BMJ Open

Knowledge, attitude and self-efficacy of elderly caregivers in Chinese nursing homes: a cross-sectional study in Liaoning province

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029869
Article Type:	Research
Date Submitted by the Author:	19-Feb-2019
Complete List of Authors:	Zhang, Huijun; Tianjin University, School of Pharmaceutical Science and Technology; Jinzhou Medical University, School of Nursing Sun, He; Tianjin University,
Keywords:	knowledge, attitude, self-efficacy, elderly caregivers, nursing homes, China

Knowledge, attitude and self-efficacy of elderly caregivers in Chinese nursing homes: a cross-sectional study in Liaoning province

Huijun Zhang

Affiliated institution: 1, School of Pharmaceutical Science and Technology, Tianjin University, Tianjin, China; 2, School of Nursing, Jinzhou Medical University, Jinzhou, Liaoning province, China

E-mail: 13904069606@163.com

He Sun （Corresponding author）

Affiliated institution: School of Pharmaceutical Science and Technology, Tianjin University, Tianjin, China

E-mail: 18768429445@163.com

Abstract

Objectives The purpose of this study is to assess the knowledge, attitude and self-efficacy of elderly caregivers in nursing homes and identify demographic characteristics and work environment factors influencing these attributes.

Setting A cross-sectional questionnaire survey was conducted on twelve nursing homes in Liaoning province, China.

Participants A total of 403 caregivers from 12 nursing homes were surveyed.

Outcome measures A Self-administered questionnaire composed of the Palmore's Facts on Aging Quiz I, the Kogan's Attitude Old People Scale, Generalized Self-efficacy Scale and background characteristics of participants was used for data collection. An average score for knowledge, attitude and self-efficacy was calculated. In addition, these scores were tested the differences across the different groups with adaptation of Student's t-tests and analysis of variance. Multivariate linear regression models were established to estimate the associated factors.

Results The participating caregivers reported an average rating score of 10.42±2.79, 127.85±14.36, and 27.12±4.9 for knowledge, attitude and self-efficacy, respectively. Multivariate regression analysis showed respondents with high-level educational level (β=0.232, p=0.018), receiving pro-job training (β=0.196, p<0.05) and high job satisfaction (β=0.358-0.370, p<0.01) gave a positive rating on knowledge. The gender (β=-0.112, p=0.026) and work experience (β=-0.130, p<0.05) had negative associations with attitude toward the old. A positive association appeared for those employed as establishment staff (β=0.136, p=0.012), with high income (β=0.214, p<0.001) and an interest in working with the elderly (β=0.191, p<0.05). Regarding self-efficacy, factors included age (β=0.205, p=0.002), pro-job training (β=0.165, p=0.002), interest in working with old adults

(β=0.154, p=0.013), job satisfaction (β=0.174, p<0.05) and health status of the old (β=0.290-0.447 $p\leq$0.001).

Conclusion

Identified associated factors varied across knowledge, attitude and self-efficacy of elderly caregivers in Chinese nursing homes. Some efforts related to improving continuing education and income for caregivers should be given priority.

Strengths and limitations of this study

- This study is among the first to understand perception of caregivers in Chinese nursing homes on knowledge about aging, attitude toward the old and self-efficacy.
- Multivariate linear regression models were established, identifying multi-faceted factors associated with caregivers-perceived knowledge, attitude and self-efficacy.
- Using widely accepted scales (FAQ 1, KAOP and GSE) for data collection made results of present study more reliable.
- The samples of this study were collected from only one province located in the northeastern region of China. Caution needs to be taken when generalizing the findings to other regions of China.

Introduction

The phenomenon of the ageing population is highlighted around the world, especially in China. According to the National Bureau of Statistics of China (2017), the elderly population aged 60 and over has reached 240 million, accounting for 17.3% of the total population[1 2]. By 2050, the number of people aged 60 years and older in China is expected to reach 450 million, accounting for 33% of its total population[3]. China will become the country with the largest number of elderly people in the world. With the acceleration of aging, needs for long-term care have increased dramatically.

Influenced by Chinese traditional culture, elderly people prefer to live with their children, and taking care of the elderly is regarded as the responsibility of the family[4]. However, increasing migration from rural to urban areas, especially among young people, and the shrinking average family size due to China's one-child policy have changed mainstream informal family-based caregiving model for older adults[5 6]. Consequently, demands for nursing homes (NHs) has increased dramatically.

