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ORIGINAL RESEARCH

Comorbidities and co-medications among 28 089 people living with HIV: A nationwide cohort study from 2009 to 2019 in Japan

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Abstract

Objectives: Comorbidities are associated with a high burden of disease in people living with HIV (PLWH). The objective was to investigate the prevalence of chronic comorbidities and use of co-medications in PLWH in Japan.

Methods: This study retrospectively analysed clinical information from PLWH receiving antiretroviral therapy (ART) between April 2009 and March 2019. Demographic characteristics, numbers and types of chronic comorbidities, and numbers and types of non-ART co-medications, were described by age groups. The source of data was the National Database of Health Insurance Claims and Specific Health Checkups of Japan (NDB).

Results: Overall, 28 089 PLWH (male 91.9%) who used ART were identified. Out of 28 089 PLWH, 81.5% had at least one chronic comorbidity. The numbers of AIDS-defining cancers and non-AIDS-defining cancers in this Japanese cohort were 2432 (8.7%) and 2485 (8.8%), respectively. The cumulative burden of comorbidities including non-AIDS-defining cancer increased with age. Changes in trend between 2009 and 2019 were observed, including a higher proportion of PLWH diagnosed at ≥ 70 years old [2019 (4.7%) vs. 2009 (2.4%)] and a decreasing percentage of patients with AIDS-defining cancers (down from 6.3% to 4.8% between 2009 and 2019). The most common co-medications during the most recent 3-month period were lipid-regulating/anti-atheroma preparations (11.3%), antacids, antiflatulents and anti-ulcerants (9.6%), and agents acting on the renin–angiotensin system (8.1%). The three most common therapeutic categories of co-medications during the study period were antacids, antiflatulents and anti-ulcerants (35.0%), systemic antihistamines (33.7%) and psycholeptics (27.1%). More than 30% of PLWH aged > 40 years used at least one co-medication in a 3-month period, while more than half of PLWH aged > 30 years had at least one co-medication prescribed concomitantly for a total of ≥ 90 days during the study period, and the numbers of co-medications used were greater in the older age groups.

Conclusions: The burden of chronic comorbidities and co-medication were found to be greater in older, as compared to younger patients, among 28 089 PLWH in a nationwide study in Japan. This finding suggests the need to identify elderly PLWH and to appropriately manage their HIV and comorbidities.

KEYWORDS

cohort study, comorbidity, elderly, HIV, National Database of Health Insurance Claims of Japan, non-AIDS-defining cancers, PLWH

INTRODUCTION

The advent of antiretroviral therapy (ART) and ongoing improvements during the last 20 years have prolonged the life expectancy of PLWH, such that these patients may now live as long as HIV-negative individuals [1]. However, various international studies have shown that age-associated chronic comorbidities, combined with HIV-associated conditions, have a negative effect on mortality rates of people living with HIV (PLWH) [2–4]. Previous studies have also shown that > 50% of HIV deaths are caused by either coinfection or age-associated non-infectious chronic comorbidities, most notably vascular diseases, hypertension, lipid disorders, diabetes mellitus, chronic kidney disease (CKD), with or without dialysis, malignancies, and bone disorders [2,5,6].

As a result of the global ageing of society, new challenges have emerged in the management of HIV, including age-associated chronic comorbidities in PLWH. These challenges take on added significance in Japan, which has the longest reported life expectancy worldwide [7]. A study in 2015 reported that > 10% of newly diagnosed PLWH in Japan were aged ≥ 50 years, supporting the finding that a significant number of HIV patients are relatively older [8]. Although the majority of newly diagnosed HIV patients in the 2015 study were aged 20–49 years (88.2%), these patients are now considered more likely to live to old age because they are projected to be appropriately managed with ART. The number of older adult PLWH appears to be increasing in Japan, corresponding to trends in other countries that are reporting increased proportions of PLWH aged ≥ 50 years [9–11]. Because of the potentially long life spans of PLWH in developed countries, it becomes central to adequate planning to update the real-world epidemiological data of the HIV population, particularly comorbidity profiles and the use of co-medication data.

