Original Paper

Relationship between HRQoL Burden and Age among Patients with Chronic Diseases Visiting Community Pharmacies in Japan: Investigation Using the EuroQol 5 Dimensions 5-Level

Norimitsu Horii[1,2], Akira Yoshida[3], Shinji Oshima[3], Junya Mikata[4],

Naohito Takahashi[4], Shigeru Ohshima[1,2] and Daisuke Kobayashi[2,3]

[1] Laboratory of Pharmacy Management, Faculty of Pharmacy and
Pharmaceutical Sciences, Josai University,
[2] Josai University Pharmacy,
[3] Laboratory of Analytical Pharmaceutics and Informatics,
Faculty of Pharmacy and Pharmaceutical Sciences, Josai University,
[4] Center of Pharmacy Practice and Education,
Faculty of Pharmacy and Pharmaceutical Sciences, Josai University

Abstract

Introduction: The risk of chronic disease increases with age, leading to a decrease in the health-related quality of life (HRQoL) of older patients. Information on the impact of chronic diseases on the HRQoL of older patients visiting community pharmacies in Japan is limited. Therefore, this study aims to investigate the characteristics of HRQoL among older patients who regularly visit community pharmacies in Japan and clarify the impact of chronic diseases on HRQoL.

Methods: An online survey was conducted with patients aged 20 to 70 who regularly visit community pharmacies. The ratio of male to female individuals in each age group was 1:1 and 1,500 respondents were recruited. HRQoL was measured using the EuroQoL-5D-5L and the burden of each chronic disease was assessed. Multiple regression analysis was conducted with HRQoL as the objective variable and sex, age group, and type of chronic disease as explanatory variables.

Results: Hypertension was the most common disease, followed by dyslipidaemia, depression and other mental illnesses, allergic rhinitis, and diabetes. The results of the multiple regression analysis among all community pharmacy patients showed that depression and other mental illnesses, eye diseases, atopic dermatitis, lower back pain, and other diseases significantly impacted the decline in HRQoL. Being older increased HRQoL. Depression and other mental illnesses were significant factors in the decline in HRQoL across all the age groups.

Conclusion: The types of chronic diseases and their impact on HRQoL among patients who use community pharmacies in Japan were clarified. Community pharmacists should implement interventions to reduce the disease burden among patients with a higher disease burden, while keeping control of primary diseases among patients with a lower disease burden to prevent future declines in HRQoL.

Key words: chronic disease, quality of life, burden, community pharmacy, older patients

Introduction

The proportion of the Japanese population aged 65 and older is 29.3%; this number is expected to increase in the future, reaching 34.8% in 2040 and 36.3% in 2045[1]. The risk of developing chronic diseases increases with age. Furthermore, older adults tend to have multiple chronic diseases, take more medication, and are more likely to experience drug interactions and adverse drug reactions than younger people[2]. Therefore, care for older adults with chronic diseases will become an increasingly important challenge in Japanese healthcare. Most patients with chronic diseases are considered manageable outpatients by their physicians. Most

連絡先：堀井徳光　〒350-0295　埼玉県坂戸市けやき台1-1　城西大学薬学部薬局管理学研究室　e-mail：horii-n@josai.ac.jp

such patients in Japan are followed up as outpatients, with outpatient drug treatment continued unless the patient's physician decides that hospitalization is necessary. They continue their treatment while receiving regular checkups at hospitals and dispensing instructions from community pharmacies[3].

Previous studies have shown that the onset and treatment of chronic diseases can lead to reduced physical activity and limitations in daily life. These factors contribute to various physical, mental, and social burdens, ultimately lowering patients' health-related quality of life (HRQoL)[4~6]. In Japan, studies have examined the HRQoL of patients with chronic diseases who visit community pharmacies[7~12]. However, to the best of our knowledge, no studies have thus far specifically focused on the HRQoL burden of older patients with chronic diseases, who are the main patient group visiting community pharmacies. As a result, it remains unclear which chronic diseases most significantly impact the HRQoL of older patients and whether the effects of different chronic conditions differ between older and younger populations. By clarifying the HRQoL burden of chronic diseases among patients who regularly visit community pharmacies by age group, it may be possible to provide more patient-centred care in outpatient medication management[13~16].

The purpose of this study is to assess and analyse the HRQoL of community pharmacy patients with chronic diseases using the EuroQol 5 dimensions 5-level (EQ-5D-5L), via the Internet, and clarify the impact of chronic diseases on HRQoL.

Methods

1.　Study design and participants

1.1.　Online survey

An online survey was conducted by Rakuten Insight, Inc. (Tokyo, Japan). Rakuten Insight Inc. is an online survey company with a panel of approximately 2.2 million people[17].

1.2.　HRQoL survey of community pharmacy patients

The survey was conducted between 22 April and 28 April 2022. From among approximately 2.2 million panellists registered with Rakuten Insight, Inc., patients who regularly visit community pharmacies were recruited and screened according to the following procedure (Fig. 1).

