interview using a structured questionnaire administered in Nepali. Adopting items from previous studies conducted in Nepal,[39–42] the questionnaire was first developed in English. Additional questions were then translated into the Nepali language and back-translated into English for verification of semantic equivalence. The Nepali version was revised based on back-translation, pretested among 30 participants, and finalized on the basis of the pretest results.

Four interviewers were hired for data collection. The first author provided a day-long training on the contents of the questionnaire and interview techniques. Using the Nepali language questionnaire, the interviewers conducted in-person interviews individually in a private setting. Each interview lasted approximately 45 to 60 minutes. Each participant received 100 Nepali rupees (approximately US $1.35) to cover transportation costs. The first and last authors supervised the fieldwork. They organized review sessions at the end of each day with all the field-team members. In these sessions, they reemphasized the importance of reassuring participants of the confidentiality of their information, checking the completeness of the survey prior to interview completion, and asking questions to each participant in the same manner to minimize within – and between-participant variability.

Measures

Perceived family support. As reported earlier,[43,44] perceived family support was measured using the 10-item Nepali Family Support and Difficulty Scale ($\alpha = .87$) specifically developed for use in Nepal.[45] The items measured participants' perceptions of both support from and negative interactions with family members in the past year. Response categories ranged from 0 *Not at all* to 3 *All the time*. Before analysis, we reversed the scores for negatively formulated items measuring negative family interaction. Then, we obtained the total perceived family support scores by summing all 10 items. With a range of 0 to 30, higher scores indicated higher levels of perceived family support. Finally, the total score was categorized by tertiles into *high* (27–30), *medium* (23–26), and *low* (0–22) levels for statistical analyses.

To measure specific dimensions of family support, the scale was further divided into three subscales: emotional support (four items, $\alpha = .79$, e.g., "How much can you share your feelings with your family members?"), instrumental support (two items, $\alpha = .66$, e.g., "How much does your family meet your basic needs?"), and negative interaction (four items, $\alpha = .74$, e.g., "How much do you feel your family has physically hurt you?"). Similar to overall scores, total scores on each subscale were categorized as *high*, *medium*, and *low* by tertiles.

ART adherence. ART adherence was measured by asking participants to recall their intake of prescribed doses of antiretroviral medicines in the previous 3 months. To minimize recall bias, first, participants were asked how many doses of antiretroviral medicines they had missed over the previous 4 days. Then, they were asked if they forgot to take antiretroviral medicines over the previous 1 month, 2 months, and 3 months. As complete adherence is considered essential in stopping HIV replication,[5] participants who reported never forgetting to take their antiretroviral medicines in the past 3 months were considered as *adherent*, while those who reported forgetting at least one dose during that same period were categorized as *nonadherent* for the purposes of our study.

Covariates. Adopting questionnaire items from those used in previous studies,[39–42] we measured key sociodemographic, drug and alcohol use, and HIV-specific clinical and psychological factors that might have potential associations with ART adherence. We categorized participants' education into *Up to primary* or *Secondary or higher* levels from the reported years of formal education. Similarly, we categorized participants' employment status as *Employed* or *Unemployed* from participants' reports of their specific types of work. We asked participants if they had disclosed their HIV status to any family members (Yes or No). Participants' current smoking status (Smoker or Nonsmoker) was classified based on reported smoking frequency.[46] We asked participants if they had used any illicit drugs in the past 6 months (Yes or No) and if they had consumed alcohol in the past 30 days (Yes or No). We assessed illness history by asking, "In the past 12 months, did you suffer from any type of disease including minor illnesses?" (Yes or No).

As reported elsewhere,[47] we measured HIV symptom burden using a 16-item HIV Symptom Index based on a 1-month recall period ($\alpha = .92$). The original scale had 20 items.[48] However, we omitted four items (*Sadness, Anxiety, Sleep trouble*, and *Sex problems*) to avoid overlap with items in the measure of depressive symptoms. The items had a 5-point response scale ranging from 0 *I don't have this problem* to 4 *I have this problem and It bothers me a lot*. We obtained the total score for the scale by summing the scores of all 16 items. We then categorized the score level as *high* (above the median) or *low* (below or equal to the median) for statistical analysis.