Despite the potential significance of the associations between chronic comorbidities and HIV mortality rates, only a few small studies regarding chronic comorbidities and infections in PLWH in Japan have been published to date [12,13]. Our group previously examined chronic comorbidities and use of co-medications among PLWH in Japan who were using antiretrovirals, obtaining patient data from a commercial hospital claims database [14,15]. However, although the commercial database included data from relatively large hospitals, the total HIV patient population studied was 1445 individuals. Results of these prior studies found that older adult PLWH on antiretrovirals had more chronic comorbidities and used more co-medications than their younger counterparts, suggesting potential issues regarding appropriate management for this older patient population. This observation led to the hypothesis that updated epidemiological data from the National Database of Health Insurance Claims and Specific Health Checkups of Japan (NDB) could be used to expand and confirm these previous findings and help to gain a better understanding of the challenges associated with coexisting diagnoses in Japanese PLWH. This is the first report to analyse comorbidities and use of co-medications among all patients in the national database, which contains data on the largest number of PLWH in Japan available to date.

METHODS

Study design and data source

This study is a multicentre retrospective observational cohort study. Based on Article 16, Paragraph 2 of the Act on Assurance of Medical Care for Elderly People [16], and with the approval of Japan's Ministry of Health, Labour and Welfare, research data were strictly controlled in accordance with the ministry's guidelines.

Study population

Between April 2009 and March 2019, patients with one or more documented ART prescriptions and one or more HIV-related illnesses were enrolled. Diseases were classified according to the reimbursement claim codes associated with the *International Classification of Diseases*, 10th

Revision (ICD-10), codes B20–24. In the data extraction, medical fee claims that were paid with public funds, other than national health insurance, were excluded in advance. To avoid including doubtful PLWH, such as those poorly recorded or patients who appeared intentionally recorded only for the purpose of making a claim, patients were required to have a record of at least one ART prescription. Prescription of ART was defined as receiving any of the following antiretroviral drugs: nucleoside reverse transcriptase inhibitors (NRTIs), nonnucleoside reverse transcriptase inhibitors (NNRTIs), protease inhibitors (PIs), integrase strand transfer inhibitors (INSTIs) and entry inhibitors.

Definitions of measures

The presence of AIDS-defining illnesses was identified using ICD-10 codes and disease names, as follows: AIDS (B24); AIDS-related complex (B24); HIV disease resulting in mycobacterial infection (B20.0); HIV disease resulting in cytomegaloviral disease (B20.2); HIV disease resulting in other viral infections (B20.3); HIV candidiasis (B20.4); *Pneumocystis jirovecii* pneumonia (B20.6); Kaposi sarcoma (B21.0); Burkitt lymphoma (B21.1); non-Hodgkin lymphoma (B21.2); HIV encephalopathy (B22.0); HIV disease resulting in lymphoid interstitial pneumonitis (B22.1); Slim disease (B22.2); HIV disease resulting in other specified conditions (B23.8); and malignant neoplasm of the cervix uteri (C53). HIV infections among AIDS (B24) were excluded. HIV disease resulting in other conditions (B23.0, B23.1, 23.2, 23.3) were omitted.

Chronic comorbidities were defined based on ICD-10 codes and related diagnosis codes. If a specific code was recorded at least once during the study period, the patients was considered to have that chronic comorbidity. All comorbidity data during the study period were included, both prior to and after the ART was recorded, except for haemodialysis which only considered events after receiving ART. The chronic comorbidities and codes in this study include: type II diabetes (E11–14); hypertension (I10–15, except for I11/I13); lipid disorders (hypercholesterolaemia/hyperlipidaemia (E78.0–78.5); vascular diseases, including hypertensive heart and renal diseases (I11/I13), angina pectoris (I20), myocardial infarction (I21–22), stroke (I64 and related receipt diagnosis codes); chronic kidney disease (N18–19); malignancies (B21.0–21.2/C00–97); psychiatric disorders, including dementia (F01/F03), psychosis (F20–29), mania and depression (F30–32), and anxiety (F40–41); bone disorders [osteoporosis (M80–81)]; hepatitis B infection (B18.1); hepatitis C infection (B18.2); and psychoactive-substance-related disorders substance abuse (F19). Among malignancies, AIDS-defining cancers were identified according to the definition used in Ruzicka *et al*'s. study [14] as Kaposi sarcoma (B21.0/C46); Burkitt lymphoma (B21.1/C83.7); non-Hodgkin lymphoma (B21.2/C82–85, exclude C83.7), and malignant neoplasm of cervix uteri (C53). All other malignancies were defined as non-AIDS-defining cancers.

