

RESEARCH ARTICLE

Long-term impact of an integrated HIV/non-communicable disease care intervention on patient retention in care and clinical outcomes in East Africa

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Abstract

Objective: To describe rates of retention in care and control of hypertension, diabetes and HIV among participants receiving integrated care services for a period of up to 24 months in East Africa.

Methods: Between 5 October 2018 and 23 June 2019 participants enrolled into a prospective cohort study evaluating the feasibility of integrated care delivery for HIV, diabetes and hypertension from a single point of care in Tanzania and Uganda (MOCCA study). Integrated care clinics were established in 10 primary healthcare facilities and care was provided routinely according to national guidelines. Initial follow-up was 12 months. Outcomes were rates of retention in care, proportions of participants with controlled hypertension (blood pressure <140/90 mmHg), diabetes (fasting blood glucose <7.0 mmol/L) and HIV (plasma viral load <1000 copies/ml). The study coincided with the COVID-19 pandemic response. Afterwards, all participants were approached for extended follow-up by a further 12 months in the same clinics. We evaluated outcomes of the cohort at the end of long-term follow-up.

Results: The MOCCA study enrolled 2273 participants of whom 1911 (84.5%) were retained in care after a median follow-up of 8 months (Interquartile range: 6.8–10.7). Among these, 1283/1911 (67.1%) enrolled for a further year of follow-up, 458 (24.0%) were unreachable, 71 (3.7%) reverted to vertical clinics (clinics providing services dedicated to study conditions), 31 (1.6%) died and 68 (3.6%) refused participation. Among participants who enrolled for longer follow-up, mean age was 51.4 ± 11.7 years, 930 (72.5%) were female and 509 (39.7%) had multiple chronic conditions. Overall, 1236 (96.3%) [95% confidence interval 95.2%–97.3%] participants were retained in care, representing 1236/2273 (54.3%) [52.3%–56.4%] of participants ever enrolled in the study. Controlled hypertension, diabetes and HIV at the end of follow-up was, 331/618 (53.6%) [49.5%–57.5%], 112/354 (31.6%) [26.8%–36.8%] and 332/343 (96.7%) [94.3%–98.4%] respectively.

Conclusion: Integrated care can achieve high rates of retention in care long term, but control of blood pressure and blood sugar remains low.

KEYWORDS

HIV, integrated care, non-communicable diseases, primary healthcare, retention in care, Tanzania, Uganda

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Sustainable Development Goal: Good Health and Well-being

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BACKGROUND

Currently, one in four adults has hypertension in Africa and one in 22 adults has diabetes [1]. At the same time, hypertension and diabetes related mortality is rising with pre-mature adult deaths attributable to the two conditions estimated at two million a year in Africa. The rise in the prevalence of hypertension and diabetes in Africa, is occurring alongside a persistent high burden of HIV. HIV-related mortality rates have declined significantly since the advent of antiretroviral therapy, and the availability of life-long treatment has turned HIV into a chronic condition [2]. However, the incidence of HIV remains high in Africa. For example, eastern and southern Africa which remain the epicentre of the global HIV pandemic, 500,000 new HIV infections were documented in 2022 [3].

The increasing dual burden of HIV and non-communicable diseases in the form of hypertension and diabetes has necessitated re-thinking models of delivery of chronic care services in African settings to meet healthcare demand. Currently healthcare delivery for HIV and non-communicable diseases (particularly diabetes and hypertension), is organised vertically in most countries in Africa [4]. That is, care is provided from clinics dedicated to treating these conditions. HIV care is provided from well-resourced clinics, with 90% of people living with HIV in regular care. On the other hand, clinics dedicated to hypertension and diabetes care are limited or poorly resourced if available in Africa [5]. As a result, less than 10% of people with diabetes or hypertension are in regular care and control of both conditions is poor even in the few that are in regular care [5]. Re-organising delivery of healthcare services for chronic conditions is of essence given the rising number of people with multiple chronic conditions in Africa. For example, among people living with HIV, hypertension or diabetes, between 25% and 40% have at least one other chronic condition [4, 6].

