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Impact of NIMART training on HIV management in Ngaka Modiri Molema District, North WEST province

Sheillah Hlamalani Mboweni[a], Lufuno Makhado[b,*]

[a] Aurum institute, 29 Queens Road, Park town, Johannesburg, South Africa
[b] Department of Public Health, School of Health Sciences, University of Venda, Thohoyandou, South Africa

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ABSTRACT

Background: The purpose of NIMART training is to upscale the capacity of PNs with knowledge, skills, confidence and competencies to provide comprehensive and quality health care services to PLWH and thereby improve the performance of the HIV programme. Therefore, this study evaluates the impact of NIMART training on the implementation of the HIV programme to identify gaps and extend best practices.
Objectives: The objective of the study is to determine and evaluate the impact of NIMART training on HIV programme in order to make recommendations leading to effective training and implementation.
Methods: A quantitative descriptive design for programme evaluation was used to examine the impact of NIMART training on the implementation of the HIV programme. The study was conducted in rural districts of the North West province. A stratified simple random sampling method was used to select n = 10 PHC fixed clinics and community health centres that met the inclusion criteria. Five sub-districts were selected to participate in the study to allow a greater degree of representativeness. The statistics of ART indicators were collected from the DHIS from January 2012 to December 2016. These ART indicators have been measured against the number of PNs trained on NIMART. Descriptive statistics were used to analyse data.
Results: The study results revealed ineffectiveness in the implementation of NIMART training programme and inefficiency in the management of HIV as there is no steady increase of new ART initiation in adults, children, and ANC pregnant women and below 90%, despite 99% of PHC selected facilities having 75% on PNs trained on NIMART, 42.8% were not certificated for competence and only 23% not trained, including the changes in eligibility criteria for treatment, introduction of PMTCT policy and universal test and treat (UTT) in September 2016. Sustainability of patient on ART is poor as the study results revealed fluctuation in both adults and children TROA and high LTFU at an average of 14%. Again, of Viral load collection (54%) & Viral load suppression (56%) rate at 12 months after ART initiation is far below the 90% target and had negative impact on patient treatment outcomes including decanting of stable patients out of the overcrowded facilities. However, adult patient death after 12 months of starting treatment declined.
Conclusion and Recommendations: There is a significant impact of NIMART training on HIV management with regard to increased access to PHC facilities. However, challenges still exist that reveal poor quality of HIV management, non-compliance to guidelines and monitoring of treatment effectiveness despite PNs trained on NIMART. Challenges or barriers that lead to the identified gaps need to be investigated in order to make recommendations that strengthen NIMART training and implementation.

1. Introduction and Background

The dual burden of human immunodeficiency virus (HIV) and tuberculosis (TB), is a global concern. Both demand antiretroviral therapy (ART) initiation to manage and control the dual epidemic. There is also a dire need for a prevention strategy for mother to child transmission (PMTCT). According to UNAIDS (2018), there are approximately 36.9 million people living with HIV (PLWH) worldwide of which 16.8 million are women; 3.4 million are children and adolescents younger than 15 years old. In the same report, 1.8 million deaths related to acquired immune deficiency syndrome (AIDS) were reported. The prevalence of HIV remains high at 19.1% among the general population and very high in key populations globally, although there was a slight decline of 0.8% since 2000, from 38.1 million to 36.9 million

* Corresponding author at: Department of Public Health, School of Health Sciences, University of Venda, Private bag X 5050, Thohoyandou 0950, South Africa.
E-mail address: lufuno.makhado@univen.ac.za (L. Makhado).

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cases in 2014 (UNAIDS, 2018). In addition, the report also indicates that only 37% of adults and 24% of children living with HIV, receives ART world wide. Consequently, the prevalence of TB and HIV co-infected cases is also increasing, adding to the burden in the management of HIV and TB. In 2012, there were 9.6 million new TB cases of which 1.2 million were among PLWH globally (WHO, 2018).

The Sub-Saharan region is the most affected with 25.8 million that account for 70% of HIV cases globally and 1.2 million deaths. PLWH who knows their status are at 45%, those receiving ART at 39% and those with suppressed viral load at 29%. All these high figures raise many concerns with regard to HIV management among public health professionals (UNAIDS, 2018).