Considering potential issues with long-term polypharmacy, this study limited the definition of co-medications to those drugs that were continuous prescriptions. In defining co-medication use, we considered both the number of medications prescribed over a period of three consecutive months and cumulative prescription days. Use of co-medication was defined as: (1) the number of concomitant non-ART medications prescribed for three consecutive months during January–March 2019; and (2) concomitant use of non-ART medications prescribed for a total of 90 days or more during the study period, based on the therapeutic subgroups (second level) of the Anatomical Therapeutic Chemical (ATC) codes.

Ethics statement

This study complied with all relevant Ministry of Labour and Welfare of Japan guidelines and all research guidelines. The study protocol was approved by the Institutional Review Board (IRB) at Juntendo University School of Medicine's IRB (IRB no. 2019216). The need for informed consent was waived because the data used did not identify any individual.

Statistical analysis

Patient's age was defined as the age at the time of the latest entry registered in the database. Patients were stratified into seven age groups: < 20, 20–29, 30–39, 40–49, 50–59, 60–69, and ≥ 70 years. Demographic characteristics and prescription drugs used during the study period were summarized descriptively, using the number and percentage of patients for categorical variables. All statistical analyses were performed in R 4.0.3 environment (R Core Team, 2020) [17].

RESULTS

Population characteristics

The demographic and clinical characteristics of the patients are shown in Table 1. A total of 28 089 PLWH were included. Of these, 15 957 (56.8%) had diseases that define AIDS. Men comprised 91.9%, with the most common age

range being 40–49 years (9820, 35.0%), followed by 30–39, 50–59, 60–69, 20–29, and ≥ 70 years.

Chronic comorbidities

Between 2009 and 2019, a cumulative total of 22 881 (81.5%) patients reported chronic comorbidities, and a cumulative total of 10 020 (35.7%) patients recorded three or more chronic comorbidities. The most frequent comorbidities, as shown in Table 1, were diabetes (42.8%), lipid disorders (39.7%), psychiatric disorders (28.7%) and hypertension (24.2%). Coinfection with HCV and HBV infection were similar (14.0%).

Figure 1(a) shows the number of chronic comorbidities by age group. Although > 70% of patients aged 20–29 years had one or no chronic comorbidities, the proportions of patients with no chronic comorbidity decreased as age increased; that is, greater numbers of chronic comorbidities were found in the older age groups, with 39.1% (2462/6304) of patients aged 30–39 years, 69.7% (4052/5818) of patients aged 50–59 years, and 88.7% (1259/1419) of patients aged ≥ 70 years having two or more chronic comorbidities. Of patients aged ≥ 70 years, 53.6% (760/1419) had four or more chronic comorbidities.

Figure 1(b) shows the prevalence of different types of comorbid clinical conditions by age group. Distributions in the proportion of psychiatric disorders, HBV and HCV were similar across different age groups (from 20–29 to ≥ 70 years old). All other comorbid clinical conditions tended to be higher in the older age groups. The most common chronic comorbidities in the older age groups were diabetes, hypertension and lipid disorders. Diabetes was the most common chronic comorbidity in the age groups 50–59 years [51.4%, 95% confidence interval (CI): 50.8–52.0], 60–69 years (62.2%, 95% CI: 61.3–63.0) and ≥ 70 years (67.9%, 95% CI: 66.8–69.1).