We measured internalized stigma using a seven-item scale ($\alpha = .74$) adopted from a previous study carried out among HIV-positive individuals[49] (e.g., "I am ashamed that I am HIV-positive"). Participants indicated either agreement (1) or disagreement (0) with each of the scale items. We obtained the total score for internalized stigma by summing the scores of all seven items, with higher scores suggesting a greater burden of felt stigma. Finally, the score was categorized as *high* (equal to or above the median) or *low* (below the median) for statistical analysis.

We used the 21-item Beck Depression Inventory-I, Nepali version[50,51] to assess depressive symptoms over the past 2 weeks ($\alpha = .89$). Participants responded to the items on a 4-point Likert scale, with a total range for the instrument of 0 to 61. The Nepali version of the scale has been validated for use in Nepal.[50] Results from the validation study indicate that a score of 20 or higher indicates moderate to severe depression requiring mental health intervention.

Statistical Analyses

First, we report proportions for sociodemographic, health, alcohol, drug, and ART adherence-related variables, as well as mean and standard deviation (*SD*), or median and interquartile range (IQR) as appropriate. Second, we compared participant characteristics according to reported high, medium, or low levels of perceived family support. Third, we tested the association between perceived family support and ART nonadherence using bivariate and multivariable logistic regression analyses to estimate AORs with 95% CIs. For this, we first examined the bivariate associations between each covariate and ART nonadherence. As Katz[52] recommends, we then performed multivariable logistic regression analysis including all covariates that had a bivariate p value $\leq .10$. Our final multivariable model adjusted for ART duration, illicit drug use, depressive symptoms, and perceived family support. Fourth, we examined associations of the emotional support, instrumental support, and negative interaction subscale scores with ART nonadherence using multivariable logistic regression analyses adjusting for ART duration, illicit drug use, and depressive symptoms. Finally, we examined the association of each individual perceived family support item with ART nonadherence using multivariable logistic regression analyses. We used SPSS Statistics 22.0 (SPSS Inc., Chicago, USA) to perform all of the analyses, with statistical significance set at $p < .05$.

Ethical Considerations

All participants were individually informed of the study procedures using a prepared information sheet, after which they voluntarily provided written informed consent to participate in the study. All interviews were conducted in a private setting. Prior to each interview, interviewers reassured participants of the confidentiality of their personal information, protections reinforced by using numerical codes in place of names in all records. The study procedures were approved by the Research Ethics Committee of the Nepal Health Research Council in Kathmandu, Nepal; the National Center for Global Health and Medicine in Tokyo, Japan; Waseda University in Tokyo, Japan; and the institutional review board of the University of Massachusetts Amherst.

Results

General Characteristics

The mean age of the participants was 35.2 ($SD = 7.1$) years. The median duration since testing positive for HIV was 53 (IQR = 24–95) months. Overall, 52.4% of participants were men, 71.2% were currently married, 69.1% were employed, and 21.2% reported illicit drug use in the past 6 months (Table 1). With respect to the ART regimen, 226 (96.3%) of participants were on two Nucleoside Reverse Transcriptase Inhibitors (NRTI; either *Lamivudine and Zidovudine* or *Lamivudine and Stavudine*) and one Nonnucleoside Reverse Transcriptase Inhibitor (either Efavirenz or Nevirapine); six (2.6%) participants were on two NRTI (Tenofovir and Didanosine) and one Protease Inhibitor (Lopinavir or Ritonavir); and one (0.4%) participant was on three NRTI (Abacavir, Zidovudine, and Lamivudine). The median duration on antiretroviral treatment was 24 months (IQR = 9–39). Nearly two thirds of participants reported a history of disease in the past 12 months. The mean score (*SD*) for internalized stigma was 10.9 (2.2).

Characteristics of Participants by Perceived Family Support

The mean score for perceived family support was 22.5 ($SD = 6.2$). Higher proportions of women and currently single participants reported low levels of perceived family support (Table 2). In addition, higher proportions of participants with lower levels of education, with a history of any disease in the past 12 months, and with higher levels of internalized stigma reported low levels of perceived family support.

Rates of ART Nonadherence

None of the participants reported missing any doses of antiretroviral medicines in the past 4 days. Seven participants (3.0%) reported missing at least one dose of antiretroviral medicines during the past week. Nine participants (3.9%) reported missing doses of antiretroviral medicines in the past month, 18 participants (7.7%) in the past 2 months, and 41 participants (17.6%) in the past 3 months.

