Exploring Polypharmacy Burden Among elderly patients with chronic diseases in Chinese community: a cross-sectional study

Yongli Wang

Zhengzhou University

Xiaodan Li

Peking University People's Hospital

Dongmei Jia

Peking University People's Hospital

Beilei Lin

Zhengzhou University

Bo Fu

Zhengzhou University

Bei Qi

Zhengzhou University

Zhenxiang Zhang (✉ zhangzx6666@126.com)

Zhengzhou University

Research Article

Keywords: medicine, medicine burden, patient-reported outcome, multi-morbidity, Living with Medicines

Posted Date: February 18th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-198514/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

RESEARCH ARTICLE

Exploring Polypharmacy Burden Among elderly patients with chronic diseases in Chinese community: a cross-sectional study

Yongli Wang^{1,2}, Xiaodan Li², Dongmei Jia², Beilei Lin¹, Bo Fu¹, Bei Qi¹, Zhenxiang Zhang¹

¹School of Nursing and Health, Zhengzhou University, No.100 Science Avenue, Zhengzhou 450001, Henan, China

²Peking University People's Hospital, No. 11 Xizhimen South Street, Xicheng Dist., Beijing 100044, China

*Correspondence: Zhenxiang Zhang, School of Nursing and Health, No.100 Science Avenue, Zhengzhou City, Henan Province, China, Tel +86 13303816666, Fax +86 0371-86565001, Email: zhangzx6666@126.com.

Abstract

Background: In the long-term use of multiple medications for elderly patients with chronic diseases, medication problems are prominent, which seriously affects their quality of life. The burden of medications of patients plays a central role in affecting their medication beliefs, behaviors and disease outcomes. Paying attention to the burden of medications of patients may be a solution. Its medication issues provide a new perspective. The objective was to use the Chinese version of Living with Medicines Questionnaire-3(C-LMQ-3) to quantify the medicines burden of elderly patients with chronic diseases in the Chinese community, and assess the relevant demographic characteristics of sub-populations with high medicines burden. **Methods:** The survey was distributed to elderly ≥ 60 years with chronic disease using ≥ 5 medicines, C-LMQ-3 scores and domain scores were compared by elderly patient characteristics using descriptive statistics and statistical tests. **Results:** A total of 430 responses were analyzed, the participants ranged in age between 60 to 91 years old, and the average age was 73.57 years (SD: 7.87). Most were female (61.7%), had a middle school education (38.5%). Moreover, 54.1% of the participants lived with spouse only, 16.2% with both spouse and children, and 10.0% lived alone. Regression analysis indicated that higher C-LMQ-3 scores were associated with those who were with low education level, 60–69 years-old, using ≥ 11 medicines, using medicines ≥ 3 times a day, Income per month(RMB) ≤ 3000 , and who having higher monthly self-paid medication(RMB) ≥ 300 ($p < 0.01$). Burden was mainly driven by cost-related burden, concerns about medicines, and the lack of autonomy over medicine regimens. **Conclusion:** Elderly patients with chronic diseases in mainland China have a heavy burden of multiple medications. Chinese health care providers should focus on evaluating and paying attention to such patients, and formulate relevant intervention strategies to ensure medication adherence and daily

medication management of elderly patients with polypharmacy.

Keywords: medicine, medicine burden, patient-reported outcome, multi-morbidity, Living with Medicines Questionnaire

Introduction

In 2009, the World Health Organization (WHO) defined “multi-morbidity” as having two or more chronic diseases. Multi-morbidity is a common problem, mainly in the elderly, one of the reasons is that population ageing is a global phenomenon^[1]. Research has shown that 61.7%-86.3% of the elderly suffer from different chronic diseases in China ^[2-4], while recent data from the China Health and Retirement Longitudinal Study showed that physical multi-morbidity increased with age and was more common in poorer regions^[5]. According to the relevant literature on the multi-morbidity of chronic diseases among the elderly in the Chinese community^[2, 6, 7], the most common six kinds of chronic diseases were found, including hypertension, diabetes mellitus, coronary heart disease, stroke, hyperlipidemia and chronic obstructive pulmonary disease (COPD).

Medicines are the most commonly used medical technology to treat chronic diseases, and elderly patients often need to use multiple medicines due to multiple chronic diseases^[8-10]. According to literature, ≥ 5 medicines are the most commonly used definition of polypharmacy^[8, 11]. Polypharmacy contributes to increases the risk for a Drug Related Problems (DRPs), such as adverse medication events^[12], decreased medication adherence^[13], increased hospitalization^[14], cognitive impairment, falls and increased mortality^[15]. A systematic review showed that^[16] medication burden is a core factor that affects a patient's beliefs about medication adherence and health status, and to some extent reflects the patient's attitude and willingness and ability to handle medication use^[14, 17]. Therefore, measurement of medication burden may

provide an important perspective for helping to reduce these medication-related problems and improve adherence.

