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Article

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Posted Date: November 9th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11386436/v1

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Additional Declarations: No competing interests reported.

Effectiveness of a Social Media–Based Peer Support Intervention for Improving Medication Adherence and Health-Related Quality of Life among Young People Living with HIV in Ghana: A Single-Group Pretest–Posttest Quasi-Experimental Study

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Abstract

Background: Young people living with HIV (YPLHIV) frequently encounter barriers to antiretroviral therapy (ART) adherence and experience suboptimal health-related quality of life (HRQoL), which together undermine viral suppression and long-term prognosis. While peer support interventions can enhance engagement in HIV care, empirical data regarding social media–facilitated peer networks among YPLHIV in sub-Saharan Africa remain scarce. This study evaluated the effectiveness of a structured, professionally moderated social media–based peer support intervention designed to enhance medication adherence and HRQoL among YPLHIV receiving ART in Ghana

Methods: A single-group pretest–posttest quasi-experimental study was conducted among 124 young adults aged 18–34 years attending the HIV Clinic of Kade Government Hospital in the Kwaebibirim Municipality, Ghana. The six-month intervention utilized Chatterbox (for anonymous group interactions) and WhatsApp (for confidential one-on-one professional counselling). Medication adherence was evaluated using the 10-item Medication Adherence Rating Scale (MARS-10), and HRQoL was assessed using the World Health Organization Quality of Life-BREF (WHOQOL-BREF). Pre- and post-intervention outcomes were compared using paired t-tests, Wilcoxon signed-rank tests, and McNemar's tests. Population-averaged generalized estimating equations (GEE) with a log link, Poisson family, and robust standard errors were fitted to estimate adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs) for factors associated with poor medication adherence and poor HRQoL.

Results: Following the six-month intervention, the proportion of participants achieving good medication adherence rose from 21.1% (26/124) to 78.9% (98/124; $p < 0.001$). Statistically significant gains occurred across all four WHOQOL-BREF domains (all $p < 0.001$). The overall prevalence of poor HRQoL declined from 96.8% to 3.2% ($p < 0.001$). Medication adherence correlated positively with physical ($r = 0.660$), psychological ($r = 0.752$), social ($r = 0.623$), and environmental ($r = 0.730$) health domains (all $p < 0.001$). In multivariable GEE modeling, the post-intervention period was independently associated with an 80% reduction in the prevalence of poor medication adherence (aPR = 0.20, 95% CI: 0.12–0.34) and a 96% reduction in poor overall HRQoL (aPR = 0.04, 95% CI: 0.01–0.13). Participants with unsuppressed viral load (≥ 50 copies/mL) were over twice as likely to experience poor adherence as suppressed peers (aPR = 2.31, 95% CI: 1.58–3.39). Never-married participants had a lower prevalence of poor HRQoL than those who were married or cohabiting (aPR = 0.86, 95% CI: 0.75–0.99).

Conclusion: A structured, multidisciplinary social media peer-support intervention was associated with substantial improvements in medication adherence, HRQoL, and virological suppression among young people living with HIV. Integrating digital peer networks into routine differentiated service delivery represents an effective and scalable avenue for youth-centered HIV care in resource-limited environments.

Keywords: Antiretroviral therapy; digital health; Ghana; medication adherence; peer support; quality of life; social media; young people living with HIV.

Introduction

Human Immunodeficiency Virus (HIV) remains a critical global public health priority, having claimed over 40 million lives worldwide since the emergence of the pandemic [1]. Despite major advances in diagnosis, prevention, and therapeutic regimens, HIV transmission persists globally. By the end of 2022, an estimated 39 million individuals were living with HIV

worldwide, with approximately two-thirds (25.6 million) residing in sub-Saharan Africa [2], and roughly 630,000 individuals succumbed to AIDS-related illnesses that same year [3].

Adolescents and young people living with HIV (AYPLHIV) bear a disproportionate burden of infection and experience unique treatment vulnerabilities [4]. In 2022 alone, approximately 480,000 youths aged 10–24 acquired HIV globally [5]. Mortality among young demographics remains an acute challenge in Africa, where approximately 46,000 AIDS-related deaths occurred among individuals aged 15–24 years in 2022 [6]. In Ghana, HIV continues to present substantial risks to youth health: 40,497 young individuals aged 15–24 years were living with HIV out of an estimated national total of 354,927 in 2022 [7]. While national prevention programs have curtailed overall mortality and incidence, new diagnoses continue to cluster within key and vulnerable youth populations [8].

