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Contribution of Mobile Populations to the HIV Epidemic Process: Analysis of Adherence and Effectiveness of Antiretroviral Therapy

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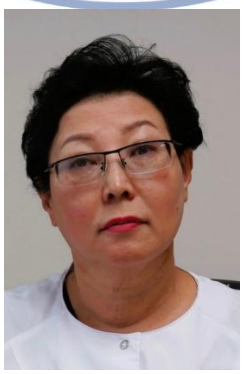

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ABSTRACT

Despite achieving high indicators of the HIV care continuum, which according to the Kazakh Scientific Center of Dermatology and Infectious Diseases reached 82-88-90 in 2023 and 83-90-92

in 2024, reflecting substantial coverage of antiretroviral therapy (hereinafter ART), these indicators are aggregated in nature and do not account for the heterogeneity of specific population groups. Mobile populations (particularly foreign nationals) are of particular importance in sustaining the epidemic process, as they are characterized by instability in dispensary follow-up, reduced adherence to ART, and limited access to healthcare services. At the same time, existing approaches to evaluating treatment effectiveness are predominantly based on the fact of ART prescription and do not always reflect actual clinical and laboratory outcomes. This creates a discrepancy between formal treatment coverage and its real effectiveness. The insufficient study of the contribution of mobile populations, defined in this study as foreign nationals, to the persistence of HIV transmission, particularly considering adherence levels and virological treatment outcomes, determines the relevance of this research.

АННОТАЦИЯ

Несмотря на достижение высоких показателей континуума лечения ВИЧ-инфекции, которые по данным Казахского Научного Центра Дерматологии и Инфекционных Заболевании в 2023 году составляли 82-88-90, а в 2024 году 83-90-92, отражающих значительный охват антиретровирусной терапией (далее АРТ), данные показатели имеют агрегированный характер и не учитывают гетерогенность отдельных групп населения. Особую значимость в поддержании эпидемического процесса представляют мобильные группы населения (в частности иностранных граждан), для которых характерны нестабильность диспансерного наблюдения, сниженная приверженность к АРТ и ограниченный доступ к медицинской помощи. В то же время существующие подходы к оценке эффективности лечения преимущественно основаны на факте назначения АРТ и не всегда отражают реальные клинико-лабораторные исходы. Это создает противоречие между формальным охватом лечением и его фактической эффективностью. Недостаточная изученность вклада мобильных групп населения, в нашем исследовании - иностранные граждане, в поддержание циркуляции ВИЧ-инфекции, особенно с учетом показателей приверженности и вирусологической эффективности терапии, определяет необходимость проведения данного исследования.

ANNOTATSIYA

OIV infeksiyasini davolash uzluksizligi ko‘rsatkichlari yuqori darajaga erishganiga qaramay, Qozog‘iston Dermatologiya va Yuqumli Kasalliklar Ilmiy Markazi ma’lumotlariga ko‘ra 2023 yilda 82-88-90 va 2024 yilda 83-90-92 ko‘rsatkichlarga yetgan bo‘lib, bu antiretrovirus terapiya (keyingi o‘rinlarda ART) bilan qamrovning yuqori ekanligini aks ettiradi, mazkur ko‘rsatkichlar agregatsiyalangan xarakterga ega bo‘lib, aholining alohida guruhlari o‘rtasidagi geterogenlikni hisobga olmaydi.Epidemik jarayonni qo‘llab-quvvatlashda mobil aholi guruhlari (xususan, xorijiy fuqarolar) alohida ahamiyatga ega bo‘lib, ular dispanser kuzatuvining beqarorligi, ARTga past darajadagi rioya qilish va tibbiy xizmatlardan foydalanish imkoniyatlarining cheklanganligi bilan tavsiflanadi.Shu bilan birga, davolash samaradorligini baholashga oid mavjud yondashuvlar asosan ART tayinlanganligi faktiga asoslanadi va har doim ham real klinik va laborator natijalarni aks ettirmaydi. Bu esa davolash bilan formal qamrov va uning haqiqiy samaradorligi o‘rtasida tafovutni yuzaga keltiradi.Mobil aholi guruhlarining, ushbu tadqiqotda xorijiy fuqarolar sifatida belgilangan,

OIV infeksiyasining tarqalib turishiga qo‘shayotgan hissasining yetarlicha o‘rganilmaganligi, ayniqsa ARTga rioya qilish darajasi va virusologik davolash natijalari nuqtai nazaridan, ushbu tadqiqotning dolzarbligini belgilaydi.

KEY WORDS

HIV, antiretroviral therapy, adherence, mobile populations, foreign nationals, CD4, viral load, epidemiology.

