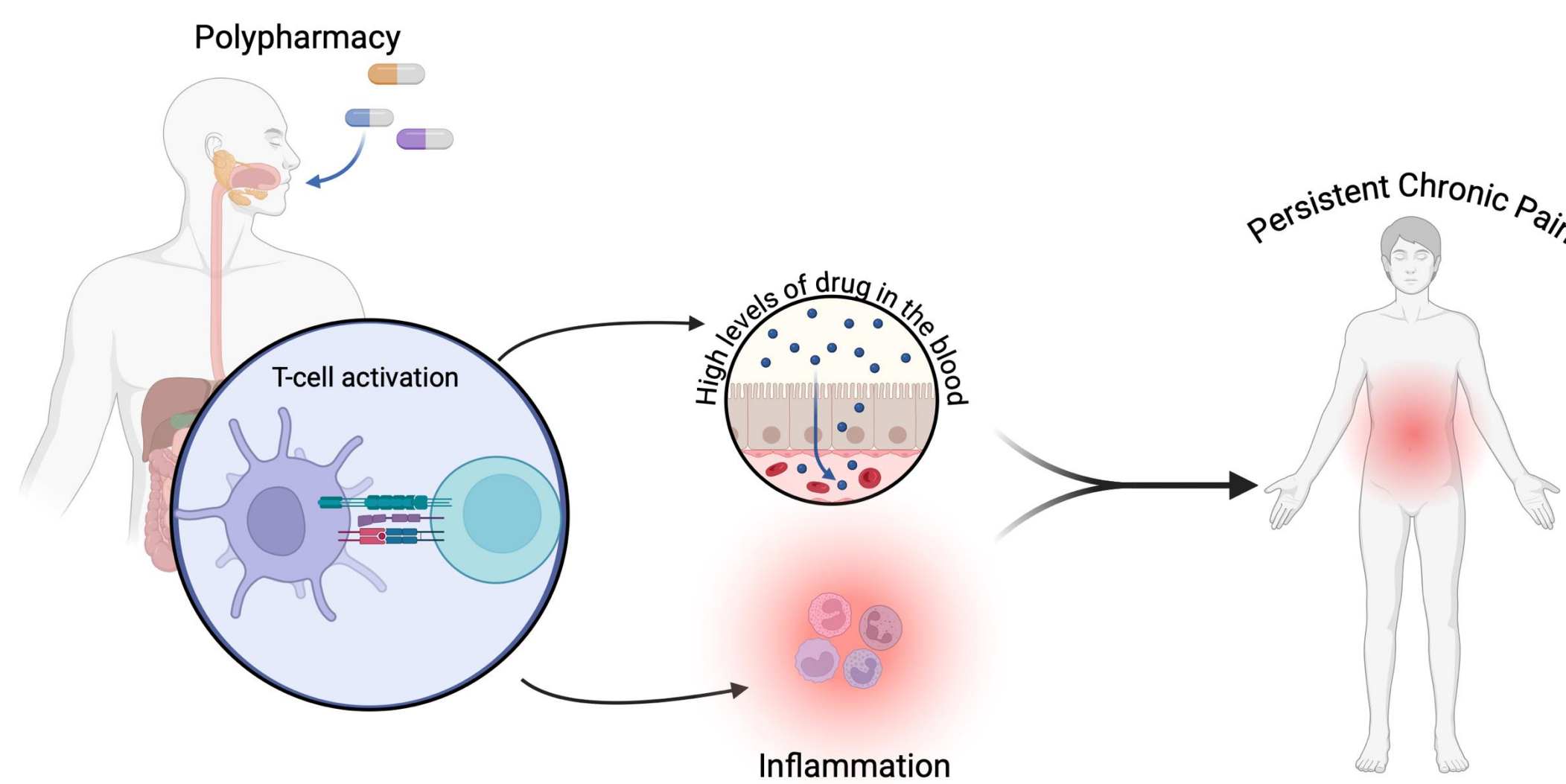


## Abstract

Chronic pain is one of the most common and debilitating comorbidities faced by people living with HIV, affecting more than half of this population over their lifetime. This study evaluates the contribution of non-antiretroviral medications to pain outcomes in people with HIV. Pain severity, measured on a 0–5 scale (0 = no pain; 5 = worst pain), and medication profiles were analyzed in 106 participants, including 92 with chronic pain and 14 without pain. Individuals with chronic pain reported significantly higher scores (mean:  $4.2 \pm 0.8$ ) compared to those without pain (mean:  $0.4 \pm 0.3$ ;  $p < 0.01$ ). Analgesics such as ibuprofen, tramadol, and acetaminophen were most frequently used among participants with pain scores  $\geq 4$ , yet high scores persisted, suggesting limited relief or tolerance to