Recently, as polypharmacy becomes widespread, a tool has been developed and validated by Kraska et al in the UK, which are specifically to measure medicine-related burden in daily life-the Living with Medicines Questionnaire (LMQ)^[18-20]. The LMQ originated from qualitative interviews with patients who were diagnosed with multi-morbidity and using multiple medicines^[21]. The LMQ can assess the patient's medicine-related burden, such as side effects, effectiveness, general concerns, and cost burden^[20]. Studies have shown that the tool has good reliability and effectiveness, and has been used in many countries(Australia, Belgium, the Netherlands, New Zealand, Qatar, and the United Kingdom)^[22-25]. The instrument has also been translated and validated for use in an elderly Chinese population- the C-LMQ-3^[26].

There are very few studies in China that report experiences of medication burden for elderly patients with multi-morbidity using multiple medicines. Research studies on both multi-morbidity and the burden of medication for patients with chronic diseases tend to focus on economic aspects of treatment burden^[27]. Medicine burden is a different construct, and to date, no studies in China have explored the burden which medicines can have on peoples' daily lives, such as side effects and other interferences^[27]. Hence, the purpose of this study were: (a) using C-LMQ-3 to quantify the medicines burden of elderly patients with chronic diseases in the Chinese community, and (b) assess the relevant socio demographic characteristics of subpopulations with high medicines burden.

Materials and Methods

Setting, Study Population, and Sample Selection

This study was a cross-sectional correlational design. Potential participants were recruited via convenience sampling in Zhengzhou from January to August 2020. Eligible participants were identified by screening residents' health records in three community health service institutions to ensure they had at least two chronic diseases. We used the following inclusion criteria: 1) aged ≥ 60 years (according to the Law of the People's Republic of China on the Protection of the Rights and Interests of the Elderly); 2) diagnosed with at least two chronic diseases (chronic diseases including hypertension, diabetes mellitus, coronary heart disease, stroke, hyperlipidemia and COPD); 3) using ≥ 5 medications for more than 3 months; and 4) willing to participate in our study and provide informed consent. Individuals with cognitive impairments or other serious physical diseases who were unable to respond appropriately to the investigation were excluded from the study.

To ensure adequate statistical power, the sample size was calculated by the G*Power 3.1 in a multiple regression analysis with power set at 0.80, $\alpha = 0.05$ ^[28], a medium effect size 0.15^[29] and the number of dependent variables is 12. The resultant sample size was at least 148 samples are required allowing for a 20% inefficiency rate.

The Survey Tool

In this study, we used the C-LMQ-3 translated by our team^[26], which includes 39 items in eight domains: relationships with health professionals, practicalities, interferences, effectiveness, side effects, concerns, cost and autonomy, scored using a 5-point scale from strongly agree to strongly disagree. Total LMQ-3 scores range from 39-195; higher scores indicate greater burden associated with medicine use. The Cronbach's alpha for C-LMQ-3 was reported as 0.855 in elderly patients with chronic diseases. The C-LMQ-3 also includes a visual analogue scale (VAS), which measures global burden scored from 0 to

10.

Data Collection

Data were collected during community elderly health checkups, free consultations, health lectures or home visits. The investigators were trained in the purpose of the investigation, the method of using the questionnaire, and the precautions. Data were collected by eight investigators, four researchers, and four community-medical staff. The questionnaire was filled out independently by the survey participants. The questionnaire issuer was permitted to read out the contents of the questionnaire one by one to help respondents complete the questionnaire, and check whether there were any problems such as omissions and missing responses. All the questionnaires were returned on the spot after completion.

Statistical Analysis

All data were entered into Microsoft Office Excel 2016 software, and IBM SPSS 21.0 was used for statistical analysis. Mean, Standard Deviation (SD), frequencies were used to describe the demographic characteristics of elderly patients with chronic disease. The multiple medicine related-burden level of the participants was analyzed by analysis of variance and t-test. Multiple linear regression analysis was used to analyze the influencing factors of multiple medicines related- burden

Results

General Characteristics of Patients

Of the 527 eligible patients identified, a total of 469 (88.9%) responded to this survey. A completion rate of 91.7% (n = 430) was gained after excluding those who provided an incomplete survey (n = 23, 4.9%) and those who refused to participate in this survey (n = 16, 3.4%). Common reasons for refusing to participate included a lack of time (n = 3), a lack of interest (n = 9) and fear of disclosure of personal

health information (n = 4).