In order to cope with the demands for aged care, the State Council of China issued guidelines on accelerating the development of the aged care service industry in 2013 to support the development of NHs. To date, there are 155,000 different type of NHs across Mainland China including old age homes, retirement departments, residential care facilities, welfare institutes, and geriatric hospitals. However, workforce in NHs are poorly developed and under-prepared[3]. In addition, most health

workers working in Chinese NHs received little training in nursing and caregiving skills, thus resulting in quality of health care provided for the elderly is not guaranteed[7 8]. Although Chinese government launched "Basic Standards for Service Quality of Aged Agencies" in 2017, quality of health care in NHs still varied a lot [9]. Providing appropriate health care for old adults in NHs has become a great challenge for development of the aged care in China.

Elderly caregivers in NHs, as the front-line health care workers, spend much time with the old people and have a direct effect on health care delivery[10]. Previous studies suggested that knowledge, attitude of caregivers about the elderly and their self-efficacy were associated with quality of health care[11-13]. Negative attitude toward older people, a lack of knowledge about the elderly and low-level self-efficacy created an adverse impact on provision of health care behavior and ultimately lead to bad health outcomes[14-16]. Therefore, improving knowledge, attitude and self-efficacy of caregivers is widely recognized as beneficial attempts for providing high-quality aged care services.

Many studies conducted in western countries revealed social workers, health care workers and nursing students had a bad attitude, misconception, inadequate knowledge and lowest priority to consider working with the older[17-19]. However, there is paucity in the literature involved in low- and middle-income Asian countries, including China. Furthermore, there are great practical significance to understand knowledge, attitude and self-efficacy of elderly caregivers in NHs with a sharp increase in demand for aged care in China.

The aim of this study is to investigate the perceptions of caregivers on knowledge about aging, attitude toward the elderly and self-efficacy and identify their associated factors using sample of Liaoning province.

Method

Setting and sampling

A cross-sectional quantitative survey was conducted on Liaoning province located in the northeastern region of China with the population over 60 years old accounts for 22.65% of the total population[20].

We adopted a multistage sampling strategy. Firstly, three cities were selected from three different geographical zones: Shenyang representing central, Jinzhou representing western and Dandong representing eastern. Then, four NHs (two for large size, two for small size) were selected in each city. Due to the different size in selected NHs, we planned to sample about 30 caregivers for small one and 50 caregivers for large one.

Data were collected over the period from November 1, 2015 to May 31, 2016. Two to four trained investigators assigned to each selected nursing home were required to invite caregivers working in different departments. The participants were asked to read the informed consent letter and gave oral consent before they filled out the questionnaires. We approached potential participants across the entire working time to maximize the chance of capturing a representative sample.

Due to fact there is no standardized definition for NHs in Mainland China, nursing homes in this study were included in residential long-term care facilities in Mainland China that mainly admit people who are 60 years and older. The caregivers who provided direct care for the elderly were eligible to participate in this study. Participants have worked in the selected NHs for more than one year and they are voluntarily participated in the survey.

Ultimately, about 800 caregivers were invited to participate this investigation, and 480 participants (60.0%) were volunteer to filled in and returned the questionnaire. After excluding questionnaires

with uncompleted key item, 403 (83.9%) left were valid for the data analysis. This sample size would be large enough for us to perform multivariate linear regression analyses for a model containing 18 dichotomous independent variables (table 1).

Measurement

We adopted Palmore's Facts on Aging Quiz I (FAQ 1), the Kogan's Attitude Old People Scale (KAOP) and Generalized Self-efficacy Scale (GSE) to measure knowledge, attitude toward the elderly and self-efficacy of nurses. In addition, the information about characteristics of the caregivers and their work environment were also collected by a self-developed questionnaire.

Facts on Aging Quiz I (FAQ I) developed by Palmore (1990) has been widely used to assess the subjects' physical, mental and social knowledge about aging, as well as some of the most common misconceptions about aging[17 21]. FAQ 1 is composed of 25 statements, for example "old people tend to react slower than young people", "Older people are not as efficient as young people". The participants responded by stating whether a statement is true (T) or false (F) and are assigned a score of 1 if answer is right, otherwise a score of 0. Therefore, the total scores ranged from 0 to 25, with a higher score representing better knowledge about the elderly. Chinese language version of FAQ 1 introduced by Wang and his colleagues was found to possess adequate reliability with α=0.68[22].

