

Original Article

A Cross Sectional Study on Factors Associated with Patients being MIS-3 on Anti-retroviral Therapy Registered at a Nodal Centre — Goa Medical College

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Background : Anti-retroviral Therapy (ART) has helped in improving lives of PLHA. But, NACP suggest a high adherence to ART is necessary for effective treatment of PLHA. Goa has a high loss to follow up and MIS-3 patients hence we conducted this study to understand the reasons behind it.

Aims and Objectives : (a) To study the demographic and Socio-economic profiles of the MIS-3 patients. (b) To study the Knowledge, Attitude, Practices towards Anti-retroviral Therapy of the participants.

Materials and Methods : A cross Sectional study was conducted at Anti-retroviral Therapy Centre, Goa Medical College. Patients registered at ART centre of Goa Medical College who did not turn up during the month of appointment for 3 consecutive months.

Results : The final study included 66 participants from a list of 70 total MIS-3 patients. Travelling, stigma, timings of OPD were the main reasons for missing treatment. The knowledge about ART was egregious among the patients which reflected in the attitude & practices about ART.

Conclusion : Knowledge pertaining to various aspects of ART seemed to be an important component in increasing adherence to ART. Similarly a positive Attitude would result in better practices with regards to ART adherence, thus resulting in less MIS patients. Hence an effective communication to all aspects of ART is the way forward to achieve the goal of elimination that we have set.

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Key words : HIV/AIDS, Adherence, Treatment Compliance, ART, Antiretroviral Treatment.

The annual new HIV infections in India have decreased by 48% in contrast to the global average of 31% (the baseline year of 2010). The annual AIDS-related mortalities have declined by 82% against the global average of 47% (the baseline year of 2010)¹. Adherence is defined as a patient's ability to follow a

Editor's Comment :

- Adherence to ART is mandatory for the treatment and improved Quality of Life of the patient.
- Poor adherence to ART is associated with less effective suppression of the viral load, which risks the health of the patient, but also risks creating permanent drug resistance.
- Robust efforts have to be made by the health services and the community to ensure adherence among the PLHAs to provide optimum Quality of Life.

treatment plan, take medications at prescribed times and frequencies and follow restrictions regarding food and other medications^{2,21}.

Poor Adherence to Anti-retroviral Therapy (ART) is associated with less effective suppression of the viral load, which risks the health of the patient but also risks creating permanent drug resistance to that particular agent or group of agents within a given combination therapy regimen^{2,3}.

The causes of poor adherence to ART are diverse, and include a variety of therapeutic regimens (eg, pill burden and dosing frequency), adverse effects, health illiteracy, an ill patient-physician relationship and limited access to ART. It is vital that the members of the healthcare team address the barriers to adherence in

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order to achieve viral load suppression and optimize outcomes in patients with HIV/AIDS. To achieve the optimal result from Anti-retroviral Therapy a level of adherence to ART (at least 95%) is needed^{2,3,10,15,20}.

Goa has a good testing rate for detection of HIV but has a high loss to follow up and MIS-3 patients hence, we conducted this study to understand the reasons behind it.

MATERIALS AND METHODS

Study design : Cross Sectional study

Study setting : Anti-retroviral Therapy Centre, Goa Medical College

Study period : 6 months from the date of receiving final approval from NACO (National AIDS Control Organisation).

Study population : Patients registered at ART centre of Goa Medical College.

Sample Size : All patients which fit the inclusion criteria were considered.

Operational definition : MIS-3 is a on ART patient who does not turn up during the month of appointment for 3 consecutive months

Inclusion criteria : People living with HIV/AIDS who have registered at ART Centre, Goa Medical College on or before 31st December, 2021 a) were started on ART on or before 31st December, 2021 b) missed ART for a period of 3 months.

Exclusion Criteria : The patients registered at ART Centre in Goa Medical College who were

(a) lost to follow up at the ART centre in Goa Medical College.

(b) Transferred to a different facility outside Goa.

Data Collection : Upon approval of the Institutional Ethics Committee of Goa Medical College, Goa State AIDS Control Society, National AIDS Control Organization, the study was initiated. Data was collected by personal interview of the patients after obtaining written informed consent. Patients were contacted via phone and were asked to come to Goa Medical College, ART centre for personal interview. If the patient could not come to the ART centre due to inconvenience or personal choice, the patient was visited at the nearby health centre. Treatment related data was collected from existing records. The details were entered in a pre-designed data collection questionnaire which included Socio-demographic data, disease history, past history, treatment history (ART and other regular treatment details), admission history, laboratory details, etc^{4,6,14-19}.