INTRODUCTION

Despite significant progress in controlling HIV infection globally and nationally, the epidemic remains a major public health challenge. Kazakhstan has achieved relatively high coverage indicators of the HIV care continuum; however, these figures are generalized and do not consider differences between population groups. Mobile populations, particularly foreign nationals, represent a vulnerable category due to migration-related barriers, reduced access to healthcare, and inconsistent adherence to treatment.

The discrepancy between formal ART coverage and actual treatment effectiveness highlights the need for more detailed research into specific subgroups. Insufficient understanding of the role of mobile populations in sustaining HIV transmission determines the relevance of this study.

LITERATURE AND METHODOLOGY / METHODS

Inclusion criteria:

- Comparison group: CD4 count < 500 cells/μL at baseline; ART adherence level 2 (85-94%) or level 3 (<85%); at least two CD4 measurements; viral load ≥ 50 copies/mL; absence of sustained positive CD4 dynamics.
- Control group: CD4 ≥ 500 cells/μL or positive CD4 dynamics; undetectable or decreasing viral load; high or satisfactory ART adherence.

Exclusion criteria:

- Non-compliance with inclusion criteria for the respective group;
- Pregnancy;
- Age under 18 years.

RESULTS

During the period 2019-2021, 359 new HIV cases were registered among foreign nationals, of which 339 were included in the analysis. Cohort heterogeneity was considered: 2 cases were children and 18 were pregnant women. A decrease in newly diagnosed cases was observed, from 137 in 2019 to 104 in 2021. The total number of patients receiving ART increased from 359 in 2019 to 403 in 2021.

Table 1. Trends in HIV Diagnosis, ART Initiation, and ART Discontinuation among Foreign Nationals, 2019-2021, Kazakhstan

year	Patients on ART (year)	Newly Diagnosed HIV Cases among Foreign Nationals (year)	Of which (from newly diagnosed HIV+)		
			Died (year)	Initiated ART (year)	Discontinued ART (year)
2019	359	137	9 (6,57%)	68 (32,12%)	44 (32,12%)

2020	383	118	13 (11,02%)	75 (40,68%)	48 (40,68%)
2021	403	104	9 (8,65%)	75 (72,12%)	75 (72,12%)

However, a comparison of ART initiation and discontinuation rates over 2019-2021 revealed comparable values (Table 1). In the comparison group, 60.47% of patients were prescribed ART, while only 43.88% remained on therapy by the end of the observation period. The average proportion of patients with high adherence (85-94%) was 25.7%. The gap between patients receiving therapy and those with high adherence was 18.18%. A high proportion of patients demonstrated zero adherence: 54.4% in 2019, 82.5% in 2020, and 70.2% in 2021. Immunological indicators in the comparison group showed negative dynamics: median CD4 decline was 91 cells/μL in 2019, 28 cells/μL in 2020, and 47 cells/μL in 2021, with an average decrease of 55 cells/μL over three years. Comparison with official data revealed that the actual treatment effectiveness among foreign nationals was 34.77% lower than the overall ART coverage reported for the general HIV-positive population. In the control group, adherence and immunological indicators were more stable compared to the comparison group.

DISCUSSION

The findings demonstrate a significant gap between formal ART prescription and its actual implementation among foreign nationals [1]. Despite relatively high ART coverage, the proportion of patients maintaining sustained adherence remains low, as evidenced by the high prevalence of zero adherence and declining immunological parameters [2]. The observed decrease in newly diagnosed HIV cases during the study period may reflect not only changes in the epidemic process—potentially influenced by the pandemic—but also variations in testing coverage [3]. The lack of sustained virological control in this patient category may contribute to the formation of a hidden HIV reservoir. Factors potentially affecting adherence and treatment effectiveness include social vulnerability, limited access to healthcare, migration mobility, socio-economic barriers, treatment interruptions, and loss to follow-up within the healthcare system [4, 5]. Thus, mobile populations, particularly foreign nationals, may significantly contribute to sustaining the HIV epidemic process [6].

CONCLUSION

1. With ART coverage at 60.47% and adherence at 25.7%, only 43.88% of patients remain on treatment, indicating substantial losses at the retention stage.
2. Negative immunological dynamics, specifically an average CD4 decline of 55 cells/μL, indicate insufficient immunological effectiveness of treatment in the study group.
3. Low adherence to ART combined with persistent viral load (≥50 copies/mL) suggests that mobile populations, particularly foreign nationals, may contribute to the formation of an epidemiological HIV reservoir.
4. Further research should focus on an in-depth assessment of factors influencing ART adherence among mobile populations.

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