therapy. Neuropathic adjuvants, including gabapentin and duloxetine, were linked to moderate pain scores (mean:  $3.1 \pm 1.0$ ). By contrast, participants without pain primarily used non-pain-related medications (e.g., antihypertensives, vitamins). Polypharmacy was more prevalent in PWH with chronic pain, raising concerns about drug–drug interactions with antiretroviral therapy. Medications such as beta-blockers and statins, which are known to cause muscle aches and fatigue, may complicate pain assessment, while vitamin D supplementation may provide partial but not curative benefits. These findings highlight the multifaceted nature of pain management in HIV and the persistence of pain despite extensive pharmacologic use. They emphasize the need for multimodal strategies, including non-pharmacologic approaches and careful medication reconciliation, to optimize outcomes. Prospective studies should further explore individualized treatments and long-term management strategies to reduce the burden of chronic pain in this population.

## Hypothesis



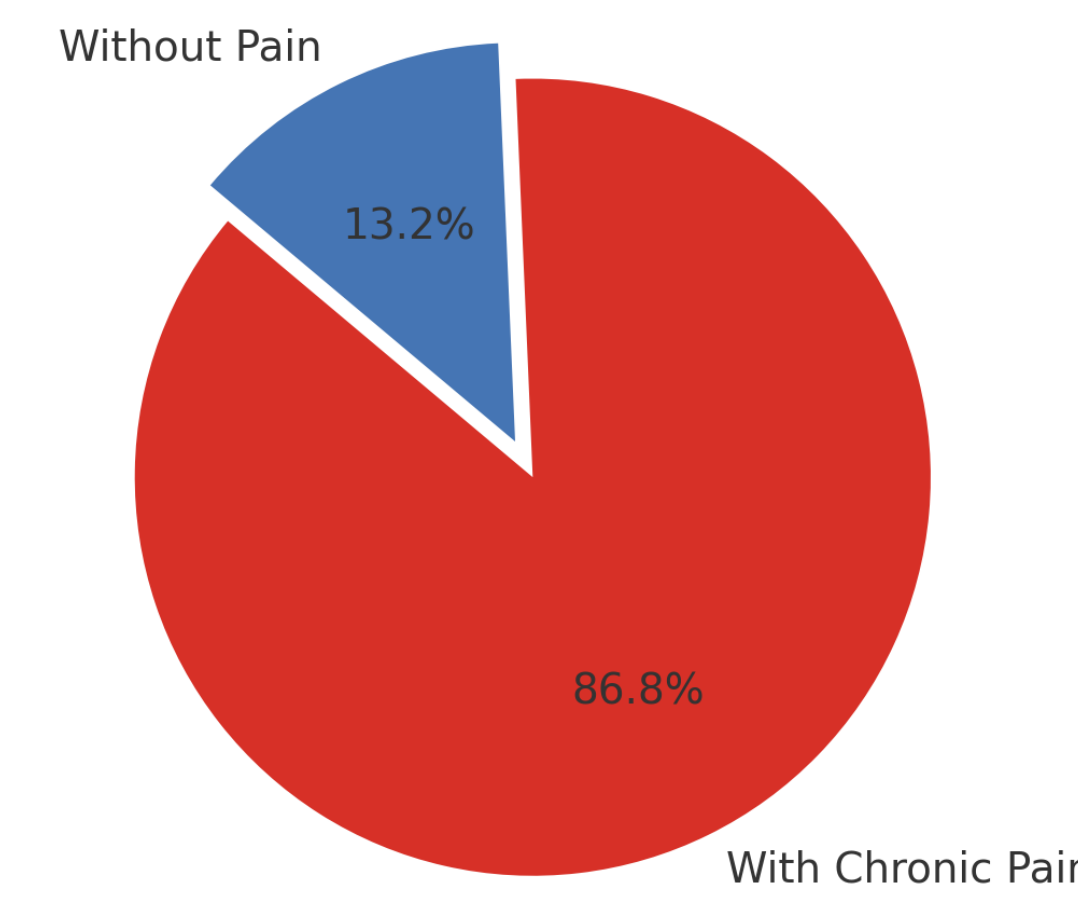
Managing chronic pain can be challenging for people with HIV, in part because of the large number of medications they often take. This issue, known as polypharmacy, raises the risk of drug-drug interactions. These interactions can make pain medications less effective, leading to inadequate pain relief and difficult-to-treat pain. To overcome these challenges and improve outcomes, doctors need to use a multimodal approach to pain management. This means combining different types of treatments and therapies rather than relying on a single medication. By doing so, they can better manage the complexity of caring for people with HIV who experience chronic pain.