South Africa was ranked as the third highest TB-burden in the world in 2013 (UNAIDS, 2018) and having the largest population of PLWH at 6.4 million, 340 000 new HIV infections, with 200 000 AIDS related deaths. The increasing number of PLWH in need of ART exerts more pressure on a health care system that is already experiencing a dire shortage of resources and high staff turnover (Ousman, Polomano, Seloilwe, Odero, & Tarmo, 2016). Among the general population, HIV prevalence in all provinces of South Africa is increasing at 6 595 232, with only about half of that number initiated on ARV. Thus, leaving 3 103 902 (47.1%) PLWH on ART, even though there is a decline among children born with HIV because of a PMTCT programme that has reduced mortality by 20%. The life expectancy of babies with HIV at birth is still below target of 70%; with females at 64.3% and males at 60.6% (Statistics South Africa, 2019).

The World Health Organisation's task-shifting recommendations (Statistics South Africa, 2019; World Health Organization, 2007) were adopted by the South African National Department of Health (NDoH), where Professional Nurses (PNs) initiate ART in community health centres (CHC) and at primary health care (PHC) level rather than only doctors. As a result, South Africa has the largest ART programme in the world. Regional training centres (RTCs) in each province were established to provide training on nurse -initiated management of ART (NIMART) and improve access to ART by training 75% of the PNs from the PHC facilities (Simelela & Venter, 2014). Challenges still exist; hence, the researcher was motivated to conduct a detailed study to investigate the impact of the NIMART training on HIV management and proffers-recommendations that seek to strengthen training strategies and implementation.

The burden and impact of HIV and TB in North West (NW) province and its districts are similar to the epidemiological profiles in South Africa, Sub-Saharan Africa and globally. According to Statistics South Africa (2019) and the West (2016), the prevalence of HIV in the NW province has declined slightly by 0.8% from 30.0% in 2011 and is now at 28.2%. There is no respite in the life expectancy at birth which is below 70%, males at 49.9% and females at 54.3%. Death related to HIV is still a principal cause at 4.8%; the incidence of Pulmonary TB (PTB) in PLWH infection is increasing while ART initiation and the number of PLWH remaining on ART is decreasing. The increasing number of PLWH and demand for ART has a serious impact on the South African health care system that is already experiencing a shortage of human, financial and material resources, as well as poor infrastructure (Sifanelo & Theron, 2010). Apart from the measures and strategies introduced in South Africa to improve access to ART and the management of a HIV programme, gaps still exist that have led to poor performance of the programme in the Ngaka Modiri Molema (NMM) District in the NW province. These gaps are attributed to PNs who are either not implementing what they have been trained for, or not complying with changes of NDoH policies and guidelines. This could also be attributed to PNs not recording, not reporting accurately, not being mentored efficiently or basically incompetent to initiate and manage ART. Another cause could be that there is poor data management or set targets are too high in relation to PLWH eligible for ART. These factors require an evaluation of the performance of the HIV programme after training in order to make recommendations directed at improving NIMART training and implementation.

Approximately 94% of PNs in the NMM district of the NW province has been trained on NIMART since 2011. Clinical mentorship was provided in the facility level and all PHC fixed facilities initiating ART (Visser, Wolvaardt, Cameron, & Marincowitz, 2018; North West Province Department of Health, 2015–2016). A post-training assessment was conducted by the RTCs to evaluate the effectiveness of NIMART using the district health information system (DHIS) statistics on ART indicators from facilities after a 12-month period (2012–2013). The results showed no marginal increase or effect on the facility performance as compared to pre-training. An observation was also made during district performance monitoring reviews for 2015/2016 and it was identified that the HIV and AIDS, STI and TB (HAST) priority programmes performance is very low, yet these are key drivers in achieving a long and healthy life for all South Africans. Such are the goals and objectives of 2012/2016 NSP and therefore there was some alarm raised with respect to the perceived low impact of NIMART. New patients initiated on ART, which include adults and children were recorded at 59% instead of a target of 91.6%, while TB/HIV co-infected patients initiated on ART were recorded at 820 and there were 1804 TB patients who are HIV positive, identified in the register. Antenatal care (ANC) patients initiated on ART were recorded at 72.2% instead of the target of 95%. Various strategies have been introduced to improve NIMART training and implementation, although there are gaps that still exist. The performance of the HIV and TB programme is still poor. The outcome of this study is used to develop questions that further explore challenges that contribute to such low and ineffectual outcomes. The purpose of the study is to evaluate the impact of NIMART training on HIV management in order to identify gaps and make recommendations that improve the quality of care to PLWH in the NMM district of the NW Province. The study aimed at achieving the following objectives and answer the research questions of the study:

- To analyse the performance of the HIV programme and determine the impact of NIMART training in the CHC and PHC facilities in the NMM district.
- What is the impact of NIMART training on HIV management?