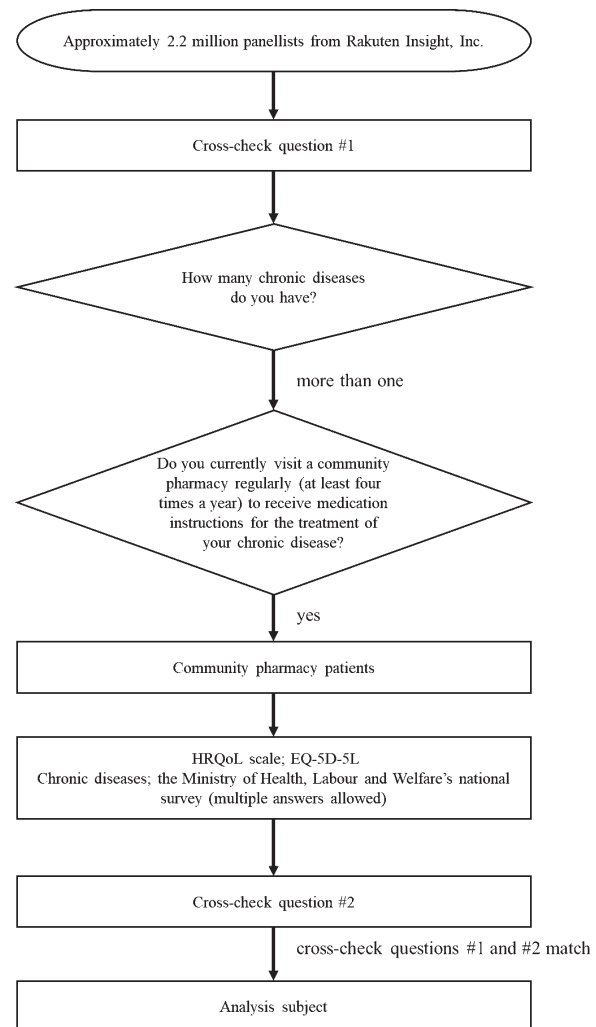Among the participants, those who answered 'more

Fig. 1　Procedure for recruiting the participants for the online survey.

than one' to the question 'How many chronic diseases do you currently have?' and who answered 'yes' to the question 'Do you currently visit a community pharmacy regularly (at least four times a year) to receive medication instructions for the treatment of your chronic disease?' were defined as those who regularly visited community pharmacies for chronic diseases (hereafter, community pharmacy patients).

The sex ratio of the participants was 1:1 and the age distribution was equally divided from 20s to 70s. The participants were asked to answer the EQ-5D-5L health survey form and questions about chronic diseases that were displayed on their browser. This study was a secondary analysis of the dataset used in our main study.

2.　Data cleaning

To eliminate dishonest respondents, we used a cross-check question (the same question was included at the beginning and end of the questionnaire) and excluded

those whose answers did not match the analysis. The number of respondents in the dataset after data cleaning was 1,500 (Fig. 1).

3. Survey items

3.1 The HRQoL scale in this study

The EQ-5D-5L was used as the HRQoL measurement scale. This scale is a questionnaire that evaluates five dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) on a five-point scale (no problems, slight problems, moderate problems, severe problems, and extreme problems/inability)[18].

The answers to the questionnaire were calculated using utility scores ranging from −0.025 to 1.00. A score of 0.00 means 'death' and 1.00 means 'full health', and the value can be less than 0.00 ('death'). The score for the next health state after 'full health' (1.00) was 0.895. Therefore, no respondent had scores above 0.895 or below 1.00. This gap is known as the truncation point[19,20].

We obtained permission to use the EQ-5D-5L online from a development group (EuroQol Group: https://registration.euroqol.org/).

3.2. Chronic diseases

In this study, we presented 35 chronic diseases listed in the Ministry of Health, Labour and Welfare's national survey and asked the respondents to select the chronic diseases that applied to them[21]. In the survey, if the respondents had more than one chronic disease, they were asked to select all of them.

4. Statistical analysis

The total number of patients in each chronic disease group was calculated by sex and age group. Next, according to previous reports, the HRQoL value (mean) was calculated from the response patterns of the EQ-5D-5L question items (five items, five levels)[22].

The impact of chronic diseases on the HRQoL of community pharmacy patients was examined using multiple regression analysis. As chronic diseases tend to differ by sex and age, sex and age were also included as explanatory variables in this study to examine the effects of various chronic diseases on HRQoL.

5. Ethical considerations

This study was approved by the Human Medical Ethics Committee of Josai University (no. Human Medical Ethics-2021-19). All the methods used in this study were conducted in accordance with the Ethical Guidelines for Life Science and Medical Research, Involving Human Subjects of the Ministry of Education, Culture, Sports, Science and Technology. In addition, the respondents read the consent statement on the browser and only participated in the survey if they agreed. Additionally, the collected data were anonymised in accordance with Rakuten Insight's privacy policy and delivered as data that could not be linked to personal information.