Data analysis: Interim data analysis was done after a period of 2 months and report was sent to NACO after 3 months after start of the study. Data was entered

in Microsoft Excel and analysed in IBM SPSS version 22. Monitoring of data entry was carried out at regular intervals¹¹⁻¹⁶.

RESULTS

This cross-sectional study was carried out from November, 2022 to February, 2023 at ARTC of Goa Medical College, Goa. The final study included 66 participants from a list of 70 total MIS-3 patients. Almost two third (70 %) of the study participants were males. Almost half (45%) of the study participants were aged between 40-59 years, one third belonged to 26 – 40-year age group, the mean age being 44.15 ± 3.08. Three fourth of the study participants were Hindu by religion followed by Christian (12%), Muslim (10%). More than half (60%) of the participants were working (Table 1)

The treatment details are described in Table 2. Various reasons were elicited from the MIS 3 for not following up to ARTC Centre. Around 11 (16 %) felt ARTC Centre was too far for regular follow up, 5 of them were aged above 60 years of age. Stigma associated with HIV/AIDS was also an important factor with 10 (15%) of the participants were reluctant to follow up due to it (Fig 1).

Many of the employed participants felt that the treatment timings have caused them to stop their regular follow up. Around 14 participants had adverse reactions following treatment with ART, among them 7 had stopped taking ART due to the adverse effect. One of the participants had retinal damage following ART Therapy. Some participants felt that ART was not

Table 1 — Distribution of MIS 3 patients as per the Socio-demographic

Variable	Frequency (nu.)	Percentage (%)	
Sex	Male	46	70
	Female	20	30
Age group	18-25	7	11
	26-40	21	33
	40-59	31	45
	60 and above	7	11
Religion	Hindu	50	75.8
	Christian	8	12.2
	Muslim	7	10.5
	Others	1	1.5
Education	Illiterate	14	21.9
	Upto Primary	11	17.2
	Upto Secondary	24	37.5
	Higher Secondary and above	17	23.4
Occupation	Unemployed	16	24
	Retired	11	16
	Employed	39	60
Socio-economic Class	I & II	35	53
	III & IV	25	38
	V	6	9

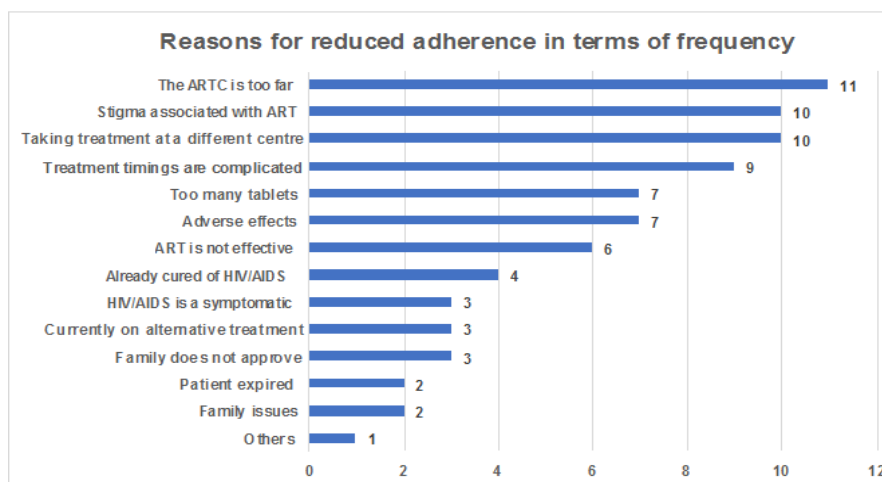


Fig 1 — Reasons for being MIS 3 on ART

Variable	Frequency (nu.)	Percentage (%)
Treatment initiated	ZLN	18 (27)
	TLE	28 (42)
	Others	20 (30)
Treatment changed to	ZLN	5
	TLD	20
	Others	8
Adverse effects	Yes	14 (21)
	No	52 (79)
INH Therapy given	Yes	16 (24)
CPT given	Yes	20 (30)

*Zidovudine + lamivudine + nevirapine (ZLN) , tenofovir + lamivudine + efavirenz (TLE) , tenofovir + lamivudine + dolutegravir (TLD) , isoniazid (INH) , cotrimaxazole preventive therapy (CPT)

effective in treatment of HIV hence they had decided to stop taking it. Around 4 (6%) participants felt they were cured of HIV hence there was no need to continue taking treatment.