Malignancies

Table 2 shows the proportion of different types of malignancies among the PLWH with malignancies. Among this group, some have more than one type of malignancy. Therefore, a total of 4917 malignancies was reported among 4305 PLWH with malignancies: 2432 (8.7%) AIDS-defining cancers and 2485 (8.8%) non-AIDS-defining cancers. Non-Hodgkin lymphoma was the most common type of AIDS-defining cancer (6.4%), and bronchus or lung cancers were the most common type of non-AIDS-defining cancers (1.1%).

Stratification of patient demographics, comorbidities and proportion of different types of malignancy among PLWH receiving ART by year (2009–2019) is presented in

TABLE 1 Demographic and clinical characteristics of the study population

	N = 28 089	
	n	(%)
Age group (years)		
< 20	34	(0.1%)
20–29	1748	(6.2%)
30–39	6304	(22.4%)
40–49	9820	(35.0%)
50–59	5818	(20.7%)
60–69	2946	(10.5%)
≥ 70	1419	(5.1%)
Sex		
Male	25 817	(91.9%)
Female	2272	(8.1%)
AIDS-defining illness	15 957	(56.8%)
AIDS	10 170	(36.2%)
Pneumocystis jirovecii pneumonia	3963	(14.1%)
HIV disease resulting in cytomegaloviral disease	1790	(6.4%)
HIV disease resulting in mycobacterial infection	1750	(6.2%)
HIV candidiasis	806	(2.9%)
Diabetes	12 034	(42.8%)
Hypertension	6808	(24.2%)
Lipid disorders	11 142	(39.7%)
Vascular diseases	3116	(11.1%)
Angina	1778	(6.3%)
Stroke	1541	(5.5%)
Myocardial infraction	362	(1.3%)
Hypertensive heart disease	95	(0.3%)
Chronic kidney disease	1633	(5.8%)
Haemodialysis	168	(0.6%)
Malignant diseases[a]	4305	(15.3%)
AIDS-defining cancers	2432	(8.7%)
Non-AIDS-defining cancers	2485	(8.8%)
Psychiatric disorders	8064	(28.7%)
Mania and depression	5526	(19.7%)
Anxiety	4055	(14.4%)
Psychosis	2297	(8.2%)
Dementia	163	(0.6%)
Osteoporosis	3572	(12.7%)
Hepatitis B infection	3935	(14.0%)
Hepatitis C infection	3929	(14.0%)
Other psychoactive substance related disorders	361	(1.3%)

[a]Number of people living with HIV (PLWH) with malignant disease is 4305; PLWH may have more than one type of malignancy.

