J Infect Chemother 25 (2019) 89–95

Contents lists available at ScienceDirect

Journal of Infection and Chemotherapy

journal homepage: http://www.elsevier.com/locate/jic

Original Article

Greater burden of chronic comorbidities and co-medications among people living with HIV versus people without HIV in Japan: A hospital claims database study☆

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ARTICLE INFO

Article history:
Received 11 June 2018
Received in revised form
11 September 2018
Accepted 10 October 2018
Available online 3 November 2018

Keywords:
HIV
Comorbidity
Co-medication
Antiretroviral therapy
Japan

ABSTRACT

Objective: This study examined the prevalence of chronic comorbidities and the use of co-medications among people living with HIV (PLWH) on antiretrovirals in Japan, compared with age-matched controls without HIV.

Methods: This was an observational, retrospective, cross-sectional study using a hospital claims database of Japanese hospitals with advanced medical capabilities (i.e., advanced treatment hospitals, general hospitals, acute care hospitals). We extracted data for PLWH aged ≥18 years with a prescription record of antiretrovirals between January 2010 and December 2015, and for age-, sex-, and hospital-matched people without HIV. For each group, chronic comorbidities (diabetes, hypertension, lipid disorders, vascular diseases, chronic kidney failure, cancers, psychiatric disorders, osteoporosis, and hepatitis B/C co-infection), and co-medications were examined by age group.

Results: We analyzed data for 1445 PLWH and 14,450 people without HIV. The proportion of patients with multiple comorbidities was much greater among PLWH than controls of the same age group. Lipid disorders and diabetes were more prevalent in PLWH than controls (31.6% vs. 10.3% and 26.8% vs. 13.2%, respectively), both of which were more common in PLWH at earlier ages. Cancer was present in 8.1% of PLWH and 8.9% of controls. A greater proportion of PLWH used multiple co-medications other than antiretrovirals at earlier ages than controls.

Conclusion: PLWH taking antiretrovirals in Japan had a greater burden of comorbidities and co-medications with increasing age than people without HIV. In addition to appropriate management of comorbidities, medication reconciliation according to patients' co-medication profiles is important for successful management of this patient population.

1. Introduction

The population with HIV infection is now aging, possibly owing to an increase in later-life acquisition of HIV, late diagnosis, and improved survival [1]. Antiretroviral therapy (ART) has dramatically increased the survival of people living with HIV (PLWH) and has prolonged life expectancy [2,3]. The life expectancy at age 20 years of PLWH has increased, from 19.1 years in 1996–1997 to 53.1 years in 2011, approaching the expectancy for people without HIV, with ART initiation at higher CD4 count further narrowing the gap between people with and those without HIV [4].

Prolonged lifespan, owing to successful ART, poses the new challenge of managing age-associated chronic comorbidities among PLWH. The proportion of older people (age ≥50 years) with at least one chronic condition in addition to HIV exceeded 50% in a French study [5], and even reached 94% among PLWH aged ≥50 years in a study in the United States [6]. In particular, cardiovascular

Abbreviations: ART, antiretroviral therapy; PLWH, people living with HIV; ICD-10, International Statistical Classification of Diseases and Related Health Problems, 10th Revision.

☆ Authorship statement: All authors meet the ICMJE authorship criteria.

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https://doi.org/10.1016/j.jiac.2018.10.006

disease, diabetes, renal disease [5,7], hypertension, and hypercholesterolemia [7] have been reported to be common among PLWH. By affecting mortality in this population [5,8–10], such age-associated non-AIDS-related comorbidities hold great importance in the treatment of PLWH in the ART era.

Chronic comorbidities raise another concern, namely, that of polypharmacy. ART itself generally requires at least three medications, and the addition of medications for comorbidities among people on ART leads to polypharmacy. Polypharmacy increases the likelihood of drug–drug interactions [11] and even compromises adherence [12], which is critical in lifelong ART. Changes in pharmacokinetics and pharmacodynamics as a person ages [13,14] add complexity and importance to the pharmacological management particularly of older PLWH.