The improvement in health (no symptoms of disease) lead to 3 (4.5%) of the participants to stop taking ART. A lacuna in knowledge was noted regarding knowledge of ART among the participants, with almost two third (67%) having no knowledge of ART Therapy helping in improving the immunity level (Table 3).

Almost two third participants (67%) knew that ART was available free of cost for treatment of HIV. Only

Statement	Yes (%)	No (%)	Don't know (%)
ART is used for treatment of HIV/AIDS	42 (65%)	21 (30%)	3 (5%)
ART is available free of cost.	44 (67%)	17 (25%)	5 (7.5%)
ART is provided by the Government of India	41 (63%)	15 (23%)	10 (15%)
ART is available at Nodal Centres in Goa.	35 (53%)	18 (28%)	13 (19%)
ART is a lifelong treatment	46 (70%)	17 (25%)	3 (4.5%)
ART helps to increase my immunity	17 (25%)	5 (8%)	44 (67%)
ART may result in some side effects	42 (65%)	14 (21%)	10 (14%)

half of the participants knew that there was a separate nodal centre for treatment of HIV. Almost one third (25%) of the participants did not know that ART was a lifelong treatment. Majority of participants agree that ART is important for their treatment and that it is effective for their treatment. A majority of them also believe that ART has scientific basis for treatment and it will prolong and improve their Quality of Life (Table 4).

A large group did not believe that ART will lead to worsening of their health. Most of the participants were of the attitude

that they will recommend ART to other PLHAs. The majority of participants would often follow practices which included visiting ARTC as advised, storing medicines properly, taking the medicines on time and regularly, reporting to ARTC in case of any adverse effect and performing investigations on time as advised by the doctor. The participants however did not take the doctor's advice before seeking additional treatment which may be the possible cause of reduced adherence (Table 5).

DISCUSSION

Our study found no significant change in adherence and age and were in congruence with a facility based cross-sectional study which was carried out among 116 People Living with HIV/AIDS (PLHAs) on ART by Madi, *et al.* Al which revealed that with increase in age there was reduced adherence to ART; however, it was not statistically significant (p=0.1).²

Age :

The results were similar to a study conducted in a tertiary health facility in cross-sectional study, conducted over a period of 12 months, from July, 2015 to June, 2016 by Alvi Y, *et al* where increase in age was not significantly associated with adherence⁴.

A facility based cross-sectional study was conducted by Banagi Yathiraj A, *et al* among PLHAs attending Infectious Disease Department of the tertiary care hospitals, at Mangalore, Karnataka where increase in age was not significantly associated with reduction in adherence and PLHAs who were

Table 4 — Distribution of MIS 3 patients as per their Attitude to ART

Statement	Mean ± SD	Categories
ART is important in treatment of HIV/AIDS	3.23 ± 0.934	Less than 3 = Disagree with statement
ART is effective for my treatment.	3.25 ± 0.939	More than 3 to 4 = Agree with statement
ART has scientific basis for treatment.	3.27 ± 0.981	More than 4 = Strongly agree with statement
ART will prolong my life.	3.30 ± 0.952	
ART will improve my quality of life.	3.07 ± 0.871	
ART will lead to worsening of my health.	2.96 ± 0.873	
I will recommend ART to other PLHAs	3.41 ± 1.041	

Table 5 — Distribution of MIS 3 patients as per their Practices wrt ART

Statement	Mean ± SD	Categories
I visit ARTC regularly as advised	3.23 ± 0.809	Less than 3 = Rarely follows the practice
I store the medicines properly	3.30 ± 0.829	
I make it a point to take my medicines on time	3.20 ± 0.883	More than 3 to 4 = Often follows practice
I take my medicines regularly.	3.14 ± 0.819	More than 4 = Frequently follows practices
I immediately report to ARTC in case of any adverse effect	3.04 ± 0.852	
I take additional treatment with consultation of my doctor.	2.95 ± 0.773	
I do my investigations on time as advised by my doctor.	3.18 ± 0.917	

more than 40 years of age were more adherent compared to those who were aged <40 years. This was explained by the authors that they considered the fact that PLHAs were aware of their HIV status in the later stage of their life because of opportunistic infections (OIs) and compromised immunity caused by HIV infection. This was given as be the reason for the concern about their health and better adherence⁵.