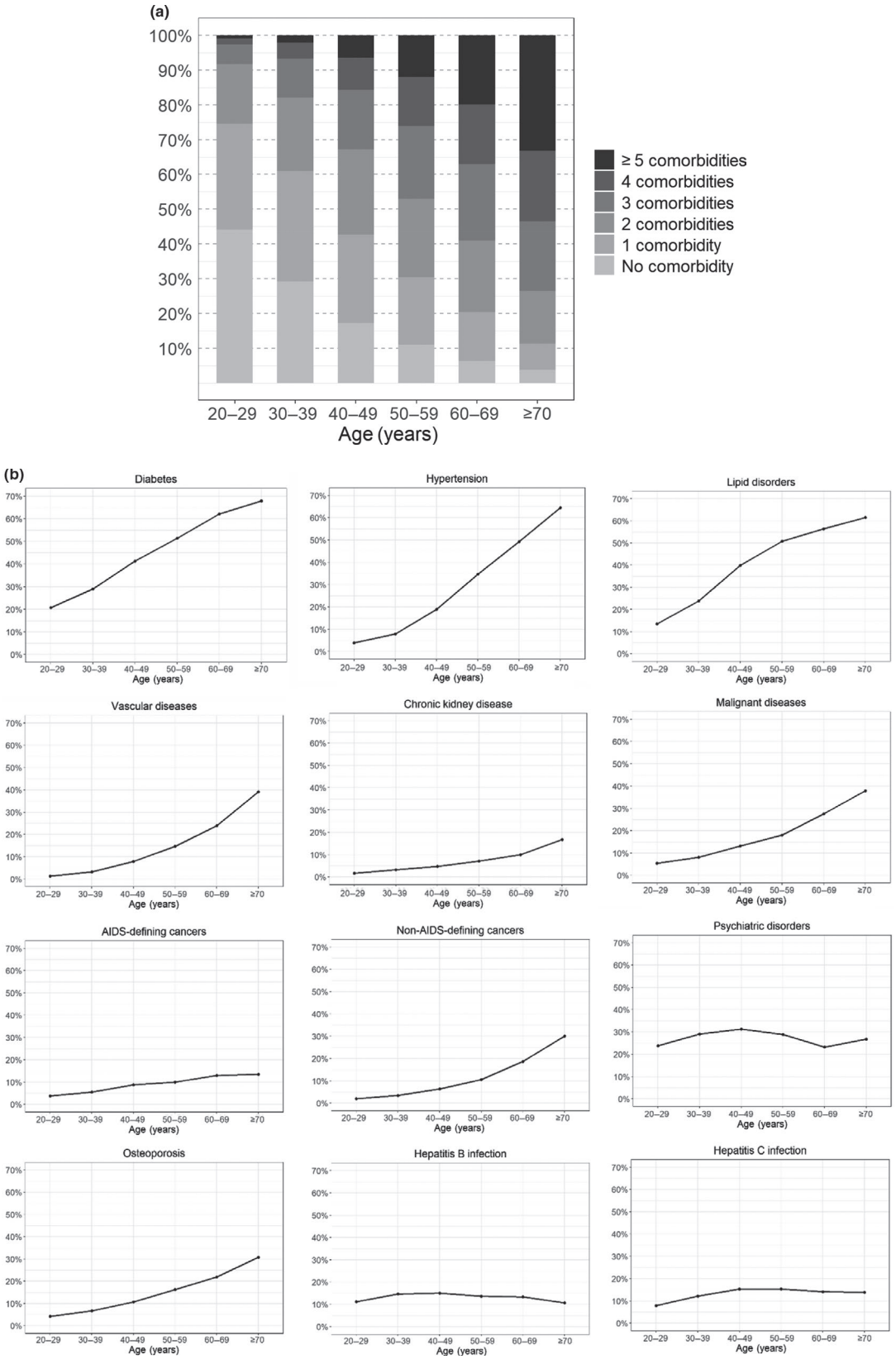

FIGURE 1 (a) Number of chronic comorbidities or infections by age group. (b) Types of chronic comorbidities or infections by age group

Tables S1 and S2. Changes in trend between 2009 and 2019 include the following: (1) an increase in the number of elderly PLWH: the proportion of patients aged ≥ 70 years with an HIV diagnosis was higher in 2019 (4.7%) than in 2009 (2.4%); (2) an increase in the presence of the comorbidities hypertension (12.3–20%) and osteoporosis

TABLE 2 Types of malignancy

Malignancy type	N = 4305 N	%[a]	%[b]
AIDS-defining cancers	2432	(49.5%)	(8.7%)
Non-Hodgkin lymphoma	1808	(36.8%)	(6.4%)
Kaposi sarcoma	701	(14.3%)	(2.5%)
Burkitt lymphoma	116	(2.4%)	(0.4%)
Cervix uteri	66	(1.3%)	(0.2%)
Non-AIDS-defining cancers	2485	(50.5%)	(8.8%)
Bronchus and lung	303	(6.2%)	(1.1%)
Liver and intrahepatic bile ducts	277	(5.6%)	(1.0%)
Stomach	228	(4.6%)	(0.8%)
Malignant neoplasm, without specification of site	183	(3.7%)	(0.7%)
Secondary malignant neoplasm of bone and bone marrow	140	(2.8%)	(0.5%)
Secondary malignant neoplasm of brain and cerebral meninges	100	(2.0%)	(0.4%)
Multiple myeloma	98	(2.0%)	(0.3%)
Rectosigmoid junction and rectum	94	(1.9%)	(0.3%)
Secondary malignant neoplasm of lung	86	(1.7%)	(0.3%)
Sigmoid colon	52	(1.1%)	(0.2%)
Oesophagus	47	(1.0%)	(0.2%)
Breast	44	(0.9%)	(0.2%)
Acute myeloblastic leukaemia (AML)	39	(0.8%)	(0.1%)
Skin of trunk	28	(0.6%)	(0.1%)

Note: $N = 4305$ people living with HIV (PLWH) with malignancy; PLWH may have more than one type of malignancy.

