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Differences in people living with HIV (PLWH) population aged over 50 years old receiving antiretroviral therapy (ART)

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Abstract

To explore differences among the elderly people (aged over 50 years old) living with HIV (PLWH) who are receiving antiretroviral therapy (ART), we collected and analyzed data using cross-sectional research methods. Among 520 elderly PLWH on ART, those over 60 years old, compared to those aged 50–60, had lower levels of education, more retirees in occupation distribution, a lower rate of active consultation, a higher proportion of heterosexual transmission, and more complications. Additionally, this study demonstrated a greater incidence of severe disease symptoms and a higher rate of ART failure. These findings underscore the importance of prioritizing targeted nursing care and interventions for elderly PLWH in future healthcare strategies.

Keywords PLWH, ART, Elderly, 50–60 years old, Over 60 years

Background

In recent years, the optimization and standardized use of antiretroviral therapy (ART) has significantly extended the survival of people living with HIV (PLWH), with their life expectancy increasingly approaching that of the general population without additional complications [1]. Globally, PLWH are progressively aging [2], with the 50–59 age group being most prevalent and the 60–69 age group experiencing the fastest rise in disease incidence [3]. This underscores the urgent need for focused prevention and care for elderly PLWH [2].

Unlike the general population, PLWH has a unique age definition, earlier studies defined older PLWH as individuals aged 50 and above, differentiating them from sexually active populations aged 15–49 [4, 5]. The growing number of elderly PLWH [6] may partly result from this group being frequently overlooked [7], personal or health factors, and poor virus suppression in the body [8]. Predictive models estimate that by 2030, the proportion of PLWH aged over 50 years old will rise from 28% in 2010 to 73% [9]. This highlights the need for intensified efforts to achieve the 90-90-90 goals of the AIDS program, with a particular emphasis on treatment and care services tailored to the elderly [10].

In China, specific policies regarding antiretroviral therapy, such as the “four exemptions and one care” policy [11], have significantly improved HIV treatment outcomes. This policy has been very successful, covering 97% of China’s PLWH population 15 years ago [12], and is the key to PLWH entering the group of people over 50 years old. Additionally, the establishment of more HIV clinics and healthcare system reforms has further

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contributed to extending the life expectancy of PLWH [13]. In conclusion, the number of PLWH in the elderly has increased. Still, ART in different age groups over 50 is related to immune function, and the failure of ART affects the survival rate of patients, reminding us that this group deserves attention [8, 13]. The purpose of this study was to analyze the characteristics of elderly PLWH receiving ART, especially to compare 50–60 years old and over 60 years old, to find a nursing breakthrough for this group.

Methods

Research object

The data for this study were obtained from the China Comprehensive AIDS Prevention and Control Data Information Management System, a national, network-based platform for standardized AIDS management, ensuring high data quality and security [14]. The study included patients with PLWH at baseline aged over 50 enrolled in the system from 2007 to 2023 who were still receiving antiretroviral therapy and were regularly followed up. Cases with incomplete information, missing follow-up data, or those complicated by severe diseases or tumors were excluded. This rigorous information screening process is essential for analyzing differences in ART access among PLWH aged 50 years and older.

Statistical method

Statistical analysis was performed using SPSS Version 26.0 (IBM, Armonk, NY, USA). Count data were described by component ratio (%), comparison was performed by χ^2 test, and measurement data inconsistent with normal distribution were described by Median (P25, P75). Test level $\alpha=0.05$, $P<0.05$ was considered statistically significant.

Results

A total of 520 elderly PLWH patients receiving ART were divided into two groups according to the research objectives: a 50–60 age group and a 60 years and older group. There were 267 PLWH cases in the 50–60 age group and 253 cases in the over-60 group, with the median ages being 55 (52, 58) years and 66 (63, 69) years, respectively. Among these patients, 81.9% were male, about one-third were divorced or widowed, 57.9% had low levels of education, and nearly 30% were retirees.