In contrast to the above studies, a cross sectional observational study was conducted at the ART Centre (ARTC) in the OPD of a tertiary-care hospital in Aurangabad between November, 2007 and September, 2009 by Gokarn A, *et al* on univariate analysis, age was significantly associated with adherence. On multivariate analysis, age was significantly associated with adherence. Patients aged equal to or less than 40 years were less adherent than older patients⁶.

Sex :

We found no association between gender and MIS-3 patients. The percentage of men was more compared to females in our study but it was not significant as more male were following up to ART Centre compared to females.

The results were similar to a study conducted in a tertiary health facility in cross-sectional study, conducted over a period of 12 months, from July, 2015 to June 2016 by Alvi Y, where gender was not

significantly associated with change in adherence⁴.

A cross sectional observational study was conducted at the ART Centre (ARTC) in the OPD of a tertiary-care hospital in Aurangabad between Nov 2007 and September, 2009 by Gokarn A, *et al* found that sex was not statistically significant with adherence to ART⁶.

In contrast a facility based cross-sectional study was carried out Madi, *et al* which revealed that females had higher adherence as compared to males and it was a statistically significant finding ($p=0.003$)².

A facility based cross-sectional study was conducted by Banagi Yathiraj A, *et al* among PLHA attending Infectious Disease Department of the tertiary care hospitals, at Mangalore, Karnataka where sex was found to statistically significant ($p=0.002$) where it was observed that females were more adherent to ART than were males. This was explained by the

authors that many of the female participants were widows and they were living with parents and/or other family members would remind them to take their treatment regularly without fail. The widows who got HIV infection through their husband after witnessing the distress they went through and with the diminishing health conditions of their spouse due to HIV infection⁵.

Marital Status :

No association was found between marital status and MIS 3 patients.

A study conducted in a tertiary health facility as a cross-sectional study, over a period of 12 months, from July, 2015 to June, 2016 by Alvi Y. where Marital status found to be not significantly associated with change in adherence but our study found that people who were widowed had lesser encouragement to follow up to ART Centre after death of their spouse, also the challenges of transport were more among unmarried/widowed females⁴.

Similar to the above study, a cross sectional observational study was conducted at the ART Centre (ARTC) in the OPD of a tertiary-care hospital in Aurangabad between November, 2007 and September, 2009 by Gokarn A, *et al* found that marital status was not statistically significant with adherence to ART⁶.

In contrast to the above, a case series study was conducted at an ART centre attached to a medical

college from June, 1, 2012, to May, 31, 2013 by Hiregoudar V, *et al*/where marital status was taken as married, not married, separated/widowed and it was found to be statistically significant where married patients had better adherence than unmarried and separated/widowed ($p=0.009$) and multivariate regression was carried out the p value was 0.014 which may be explained because of the better support they receive from their spouses⁷.

A study was carried out in ART Centre at Government Medical College, Thrissur from the period of 20th March, 2009 and 1st July, 2009 by Ajithkumar K, *et al*/where it showed that marital status was not statistically significant ($p=0.06$) by the method of multivariate regression⁸.

Education :

No association was found between education level and MIS-3 status in our study.

A study conducted in a tertiary health facility as a cross-sectional study, over a period of 12 months, from July, 2015 to June 2016 by Alvi Y. where education was found to be not significantly associated with change in adherence⁴.

Similar to the above study, a cross sectional observational study was conducted at the ART centre (ARTC) in the OPD of a tertiary-care hospital in Aurangabad between November, 2007 and September, 2009 by Gokarn A, *et al*/found that education was not statistically significant with adherence to ART⁶.

Just like the above study, a case series study was conducted at an ART centre attached to a medical college from June, 1, 2012, to May, 31, 2013 by Hiregoudar V, *et al*/where education was found to be statistically significant ($p=0.016$) where the higher the education meant improvement in adherence of the patient⁷.

In contrast to the study conducted by Hiregoudar *et al*, a study was carried out in ART Centre at Government Medical College, Thrissur from the period of 20th March 2009 and 1st July 2009 by Ajithkumar K *et al* where it showed that education was not statistically significant ($p=0.38$) by the method of multivariate regression⁸.