We previously examined chronic comorbidities and use of co-medications in PLWH who were taking antiretrovirals in Japan, using a large-scale hospital claims database [15]. In that study, we found that older PLWH on antiretrovirals had more chronic comorbidities and used more co-medications, suggesting the difficulty of appropriate management for this patient population. Still, without comparison with a Japanese population without HIV, we were unable to clarify whether our results only reflected consequences of the normal aging process or those of HIV infection coupled with aging. The objective of this study was to further characterize the population of PLWH on antiretrovirals and to generate a hypothesis by assessing whether PLWH on antiretrovirals in Japan indeed have a larger burden of chronic comorbidity and co-medication than people without HIV. Thus, we examined the prevalence of the chronic comorbidities of interest and use of co-medications among PLWH taking antiretrovirals in Japan, compared with an age-matched control group of people without HIV (not a general population), by describing these medical profiles of each group using the same database as in our previous study.

2. Materials and methods

2.1. Study design and data source

This observational, retrospective, cross-sectional database study examined the numbers and types of chronic comorbidities and co-medications in people living with and those without HIV in Japan. Data were extracted from a hospital claims database compiled by Medical Data Vision Co., Ltd. The database contains information of over 17 million patients in 288 acute care hospitals in Japan, accounting for approximately 17% of all Japanese acute care hospitals that use the diagnosis procedure combination/per-diem payment system (as of January 2017), a hospital payment system uniquely developed in Japan. Note that these hospitals referred to as “acute care hospitals” here do not exclusively include acute care-only hospitals. In Japan, the term is used to describe hospitals that have advanced medical capability (i.e., advanced treatment hospitals, general hospitals, and acute care hospitals). Thus, the database used includes hospitals that provide both acute and chronic care (excluding nursing homes or hospices). The database contains information on age, sex, department visited, date of medical service, diagnosis codes, hospitalization, medical procedures, and prescriptions.

2.2. Study population

This study used the same population of PLWH on antiretrovirals as in our previous study [15]. Patients were aged ≥18 years with a diagnosis record of HIV, according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) codes B20–24: HIV disease resulting in infectious and parasitic diseases (B20), malignant neoplasms (B21), other specified diseases (B22), other conditions (B23), and unspecified HIV disease (B24); in addition, patients had a prescription record of ART between January 2010 and December 2015, which was the study period. ART included nucleoside reverse transcriptase inhibitors, non-nucleoside reverse transcriptase inhibitors, protease inhibitors, integrase strand transfer inhibitors, and entry inhibitors.

Each patient with HIV was matched with 10 patients who had no record of HIV infection (ICD-10 codes B20–24), based on age at the time of their last visit (age groups: 18–29, 30–39, 40–49, 50–59, 60–69, and ≥70 years), sex, and hospital within the same database. Age, sex, and hospital were considered as potential confounders influencing chronic comorbidity development and co-medication prescription. Thus, age, sex, and hospital were included in matching factors to select the control group, to minimize the differences in these potential confounders between the two groups. Please note that people without HIV (control group) in this study do not represent a healthy or general population because these were patients from the same hospital claims database and therefore were also hospitalized or outpatients seeking medical treatment.

2.3. Definitions

We extracted the following data: demographic characteristics (age and sex), diagnoses of chronic comorbidities of interest, and prescriptions of ART and co-medications. The chronic comorbidities investigated included diabetes, hypertension, lipid disorders, vascular diseases, chronic kidney failure, cancers, psychiatric disorders, osteoporosis, and hepatitis B/C co-infection. Considering that the conditions and diseases defining these comorbidities can only be treated with continuous medications and are unlikely to be cured rapidly, patients were considered to have a particular comorbidity if the corresponding ICD-10 code(s) (Table 1) were recorded at least once during the study period, regardless of whether they were recorded before or after the HIV diagnosis.

Cancers were classified as AIDS-defining and non-AIDS-defining cancers. AIDS-defining cancers included Burkitt lymphoma (B21.1/C83.7), Kaposi sarcoma (B21.0/C46), non-Hodgkin lymphoma

Table 1
Chronic comorbidities.

Category	Included pathologies	ICD-10 codes
Diabetes	Diabetes type II	E11–14
Hypertension	–	I10, I12, I14–15
Lipid disorders	Hypercholesterolemia, hyperlipidemia	E78.0–78.5
Vascular diseases	Myocardial infarction	I22
	Stroke	I64
	Angina pectoris	I20
	Hypertensive heart and renal diseases	I11, I13
Chronic kidney failure	–	N18–19
Cancers	Any malignancy	B21.0–21.2, C00–97
Psychiatric disorders	Mania and depression	F30–32
	Anxiety	F40–41
	Psychosis	F20–29
	Dementia	F01, F03
	Insomnia	F51
Osteoporosis	–	M80–81
Hepatitis B/C co-infection	Chronic hepatitis B/C	B18

Abbreviation: ICD-10, International Statistical Classification of Diseases and Related Health Problems, 10th Revision.