Results

1. The chronic disease prevalence among community pharmacy patients by sex and age group

Table 1 shows the total number of patients by disease and the percentages of patients by sex and age group. In this study, diseases with a total number of patients of 100 or fewer and other diseases in the original survey were collectively referred to as 'other.' There were 26 types of other diseases.

The most common chronic disease was hypertension, which affected 384 of the patients, accounting for 25.6% of the total. This was followed by dyslipidaemia, depression and other mental illnesses, allergic rhinitis, and diabetes, with 234 (15.6%), 223 (14.9%), 175 (11.7%), and 164 (10.9%) patients, respectively. Of all the diseases surveyed, the top five diseases included three lifestyle-related diseases: hypertension, dyslipidaemia, and diabetes.

For both sexes, the rates of diabetes, dyslipidaemia, eye diseases, hypertension, and lower back pain tended to increase with age, while the rates of depression and other mental illnesses, allergic rhinitis, atopic dermatitis, and asthma tended to decrease with age (Fig. 2).

2. The impact of chronic diseases on HRQoL

Table 2 shows the results of the multiple regression analysis with the HRQoL values for community pharmacy patients as the objective variable and chronic disease, sex, and age group as explanatory variables. The items in bold in the table are those that showed a statistically significant impact.

The diseases that had a significant impact on the decline in the HRQoL of community pharmacy patients were depression and other mental illnesses, eye diseases, atopic dermatitis, lower back pain, and other diseases. However, while sex did not impact the changes in HRQoL, being aged 65 and over had a significant impact on improving HRQoL.

Table 1　Percentage of each disease in the young (20–39 years), middle-aged (40–64 years), and older (65–79 years) age groups.

	Sample size	Chronic diseases*									
		Diabetes	Dyslipidae-mia (cholester-olemia, etc.)	Depression and other mental illnesses	Eye diseases	Hyper-tension	Allergic rhinitis	Asthma	Atopic dermatitis	Lower back pain	Other**
Young	500	4.8%	4.0%	25.4%	7.0%	5.6%	14.4%	12.2%	18.6%	4.0%	57.0%
Male	250	5.6%	6.8%	24.8%	6.4%	10.4%	14.0%	11.2%	15.2%	4.0%	54.8%
Female	250	4.0%	1.2%	26.0%	7.6%	0.8%	14.8%	13.2%	22.0%	4.0%	59.2%
Middle-aged	647	13.1%	19.0%	13.4%	9.1%	28.3%	10.8%	7.7%	5.3%	7.7%	58.3%
Male	321	16.5%	20.9%	13.4%	8.1%	35.2%	9.7%	7.5%	7.2%	7.2%	54.5%
Female	326	9.8%	17.2%	13.5%	10.1%	21.5%	12.0%	8.0%	3.4%	8.3%	62.0%
Older	353	15.6%	25.8%	2.5%	16.1%	49.0%	9.3%	2.5%	1.1%	8.8%	56.4%
Male	179	22.3%	19.0%	2.8%	18.4%	58.1%	8.9%	2.2%	0.6%	11.2%	64.2%
Female	174	8.6%	32.8%	2.3%	13.8%	39.7%	9.8%	2.9%	1.7%	6.3%	48.3%
All	1,500	10.9%	15.6%	14.9%	10.1%	25.6%	11.7%	8.0%	8.7%	6.7%	57.4%

*If the patient has multiple chronic diseases, multiple answers were allowed.
**Diseases with a frequency of 100 or fewer

Table 2　The impact of chronic diseases on HRQoL.

	Coefficient	Lower 95%	Upper 95%	*P*-value
Intercept	0.9228	0.9069	0.9387	0.0000
Diabetes	0.0030	−0.0190	0.0251	0.7859
Dyslipidaemia	0.0130	−0.0060	0.0320	0.1797
Depression and other mental illnesses	**−0.1592**	**−0.1791**	**−0.1394**	**0.0000**
Eye diseases	**−0.0410**	**−0.0638**	**−0.0182**	**0.0004**
Hypertension	−0.0008	−0.0178	0.0162	0.9247
Allergic rhinitis	−0.0104	−0.0319	0.0112	0.3455
Asthma	−0.0017	−0.0273	0.0239	0.8978
Atopic dermatitis	**−0.0840**	**−0.1089**	**−0.0591**	**0.0000**
Lower back pain	**−0.0766**	**−0.1046**	**−0.0485**	**0.0000**
Other	**−0.0522**	**−0.0666**	**−0.0378**	**0.0000**
Gender (Male, Female: 1, 0)	−0.0037	−0.0174	0.0100	0.5951
Older (aged 65 and over, aged 64 and under: 1, 0)	**0.0208**	**0.0035**	**0.0381**	**0.0184**

3.　The impact of chronic diseases on HRQoL by age group

In the above analysis, older age was shown to have a significant impact on the HRQoL of community pharmacy patients. Therefore, multiple regression analysis was used to re-examine the impact of age on HRQoL by age group: young (20–39 years), middle-aged (40–64 years), and older (65–79 years).

