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Is membership in microfinance initiatives associated with viral load suppression among HIV patients? Evidence from western Kenya

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Abstract

Background Social and economic factors have considerable influence on the lives of people living with HIV (PLHIV). These factors shape their health behaviors, willingness to engage with other members of their communities for support, and ability to seek appropriate and timely treatment options. Evidence has shown that microfinance initiatives, by providing access to credit and social networks, have the potential to help PLHIV overcome some of these barriers. The objective of this study was to understand the association between microfinance membership and viral load suppression among HIV patients.

Methods We used data from the Academic Model Providing Access to Healthcare (AMPATH)-Kenya's Group Integrated Savings for Health Empowerment (GISHE), a microfinance initiative (MFI), to study the association between GISHE participation and viral load suppression. Our longitudinal dataset consisted of a matched group of 3609 HIV patients. We examined the association between GISHE membership and viral load suppression by addressing the missing data problem with respect to the viral load count via multiple imputation.

Results Our study revealed that GISHE membership was associated with increased viral load suppression (adjusted odds ratio (AOR) = 1.15; 95% confidence interval (CI), 1.03–1.29). Further, the study found that male patients were less likely to be virally suppressed (AOR = 0.85; 95% CI, 0.74–0.97), as were the patients in the most advanced disease stage (AOR = 0.71; 95% CI, 0.52–0.95). The finding that GISHE participation was associated with a greater likelihood of viral load suppression held even after addressing the missing data problem.

Conclusions We conclude that GISHE-type programs hold promise as scalable interventions to combat HIV/AIDS in Kenya and other countries where the disease is a generalized epidemic.

Keywords Microfinance, HIV, Viral load, Social capital, Low-income

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Background

Social and structural vulnerabilities such as poverty, income, social norms, food insecurity, and gender inequality have considerable influence on the lives of people living with HIV (PLHIV) [1]. These factors shape their health behaviors, willingness to engage with other members of their communities for support, and ability to seek appropriate and timely care. Microfinance initiatives have the potential to help PLHIV overcome some of these barriers.

Broadly speaking, microfinance initiatives (MFIs) are interventions that provide financial services to poor people at a small scale. MFIs involve people, often women, forming a group that meets regularly to make decisions for the betterment of the group members and their households and has in place a mechanism to save, raise, and utilize small amounts of funds [2, 3]. MFIs can influence health outcomes for PLHIV in several ways. MFIs can help address the financial barriers that PLHIV face. Existing evidence suggests that financial barriers are not only associated with poorer HIV/AIDS outcomes, such as reduced ART adherence and CD4 + cell count [4] but also that these barriers become more pronounced for PLHIV [5, 6]. MFIs provide predictable and regular access to credit, thereby helping PLHIV and their networks of immediate families and communities cope with HIV-specific shocks related to income, food security, and other related factors.

MFIs can also be a source of social and emotional support for members. A key feature of MFIs is that they operate as a group and consist of like-minded people from similar socioeconomic backgrounds who trust each other. In the case of formal MFIs, a credit lending institution typically provides credit to formally established groups. Members must work together to fulfill their financial obligations on time to avoid any penalties. Members need to be accountable to each other and, as a group, be accountable to the credit lending institution. While flexibility with collateral requirements is often a reason why low-income households are attracted to formal MFIs, interest rates can be hefty. It is therefore even more important for the members to work collectively and cohesively to fulfill their obligations, explicit or implicit. Social solidarity and support, external to the familial ties, afforded by MFIs can positively impact health outcomes (including HIV outcomes) [7, 8].

In addition to providing socio-emotional support, leveraging social capital and accountability, and addressing credit constraints, MFIs may serve as an important vehicle for women's empowerment. Because a vast majority (~ 75%) of the members in MFIs are women [9], the financial and economic benefits accrued through MFIs primarily, and most directly, serve women. While these

benefits alone may not directly indicate increased women's empowerment, they likely reflect a positive shift in individual agency associated with these advantages. More over, it is not just the income that makes a difference, but also the sense of community and mutual support among women afforded by these programs that matter [10].