Integration of HIV, hypertension and diabetes care has been explored as an approach to cope with demand for care and to reduce inequity for hypertension and diabetes services in primary healthcare settings in Africa. Several models of HIV/hypertension and diabetes service integration have been proposed, ranging from 'single stop' chronic care clinics (that is, health facilities providing HIV, hypertension and diabetes services from a single point of care to the general population), to HIV clinics targeting patients with co-morbid conditions of HIV/hypertension and diabetes [4, 7–10]. The underlying premise of these models is leveraging existing HIV platforms for hypertension and diabetes care in African settings. There is, however, concern that this may lead to trade-offs in quality of HIV care and potentially reverse the gains of the HIV response in Africa [7].

Evidence showing the feasibility and acceptability of integrating HIV/non-communicable disease services in primary health care services in limited resource settings, including Africa is increasing [4, 6, 11, 12]. The evidence

suggests favourable clinical outcomes and economic benefits accrue from integrated care approaches [4, 13] and that the approach does not negatively impact HIV outcomes [6]. While these studies demonstrate success, by and large, their evidence is based on short-term follow-up, often less or up to 12 months duration. The impact of integrating HIV, hypertension and diabetes services on retention in care and patient clinical outcomes beyond one year of follow-up is poorly described.

In this study, we evaluated rates of retention in care and clinical control of hypertension, diabetes and HIV among participants receiving care from integrated care clinics for a period of up to 24 months in primary healthcare services in East Africa. This evidence is necessary to inform policy makers and other stakeholders on integration scale-up efforts in similar settings.

MATERIALS AND METHODS

Study design and setting

This was a prospective cohort designed to evaluate the retention in care and control of diabetes, hypertension and HIV from a cohort of adult patients (18 years and older), known or newly diagnosed with any one of these conditions, alone or in combination in primary healthcare settings in Tanzania and Uganda. Standard care is currently vertical service provision for these conditions in both Tanzania and Uganda.

Study cohort and selection of participants

Between 5 October 2018 and 23 June 2019 participants were initially enrolled into a prospective cohort study evaluating the feasibility and acceptability of integrating care for HIV, diabetes, and hypertension from a single point of care. The study was called the Management of Chronic Conditions in Africa (MOCCA study) and is described elsewhere [4].

In brief, integrated care clinics were established in 10 primary healthcare facilities, five each in Tanzania and Uganda, and provided services to patients with conditions of HIV, diabetes and hypertension as single conditions or in combination, all from a single point of care. Multimorbidity was defined as co-morbidity. That is, any combination of two chronic conditions—HIV, diabetes or hypertension—or all three conditions occurring together. Each clinic had about 250–300 participants who shared waiting areas, were managed by the same clinical staff and used the same pharmacy and laboratory services regardless of medical condition. For participants with co-morbidities, all conditions were treated in a single clinic visit by the same clinical staff except for specialised cases where applicable, such as diabetic foot.

Being a proof-of-concept study, whose findings were meant to inform a much larger trial [6], participants

were only followed up for a median period of 8.2 months (interquartile range: 6.8–10.7 months). The outcomes of the study were rates of retention in care and proportions of participants with controlled hypertension, diabetes and HIV plasma viral suppression.

When the study ended, different approaches were taken to the integrated care clinics in Tanzania and Uganda. In Uganda, facility managers opted to continue with the integrated care model while awaiting findings from a larger clinical trial of the same model [6]. In Tanzania, the integrated care clinics closed. The Ministry of Health required further evidence from the clinical trial before approving any modifications to the delivery of healthcare services.

The preliminary findings of the study demonstrated high rates of retention in care with good viral suppression among participants living with HIV [4]. These positive findings prompted the interest to extend the operations of the integrated care clinics and investigate the longer-term effects of the integrated care model on the same study outcomes (retention in care and clinical control of study conditions).