Socio-economic Status :

A study conducted in a tertiary health facility as a cross-sectional study, over a period of 12 months, from July, 2015 to June, 2016 by Alvi Y. where Socio-economic status was not found to be significantly associated with change in adherence where higher Socio-economic classes (IV, V) did not lead to higher level of adherence⁴.

A cross sectional observational study was conducted at the ART Centre (ARTC) in the OPD of a tertiary-care hospital in Aurangabad between November, 2007 and Sept 2009 by Gokarn A, *et al* where employment status and total annual family income was studied and it was found that both the variables were not statistically significant with and being employed or having a higher income did not improve adherence to ART.⁶

Just like the above study, a case series study was conducted at an ART centre attached to a Medical College from June, 1, 2012, to May, 31, 2013 by Hiregoudar V, *et al*/where Socio-economic status was not found to be statistically significant ($p=0.098$) where the higher the Socio-economic status did not mean improvement in adherence of the patient⁷.

Similar to the study conducted by Hiregoudar, *et al*, a facility based cross-sectional study was conducted by Banagi Yathiraj A, *et al* among PLHA attending Infectious Disease Department of the tertiary care hospitals, at Mangalore, Karnataka where Socio-economic status was not statistically significant finding⁵.

Occupation :

A case series study was conducted at an ART centre attached to a Medical College from June, 1, 2012, to May, 31, 2013 by Hiregoudar V, *et al*/where occupation was not found to be statistically significant ($p=0.607$) where the difference in occupation did not mean a change in adherence⁷.

A cross sectional observational study was conducted at the ART Centre (ARTC) in the OPD of a tertiary-care hospital in Aurangabad between November, 2007 and September, 2009 by Gokarn A, *et al* where occupation was taken as employed or unemployed and this was not statistically significant⁶.

A study done by Molla, *et al* which was an institution based cross-sectional study conducted from May to June, 2015 at the University of Gondar Referral Hospital Chronic HIV Care and Treatment Clinic in Ethiopia where occupation was not statistically significant⁹.

Residence :

A case series study was conducted at an ART centre attached to a Medical College from June 1, 2012, to May 31, 2013 by Hiregoudar V, *et al*/where occupation was found to be statistically significant ($p=0.009$) where the rural population had a higher adherence than the urban population⁷.

A cross sectional observational study was conducted at the ART Centre (ARTC) in the OPD of a tertiary-care hospital in Aurangabad between

November, 2007 and September, 2009 by Gokarn A, *et al* where residence was taken as rural or urban and this was not statistically significant⁶.

A study done by Molla, *et al* which was an institution based cross-sectional study conducted from May, to June, 2015 at the University of Gondar Referral Hospital Chronic HIV Care and Treatment Clinic in Ethiopia where residence was statistically significant where urban population was found to have a higher level of adherence⁹.

Pill burden :

Almost 11% participants described high number of pills as a reason for discontinuing ART which is in accordance with a study conducted in a tertiary health facility as a cross-sectional study, over a period of 12 months, from July, 2015 to June, 2016 by Alvi Y *et al* where pill burden was not found to be significantly associated with change in adherence ($p=0.182$)⁴.

A facility based cross-sectional study was conducted by Banagi Yathiraj A, *et al* among PLHAs attending Infectious Disease Department of the tertiary care hospitals, at Mangalore, Karnataka where pill burden was not statistically significant finding where higher pill burden did not result in poor adherence⁵.

Development of Adverse Effects :

A study conducted in a tertiary health facility as a cross-sectional study, over a period of 12 months, from July, 2015 to June, 2016 by Alvi Y, *et al* where development of adverse effects was found to be significantly associated⁴.

Similar to the above study, a facility based cross-sectional study was carried out among 116 People Living with HIV/AIDS (PLHAs) on ART by Madi, *et al* which revealed that development of adverse effects was a statically significant finding ($p=0,001$)².

Similar to the above studies, a case series study was conducted at an ART centre attached to a medical college from June, 1, 2012, to May, 31, 2013 by Hiregoudar V, *et al* where development of adverse effects was found to be statistically significant where non development of adverse effects was found to have better adherence ($p<0.005$)⁷.

In contrast to the above, a study was carried out in ART Centre at Government Medical College, Thrissur from the period of 20th March, 2009 and 1st July, 2009 by Ajithkumar K, *et al* where it showed that development of adverse effects was not statistically significant⁸.