The scale-up of antiretroviral therapy (ART) has transitioned HIV from a fatal diagnosis into a manageable chronic infection [9]. Sustained ART achieves viral suppression, reduces transmission risks, limits morbidity, and enhances health-related quality of life (HRQoL) [10]. Consequently, the World Health Organization (WHO) recommends universal and immediate ART initiation upon diagnosis, regardless of clinical staging or CD4 cell count [11]. Nevertheless, treatment retention and optimal adherence remain difficult to sustain in resource-constrained environments [12]. Globally, nearly 9.2 million people living with HIV remained without treatment access at the close of 2022 [13]. Among those initiated on therapy, adolescents and young adults exhibit worse longitudinal outcomes than older cohorts, including elevated rates of clinic attrition, treatment interruptions, and psychosocial challenges [14,15].

Young people are made vulnerable by complex intersecting factors, including early sexual debut, irregular condom use, substance use, internalized and social stigma, and inadequate access to adolescent-friendly sexual and reproductive health services [16, 17].

In Ghana, prior studies demonstrate suboptimal ART adherence among youths. A systematic review reported pooled adherence rates 66% among adolescents and young adults, lower than that of adults [18]. Suboptimal ART adherence directly drives therapeutic failure, promotes drug-resistant viral mutations, accelerates clinical progression, and increases mortality [19].

Beyond medication compliance, HRQoL remains notably poor; only 30.8% of young people living with HIV in Ghana report favorable HRQoL relative to the general population [20].

Suboptimal HRQoL among may be associated with social stigma and discrimination, mental health challenges, inadequate psychosocial support, and difficulties associated with lifelong medication use

Mitigating these adverse outcomes requires adolescent-friendly psychosocial strategies. Peer support models, rooted in the mental health consumer advocacy of the 1970s and adapted to chronic disease care, enable individuals sharing lived experiences to offer emotional, navigational, and informational support [21].

Peer supporters often provide empathy, encouragement, coping strategies, and practical advice that enhance self-efficacy, autonomy, and hope among recipients [22]. The WHO strongly endorses peer-led strategies for young demographics living with HIV because they consistently improve retention and clinical outcomes [23]. Peer support buffers against perceived and internalized stigma, fosters self-worth, encourages consistent pill taking, and re-establishes social belonging [24].

Given the near-ubiquitous adoption of mobile technologies and digital platforms among African youth, social media–delivered peer interventions provide a scalable opportunity to address systemic care barriers. However, empirical evidence evaluating digital peer networks among young individuals living with HIV in Ghana, particularly in rural and peri-urban districts such as the Kwaebibirim Municipality, remains limited. Addressing this gap is critical to achieving Ghana's national HIV strategic objectives and the UNAIDS 95-95-95 targets by 2025 [25]. This study therefore assessed the effectiveness of a six-month, professionally moderated social media–based peer support intervention in improving medication adherence and HRQoL among young people living with HIV in the Kwaebibirim Municipality of Ghana.

Materials and Methods

Study Design and Setting

A one-group pretest–posttest quasi-experimental study design was utilized to evaluate changes in HRQoL and medication adherence following a six-month social media peer-support intervention. Baseline assessments were obtained immediately prior to intervention roll-out, with matched post-intervention evaluations conducted after six months.

The study was located within the Kwaebibirim Municipality, a peri-urban district situated in the southwestern section of the Eastern Region of Ghana. The municipality has a total population of 121,698, of which approximately 37% are young persons aged 10–29 years. Educational attainment and literacy are relatively high: the literacy rate among residents aged 11 years and older is 84.7%, with 68.6% exhibiting bilingual proficiency in English and a Ghanaian language. Moreover, mobile phone ownership among individuals aged 12 years and older is estimated at 45.1%, confirming the technical feasibility of smartphone-delivered digital health strategies. The municipality was selected specifically because of its local epidemiology: the estimated HIV prevalence in Kwaebibirim Municipality is 2.48%, substantially higher than the national prevalence of 1.5% [30].

Study Population

The study population comprised young people living with HIV who were receiving treatment and care at the Anti-retroviral Therapy (ART) Unit of Kade Government Hospital, a referral facility located in the Kwaebibirim Municipality, during the study period. The study included young adults aged 18–34 years who were physically and psychiatrically stable enough to interact within a group, owned a compatible smartphone, and could read and write the English Language.

Implementation Phases

The trial was conducted in four sequential operational phases:

- Phase 1 (Formative Acceptability): Conducted among a purposive sample of 20 eligible participants at the ART Unit to assess intervention acceptability, digital privacy concerns, and participant preferences using semi-structured interviews. Findings informed the final curriculum and security protocols.

- Phase 2 (Pre-Intervention Baseline Assessment): Comprehensive baseline data collection using standardized psychometric instruments and clinical abstraction.
- Phase 3 (Intervention Delivery): Roll-out of the structured six-month social media peer support and clinical moderation program.
- Phase 4 (Post-Intervention Endline Assessment): Follow-up administration of identical measurement batteries six months post-baseline to evaluate primary and secondary outcomes.

Sample Size determination and Sampling

For Phase 1 qualitative interviews, a sample size of 20 was established based on thematic saturation.