A total of 39.0% of the patients were diagnosed through taking the initiative to find, with all cases being sexually transmitted, and heterosexual transmission being the most common (58.8%). At the initial CD4 test, 46.3% of patients had a CD4 count of less than 200 cells/ul, 44.6% had severe disease symptoms, and 12.7% had comorbidities. At their first visit, 43.7% of patients did not receive ART promptly upon diagnosis. Among all patients, 65.8%

received first-line ART regimens, and the failure rate of antiviral treatment was 10.8%. Compared with the PLWH group aged 50–60, the PLWH group aged 60 and above had a lower level of education (35.6% vs. 48.3%, $p=0.003$), more retirees in occupation (54.2% vs. 6.4%, $p<0.001$), a lower proportion of proactive medical visits (34.4% vs. 43.4%, $p=0.034$), a higher proportion of heterosexual transmission (64.8% vs. 53.2%, $p=0.007$), more complications (15.8% vs. 9.7%, $p=0.038$), higher proportion of severe disease symptoms (51.0% vs. 38.6%, $p=0.004$), and higher rates of ART treatment failure (14.6% vs. 7.1%, $p=0.006$), as shown in Table 1.

The failure rate of elderly PLWH ART is 10.8%, and PLWH failures among people over 60 years old account for 66.1% of the elderly population. Moreover, there were more retirees aged 60 and above in the PLWH group (59.5% vs. 21.0%, $p=0.013$) with a higher proportion of severe disease symptoms (67.6% vs. 26.3%, $p=0.003$) and more comorbidities (29.7% vs. 5.3%, $p=0.043$), as shown in Table 2.

Discussion

Our study uniquely focuses on 520 elderly PLWH patients receiving antiretroviral therapy, examining the differences within this population. While extending the lifespan of PLWH is a positive outcome, elderly PLWH faces significant challenges [15]. This study found that among elderly PLWH receiving ART, individuals aged 60 and older had lower levels of education compared to those aged 50–60, with a higher proportion being retirees. Lower educational attainment may impact cognitive behavior and limit awareness of HIV/AIDS prevention [16]. Additionally, the older generation often lacked access to systematic sex education in their youth. Upon retirement, some may explore new experiences out of curiosity, increasing their risk of HIV infection, particularly through heterosexual transmission [3, 17]. Our findings further indicate that heterosexual transmission is more prevalent among PLWH over 60 years old. Driven by sexual activity, many elderly individuals are reluctant to adopt protective measures, heightening their risk of infection. Therefore, strengthening sexual health education for the elderly and promoting awareness of proper preventive measures are critically important.

We also found that PLWH aged 60 and older exhibit low awareness of proactively seeking medical attention, which can result in delayed diagnosis and adversely impact their health outcomes [18]. Furthermore, elderly patients who delay seeking medical care are often in poorer health and face a higher risk of developing severe disease symptoms. This increases the likelihood of coexisting with non-HIV-related diseases, a conclusion supported by the model analysis conducted by Kong AM et al. [19]. So, initiating antiretroviral therapy as early as

Table 1 Comparison of characteristics among elderly PLWH between the 50–60 years old group and the 60 years old and above group [n (%)]

Variable		50–60 years old group (n = 267)	60 years old above group (n = 253)	p value
Sex	Male	219(82.0)	207(81.8)	0.952
Divorced or Widowed	Yes	82(30.7)	79(31.2)	0.899
High level of education	Yes	129(48.3)	90(35.6)	0.003
Local medical consultation	Yes	122(45.7)	97(38.3)	0.090
Occupation				<0.001
	Cadres and staffs	25(9.4)	9(3.6)	
	Farmers	19(7.1)	12(4.7)	
	Workers	30(11.2)	17(6.7)	
	Housekeeping and unemployment	68(25.5)	36(14.2)	
	Commercial service	63(23.6)	19(7.5)	
	Retirees	17(6.4)	137(54.2)	
	Other/unknown	45(16.9)	23(9.1)	
Take the initiative to find disease	Yes	116(43.4)	87(34.4)	0.034
Heterosexual transmission	Yes	142(53.2)	164(64.8)	0.007
Severe disease symptoms	Yes	103(38.6)	129(51.0)	0.004
Initial CD4 test <200 cells/ul	Yes	127(47.6)	114(45.1)	0.567
Complication	Yes	26(9.7)	40(15.8)	0.038
No immediate ART treatment	Yes	126(47.2)	101(39.9)	0.095
ART treatment time >3years	Yes	197(73.8)	195(77.1)	0.384
First-line ART therapy	Yes	173(64.8)	169(66.8)	0.630
ART failure	Yes	19(7.1)	37(14.6)	0.006