Knowledge about ART :

The knowledge of ART was poor among the MIS-3 Patients which could have been a factor for poor adherence although a study conducted in a tertiary

health facility as a cross-sectional study, over a period of 12 months, from July, 2015 to June, 2016 by Alvi Y, *et al* where knowledge about ART was not significantly associated⁴. But a case series study was conducted at an ART centre attached to a medical college from June 1, 2012, to May 31, 2013 by Hiregoudar V. *et al*. where knowledge regarding ART was statistically significant ($p<0.005$) where better the knowledge, better was the adherence to ART and decreased MIS-3 rate⁷.

Attitude :

The bulk of participants often adhered to certain behaviours, such as visiting ARTC as instructed, keeping medications appropriately, taking them on schedule, reporting side effects to ARTC, and scheduling investigations in accordance with doctor's orders.

The majority of participants concur that ART is crucial to their therapy and that it is successful. The majority of them also think that ART will lengthen their lives and enhance their Quality of Life and has a scientific foundation for therapy. But a paucity in knowledge that ART is a life-long treatment exists which has led to them being MIS-3 patients even after having a positive attitude towards ART.

Similar findings were noted by Mihaja, *et al* where only (30 %) were aware about the continuation of ART even after improvement of symptoms which were in accordance to our reasons to stop ART.

Reasons :

Feeling healthy, busy schedule and stigma were the main reasons for stopping of ART in our study which echoed the findings of the study conducted by Bukyenka, *et al* who concluded that feeling healthy, stigma being the main reasons for poor adherence to ART.

Another study by Brretzki J, *et al* found a poor adherence to ART following decrease viral loads which would suggest decreased adherence following decrease in symptoms in addition to complexity of dosing, dissatisfaction with regimen which was also noted in our study.

CONCLUSION

The launch of the National AIDS and STD Control Programme (NACP) was in 1992 was the beginning of the comprehensive response to the pandemic which after 35 years is still working towards elimination of this disease.

Adherence to ART is mandatory for the treatment and improved quality of life of the patient. Poor

adherence to ART is associated with less effective suppression of the viral load, which risks the health of the patient, but also risks creating permanent drug resistance to that particular agent or group of agents within a given combination therapy regimen.

Knowledge pertaining to various aspects of ART seemed to be an important component in increasing adherence to ART. Similarly a positive Attitude would result in better practices with regards to ART adherence, thus resulting in less MIS patients. Hence an effective communication to all aspects of ART is the way forward to achieve the goal of elimination that we have set.

Funding : Funding was provided by Goa State AIDS Control Society in collaboration with National AIDS Control Organization through proper channel to the extent of One lakh rupees.

Conflict of Interest : Nil

Recommendations :

- **Related to Patient factors:** Linking the patient to an NGO to allow for vocational rehabilitation
- **Related to Health-system related factors:** An effective strategy would be using the vehicle provided to the nearby Primary Health Centre (PHC) to transport ART patients from the PHC to ARTC, Goa Medical College or the nearby link ART centre.

