Review Article

Relationship among older people living alone, hypertension and depression: a systematic review

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Abstract

Purpose

The purpose of this study was to clarify the association among older people living alone, hypertension and depression.

Methods

A systematic search was performed using the following key words: aged, living alone, depression and hypertension. And the evidence level was graded to analyze the relevant studies.

Results

The systematic search identified 5 studies that met the inclusion criteria. RCT Study was used in one II-level study. Cohort study was used in one IVa-level study. Cross-sectional study was used in two IVb-level studies. Case-control study was used in one IVb-level study. The 2 studies from China were aimed at the older people with hypertension, while the participants in the other 3 studies were general older people.

Conclusions

Limited studies were identified by the systematic research and the relationship among older people living alone, hypertension and depression were not clear. Thus, it is necessary to study the association among 3 factors in the further study.

Keywords: depression, hypertension, living alone, older people

Introduction

The pace of population aging is much faster than in the past. The number of people aged 60 years or older will rise from 900 million to 2 billion between 2015 and 2050 (increasing from 12% to 22% of the total global population).[1)] Although the prevalence of people living alone during later life varies widely across different countries, the increasing number of older people who live alone has been one of the noticeable population changes globally.[2)]

Older people face special physical health challenges that need to be recognized, and living alone may contribute to poor management for these problems. Taking hypertension as an example, an analysis for 12 high-income countries showed that prevalence of hypertension in older people ages 70–79 years ranged from 61% to 82% in women, and from 55% to 77% in men.[3)] Another study showed that from 42.6% to 79.8% of those aged 65 years or over have hypertension among 8 developing country.[4)] In previous studies that explored correlates of hypertension in older people, the group living alone was found to have worse treatment and control of hypertension than did people who were married or living with others and needed more long-term care.[5)]

Besides physiological diseases, approximately 15% of adults aged 60 or over suffer from mental disorders. Unipolar depression occurs in 7% of the general older population and accounts for 5.7% of years lived with disability (YLDs) among those aged older than 60 years.[6)] Meanwhile, other research showed that older people living alone had elevated levels of depressive symptomatology compared to those living with family members.[7)]

Mass data indicate that older people living alone, hypertension, and depression are neither small problems nor separate issues. Thus, the aim of the current study was to define current research results of the correlation between the three factors, as well as the part remains unclear and the future research contents based on a systematic review.

Methods

1. *Databases and keywords*

A systematic search was performed using 6 electronic databases: Japan Medical Abstracts Society (JAMAS), Citation Information by NII (CiNii), Ministry of Health, Labour and Welfare (MHLW), Dia's Library on Social Gerontology (DiaL), PubMed, and China National Knowledge Infrastructure (CNKI). In the PubMed, we used the search terms "aged", "living alone", "hypertension" and "depression". We searched CNKI (a Chinese database) for articles published in China, studies were selected if they included the keywords "老年人", "独居", "高血压" and "抑郁". In the Japanese databases（JAMAS, CiNii, DiaL and MHLW), studies were reviewed if they included the keywords "高齢者", "ひとり暮らし", "高血圧" and "抑うつ" (Table 1).

2. *Exclusion criteria*

Case reports, conference abstracts, commentaries are excluded as well as the original research articles that did not investigate for living alone, hypertension or depression. Original research articles were also excluded if the participants were aged younger than 60 years.

3. *Evidence level*

The evidence level was graded using the Minds Medical Guidelines (Table 2). [8)]

Results

1. *Search results*

No relevant articles were found in the Cochrane Library as a result of a search using the above key words. Otherwise, 25 studies were identified (Table 1). According to the title review, abstract review, and full-text review to assess the eligibility of these studies, 5 studies met the inclusion criteria for this review (Fig. 1). The studies were critically reviewed and assessed for the validity of their findings. Referring to the abstracts, we summarized the 5 studies in a table (Table 3).