## Materials and Methods

- Study Population:** Data was collected from 106 HIV patients, including 92 with chronic pain and 14 without pain.
- Pain Assessment:** Pain levels were recorded using a 0–5 pain scale (0 = no pain, 5 = agony).
- Medication Analysis:** Patients' non-antiretroviral medications were categorized into analgesics, neuropathic pain medications, and non-pain-related drugs to assess polypharmacy effects.
- Statistical Analysis:** Mean pain scores were compared between groups using Two-way ANOVA and Tukey post hoc test, with significance set at  $p < 0.01$ .

## Results

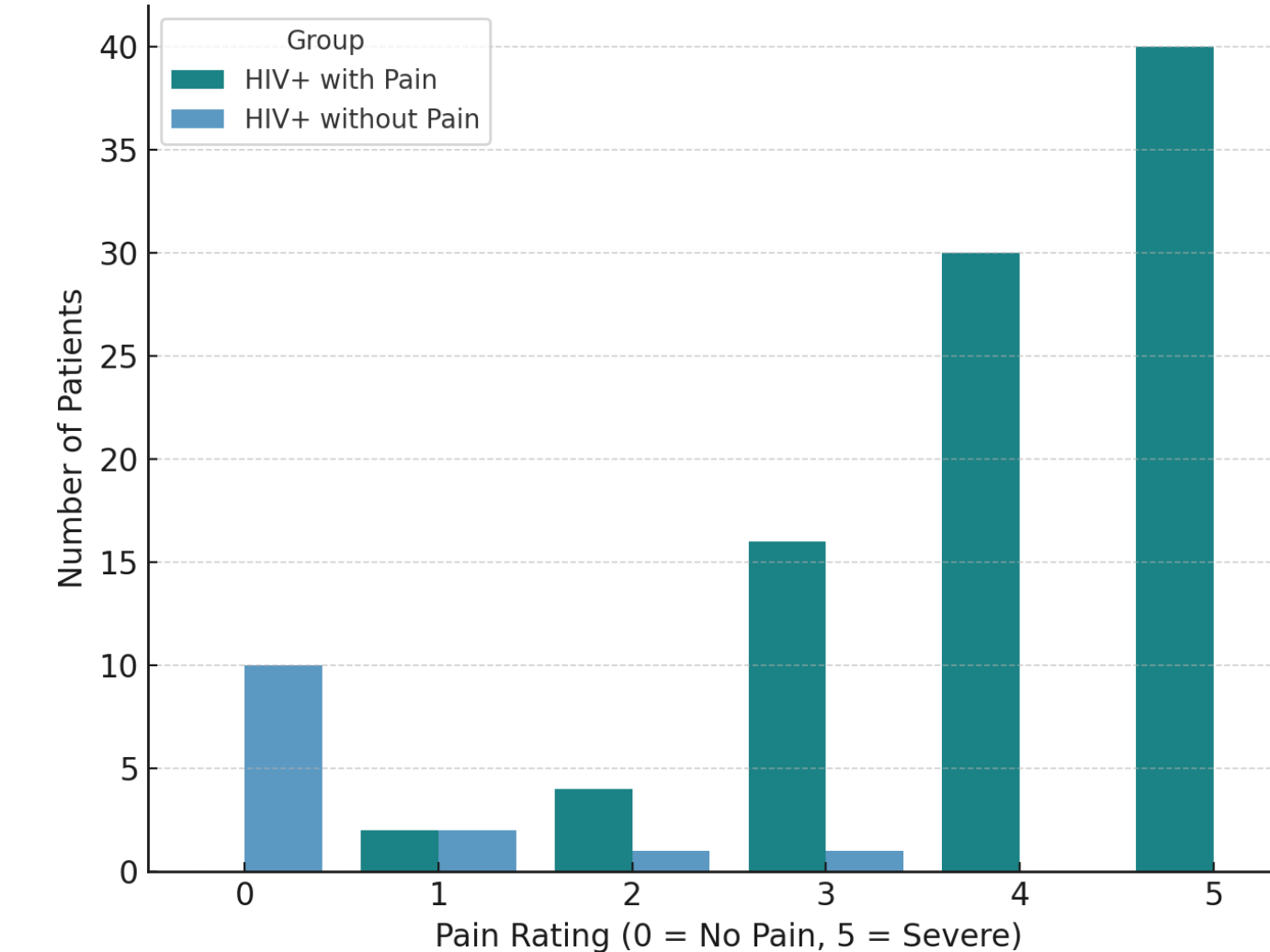
HIV+ Patients With and Without Chronic Pain



**Figure 1: Distribution of Chronic Pain in HIV+ Patients**

This pie chart illustrates the proportion of HIV-positive individuals in the study experiencing chronic pain. Out of 106 patients, 92 (86.8%) reported living with chronic pain, while only 14 (13.2%) reported no pain. This high prevalence underscores the importance of addressing pain as a critical component of HIV care.