Association Between Perceived Family Support and ART Nonadherence

A higher proportion of participants with low levels of perceived family support reported a history of missing antiretroviral medication doses in the past 3 months; the nonadherence rate among those with low levels of perceived family support was 25.6%, whereas the rates among those with medium and high levels of perceived family support were 15.9% and 9.2%, respectively

Table 1. Demographic and Health Characteristics of Participants ($N = 233$).

Characteristic	*n*	(%)
Age (years)		
20–34	119	(51.1)
35–60	114	(48.9)
Sex		
Female	111	(47.6)
Male	122	(52.4)
Current marital status		
Single	67	(28.8)
Married	166	(71.2)
Education[a]		
Up to primary	105	(45.5)
Secondary or higher	126	(54.5)
Employed		
No	72	(30.9)
Yes	161	(69.1)
Months since testing HIV positive		
1–52	116	(49.8)
53+	117	(50.2)
HIV disclosure to any family member[b]		
No	40	(17.4)
Yes	190	(82.6)
Illicit drug use, past 6 months		
No	207	(88.8)
Yes	26	(21.2)
Current smoker		
No	137	(58.8)
Yes	96	(41.2)
Alcohol use, past 30 days		
No	212	(91.0)
Yes	21	(9.0)
Current antiretroviral therapy regimen		
Lamivudine, Zidovudine, and Nevirapine	117	(50.2)
Lamivudine, Zidovudine, and Efavirenz	61	(26.2)
Lamivudine, Stavudine, and Nevirapine	44	(18.9)
Lamivudine, Stavudine, and Efavirenz	4	(1.7)
Tenofovir, Didanosine, and Lopinavir or Ritonavir	6	(2.6)
Abacavir, Zidovudine, and Lamivudine	1	(0.4)

(continued)

Table 1. Continued.

Characteristic	*n*	(%)
Months on antiretroviral therapy		
1–23	114	(48.9)
24+	119	(51.1)
History of any disease in past 12 months		
No	83	(35.6)
Yes	150	(64.4)

[a]Two participants did not respond to this question.
[b]Three participants did not respond to this question.

(Table 3). In bivariate logistic regression analysis, low levels of perceived family support were associated with increased risk of ART nonadherence compared with high levels of perceived family support ($OR = 3.38$, 95% CI [1.28, 8.91]). In multivariable logistic regression analysis, those with low levels of perceived family support had 3.39-fold higher odds of reporting ART nonadherence compared with those with high levels of perceived family support. Similarly, those participants who had been on antiretroviral treatment for longer durations and who reported illicit drug use were more likely to report a history of ART nonadherence.

Table 4 shows the results of multivariable analyses for perceived family support subscale scores and individual items associated with ART nonadherence. Of the three subscales, only emotional support was statistically associated with ART nonadherence; namely, reporting medium (AOR = 0.37, 95% CI [0.16, 0.88]) and high (AOR = 0.23, 95% CI [0.08, 0.64]) levels of emotional support were associated with reduced risk of ART nonadherence compared with reporting low levels of emotional support. All four items of emotional support were significantly associated with ART adherence after adjusting for potential confounders.

Conversely, two negative interaction items were statistically associated with ART nonadherence. Higher levels of felt emotional distance from family was associated with increased risk of ART nonadherence (AOR = 1.46, 95% CI [1.00, 2.14]). Similarly, a history of higher levels of physical harm by family members was associated with increased risk of ART nonadherence (AOR = 2.04, 95% CI [1.07, 3.91]). In addition, a higher proportion ($n = 6$, 40.0%) of participants who reported the experience of more frequent physical harm from family had not disclosed their HIV status to their families than among those who reported less frequent physical harm from family ($n = 34$, 15.8%, $p = .017$).

Discussion

This study revealed that the experience of a low level of perceived family support—emotional support, in particular—was associated with increased risk of

Table 2. Sociodemographic and Health Characteristic of Participants According to Reported Level of Perceived Family Support ($N = 233$).