Table 2 Comparative analysis of antiretroviral failure in individuals aged 50 and above [n (%)]

Variable		ART failure		p value
		50–60 years old group (n = 19)	60 years old above group (n = 37)	
Sex	Male	14(73.7)	30(81.1)	0.523
Divorced or Widowed	Yes	5(26.3)	10(27.0)	0.955
High level of education	Yes	7(36.8)	7(18.9)	0.142
Local medical consultation	Yes	8(42.1)	12(32.4)	0.474
Occupation				0.013
	Cadres and staffs	3(15.8)	1(2.7)	
	Farmers	0(0.0)	2(5.4)	
	Workers	1(5.3)	2(5.4)	
	Housekeeping and unemployment	4(21.0)	7(18.9)	
	Commercial service	4(21.0)	1(2.7)	
	Retirees	4(21.0)	22(59.5)	
	Other/unknown	3(15.8)	2(5.4)	
Take the initiative to find disease	Yes	8(42.1)	11(29.7)	0.354
Heterosexual transmission	Yes	12(63.2)	27(73.0)	0.449
Severe disease symptoms	Yes	5(26.3)	25(67.6)	0.003
Initial CD4 test <200 cells/ul	Yes	3(15.8)	4(10.8)	0.679
Complication	Yes	1(5.3)	11(29.7)	0.043
No immediate ART treatment	Yes	14(73.7)	18(48.6)	0.073
ART treatment time >3years	Yes	9(47.4)	25(67.6)	0.143
First-line ART therapy	Yes	10(52.6)	26(70.3)	0.192

possible, while the body still retains robust immune function, can significantly improve treatment success rates for elderly PLWH and reduce disease-related mortality.

According to previous studies, the likelihood of virological failure in elderly PLWH patients is 18% higher compared to younger individuals [20]. Our latest research results indicate that the failure rate of ART treatment for elderly PLWH is 10.8%, with the most common being among PLWH aged 60 and older. Several factors may explain this: elderly individuals often exhibit poor immune function and heightened sensitivity to drug side effects [21]. This is primarily due to the presence of multiple chronic diseases common in this age group and the impact of aging on overall prognosis [22]. Moreover, the concurrent use of multiple medications during treatment can lead to a significant medication burden [23], which negatively affects ART adherence. In addition, elderly PLWH often experiences feelings of shame or face societal discrimination, further compromising treatment adherence [24]. These factors collectively contribute to higher rates of treatment noncompliance and ART failure in this population. To enhance treatment adherence among elderly PLWH, it is essential to address not only physical and mental health but also emotional well-being, while increasing access to psychological support [25]. Furthermore, attention should be given to adapting nursing models for elderly PLWH and combating stigma and discrimination from both patients and society. In summary, we emphasize the need for tailored, precise care for elderly PLWH, particularly those aged 60 and older, to improve treatment outcomes and overall quality of life.

Conclusion

Our study found significant population differences between PLWH aged 50–60 years and those over 60 years who are receiving ART. With variations in the importance and challenges of nursing care across different age groups. Understanding how to implement early and effective interventions will be crucial, in shaping the direction of future research and discussion. The health system must pay special attention to these age-specific needs to improve outcomes for elderly PLWH.

Abbreviations

PLWH People living with HIV
ART Antiretroviral therapy

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Author contributions

PSS was responsible for data analysis, writing the manuscript, and revising the manuscript. XX proposed the topic selection and developed the research proposal. ZLD was responsible for developing research objectives and conducting feasibility analyses. LQQ performed the data collection and organization. CLL verified the research results. FJ provided the research technology and material support. YQ performed the project administration. NZ provided supervision of the process. XST was responsible for the review of the first draft and fund support. All authors reviewed the manuscript.