The study findings and recommendations contribute significantly to the improvement of NIMART training in achieving its intended objectives of producing skilled nurses who can provide quality comprehensive individualised care to PLWH, rather than a high quantity of services. This also adds to compliance to policies and guidelines set out to reach the outcomes of the HIV programme.

2. Materials and methods

2.1. Research design

A descriptive programme evaluation research design was used in the study to examine the impact of NIMART training on HIV management. Programme evaluation research refers "to an applied system of scientific methods used to measure or assess the implementation, conceptualization, design, utility and outcomes or impact of social programmes for decision making purposes" (Cloete, Rabie, & De Coning, 2014). The aim of the design is to determine the effectiveness of the NIMART training programme in producing efficient and sustainable HIV management in order to achieve the intended results.

The planned targets cover the following: 75% of PNs in the CHC and PHC facility be trained on NIMART and 90% of the patients diagnosed with HIV infection are on sustained ART. The strategic objectives include, but are not limited to, increased ART initiation to all people living with HIV (diagnosed). The ultimate goal-oriented outcomes of the effective NIMART training process is to produce knowledgeable, skilled, confident and competent professional nurses who will efficiently implement the ART programme with a view to improve the

health status of PLWH.

2.2. Sampling and context of the study

The population of the study includes all the NMM district fixed CHC and PHC facilities (N = 101). The management of the HIV programme and NIMART training was decentralised from a provincial level to the district health care system (DHS), fixed PHC facilities to increase access to ART, supported by district clinical specialist team (DCST) and developmental partners. Patients with complications are referred to district, regional and tertiary hospitals for specialised care. The Regional Training Centre (RTC) played a major role in capacity building of PNs to manage PLWH. The study was conducted from the five (5) community health centres (CHCs) and five PHC clinics from a predominantly rural district of the NW Province. The district is divided into five (5) sub-districts or local municipalities with 101 PHC facilities (clinics and CHCs) initiating ART (West, 2012, 2015). There are 476 PNs of which 447 (94%) are trained in NIMART (North West Province Department of Health, 2015–2016) and distributed across the five regional training centres.

Inclusion criteria: Every facility with PNs trained on NIMART was included. A stratified simple random sampling method was used to select CHCs and PHC clinics that meet the inclusion criteria. Facilities were grouped per sub district, classified as CHCs (14) and PHC clinics (87), categorised in rural, semi-urban and urban areas, to ensure a greater degree of representativeness and reduce error. A list was compiled and every fourth CHC and fifth clinic per category were selected. A total number of n = 10 facilities were part of the study (Gray, Grove, & Sutherland, 2016).

2.3. Data collection methods

Data was collected from secondary sources, specifically the statistics from the district health information system (DHIS) and Tier.net, between January 2012 to December 2016 and the following variables were measured:

- Total patients tested HIV-positive and commenced on ART during this month – naïve;
- Loss to follow up after 12 months of starting ART,
- Viral load completion rate and suppression rate after 12 months of starting ART,
- Number of PNs trained on NIMART from RTC skills audit report 2015/16

2.4. Data analysis

Descriptive statistics were used to determine the number of PNs trained on NIMART and those initiating ART; cross-tabs were used to describe the target of the indicators on ART initiation and actual performance of facilities, as well as the relationship between NIMART training and performance of the HIV programme which was established using the correlational co-efficient test.

2.5. Reliability and validity of the study

Reliability refers to the consistency with which an instrument measures what it purports to measure (Gray et al., 2016). Data was collected from already existing secondary sources, which is the DHIS and Tier.net. The validity of this study is assured in that it measures the truth or accuracy of the claim (Gray et al., 2016). Face validity was maintained by using the national indicators data sets (NIDS), used to monitor the progress of the HIV programme. Content validity was maintained by ensuring that the statistics used was verified, validated and cleaned before use by data management experts. All NMM PHC fixed facilities were grouped per sub-district and randomly selected to ensure more representativeness and allow for the generalization of the results to the entire district. There was no risk of subject attrition because the study involves only statistics.