For the quantitative quasi-experimental trial, sample size was estimated using the standard formula for paired continuous means:

$$n = \frac{\left(Z_{1-\alpha/2} + Z_{1-\beta}\right)^2}{d^2}$$

Where $Z_{1-\alpha/2} = 1.96$ (two-sided type I error rate $\alpha = 0.05$), $Z_{1-\beta} = 0.84$ (statistical power of 80%), and $d = 0.30$ (hypothesized medium effect size):

$$n = \frac{(1.96 + 0.84)^2}{(0.30)^2} = \frac{(2.80)^2}{0.09} = \frac{7.84}{0.09} \approx 87$$

Anticipating an attrition rate of 30% over the six-month follow-up period, the target sample was adjusted as:

$$\text{Adjusted Sample Size} = \frac{n}{1 - \text{attrition}} = \frac{87}{1 - 0.30} = \frac{87}{0.70} \approx 124.3$$

Thus, 124 participants were enrolled.

Sampling was conducted using simple random sampling. A sampling frame containing all eligible clients was extracted from the Hospital's ART registry. Unique identification codes were assigned to each entry, and a computer-based random number sequence was generated to select 124 primary participants. A secondary reserve list was generated via the same

procedure to replace non-reachable or declining clients systematically, preserving randomization integrity.

Detailed Description of the Intervention

The six-month intervention integrated automated reminders, structured peer discussions, and multi-specialty clinical oversight delivered across two complementary mobile communication platforms:

1. **Chatterbox:** Utilized for moderated group discussions while ensuring anonymous user handles to protect participant identity.
2. **WhatsApp:** Employed for private, one-to-one clinical communications, personalized counseling, and individualized case management.

Weekly peer discussions focused on four recurring structured modules:

- HIV treatment literacy, viral load dynamics, and medication adherence strategies;
- Mental health, stress reduction, and emotional coping;
- Nutrition, lifestyle modifications, and immune support;
- Navigating relationship challenges, disclosure decisions, and stigma mitigation.

Automated medication reminder alerts were disseminated daily. To maintain informational accuracy, the intervention was continuously moderated by a multidisciplinary clinical team consisting of a medical doctor, a mental health professional, two certified HIV nurse counsellors, and a nutritionist. Moderators monitored forums daily to answer technical medical inquiries, correct misinformation, maintain adherence to community respect standards, and identify participants experiencing psychological distress. Any participant requiring urgent medical or emotional care was transitioned to confidential WhatsApp channels for one-on-one professional counseling.

Participants completed a comprehensive onboarding training upon recruitment covering platform navigation, digital privacy, and group rules (mutual respect, strict confidentiality, and zero tolerance for discrimination). To overcome financial and network accessibility barriers,

each participant received a complimentary 1.0-gigabyte mobile data bundle monthly throughout the six-month study period. Ongoing technical troubleshooting was provided to minimize engagement drop-off.

Data Collection Procedures, tools, and measurements

Data were collected in designated private consultation suites at the ART clinic by trained research assistants and HIV-specialist nurses. Phase 1 formative interviews explored user privacy, digital safety, perceived utility, and platform usability. To encourage unreserved feedback on sensitive HIV topics, audio recordings were omitted; trained note takers captured detailed transcripts during interviews.

Quantitative assessments were recorded at baseline and six-month endline directly onto digital tablets using KoboCollect to prevent missing data and transmission errors:

- **Medication Adherence (MARS-10):** Adherence behaviours and attitudes were evaluated using the 10-item Medication Adherence Rating Scale (MARS-10) with binary yes/no response scoring. Composite scores range from 0 to 10; scores ≤ 7 were categorized as "poor adherence" and scores ≥ 8 were categorized as "good adherence".
- **Health-Related Quality of Life (WHOQOL-BREF):** The 26-item WHOQOL-BREF evaluates four core domains: physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items), alongside two standalone items assessing general health satisfaction and overall QoL. Items are scored on a 5-point Likert scale (1 to 5). Negatively framed questions (items 3, 4, and 26) were reverse coded. Participants with ≥ 21 valid responses were included in scoring. Mean raw domain scores were converted linearly into transformed scores on scales of 4–20 and 0–100 according to WHO guidelines, with higher scores denoting superior quality of life. Domain and overall scores were dichotomized into "good"

versus "poor" HRQoL using distribution-derived cut-offs. Overall poor HRQoL served as the primary binary quality-of-life endpoint.

- **Clinical and Biological Markers:** Plasma viral load counts and time on ART were extracted directly from clinic records. Viral load status was categorized into < 50 copies/mL (virologic suppression), ≥ 50 copies/mL (unsuppressed), target not detected (undetectable), and not due for viral load testing.