Although a positive association between MFIs and HIV prevention has been reported, quantitative evidence of their role in HIV care and treatment outcomes remains relatively scant [1, 11]. Specifically, evidence remains limited regarding whether, and to what extent, MFIs serve as a source of psychosocial support and economic empowerment in their efforts to influence HIV outcomes, such as viral load (VL) suppression. Our study considers the role of microfinance in affecting HIV outcomes in Kenya. From a policy perspective, understanding the association between MFI and HIV outcomes is important for Kenya because HIV is still one of the major drivers of the country's disease burden. Nearly 1.5 million Kenyan individuals are estimated to be living with HIV [12]. Interventions that aim to address any aspect of the HIV care continuum directly inform Kenya's national health policy agenda.

This study investigated the relationship between MFI affiliation and VL suppression in the context of a microfinance program (called Group Integrated Savings for Health Empowerment, GISHE) implemented in Western Kenya. The program has been implemented via the Academic Model Providing Access to Healthcare (AMPATH), a consortium of US-based academic institutions that works in partnership with the Kenyan Ministry of Health to deliver HIV/AIDS and other health services to millions of people. Ever since it started in 1998, AMPATH's focus has been on ensuring a holistic approach to the delivery of HIV/AIDS services by utilizing the existing healthcare infrastructure [13, 14].

While MFIs have shown promise in supporting ART adherence and retention in care among PLHIV, evidence linking MFI participation to VL suppression is limited [15]. This study assesses the association between MFI participation (via GISHE) and VL suppression in PLHIV in Kenya. We hypothesize that participation in MFIs is positively associated with VL suppression.

Methods

Data sources

Data were extracted from AMPATH Medical Records System (AMRS), for 2018 and 2019. The system keeps records of demographic information as well as information on HIV care and treatment. AMRS data are used by clinicians and nonclinicians (for example, outreach workers, social workers, nutritionists, research officers, and others). While clinicians use the data to ensure appropriate patient care on a daily basis, nonclinicians such as

social workers use the data to determine financial needs [16]. Data from AMPATH was requested in mid-2020. Therefore, the most recent available data covered only the 2018 and 2019 periods.

Sample

Our sample was a matched group of individuals who received HIV care via AMPATH-supported healthcare providers, including Moi Teaching and Referral Hospital (MTRH), in Uasin Gishu and Bungoma Counties. Methods for sample selection have been described elsewhere (see the Genberg et al. (2021) paper). Briefly, the sample included patients who were 18 years and older in 2012 and who received HIV care in 2018 and 2019. To obtain a final sample of 3609 individuals, propensity score matching was used to match GISHE patients to non-GISHE patients from a larger pool of individuals consisting of both GISHE patients and non-GISHE patients. Propensity score matching (PSM) technique was used to reduce bias resulting from the nonrandom selection of people into treatment, i.e., GISHE [17]. The implementation of the PSM technique required the estimation of a propensity score based on a logistic model and then resulting propensity score was used to create a matched comparison group of non-GISHE patients with observable characteristics similar to that of GISHE patients. Each patient in the GISHE group was matched with two patients in the non-GISHE group via many-to-one (2:1) matching. The matching variables were age, sex, geographic location of initial clinic visit, and length of time in care. The final sample consisted of 3609 patients, of which 1203 were GISHE patients and 2406 were non-GISHE patients. A schematic of the sample inclusion criteria is included in Additional file 1: Figure S1.

Variables

Our main explanatory variable was an indicator variable for microfinance participation, which was based on membership in the GISHE program, as of January 2018. Implemented in Eldoret, western Kenya, the GISHE is a client-driven model of village-level savings and loan associations. Members of community-led groups mobilize and manage their own savings, provide interest-bearing loans, and contribute to a social fund for use in cases of emergency [18].

Our outcome measure was a binary measure for VL suppression and was defined on the basis of having more or less than 50 copies of HIV per millilitre of blood [19]. HIV patients whose VL was lower than this threshold were categorized as being virally suppressed and were assigned a value of 1. Patients with a VL count of exactly 50 copies or higher than this threshold were categorized

as not being virally suppressed and were assigned a value of 0.