KAOP, developed by Kogan in 1961, has been used to measure attitude toward the aged in many studies. This scale contains 34-item with 17 negative (KAOP-) and 17 (KAOP+) positive statement, for example, "most the elderly gets set in their ways and are unable to change", and "it is very easy to get on with the elderly". Each item in scale adopted 6-point Likert (strongly disagree = 1, disagree = 2, slightly disagree = 3, slightly agree = 5, and strongly agree = 6). The scores on the statement presented negatively had to be reversed in order to obtain the total score. The total scores for the

KOAP is from 34 to 204, with higher scores representing positive attitude toward the aged [14]. For the Chinese version of KOAP, the Cronbach's alpha was 0.82 for the total scale, indicating it is a fully reliable instrument[23].

GSE developed by Zhang and Schwarzer in 1995 is used widely to measure a general sense of perceived self-efficacy [24]. The 10 items of the GSE are scored on a 4-point scale (not at all true=1, hardly true=2, moderately true=3, exactly true=4) and yield scores that range from 10 to 40 with a high score present indicating a greater self-efficacy. A Cronbach's alpha value of 0.89 for the Chinese version of the GSE indicated this instrument tool has a high reliability for our study population[2].

In the last part of the questionnaire, some closed-ended questions were design to collect some information about background characteristics of participating caregivers and their work environment[17 25], such as age, gender, education level, work tenure, employment form, monthly income, pre-job training, interest in working with the aged and job satisfaction (table 1).

Data analysis

Score for each item corresponding to the three scales were added up and an average score was calculated to evaluate level of knowledge, attitude and self-efficacy. According to the guidance on use of each scale, every item was given a same weight.

Due to the normal distribution of knowledge, attitude and self-efficacy scores, Student's t-tests or analysis of variance were performed to test the statistical differences in these scores across the different groups. Then, multivariate linear regression models were established to identify the factors influencing knowledge, attitude and self-efficacy scores serving the characteristics of respondents as independent variables. We used the ENTER approach in the modelling, with a *p* value of less

than 0.05 being considered as statistically significant.

A double entry strategy was adopted to ensure the accuracy of data input by using the EpiData 3.1.

All statistical analyses were performed using IBM SPSS Statistics V.22.0.

Results

Characteristics of respondents

Of the 403 respondents, 89.8% were the female. 70.5% of respondents aged more than 40. Only 20.3% of caregivers in our study have completed bachelor degree or above. More than half of respondents had work tenure of less than 3 years and worked in the urban setting. The majority (86.8%) was employed as non-establishment staff. Only 10.7% earned a monthly income more than ¥3000. 68.0% and 85.4% of respondents reported they received pre-job training and had an interest in elderly care, respectively (table 1).

Knowledge, attitude toward the elderly and self-efficacy

On average, the scores of knowledge measured by FAQ 1 and attitude measured by KAOP were 10.42±2.79 and 127.85±14.36, respectively. Scores of self-efficacies measured by GSE was 27.12±4.91.

Table1 showed the differences in scores of knowledge, attitude and self-efficacy rated by caregivers with different characteristics. Male respondents had a higher score on attitude than female (p<0.05). the older caregivers showed a greater self-efficacy compared with the younger (p<0.05). There was statistically significant difference in the scores of knowledge among caregivers with different degrees of education level (p<0.05). In addition, a high score on knowledge and attitude was reported among caregivers working in public NH presented (p<0.05). Establishment staff had a

better performance on knowledge, attitude and self-efficacy(p<0.05). Scores of attitudes increased with a rise of monthly salary (p<0.001). Those receiving pro-job training rated a higher score on knowledge and self-efficacy (p<0.05). Respondents with an interest in elderly care showed a better performance on attitude and self-efficacy (p<0.05). Caregivers with different level of job satisfaction had significantly different score on all three domains (p<0.05).