Statistical Analysis

Analyses were performed using Stata version 17.0 (StataCorp LLC, College Station, TX, USA). Participant characteristics were summarized using descriptive statistics: categorical variables were presented as absolute frequencies and percentages, and continuous variables were expressed as means $\pm$ standard deviations (SD) or medians with interquartile ranges (IQR). Within-subject differences between baseline and post-intervention evaluations were tested using McNemar's χ^2 tests for paired categorical data and paired t-tests or Wilcoxon signed-rank tests for continuous variables based on normality checks. Instrument internal consistency was verified via domain-specific and overall Cronbach's alpha (α) coefficients. Bivariate linear associations between adherence scores and HRQoL domains were examined using Pearson correlation coefficients (r).

To determine independent factors associated with binary outcomes across repeated evaluations, population-averaged Generalized Estimating Equation (GEE) models were fitted. A modified Poisson regression approach with a log-link function, robust variance estimation, and an exchangeable correlation matrix was specified to model within-subject longitudinal covariance directly. This yielded adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs). The primary exposure across all multivariable models was the study period (pre-intervention vs. post-intervention), adjusting for socio-demographic covariates (sex, age group, education, marital status, employment status) and clinical markers (duration living with HIV, viral load status), with medication adherence included as an additional covariate in the HRQoL model. Statistical significance was established at two-tailed $p < 0.05$.

Results

Participants characteristics

A total of 124 participants completed both the baseline and endline assessments (100% retention). Baseline demographic and clinical characteristics are summarized in Table 1. Fixed socio-demographic attributes remained identical across both evaluation points: basic education was reported by 49.2% (61/124), a majority were self-employed (51.6%, 64/124) or unemployed (26.6%, 33/124), and 57.3% (71/124) were married or cohabiting.

The proportion of participants aged 15–24 years decreased from 30.6% (38/124) at baseline to 17.7% (22/124) at endline, with a reciprocal increase among those aged 25–35 years from 69.4% (86/124) to 82.3% (102/124; $\Delta p = +0.13$, $p = 0.018$). Concurrently, time since HIV diagnosis lengthened: clients diagnosed < 6 months declined from 25.8% (32/124) to 0.0% ($\Delta p = -0.26$, $p < 0.001$), with a corresponding increase in those living with HIV for 6–11 months from 8.9% (11/124) to 30.6% (38/124; $\Delta p = +0.22$, $p < 0.001$).

Participants categorized as "target not detected" (undetectable viral load) increased from 17.7% (22/124) at pre-intervention to 42.7% (53/124) post-intervention ($\Delta p = +0.25$, $p < 0.001$). Participants previously classified as "not due" for viral load testing dropped from 26.6% (33/124) to 0.0% ($\Delta p = -0.27$, $p < 0.001$) as all participants reached routine clinical testing eligibility during follow-up.

Table 1: General characteristics of study participants

Characteristic	Pre-Intervention (N=124)	Post-Intervention (N=124)	Δp (p-value)
Age (In completed years)			
15-24	38 (30.6%)	22 (17.7%)	-0.13 (0.018)
25-35	86 (69.4%)	102 (82.3%)	+0.13 (0.018)
education			
Basic school	61 (49.2%)	61 (49.2%)	0.00 (1.000)
SHS\Vocational\Technical	54 (43.5%)	54 (43.5%)	0.00 (1.000)
Tertiary	9 (7.3%)	9 (7.3%)	0.00 (1.000)
Marital status			
Currently married/cohabiting	71 (57.3%)	71 (57.3%)	0.00 (1.000)
Divorced	4 (3.2%)	4 (3.2%)	0.00 (1.000)
Never married	49 (39.5%)	49 (39.5%)	0.00 (1.000)
Employment status			

Unemployed	33 (26.6%)	33 (26.6%)	0.00 (1.000)
Self employed	64 (51.6%)	64 (51.6%)	0.00 (1.000)
Public servants	27 (21.8%)	27 (21.8%)	0.00 (1.000)
Duration living with HIV			
<6 months	32 (25.8%)	0 (0.0%)	-0.26 (<0.001)
6-11 months	11 (8.9%)	38 (30.6%)	+0.22 (<0.001)
1-3 years	53 (42.7%)	58 (46.8%)	+0.04 (0.516)
4-6 years	27 (21.8%)	27 (21.8%)	0.00 (1.000)
7-10 years	1 (0.8%)	1 (0.8%)	0.00 (1.000)
Viral Load level			
less than 50copies/mL	22 (17.7%)	34 (27.4%)	+0.09 (0.068)
≥50 copies/mL	47 (37.9%)	37 (29.8%)	-0.08 (0.178)
Not due	33 (26.6%)	0 (0.0%)	-0.27 (<0.001)
Target not detected	22 (17.7%)	53 (42.7%)	+0.25 (<0.001)

Δp = post-intervention proportion − pre-intervention proportion., The p-values are from a two-tailed two-proportion z-test.

