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Social factors affecting ART adherence in rural settings in Zambia

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The purpose of this study was to assess the factors that influence ART adherence arising in rural settings in Zambia. A survey was conducted with face-to-face interviews using a semi-structured questionnaire and written informed consent was obtained at ART sites in Mumbwa District in rural Zambia. The questionnaire included items such as the socio-demographic characteristics of respondents, support for adherence, ways to remember when to take ARVs at scheduled times, and the current status of adherence. Valid responses were obtained from 518 research participants. The mean age of the respondents was 38.3 years and the average treatment period was 12.5 months. More than half of the respondents (51%) were farmers, about half (49%) did not own a watch, and 10% of them used the position of the sun to remember when to take ARVs. Sixteen percent of respondents experienced fear of stigma resulting from taking ARVs at work or home, and 10% felt pressured to share ARVs with someone. Eighty-eight percent of the participants reported that they had never missed ARVs in the past four days. Multivariable logistic regression analysis identified age (38 years old or less, odds ratio (OR) = 2.5, 95% confidence interval (CI): 1.3–4.8, $p = 0.005$), "remembering when to take ARVs based on the position of the sun" (OR = 3.3, 95% CI: 1.3–8.8, $p = 0.016$), and "feeling pressured to share ARVs with someone" (OR = 4.4, 95% CI: 1.6–12.0, $p = 0.004$) as independent factors for low adherence. As ART services expand to rural areas, program implementers should pay more attention to more specific factors arising in rural settings since they may differ from those in urban settings.

Keywords: antiretroviral therapy; adherence; rural setting

Introduction

By December 2007, almost three million people living with HIV (PLWH) were estimated to be receiving antiretroviral therapy (ART) in low- and middle-income countries, representing 30% of the estimated population needing antiretrovirals (ARVs) in 2007. Sub-Saharan Africa is now estimated to have more than two million people on ART although four years ago there were 100,000 people on ART and coverage amounted to only 2% (United Nations, 2008).

Zambia is one of the sub-Saharan African countries worst affected by the HIV pandemic. Adult HIV prevalence is about 14% and the number of PLWH is estimated to be 1.2 million (Central Statistic Office et al., 2009). In August 2005, the Zambian Government announced free provision of ARVs to those who are in need in an attempt to achieve the national target of the "3 by 5" initiatives followed by the Universal Access targets. Out of the estimated 280,000 PLWH who are in need of ART, nearly half are believed to have used ART services prior to the end of 2007 (UNAIDS, 2008). ART services have been expanded nationwide in Zambia and conse-quently ART has become increasingly accessible to PLWH in rural areas as well.

Given the living conditions in rural areas, the situation for PLWH in rural Zambia differs substantially from that in urban areas or in developed countries. Those differences should be taken into consideration to devise successful ART expansion programs.

ART adherence is now considered crucial for HIV-positive individuals receiving therapy and an important component for an ART program to succeed. Intervention strategies to support adherence have been found to be important in the achievement of positive outcomes (Amico et al., 2006). Consistently, high levels of adherence are needed for reliable viral suppression (Bangsberg et al., 2000; Paterson et al., 2000) and to prevent drug resistance (Bangsberg et al., 2003; Hecht et al., 1998; Pillay, 2001), disease progression (Bangsberg et al., 2001), and death (Garcia de Olalla et al., 2002; Wood et al., 2003). Many factors, including complicated therapeutic regimens, depression, alcohol and drug use, and changes in daily routines may reportedly impact a

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patient's ability to adhere to these medications (Chesney et al., 2000; Kleeberger et al., 2001). In Zambia, several reports demonstrated factors associated with adherence in rural settings (Birbeck et al., 2009; Carlucci et al., 2008). However, no reports have examined more specific social issues in rural settings as factors influencing adherence to ART. Thus, this study investigated adherence to ART in rural settings in Zambia and assessed social and specific factors that may influence ART adherence in rural settings in order to help improve ART expansion strategies to better suit rural settings.

Methods

Study site

This study was conducted in Mumbwa District, which is located 150 km west of the capital and has a district hospital and 27 rural health centers, where the Ministry of Health has been expanding ART services. Among the health facilities, services were available only at the district hospital and four rural health centers that had approximately 2000 ART clients in total.

Study participants and procedures

Between 25 March and 25 April 2008, all ART clients aged 18 and over that came to the hospital or one of the four rural health centers where ART services were offered were asked to participate in the study. Prior to participation in the study, informed consent was obtained by trained interviewers.