Table1 differences in scores of knowledge, attitude and self-efficacy among different characteristics caregivers

Variables	N (%)	FAQ 1 scores		KAOP scores		Self-efficacy scores	
		Mean ± SD	*p*-value	Mean ± SD	*p*-value	Mean ± SD	*p*-value
Gender			0.055		0.034		0.890
Male	41 (10.2)	11.22±3.09		132.30±15.75		27.02±4.21	
Female	362 (89.8)	10.33±2.75		127.31±14.13		27.13±4.98	
Age(years)			0.070		0.909		0.004
30-39	119 (29.5)	10.37±2.70		128.22±14.13		26.33±4.19	
40-49	141 (35.0)	10.83±2.96		127.93±15.07		26.70±5.41	
50≤	143 (35.5)	10.07±2.66		127.45±13.93		28.18±4.79	
Education level			0.046		0.276		0.927
Junior high school or below	225 (55.8)	10.23±2.90		126.93±13.78		27.09±4.83	
Secondary high school	96 (23.8)	11.04±2.77		129.72±14.08		27.03±5.20	
Bachelor degree or above	82 (20.3)	10.23±2.44		128.16±16.11		27.30±4.81	
Work tenure (years)			0.858		0.172		0.355
1-3	222 (55.1)	10.47±2.87		129.70±15.43		27.44±5.02	
4-6	114 (28.3)	10.44±2.81		128.55±10.61		26.76±4.64	

7≤	67 (16.6)	10.25±2.53		126.68±14.72		26.68±4.96	
Ownership of nursing home			0.033		0.032		0.708
Public	132 (32.8)	14.24±2.99		133.94±15.91		26.99±4.61	
Private	271 (67.2)	10.51±2.69		127.80±13.58		27.18±5.05	
Work place			0.127		0.862		0.296
Urban	249 (61.8)	10.26±2.84		127.94±15.20		27.32±4.96	
Rural	154 (38.2)	10.69±2.71		127.69±12.95		26.78±4.82	
Employment form			0.037		0.011		0.042
Non-establishment staff	350 (86.8)	10.24±2.81		127.05±14.20		25.33±4.47	
Establishment staff	53 (13.2)	15.40±2.56		135.63±15.96		27.66±5.22	
Monthly income (¥)			0.466		<0.001		0.975
< 2000	160 (39.7)	10.21±2.81		126.52±15.21		27.05±5.24	
2000-3000	200 (49.6)	10.56±2.74		127.13±12.71		27.16±4.91	
> 3000	43 (10.7)	10.60±3.00		136.11±15.59		27.18±3.51	
Pre-job training			0.040		0.106		0.001
No	129 (32.0)	10.01±2.95		126.16±14.38		25.91±4.62	
Yes	274 (68.0)	10.62±2.70		128.64±14.31		27.69±4.94	
The health status of the elderly			0.868		0.602		<0.001
Complete disability	34 (8.4)	10.21±2.21		125.49±14.11		26.32±4.34	
Partial disability	219 (54.3)	10.42±2.79		127.98±13.50		27.62±5.17	
No disability	150 (37.2)	10.49±2.92		128.19±15.63		30.64±5.41	
Interest in working with the aged			0.273		0.019		0.022

No	58 (14.4)	9.88±2.72	123.74±14.15	25.68±4.66
Yes	344 (85.4)	10.51±2.80	128.60±14.28	27.34±4.91
Job Satisfaction		0.001	0.033	0.001
Not satisfied	34 (8.4)	8.68±2.77	121.97±16.80	25.14±5.42
Generally satisfied	151 (37.5)	10.66±2.49	127.70±13.29	26.42±4.94
Very satisfied	218 (54.1)	10.54±2.91	128.86±14.51	27.91±4.66

Factors associated with knowledge, attitude and self-efficacy: results of multivariate linear regression analyses

Table 2 showed results of three multivariate linear regression models to analyze factors associated with knowledge, attitude and self-efficacy.

Knowledge about the elderly

Respondents with bachelor degree or above (β=0.232, p=0.018) gave a higher score in FAQ I than those only completing junior high school or below. Receiving pre-job training (β=0.196, p<0.05) had a positive effect on the knowledge scores. Job satisfaction (β=0.358-370, p<0.01) was found to have a positive association with the knowledge.

Attitudes towards older people

The female (β=-0.112, p=0.026) and respondents with more than 7 years' work experience (β=-0.130, p<0.05) presented a negative response to attitude scores in KAOP. However, a higher score appeared on those caregivers who are employed as establishment staff (β=0.136, p=0.012), earn more than 3,000 RMB per month (β=0.214, p<0.001) and have an interest in working with the aged (β=0.191, p<0.05).