While we were awaiting ethics approval for this, activities were interrupted by the COVID-19 pandemic response in both countries in March 2020. The local response to the COVID-19 pandemic led to delays in approvals from ethics and health regulatory bodies in both countries, and halted patient recruitment for all non-COVID-19 research. There were concerns that study procedures would increase the risk of exposure to COVID-19 for participants.

Sampling

When the COVID-19 response measures were relaxed in both countries, we set out to re-enrol the cohort and extend follow-up by a further 12 months. All participants were invited by telephone to enrol for longer follow-up in the same integrated care clinics in both countries. For those who were willing, appointments were made to attend the clinic for screening and written consent. Figure 1 describes the timelines for enrolment and longer-term follow-up of the cohort.

Study procedures

Consented participants had clinical measurements of blood pressure, weight, height, a lipid profile test and a fasting plasma glucose test for those with diabetes at enrolment for long-term follow-up. For participants with HIV, recent HIV plasma viral load data were abstracted from their routine care files into the study database. Participants due for HIV plasma viral load testing were referred to routine services for testing. All treatment, including medications were prescribed and dispensed by routine healthcare and pharmacy services according to the national treatment guidelines for each condition.

Data collection and management

All study data (blood pressure, fasting blood glucose measurements and HIV plasma viral load) were collected in real time using an electronic data capture system at the point-of-care, with paper case report forms as a backup in the case of power outages. All study personnel received training on the electronic data capture system before the start of extended follow-up.

Definition of study measures and outcomes

Outcomes measured at the end of long-term follow-up were (i) retention in care, defined as the proportion of enrolled participants alive and in care in the integrated clinics and (ii) clinical control of biomedical conditions that is, proportions of participants with blood pressure <140/90 mmHg, fasting blood glucose <7.0 mmol/L and plasma HIV viral load <1000 copies/ml.

RESULTS

A total of 2273 participants enrolled into the MOCCA study of whom 1911 (84.5%) were available for extended follow-

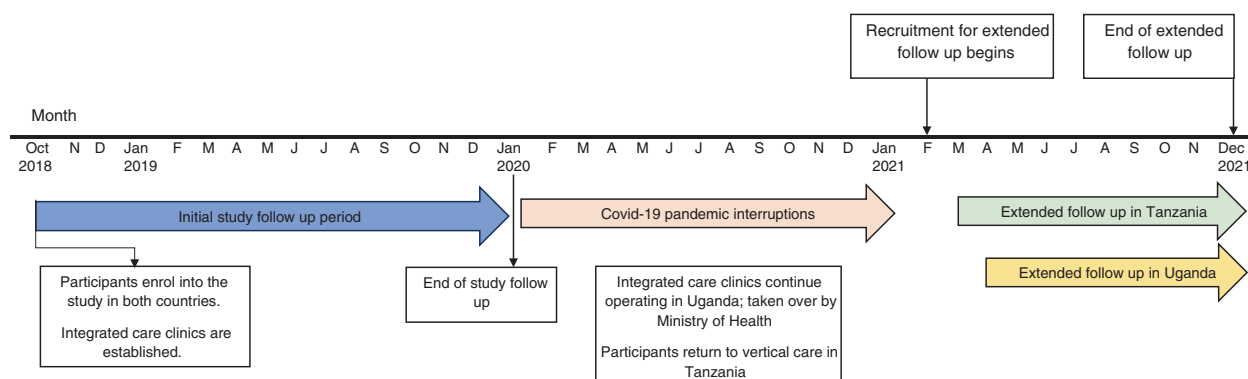


FIGURE 1 Timeline for enrolment and follow-up of study participants.

up [4]. A median time of 16.3 months (interquartile range: 15.6–17.3) passed between the end of the MOCCA study and enrolment of participants for extended follow-up (Figure 2).