[a]% among 4917 malignancies.

[b]% among 28 089 total PLWH cohort.

(2.7–9.3%); (3) a continually decreasing trend in the number of patients with AIDS-defining cancers, from 6.3% to 4.8%, between 2009 and 2019; (4) a decrease in the proportion of PLWH with HCV infection, from 12% to 8.4%, but no change in the proportion of HBV infection between 2009 and 2019 – this is probably due to the effectiveness of new medication for HCV, and low acceptance of HBV vaccine in Japan.

Co-medications

Depending on the definition of the included period, the most common non-ART medications differ. Table 3 shows that the common co-medications during the most recent 3-month period (between January and March 2019) were lipid-regulating/anti-atheroma preparations (11.3%), antacids, antiflatulents and anti-ulcerants (9.6%) and agents acting on the renin–angiotensin system (8.1%). Table S3 shows the common non-ART medications used during the 10-year study period. The three most common therapeutic categories were antacids, antiflatulents and antiulcerants (35.0%); systemic antihistamines (33.7%); and psycholeptics (27.1%).

TABLE 3 The most common non-antiretroviral therapy (ART) medications used in a period of three consecutive months between January and March 2019

	N = 21 865 n	(%)
Lipid-regulating/anti-atheroma preparations	2475	(11.3%)
Antacids, antiflatulents and anti-ulcerants	2091	(9.6%)
Agents acting on the renin–angiotensin system	1768	(8.1%)
Psycholeptics	1651	(7.6%)
Systemic antimicrobials	1611	(7.4%)
Vitamins	775	(3.5%)
Antidiarrheals, oral electrolyte replacers and intestinal anti-inflammatories	614	(2.8%)
Systemic antibacterial	451	(2.1%)
Anti-inflammatory and anti-rheumatic products	385	(1.8%)
Cough and cold preparations	172	(0.8%)

Figure 2 shows the number of non-ART co-medications prescribed concomitantly for three consecutive months during January to March 2019. It was also observed that more patients in the older age groups used greater numbers of non-ART co-medications. The proportions of patients using three or more non-ART co-medications were $< 5\%$ for those aged < 50 years, 7.3% for those aged 50–59 years, 10.8% for those aged 60–69 years, and 15.7% for those aged ≥ 70.

Figure S1 shows the number of non-ART co-medications prescribed concomitantly for ≥ 90 cumulative days during the study period, by age group. Among 28 089 PLWH, 21 442 (76.3%) used at least one co-medication and 3749 (13.4%) used five or more non-ART co-medications. The proportions of patients who used at least one co-medication were 49.5% (866/1748) for those aged 20–29 years, 78.1% (7666/9820) for those aged 40–49 years, and 90.9% (1290/1419) for those aged ≥ 70 years. More patients in the older age groups used greater numbers of co-medications, and the proportions of patients using