The demographic and medical characteristics of the 430 respondents are shown in Table 1. the participants ranged in age between 60 to 91 years old, and the average age was 73.57 years (SD: 7.87). Most were female (61.7%), had a middle school education (38.5%). In addition, 54.0% of the participants had a monthly income less than 3000 RMB. Moreover, 54.1% of the participants lived with spouse only, 16.2% with both spouse and children, and 10.0% lived alone. On average, participants took 10.1 ± 3.5 prescription medications, ranging from 5 (n = 52) to 18 (n=1). Most used 5-10 medicines (n=174, 40.4%) or 11-15 medicines (203, 47.1%) and used medicines twice (91, 21.1%) or three times daily (224, 52.0%).

Assessment of Polypharmacy Burden

Table 2 presents the responses to individual statements in the C-LMQ-3 and 8 domains score, the C-LMQ-3 total scores were normally distributed: mean 112.9 (SD= 11.3), range 84–145 (maximum possible range 39–195). VAS scores were skewed to higher values with a median (range) of 6 (0–10) and mean 5.4 (SD= 1.7). At the same time, the VAS-burden scores showed a strong-positive relationship with C-LMQ-3 total scores (Spearman's $r = 0.869$; $p < 0.001$). The top 10 items with the highest scores in C-LMQ-3 are shown in Table 3.

Factors Associated with Polypharmacy Burden

Table 1 demonstrates results of the differences in C-LMQ-3 scores between the demographic characteristics and medicine use of different elderly patients with chronic diseases. There were significant differences in the age, education level, primary caregiver, income per month(RMB), types of medicine, frequency of medicines, monthly self-paid medication (RMB), and burden of multiple medications among elderly patients with chronic diseases ($P < 0.05$). There were no significant differences in burden of

multiple medications among elderly patients with chronic diseases with regard to gender, marital status, living status, and health conditions ($P > 0.05$).

Table 4 shows results from the multiple linear stepwise regression analysis to determine factors associated with multiple medicines burden of elderly patients with chronic diseases. Age, education level, primary caregiver, income per month(RMB), number of medicines, frequency of medicine use, monthly self-paid medication (RMB) were significantly related to multiple medicines burden. Elderly patients with relatively young age, low education level, low per capita economic income, higher numbers of medicines, high frequency of daily use, and high monthly self-payment medication fees may have heavy multiple medicine burden. There was no multicollinearity in this study, because the tolerance of each variable was between 0.82- 0.97, > 0.25 , and variance inflation factors for these variables were between 1.03-1.22, both < 10.0 .

Discussion

In this study, which used the C-LMQ-3, we found that the burden of multiple medications for elderly patients with chronic diseases in China is relatively heavy, the C-LMQ-3 total scores were mean 112.9 ± 11.3 , range 84-145 (maximum possible range 39-195). Our domain analysis showed that the main drivers of burden were: (i) cost-related burden (ii) concerns about medicines, and (iii) the lack of autonomy over medicine regimens. Multiple linear regression indicated significantly higher burden in those with low education level, 60-69 years-old, using ≥ 11 medicines, using medicines ≥ 3 times a day, Income per month (RMB) ≤ 3000 , and having higher monthly self-paid medication(RMB) ≥ 300 . Governments, health professionals and pharmacists should focus their interventions on these populations in order to reduce their medicines burden and help them make optimal

use of their medicines.

The results of this study show that participants scored higher on the cost burden domain, which may be related to their children's support and some medicines are not included in the medical insurance system. This is similar to the results of an American survey on the cost of daily medication for 8777 patients ≥ 65 years of age ^[30]. Thus, despite the long-term multi-drug elderly patients receiving medical insurance, the expensive medicines costs are still related to the medication burden. In addition, China's basic medical insurance system is affected by factors such as economic foundations and institutional settings, and has a certain degree of regionalization. Also some chronic diseases and related medicines are not covered by medical reimbursement. Therefore, the government should vigorously promote the rectification and reform of medical insurance ^[31], implement innovative outpatient chronic disease management, implement family doctors' contracted services, and the sound operation of chronic disease prescriptions ^[32].

The results of this study showed that the medication burden was heavier when the participants were 60-69 years old. This result is different from the other studies which found the older age have the lower the medication burden ^[24, 33]. The reason may be that the age of the patients included in this study is (73.57 ± 7.87) years old, older patients may take medication for a longer period of time and can better develop a strategy in line with self-medication habits; also, older patients have relatively low expectations of medicines treatment itself^[34], and have low perception of the impact of medicines interfering with their daily lives; some patients enjoy medical insurance policy subsidies, and the cost burden of medication is relatively light; some patients maintain good communication with medical staff^[35, 36].

When the participants' educational level and economic income were higher, the patients' multiple

medication burden level was lower, which may be related to their less economic burden, and the patients with higher education level would actively seek other medical resources, such as medication help and medication information^[37, 38]. Meanwhile, participants with high education level have higher health literacy and medication literacy level, which can improve the medication adherence^[36, 39].