Tables 3~5 show the analysis results by age group. In all the age groups, depression and other mental illnesses had a significant impact on HRQoL. By contrast, lifestyle-related diseases such as hypertension, dyslipidaemia, and diabetes did not affect the HRQoL of any age group. In addition, eye diseases and atopic dermatitis affected both young and middle-aged people, while lower back pain affected middle-aged and older patients. Asthma showed a significant decrease in HRQoL only in older patients (Fig. 3).

Discussion

This study is the first to examine the differences in the prevalence of chronic diseases among older and younger patients with chronic diseases who regularly visit community pharmacies in Japan as well as the
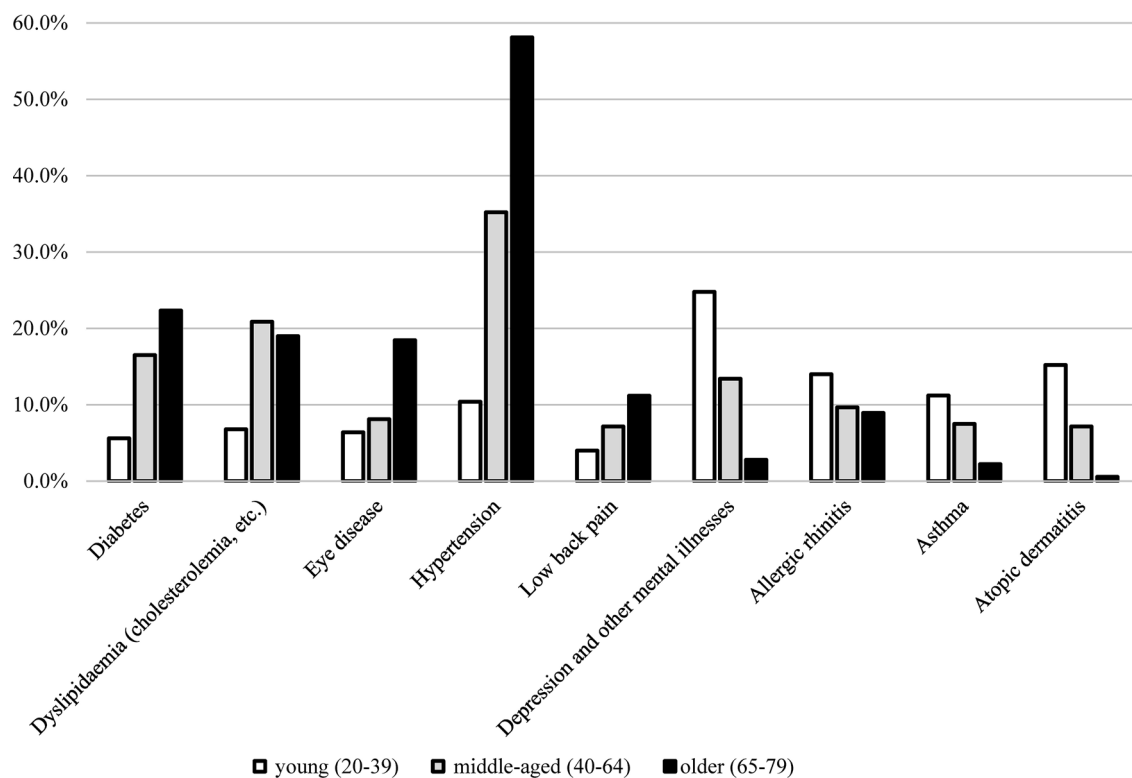
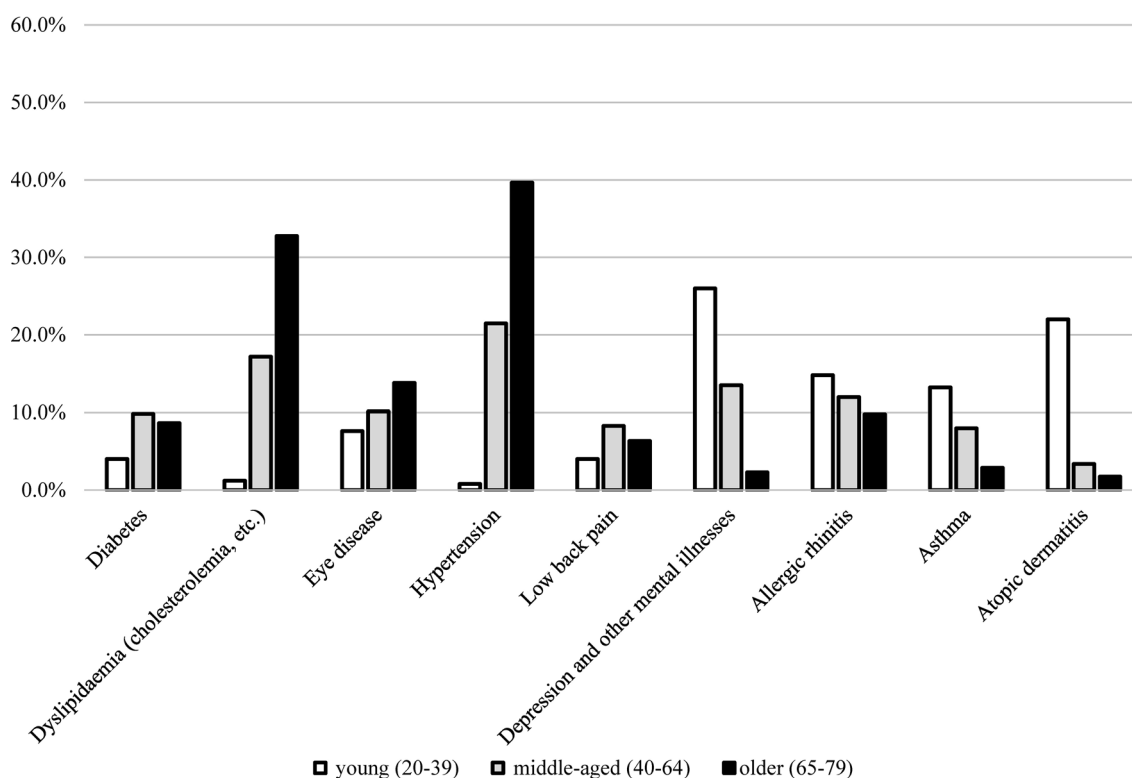Fig. 2A Chronic disease prevalence for men by age.