	Perceived family support level[a]						
	High ($n = 65$)		Medium ($n = 82$)		Low ($n = 86$)		
Variable	*n*	(%)	*n*	(%)	*n*	(%)	*p*
Age (years)							
20–34	29	(24.4)	43	(36.1)	47	(39.5)	.452
35–60	36	(31.6)	39	(34.2)	39	(34.2)	
Sex							
Female	16	(14.4)	35	(31.5)	60	(54.1)	<.001
Male	49	(40.2)	47	(38.5)	26	(21.3)	
Current marital status							
Single	13	(19.4)	18	(26.9)	36	(53.7)	.003
Married	52	(31.3)	64	(38.6)	50	(30.1)	
Education[b]							
Up to primary	17	(16.2)	38	(36.2)	50	(47.6)	<.001
Secondary or higher	47	(37.3)	44	(34.9)	35	(27.8)	
Employed							
No	17	(23.6)	26	(36.1)	29	(40.3)	.597
Yes	48	(29.8)	56	(34.8)	57	(35.4)	
Months since testing HIV positive							
1–52	32	(27.6)	43	(37.1)	41	(35.3)	.822
53+	33	(28.2)	39	(33.3)	45	(38.5)	
HIV disclosure to any family member[c]							
No	6	(15.0)	13	(32.5)	21	(52.5)	.041
Yes	58	(30.5)	69	(36.3)	63	(33.2)	
Illicit drug use, past 6 months							
No	55	(26.6)	74	(35.7)	78	(37.7)	.442
Yes	10	(38.5)	8	(30.8)	8	(30.8)	
Current smoker							
No	33	(24.1)	47	(34.3)	57	(41.6)	.150
Yes	32	(33.3)	35	(36.5)	29	(30.2)	
Alcohol use, past 30 days							
No	57	(26.9)	77	(36.3)	78	(36.8)	.423
Yes	8	(38.1)	5	(23.8)	8	(38.1)	

(continued)

Table 2. Continued.

	Perceived family support level[a]						
	High ($n = 65$)		Medium ($n = 82$)		Low ($n = 86$)		
Variable	*n*	(%)	*n*	(%)	*n*	(%)	*p*
History of any disease, past 12 months							
No	28	(33.7)	34	(41.0)	21	(25.3)	.023
Yes	37	(24.7)	48	(32.0)	65	(43.3)	
Months on antiretroviral therapy							
1–23	30	(26.3)	38	(33.3)	46	(40.4)	.567
24+	35	(29.4)	44	(37.0)	40	(33.6)	
Internalized stigma score (Median: 11)							
Low (7–10)	42	(41.6)	34	(33.7)	25	(24.8)	<.001
High (11–14)	23	(17.4)	48	(36.4)	61	(46.2)	

[a]Perceived family support scores (High: 27–30, Medium: 23–26, and Low: 0–22).
[b]Two participants did not respond to this question.
[c]Three participants did not respond to this question.

ART nonadherence among the surveyed HIV-positive individuals. Moreover, more frequent experience of physical harm by family and higher levels of felt emotional distance from family members was associated with increased risk of ART nonadherence. To our knowledge, this is the first study exploring the association of both positive and negative aspects of family support with ART adherence among HIV-positive individuals, while adjusting for potential confounders.

Adding to existing literature on the positive association between overall family support and ART adherence,[11–14] our study provides further information on the distinct roles of both positive and negative elements of family support on ART adherence among HIV-positive individuals. In our study, positive forms of family support, particularly in the emotional domain, appear to be protective toward improving ART adherence. As reported by previous studies,[18,19] perception of a supportive family environment in the form of felt emotional support is likely to decrease negative affect associated with the disease, probably by increasing self-esteem and adaptive coping. High levels of family attachment and adaptiveness are expected in a positive family environment, as reflected in the items of the emotional support subscale. Family members residing in such an environment are likely to adapt better to unexpected events and transitions[27] such as HIV diagnosis, treatment initiation, and adverse side effects or setbacks in the disease progression. Furthermore, HIV or AIDS-related knowledge and treatment may be expected to be better absorbed[53] and used to maintain medication adherence in such environments.

Table 3. Odds Ratios and 95% CIs for ART Nonadherence by Level of Perceived Family Support (N = 233).