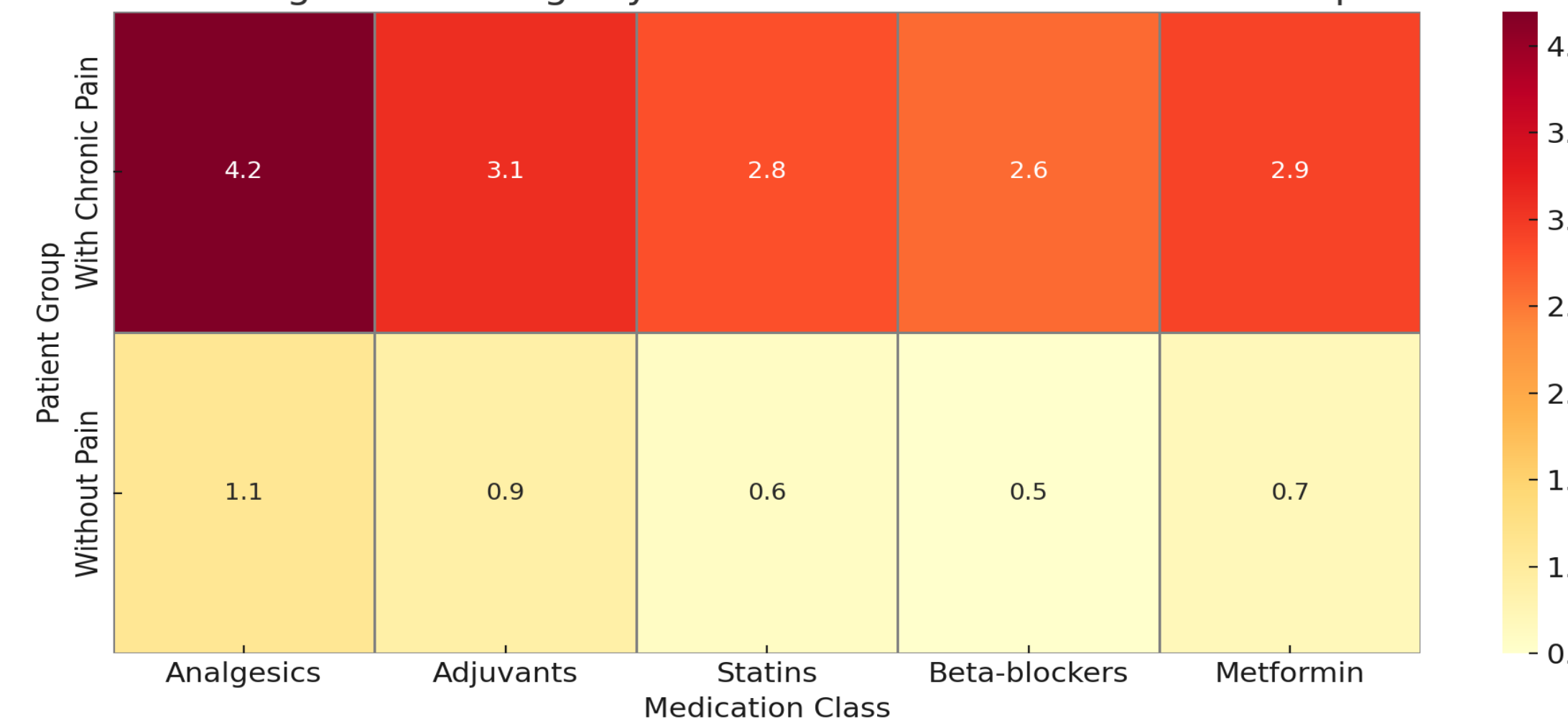
Distribution of Pain Severity in HIV+ Patients



**Figure 2: Distribution of Pain Severity Among HIV+ Patients**

This bar chart shows the self-reported pain levels on a scale from 0 (no pain) to 5 (very severe pain). Nearly all HIV-positive patients with chronic pain rated their pain as moderate to severe (ratings 3–5), with the largest group reporting the maximum pain score. In contrast, HIV+ patients without pain overwhelmingly reported a score of 0, confirming the study's group stratification and highlighting the burden of persistent pain in this population.