Self-efficacy of caregivers

Age was significantly related to self-efficacy, where caregivers aged more than 50 (β=0.205, p=0.002) rated a higher score on self-efficacy. Pre-job training (β=0.165, p=0.002), interest in working with aged (β=0.154, p=0.013) and job satisfaction (β=0.174, p<0.05) were associated with scores. In addition, health status of the elderly who are provided care by caregivers also had a significant effect on self-efficacy, in which those with partial or no disability could have a better performance on self-efficacy (β=0.290-0.447 $p\leq$0.001).

In addition, we found that correlation coefficients between knowledge and attitudes was 0.233 (p<0.05), and self-efficacy was 0.034(p>0.05) by Pearson correlation calculations. Meanwhile, a positive correction also appeared on between attitude and self-efficacy (r=0.150, p<0.05).

Table 2 Predictors of knowledge, attitude and self-efficacy: multivariate linear regression models

Variables		FAQ 1 scores		KAOP scores		Self-efficacy scores	
		β	*p-value*	*β*	*p-value*	*β*	*p-value*
Gender							
	Male	Ref.		Ref.		Ref.	
	Female	-0.082	0.102	-0.112	0.026	0.011	0.818
Age(years)							
	30-39	Ref.		Ref.		Ref.	
	40-49	0.110	0.102	-0.017	0.792	0.095	0.131
	50≤	-0.018	0.791	-0.043	0.534	0.205	0.002
Education level							
	Junior high school or below	Ref.		Ref.		Ref.	
	Secondary high school	0.102	0.067	0.076	0.170	0.015	0.772

Bachelor degree or above	0.232	0.018	-0.013	0.840	0.023	0.708
Working tenure(years)						
1-3	Ref.		Ref.		Ref.	
4-6	-0.005	0.923	0.094	0.071	-0.089	0.075
7≤	-0.056	0.290	-0.130	0.044	-0.048	0.344
Ownership of nursing home						
Public	Ref.		Ref.		Ref.	
Private	0.032	0.528	-0.001	0.984	0.057	0.242
Work place						
Urban	Ref.		Ref.		Ref.	
Rural	0.054	0.286	-0.022	0.663	-0.003	0.956
Employment form						
Non-establishment staff	Ref.		Ref.		Ref.	
Establishment staff	0.109	0.052	0.136	0.012	0.102	0.069
Monthly income (¥)						
< 2000	Ref.		Ref.		Ref.	
2000-3000	0.015	0.784	-0.004	0.939	0.014	0.796
> 3000	0.036	0.516	0.214	<0.001	-0.004	0.936
Pre-job training						
No	Ref.		Ref.		Ref.	
Yes	0.196	0.047	0.056	0.305	0.165	0.002
The health status of the elderly						

Complete disability	Ref.		Ref.		Ref.	
Partial disability	0.001	0.987	0.114	0.214	0.447	<0.001
No disability	0.010	0.910	0.084	0.362	0.290	0.001
Interest in working with the aged						
No	Ref.		Ref.		Ref.	
Yes	0.080	0.122	0.191	0.039	0.154	0.013
Job Satisfaction						
Not satisfied	Ref.		Ref.		Ref.	
Generally satisfied	0.358	<0.001	0.081	0.393	0.052	0.572
Very satisfied	0.370	<0.001	0.109	0.278	0.174	0.044
F	2.378		2.344		3.740	
p (model fit)		0.001		0.001		<0.001
R^2	0.116		0.114		0.171	

Discussion

With accelerated aging, meeting the increasing demands for professional aged healthcare become a great challenge for Chinese government. This study assessed the knowledge, attitude toward the ageing and self-efficacy of elderly caregivers working in NHs from Liaoning province. Overall, the findings indicated that there was relative low-level of knowledge, attitude and self-efficacy comparing with other countries or regions. Due to initial stage of NHs development in China, severe shortage of qualified workers and professional training resulted in the majority of health workers had difficulties in coping with heavy working burden[3]. In addition, lower income and negative

expectations for career development created an adverse impact on their work performance[26]. These unfavorable factors affected perception of caregivers on knowledge, attitude and self-efficacy to great extent.

Consistent with other studies[11 27], the results found the caregivers who received high level education and pro-job training gave a high score on knowledge about the elderly measured by FAQ 1. The possible reason is that long-term education and professional training not only improve working ability, but can deepen the understanding for their profession, thus changing misconceptions about older adults. In addition, high-level job satisfaction, as a driving force factor, was found to encourage staff to learn more knowledge related to their works[28].