(B21.2/C82–85 except for C83.7/C91.5), and cancer of the cervix uteri (C53). All other cancers were defined as non-AIDS-defining cancers.

Co-medications were defined as non-ART drugs prescribed for a total ≥30 days during the study period, based on the therapeutic subgroups (2nd level) of the Anatomical Therapeutic Chemical codes.

2.4. Ethics statement

The requirement for informed consent was waived because this was an observational study using de-identified claims data, and the Japanese Ethical Guidelines for Medical and Health Research Involving Human Subjects do not apply to a study exclusively using de-identified data.

2.5. Statistical analysis

All the data were summarized descriptively for each group. For the difference in proportions between the two groups, the 95% confidence interval (CI) was calculated using the Newcombe score method. All statistical analyses were performed using SAS release 9.4 (SAS Institute Inc., Cary, NC, USA).

Table 2
Characteristics of people living with and those without HIV.

	PLWH (n = 1445)		People without HIV (n = 14,450)	
	n	(%)	n	(%)
Male	1306	(90.4)	13,060	(90.4)
Age (years), mean (SD)	47.0	(12.7)	47.3	(13.7)
Age category (years)				
18–29	100	(6.9)	1000	(6.9)
30–39	309	(21.4)	3090	(21.4)
40–49	510	(35.3)	5100	(35.3)
50–59	256	(17.7)	2560	(17.7)
60–69	188	(13.0)	1880	(13.0)
≥70	82	(5.7)	820	(5.7)
Key drug class in ART				
INSTI	789	(54.8)	–	
NNRTI	359	(24.9)	–	
PI	617	(42.8)	–	

Abbreviations: PLWH, people living with HIV; SD, standard deviation; ART, antiretroviral therapy; INSTI, integrase strand transfer inhibitor; NNRTI, non-nucleoside reverse transcriptase inhibitor; PI, protease inhibitor.

3. Results

3.1. Patient characteristics

A total of 1445 PLWH who had antiretroviral prescriptions and 14,450 people without HIV were included in the analysis (Table 2). In both groups, the mean age was 47 years and 90.4% were male.

3.2. Chronic comorbidities

More PLWH on antiretrovirals had at least one chronic comorbidity compared with people without HIV (67.3% vs. 34.9%). Older patients had a greater number of chronic comorbidities in both groups, but the proportion of patients with multiple chronic comorbidities was substantially greater in PLWH than in controls of the same age group (Fig. 1). The proportions of patients with two or more comorbidities among PLWH aged 30–39 years (21.0%) and 40–49 years (32.5%) were comparable to control patients aged 50–59 years (22.5%) and 60–69 years (31.5%), respectively.

Several types of chronic comorbidities were substantially more prevalent in PLWH on antiretrovirals than controls, particularly lipid disorders (31.6% vs. 10.3%), hepatitis B/C co-infection (18.2% vs. 2.5%), diabetes (26.8% vs. 13.2%), and psychiatric disorders (15.2% vs. 6.5%) (Fig. 2). The prevalence of cancers was similar between the two groups (8.1% in PLWH and 8.9% in people without HIV).

Table 3 summarizes the proportions of patients with different types of cancer in each group. Among PLWH on antiretrovirals, 5.5% had AIDS-defining cancers. Non-AIDS-defining cancers were present in 3.6% of PLWH on antiretrovirals and 8.2% of non-HIV controls. The most common types of cancer in PLWH were non-Hodgkin lymphoma (4.2%), followed by Kaposi sarcoma (1.1%), and bronchus or lung cancers (0.6%); among people without HIV, the most common were stomach cancers (1.2%), bronchus or lung cancers (1.0%), and non-Hodgkin lymphoma (0.7%). The proportions of cancer types were also summarized using the number of patients with any cancer in each group as a denominator. Of 117 PLWH with cancer on antiretrovirals, 68.4% had AIDS-defining cancers and 44.4% had non-AIDS-defining cancers (Supplementary Table 1).