REFERENCES

- 1 National AIDS Control Organization (2022). Strategy Document: National AIDS and STD Control Programme Phase-V (2021-26). New Delhi: NACO, Ministry of Health and Family Welfare, Government of India.
- 2 Madi D, Bhaskaran U, Ramapuram J, Rao S, Mahalingam S, Achappa B — Adherence to antiretroviral therapy among people living with HIV. *North Am J Med Sci* 2013; **5(3)**: 220.
- 3 Kumar A, Alandikar V, Mhaskar R, Emmanuel P, Djulbegovic B, Patel S, *et al* — Adherence to antiretroviral therapy in India: A systematic review and meta-analysis. *Indian J Community Med* 2013; **38(2)**: 74.
- 4 Alvi Y, Khalique N, Ahmad A, Khan HS, Faizi N — World Health Organization Dimensions of Adherence to Antiretroviral Therapy: A Study at Antiretroviral Therapy Centre, Aligarh. *Indian Journal of Community Medicine* 2019; **44(2)**: 7.
- 5 Banagi Yathiraj A, Unnikrishnan B, Ramapuram JT, Kumar N, Mithra P, Kulkarni V, *et al* — Factors Influencing Adherence to Antiretroviral Therapy among People Living with HIV in Coastal South India. *J Int Assoc Provid AIDS Care* 2016; **15(6)**: 529-33.
- 6 Gokarn A, Narkhede MG, Pardeshi GS, Doibale MK — Adherence to Antiretroviral Therapy. *J Assoc Physicians India [Internet]* 2012; **60**: 16-20.
- 7 Hiregoudar V, Bellara R, Goud Tg — Proportion and determinants of adherence to antiretroviral therapy among HIV positive people registered under ART centre in South India. *Int J Prev Med* 2019; **10(1)**: 206.
- 8 Ajithkumar K, Neera PG, Parameswaran P — Relationship between social factors and treatment adherence: a study from south India. *Eastern Journal of Medicine* 2011; **6**.
- 9 Molla AA, Gelagay AA, Mekonnen HS, Teshome DF — Adherence to antiretroviral therapy and associated factors among HIV positive adults attending care and treatment in University of Gondar Referral Hospital, Northwest Ethiopia. *BMC Infect Dis*. 2018 Dec; **18(1)**:266.
- 10 Karim SA, Adler J, Annan K, Suu Kyi DAS, Ki-Moon B, Birx D *et al* — How AIDS changed Everything, UNAIDS, 2015
- 11 Wani MA — Social Support, Self-Esteem and Quality of Life among People Living With HIV/AIDS in Jammu & Kashmir India: Apoyo social, autoestima y calidad de vida entre las personas que viven con el VIH / SIDA en Jammu y Cachemira, India. *AN PSICOL-SPAIN*. 2020; **36(2)**: 232-41.
- 12 Anuradha S, Makkar AM, Nandi PK, Rajeshwari K — Quality of Life and Its Determinants among People Living with HIV Attending an Antiretroviral Treatment Centre in Delhi, India. *Indian Journal of Public Health* 2020; **64(2)**: 7.
- 13 Sari PI, Martawinarti RN, Lataima NS, Berhimpong VM — The Quality of Life of Patients with HIV/AIDS Undergoing Antiretroviral Therapy: A Systematic Review. *J Ners* 2019; **14(3)**: 50-4.
- 14 Vu GT, Tran BX, Hoang CL, Hall BJ, Phan HT, Ha GH, *et al* — Global Research on Quality of Life of Patients with HIV/AIDS: Is It Socio-Culturally Addressed? (GAPRESEARCH). *IJERPH*. 2020; **17(6)**: 2127.
- 15 Mohammed SA, Yitafr MG, Workneh BD, Hailu AD — Health-related quality of life and associated factors among people living with human immunodeficiency virus on highly active antiretroviral therapy in North East Ethiopia: Cross-sectional study. Tesfaye M, editor. *PLoS ONE* 2021; **16(3)**: e0247777.
- 16 Sarkar T, Karmakar N, Dasgupta A, Saha B — Quality of life of people living with HIV/AIDS attending antiretroviral clinic in the centre of excellence in HIV care in India. *Journal of Education and Health Promotion* 2019; **8**: 8.
- 17 Vrontaras N, Myrvali K, Kyrou D, Metallidis S, Tsachouridou O, Chini M, *et al* — An exploration of the quality of life of people living with HIV in Greece: Challenges and opportunities. Essop MF, editor. *PLoS ONE* 2022; **17(4)**: e0266962.
- 18 Popping S, Kall M, Nichols BE, Stempher E, Versteegh L, van de Vijver David AMC, *et al* — Quality of life among people living with HIV in England and the Netherlands: a population-based study. *The Lancet Regional Health - Europe* 2021; **8**: 100177.
- 19 den Daas C, van den Berk GEL, Kleene MJT, de Munnik ES, Lijmer JG, Brinkman K — Health-related quality of life among adult HIV positive patients: assessing comprehensive themes and interrelated associations. *Qual Life Res* 2019; **28(10)**: 2685-94.
- 20 Arjun BY, Unnikrishnan B, Ramapuram JT, Thapar R, Mithra P, Kumar N, *et al* — Factors Influencing Quality of Life among People Living with HIV in Coastal South India. *J Int Assoc Provid AIDS Care* 2017; **16(3)**: 247-53.
- 21 Sharp PM, Hahn BH — Origins of HIV and the AIDS Pandemic. *Cold Spring Harbor Perspectives in Medicine* 2011; **1(1)**: a006841–a006841.