	ART nonadherence								
	Yes		No						
Variable	n	(%)	n	(%)	OR	(95% CI)	AOR	(95% CI)	*P*
Perceived family support									
High (27–30)	6	(9.2)	59	(90.8)					
Medium (23–26)	13	(15.9)	69	(84.1)	1.85	(0.66–5.17)	1.86	(0.63–5.46)	0.259
Low (0–22)	22	(25.6)	64	(74.4)	3.38	(1.28–8.91)	3.39	(1.19–9.65)	0.022
Age (in years)									
20–34	25	(21.0)	94	(79.0)					
35–60	16	(14.0)	98	(86.0)	0.61	(0.30–1.22)			
Sex									
Female	22	(19.8)	89	(80.2)					
Male	19	(15.6)	103	(84.4)	0.74	(0.38–1.96)			
Current marital status									
Single	13	(19.4)	54	(80.6)					
Married	28	(16.9)	138	(83.1)	0.84	(0.40–1.74)			
Education[a]									
Up to primary	19	(18.1)	86	(81.9)					
Secondary or higher	22	(17.5)	104	(82.5)	0.95	(0.48–1.88)			
Employed									
No	11	(15.3)	61	(84.7)					
Yes	30	(18.6)	131	(81.4)	1.27	(0.59–2.70)			
Months since testing HIV positive									
1–52	16	(13.8)	100	(86.2)					
53+	25	(21.4)	92	(78.6)	1.69	(0.85–3.38)			
ART duration (in months)									
1–23	14	(12.3)	100	(87.7)					
24+	27	(22.7)	92	(77.3)	2.09	(1.03–4.24)	3.01	(1.38–6.56)	0.005
HIV disclosure to any family member									
No	7	(17.5)	33	(82.5)					
Yes	34	(17.9)	156	(82.1)	0.97	(0.39–2.38)			
Illicit drug use, past 6 months									
No	33	(15.9)	174	(84.1)					
Yes	8	(30.8)	18	(69.2)	2.34	(0.94–5.83)	3.17	(1.15–8.69)	0.025
Current smoker									
No	21	(15.3)	116	(84.7)					
Yes	20	(20.8)	76	(79.2)	1.45	(0.73–2.86)			
Alcohol use, past 30 days									
No	37	(17.5)	175	(82.5)					
Yes	4	(19.0)	17	(81.0)	1.11	(0.35–3.49)			

(continued)

Table 3. Continued.

	ART nonadherence								
	Yes		No						
Variable	n	(%)	n	(%)	OR	(95% CI)	AOR	(95% CI)	*P*
Depressive symptoms									
No (BDI-I < 20)	23	(13.8)	144	(86.2)					
Yes (BDI-I ≥ 20)	18	(17.3)	48	(72.7)	2.34	(1.16–4.71)	2.10	(0.97–4.54)	0.059
HIV symptom burden									
Low (16–32)	16	(13.7)	101	(86.3)					
High (33–64)	25	(21.6)	91	(78.4)	1.73	(0.87–3.45)			
History of any disease, past 12 months									
No	13	(15.7)	70	(84.3)					
Yes	28	(18.7)	122	(81.3)	1.23	(0.60–2.54)			
Internalized stigma score									
Low (7–10)	16	(15.8)	85	(84.2)					
High (11–14)	25	(18.9)	107	(81.1)	1.24	(0.62–2.47)			

Note. AOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio; ART = antiretroviral therapy; BDI-I = Beck Depression Inventory-I.

[a]Two participants did not respond to this question.

In terms of negative family interactions, higher levels of physical harm by family and higher levels of felt emotional distance from family significantly increased the likelihood of ART nonadherence among our participants. The familial relationships can be a source of tension in families with low levels of attachment[27] or having frequent negative interactions. In such environments, family members may not be helpful in supporting individuals to accept their HIV diagnosis, transition smoothly to ART initiation, or maintain consistent ART adherence. One previous study reported a negative effect of home-based peer adherence support on treatment outcomes among HIV-positive individuals residing in the most vulnerable or dysfunctional families.[54] Some HIV-positive individuals in such families may not disclose their HIV status to their family members. In our study, for example, a significantly higher proportion of the participants who reported experiencing physical harm by their family members had not disclosed their HIV status to any of their family members. However, a history of HIV nondisclosure was not statistically associated with increased risk of ART nonadherence among our participants.

Similar to the results of previous studies carried out in China[55] and India,[56] we found that HIV-positive individuals on ART for longer periods were at significantly increased risk of ART nonadherence compared with those on ART for shorter periods. Unlike our study, however, a separate independent study conducted in Kathmandu did not find any statistical association between the length of ART and ART adherence.[57] The differences in participant

Table 4. Multiple Logistic Regression Analyses on the Association Between Individual Perceived Family Support Items and ART nonadherence (N = 233)[a].