Evaluated by age, the prevalence of diabetes, hypertension, lipid disorders, and osteoporosis was much greater among PLWH on antiretrovirals than controls, particularly in older age groups (Fig. 3). This gap was notable for diabetes and lipid disorders; the proportion of diabetes among PLWH aged 30–39 and 40–49 years (17.2% and 24.9%, respectively) corresponded to that among control

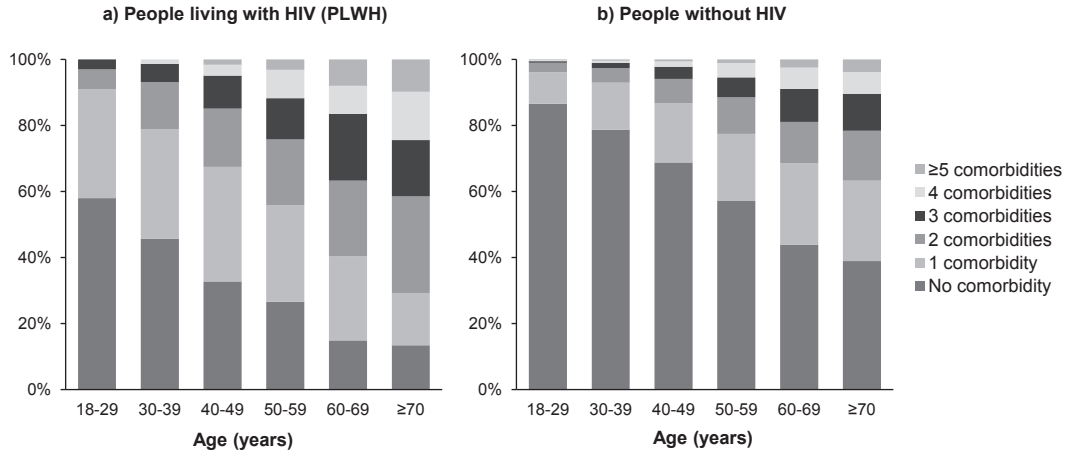

Fig. 1. Proportion of patients with different number of chronic comorbidities, by age group.

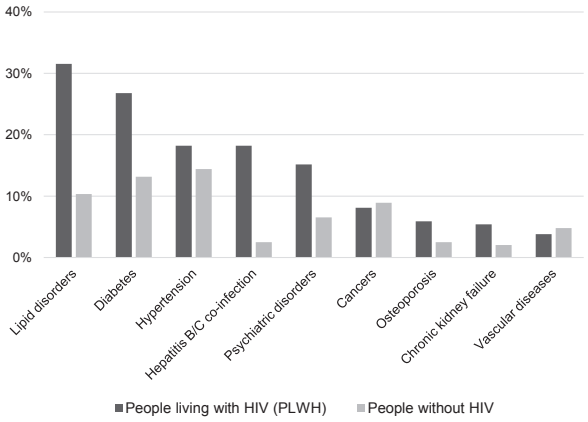

Fig. 2. Prevalence of each type of chronic comorbidity among people living with and those without HIV.

patients aged 50–59 and 60–69 years (17.2% and 24.9%, respectively). The proportion of lipid disorders among PLWH in the age groups 18–29 and 30–39 years (13.0% and 20.1%, respectively) was similar to that among control patients in the age groups 50–59 and 60–69 years (14.6% and 18.6%, respectively). The proportions of psychiatric disorders and hepatitis B/C co-infection were also larger among PLWH, but both shifted in parallel with their non-HIV counterparts across all age groups.

3.3. Co-medications

More PLWH on antiretrovirals than people without HIV used two or more co-medications, other than ART (59.4% vs. 24.2%). The proportions of patients using three or more co-medications among PLWH aged 18–29 years (28.0%) and 30–39 years (28.8%) were similar to those among control patients aged 60–69 years (28.5%) and ≥70 years (28.2%), as shown in Fig. 4.

Table 4 summarizes the 10 most common co-medications among PLWH on antiretrovirals and the corresponding proportions among controls. Antacids, antiflatulents, and antiulcerants were most commonly prescribed in both groups (31.7% in PLWH and 15.1% in people without HIV). The gap between PLWH and non-HIV controls was largest for systemic antibacterial drugs (22.2% vs. 2.6%).

4. Discussion

This is the first real-world evidence study that used cross-sectional study design and a large healthcare database in Japan to elucidate the chronic comorbidity and medication profiles of PLWH on antiretrovirals compared with age-matched controls. The results demonstrated that chronic comorbidities and co-medications were more prevalent and started earlier in PLWH on antiretrovirals than in people without HIV. HIV is recognized as a chronic disease, and its treatment requires integrated management of HIV infection and chronic comorbidities rather than mere antiretroviral management [16]. Our study delineating comorbidities and medication profiles of a population with HIV on antiretrovirals in Japan is important to support medical professionals who treat this population in establishing optimal management strategies.