A cross-sectional survey with a semi-structured questionnaire with face-to-face interviews was administered via trained interviewer in the local language. Interviewers were trained in the study protocol including questionnaire and the objectives of the study. Items on the questionnaire included: socio-demographic characteristics of the respondents; travel burden; support for adherence; the most frequently used method to remember when to take ARVs at scheduled times; ownership of a watch, a radio, or a mobile phone; and adherence to ART. In order to evaluate travel burden, time and cost for travel to the ART sites were asked. We asked time for only one-way trip, otherwise some respondents might include waiting time at clinics as travel time. Adherence was assessed by asking participants to report the number of ARV doses missed in the past four days. Participants reporting any missed dose were classified in the non-adherent group, while those reporting no missed doses were classified in the adherent group. In addition, respondents were asked about their

perceived fear of stigma resulting from taking ARVs at home or work and feeling pressured to share ARVs with someone, conditions that were sometimes observed at the sites. The respondents verbally answered all the items and the interviewers recorded their answers. The respondents did not receive any financial profit but did receive a small gift such as cooking oil.

Data analysis

Data were processed and analyzed in SPSS 15.0 for Windows. A logistic regression model was used to compute the relative risk of non-adherence, as indicated by missed doses in the past four days. A chi-square test was used to compare various independent variables in proportions when appropriate. The relative risks of possible factors were estimated by odds ratios (OR) and 95% confidence intervals (CI). In a multivariable logistic regression analysis, we included way to remember when to take ARVs since this variable could be a specific social factor to rural settings. And, independent variables that had a significant relationship with dependent variables at the $p < 0.05$ level were selected and included in the analysis.

Results

A total of 518 ART clients aged 18 and over from the hospital and the rural health centers were asked to participate in the study, and 518 (100%) agreed to respond to the questionnaire.

The mean age of the respondents was 38.3 years (range: 18–72 years) and the average months of treatment were 12.5 (range: 1–50 months) (Table 1). Of the 518 respondents, 206 (40%) were male, 251 (49%) were married or remarried, 266 (51%) were farmers, and 258 (50%) were treated by a rural health center. Two hundred and sixty-two respondents (51%) had a watch and 98 (19%) had a mobile phone. In order to access an ART service, 166 (32%) and 94 (18%) respondents spent more than two hours on one-way travel and more than 10,000 Kwacha (equivalent to 2.5 US$) on the return trip.

Four hundred and fifty-eight respondents (88%) reported no missed doses during the last four days, while 502 (97%) of respondents endorsed "completely" when asked if they understood the need to take ARVs regularly at the same time. The most frequently reported ways to remember when to take ARVs were a watch (245, 47%) and a clock (79, 15%). Of note is the fact that 49 of the respondents (10%) reported using the position of the sun to remember when to take ARVs. Eighty-four (16%) perceived fear of stigma

Table 1. Characteristics of study respondents.

		Setting for ART		
	Total (*n* = 518)	District hospital (*n* = 260)	Rural health centers (*n* = 258)	*P*-value
Average age (year)	38.2 (9.2 SD)	38.0 (9.1 SD)	38.6 (9.3 SD)	–
Gender				
Male	206 (39.8%)	112 (45.0%)	94 (37.0%)	0.069
Female	297 (57.3%)	137 (55.0%)	160 (63.0%)	
Marital status				
Single/Divorce/Widowed	248 (47.9%)	129 (52.4%)	119 (47.0%)	0.227
Married/Remarried	251 (48.5%)	117 (47.6%)	134 (53.0%)	
Occupation				
Government staff member	18 (3.5%)	16 (6.5%)	2 (0.8%)	<0.001
Company employee	16 (3.1%)	12 (4.9%)	4 (1.7%)	
Self-employed	68 (13.1%)	48 (19.6%)	20 (8.3%)	
Farmer	266 (51.4%)	102 (41.6%)	164 (67.8%)	
Housewife	53 (10.2%)	21 (8.6%)	32 (13.2%)	
Other	66 (12.7%)	46 (18.8%)	20 (8.3%)	
Which do you own				
Watch	262 (50.6%)	138 (53.1%)	124 (48.1%)	0.254
Mobile phone	98 (18.9%)	66 (55.0%)	32 (55.0%)	<0.001
Radio	254 (49.0%)	129 (49.6%)	125 (48.4%)	0.791
Television set	109 (21.0%)	83 (55.0%)	26 (55.0%)	<0.001
Average treatment period (month)	12.5 (10.3 SD)	15.2 (10.2 SD)	9.7 (9.7 SD)	
Travel expenses for return trip				
Free of charge	227 (43.8%)	83 (32.0%)	144 (56.7%)	<0.001
Less than 10,000 Kw	192 (37.1%)	101 (39.0%)	91 (35.8%)	
More than 10,000 Kw	94 (18.1%)	75 (29.0%)	19 (7.5%)	
Understanding of need to take ARVs regularly at the same time				
Yes, complete	502 (96.9%)	251 (96.5%)	251 (98.0%)	0.456
Yes, but incomplete	10 (1.9%)	7 (2.7%)	3 (1.2%)	
No	6 (0.8%)	3 (0.8%)	3 (0.8%)	
Way to remember when to take ARVs				
Watch	245 (47.3%)	123 (47.5%)	122 (47.4%)	<0.001
Clock	79 (15.3%)	44 (16.9%)	35 (13.6%)	
Mobile phone	58 (11.2%)	44 (16.9%)	14 (5.4%)	
Radio/Television set	72 (13.9%)	20 (7.7%)	52 (20.2%)	
Position of the sun	49 (9.5%)	20 (7.7%)	29 (11.3%)	
Other	13 (2.5%)	8 (3.1%)	5 (1.9%)	
Adherence support				
None	99 (19.1%)	69 (26.5%)	30 (11.7%)	<0.001
Family	264 (51.0%)	137 (52.7%)	127 (49.6%)	
Other	153 (29.7%)	54 (20.8%)	99 (38.7%)	
Perceived stigma of taking ARVs				
Never experienced stigma	432 (83.7%)	202 (78.0%)	230 (89.5%)	<0.001
Experienced stigma	84 (16.3%)	57 (22.0%)	27 (10.5%)	