In terms of attitude toward the elderly, this study indicated the female were more likely to have a negative attitude comparing with male, which was inconsistent with other studies[17 29]. The potential explanation is the burden that women in Chinese traditional family take responsibility for cultivating the children and taking care of the old people resulted in female caregivers developing bad attitudes. Work tenure was corrected negatively with attitudes can be explained by the fact long-term work in the same position can increase burnout[30], thus resulting in negative emotion to works.

Similar to other study[31], those employed as establishment staff had a positive attitude toward the elderly than non-establishment staff. This finding mainly related to salary system in Chines NHs. Generally, establishment staff can obtain more payment than non-establishment, although they did the same works. [32]. Consequently, an unequal payback for non-establishment staff leaded to a negative attitude towards their works. In addition, the fact that KAOP scores increased with a rise of income maybe link to a reason that an increased salary, as an incentive strategy, can improve work enthusiasm of employees, thus presenting a better performance [33]. Moreover, caregivers with

interests in working with the aged reported more positive attitudes. A possible explanation for it is a good interest in their job can alleviate the perceived work stress and further reduce prejudice against the elderly [34 35].

The present study found that the age of caregivers, in line with previous study, had a positive relationship with self-efficacy [36]. This is because people can deepen the self-perception for their ability and cope with work more easily with an increase in age and life experience. Similarly, improvement of work skills by pro-job training might create a positive effect on perceived self-efficacy[37].

In addition, the health status of the aged served by caregivers was found to be associated with self-efficacy scores. This result mainly related to fact the old adults without disability can reduce workload and difficulties of caregivers greatly during provision of health services comparing with the disabled[38], thereby improving perception on self-abilities. Meanwhile, the finding on positive impact of interest in working with the old and high-level job satisfaction on self-efficacy indicated these factors can evoke enthusiastic attitudes toward works.

Actually, the positive relationship among knowledge, attitude and self-efficacy presented in this study agrees with "knowledge-attitude-practice (KAP)" theory[39 40]. Although knowledge did not associate with self-efficacy directly, it plays indirect role in connection between attitude and self-efficacy. Therefore, an effective workforce management for caregivers should take improvement of knowledge, attitude and self-efficacy into account synthetically.

Limitation

There are some limitations in this study should be mentioned. Firstly, 402 sample sizes from

Liaoning province in present study were limited to reflect comprehensive situation of China, despite it is enough for data analysis. Caution needs to be taken when generalizing the findings. Additionally, the variables in our research model are not comprehensive, despite the selection of these variables is supported by literature and interviews. Further research considering other variables potentially influencing knowledge, attitude and self-efficiency of elderly caregivers would generate more insights. Finally, readers should be aware that participants may report what they think the researcher wants to know rather than the truth by using a self-reporting questionnaire, which resulted in their responses can be idealized to meet socially acceptable norms.

Conclusion

This study sheds some light on caregivers-perceived knowledge, attitude about the elderly and self-efficacy in Chinese NHs, and identify their associated the characteristics and work environment factors. A relatively poor-level knowledge, attitude and self-efficacy suggest more emphasis should be placed on improvement of these attributes. The findings related to factors provide the implication that continuing education and professional training should be considered as a strategy to improve knowledge and self-efficacy. Additionally, an increased income and equal payment can help develop a positive attitude toward the old people. Furthermore, some measures related to foster an interest in working with the elderly and improve job satisfaction of caregivers also should be given an appropriate attention.

Ethics approval and consent to participate

Our study was approved by the ethics committee of Jinzhou Medical University

Consent for publication

Consent for publication was obtained from persons we investigated in this study.

Availability of data and material

The data sets analyzed during this study are available from the corresponding author on reasonable request

Competing interests

The authors declare that they have no competing interests.

Funding

This work was supported by Liaoning Provincial Social Science Project (NO.2019lslktyb-067)

Authors' contributions

All authors made significant contributions to the study. HZ conceptualized this study and analyzed the data. Moreover, she wrote the first draft of the manuscript. HS interpreted the results and revised the manuscript. The final version submitted for publication was read and approved by all authors.

Acknowledgements

The authors gratefully acknowledge all interviewees participating in this study.