3. Results

The results of this study show that 99% of the selected facilities have 75% of the PNs trained on NIMART, which is in line with the RTC target to train 75% of PNs, except for one CHC that was below the RTC target at 58.8%. However, there is still 23% of PNs who are not trained from the selected facilities and 42.8% that are not certificated for competency and need to be targeted for competency training. The majority of facilities were from the rural areas of the district.

3.1. NIMART implementation

The study findings reveal poor implementation of NIMART as evident from low HIV testing services (HTS), ART initiation, viral completion rate and suppression including loss to follow up. This has a negative impact in achieving WHO 90-90-90 strategy targets. HTS intake was found to be very low & fluctuating, and this affected the 1st 90 of 90-90-90. Linkage of a HIV-positive patient to ART is very poor, affecting the 2nd 90 of starting 90% of HIV positive patients on ART. Therefore, most patients leave the PHC facilities without HTS and treatment, while 75% of PNs are trained on NIMART. Monitoring of patients on ART is also poor as the viral load completion rate and suppression is far below the target of 90%. This also affects the 3rd 90 of adherence and retention of 90% of patients started on ART. This is evident due to a high rate of loss to follow on ART above the target of 14%.

3.2. HIV testing services versus ART initiation

HIV testing services (HTS) is fluctuating in most CHCs as displayed in Table 1. In CHC 1, both HIV testing, HIV positive (+ve) clients and ART initiation reveal fluctuating trends while the positivity rate is decreasing. CHC 2 testing is increasing while those HIV positive clients and ART initiation numbers are fluctuating, and the positivity rate decreasing. CHC 3 and 5 show that both testing, and HIV positive clients' numbers are fluctuating, the positivity rate increasing while ART initiation is decreasing. CHC 4 HIV shows that testing and HIV positive are fluctuating, ART initiation is decreasing and HIV positivity rate decreasing. There is a correlation between the number of patients tested positive and those initiated on ART. HIV counselling skills for lay counsellors should be assessed and taken into consideration including the facility patients' flow and referral systems for treatment. The target group being tested, and positivity rate need to be investigated for proper intervention.

Regarding geographical location, CHC 1 is found in an urban area; HIV testing was found to be high although fluctuating while positivity rate is low and decreasing to 8% in 2016. The fluctuation might be because of people moving in and out looking for jobs and better conditions or this might suggest that the key population is not targeted or mobilised for such screening. CHC 2 is a rural centre where HIV testing is high and increasing but positivity rate is recorded as low at 9% in 2016. CHC 3 is in a semi-urban area, characterised by low HIV testing and fluctuating but high positivity rate. CHC 4 is also in a semi-urban area, HIV testing is low but increasing while positivity rate is high. This is likely to be associated with social problems that expose people to HIV such as poverty and unemployment.

The study findings from the evaluation of the implementation of HTS in NMM PHC clinics as indicated in Table 2, are different to CHCs. The HIV testing in all clinics is low but not related to the population served or head count and clinics not meeting their target, while the positivity rate is high above 12% and needs serious attention. In NMM district nursing, assistants and a few enrolled in health care, are trained

Table 1
NIMART training coverage of the selected facilities.

Sub district	Site	Facilities	Total No of PNs in the facility	PNs trained on NIMART	PN not trained on NIMART	PNs initiating ART	PNs certificated	PNs Not certificated for competency on NIMART
1	U	CHC 1	17	13(76%)	4(23.5%)	13	9	4(30.7%)
.	R	Clinic 1	13	10 (77%)	3(23%)	10	7	3(30%)
2	R	CHC 2	15	14(93%)	1(6.6%)	14	11	3(21.4%)
	R	Clinic 2	2	2(100%)	0	2	0	2(100%)
3	SU	CHC 3	12	9(75%)	3(25%)	9	3	6(66.6%)
	R	Clinic 3	4	3(75%)	1 (25%)	3	0	3(100%)
4	SU	CHC 4	8	6(75%)	2(25%)	6	5	1(16.6%)
	R	Clinic 4	2	2(100%)	0	2	1	1(50%)
5	SU	CHC 5	17	10(58.8%)	7(41%)	10	4	6(60%)
	R	Clinic 5	1	1(100%)	0	1	0	1(100%)
		Total	**91**	**70(76.9%)**	**21(23%)**	**70(76.9%)**	**40(57.1%)**	**30(42.8%)**