Medication Adherence

Medication adherence increased significantly following the six-month intervention. The MARS-10 mean score increased from 4.0 ± 2.6 at baseline to 7.5 ± 1.4 post-intervention ($p < 0.001$), with median scores shifting from 3.0 (IQR: 2.0–6.5) to 8.0 (IQR: 8.0–8.0; $p < 0.001$). The proportion of participants meeting the criteria for good medication adherence (score ≥ 8) rose from 21.1% (26/124) at pre-intervention to 78.9% (98/124) post-intervention, representing a net improvement of 57.8 percentage points. Concurrently, poor adherence declined from 78.9% to 11.3% ($p < 0.001$).

Health-Related Quality of Life

Participation in the intervention resulted in significant gains across all WHOQOL-BREF quality-of-life domains (Table 2; all $p < 0.001$). Physical Health: increased from 39.9 ± 9.7 to 70.4 ± 5.1 ($\Delta = +30.5$, Cohen's $d = 2.75$, $p < 0.001$); Psychological Health: increased from 44.7 ± 13.5 to 80.1 ± 9.5 ($\Delta = +35.5$, Cohen's $d = 2.41$, $p < 0.001$); Social Relationships: increased from 77.0 ± 7.7 to 98.8 ± 5.4 ($\Delta = +21.8$, Cohen's $d = 2.39$, $p < 0.001$); Environment: increased from 43.3 ± 11.1 to 97.4 ± 10.8 ($\Delta = +54.1$, Cohen's $d = 3.51$, $p < 0.001$); Overall Composite HRQoL: increased from 47.2 ± 6.2 to 86.2 ± 8.3 ($\Delta = +38.9$, Cohen's $d = 3.76$, $p < 0.001$).

Categorical classification confirmed a large shift in HRQoL status. The proportion of participants with good physical health HRQoL rose from 4.0% (5/124) to 96.0% (119/124; Risk Difference [RD] = 0.92, 95% CI: 0.86–0.98; McNemar $\chi^2 = 114.0$, $p < 0.001$). Good psychological HRQoL increased from 9.2% (12/131) to 90.8% (119/131; RD = 0.86, 95% CI: 0.79–0.93; McNemar $\chi^2 = 107.0$, $p < 0.001$). Good social relationships HRQoL increased from 28.0% (46/164) to 72.0% (118/164; RD = 0.58, 95% CI: 0.49–0.68; McNemar $\chi^2 = 72.0$, $p < 0.001$). Good environmental HRQoL increased from 7.0% (9/129) to 93.0% (120/129; RD

= 0.895, 95% CI: 0.83–0.96; McNemar $\chi^2 = 111.0, p < 0.001$). For overall composite HRQoL, participants classified as good HRQoL increased from 2.4% (3/123) to 97.6% (120/123), while overall poor HRQoL fell from 96.8% (121/125) to 3.2% (4/125; RD = 0.94, 95% CI: 0.89–0.99; McNemar $\chi^2 = 117.0, p < 0.001$).

The WHOQOL-BREF scale demonstrated high internal consistency across all subscales: physical health ($\alpha = 0.98$), psychological health ($\alpha = 0.96$), social relationships ($\alpha = 0.88$), environmental health ($\alpha = 0.96$), and the full 26-item scale ($\alpha = 0.98$)

Table 2: Health-related Quality of Life Domain Scores at Pre- and Post-Intervention

	Pre-test (N=124**)**	**Post-test (N=124)**	**Mean diff.**	**OR**	**Test statistic/ McNemar χ^2 (p-value)**	**RD (95% CI),**	**RR (95% CI)**
Physical Health							
Raw (Mean ±Std)	2.6±0.4)	3.8±0.2)					
Transformed (0-100), (Mean ± Std)	39.9±9.7)	70.4±5.1)	+30.5	2.75	+30.6 (<0.001)		
Categorical status							
Good	5/124 (4.0%)	119/124 (96.0%)	+0.92	30.41	114.0 (<0.001)	0.92 (0.86, 0.98)	23.80 (10.09, 56.13)
Poor	119/124 (96.0%)	5/124 (4.0%)					
Psychological Health							
Raw, (Mean ± Std)	2.8±0.5)	4.2±0.4)					
Transformed (0-100), (Mean ± Std)	44.7±13.5)	80.1±9.5)	+35.5	2.41	+26.8 (<0.001)		
Categorical status							
Good	12/131 (9.2%)	119/131 (90.8%)	0.86	28.51	107.0 (<0.001)	0.86 (0.79, 0.93)	22.40 (9.51, 52.76)
Poor	112/117 (95.7%)	5/117 (4.3%)					
Social Relationships							
Raw, (Mean ± Std)	4.1±0.3)	5.0±0.2)					
Transformed (0-100), (Mean ± Std)	77.0±7.7)	98.8±5.4)	+21.8	2.39	+26.6 (<0.001)		
Categorical status							
Good	46/164 (28.0%)	118/164 (72.0%)	0.58	19.02	72.0 (<0.001)	0.58 (0.49, 0.68)	13.00 (6.03, 28.04)
Poor	78/84 (92.9%)	6/84 (7.1%)					
Environment							
Raw, (Mean ± Std)	2.7±0.4)	4.9±0.4)					
Transformed (0-100), (Mean ± Std)	43.3±11.1)	97.4±10.8)	+54.1	3.51	+39.1 (<0.001)		
Categorical status							
Good	9/129 (7.0%)	120/129 (93.0%)	0.89	29.59	111.0 (<0.001)	0.895 (0.83, 0.96)	28.75 (10.98, 75.30)