Fig. 2B Chronic disease prevalence for women by age.

burden of each chronic disease on the HRQoL in each age group. The fact that the burden of chronic diseases on HRQoL differs by age group suggests that community pharmacists can provide patient care based on the combination of a patient's age and chronic disease.

According to the 2020 Patient Survey, the most common diseases in Japan are hypertension, dyslipidaemia, and type 2 diabetes. Furthermore, in younger age

Table 3　The impact of chronic diseases on HRQoL among younger patients (20–39 years).

	Coefficient	Lower 95%	Upper 95%	*P*-value
Intercept	0.9080	0.8801	0.9358	0.0000
Diabetes	−0.0471	−0.1090	0.0148	0.1354
Dyslipidaemia	−0.0039	−0.0723	0.0644	0.9105
Depression and other mental illnesses	**−0.1574**	**−0.1889**	**−0.1259**	**0.0000**
Eye diseases	**−0.1009**	**−0.1533**	**−0.0486**	**0.0002**
Hypertension	−0.0397	−0.0983	0.0188	0.1833
Allergic rhinitis	−0.0183	−0.0568	0.0201	0.3497
Asthma	0.0018	−0.0396	0.0433	0.9309
Atopic dermatitis	**−0.0859**	**−0.1214**	**−0.0504**	**0.0000**
Lower back pain	−0.0263	−0.0967	0.0441	0.4629
Other	**−0.0516**	**−0.0801**	**−0.0231**	**0.0004**

Table 4　The impact of chronic diseases on HRQoL among middle-aged patients (40–64 years).

	Coefficient	Lower 95%	Upper 95%	*P*-value
Intercept	0.9295	0.9089	0.9501	0.0000
Diabetes	0.0066	−0.0225	0.0357	0.6564
Dyslipidaemia	0.0108	−0.0142	0.0359	0.3969
Depression and other mental illnesses	**−0.1452**	**−0.1746**	**−0.1159**	**0.0000**
Eye diseases	**−0.0374**	**−0.0713**	**−0.0035**	**0.0308**
Hypertension	0.0040	−0.0186	0.0266	0.7287
Allergic rhinitis	0.0019	−0.0303	0.0341	0.9084
Asthma	0.0145	−0.0225	0.0516	0.4417
Atopic dermatitis	−0.0370	−0.0816	0.0076	0.1037
Lower back pain	**−0.0986**	**−0.1369**	**−0.0603**	**0.0000**
Other	**−0.0514**	**−0.0721**	**−0.0307**	**0.0000**

Table 5　The impact of chronic diseases on HRQoL among older patients (65–79 years).