Table 1. Literature based on 4 keywords in the database

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Keywords	JAMAS	CiNii	MHLW	DiaL	PubMed	CNKI
1. aged/高齢者/老年人	1253705	112696	3220	4250	2855798	158423
2. living alone/ひとり暮らし/独居	3884	336	8	28	9941	10410
3. hypertension/高血圧/高血压	169196	35558	1127	108	109562	344395
4. depression/抑うつ/抑郁	28532	6033	342	204	80543	89976
A. 1＋2	2671	174	6	24	2093	474
B. A＋3	23	0	0	1	87	18
C. B＋4	2	0	0	0	18	5

Table 2. The Minds Medical Guidelines

I.	Systematic Review / Meta-analysis of randomized controlled trials（RCT）
II.	One or more randomized controlled trials
III.	Non-randomized controlled trials
IVa.	Analysis Epidemiological study (Cohort study)
IVb.	Analysis Epidemiological study (Case-control study, Cross-sectional study)
V.	Description study
VI.	Experts committee reports

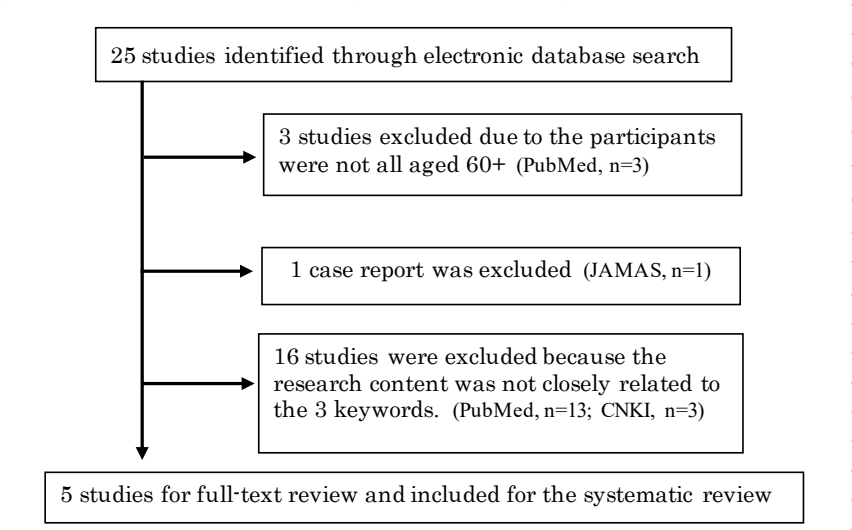

Fig.1. Flowchart of selection processes

Table 3. The abstract table of summarizing

	Study Designs	Database，year	Author, country	Participants	Methods	Findings	Evidence level
1	RCT	PubMed 2014	Stijnen M *et al.*, Netherla-nds	N=1742 F: 34.5% M: 65.5% Age: 82.5±4.5 La: 60.2% High systolic BP: 47.5% High diastolic BP: 8.59%	Questionnaire & Interview; Depression：Self-evaluation in psychological/ mental problems; HTN：Self-evaluation in physical problems	●The most frequently detected problems among older people were physical problems: dependency in ADL, undesired weight loss, underweight (all $p<0.001$),high systolic blood pressure ($p=0.145$), high diastolic blood pressure($p=0.376$), overweight ($p=0.014$), decreased appetite($p=0.002$); psychological/mental problems: depressive complaints, memory problems, personality disorder and anxiety (all $p<0.001$) ; social problems(loneliness, unsatisfied with daily life(all $p<0.001$) and life problems: insufficient physical activity ($p<0.001$) ●More problems were detected among women, higher age groups, those living alone and less educated (all $p<0.001$). [11]	II
2	Cohort study	PubMed 2014	Corrao S *et al.*, Italy	N=1380, F: 50.5% M: 49.5% Age:78.1~79.4 La: 23.5% Hypertension (HTN): 78.7%	Questionnaire; Depression: GDS; HTN：Information from medical records	●Disease distribution showed that malignancy(p＜0.0001), diabetes(p=0.0004), coronary artery disease(p＜0.0001), chronic kidney disease(p＜0.0001) and chronic obstructive pulmonary disease(p=0.0001) were more frequent in men, while hypertension(p=0.05), osteoarthritis (p<0.0001) anemia(p=0.05) and depression(p=0.01) were so in women. ●Women were more frequently widow and living alone than men (p＜0.001). [19]	IVa