Poor	115/119 (96.6%)	4/119 (3.4%)					
Overall quality of life (Item 1)							
Raw, (Mean ± Std)	2.9±1.5)	4.9±0.6)					
Transformed (0-100), (Mean ± Std)	47.4±36.7)	96.8±15.3)					
Categorical status							
Good	27/145 (18.6%)	118/145 (81.4%)			+0.63 (<0.001)		
Poor	97/103 (94.2%)	6/103 (5.8%)			-0.73 (<0.001)		
General health satisfaction (Item 2)							
Raw, (Mean ± Std)	3.2±1.1)	4.8±0.7)					
Transformed (0-100), (Mea n± Std)	15.4±35.0)	93.6±24.4)					
Categorical status							
Good	18/134 (13.4%)	116/134 (86.6%)			+0.73 (<0.001)		
Poor	106/114 (93.0%)	8/114 (7.0%)			-0.79 (<0.001)		
Overall WHOQoL BRIEF							
Raw, (Mean ± Std)	2.9±0.2)	4.4±0.3)					
Transformed (0-100), (Mean ± Std)	47.2±6.2)	86.2±8.3)	+38.9	3.76	+41.8 (<0.001)		
Categorical status							
Good	3/123 (2.4%)	120/123 (97.6%)	0.944	31.22	117.0 (<0.001)	0.94 (0.89, 0.99)	30.25 (11.54, 79.29)
Poor	121/125 (96.8%)	4/125 (3.2%)					

Note: Δ*p* (Absolute Risk Reduction [ARR]) = post-intervention proportion − pre-intervention proportion. The p-values are from a two-tailed two-proportion z-test. **Abbreviations:** SD, standard deviation; RD: Risk Difference; RR, risk ratio (proportion ratio); OR, matched-pair odds ratio; RD, risk difference; CI, confidence interval. A = Paired t-test, B = Wilcoxon signed-rank test, C = McNemar's test.

Correlation Between Quality of Life domains and Medication Adherence

Pearson correlation analysis demonstrated that post-intervention medication adherence correlated positively and significantly with all four WHOQOL-BREF domains (Table 3; all $p < 0.001$). Adherence displayed strong correlations with psychological health ($r = 0.752$), environmental health ($r = 0.730$), and physical health ($r = 0.660$), and a moderate-to-strong correlation with social relationships ($r = 0.623$). Inter-domain correlations among the four HRQoL dimensions were also uniformly high, ranging from $r = 0.770$ (psychological and social relationships) to $r = 0.940$ (psychological and environmental health).

Table 3: Correlation Between HRQoL domains and Medication Adherence

Variable	Physical Health	Psychological Health	Social Relationship	Environment	Medication Adherence
Physical Health	1.000				
Psychological Health	0.871 (<0.0001)	1.000			
Social Relationship	0.815 (<0.001)	0.770 (<0.001)	1.000		
Environment	0.927 (<0.001)	0.940 (0.000)	0.854 (<0.001)	1.000	
Medication Adherence	0.660 (<0.001)	0.752 (<0.001)	0.623 (<0.001)	0.730 (<0.001)	1.000

Note: All values represent Pearson correlation coefficients (r) with corresponding two-sided p-values in parentheses

Multivariable GEE Analysis

Multivariable GEE modified Poisson models evaluated factors independently associated with poor medication adherence (Model I) and poor HRQoL (Model II; Table 4).

In Model I, the intervention period was the strongest predictor of adherence improvement: the post-intervention phase was associated with an 80% relative reduction in the prevalence of poor adherence compared to baseline (aPR = 0.20, 95% CI: 0.12–0.34, $p < 0.001$). Viral load status was also independently associated with adherence behavior: participants with an unsuppressed viral load (≥ 50 copies/mL) had a significantly higher prevalence of poor adherence compared to those with viral suppression < 50 copies/mL (aPR = 2.31, 95% CI: 1.58–3.39, $p < 0.001$). Similarly, clients not yet due for viral load testing exhibited higher rates of poor adherence (aPR = 1.82, 95% CI: 1.16–2.85, $p = 0.009$). Sex, age group, education, marital status, and employment status did not show significant associations with adherence ($p > 0.05$).