Reference

1. Wu M, Li SX, Zhang NJ, et al. Nursing home research in Jinan, China: a focus group approach. *International Journal of Public Policy* 2012;1(8):21-30.

2. Fua F, Lianga Y, Anb Y, et al. Self-efficacy and psychological well-being of nursing home residents in China: the mediating role of social engagement. *Asia Pacific Journal of Social Work and Development* 2018;28(2):128-40.

3. Song Y, Anderson RA, Corazzini KN, et al. Staff characteristics and care in Chinese nursing homes: A systematic literature review. *International Journal of Nursing Sciences* 2014;1(4):423-36.

4. Chan YK, Lee RPL. Network Size, Social Support and Happiness in Later Life: A Comparative Study of Beijing and Hong Kong. *Journal of Happiness Studies* 2006;7(1):87-112.

5. Wong YC, Leung J. Long-term care in China: issues and prospects. *J Gerontol Soc Work* 2012;55(7):570-86.

6. Zhan HJ. Population Aging and Long-Term Care in China. *Generations* 2013;37(1):53-58.

7. Hao Q, Wu S, Ying L, et al. Current dilemmas of nursing homes in Chengdu: a cross-sectional survey. *Journal of the American Medical Directors Association* 2012;13(4):406.e9-06.e12.

8. Feng Z, Liu C, Guan X, et al. China's Rapidly Aging Population Creates Policy Challenges In Shaping A Viable Long-Term Care System. *Health Affairs* 2012;31(12):2764-73.

9. Zhang H. Who will care for our parents? Changing boundaries of family and public roles in providing care for the aged in urban China. *Care Management Journals* 2007;8(1):1-10.

10. Lee AC, Wong AK, Loh EK. Score in the Palmore's Aging Quiz, knowledge of community resources and working preferences of undergraduate nursing students toward the elderly in Hong Kong. *Nurse Educ Today* 2006;26(4):269-76.

11. Scerri A, Scerri C. Nursing students' knowledge and attitudes towards dementia — A questionnaire survey. *Nurse Education Today* 2013;33(9):962-68.

12. Cui Y, Fan R, Wang YM, et al. A Changing Healthcare System Model: The Effectiveness of Knowledge, Attitude, and Skill of Nursing Assistants Who Attend Senile Dementia Patients in Nursing Homes in Xi'an, China - A Questionnaire Survey. *Ochsner J* 2014;14(3):328-34.

13. Hu SH, Yu YM, Chang WY, et al. Social support and factors associated with self-efficacy among acute-care nurse practitioners. *Journal of Clinical Nursing* 2017;27(2):876-82.

14. Wang CC, Liao WC, Kao MC, et al. Taiwanese medical and nursing student interest levels in and attitudes towards geriatrics. *Annals of the Academy of Medicine Singapore* 2009;38(3):230.

15. Zisberg A, Topaz M, Bandwintershtein T. Cultural- and Educational-Level Differences in Students Knowledge, Attitudes, and Preferences for Working With Older Adults: An Israeli Perspective. *Journal of Transcultural Nursing* 2015;26(2):194-201.

16. MS MHvZ, PhD MPR, MD MS, et al. Medical Students' Positive and Negative Misconceptions About the Elderly. *Gerontology & Geriatrics Education* 2001;21(3):31-40.

17. Hweidi IM, Alhassan MA. Jordanian nurses' attitudes toward older patients in acute care settings. *International Nursing Review* 2010;52(3):225-32.

18. Gallagher S, Bennett KM, Halford JC. A comparison of acute and long-term health-care personnel's attitudes towards older adults. *International Journal of Nursing Practice* 2010;12(5):273-79.

19. Jacelon CS. Attitudes and behaviors of hospital staff toward elders in an acute care setting *Applied Nursing Research* 2002;15(4):227-34.

20. Network CY. The growth rate of the elderly population in Liaoning Province slowed down in 2017, and the population of young and old people increased rapidly. 2017 [Available from: https://sh.qihoo.com/9715f9adce7664579?cota=1&refer_scene=so_1&sign=360_e39369d1.

21. Kane RL. Ageism: Negative and Positive 2nd Edition. *Journal of Public Health Policy* 2000;21(2):247-49.

22. Wang CC, Liao WP, Yuan SC, et al. The Chinese version of the Facts on Aging Quiz scale: reliability and validity assessment. *International Journal of Nursing Studies* 2010;47(6):742-52.