Table 1 (*Continued*)

	Total (*n* = 518)	Setting for ART		*P*-value
		District hospital (*n* = 260)	Rural health centers (*n* = 258)	
Felt pressured to share ARVs				
Never pressured	466 (90.5%)	230 (88.8%)	236 (92.2%)	0.191
Felt pressured	49 (9.5%)	29 (11.2%)	20 (7.8%)	
Recent Adherence (missed dose in the past four days)				
Never missed	458 (88.4%)	233 (90.7%)	225 (88.6%)	0.441
One or more	53 (10.2%)	24 (9.3)	29 (11.4%)	

resulting from taking ARVs at home or work, and 49 (10%) had felt pressured to share ARVs with someone such as a family member or friend. About half of the respondents (51%) received support for adherence from their family members.

Bivariate analysis indicated that a younger age, i.e., 38 years or younger (OR = 2.5, 95% CI: 1.3–4.8, $p = 0.005$), and higher travel expenses (OR = 2.3, 95% CI: 1.1–4.8, $p = 0.022$), were associated with being classified in the non-adherent group (Table 2). Perceived fear of stigma resulting from taking ARVs at home or work (OR = 2.3, 95% CI: 1.2 to 4.5, $p = 0.011$) and feeling pressured to share ARVs with someone (OR = 5.7, 95% CI: 2.9 to 11.4, $p < 0.001$) were also significantly associated with being classified in the non-adherent group. In contrast, support for adherence from family related to lower odds of being classified in the non-adherence group in comparison to some other form of support or no support (OR = 0.4, 95% CI: 0.2–0.9, $p < 0.001$).

Multivariable logistic regression analysis was performed with age, cost of the return trip, support for adherence, ways to remember when to take ARVs, perceived fear of stigma resulting from taking ARVs, and feeling pressured to share ARVs with someone (Table 3). A multivariable model demonstrated that age (38 or less; OR = 2.6, 95% CI: 1.3–5.5, $p = 0.009$), ways to remember when to take ARVs (the position of the sun) (OR = 3.3, 95% CI: 1.3–8.8, $p = 0.016$), and feeling pressured to share ARVs with someone (OR = 4.4, 95% CI: 1.6–12.0, $p = 0.004$) were significantly associated with membership in the non-adherent group.

We also found a high association between feeling pressured to share ARVs and perceived fear of stigma (OR = 20.7, 95% CI: 10.4–41.2, $p < 0.001$) and between higher travel expenses and perceived fear of stigma (OR = 1.4, 95% CI: 1.1–1.7, $p = 0.001$).