Not surprisingly, high or frequent use of medicines was associated with higher C-LMQ-3 scores; multiple linear regression showed that there was an association ($P<0.001$) and higher scores between the use of ≥ 11 medicines per day or ≥ 3 times a day. The reason may be that when the patients use more kinds of medicines every day, more time, energy, emotion and money spent on medication practice management^[25, 40], such as medicine selection, medicine reserve, medicine-related precautions, medicine collocation taboo, medicine purchase that will aggravate their medication burden^[41, 42].

There are several strengths in our study. First, this is the first study to investigate the factors that influence the burden of medication in the long-term multi-medicines use of elderly patients with chronic diseases in Chinese mainland. Secondly, this study assessed the various aspects of medication burden of elderly patients with chronic diseases during the long-term use of multiple medicines, which can help us better understand the daily medication experience of patients. Third, health care providers can use this research to screen patients with chronic diseases who need medication and provide interventions to reduce the burden of medication. Fourthly, we used a validated tool of C-LMQ-3 to measure medication burden, which lends validity to the study results.

The limitations of our study should be acknowledged. First, a convenience sample of elderly participants with chronic disease was used which was drawn only from Zhengzhou community in China, Whether and to what extent they can represent other elderly patients with chronic disease population in

China remains to be determined. So may limit the generalizability of our findings. Second, our sample size was also limited, in future research, we need to conduct multi-center and large-sample studies in other regions of China to see if our survey results can be confirmed in other Chinese populations.

Conclusions

The results of this study show that elderly patients with chronic diseases in mainland China have a heavy burden of multiple medications, especially domains of cost-related burden, concerns about medicines, and the lack of autonomy over medicine regimens. Those elderly patients who with low education level, 60-69 years-old, using ≥ 11 medicines, using medicines ≥ 3 times a day, income per month(RMB) ≤ 3000 , and monthly self-paid medication(RMB) ≥ 300 have a higher burden of medication. This suggests that Chinese health care providers should focus on evaluating and paying attention to such patients, and formulate relevant intervention strategies to ensure medication adherence and daily medication management of elderly patients with polypharmacy use.

Abbreviations

C-LMQ-3: The Chinese version of Living with Medicines Questionnaire-3; WHO: World Health Organization; COPD: chronic obstructive pulmonary disease; DRPs: Drug Related Problems; LMQ: The Living with Medicines Questionnaire; VAS: visual analogue scale

Acknowledgments

We would like to thank all participants, researchers and community workers for their contributions to this work, and we are also grateful to Professor Janet Krska for his suggestions on the revision of this paper.

Authors' contributions

YW and ZZ drafted the outline of this study. YW, BL, BF, BQ were responsible for collecting the data. YW, XL, DJ, BF and BQ performed data management, and YW, ZZ, and XL performed the data analysis. All co-authors critically reviewed the first results. YW drafted the first manuscript, and ZZ, XL, DJ, BL, BF, and BQ gave critical feedback. All authors have read and approved the final manuscript.

Funding

This study was funded by Science and Technology Department of Henan Province (No. 182102310198), and General research project of Humanities and social sciences of Henan Provincial Department of Education (No. 2018-ZZJH-547) .

Availability of data and materials

The data set used and analyzed in this study can be obtained from the corresponding author according to relevant reasonable requirements.

Ethics approval and consent to participate

This study was approved by the Zhengzhou University ethical committee in China. During the investigation, we obtained the informed consent of the head of the community service center, all researchers and participants. We actively introduced the purpose and significance of this study to the participants, we also assured the participants that their responses would be anonymous and personal information confidential, prior to them signing the informed consent form. Also, the methods involved in our research are carried out in accordance with relevant guidelines and regulations (Declaration of Helsinki).

Consent for publication

Not applicable.

Consenting interests

The authors report no conflicts of interest in this work.

Author details

¹School of Nursing and Health, Zhengzhou University, No.100 Science Avenue, Zhengzhou 450001, Henan, China; ²Peking University People's Hospital, No.11 Xizhimen South Street, Xicheng Dist, Beijing 100044, China.