In this study, PLWH on antiretrovirals experienced a greater comorbidity burden than controls, which is consistent with previous studies in terms of total number of comorbidities as well as specific types of comorbidity (e.g., lipid disorders, diabetes, hypertension, and chronic kidney failure). In prior research, PLWH were reported to have more age-associated comorbidities than people without HIV [17–19], particularly noninfectious ones (e.g., cardiovascular disease, hypertension, bone fractures, kidney failure, and diabetes mellitus) [17,18]. HIV-associated immune activation and chronic inflammation; ART, particularly protease inhibitors [20,21]; as well as conventional risk factors (e.g., obesity and smoking) [21] induce metabolic dysfunction and may result in the comorbidities most commonly reported in PLWH (lipid disorders,

Table 3
Proportions of patients with different types of cancer among people living with and those without HIV.

	PLWH (n = 1445)		People without HIV (n = 14,450)		Differences in %	
	n	(%)	n	(%)	%	(95% CI)
AIDS-defining cancers	80	(5.5)	118	(0.8)	4.7	(3.6, 6.0)
Non-Hodgkin lymphoma	61	(4.2)	100	(0.7)	3.5	(2.6, 4.7)
Kaposi sarcoma	16	(1.1)	0	(0.0)	1.1	(0.7, 1.8)
Burkitt lymphoma	5	(0.3)	0	(0.0)	0.3	(0.1, 0.8)
Cervix uteri	2	(0.1)	18	(0.1)	0.0	(−0.1, 0.4)
Non-AIDS-defining cancers[a]	52	(3.6)	1189	(8.2)	−4.6	(−5.6, −3.5)
Bronchus or lung	8	(0.6)	147	(1.0)	−0.5	(−0.8, 0.1)
Secondary malignant neoplasm of bone and bone marrow	6	(0.4)	50	(0.3)	0.1	(−0.2, 0.6)
Colon	3	(0.2)	58	(0.4)	−0.2	(−0.4, 0.2)
Breast	3	(0.2)	54	(0.4)	−0.2	(−0.3, 0.2)
Malignant neoplasm, without specification of site	3	(0.2)	39	(0.3)	−0.1	(−0.2, 0.3)
Secondary malignant neoplasm of brain and cerebral meninges	3	(0.2)	28	(0.2)	0.0	(−0.1, 0.4)
Acute myeloblastic leukemia (AML)	3	(0.2)	26	(0.2)	0.0	(−0.1, 0.4)
Multiple myeloma	3	(0.2)	18	(0.1)	0.1	(−0.1, 0.5)
Stomach	2	(0.1)	170	(1.2)	−1.0	(−1.3, −0.6)
Secondary malignant neoplasm of lung	2	(0.1)	61	(0.4)	−0.3	(−0.4, 0.1)
Liver cell carcinoma	2	(0.1)	58	(0.4)	−0.3	(−0.4, 0.1)
Sigmoid colon	2	(0.1)	37	(0.3)	−0.1	(−0.3, 0.3)
Thoracic part of esophagus	2	(0.1)	33	(0.2)	−0.1	(−0.2, 0.3)
Skin of trunk	2	(0.1)	0	(0.0)	0.1	(0.0, 0.5)

PLWH: people living with HIV.
Percentages are calculated using the number of patients of each group as a denominator.
The total may not be equal to 100% for multiple records.
[a] Types of non-AIDS-defining cancers present in more than one person living with HIV are listed.