The covariates were age, sex (=1 if male), household size (defined as the total members in a household), WHO disease stage at the time of enrollment schooling, access to electricity and water, travel time to clinic, and the location of the clinic. Patient disease stage at enrollment was defined according to the WHO's 2005 clinical guidelines and included four categories between 1 and 4, with 1 being the least severe of the disease and 4 being the most severe stage of the disease [20]. More specifically, the definition of disease stage included the following: (1) asymptomatic (CD4 + cell count ≥ 500 cells per microliter); (2) mild (CD4+ cell count ≥ 350 –499 per microlitre); (3) advanced (CD4+ cell count ≥ 200 –349 per microlitre); and (4) severe (CD4+ cell count < 200 per microlitre). The travel time to the clinic was also coded as a categorical variable with four categories: (1) if the travel time was between 60 and 120 min, (2) if it was between 30 and 60 min, (3) if the travel time was less than 30 min, and (4) if the travel time was more than 120 min. Clinic location was coded as 1 if a patient's primary clinic was Moi Teaching and Referral Hospital (MTRH) and 0 otherwise. Schooling was defined on the basis of whether a patient had any schooling. Similarly, if a patient had access to both electricity and water at home, the electricity and water variable was coded as 1 and 0 otherwise. Finally, we included a dummy variable for year.

Statistical analysis

We first compared the baseline characteristics of the GISHE participants and non-GISHE participants. The comparison was based on the two-tailed *T*-test and involved evaluating the differences in baseline variable means, with *p*-values indicating statistical significance for the difference. We then checked for the extent of missingness in the VL count. Understanding missingness in the outcome variable was important because people with missing VL count data may be systematically different from those with nonmissing data. It is well established in the literature on missing data that statistical inferences based on nonmissing data (i.e., complete cases) for the outcome variable may be biased [21].

Third, because we found in the previous step that missing data was an issue (as illustrated in Additional file 1), we used a multiple imputation technique as a way to address this issue. We used predictive mean matching (PMM) to impute the VL count separately for 2018 and 2019. In brief, PMM is a multiple imputation technique used when the variable to be imputed is continuous and has a nonnormal distribution [22]. Importantly, we imputed values only for those who were not lost to follow-up. In other words, we did not impute values for the

VL count for those who were lost to follow ups (LTFUs), i.e., those who were present in 2018 but not in 2019.

Additional details on missing data analysis are provided in Additional file 1. These details include the proportion of missingness in the outcome variable separately for 2018 and 2019, as well as regression estimates of the association between GISHE membership and the likelihood of missingness before the imputation. Taken together, the results suggest that missing data were associated with several characteristics of PLHIV, so the missing data were violated completely at random.

The resulting imputed data were then used to understand the association between GISHE participation and the VL. We used both the binary measure (i.e., VL suppression) and the log-transformed continuous measure (i.e., the log of the VL count). We used the binary measure to estimate the association between GISHE affiliation and the likelihood of being virally suppressed and the continuous measure to estimate the unit change in the log of the VL count for GISHE members relative to non-GISHE members. We used generalized estimating equations (GEEs) to estimate the associations [23, 24]. For the binary measure, we specified a binomial family of distributions with log links. For the log-transformed continuous measure, we specified a Gaussian family of distributions with identity links. Our analysis adjusted for age, sex, household size, disease stage at the time of

enrollment, schooling, access to electricity and water, travel time to clinic, and the location of the clinic.

We ran two sensitivity analyses. First, we reran our model while assuming a negative binomial distribution of the VL count. We choose a negative binomial distribution because the distribution of the VL count includes many zeros and is left-skewed. The literature suggests that outcomes involving a large number of zeros and/or heavy left-skewness are better suited for modeling under the assumption of a negative binomial distribution [25]. Second, we used inverse probability weighting (IPW) to correct for missingness in the VL count. This approach treats all missingness in the outcome variable in the same way and makes no distinction between whether the missingness is caused by loss-to-follow-up or other reasons [26–28]. The results for the sensitivity analysis are presented in Additional file 1: Tables S3 & Table S4.