References

- [1] Affairs U N D O. World Population Ageing 2019. [EB/OL].[10.28]. <https://www.un.org/en/sections/issues-depth/ageing/>.
- [2] YAN Wei L Y Z R. Multimorbidity status of the elderly in China-research based on CHARLS data[J]. Chinese Journal of Disease Control & Prevention, 2019,23(4):426-430.
- [3] Yun C, Man X, Bing L, et al. Analysis on non-communicable chronic diseases status and its influencing factors among the elderly in the northwest part of Hubei Province[J]. Chinese Journal of Prevention and Control of Chronic Diseases, 2015,23(2):85-88.
- [4] Wang S B, D'Arcy C, Yu Y Q, et al. Prevalence and patterns of multimorbidity in northeastern China: a cross-sectional study[J]. Public Health, 2015,129(11):1539-1546.
- [5] Zhao Y, Atun R, Oldenburg B, et al. Physical multimorbidity, health service use, and catastrophic health expenditure by socioeconomic groups in China: an analysis of population-based panel data[J]. Lancet Glob Health, 2020,8(6):e840-e849.
- [6] R Z, Yun L, Shanshan Z, et al. Prevalence pattern and component correlation of chronic disease comorbidity among the elderly in China[J]. Chinese Journal of Public Health, 2019,25(8):1003-1005.
- [7] Xiaolan H. Investigation on the current situation of comorbidity of chronic diseases in the community[D]. Beijing: Capital medical university, 2015.

- [8] Abdulah R, Insani W N, Destiani D P, et al. Polypharmacy leads to increased prevalence of potentially inappropriate medication in the Indonesian geriatric population visiting primary care facilities[J]. *Ther Clin Risk Manag*, 2018,14:1591-1597.
- [9] Yang M, Lu J, Hao Q, et al. Does residing in urban or rural areas affect the incidence of polypharmacy among older adults in western China?[J]. *Arch Gerontol Geriatr*, 2015,60(2):328-333.
- [10] Morin L, Johnell K, Laroche M L, et al. The epidemiology of polypharmacy in older adults: register-based prospective cohort study[J]. *Clin Epidemiol*, 2018,10:289-298.
- [11] Mendonca P, Feitosa R P, Magalhaes S. The critical role of comorbidities and polypharmacy in lower risk myelodysplastic patients: is there any difference between countries?[J]. *Med Oncol*, 2018,35(11):143.
- [12] Gnjjidic D, Tinetti M, Allore H G. Assessing medication burden and polypharmacy: finding the perfect measure[J]. *Expert Rev Clin Pharmacol*, 2017,10(4):345-347.
- [13] Lai X X Z H W H. The current status and associated factors of medication compliance in the elderly undergoing polypharmacy[J]. *Chinese Nursing Management*, 2016,16(12):1624-1638.
- [14] Ulley J, Harrop D, Ali A, et al. Deprescribing interventions and their impact on medication adherence in community-dwelling older adults with polypharmacy: a systematic review[J]. *BMC Geriatr*, 2019,19(1):15.
- [15] Hanlon J T, Zhao X, Naples J G, et al. Central Nervous System Medication Burden and Serious Falls in Older Nursing Home Residents[J]. *J Am Geriatr Soc*, 2017,65(6):1183-1189.
- [16] Mohammed M A, Moles R J, Chen T F. Medication-related burden and patients' lived experience with medicine: a systematic review and metasynthesis of qualitative studies[J]. *BMJ Open*, 2016,6(2):e10035.
- [17] van der Laan D M, Elders P J M, Boons C C L M, et al. The impact of cardiovascular medication use on patients' daily lives: a cross-sectional study[J]. *International Journal of Clinical Pharmacy*, 2018,40(2):412-420.
- [18] Krska J, Morecroft C W, Rowe P H, et al. Measuring the impact of long-term medicines use from the patient perspective[J]. *International Journal of Clinical Pharmacy*, 2014,36(4):675-678.
- [19] Krska J, Katusiime B, Corlett S A. Validation of an instrument to measure patients' experiences of medicine use: the Living with Medicines Questionnaire[J]. *Patient Prefer Adherence*, 2017,11:671-679.
- [20] Katusiime B, Corlett S, Krska J. Development and validation of a revised instrument to measure burden of long-term medicines use: the Living with Medicines Questionnaire version 3[J]. 2018, Volume 9:155-168.
- [21] Krska J, Morecroft C W, Poole H, et al. Issues potentially affecting quality of life arising from long-term medicines use: a qualitative study[J]. *Int J Clin Pharm*, 2013,35(6):1161-1169.
- [22] Carter S R, Bulanadi M G, Katusiime B, et al. Comprehensibly measuring patients' subjective thoughts, feelings and experiences of living with medicines: the Living with Medicines Questionnaire (LMQ)[J]. *INTERNATIONAL JOURNAL OF CLINICAL PHARMACY*, 2015,37(2):424-425.
- [23] Wuyts J, Maesschalck J, De Wulf I, et al. Studying the impact of a medication use evaluation by the community pharmacist (Simenon): Patient-reported outcome measures[J]. *Research in Social and Administrative Pharmacy*, 2020.