Among 1911 participants available for long-term follow-up, 458 (24.0%) were unreachable, 71 (3.7%) transferred out

to mainstream HIV and non-communicable disease vertical clinics, 31 (1.6%) died and 68 (3.6%) refused participation. Among participants who refused participation, 28 (41.2%) were unwell, 20 (29.4%) said they had travelled, 11 (16.2%) cited lack of funds to cover transport costs to the clinic, and 9 (13.2%) withdrew consent. Participants who did not enrol

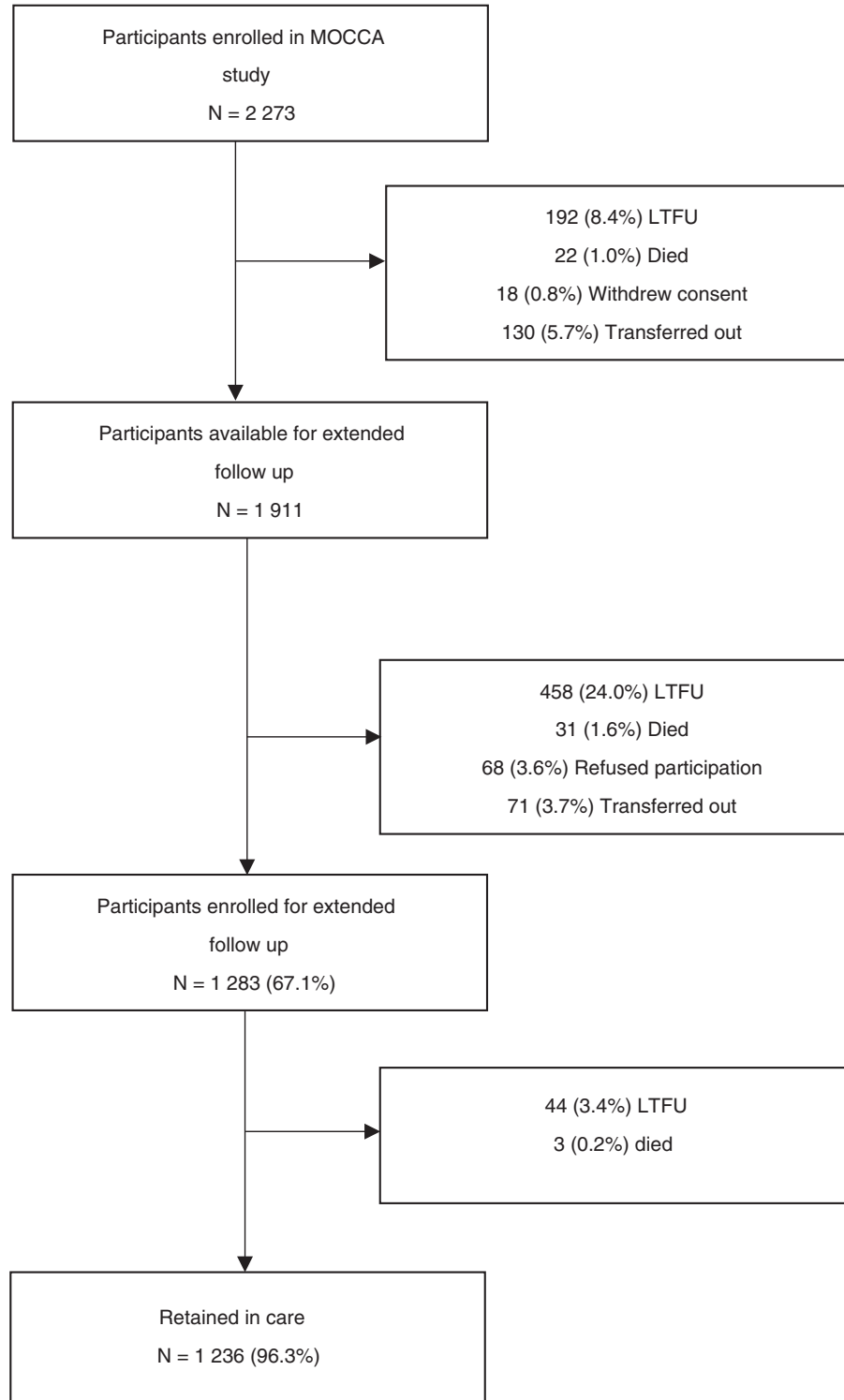


FIGURE 2 Study consort chart. MOCCA, Management of Chronic Conditions in Africa.

for long-term follow-up were younger, had lower BMI and higher proportion of single conditions at enrolment into the MOCCA study compared to those who enrolled into the study long term (Table S1).