Source: skills audit report, RTC 2016 R*rural. SU*semi urban, U*urban, CHC* community health Centre, PNs* professional nurse, ART* antiretroviral therapy, NIMART*nurse- initiated management of ART.

on HIV counselling and testing but the coverage is still low. Geographically, most PHC clinics are located in rural areas while most CHCs are in urban and semi-urban areas. This is attributed to high head count and population in urban and semi-urban areas or people moving from rural to urban areas for better services.

Additional tracer indicators of monitoring viral load completion, viral load suppression and loss to follow up were analysed to obtain a clearer picture of the impact of NIMART training on patients receiving ART.

3.3. Adults lost to follow up rate

Fig. 1 represents the percentage of adults lost to follow up after 12 months of ART initiation and this peaks at an average of 14% against the target of 10% or less. Adherence counselling should be evaluated and strengthened as this affects collection of VL to monitor suppression and how such adults respond to treatment.

3.4. Viral load completion and suppression rate

Fig. 2 represents Monitoring of patients on ART after 12 months of starting treatment or ART through collecting and analysing blood viral completion and viral suppression rate against the national target of 90% for both. The study reveals that viral load completion is relatively low in all the years at an average of 54%, a noticeable increase in viral load completion is evident in 2014 whereas a noticeable decline is evident in 2015. Challenges need to be investigated. Facilities are overcrowded, there are long waiting periods and health care workers are significantly overworked, all compounding the complexities and challenges of implementing and adherence to the national adherence guideline (AGL) decanting strategies of CCMDD, fast lane or adherence clubs and relieving the health care system and workers as most clients VL are not monitored or not suppressed at the average of 56% displayed. Patients who are not responding well to ART drugs are not monitored and identified early for switching or change regimen or transfer for advanced clinical care.

4. Discussion

The impact of NIMART training on HIV management is evaluated using the HIV indicators. The data was collected from the District Health Information System (DHIS), which is a reliable government

Table 2
HIV testing versus ART initiation in NMM district PHC CHC.

Sub district	Facilities	HTS all ages	Jan-Dec 12	Jan-Dec 13	Jan-Dec 14	Jan-Dec 15	Jan Dec 16	Total
1	CHC 1	HIV Tested	3 177	3 765	4 122	4 723	4 589	20 376
		HIV +ve	419	392	449	399	359	2018
		Total Initiated	259	250	326	221	258	1 314
		+ve rate%	13	10	11	8	8	51
2	CHC 2	HIV tested	1 111	1 673	1 723	1 803	2 211	8521
		HIV +ve	239	263	299	194	201	1196
		Total Initiated	187	136	191	96	103	713
		+ve rate%	22	16	17	11	9	74
3	CHC 3	HIV Tested	749	603	849	895	501	3597
		HIV +ve	219	189	209	192	258	1067
		Total Initiated	109	122	127	135	34	527
		+ve rate %	29	31	25	21	51	158
4	CHC 4	HIV Tested	503	488	591	607	678	2867
		HIV +ve	179	191	122	104	111	707
		Total Initiated	99	139	92	124	34	488
		+ve rate%	36	39	21	17	16	129
5	CHC 5	HIV Tested	1 122	1 599	1 879	2 088	2 322	9010
		HIV +ve	199	319	352	409	489	1768
		Total Initiated	233	248	205	152	212	1050
		+ve rate%	18	20	19	20	21	97

Source: DHIS & Tier.net February 2017. Key: +ve- positive, CHC- community health Centre, HIV- human immunodeficiency virus, +ve rate- incidence of HIV new infection.