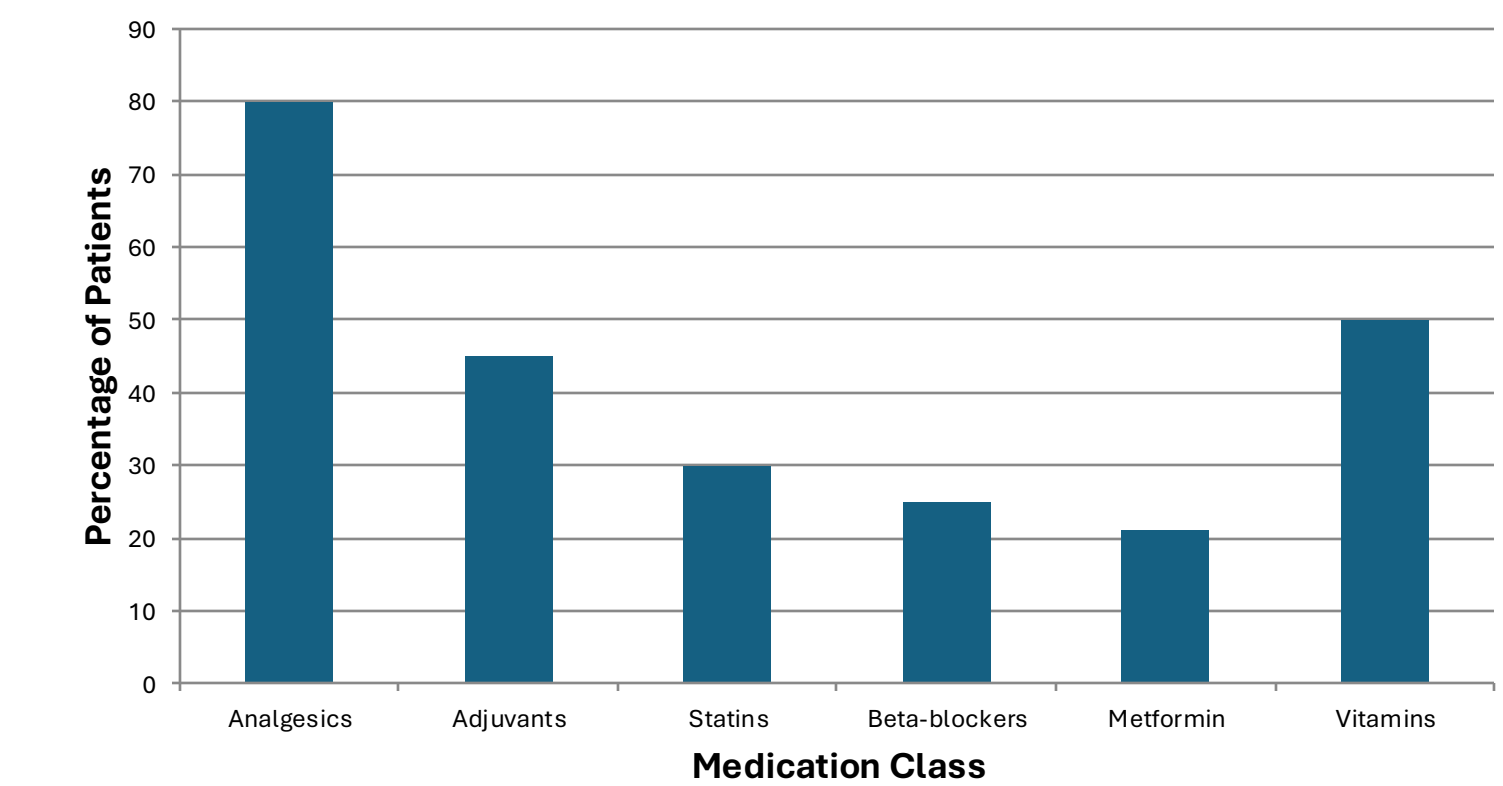
Average Pain Ratings by Medication Class and Patient Group



**Figure 3: Average Pain Ratings by Medication Class and Patient Group**

This heatmap compares mean pain scores between HIV-positive patients with and without chronic pain across different medication classes. Patients with chronic pain reported the highest average pain while taking analgesics (4.2), followed by adjuvants (3.1) and statins (2.8). In contrast, patients without pain had consistently low ratings ( $\leq 1.1$ ) across all medication classes, highlighting potential associations between medication type and pain perception.