- [24] Tordoff J M, Brenkley C, Krska J, et al. Exploring Medicines Burden Among Adults in New Zealand: A Cross-Sectional Survey[J]. *Patient preference and adherence*, 2019,13:2171-2184.
- [25] Krska J, Corlett S, Katusiime B. Complexity of Medicine Regimens and Patient Perception of Medicine Burden[J]. *Pharmacy*, 2019,7(1):18.
- [26] Wang Y, Krska J, Lin B, et al. Cross-Cultural Adaptation and Reliability Testing of Chinese Version of the Living with Medicines Questionnaire in Elderly Patients with Chronic Diseases[J]. *Patient Prefer Adherence*, 2020,14:2477-2487.
- [27] LIU Fei L Y C Q. Investigation of the affordability of chronic diseases drug use in families from three provinces in Western China[J]. *Chinese Journal of Health Policy*, 2017,10(12).
- [28] Faul F, Erdfelder E, Buchner A, et al. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses[J]. *Behav Res Methods*, 2009,41(4):1149-1160.
- [29] Braitman L E. Statistical power analysis in medical research[J]. *Ann Intern Med*, 1983,99(2):269-271.
- [30] Burcu M, Alexander G C, Ng X, et al. Construct validity and factor structure of survey-based assessment of cost-related medication burden[J]. *Med Care*, 2015,53(2):199-206.
- [31] XinChun Z, RuiHong Z, Qingwen Q, et al. Discussion on Chronic Diseases Management from Perspective of Medical Insurance[J]. 2018,31(2):42-44.
- [32] Hongmei Y, Jing W, Junhua Z. Analysis of chronic disease long prescription in Shanghai based on the stakeholders theory[J]. *Chinese Hospitals*, 2016,20(4):52-54.
- [33] Krska J, Katusiime B, Corlett S A. Patient experiences of the burden of using medicines for long-term conditions and factors affecting burden: A cross-sectional survey[J]. *Health & Social Care in the Community*, 2018,26(6):946-959.
- [34] Ulley J, Harrop D, Ali A, et al. Deprescribing interventions and their impact on medication adherence in community-dwelling older adults with polypharmacy: a systematic review[J]. *BMC Geriatr*, 2019,19(1):15.
- [35] Weir K, Nickel B, Naganathan V, et al. Decision-Making Preferences and Deprescribing: Perspectives of Older Adults and Companions About Their Medicines[J]. *J Gerontol B Psychol Sci Soc Sci*, 2018,73(7):e98-e107.
- [36] Gomes D, Placido A I, Mo R, et al. Daily Medication Management and Adherence in the Polymedicated Elderly: A Cross-Sectional Study in Portugal[J]. *Int J Environ Res Public Health*, 2019,17(1).
- [37] Beuscart J B, Petit S, Gautier S, et al. Polypharmacy in older patients: identifying the need for support by a community pharmacist[J]. *BMC Geriatr*, 2019,19(1):277.
- [38] Cutler R L, Fernandez-Llimos F, Frommer M, et al. Economic impact of medication non-adherence by disease groups: a systematic review[J]. *BMJ Open*, 2018,8(1):e16982.
- [39] Zhong Z, Zheng F, Guo Y, et al. Medication Literacy in a Cohort of Chinese Patients Discharged with Acute Coronary Syndrome[J]. *Int J Environ Res Public Health*, 2016,13(7).
- [40] WANG Yongli, LUAN Wenyan, GUO Yawen, et al. Multiple Medication Experience of Elderly Patients with Multimorbidity at Home:a Qualitative Study[J]. *Chinese General Practice*, 2020,23(17):2197-2202.
- [41] Wimmer B C, Cross A J, Jokanovic N, et al. Clinical Outcomes Associated with Medication Regimen Complexity in Older People: A Systematic Review[J]. *J Am Geriatr Soc*, 2017,65(4):747-753.

[42] Swain L, Barclay L. They've given me that many tablets, I'm bushed. I don't know where I'm going: Aboriginal and Torres Strait Islander peoples' experiences with medicines[J]. Aust J Rural Health, 2013,21(4):216-219.

TABLE1 Demographic characteristics of participants (n=430)