A total of 1283 (67.1%) participants enrolled for long-term follow-up for a median time of 7.6 months (interquartile range: 4.9–10.2). Among these, 579 (45.1%) were from Tanzania and 704 (54.9%) were from Uganda. The mean age \pm standard deviation was 51.4 ± 11.7 years overall, and 930 (72.5%) were female (Table 1). A total of 774 (60.3%) participants had single conditions of HIV, diabetes or hypertension (Table 1) whereas 188 (14.7%) had HIV and hypertension, 30 (2.3%) had HIV and diabetes, 246 (19.2%) had diabetes and hypertension, 45 (3.5%) had all three conditions.

Overall, 1236 (96.3%) [95% confidence interval: 95.2%–97.3%] participants were retained in care at the end of long-term follow-up, representing 1236/2273 (54.3%) [52.3%–56.4%] of participants ever enrolled in the study. Rates of retention in care differed by country of residence (p value <0.001) but were similar between participants with single conditions 741/774 (95.7%) and multimorbid participants 495/509 (97.3%), (p value = 0.158). Table S2 shows rates of retention in care stratified by country of residence and disease condition for the cohort.

Overall, blood pressure control ($<140/90$ mmHg) at the end of long-term follow-up was 53.6% (331/618) [95% confidence interval 49.5%–57.5%] compared to 416/1085 (38.3%) [35.4%–41.3%] at enrolment into the MOCCA study among participants with hypertension. The mean systolic and diastolic blood pressure did not differ between participants with single conditions and those with multiple chronic conditions during follow-up (Table S3), p -values = 0.160 and 0.05 respectively.

Among participants living with diabetes, fasting blood glucose was <7 mmol/L in 145/509 (28.5%) [24.6%–32.6%] participants at baseline and increased to 112/354 (31.6%) [26.8%–36.8%] at the end of long-term follow-up. Mean fasting blood glucose was consistently higher among participants with single conditions compared to participants with multiple chronic conditions (Table S3), p value <0.001 .

A steady increase in proportions of participants achieving HIV plasma viral load <1000 copies/mL was observed throughout the duration of follow-up. Overall, the proportion of participants with HIV plasma viral load <1000 copies/mL at baseline was 509/646 (80.3%) [77.1%–83.3%], increasing to 332/343 (96.7%) [94.3%–98.4%] at the end of long-term follow-up. Virologic control was higher among participants with multiple chronic conditions compared to those with single conditions at the different times of follow-up (Table S3), p value <0.001 .

DISCUSSION

This study shows that the integrated care model for delivery of HIV, diabetes and hypertension services can achieve high

rates of retention in care long-term in primary healthcare settings in Africa. Furthermore, the study suggests that the model does not adversely impact HIV care considering that more than 90% of people with HIV had viral suppression. However, the control of glycaemia and blood pressure among participants living with diabetes and hypertension remained low.

The findings also suggest that the integrated care model may appeal to older patients, and those with multiple chronic conditions and that the model will achieve near-universal retention in care in these sub-groups. Of the people we were able to contact to rejoin the clinic two thirds agreed to return and 96% were retained in care at the end of follow-up. Overall, the rate of retention in care in this study compares with reports from other studies evaluating retention in care in models of HIV/non-communicable disease service integration which ranges from 53% to 71% after more than one year of follow-up [7, 14, 15]. However, our study was also negatively impacted by the COVID-19 pandemic interruption, and retention in care over the periods the study was running were very high at over 80% overall and when stratified by disease condition [4]. Beyond the COVID-19 pandemic interruptions overall rates of retention in care among people living with diabetes and/or hypertension in this study compare with reports from studies evaluating retention in diabetes/hypertension care in primary healthcare settings in Africa, estimated at 38%–44% [7, 14–18].