In Model II, participation in the intervention was associated with a 96% reduction in poor overall HRQoL (aPR = 0.04, 95% CI: 0.01–0.13, $p < 0.001$). Marital status was also significantly associated with HRQoL: never-married individuals experienced a lower prevalence of poor quality of life than married or cohabiting participants (aPR = 0.86, 95% CI: 0.75–0.99, $p = 0.038$). Poor adherence was marginally associated with poor HRQoL, though this did not attain conventional statistical significance after adjustment (aPR = 1.46, 95% CI: 0.93–2.30, $p = 0.099$).

Table 4: Multivariable Generalized Estimating Equation (GEE) models of factors associated with poor medication adherence and poor health-related quality of life ($N = 248$ observations)

Variable	Model I: Medication Adherence			Model II: Quality of Life)		
	aPR	95% CI	p-value	aPR	95% CI	p-value
Sex						
Female	1.000			1.000		
Male	1.060	[0.900,1.250]	(0.484)	0.964	[0.868,1.070]	(0.493)
Age (In completed years)						
15-24	1.000			1.000		
25-35	1.101	[0.905,1.341]	(0.336)	0.931	[0.835,1.039]	(0.201)
Educational level						
Basic School	1.000			1.000		
SHS	1.122	[0.934,1.347]	(0.220)	1.000	[0.903,1.108]	(0.997)
Tertiary	1.025	[0.777,1.352]	(0.864)	0.897	[0.758,1.060]	(0.200)
Marital status						
Currently married	1.000			1.000		
Divorced	1.026	[0.755,1.394]	(0.868)	0.926	[0.806,1.064]	(0.281)
Never married	1.031	[0.869,1.224]	(0.724)	0.862	[0.749,0.992]	(0.038)
Employment status						
Unemployed	1.000			1.000		
Self employed	0.977	[0.810,1.178]	(0.807)	0.889	[0.785,1.006]	(0.062)
Public servants	0.972	[0.742,1.273]	(0.836)	1.074	[0.877,1.316]	(0.491)
Duration living with HIV						
<1 year	1.000			1.000		
1+	0.837	[0.591,1.186]	(0.318)	1.066	[0.915,1.242]	(0.413)
Viral Load status						
less than 50	1.000			1.000		
50 and above	2.314	[1.579,3.392]	(<0.001)	1.050	[0.895,1.230]	(0.551)
Not due	1.818	[1.160,2.851]	(0.009)	0.999	[0.852,1.171]	(0.988)
Target not detected	0.000	[0.000,0.000]	(<0.001)	1.247	[0.899,1.731]	(0.187)
Period						
Pre-Intervention	1.000			1.000		
Post- Intervention	0.204	[0.121,0.344]	(<0.001)	0.041	[0.013,0.128]	(<0.001)
Medication Adherence						
Good				1.000		
Poor				1.463	[0.931,2.299]	(0.099)

Abbreviations: aPR = adjusted prevalence ratio; CI = confidence interval; GEE = generalized estimating equation. Models were adjusted for all variables presented in the table and accounted for repeated measurements among participants using an exchangeable correlation structure with robust standard errors. Reference categories are indicated by aPR = 1.000.

Discussion

Adolescents and young adults living with HIV face intersecting psychosocial, developmental, and structural challenges that compromise ART adherence and undermine HRQoL [26, 27]. In

Ghana, persistent societal stigma, fear of status disclosure, and limited youth-tailored health infrastructure exacerbate these treatment challenges [28]. This quasi-experimental study examined the impact of an innovative, multidisciplinary, social media–based peer support program deployed within a high-prevalence peri-urban municipality. The findings indicate substantial improvements across behavioural, psychosocial, and biological outcomes over the six-month follow-up period.

The intervention was associated with an increase in self-reported good medication adherence from 21.1% to 78.9%, alongside an 80% independent reduction in the prevalence of poor adherence. Concurrently, virological suppression improved substantially: participants with undetectable viral loads rose from 17.7% to 42.7%, and self-reported illness resolved completely. These clinical improvements support the validity of the self-reported MARS-10 measures and align with previous findings across sub-Saharan Africa showing that mobile health reminders, digital peer tracking, and dedicated counseling can increase ART retention and viral suppression among young populations [29-31]. In Ghanaian clinical contexts, previous research noted that adherence rates hover near 55% under routine standard care, but rise toward 80% when supplemented with structured counseling and peer support [32].