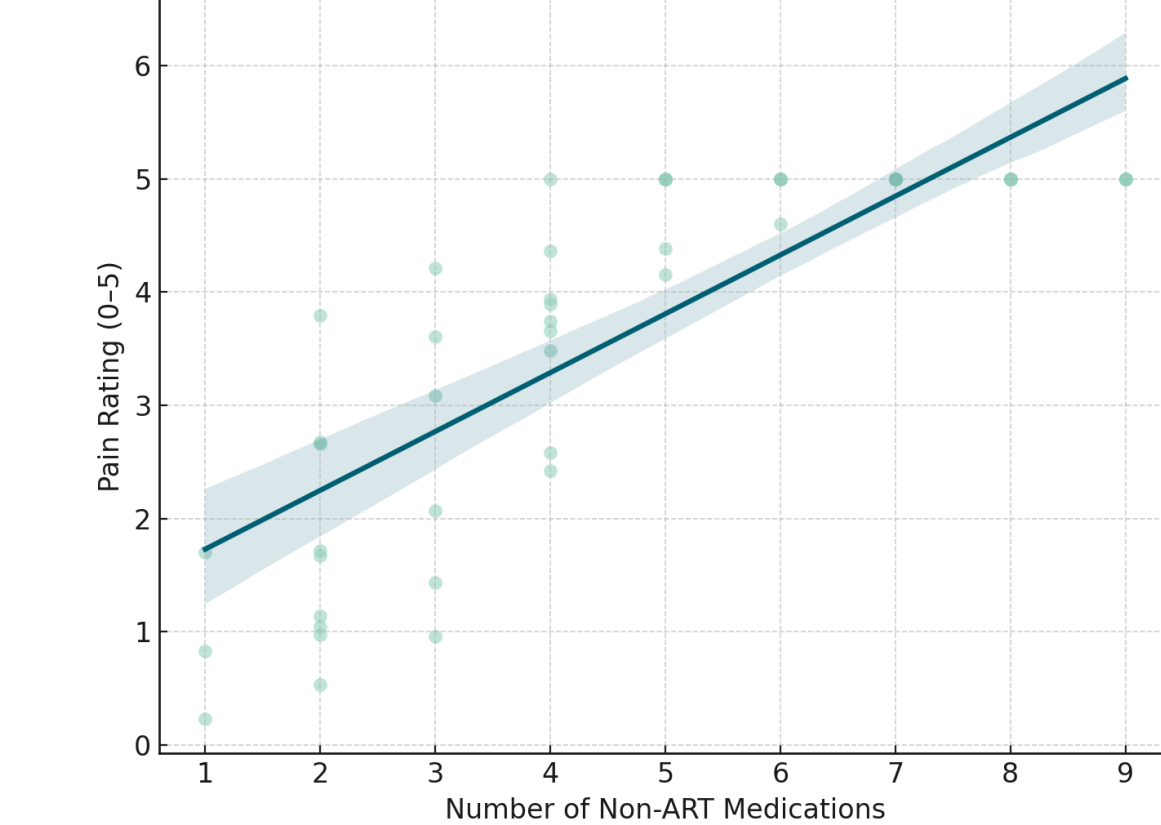
Prevalence of Non-ART Medication Use Among HIV-Positive Patients



**Figure 4: Prevalence of Non-ART Medication Use Among HIV-Positive Patients**

The percentage of HIV-positive patients using non-antiretroviral medications across different classes. Analgesics were the most frequently reported (80%), followed by vitamins (50%) and adjuvants (45%). Use of statins, beta-blockers, and metformin was less common but still notable, reflecting the presence of comorbidities. These findings highlight the prevalence of polypharmacy in this population and its potential influence on pain perception and management.