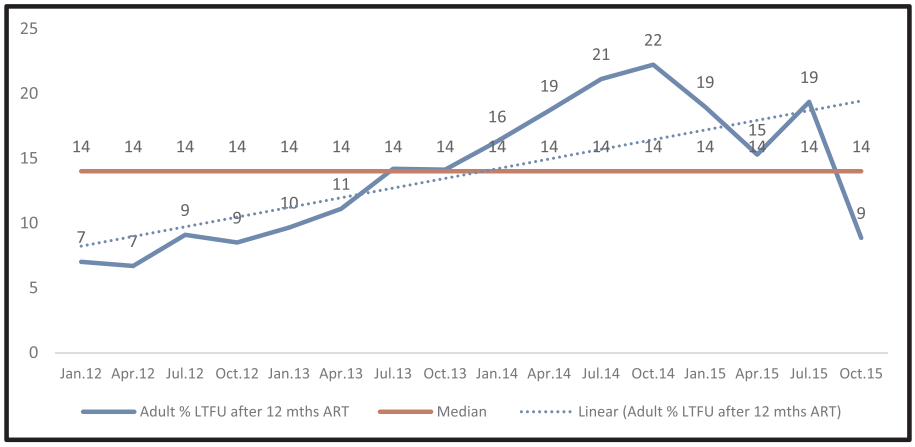

Fig. 1. Quarterly % of adults LTFU after 12mths ART from Jan 12 to Oct 2016, NMM district Key: LTFU* Loss to follow up, ART* antiretroviral therapy.

information system supplemented by data from Tier.net. The NIMART training coverage of both PHC clinics and CHCs is on target of 75% and above, except for one CHC. However, inefficiency in the implementation of the HIV programme is evident by study findings that revealed low or no steady increase in new ART amongst adults, paediatric and ANC pregnant women eligible for ART even after the introduction of the PMTCT policy in 2013, that directs pregnant women and children under the age of 5 years should be initiated on ART irrespective of CD4 count, including the introduction of universal and treat (UTT) policy in 2016 (West, 2012, 2015) and implementation of UTT policy in September 2016 initiation. NIMART nurses do not comply with policies and guidelines for HIV management. A study conducted in Haiti on the expansion of the ART programme had similar outcomes (McNairy, Joseph, Unterbrink, Galbaud, & Mathon, 2017). This might suggest that the NIMART training is not effective enough to equip PNs with the necessary skills, confidence and competency to initiate and manage ART patients and needs further investigation to make sound conclusions. Majority of the selected facilities fail to reach 90% of the NDoH ART initiation target. According to Theuring, Sewangi, Nchimbi, Harms, and Mbezi (2014), ANC pregnant women are missed while attending the clinic, poor compliance to guidelines and late booking together contribute to low ANC ART intake and exposes infants to HIV infection.

Adult ART initiation is better, but the HTS results revealed that there are still HIV-positive patients that are not initiated on ART while facilities have enough PNs trained. Studies conducted by Baloyi, Meyer, Summers, and Johnson (2014) and Grimsud, Kaplan, Bekker, and London (2014), indicate that patients eligible for ART are lost early, before initiation, due to poor recording, incomplete patient contact details for follow up and death due to OIs. Poor linkage of HIV testing and ART initiation site lead to low uptake (Reddy, Agala, Maro, Ostermann, & Pence, 2016). Children ART initiation in the selected PHC facilities is low, even in CHCs which are referral sites for the clinics, suggesting that children are still initiated in hospitals by doctors while PNs are trained on IMCI. This finding is supported by studies conducted by (Kufa et al., 2014; Smith et al., 2016). True reasons for children loss to follow up and poor initiation also need to be investigated (Abuogi, Smith, & McFarland, 2016).

Sustaining PLWH on ART is still a challenge and lead to poor prognosis, as treatment became ineffective. The study revealed a high rate of loss to follow up and TROA fluctuating instead of increasing. Monitoring of the treatment outcomes is poor and had a negative impact on the HIV service and improving the life of PLWH. The study reveals low viral load completion and viral load suppression rates after 12 months of starting ART. Ally, Meyer, Schellack, and Summers (2015) reported that monitoring of adverse effects is not done randomly and can lead to unsafe drug use, resistance or virologic failure and death. This a global concern and calls for serious attention. Studies conducted in Asia, Cameroon, Ethiopia and Kenya confirm Africa has a serious challenge with regard to adherence and retention of ART patients to care across all age groups (De La Mata, Ly, Nguyen, Merati, & Pham, 2017; Gesesew, Ward, Woldemichael, & Mwanri, 2017; Ojwang et al., 2016; Sidze, Faye, Tetang, Peng, & Guemkam, 2015). Disclosure and stigma continue to be worrisome challenges to adherence and retention of ART patients to care, especially in rural areas (Kimeu et al., 2016; Plazy et al., 2015).