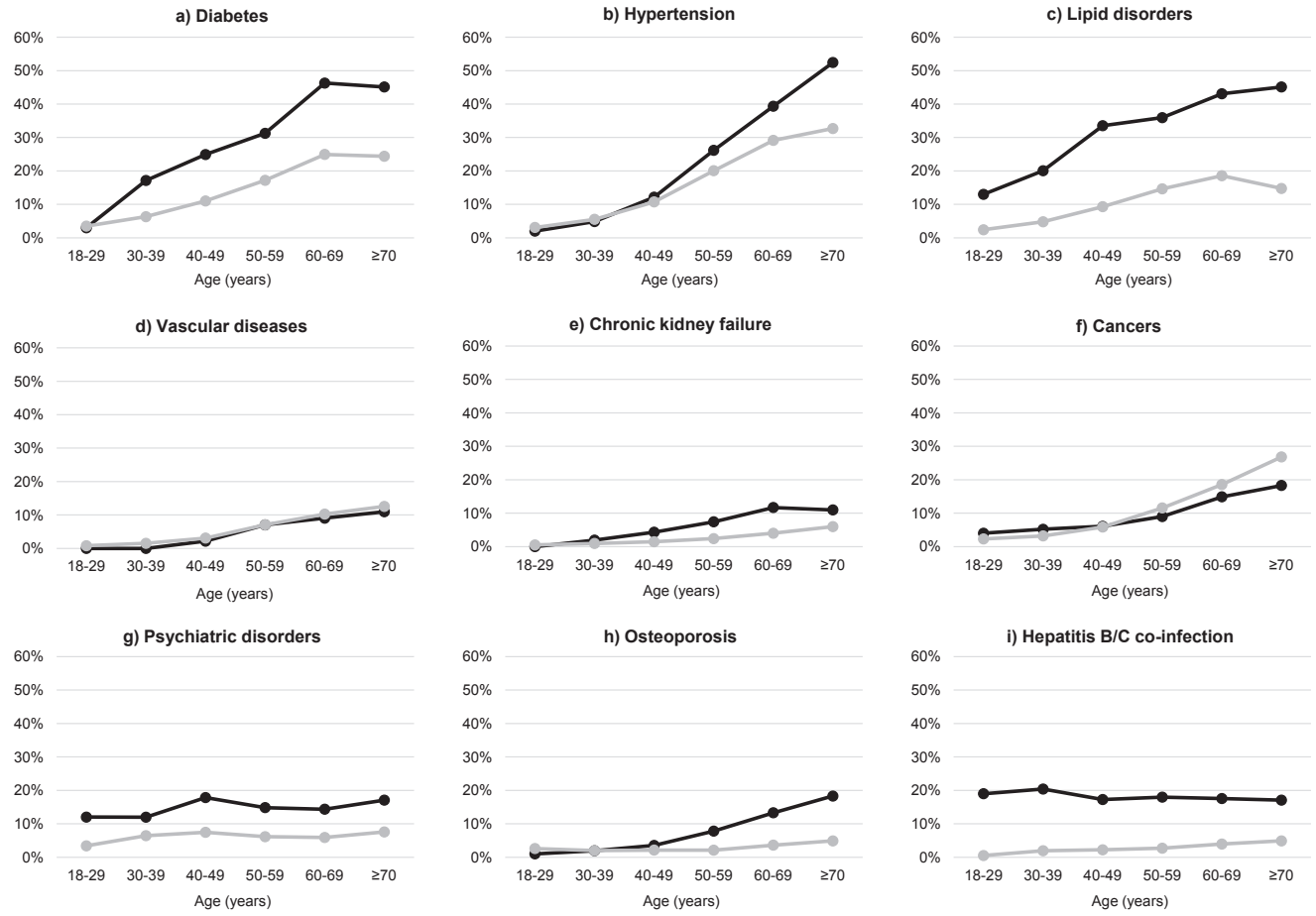

Fig. 3. Prevalence of each type of chronic comorbidity by age among people living with and those without HIV. Note: Black line indicates people living with HIV (PLWH); light gray line indicates people without HIV.

diabetes, and hypertension). Associated with these comorbidities, cardiovascular diseases were expected to be more prevalent among PLWH than controls in this study; however, the prevalence was similar between the two groups (3.8% in PLWH and 4.8% in controls). Vascular diseases being defined by relatively severe conditions (e.g., myocardial infarction and stroke) in this study may be partly responsible for the relatively low prevalence in both groups. A broader definition of vascular diseases might lead to a different result in the prevalence between the two groups.

The prevalence of cancer was similar between PLWH on antiretrovirals (8.1%, n = 117) and people without HIV (8.9%, n = 1286). As demonstrated in a previous study [22], AIDS-defining cancers remain a particular concern for PLWH, accounting for about 70% of PLWH with cancer but only <10% of their non-HIV counterparts. Various authors have demonstrated that even some non-AIDS-defining cancers, such as Hodgkin's lymphoma and anal, liver, and lung cancers are more prevalent in PLWH than in the general population [22,23]. These reports suggest that these non-AIDS-related cancers be attributed to traditional lifestyle cancer risk factors such as smoking, which are more commonly observed in PLWH than in people without HIV [24]. Another possible explanation is that an immune system compromised by HIV infection may predispose patients to oncogenic viral infection [25]. In this study, however, stomach cancers were present in 1.2% (n = 170) of people without HIV and only in 0.1% (n = 2) of PLWH; similar trends were also observed for bronchus or lung cancers (1.0% vs. 0.6%, respectively) and liver cell carcinoma (0.4% vs. 0.1%, respectively). These results are inconsistent with trends suggested in previous studies [22,23], which might be caused by the small number of PLWH who had cancer (n = 117) and possible selection bias owing to use of claims database of hospitals with advanced medical capabilities to select the controls in our study. Comparing the prevalent cancer types among people without HIV in this study (e.g., stomach, bronchus or lung, and non-Hodgkin lymphoma) with those among the general population in Japan (e.g., prostate, stomach, and lung cancers) [26] may support our inference that our control group might be somewhat biased. Therefore, the overall trends of cancer between people with and without HIV in Japan (e.g., the overall prevalence of cancer and common cancer types) might not be fully depicted in our study and should be further investigated in future studies.