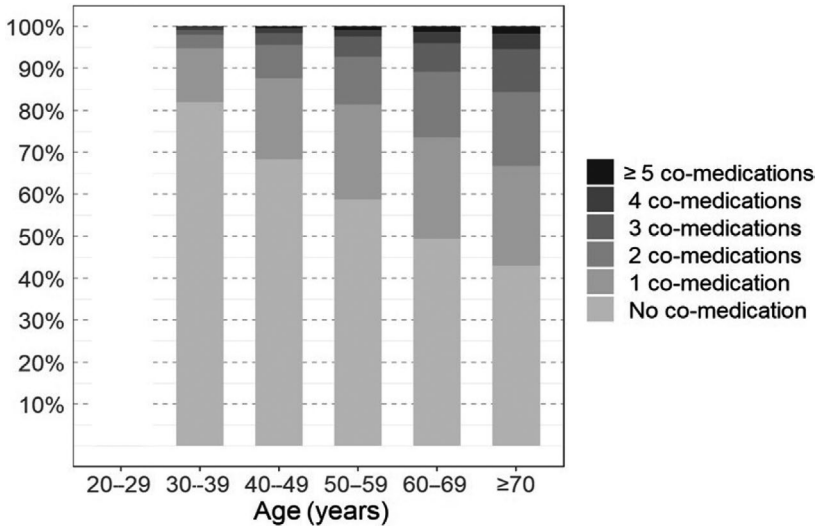

FIGURE 2 Number of non-antiretroviral therapy (ART) co-medications by age group. Co-medication was defined as the number of non-antiretroviral medications prescribed concomitantly for three consecutive months during January–March 2019. Note that the bar graph for the age group 20–29 years is not shown, in order to ensure patient privacy (in accordance with the regulations of the Japan Ministry of Health, Labour and Welfare, counts are not to be disclosed)

four or more co-medications by age group were: 12.8% (808/6304) for those aged 30–39 years, 29.9% (1737/5818) for those aged 50–59 years, and 40.3% (572/1419) for those aged ≥ 70 years. Antacids, antiflatulents and antiulcerants were the most common co-medications in most age groups, especially in those who were aged 70 or older (61.2%; 868/1419). Systemic antihistamines, psycholeptics and systemic antimicrobials was used mostly commonly among the age groups 40–49 (37.8%), ≥ 70 (31.6%) and 50–59 years (28.2%). Lipid-regulating agents were used more commonly in the older age groups, being used in 30.0–40.3% of patients aged ≥ 50 years.

DISCUSSION

The main findings of this study, comprising a Japanese cohort of 28 089 PLWH (male 91.9%) taking ART from 2009 to 2019, are as follows: the cumulative burden of vascular disease and AIDS-defining cancers increased with age, with the incidence of AIDS-defining cancers being 6.4% for non-Hodgkin lymphoma and 1.1% for bronchus or lung cancer. At the end of 2019, the total number of patients in Japan with HIV infection reported under the Infectious Diseases Control Law and people diagnosed with AIDS at the time of their initial report was 31 385 (male 95.1%). This is the first report of comorbidities and co-medications in a nationwide Japanese cohort.

Similar changes in the spectrum of the burden of chronic comorbidities were observed in PLWH, as in our previous study of fewer subjects, with chronic comorbidities common in HIV populations, and the cumulative burden of vascular disease and non-AIDS-defining cancer increasing with age. Recent population-based cohort studies in different countries have also reported greater numbers of comorbidities in older PLWH [18-20]. A study in Canada (2021) found an excess burden of age-associated comorbidities in PLWH, with a higher prevalence of comorbidities and earlier ages at diagnosis compared with HIV-negative individuals [18]. In France (2020), non-HIV-related comorbidities were more common among PLWH than among matched non-HIV controls [19]. In the BESIDE study in Germany (2020) [20], the prevalence of comorbidities and use of co-medications remained consistently high, increasing across age groups and highlighting the complexity of treating older PLWH. In Switzerland and the US, older PLWH, when compared with younger patients, were more likely to have diabetes mellitus, cardiovascular diseases, non-AIDS-defining malignancies, osteoporosis, liver diseases and chronic kidney disease [2,3,21].

The cumulative incidence of the AIDS-defining cancer Kaposi sarcoma in a North American cohort study (2015) was 4.1%, and that of non-Hodgkin lymphoma was 4.0% by age 75 years [22]. The prevalence was much lower than that reported in a previous Japanese study of autopsied PLWH who had received ART from 1985 to 2012, being 37.9% and 15.2% for non-Hodgkin lymphoma and Kaposi sarcoma, respectively [23]. This discrepancy is probably attributed to the different study populations, particularly the fact that autopsied patients are usually examined in more detail because of greater acuity than in the PLWH study population. In addition, this study population represents PLWH in the current ART era, which is noted for

improved immune function. It is possible that the incidence of non-Hodgkin lymphoma and Kaposi sarcoma in PLWH has decreased due to effective ART [24].