The low rates of retention in care and poor control of diabetes and hypertension in routine clinical care in Africa is often attributed to erratic drug supplies for these conditions [19, 20]. Some patients opt out to seek care from private healthcare providers which is uncommon in these settings and brings huge out-of-pocket costs for patients. HIV programmes on the other hand, are well resourced and have over the years succeeded in linking and retaining patients in care such that the UNAIDS 90-90-90 targets are no longer an ambitious target to attain [21]. Over 80% of people living with HIV are in regular care and are virally suppressed [15]. In this study, diabetes and hypertension medicines were supplemented during follow-up to serve to purposes (i) to alleviate shortage of medicines for people living with diabetes and hypertension and (ii) to minimise the confounding factor of drug shortages on the impact of the model on study outcomes. Conversely, the availability of drugs may have motivated participants to remain in care for longer, but this was not enough to improve clinical control for diabetes and hypertension.

Similar findings of low levels of control (less than 30%) among participants with hypertension or diabetes have also been reported elsewhere [22–24]. By extension, diabetes and hypertension control outside of research settings is much worse due to less resources and clinical expertise for managing these conditions in Africa. Contributing factors include inconsistent drug supplies, inability to conduct regular monitoring, poor adherence and lifestyle management counselling and lack of a trained healthcare workforce that can optimise drug dosing [25].

TABLE 1 Characteristics of study participants at enrolment for long-term follow-up.

Attribute	Overall N = 1283	HIV only n = 384	Hypertension only n = 252	Diabetes only n = 138	Multi-morbidity n = 509
Age (years)					
<40	199 (15.5%)	142 (37.0%)	10 (4.0%)	16 (11.6%)	31 (6.1%)
40–49	359 (28.0%)	144 (37.5%)	47 (18.7%)	47 (34.1%)	121 (23.8%)
50–59	403 (31.4%)	76 (19.8%)	94 (37.3%)	47 (34.1%)	186 (36.5%)
60 years and older	322 (25.1%)	22 (5.7%)	101 (40.1%)	28 (20.3%)	171 (33.6%)
Mean ± SD	51.4 ± 11.7	42.8 ± 10.2	57.5 ± 10.4	50.9 ± 10.8	55.0 ± 9.8
Female sex	930 (72.5%)	267 (69.5%)	190 (75.4%)	99 (71.7%)	374 (73.5%)
Blood pressure (mmHg)					
≤139/89	1282	383	252	138	509
≥140/90	778 (60.7%)	322 (84.1%)	120 (47.6%)	117 (84.8%)	219 (43.0%)
≥180/120	444 (34.6%)	58 (15.1%)	117 (46.4%)	21 (15.2%)	248 (48.7%)
Systolic blood pressure median (IQR)	60 (4.7%)	3 (0.8%)	15 (6.0%)	0 (0.0%)	42 (8.3%)
Diastolic blood pressure median (IQR)	130 (116–145)	115 (106–129)	137 (119–149)	122 (111–134)	139 (125–155)
Fasting blood glucose (mmol/L)	81 (74–91)	78 (70–86)	82 (74–93)	76 (70–82)	86 (77–95)
<6.1	815	193	113	121	388
6.1–6.9	396 (48.6%)	156 (80.8%)	83 (73.5%)	16 (13.2%)	141 (36.3%)
≥7.0	106 (13.0%)	26 (13.5%)	20 (17.7%)	8 (6.6%)	52 (13.4%)
Fasting blood glucose median (IQR)	313 (38.4%)	11 (5.7%)	10 (8.9%)	97 (80.2%)	195 (50.3%)
BMI (kg/m ²)	8.2 (6.1–12.0)	5.7 (5.2–6.3)	5.0 (4.8–5.5)	9.6 (7.1–13.0)	8.6 (6.2–11.8)
<25.0	1282	383	252	138	509
25 ≤ 30	481 (37.5%)	209 (54.6%)	81 (32.1%)	59 (42.8%)	132 (25.9%)
30 ≤ 35	424 (33.1%)	104 (27.2%)	83 (32.9%)	42 (30.4%)	195 (38.3%)
≥35	262 (20.4%)	49 (12.8%)	58 (23.0%)	29 (21.0%)	126 (24.8%)
Females, BMI median (IQR)	115 (9.0%)	21 (5.5%)	30 (11.9%)	8 (5.8%)	56 (11.0%)
Males, BMI median (IQR)	27.8 (24.0–31.6)	25.8 (22.7–30.1)	28.9 (25.2–32.0)	27.0 (23.5–32.0)	28.8 (25.4–32.0)
Low density lipoprotein (mmol/L)	24.2 (20.9–27.2)	21.7 (19.0–24.6)	24.4 (22.0–27.9)	24.4 (21.1–27.6)	26.2 (22.9–28.7)
LDL <2.6	1248	380	244	131	493
LDL ≥2.6	491 (39.3%)	213 (56.1%)	80 (32.8%)	47 (35.9%)	151 (30.6%)
Total cholesterol (mmol/L)	757 (60.7%)	167 (43.9%)	164 (67.2%)	84 (64.1%)	342 (69.4%)
<5.2	1246	380	242	131	493
≥5.2	848 (68.1%)	319 (84.0%)	139 (57.4%)	96 (73.3%)	294 (59.6%)
	398 (31.9%)	61 (16.1%)	103 (42.6%)	35 (26.7%)	199 (40.4%)