3	Case-control study	CNKI 2014	Yafang Wu, China	N=961, F:57.4% M:42.6% Age:60.0~90.0 La: 20.1% HTN: 100%	Questionnaire & Interview; Depression: Patient Health Questionnaire Depression Module(PHQ-9); HTN: Information from medical records	●Female (OR=1.718, *p*=0.001), numbers of children (OR=3.619, *p*=0.001) were risk factors of depressive symptoms in hypertensive older people. ●Diabetes (OR=2.705, *p*=0.018), ADL (OR=6.054, *p*=0.016) and negative life events (OR=16.403, *p*=0.000) were risk factors of depression symptoms among older people with hypertension. [16]	IVb
4	Cross-sectional study	JAMAS 2015	Sumida H *et al.*, Japan	N=577, F: 54.8% M: 45.2% Age: 74.5±6.1 La: 15.4% HTN: 45.4%	Questionnaire； Depression: GDS; HTN: Self-evaluation	●Life satisfaction was positively correlated with subjective sense of well-being (*p*=0.000, VIF= 1.351) , hypertension (*p*= 0.001, VIF= 1.357), social supports (*p*=0.004,VIF= 1.233), love for the region(*p*= 0.001, VIF= 1.186), no medical problems(*p*= 0.018, VIF= 1.481) and the negatively correlated with neuroticism (*p* = 0.000, VIF= 1.233) and stress (*p*= 0.000, VIF= 1.165). ●The risk factors for depression were living alone (OR= 3.51, *p*=0.009) neuroticism (OR= 2.08, *p*=0.000), stress (OR=2.07, *p*=0.047), and the improvement factors were subjective sense of well-being(0R = 0.48, *p* =0.003), hobby(OR= 0.72, *p*=0.000), fine views(OR= 0.81, *p*=0.001) and sociability(OR= 0.77, *p*=0.017) [9]	IVb
5	Cross-sectional study	CNKI 2018	Yanche-ng Liu *et al.*, China	N=212, F: 54.2% M:45.8% Age: 75.1±6.2 La: 15.6% HTN: 100%	Questionnaire & Interview; Depression：Hamilton Depression Scale-24 item (HAMD-24); HTN：Information from medical records	The risk factors of depression in older people hypertensive patients included living alone (OR=6.253, $p<0.01$) and malnutrition (OR=4.835, $p<0.01$). [10]	IVb

F, female; GDS, Geriatric Depression Scale; HTN, hypertension; La, living alone; M, male; VIF, variance inflation factor.

2. *Evidence level*

An RCT Study was used in one II-level study. A cohort study was used in one IVa-level study. A cross-sectional study was used in two IVb-level studies. A case-control study was used in one IVb-level study.

3. *Participants*

In the all studies, the number of women was greater than that of men. All the participants were aged 60 or over (2 studies: 60 years or over; 2 studies: 65 years or over; 1 study: 75 years or over). Participants in the all studies included older people living alone and those who were not living alone.

In 3 of the studies, older participants with psychosis or cognitive impairments were excluded. The participants in both studies from China were older people with hypertension, while remaining 3 studies didn't set screening criteria except age for the participants.

4. *Methods*

Two studies used a questionnaire, and three studies used both face-to-face interview with a questionnaire.

5. *Items and Scale*

All the studies surveyed social demographic variables including age, gender, living status, and marital status. And some of the studies surveyed other factors such as education level, profession, income, number of children, physical problems, smoking, and drinking status.

For the measurement scale of hypertension, 2 studies based on self-evaluation results in the questionnaire, while the other 3 studies based on the information from the medical records.

For the measurement scale of depression, 2 studies used the Geriatric Depression Scale (GDS) to evaluate depression; 1 study, the Patient Health Questionnaire Depression Module (PHQ-9); and 1 study, the Hamilton Depression Scale-24 item (HAMD-24) by clinicians. All these scales can measure depressive symptoms, but only the GDS is a depression scale appropriate for older people.

6. *Findings*

The results from 5 studies showed that depression was related to factors such as living alone, neuroticism, stress, gender, number of children, diabetes, ADL, negative life events, and malnutrition. The differences between men and women were shown to be significant, with women being more prone to depression. However, limited studies have been conducted on the relationships among older people living alone, hypertension, and depression.

Discussion

1. *Relationship among living alone, depression and hypertension*

According to this systematic review, a great quantity of studies contained one or more keywords of living alone, depression, or hypertension. However, there were only a small number of studies related to all the 3 keywords, and only 5 studies met the inclusion criteria for review. Among the 5 studies, 2 studies came to the same conclusion that living alone was a risk factor of depression.[9,10] Yancheng Liu et al (2018) focused on factors affecting depression in older people with hypertension and showed that the presence of depressive symptoms for older people with hypertension was associated with living alone.[10] Unfortunately, the study had not compared the effects of living alone on depression in older people with or without hypertension, since the respondents in the study were all hypertensive older people.