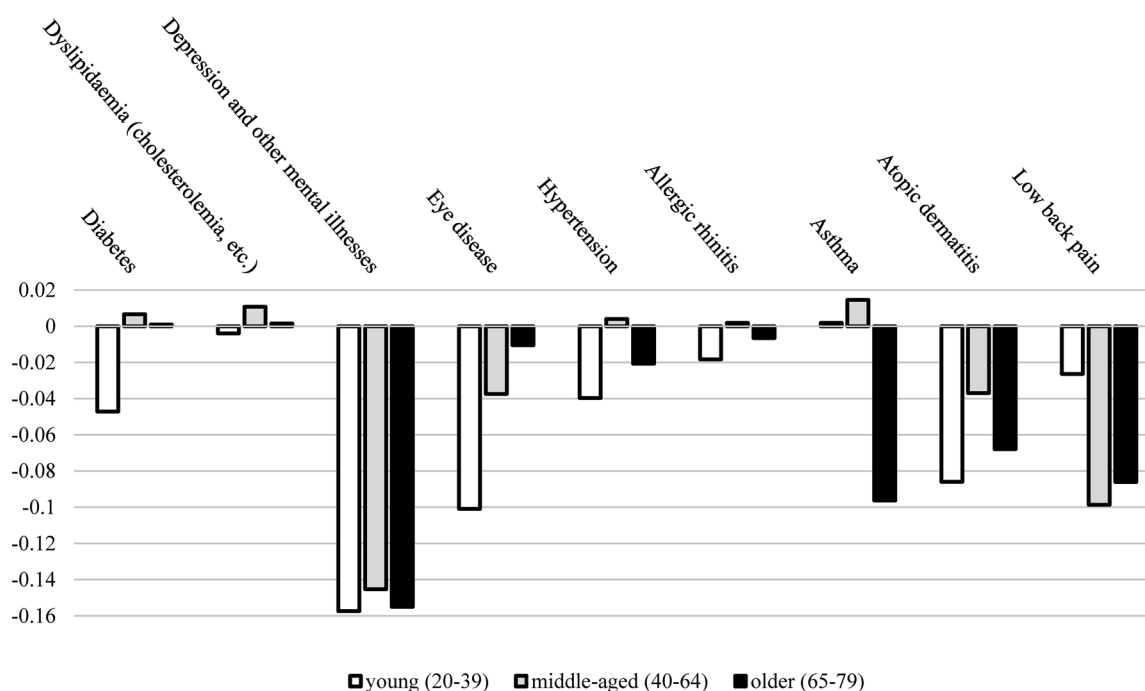|	Coefficient	Lower 95%	Upper 95%	*P*-value
Intercept	0.9558	0.9284	0.9832	0.0000
Diabetes	0.0010	−0.0331	0.0350	0.9561
Dyslipidaemia	0.0015	−0.0272	0.0301	0.9186
Depression and other mental illnesses	**−0.1550**	**−0.2345**	**−0.0756**	**0.0001**
Eye diseases	−0.0104	−0.0450	0.0242	0.5541
Hypertension	−0.0207	−0.0461	0.0047	0.1100
Allergic rhinitis	−0.0066	−0.0490	0.0359	0.7606
Asthma	**−0.0962**	**−0.1754**	**−0.0171**	**0.0173**
Atopic dermatitis	−0.0679	−0.1868	0.0509	0.2618
Lower back pain	**−0.0861**	**−0.1321**	**−0.0400**	**0.0003**
Other	**−0.0582**	**−0.0843**	**−0.0321**	**0.0000**

Fig. 3　The impact of chronic diseases and age on HRQoL.

groups, allergic diseases such as asthma and atopic dermatitis are more common than in other age groups, while mental disorders are also common[23]. The percentages of people with chronic diseases by sex and age group in this survey were consistent with these reports. Therefore, the diseases experienced by the survey population in this study did not differ greatly from those in the real world.

The analysis of the effects of sex, age group, and chronic diseases on the HRQoL of community pharmacy patients suggested that the HRQoL of older adults was higher than that of younger adults. In general, it has been reported that younger people have lower psychological resilience and HRQoL than older people[24, 25]. The results of this study suggest that psychological resilience may also affect the HRQoL of younger community pharmacy patients.

In this study, hypertension, dyslipidaemia, and diabetes did not significantly reduce the HRQoL of any age group. This suggests that regardless of age, patients with outpatient-followable diseases of moderate severity, who were the target of this survey, were not significantly affected in their daily lives because of the burden of these chronic diseases and outpatient medication. In particular, middle-aged patients did not experience a decline in HRQoL due to diabetes, dyslipidaemia, or hypertension. Moreover, they tended to be less aware of the burden of chronic diseases on their daily lives.

By comparison, in this survey, the incidence of lifestyle-related diseases increased with age. Previous reports have shown that some patients in early adulthood and middle age tend to deny having a chronic disease or not be concerned about or take it seriously[26]. Considering this, the low burden of chronic diseases in middle-aged patients may not indicate successful medication but may reflect an underestimation of the incidence of these chronic diseases, medication, and restrictions on daily life. This important insight is consistent with reports that patients under 60 years have poorer medication adherence than those aged 60 and older[27].