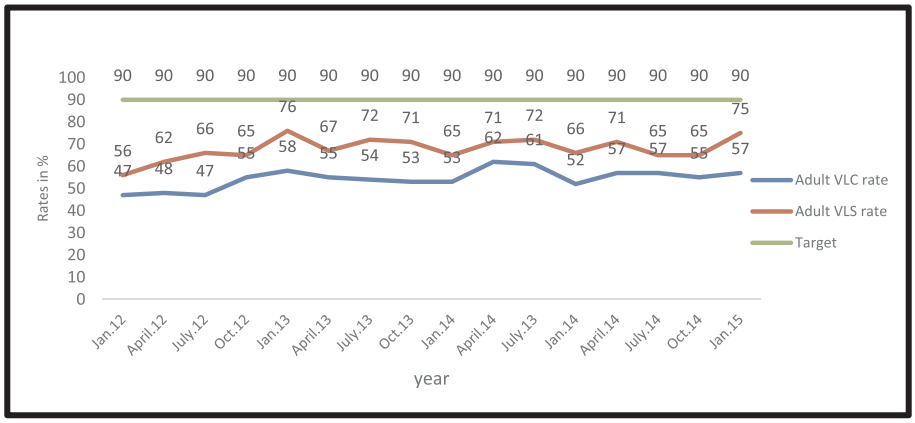

Fig. 2. Adult VLC and VLS rate at 12mths Jan 12 – Jan 15, NMM district Key: VLC*viral load completion, VLS *viral load suppression.

4.1. Practical implications

With reference to the study results and recommendations, improvement of NIMART training and implementation could have a positive impact on ART management and monitoring, achieving the better programme and quality patient outcomes. The recommendations made might also practically improve integration of theory and practise and dealing decisively with challenges affecting implementation in the PHC facilities.

4.2. Limitations of the study

The study only focusses on the statistics of the ART indicators which provided insight on the performance and quality of the HIV programme compared to the number of nurses trained to render ART services. However, its lack of narrative support of the factors or challenges that lead to such performance, suggests that there is an urgent need for further investigation to explore those factors or challenges to make sound conclusions and comprehensive recommendations. Data from DHIS and Tier.net might not be reliable as there might be a possibility of data not recorded and captured as expected in some facilities.

5. Conclusion

There is significant impact of NIMART training implementation in terms of expansion of ART initiation by PNs in the NMM district PHC facilities, however, ART monitoring, adherence and retention to care including compliance to guidelines remain a challenge and has a negative impact on the quality of care. Strengthening NIMART training and exploring barriers influencing implementation should be investigated to achieve the desired HIV programme outcomes.

Recommendations

Based on the study results, the following is recommended: NIMART trained PNs should improve linkage of adults, paediatrics and ANC pregnant women tested HIV-positive to care through proper tracking and tracing systems to increase new ART initiations. Intensifying routine monitoring of ART initiation, uptake & VL collection per cohort to assess the effectiveness of ARVs through the initiation of facility's quality improvement projects. There is a need to strengthen compliance to national ART guidelines through conducting of in-service training, weekly file audits & feedback to improve recording and patient outcomes. Use of training strategies that stimulate critical thinking, improve decision making skills, confidence and competency of PNs trained on NIMART are also strongly recommended.

Research ethics

Approval to conduct the study was awarded by the NWU ethics committee and permission to access data by the NW province. Anonymity and confidentiality were maintained by using numbers when referring to sub-districts and facilities. The master list was kept separately and under lock and key from the data (Grove, Burns, & Gray, 2013 and (LoBiondo-Wood & Haber, 2010).

Competing interest

The study is funded by the NRF and promoted by NWU. The researcher has declared that there is no interest attached to the study. I am grateful to the librarians who assisted in the literature search.

Author's contribution

SHM & LM Conceptualise and designed the study. SHM was responsible for data collection and analysis. SHM and LM wrote and edited the manuscript. LM Supervised the whole process of the study.

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Ethical approval details

The study received ethical clearance from the North West University ethics committee (NWU-00607-17-A9) and permission to conduct study was granted by the North West Province Department of Health.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijans.2019.100170.

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