Characteristic	n(%)	score ($\bar{x}\pm s$)	<i>t</i> / <i>F</i> value	<i>P</i>
Age(years)				
60~	116(27.0)	113.53±9.39	7.624 ^b	0.001
70~	216(50.2)	114.34±11.80		
80~	98(22.8)	109.13±11.39		
Gender				
Male	164(38.1)	112.17±11.08	-1.094 ^a	0.274
Female	266(61.7)	113.39±11.38		
Education level				
Primary school or less	69(16.0)	116.62±10.29	12.168 ^b	<0.001
Middle school	166(38.5)	115.28±10.35		
High school	136(31.6)	110.45±11.02		
College or above	59(13.7)	107.71±12.41		
Marital status				
Unmarried	3(0.7)	118.67±7.51	1.136 ^b	0.334
Married	313(72.6)	112.99±11.01		
Divorce	10(2.3)	107.20±11.60		
Widowed	104(24.1)	113.13±12.02		
Primary caregiver				
Spouse	138(32.0)	112.12±8.84	2.984 ^b	0.019
Child	154(35.7)	111.53±10.21		
Nursing workers	39(9.0)	114.67±15.15		
No	86(20.0)	116.22±13.63		
Other	13(3.0)	111.00±12.28		
Income per month(RMB)				
<2000	83(19.3)	116.93±10.13	17.315 ^b	<0.001
2000~	149(34.6)	115.83±11.20		
3000~	135(31.3)	110.01±10.06		
>4000	63(14.6)	107.03±11.37		
Living status				
Lives with spouse only	233(54.1)	113.31±10.23	0.199 ^b	0.897
Lives with children only	84(19.5)	112.58±12.46		
Lives with both spouse and children	70(16.2)	112.33±11.86		
Lives alone	43(10.0)	112.51±13.38		
Health conditions(diagnoses)				
High blood pressure	362(84.0)	112.95±11.37	-0.095	0.924
Stroke	199(46.2)	113.20±11.22	-0.466	0.641
Diabetes	255(59.2)	113.73±11.22	-1.794	0.074

Hyperlipidemia	281(65.2)	111.99±19.70	2.385	0.022
Coronary heart disease	254(58.9)	112.30±10.74	1.383	0.176
Chronic obstructive pulmonary disease	134(31.1)	115.22±10.72	-2.867	0.004
Number of medicines				
5~10	174 (40.4))	109.71±10.31	25.901 ^b	<0.001
11~15	203 (47.1))	113.41±11.15		
>15	53 (12.3)	121.66±9.86		
Frequency of medicines				
Once per day	49(11.4)	105.16±9.97	16.367 ^b	<0.001
Twice per day	91(21.1)	110.36±11.49		
Three per day	224(52.0)	114.16±10.71		
More than three times per day	66(15.3)	118.06±10.09		
Monthly self-paid medication(RMB)				
<100	44(10.2)	104.20±9.69	13.573 ^b	<0.001
100~	98(22.7)	110.28±9.93		
300~	128(29.7)	113.64±11.57		
500~	129(29.9)	115.89±10.12		
800~	31(7.2)	118.42±12.37		

Tips:a represents T value; b represents F value

TABLE 2 Responses to individual statements in the C-LMQ-3 and 8 domains score (n=430)

Statements /domains	Agree/ Strongly Agree N (%)	Neutral opinion N (%)	Disagree/ Strongly Disagree N (%)
Practical difficulties (6 items; Mean (SD)=17.2 (2.5))			
I find getting my prescriptions from the doctor difficult	113 (26.2)	134(31.2)	183(42.6)
I am comfortable with the times I should take my medicines	262(60.9)	93(21.6)	75(17.5)
I am concerned that I may forget to take my medicines	207(48.1)	132(30.7)	91(21.2)
It is easy to keep my medicines routine	250(58.1)	123(28.6)	57(13.3)
I find using my medicines difficult (eg: taking the medication from the package, keeping in mind the precautions for medication use, etc.).	216(50.2)	71(16.5)	143(33.3)
I have to put a lot of planning and thought into taking my medicines	107(24.9)	163(37.9)	160(37.2)
lack of effectiveness (5 items; Mean (SD)=13.3 (2.6))			
My medicines prevent my condition getting worse	219(50.9)	160(37.2)	51(11.9)
My medicines live up to my expectations	208(48.4)	164(38.1)	58(13.5)
My medicines allow me to live my life as I want to	205(47.7)	102(23.7)	123(18.6)
My medicines are working	232(54.0)	114(26.5)	84(19.5)
The side effects are worth it for the benefits I get from my medicines	181(42.1)	159(37.0)	90(20.9)
Cost-related burden (3 items; Mean (SD)=9.4 (2.3))			
I worry about paying for my medicines	229(53.3)	91(21.1)	110(25.6)
I sometimes have to choose between buying basic essentials or medicines	103(24.0)	143(33.3)	184(42.8)
I have to pay more than I can afford for my medicines.	167(38.8)	161(37.4)	102(23.8)
Communication/relationships with HCPs (5 items; Mean (SD)=13.6 (3.4))			
I trust the judgement of my doctor(s) in choosing medicines for me.	293(68.1)	49(11.4)	88(20.5)
My doctor(s) listen to my opinions about my medicines	218(50.7)	99(23.0)	113(26.3)
My doctor takes my concerns about side effects seriously.	164(38.1)	145(33.7)	121(28.1)
I get enough information about my medicines from my doctor(s)	256(59.5)	90(21.0)	84(19.5)
The health professionals providing my care know enough about me and my medicines	159(37.0)	160(37.2)	111(25.8)
Concerns about medicine use (7 items; Mean (SD)=21.8 (4.1))			
I worry that I have to take several medicines at the same time	213(49.5)	73(17.0)	144(33.5)
I would like more say in the brands of medicines I use	203(47.2)	70(16.3)	157(36.5)
I feel I need more information about my medicines	204(47.4)	138(32.1)	88(20.5)
I am concerned about possible damaging long-term effects of taking medicines	194(45.1)	50(11.6)	186(43.3)
I am concerned that I am too reliant on my medicines	178(41.4)	129(30.0)	123(28.6)
I am concerned that my medicines interact with eating habits (other food, alcohol, drinks, etc.).	101(23.5)	129(30.0)	200(46.5)
I worry that my medicines may interact with each other	150(34.9)	171(39.8)	109(25.3)