Discussion

The current study investigated social factors and considered possible conditions affecting the daily lives of patients on ART in rural areas, as well as socio-demographic characteristics related to ART adherence in rural Zambia. Findings demonstrated that age (38 years old or less), "remembering when to take ARVs based on the position of the sun" and "feeling pressured to share ARVs with someone" were independent factors for being classified in the non-adherent group. Given the lives of the participants in the study, conditions related to ART might differ from those in urban areas. In fact, more than half of respondents were farmers, about half did not own a watch, and more than one-third did not use a watch or a clock while nearly 10% used the position of the sun to remember when to take ARVs. It is suggested that PLWH in rural areas had limited ways of knowing the exact time and ways to remember when to take ARVs.

The distance to health care services in particular is longer in rural areas than in urban areas (Perry and Gesler 2000; Whetten et al., 2006). Therefore the distance to ART services and travel expenses are well-known barriers to optimal adherence in rural areas (Grace et al., 1999; Reif et al., 2005; Stout et al., 2004). However, Carlucci et al. (2008) reported that patients in rural Zambia were able to achieve an adherence rate compatible with good clinical outcomes despite long-travel distances. In contrast, we found a trend for high travel expenses to reach ART services to be related to higher odds of classification in the non-adherent group (OR = 2.2, 95% CI: 0.9–5.2, $p = 0.06$), although it was not significant in multivariable logistic regression analysis probably because of the association with feeling pressured to share ARVs.

Table 2. Bivariate logistic regression analysis of correlates of non-adherence.

	Missed dose in the past four days			
	One or more ($n = 53$)	Never ($n = 458$)	Odds ratio (95% CI)	*P*-value
Age				
More than 38 years	13 (24.5%)	205 (55.2%)	Ref	
38 years or less	40 (75.5%)	253 (44.8%)	2.493 (1.299–4.787)	0.005
Gender				
Male	15 (28.8%)	188 (42.3%)	Ref	
Female	37 (71.2%)	256 (57.7%)	1.812 (0.966–3.401)	0.061
Marital status				
Single/Divorce/ Widowed	30 (57.7%)	214 (48.5%)	Ref	
Married/Remarried	22 (42.3%)	227 (51.5%)	0.691 (0.387–1.236)	0.211
Duration of ART				
More than 12 months	30 (56.6%)	276 (60.3%)	Ref	
12 months or less	23 (43.4%)	182 (39.7%)	1.163 (0.655–2.065)	0.607
Place of ART				
District hospital	24 (45.3%)	233 (50.9%)	Ref	
Rural health center	29 (54.7%)	225 (49.1%)	1.251 (0.707–2.215)	0.442
Cost of return trip				
Free of charge	18 (36.0%)	204 (44.7%)	Ref	
Less than 10,000 Kw	16 (32.0%)	174 (38.2%)	1.043 (0.516–2.105)	0.908
More than 10,000 Kw	16 (32.0%)	78 (17.1%)	2.325 (1.129–4.787)	0.022
Way to remember when to take ARVs				
Watch	24 (46.2%)	220 (49.4%)	Ref	
Clock	8 (15.4%)	68 (15.3%)	1.078 (0.463–2.511)	0.861
Mobile phone	2 (3.8%)	55 (13.4%)	0.333 (0.076–1.453)	0.144
Radio/Television	10 (19.2%)	61 (13.7%)	1.503 (0.062–3.312)	0.312
Position of the sun	8 (15.4%)	41 (9.2%)	1.789 (0.245–1.256)	0.189
Adherence support				
None	15 (10.3%)	84 (18.4%)	Ref	
Family	19 (35.8%)	241 (52.7%)	0.441 (0.215–0.908)	0.026
Other	19 (35.8%)	123 (28.9%)	0.806 (0.388–1.678)	0.563
Perceived stigma of taking ARVs				
Never experienced stigma	37 (71.2%)	390 (85.2%)	Ref	
Experienced stigma	15 (28.8%)	68 (14.8%)	2.325 (1.210–4.467)	0.011
Felt pressured to share ARVs				
Never pressured	36 (69.2%)	424 (92.8%)	Ref	
Felt pressured	17 (30.8%)	33 (7.2%)	5.710 (2.872–11.353)	<0.001

Within the current structure of ARV services, education and information about the importance of taking ARVs at a specific dose time is delivered frequently by health care providers. However, whether this simple instruction is effective for people living in rural areas, like those in the current study, is questionable. Multivariable logistic regression analysis showed that "remembering when to take ARVs based on the position of the sun" was an independent factor associated with higher odds of classification in the non-adherent group although it was not significant in bivariate analysis probably because of the correlation with the adherence support from family member. Health care providers should give rural patients more applicable instructions in accordance with their living conditions. More effective and

Table 3. Multivariable logistic regression analysis of correlates of non-adherence.