All analyses were conducted using Stata version 17.0 (StataCorp, College Station, TX, USA). Analytical code used in the analysis is attached as Additional file 2.

Results

The study population (Table 1) included 3609 patients (GISHE, 1203 and non-GISHE, 2406). For the overall population (i.e., both GISHE and non-GISHE patients combined), the mean (SD) age was 38 (10) years and 22% of the patients were males. Patients were on ART for a

Table 1 Baseline characteristics by GISHE participation status

	Overall (N = 3609)	Non-GISHE (N = 2406)	GISHE (N = 1203)	p value
Age at enrollment in yrs, mean(SD)	38 (10)	38 (10)	39 (10)	0.12
Males (%)	22%	22%	21%	0.78
Initial clinic visit done at MTRH (%)	11%	11%	11%	0.94
WHO stage at enrollment (%)				0.55
Stage 1	43%	42%	43%	
Stage 2	25%	25%	26%	
Stage 3	29%	29%	27%	
Stage 4	3%	4%	3%	
Household size, mean (SD)	5 (3)	5 (3)	5 (3)	< 0.001
Travel time to clinic (%)				0.04
> 120 min	10%	11%	8%	
60–120 min	25%	24%	26%	
30–60 min	35%	35%	35%	
< 30 min	30%	30%	31%	
Time on ART in years, mean(SD)	11 (3)	11 (3)	11 (3)	0.92
Total time in HIV care in years, mean(SD)	12 (2)	12 (2)	12 (2)	0.71
Ever attended school (%)	88%	88%	88%	0.99
Availability of electricity and running water at home (%)	15%	17%	11%	< 0.001

WHO World Health Organization, MTRH Moi Teaching And Referral Hospital, GISHE Group Integrated Savings for Empowerment, SD standard deviation, ART antiretroviral therapy

mean (SD) of 11 (3) years. Only 15% of the patients had electricity and running water available at home. In terms of the extent of missingness, approximately 6.5% of cases for VL count were missing. Missing share was slightly higher for 2018 (7.45%) than 2019 (5.43%). Death was one of the causes of missingness, with 21 recorded deaths in 2018 and 7 recorded deaths in 2019. Other causes of missingness could not be inferred from the data.

Table 1 also shows the extent to which observable characteristics differ between GISHE participants and non-GISHE participants. The data suggest that the two groups were broadly similar in terms of their baseline characteristics. The three exceptions, as indicated by the statistical significance for the difference in means, were household size, travel time to clinic, and access to electricity and water at home.

Table 2 presents adjusted estimates for the association between GISHE membership and VL suppression. GISHE patients had a significantly higher likelihood of VL suppression. The odds of being virally suppressed for patients with GISHE syndrome were 1.15 times greater than those for non-GISHE syndrome patients (adjusted odds ratio (AOR)=1.15; 95% confidence interval (CI), 1.03–1.29). Male patients were less likely to be virally suppressed than female patients. The odds of being virally suppressed as a male was 15% lower than the odds of being virally suppressed as female (AOR=0.85; 95% CI, 0.74–0.97). Similarly, patients in more severe stages of the disease were less likely to be virally suppressed. Compared to asymptomatic patients, patients in the severe disease category were had nearly 30% lower odds being virally suppressed (AOR=0.71; 95% CI, 0.52–0.95). The adjusted estimates for the association between GISHE membership and the log-transformed VL count are consistent with the results in Table 2 and are presented in Additional file 1: Table S4. Results of the sensitivity analyses (presented in Additional file 1: Table S5 and Table S6) were broadly consistent with the main results, i.e., GISHE participation was associated with an increase in VL suppression. For example, results based on generalized estimating equations (GEEs) showed that GISHE membership had an incidence rate ratio (IRR) of 0.68. This suggested that GISHE members had a VL count rate that was 0.68 times the rate for non-GISHE members. The results based on IPW were similar.