We compared the results of an HIV cohort from our previous study with those of age-matched controls and found that PLWH on antiretrovirals tended to have ≥2 comorbidities, diabetes, and lipid disorders at an age 20–30 years younger than controls. The results imply that PLWH have a greater comorbidity burden at earlier ages than people without HIV, which seems to corroborate the hypothesis of premature aging among PLWH [17,18]. One possible theory discussed in other studies is that persistent inflammatory and immune changes induced by HIV infection may underlie premature aging by accelerating the normal aging process [27–29]. The exact mechanisms of premature aging in PLWH have yet to be clarified in future studies that comprehensively evaluate the multifaceted aging process [30] and diverse risk factors in people

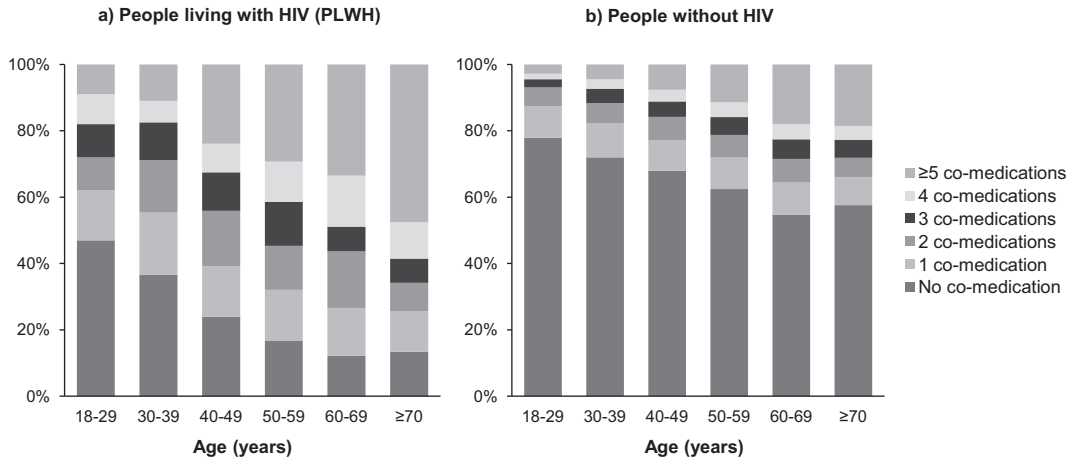

Fig. 4. Proportion of patients with different number of co-medications, by age group.

Table 4
Ten most common co-medications among people living with HIV.

	PLWH (n = 1445)		People without HIV (n = 14,450)		Differences in %	
	n	(%)	n	(%)	%	(95% CI)
Antacids, antiflatulents and anti-ulcerants	458	(31.7)	2175	(15.1)	16.6	(14.2, 19.2)
Systemic antibacterials	321	(22.2)	381	(2.6)	19.6	(17.5, 21.8)
Psycholeptics	318	(22.0)	942	(6.5)	15.5	(13.4, 17.7)
Systemic antihistamines	268	(18.5)	502	(3.5)	15.1	(13.1, 17.2)
Lipid-regulating/anti-atheroma preparations	249	(17.2)	797	(5.5)	11.7	(9.8, 13.8)
Anti-inflammatory and anti-rheumatic products	224	(15.5)	884	(6.1)	9.4	(7.6, 11.4)
Antidiarrheals, oral electrolyte replacers and intestinal anti-inflammatories	175	(12.1)	549	(3.8)	8.3	(6.7, 10.1)
Agents acting on the renin-angiotensin system	160	(11.1)	900	(6.2)	4.8	(3.3, 6.6)
Vitamins	148	(10.2)	579	(4.0)	6.2	(4.7, 7.9)
Cough and cold preparations	138	(9.6)	290	(2.0)	7.5	(6.1, 9.2)

Abbreviation: PLWH, people living with HIV.

with and those without HIV [29]. Nevertheless, our findings suggest that PLWH on antiretrovirals may benefit from the prevention of comorbidities and active screening for early detection of comorbidities.