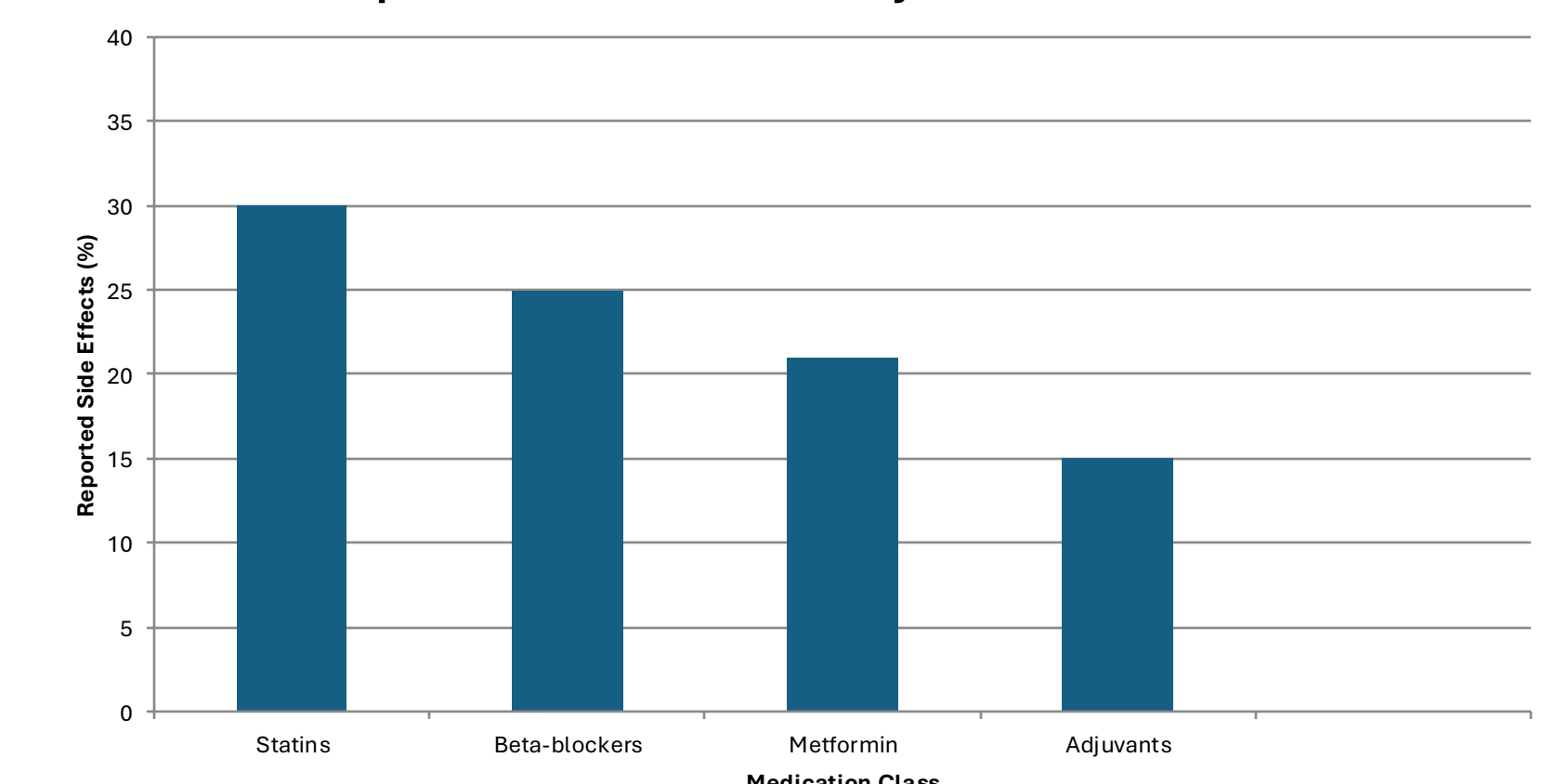
Number of Medications vs Pain Severity



**Figure 5: Relationship Between Number of Non-ART Medications and Pain Severity**

This scatter plot with a regression line demonstrates a positive correlation between the number of non-antiretroviral (non-ART) medications and self-reported pain severity in HIV-positive patients. As the number of medications increases, so does the average pain score, suggesting that polypharmacy may contribute to pain either through side effects, drug interactions, or treatment burden. The shaded area represents the 95% confidence interval.

Reported Pain Side Effects by Medication Class



**Figure 6: Reported Pain Side Effects by Medication Class**

HIV-positive patients reporting pain-related side effects linked to specific non-ART medication classes. Statins were associated with the highest incidence (30%), followed by beta-blockers (25%), metformin (21%), and adjuvants (15%). These findings suggest that common medications for comorbidities may contribute to pain symptoms and should be carefully evaluated during treatment planning.

## Conclusion

HIV patients with chronic pain experience persistent pain despite high analgesic use, highlighting the limitations of current pharmacologic treatments. Polypharmacy contributes to drug interactions that may hinder pain relief. A multidisciplinary approach with personalized medication reconciliation and non-pharmacologic interventions is needed to improve outcomes.