Discussion

Using a sample of 3609 HIV patients from Eldoret, western Kenya, we examined whether there was any association between being a member of a microfinance initiative and VL suppression. Membership in a microfinance initiative was represented by membership in GISHE. After applying the multiple imputation technique to address

Table 2 Association between GISHE membership and viral load suppression

	AOR	95% CI	
GISHE membership	1.15	1.03	1.29
Age	1.00	0.99	1.00
Male	0.85	0.74	0.97
WHO stage at enrollment			
Stage 1 (ref.)			
Stage 2	1.00	0.88	1.14
Stage 3	0.90	0.79	1.02
Stage 4	0.71	0.52	0.95
Initial clinic visit at MTRH	0.98	0.82	1.16
Electricity and water at home	1.14	0.98	1.33
Any schooling	1.05	0.89	1.24
Travel time to clinic			
Between 60 and 120 min (ref.)			
Between 30 and 60 min	0.87	0.76	0.99
< 30 min	0.98	0.85	1.13
> 120 min	1.12	0.92	1.36
Total time in HIV care	0.98	0.95	1.00
Year			
2018 (ref.)			
2019	1.23	1.11	1.37
Constant	2.13	1.36	3.32

The table shows adjusted estimates of the association between GISHE membership and viral load suppression

AOR adjusted odds ratio, WHO World Health Organization, MTRH Moi Teaching And Referral Hospital, GISHE membership membership in the microfinance initiative called Group Integrated Savings for Empowerment

missing data in the VL count, we found that there was a statistically significant positive association between GISHE membership and VL suppression. Relative to non-GISHE members, GISHE members were 1.15 times more likely to be virally suppressed.

An interpretation of our results is that GISHE promotes economic and non-economic empowerment among members. The increased economic empowerment may come about partly as a result of increased access to income-generating activities (including agriculture-based income-generating activities) and improved financial management practices (including an improvement in the members' saving habits) [15, 29, 30]. Health literacy provided as a part of the GISHE program may have been another contributor to the observed positive association between GISHE membership and VL suppression [31]. The health literacy component of the GISHE program may have encouraged GISHE members to adopt healthy habits and behaviors, including those that enable VL suppression. Another possible mechanism for the observed positive association between GISHE membership and VL suppression includes the group-level encouragement

that the GISHE members receive to participate in the National Hospital Insurance Fund (NHIF), the public health insurance provider in Kenya [29]. If more GISHE members participated in NHIF as a result of such encouragement, these members likely reaped the direct benefits (possibly through easier and timely access to healthcare) and indirect benefits (possibly through educational and awareness initiatives) available by virtue of being an NHIF beneficiary.

Overall, our results are consistent with the existing literature evaluating the role of interventions involving one or more components of MFIs on HIV-related outcomes. For example, a Uganda-based cluster randomized control trial examining the impacts of a savings-led economic empowerment program showed that the program was associated with a reduction in the VL count [32]. Another study based in the US reported that financial incentives can help increase VL suppression [33]. These two studies are similar to our study in that they both focus on VL suppression and evaluate interventions involving financial benefits to the participants. Our results align with the existing evidence linking self-help groups with increased economic and social empowerment [34] as well as with the existing pieces of work on the association between income-generating activities and improved HIV outcomes in Kenya and Ethiopia [35–38].

While our results are encouraging, the extent to which VL suppression is sustained over a period of time is an important consideration. Research conducted in the USA shows that interventions involving financial incentives can lead to an increase in VL suppression for some time, but the increase may not last much longer after the end of the intervention [39]. Another study suggested that achieving durable VL suppression requires systematically addressing social determinants of health [40, 41]. Given that they involve several different components other than financial pieces, MFIs such as GISHE may partially obviate the need to address every single social determinant.