Our results demonstrated the greater burden of co-medications among PLWH on antiretrovirals than people without HIV. In this study, younger PLWH commonly used multiple co-medications, suggesting the extended duration of exposure to polypharmacy and its potential adverse effects, e.g., drug–drug interactions, which adds complexity to the difficult management of polypharmacy in PLWH [31–33]. Unfortunately, it was not possible to reveal the reasons behind the greater use of co-medications in PLWH on antiretrovirals than people without HIV because this was a cross-sectional study, in which we considered that all events during a study period occurred at a single time point. As most co-medications commonly prescribed for PLWH on antiretrovirals are not related to the examined chronic comorbidities, our results may not be largely attributable to the greater number of chronic comorbidities, although this must have contributed somewhat to polypharmacy among PLWH on antiretrovirals with these comorbidities. Polypharmacy constitutes a great concern in HIV treatment, particularly for older patients, which is supported by our results showing the greater number of co-medications used by older PLWH on antiretrovirals compared with controls of the same age group. In addition to HIV infection, aging generally reduces renal and hepatic functional reserve and compromises drug metabolism [13], making older patients susceptible to the negative effects of polypharmacy; these extend beyond adverse drug reactions to poor adherence and progression of geriatric syndromes [34]. Although identifying the risk factors for such polypharmacy is outside the scope of this study, our results showing the large co-medication burden on older PLWH in Japan suggest that individually tailored approaches to HIV management, including medication reconciliation, are important, particularly for this population.

This study has some limitations to be considered. First, generalizability of the present findings may be limited. The database used consists of data collected from hospitals with advanced medical capabilities; therefore, the control group did not represent a healthy or general population. The conditions of patients in the control group may have been more clinically severe than those observed in other hospitals without advanced medical capabilities or in the general population. Thus, comorbidity types in the control group may have been overestimated. Likewise, our results on common co-medication types among PLWH taking antiretrovirals may not be generalizable to all PLWH on antiretrovirals in Japan because treatment patterns for comorbidities in hospitals included in the database of this study may differ from those in hospitals that treat PLWH but were not included in the database. Moreover, the definition of HIV based on ART may make our findings inapplicable to PLWH who are not on ART. Second, as this is a cross-sectional study and we cannot specify the date of HIV infection without the availability of corresponding data in the database, our definitions of comorbidities and co-medications included those before HIV infection and/or diagnosis; therefore, we cannot infer causality

between HIV infection and comorbidities. Third, a possibility of misclassification cannot be excluded because of the nature of a retrospective study using a hospital claims database. For example, data of patients who received other diagnoses or medications at different hospitals were not entered into the database used in this study. Our results regarding comorbidities and co-medications may have been underestimated owing to such missing information. Furthermore, because we used a preexisting hospital claims database, our analysis lacks important data from the included hospitals, such as HIV infection status (e.g., CD4 counts and HIV RNA levels), time from HIV diagnosis, and ART duration, as well as all data from hospitals not included in this database. Nevertheless, because there are few available data on the comorbidity and comedication profiles of Japanese PLWH on antiretrovirals, in comparison with a non-HIV-infected cohort, we believe the insights of this study are meaningful for clinicians and researchers.

In conclusion, the present study showed that PLWH on antiretrovirals in Japan had a greater burden of comorbidities and co-medications at younger ages than people without HIV, and the burden tended to increase with age. In addition to appropriate prevention and management of comorbidities, medical professionals who care for PLWH on antiretrovirals, especially older patients, are required to perform proper medication reconciliation.

Funding

This study was supported by MSD K.K., Tokyo, Japan. MSD K.K. had no role in the data collection, but was involved in the study design, data analysis, and preparation of the manuscript.

Conflicts of interest

DJR, KI, and KT are employees of MSD K.K., Tokyo, Japan. TN received no funding for this study but received lecture fees from MSD K.K., Tokyo, Japan.

Acknowledgments

Medical writing and statistical support was provided by Tetsumi Toyoda and Emiko Sato of Clinical Study Support, Inc. We are particularly grateful for the assistance given by Noriyo Ihara of MSD, K.K.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jiac.2018.10.006.

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