HRQoL improved substantially across all evaluated dimensions. Mean transformed scores for physical and psychological domains nearly doubled, and participants classified as having good overall HRQoL increased from 2.4% at baseline to 97.6% post-intervention. The correlation between higher adherence and improved HRQoL across all domains confirms that behavioral adherence and psychosocial well-being are mutually reinforcing. These findings reflect observations by Nawfal et al. and Saah et al., who noted that digital platforms that mitigate stigma and provide continuous peer reinforcement reduce emotional distress and isolation among individuals living with HIV [20, 33].

Several operational mechanisms likely drove the observed gains: (i) Delivering peer discussions via anonymous Chatterbox handles minimized the risk of unwanted disclosure, allowing participants to share treatment challenges openly. (ii) Integrating medical officers, nurse counselors, mental health clinicians, and nutritionists ensured that peer interactions remained evidence-based, medically safe, and professionally moderated. (iii) The two-tiered architecture, combining public anonymous group discussions on Chatterbox with encrypted private counseling via WhatsApp, enabled efficient escalation of acute psychological or

medical concerns to clinicians. (iv) The provision of monthly mobile data bundles resolved digital poverty barriers, ensuring equitable participation across socioeconomic strata.

Interestingly, multivariable modeling demonstrated that never-married young people had a 14% lower prevalence of poor HRQoL than married or cohabiting individuals. This finding may reflect the interpersonal stressors, fear of marital breakdown, or challenges surrounding serostatus disclosure common in intimate cohabiting unions in conservative peri-urban settings. Furthermore, participants with unsuppressed viral loads were over twice as likely to experience poor adherence, highlighting the clinical association between non-adherence and viral breakthrough.

Together, these findings highlight the utility of structured social media platforms in bridging the gap between facility-based clinical encounters and community-level daily self-management. Digital peer platforms provide a scalable mechanism to extend differentiated HIV care, support UNAIDS 95-95-95 targets, and improve overall well-being among young populations living with HIV in resource-limited contexts.

Limitations

Several methodological limitations should be considered when interpreting these findings: (i) The absence of an unexposed parallel control group means that the influence of external factors, secular trends, regression to the mean, or the Hawthorne effect cannot be completely excluded, precluding definitive causal inferences. (ii) Medication adherence was measured using the self-reported MARS-10 scale, which is susceptible to social desirability and recall biases. However, the observed virological improvements provide objective biomarker support for the self-reported behavioural changes. (iii) Inclusion was restricted to individuals who possessed compatible smartphones, had internet access, and were literate in English. This may limit the generalizability of findings to illiterate youths or those residing in areas with poor telecommunications infrastructure. (iv) The six-month evaluation timeline does not capture whether behavioural adherence and HRQoL improvements persist over multi-year periods. (v) Because the intervention combined daily automated reminders, anonymous peer discussions, professional moderation, and internet data subsidies, the independent contribution of each discrete element could not be isolated.

Conclusion

A six-month, professionally moderated social media peer-support intervention was associated with improvements in medication adherence, HRQoL, and virologic suppression among young people living with HIV in the Kwaebibirim Municipality of Ghana. Marked improvements occurred across all WHOQOL-BREF domains, accompanied by a major reduction in poor adherence and an increase in viral suppression. Utilizing a dual-platform digital strategy that pairs anonymous group interactions with private professional counseling addresses critical stigma and communication barriers, representing an effective, scalable complement to routine ART delivery in resource-limited settings. The Ghana Health Service (GHS) and the National AIDS Control Programme (NACP) should, therefore, formulate policy frameworks to integrate moderated social media peer-support networks into adolescent- and youth-friendly health services (AYFHS). Multicenter randomized controlled trials with longer follow-up horizons, incorporating electronic drug monitoring (e.g., MEMS caps) and economic evaluations to establish causality, long-term sustainability, and cost-effectiveness.

Declarations

Ethical Consideration and Consent to Participate:

This study was conducted in accordance with the ethical tenets of the Declaration of Helsinki. Ethical clearance was formally granted by the University of Health and Allied Sciences Research Ethics Committee (Ref: UHAS-REC [M.10(027)24-25]). All participants provided written informed consent prior to enrollment. To mitigate digital participation costs, participants received a 1.0-gigabyte mobile internet data bundle monthly for six months. Clinical counseling was accessible for any participant experiencing psychological distress. This study was conducted in accordance with the Declaration of Helsinki.

Consent for Publication:

Not applicable.

Availability of Data:

The datasets generated and analyzed during the current study is available with the corresponding author upon reasonable request.

Competing Interests:

The authors declare that they have no competing financial or non-financial interests.

Funding:

The authors received no external funding for this study

Authors' Contributions:

EM conceptualised and implemented the study. ER contributed to the design and drafted the original manuscript. VUG performed formal analysis. All authors read and approved the final manuscript.

Acknowledgements:

The authors express their gratitude to the study participants for their commitment and time. We also thank the management and clinical staff of the Kade Government Hospital ART Unit for institutional facilitation and administrative support.

Clinical Trial Registration:

Not applicable.

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