Side-effect-burden (4 items; Mean (SD)=11.9 (1.9))			
The side effects I get are sometimes worse than the problems for which I take my medicines	205(47.7)	152(35.3)	73(17.0)
The side effects that I get from my medicines interfere with my day to day life	143(33.3)	149(34.7)	138(32.1)
The side effects I get from my medicines are bothersome	147(34.2)	173(40.2)	110(25.6)
The side effects I get from my medicines adversely affect my wellbeing	70(16.3)	106(24.6)	254(59.1)
Interference to day-to-day life (6 items; Mean (SD)=17.4 (2.6))			
My medicines interfere with my social or leisure activities	109(25.3)	256(59.6)	65(15.1)
Taking medicines affects my going out (walking, Cycling, driving, etc.)	81(18.8)	159(37.0)	190(44.2)
My medicines interfere with my social relationships with (family, friends, colleagues)	64(14.9)	132(30.7)	234(54.4)
Taking medicines causes problems with daily tasks	135(31.4)	218(50.7)	77(17.9)
My medicines interfere with my sexual life	79(18.4)	135(31.4)	216(50.2)
My life revolves around using medicines	170(39.5)	193(44.9)	67(15.6)
Autonomy/control (3 items; Mean (SD)=8.5 (2.2))			
I can vary the dose of the medicines I take	231(53.7)	133(30.9)	66(15.4)
I can choose whether or not to take my medicines	181(42.1)	100(23.3)	149(43.6)
I can vary the times I take my medicines	154(35.8)	147(34.2)	129(30.0)

TABLE3 The top 10 items with the highest scores in C-LMQ-3.

Item	score ($\bar{x} \pm s$)	sort
3. I worry about paying for my medicines	3.37 ± 1.05	1
7. I feel I need more information about my medicines	3.37 ± 0.94	2
19. The side effects I get are sometimes worse than the problems for which I take my medicines	3.33 ± 0.78	3
8. I am concerned that I may forget to take my medicines	3.31 ± 0.92	4
39. My life revolves around using medicines	3.28 ± 0.78	5
4. I worry that I have to take several medicines at the same time	3.24 ± 1.07	6
31. I have to pay more than I can afford for my medicines.	3.22 ± 0.94	7
27. I find using my medicines difficult (eg: taking the medication from the package, keeping in mind the precautions for medication use, etc).	3.20 ± 0.95	8
6. I would like more say in the brands of medicines I use	3.18 ± 1.24	9
34. My medicines interfere with my social or leisure activities	3.16 ± 0.76	10

TABLE4 Multivariable stepwise linear model analysis for the association with the multiple medicationburden among elderly patients with chronic diseases (n= 430)^a

Variables((Reference)	β	<i>SE</i>	<i>t</i>	<i>P</i>value
Age(per 10years)	-2.044	0.637	-3.211	0.001
Education(College or above)	-1.960	0.534	-3.671	<0.001
Income per month(RMB>4000)	-1.799	0.513	-3.508	<0.001
Types of medicines(>11)	3.728	0.685	5.441	<0.001
Monthly self-paid medication(RMB>800)	2.125	0.423	5.022	<0.001
Frequency of medicines(≥ 3 times daily)	3.213	0.532	6.043	<0.001
Constant	101.03	4.108	24.596	0.000

 $R^2 = 0.345$, Adj $R^2 = 0.329$; $F = 10.31$, $P < 0.0001$

^aAdjustment for age (60-69,70-79, ≥ 80), education level (Primary school or less, Middle school, High school, College or above), Income per month(RMB) (<2000,2000~,3000~,>4000), Types of medicines (5~10,11~15,>15), Frequency of medicines (Once per day, Twice per day, Three per day, More than three times per day), Monthly self-paid medication(RMB)(100,100~,300~,500~,800~)and other variables in the models.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Relatedtables.pdf](#)