Diabetes, dyslipidaemia, and hypertension are risk factors for myocardial infarction and stroke[28, 29]. Therefore, community pharmacists should focus on preventing myocardial infarction and stroke by controlling diabetes, dyslipidaemia, and hypertension rather than merely improving current HRQoL (i.e. reducing the HRQoL burden of the disease on daily life and medical treatment). To achieve this, it is necessary not only to improve medication compliance among these patients, but also to emphasise in medication instructions that controlling the underlying disease is important for preventing future serious diseases, which would lead to the maintenance of HRQoL in the future.

Notably, in this analysis, depression and other mental

illnesses were the only chronic diseases that were factors in the decline in HRQoL for all age groups. Mood disorders can cause significant emotional depression and other changes that interfere with daily life[30]. Therefore, when measuring and assessing HRQoL using the EQ-5D-5L for these patient groups, it is necessary to carefully observe and assess whether the dimensions of mobility, self-care, and usual activities are reduced by physical problems or the negative influence of psychological aspects.

Respiratory diseases in older people can cause significant problems in their daily lives[31]. In this study, asthma was found to cause a significant decrease only in the HRQoL of older patients. This finding is consistent with previous reports and emphasises the importance of managing the drug treatment of respiratory diseases in older community pharmacy patients. Considering that inhaled corticosteroids are the foundational asthma treatment, pharmacist-provided inhalation instructions for older patients with a poor inhalation technique may help increase their HRQoL.

The results of this study suggest that community pharmacists can contribute to maintaining and improving HRQoL by intervening based on the consideration of the patient's age and chronic disease. However, this study had several limitations. Since we only recruited respondents online, the respondents may not have included more seriously ill patients who were also outpatients. In addition, because the chronic diseases were chosen by the patients themselves, they may have differed from the chronic diseases diagnosed by doctors. The other diseases that showed a significant effect on HRQoL in this study are not a specific group of diseases but rather a collection of various diseases. Therefore, they share no common characteristics and distinguishing the effects of individual diseases is impossible. For this reason, it is difficult to clearly interpret the effect of other diseases on HRQoL based on these results alone.

However, being able to provide information on the relationship between chronic diseases and HRQoL burden among community pharmacy patients, information that has been lacking until now, will be useful for community pharmacists to provide more effective patient care in the future.

Acknowledgments

Conflict of interest

No conflicts of interest to disclose.

Availability of data and materials

The datasets generated and/or analysed in this study are available from the corresponding author upon reasonable request.

References

1) Ministry of Health, Labour and Welfare, "About the population of Japan", 〈https://www.mhlw.go.jp/stf/newpage_21481.html〉, cited 20 February, 2025.

2) The Japan Geriatrics Society, "Guidance statement on appropriate medical services for the elderly", 〈https://www.jpn-geriat-soc.or.jp/proposal/pdf/geriatric_care_GL.pdf〉, cited 20 February, 2025.

3) Japan Pharmaceutical Association, "Progressing the pharmaceutical division of labour", 〈www.nichiyaku.or.jp/assets/uploads/activities/bungyo/s/R5suikei.pdf〉, cited 20 February, 2025.

4) Olfson M, Wall M, Liu SM, Schoenbaum M, Blanco C, Declining health-related quality of life in the US, Am J Prev Med, 2018, 54, 325–333.

5) Van Wilder L, Devleesschauwer B, Clays E, Van der Heyden J, Charafeddine R, Scohy A, et al., QALY losses for chronic diseases and its social distribution in the general population: results from the Belgian Health Interview Survey, BMC Public Health, 2022, 22, 1304.

6) Lee JE, Lee J, Shin R, Oh O, Lee KS, Treatment burden in multimorbidity: an integrative review, BMC Prim Care, 2024, 25, 352.

7) Ichimura T, Ogawa C, Murata H, Miyahara K, Yuge S, Tsukioka R, et al., Community pharmacists' measurement of health-related quality of life in outpatients taking high-risk drugs, Pharmazie, 2022, 77, 202–206.

8) Okada H, Onda M, Shoji M, Sakane N, Nakagawa Y, Sozu T, et al., Effects of lifestyle advice provided by pharmacists on blood pressure: the COMmunity Pharmacists ASSist for Blood Pressure (COMPASS-BP) randomized trial, Biosci Trends, 2018, 11, 632–639.

9) Sakakibara M, Igarashi A, Takase Y, Kamei H, Nabeshima T, Effects of prescription drug reduction on quality of life in community-dwelling patients with dementia, J Pharm Pharm Sci, 2015, 18, 705–712.

10) Uejima K, Hayasaka M, Kato J, Sakata W, Otsuka S, Watanabe F, et al., Hospital-pharmacy cooperative training and drug-taking compliance in outpatients with chronic pain: a case-control study, Integr Pharm Res Pract, 2019, 8, 63–74.