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Data availability

The data presented in the study are available from the corresponding authors upon reasonable request and with permission of the Center for Disease Control and Prevention of the Pudong New Area, Shanghai, China.

Declarations

Ethics approval and consent to participate

The studies involving human participants were reviewed and approved by the Ethics Committee of the Pudong New Area Center for Disease Control and Prevention. The Centre for Disease Control and Prevention of Shanghai Pudong New Area, which is information from the China Epidemiological Information Network, has strict confidentiality. Written informed consent for participation was not required for this study by the national legislation and the institutional requirements.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Marcus JL, Leyden WA, Alexeeff SE, Anderson AN, Hechter RC, Hu H, et al. Comparison of overall and comorbidity-free life expectancy between insured adults with and without HIV infection, 2000–2016. *JAMA Netw Open*. 2020;3(6):e207954. <https://doi.org/10.1001/jamanetworkopen.2020.7954>.
2. Wing EJ. HIV and aging. *Int J Infect Dis*. 2016;53:61–8. <https://doi.org/10.1016/j.ijid.2016.10.004>.
3. Liang X, Deng Y, Xu H, Peng Z, Chen P, Chen Q, et al. The trend analysis of HIV and other sexually transmitted infections among the elderly aged 50 to 69 years from 1990 to 2030. *J Glob Health*. 2024;14:04105. <https://doi.org/10.7189/jogh.14.04105>.
4. Kiplagat J, Tran DN, Barber T, Njuguna B, Vedanthan R, Triant VA, et al. How health systems can adapt to a population ageing with HIV and comorbid disease. *Lancet HIV*. 2022;9(4):e281–92. [https://doi.org/10.1016/S2352-3018\(22\)00009-1](https://doi.org/10.1016/S2352-3018(22)00009-1).
5. Blanco JR, Jarrín I, Vallejo M, Berenguer J, Solera C, Rubio R, et al. Definition of advanced age in HIV infection: looking for an age cut-off. *AIDS Res Hum Retroviruses*. 2012;28(9):1000–6. <https://doi.org/10.1089/AID.2011.0377>.
6. Hosaka KRJ, Greene M, Premeaux TA, Javandel S, Allen IE, Ndhlovu LC, et al. Geriatric syndromes in older adults living with HIV and Cognitive Impairment. *J Am Geriatr Soc*. 2019;67(9):1913–6. <https://doi.org/10.1111/jgs.16034>.
7. Seeley J. HIV diagnosis increasing in older adults in Europe. *Lancet HIV*. 2017;4(11):e480–1. [https://doi.org/10.1016/S2352-3018\(17\)30151-0](https://doi.org/10.1016/S2352-3018(17)30151-0).
8. Bhatta M, Nandi S, Dutta N, Dutta S, Saha MK. HIV Care among Elderly Population: systematic review and Meta-analysis. *AIDS Res Hum Retroviruses*. 2020;36(6):475–89. <https://doi.org/10.1089/AID.2019.0098>.