This study has limitations. First, although PSM helped improve covariate balance and ensured that the GISHE patients and non-GISHE patients were similar in terms of their observed characteristics, residual (or unmeasured) confounding factors cannot be ruled out [42, 43]. Such confounding can occur because our study does not account for all the possible confounders. It cannot account for all the observable confounders in part because AMPATH's record-keeping system, which is what our study relies on, keeps track of only a limited number of socioeconomic and demographic variables. Second, while our study included WHO-based disease severity classification in the analysis, an ideal approach would have been to use the CD4+ cell count as a marker

of disease severity. Research shows that retention in care has a differential association with VL suppression based on the CD4+ cell count [44]. This implies that the association between GISHE membership and the VL count may be biased upward or downward depending on the proportion of the sample that has a low or high VL count. Third, our study presents estimates for the overall association between being a member of the GISHE and VL suppression, but we do not know what specific components of the GISHE were more or less important for the observed association. For example, it is difficult to parse out the role of income versus the role of support social and psychological environment in explaining the observed relationship. Fourth, as previously mentioned, the increase in income-generating activities associated with GISHE membership likely played a key role in the observed association. However, the lack of income data limits our ability to make concrete assertions or quantify this relationship. Finally, even though the study results are based on a matched sample, it is important to note that this is not a causal study. The association observed (between GISHE participation and VL suppression) therefore, should not be interpreted as the direct cause-and-effect relationships.

Official development assistance for HIV/AIDS in Kenya will inevitably decline. This decline is a function of the COVID-19 pandemic, but more importantly, it is a function of Kenya's rising economic status. Because Kenya is now classified as a middle-income country [45], its access to external funds (particularly grants) will become increasingly limited. To maintain the gains made in the fight against HIV/AIDS, Kenya needs to ensure that the fight is well resourced. Since credit access is an important factor, though not the only one, MFIs such as GISHE programs may serve as a useful supplement to bridge the resource gap. Additionally, given the increasing burden of noncommunicable diseases, GISHE-type programs can provide opportunities for addressing the double burden [46, 47].

Conclusions

Our findings suggest that MFIs such as the GISHE program in Kenya may be an important avenue in the fight against HIV/AIDS. In Kenya, South Africa, and other parts of Africa where HIV is a generalized epidemic, population-wide interventions will continue to be as important as interventions that are targeted and tailored to specific subgroups (such as sex workers, prison populations, and others) [48]. In such a scenario, GISHE-type programs may hold promise as scalable interventions to combat HIV/AIDS.

Abbreviations

AOR	Adjusted odds ratio
AMRS	AMPATH Medical Records System
AMPATH	Academic Model Providing Access to Healthcare
ART	Antiretroviral treatment
GEE	Generalized estimating equations
GISHE	Group Integrated Savings for Health Empowerment
HIV	Human immunodeficiency virus
IRR	Incidence rate ratio
IPW	Inverse probability of treatment weighting
LTFU	Loss to follow-up
MFIs	Microfinance institutions
MTRH	Moi Teaching and Referral Hospital
OR	Odds ratio
PLHIV	People living with HIV
PMM	Predictive mean matching
VL	Viral load
WHO	World Health Organization

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s44263-025-00170-v>.

Additional file 1: Data description: This additional file provides details into the missing data piece (including the missing data pattern and the use of multiple imputation) as well as results of the sensitivity analysis.
Additional file 2: Data description: analytic code used.

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Authors' contributions

BT led the conception and design of the study, analysis and interpretation of data, drafting of the manuscript, and approval of the final version for publication. BG contributed to the study design, data interpretation, review of the manuscript draft, and approval of the final version. JW conducted a thorough review of the manuscript draft, provided contextual expertise in light of the study findings, and approved the final version. JS contributed to the study design, data interpretation, review of the manuscript draft, and approval of the final version. OG provided overall guidance and supervision while contributing to the study conception and design, data interpretation, review of the manuscript draft, and approval of the final version for publication. All authors read and approved the final manuscript.

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Data availability

Due to the sensitive nature of the data involved, they cannot be shared openly. Aggregated data may be available upon reasonable request. Analytical code used in our analysis is attached as an additional file 2.

Declarations

Ethics approval and consent to participate

Approval was received from the Moi University Institutional Research and Ethics Committee (IREC#0003054) and the Brown University Institutional Review Board under an IRB Authorization Agreement (IAA#18–90). All participants

provided written voluntary informed consent for study participation. The research also confirmed to the principles of the Helsinki Declaration.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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