In the present study, non-AIDS-defining cancers accounted for 50.5% of all malignancies, with approximately 30% of non-AIDS-defining cancers observed in patients aged ≥ 70 years compared with < 10% in patients aged < 40 years, confirming the previous finding by Ruzicka et al. [14,15] that non-AIDS-defining cancers were more frequent in PLWH aged ≥ 60 years. Increases in non-AIDS-defining cancers among the HIV population appear to be a consequence of ageing in the AIDS population [24]. Given these previous findings, the present results highlight the importance of non-AIDS-defining cancers among elderly PLWH as a result of their extended life spans.

A 2013 study by Holtzman et al. [25] reported that 32% of patients aged < 50 years and 54% of patients aged ≥ 50 years used five or more co-medications. In another study, 47.6% of PLWH aged ≥ 70 years used five or more co-medications [14]. The proportions on co-medications were smaller in the present study. Although the result of co-medication in PLWH in the present study showed that younger PLWH used fewer co-medications than older PLWH, the use of co-medications was common across all age groups. These results further support the view that the treatment strategies for HIV and comorbidities in PLWH could be complicated by drug–drug interactions [20,26].

Limitations of this study

The present study has several limitations. Cross-sectional design cannot infer causality, which limited the ability to draw a conclusion about a causal relationship. A more rigorous longitudinally designed study is needed to show causality between HIV infection and comorbidities and/or co-medications. Patients without records of ART were excluded, even though a certain proportion of PLWH do not receive ART. Homelessness is not a disease classification in Japan, and thus the prevalence of HIV in homeless people, and the effect of lack of housing on delays to HIV care or treatment were not examined in this study. Potential relationships between chronic comorbidities and CD4 count, HIV-RNA or ART duration could not be analysed due to a lack of sufficient detailed data regarding HIV infection status. Stigma against women and bisexual men in Japan may possibly lead to some under-reporting, but the proportion is likely to be minor as, according to a report by Iwamoto et al. [27], 85.6% of the PLWH population in Japan has been diagnosed with HIV.

Despite these limitations, the critical strength of this study is that it is a cohort study using a national database that stores electronic claims for > 99.9% of hospitals in Japan. The NDBis a database in which Japanese insurance claims data and specific health check-up data are stored. It has been managed since 2009 by the Ministry of Health, Labour and Welfare, and has been widely used for public research since 2011. The NDB claims data include essentially every insured citizen in Japan. Japan's universal healthcare coverage system consists of national health insurance for most employees, the self-employed and unemployed individuals and a medical care system for the elderly in the latter stage of life, including individuals aged 75 and older and those aged 65 and older with certified disabilities. The NDB stores data for 99.9% of hospitals in Japan and is one of the largest databases in the world, recording more than 1.6 billion electronic claims annually. The database includes hospital identification codes, hospital types and comprehensive patient data, including admission and discharge status, diagnoses, drugs and procedures used. A recent review of studies using the database shows extensive study across various disease entities [28,29]. Therefore, we are confident that the present study provides a comprehensive sample of PLWH nationwide in Japan.

CONCLUSIONS

Analysis of data from 28 089 PLWH receiving ART in Japan showed that the cumulative burden of chronic comorbidities and non-AIDS-defining cancers increased with age and that co-medication was more common among older patients. These findings suggest that special treatment and attention by physicians are needed to support the development of optimal healthcare strategies for different age groups, particularly the increasing population of older individuals. Further, non-AIDS-defining cancers are more common than AIDS-defining cancers, especially among older PLWH. A thoughtful review of the strategies used for screening cancers in older PLWH would probably demonstrate benefits to patient populations.

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CONFLICTS OF INTEREST

No conflict of interest declared.

AUTHOR CONTRIBUTIONS

TN, KF and SF contributed to the study design. MY, NF and ST contributed to the analysis and interpretation of the data. TN, MS, KG-H and RK critically revised the draft manuscript and approved the final version of the manuscript.

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SUPPORTING INFORMATION

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