Besides the 5 articles selected into review, there are also some studies on the correlation between two of living alone, hypertension and depression. Living alone was likely strictly related to an increased prevalence of hypertension.[11,12] Older people living alone may not be able to identify health problems in time, which contributes to poor management of hypertension. Previous studies have

also indicated that the prevalence of depression was found to be significantly higher among people with a history of chronic disease than among those without it.[13,14,15] Hypertension is a chronic disease with complex pathogenesis, which takes a long time to treat and may cause recurrent illnesses. Yafang Wu (2014) showed that hypertension increased the incidence of depression in the older people. [16] However, evidence that supporting the relationship between depression and hypertension or addressing the relationship between depression and hypertension control in hypertensive populations remained inadequate.

To summarize, there was a certain correlation between any two of living along, hypertension and depression. Though causal links among the three factors were impossible to prove from our review, we assumed that the three factors were not separately functional when they exist simultaneously. Thus we need to explore whether there are interactive triangle relations between the three factors.

2. *Differences between countries*

In the review, we analyzed 5 studies from Japan, China, Italy and Netherlands. We found fairly different results regarding the relationships among older people living alone, hypertension, and depression between China and three other countries. The 4 countries have entered periods of population ageing, however, in terms of the share of older people living alone, life expectancy, healthy life expectancy, and pension coverage, developed countries (Japan, Italy and Netherlands) obviously have higher shares than China (Table 4). A good few studies have found that living alone is a risk factor for depression.[9,10] Nevertheless, Yafang Wu (2014) didn't get the correlation between living alone and depression, but found that the number of children has an impact on prevalence of depression,[16] while the latter is only reported in China.[16,17,18] The study also declared that the subjects surveyed are close to their children and have more contact with their children,[16] so further study was needed to prove

Table 4. Characteristics of 4 countries

Country	The population over 60 (2015) [22]	The share of older people living alone (2015)	Life expectancy (2015) [22]	Healthy life expectancy (2015) [22]	Pension coverage [22] (65+, 2015)	Prevalence of hypertension [26] (ages 18+, 2015)	Depressive disorders [28]
Japan	33.1%, 41.9 million	26.3% [23]	86	80.3	98%	17.6%, Female: 73.2% Male: 80.6%, (70+, 2010) [27]	4.2%
China	15.2%, 209.2 million	9.63% [24]	79	76.8	74%	19.2%, 60+: 66.9% (2016) [4]	4.2%
Netherlands	24.5%, 4.2 million	32.2% [25]	84	77.8	100%	18.70%	4.7%
Italy	28.6%, 17.1 million	30.7% [25]	85	78.5	81%	21.20%	5.1%

the conclusion. We assume that differences in the sociocultural or socioeconomic context, as well as in the situations of the older people among countries, might be key factors to explain the differences in research results. Besides, because the number of older people individuals with hypertension or physical or mental conditions of the older people differs by country, whether the same correlation can be concluded remains unknown. Therefore, especially for countries other than China, the number of children is also a good indicator that should be selected in the future research about living alone, hypertension, and depression.

3. *Gender Difference*

In the ageing population, gender differences are known to exist in terms of various aspects. Older people women had a higher tendency than older people men to be widowed, which is likely because women have a longer life expectancy.[19,20] Moreover, according to the systematic review, women are more prone to depression.[9,16,19] Corrao S et al (2014) showed that women were more likely to be affected by hypertension than men.[19] Controversially, another study found no differences in the prevalence of hypertension between men and women.[21] Future researches need to pay more attention to the gender option, including the relationship between gender and hypertension.

Conclusion

According to the analysis and discussion above, the following conclusions may be drawn:

(1) The numbers of researches including all three factors (older people living alone, hypertension, and depression) simultaneously were limited, as well as their evidence level were relatively low.

(2) While the correlation between living alone and depression has already been proven by existing research results, the association of hypertension and depression has not been completely established as well as the correlation between hypertension and living alone.

(3) The interrelation of all 3 factors remained unclear from the current researches. Future research could focus on how one dose affect the other two when three factors exist at the same time.

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令和 1 年　7 月 11 日　　受付
令和 1 年 10 月 24 日　採用決定