Item[b]	AOR	(95% CI)	*P*
Emotional support			
Feeling shown love and caring by family	0.65	(0.45–0.95)	0.026
Feeling have an important role in family	0.61	(0.40–0.92)	0.019
Feeling involved in family decision making	0.69	(0.50–0.95)	0.024
Feeling able to share feelings with family	0.62	(0.44–0.88)	0.007
Total emotional support score			
High (10–12)			
Medium (7–9)	0.37	(0.16–0.88)	0.025
Low (0–6)	0.23	(0.08–0.64)	0.005
Instrumental support			
Feeling basic needs (food/clothes) met in family	1.03	(0.60–1.77)	0.894
Feeling supported by family when sick	0.77	(0.55–1.07)	0.120
Total instrumental support score			
High (6)			
Medium (5)	0.62	(0.24–1.59)	0.326
Low (0–4)	0.50	(0.21–1.14)	0.102
Negative interaction			
Feeling disliked by family	1.33	(0.90–1.96)	0.143
Feeling (emotionally) distant from family	1.46	(1.00–2.14)	0.048
Having been physically hurt by family member(s)	2.04	(1.07 –3.91)	0.030
Feeling exploited (for household and farming) by family	1.36	(0.92–2.00)	0.122
Total negative interaction score			
High (12)			
Medium (11)	1.71	(0.61–4.76)	0.299
Low (0–10)	1.38	(0.61–3.08)	0.432

Note. AOR = adjusted odds ratio; CI = confidence interval; ART = antiretroviral therapy.
[a]Separate analyses were done for each item of the perceived family support scale, adjusting for ART duration, history of illicit drug use in the past six months, and depressive symptoms.
[b]Each individual item was assessed as a continuous variable.

recruitment strategy (community-based approach in our study vs. clinic-based approach in the other) might explain the discrepancies in these findings. Regardless, the implications of our findings are that HIV-positive individuals would benefit from family support for better adherence over time.

In our study, the rate of nonadherence was higher among those HIV-positive individuals reporting a history of any illicit drug use compared with those without such a history. Consistent with our results, previous studies have also

reported an association between illicit drug use and ART nonadherence among HIV-positive individuals.[57–60] This finding is not surprising, as current illicit drug use is likely to be associated with disruptions in daily activities, thereby leading to greater chance of failure to take antiretroviral medicines. This suggests the need to provide particular support to HIV-positive individuals with a history of illicit drug use to improve their medication adherence.

Limitations

Some limitations should be considered when interpreting our findings. First, we used cross-sectional data for this study and thus cannot infer causality. Longitudinal studies would be necessary to establish clear causal relationships. Second, as our measurements of ART adherence and other variables are based on self-report, participants' responses might have been influenced by a social desirability bias, despite our efforts to minimize such bias by assuring participants of the confidentiality of their information. Third, our study is based on participants' perceived rather than an objective measure of family support, though the distinction may not actually be of real concern, as previous studies have reported an even more important role for perceived support than network size or received support in influencing health and adjustment criteria.[61,62]

Finally, caution is necessary in generalizing our study findings to the country's HIV-positive population as a whole, as our study participants do not represent a random sample of HIV-positive individuals in the study area. More specifically, our findings are applicable to individuals included in the networks of support groups providing services to the HIV-positive population at the community level, as commonly exist in resource-limited countries in Asia and other regions.

Conclusions

Positive family support in the form of perceived emotional support was associated with higher levels of ART adherence, whereas negative family interactions in the form of family-inflicted physical harm and higher levels of felt emotional distance from family were associated with increased risk of ART nonadherence among HIV-positive individuals in the Kathmandu Valley, Nepal.

Our findings have important implications for the design and testing of ART adherence support interventions involving family members. Involving families of HIV-positive individuals with high levels of perceived emotional support in adherence support interventions might improve ART adherence. The goal of the involvement of family members in such cases should be towards building on strengths. On the other hand, involvement of the families of those with more frequent experience of family-inflicted physical harm or higher levels of felt emotional distance from family in adherence support interventions might be more appropriate only with participants' prior consent. The focus of the

involvement of family members in such cases, however, should be geared toward mitigating the harms. Our results may also be of interest to clinicians or other health-care providers assisting HIV-positive individuals who are on ART. Furthermore, our results would be useful in designing training programs for outreach workers involved in providing home-based care services to HIV-positive individuals. However, further longitudinal studies on the role of family support in improving ART adherence among HIV-positive individuals are warranted.

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