Note: Percentages may exceed 100% due to rounding off.
Abbreviations: BMI, body mass index; IQR, interquartile range; SD, standard deviation.

Further attention to adherence and optimal dosage of drugs for diabetes and hypertension is likely needed, and over a longer period improvement in control may be seen. Other studies recommend innovation around medicines supply and formulation of medicines for diabetes and hypertension such as fixed dose therapies, as is currently done for HIV for improving adherence and ultimate control of these conditions [22, 26]. Furthermore, the interaction of patients in integrated HIV/non-communicable disease services provides opportunity for psychosocial support amongst patients owing to the chronic nature of all three conditions. This may improve outcomes for diabetes and hypertension.

Interpretation of our study findings requires acknowledgment of some limitations. The study sample may have been biased to participants who were more likely to benefit from the integrated care model, that is, older participants (as reflected by an overall mean age of over 50 years at baseline) and/or those living with multiple chronic conditions (at 40% in the study sample). Furthermore, participant follow-up was impacted by the COVID-19 pandemic interruptions. Participant drop out due to health concerns and pandemic restrictions may have skewed the study sample. As a result, findings observed in this study may not be generalisable. Finally, despite having a large sample, the study did not have a comparison group.

To conclude, our findings demonstrate that the integrated chronic care model can achieve high retention in care long-term, an important first step in increasing access to care and achieving better clinical outcomes for people living with non-communicable diseases. Governments considering scaling up integrated chronic care services should consider prioritising regular monitoring for diabetes and blood pressure control, strengthening drug supplies and further training and support of healthcare workers in diabetes and hypertension management. Future research work should investigate addressing this gap.

ACKNOWLEDGEMENTS

The authors thank the patients, MOCCA study teams and health facility staff, who supported the study and provided patient care and Ministries of Health from the two countries for their support.

CONFLICT OF INTEREST STATEMENT

There are no conflicts to declare.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Namakoola I, Moyo F, Birungi J, Kivuyo S, Karoli P, Mfinanga S, et al. Long-term impact of an integrated HIV/non-communicable disease care intervention on patient retention in care and clinical outcomes in East Africa. *Trop Med Int Health*. 2024. <https://doi.org/10.1111/tmi.14026>