	Odds ratio (95% CI)	*P*-value
Age		
More than 38 years	Ref	
38 years or less	2.646 (1.271–5.508)	0.009
Cost of return trip		
Free of charge	Ref	
Less than 10,000 Kw	1.081 (0.501–2.336)	0.842
More than 10,000 Kw	2.217 (0.942–5.236)	0.068
Adherence support		
None	Ref	
Family	0.538 (0.226–1.282)	0.162
Other	1.176 (0.504–2.747)	0.708
Way to remember when to take ARVs		
Watch	Ref	
Clock	1.477 (0.561–3.891)	0.43
Mobile phone	0.654 (0.142–3.012)	0.585
Radio/Television	2.252 (0.920–5.525)	0.076
Position of the sun	3.311 (1.252–8.772)	0.016
Perceived stigma of taking ARVs		
Never experienced stigma	Ref	
Experienced stigma	1.06 (0.409–2.747)	0.905
Felt pressured to share ARVs		
Never pressured	Ref	
Felt pressured	4.390 (1.615–11.933)	0.004

practical strategies for remembering and cuing dose times to offer patients should be identified and included in the current strategies, and may result in higher adherence in rural areas. In Thailand, for instance, the national anthem, which is played at 8:00 and 18:00 every day on radio and TV, is successfully used as a reminder for patients to take ARVs (UNICEF, 2006).

The use of mobile phones has spread rapidly and 18% of participants owned it while they were in rural area in our study. Collier et al. (2005) reported that telephone call support was an effective way to remember the time and to maintain a desirable level of adherence in a research setting. And automated reminding service using short message service (SMS) is provided and favorably received in some countries. For the people who own the mobile phone, intervention using it could be considered in the future.

Feeling pressured to share ARVs with someone such as a family member or friend, which nearly 10% of the participants experienced, was the strongest factor associated with being classified in the non-adherent group in this study. This can also be an issue for patients on ART in rural areas where ARVs are not easily obtainable. Although participants were not asked if they actually shared their medicine with others, health care providers and counselors need to be aware of this issue and to carefully monitor patients in rural areas. A similar issue was the fear of stigma resulting from taking ARVs at work or home, which was experienced by 16% of participants and significantly associated with being classified in the non-adherent group in bivariate analysis. However, perceived fear of stigma resulting from taking ARVs did not maintain significance in the multivariable analysis, probably because of the high association with feeling pressured to share ARVs with someone as confounding factor. Per Zambian policy, ART patients must choose someone to provide treatment support to maintain high adherence to ART before starting the treatment, and most choose a family member. The issues of feeling pressured to share ARVs with a family member and the fear of stigma resulting from taking ARVs at home should be taken into careful consideration, especially for female patients (Murray et al., 2009). Education and counseling of family members should be performed along with careful monitoring of patients by health care providers.

One limitation of this study, however, is that information was not collected from patients who defaulted from treatment or untraceable patients because this was conducted among who came to health facility for treatment. Important findings in

relation to adapting ART programs to rural areas may be revealed by determining factors for low adherence from patients lost to follow-up or their reason for withdrawing from treatment.

The percentage of participants who had not missed a dose in the past four days was 88%, which was comparable to results of other studies using similar questions (Gifford et al., 2000; Nemes et al., 2004; Samet et al., 2004; Tesoriero et al., 2003). Although optimal adherence is required for better treatment outcomes for ART, there is still no "golden standard" by which to measure adherence because each methodology has its own advantages and disadvantages (DiMatteo, 2004; Gill et al., 2005; Oyugi et al., 2004). Self-report is most frequently used measure of adherence to ART because it is simple and inexpensive method. In addition, its significant association with virological treatment response has been reported (Nieuwkerk and Oort 2005; Simoni et al., 2006). Therefore, we adopted self-report of missed doses in the past four days to evaluate recent adherence.

As ART services expand to rural areas, information of more specific factors arising in rural settings can help program implementers because they may differ from those in urban settings. Lessons learned in urban settings must be cautiously applied to rural areas because resources are limited in rural areas and because of these factors. The current results show that specific factors related to possible conditions occurring in the daily lives of patients on ART in rural Zambia are likely to affect adherence to treatment.

Conclusion

As ART services expand to rural areas, program implementers should pay more attention to more specific factors arising in rural settings since they may differ from those in urban settings. This study conducted in rural area, however, suggested that specific factors such as remembering when to take ARVs based on the position of the sun and feeling pressured to share ARVs with someone, need to be carefully considered along with demographic factors as predictive factors for low adherence.

Acknowledgements

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