11） Ichimura T, Nomura H, Shimizu H, Community pharmacists' measurement of health-related quality of life for breast cancer with positive hormone receptors: a prospective observational study, SAGE Open Med, 2023, 11, 20503121231164491.

12） Sakakibara M, Kido M, Kuribayashi J, Okada H, Igarashi A, Kamei H, et al., Comparison of the effects of a brand-name drug and its generic drug on the quality of life of Alzheimer's disease patients, Clin Psychopharmacol Neurosci, 2015, 13, 174–179.

13） Fazekas-Pongor V, Fekete M, Balazs P, Árva D, Pénzes M, Tarantini S, et al., Health-related quality of life of COPD patients aged over 40 years, Physiol Int, 2021, 108, 261–273.

14） Mawarikado Y, Inagaki Y, Fujii T, Imagita H, Fukumoto T, Kubo T, et al., Preoperative factors affecting patient-reported outcome measures for total knee arthroplasty, Prog Rehabil Med, 2022, 7, 20220049.

15） Nixon AC, Wilkinson TJ, Young HML, Taal MW, Pendleton N, Mitra S, et al., Symptom-burden in people living with frailty and chronic kidney disease, BMC Nephrol, 2020, 21, 411.

16） Niino M, Fukumoto S, Okuno T, Sanjo N, Fukaura H, Mori M, et al., Health-related quality of life in Japanese patients with multiple sclerosis, J Neurol, 2023, 270, 1011–1018.

17） Rakuten Insight, Inc., "Beginner's guide to market research", 〈https://insight.rakuten.co.jp/beginner/〉, cited 20 February, 2025.

18） EuroQoL, "EQ-5D-5L user guide", 〈https://euroqol.org/wp-content/uploads/2023/11/EQ-5D-5LUserguide-23-07.pdf〉, cited 20 February, 2025.

19） Shiroiwa T, Ikeda S, Noto S, Igarashi A, Fukuda T, Saito S, et al., Comparison of value set based on DCE and/or TTO data: scoring for EQ-5D-5L health states in Japan, Value Health, 2016, 19, 648–654.

20） Neilson AR, Jones GT, Macfarlane GJ, Pathan EM, McNamee P, Generating EQ-5D-5L health utility scores from BASDAI and BASFI: a mapping study in patients with axial spondyloarthritis using longitudinal UK registry data, Eur J Health Econ, 2022, 23, 1357–1369.

21） Ministry of Health, Labour and Welfare, "Comprehensive survey of living conditions", 〈www.mhlw.go.jp/toukei/chousahyo/20-21/dl/koku2025ke.pdf〉, cited 20 February, 2025.

22） Ikeda S, Shiroiwa T, Igarashi A, Noto S, Fukuda T, Saito S, et al., Developing a Japanese version of the EQ-5D-5L value set, J Natl Inst Public Health, 2015, 64, 47–55.

23） Ministry of Health, Labour and Welfare, "2020 summary report of patient survey", 〈https://www.mhlw.go.jp/toukei/saikin/hw/kanja/20/index.htm〉, cited 20 February, 2025.

24） Ueno Y, Hirano M, Oshio A, The relationship between resilience and age in a large cross-sectional Japanese adult sample, Jpn J Psychol, 2018, 89, 514–519.

25） N'Goran AA, Déruaz-Luyet A, Haller DM, Zeller A, Rosemann T, Streit S, et al., Comparing the self-perceived quality of life of multimorbid patients and the general population using the EQ-5D-3L, PLoS One, 2017, 12, e0188499.

26） Imao M, The mourning process of young and middle-aged adults with chronic illnesses, Jpn J Dev Psychol, 2010, 21, 125–137.

27） Osanai Y, Katsura S, Sato H, Kimura R, Kodama H, Takasugi K, et al., Evaluation of the factors influencing medicine-taking behavior for the patients taking oral medication, Jpn J Soc Pharm, 2015, 34, 72–80.

28） The Japan Stroke Society, "Japanese stroke society guidelines for the treatment of stroke 2021", 〈https://www.jsts.gr.jp/img/guideline2021_kaitei2023.pdf〉, cited 20 February, 2025.

29） The Japanese Circulation Society, "JCS 2018 guideline on diagnosis and treatment of acute coronary syndrome", 〈https://www.j-circ.or.jp/cms/wp-content/uploads/2018/11/JCS2018_kimura.pdf〉, cited 20 February, 2025.

30） Japanese Society of Mood Disorders, "Guidelines of treatment for depression from the Japanese society of mood disorders", 〈https://www.secretariat.ne.jp/jsmd/iinkai/katsudou/data/20240301.pdf〉, cited 20 February, 2025.

31） Joshi PR, Pulmonary diseases in older patients: understanding and addressing the challenges, Geriatrics (Basel), 2024, 9, 34.