9. Smit M, Brinkman K, Geerlings S, Smit C, Thyagarajan K, Sighem A, et al. Future challenges for clinical care of an ageing population infected with HIV: a modelling study. *Lancet Infect Dis*. 2015;15(9):810–8. [https://doi.org/10.1016/S1473-3099\(15\)00056-0](https://doi.org/10.1016/S1473-3099(15)00056-0).
10. Farley SM, Wang C, Bray RM, Low AJ, Delgado S, Hoos D, et al. Progress towards the UNAIDS 90-90-90 targets among persons aged 50 and older living with HIV in 13 African countries. *J Int AIDS Soc*. 2022;25(Suppl 4):e26005. <https://doi.org/10.1002/jia2.26005>.
11. State Council of the People's Republic of China, Regulations on the Prevention and Control of AIDS. 2006. https://www.gov.cn/gongbao/content/2006/content_244465.htm. Accessed 2 Dec 2024.
12. Zhang F, Dou Z, Ma Y, Zhao Y, Liu Z, Bulterys M, et al. Five-year outcomes of the China National Free Antiretroviral Treatment Program. *Ann Intern Med*. 2009;151(4):41–42. <https://doi.org/10.7326/0003-4819-151-4-200908180-00003>.
13. Wang YY, Yang Y, Chen C, Zhang L, Ng CH, Ungvari GS, et al. Older adults at high risk of HIV infection in China: a systematic review and meta-analysis of observational studies. *PeerJ*. 2020;8:e9731. <https://doi.org/10.7717/peerj.9731>.
14. Mao Y, Wu Z, Poundstone K, Wang C, Qin Q, Ma Y, et al. Development of a unified web-based national HIV/AIDS information system in China. *Int J Epidemiol*. 2010;39(Suppl 2):ii79–89. <https://doi.org/10.1093/ije/dyq213>.
15. Zdanowicz MM, Valdes B, Salani D. Management of HIV in the older adults: clinical and public health challenge. *Public Health Nurs*. 2024;41(3):406–15. <https://doi.org/10.1111/phn.13288>.
16. Huang H, Cao Y, Li M, Bao Y, Robbins S, Chu M, et al. An observational study on HIV and Syphilis Rates and Associated Risk Factors among Elderly men in Wuxi, China. *Curr HIV Res*. 2023;21(1):56–62. <https://doi.org/10.2174/1570162X21666230123154718>.
17. Hou Y, Jin Y, Cai C, Qin Q, Tang H, Lyu F. Comparative Analysis of Epidemiological Features of HIV/AIDS cases aged over and under 50 Years Old - China, 2010–2022. *China CDC Wkly*. 2023;5(48):1079–83. <https://doi.org/10.46234/ccdcw2023.202>.
18. Alencar RA, Ciosak SI. Aids in the elderly: reasons that lead to late diagnosis. *Rev Bras Enferm*. 2016;69(6):1140–6. <https://doi.org/10.1590/0034-7167-2016-0370>. Portuguese, English.
19. Kong AM, Pozen A, Anastos K, Kelvin EA, Nash D. Non-HIV Comorbid conditions and Polypharmacy among people living with HIV Age 65 or older compared with HIV-Negative individuals Age 65 or older in the United States: a retrospective claims-based analysis. *AIDS Patient Care STDS*. 2019;33(3):93–103. <https://doi.org/10.1089/apc.2018.0190>.
20. Zhu Q, Huang J, Wu X, Chen H, Shen Z, Xing H, et al. Virologic failure and all-cause mortality among older people living with HIV/AIDS in South China. *AIDS Care*. 2023;35(12):1815–20. <https://doi.org/10.1080/09540121.2022.2099513>.
21. Li N, Zheng HY, He WQ, He XY, Li R, Cui WB, et al. Treatment outcomes amongst older people with HIV infection receiving antiretroviral therapy. *AIDS*. 2024;38(6):803–12. <https://doi.org/10.1097/QAD.0000000000003831>.
22. Montano M, Oursler KK, Xu K, Sun YV, Marconi VC. Biological ageing with HIV infection: evaluating the geroscience hypothesis. *Lancet Healthy Longev*. 2022;3(3):e194–205. [https://doi.org/10.1016/s2666-7568\(21\)00278-6](https://doi.org/10.1016/s2666-7568(21)00278-6).
23. Greene M, Steinman MA, McNicholl IR, Valcour V. Polypharmacy, drug-drug interactions, and potentially inappropriate medications in older adults with human immunodeficiency virus infection. *J Am Geriatr Soc*. 2014;62(3):447–53. <https://doi.org/10.1111/jgs.12695>.
24. Guaraldi G, Milic J, Cascio M, Mussini C, Martinez E, Levin J, et al. Ageism: the -ism affecting the lives of older people living with HIV. *Lancet HIV*. 2024;11(1):e52–9. [https://doi.org/10.1016/S2352-3018\(23\)00226-6](https://doi.org/10.1016/S2352-3018(23)00226-6).
25. Ahmed MH, Ahmed F, Abu-Median AB, Panourgia M, Owles H, Ochieng B, et al. HIV and an Ageing Population-what are the Medical, Psychosocial, and Palliative Care challenges in Healthcare provisions. *Microorganisms*. 2023;11(10):2426. <https://doi.org/10.3390/microorganisms11102426>.

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