23. Yen CH, Liao WC, Chen YR, et al. A Chinese version of Kogan's Attitude Toward Older People Scale: reliability and validity assessment. *International Journal of Nursing Studies* 2009;46(1):38-44.

24. Schwarzer R, Bäßler J, Kwiatek P, et al. The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the General Self-efficacy Scale. *Applied Psychology* 2010;46(1):69-88.

25. Richter J, Eisemann MR. Attitudinal patterns determining decision-making in severely ill elderly patients: a cross-cultural comparison between nurses from Sweden and Germany. *International Journal of Nursing Studies* 2001;38(4):381-88.

26. Gaugler JE, Mittelman MS, Hepburn K, et al. Predictors of change in caregiver burden and depressive symptoms following nursing home admission. *Psychol Aging* 2009;24(2):385-96.

27. Lambrinou E, Sourtzi P, Kalokerinou A, et al. Attitudes and knowledge of the Greek nursing students towards older people. *Nurse Educ Today* 2009;29(6):617-22.

28. Humphris GM, Turner A. Job satisfaction and attitudes of nursing staff on a unit for the elderly severely mentally infirm, with change of location. *Journal of Advanced Nursing* 1989;14(4):298.

29. Sung KT. Respect for Elders: Myths and Realities in East Asia. *Journal of Aging & Identity* 2000;5(4):197-205.

30. Lamb HR. Staff burnout in work with long-term patients. *Hospital & Community Psychiatry* 1979;30(6):396-8.

31. P S. Interactions of nurses with elderly patients: relationship to nurses' attitudes and to formal activity periods. *Journal of Advanced Nursing* 2010;18(1):14-19.

32. Zuo H. Formal and Informal Employment in China: Probability of Employment and Determinants of Monthly Wages. *Australian Economic Review* 2013;46(4):405-23.

33. Idrees Z, Xinping X, Shafi K, et al. Effect of salary, training and motivation on job performance of employees. *American Journal of Business, Economics and Management* 2015;3(2):55-58.

34. Undergraduate Nursing Students and the Elderly: an Assessment of Attitudes in a Turkish University. Apha Meeting and Exposition; 2017.

35. Monnot MJ, Beehr TA. Subjective well-being at work: Disentangling source effects of stress and support on enthusiasm, contentment, and meaningfulness. *Journal of Vocational Behavior* 2014;85(2):204-18.

36. Li J, He Z, Luo Y, et al. Perceived Transcultural Self-Efficacy of Nurses in General Hospitals

in Guangzhou, China. *Nursing Research* 2016;65(5):371-79.

37. Hendrix CC, Landerman R, Abernethy AP. Effects of an individualized caregiver training intervention on self-efficacy of cancer caregivers. *West J Nurs Res* 2013;35(5):590-610.

38. Uysal A, Albayrak B, Koçulu B, et al. Attitudes of nursing students toward people with disabilities. *Nurse Educ Today* 2014;34(5):878-84.

39. Howell D, Butler L, Vincent L, et al. Influencing nurses' knowledge, attitudes, and practice in cancer pain management. *Cancer Nursing* 2000;23(1):55.

40. Pan HH, Shih HL, Wu LF, et al. Path modeling of knowledge, attitude and practice toward palliative care consultation service among Taiwanese nursing staff: a cross-sectional study. *Bmc Palliative Care* 2017;16(1):42.

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Page1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Page2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	Page5
Methods			
Study design	4	Present key elements of study design early in the paper	Page5-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Page6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page7
Bias	9	Describe any efforts to address potential sources of bias	Page6
Study size	10	Explain how the study size was arrived at	Page6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page7-8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Page8
		(*b*) Describe any methods used to examine subgroups and interactions	Page8
		(*c*) Explain how missing data were addressed	Page6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page9-11
		(b) Give reasons for non-participation at each stage	Not applicable
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page9-11
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	Page9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Page 12-15
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Page15-17
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Knowledge, attitude and self-efficacy of elderly caregivers in Chinese nursing homes: a cross-sectional study in Liaoning province

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029869.R1
Article Type:	Original research
Date Submitted by the Author:	16-Jul-2019
Complete List of Authors:	Zhang, Huijun; Tianjin University, School of Pharmaceutical Science and Technology; Jinzhou Medical University, School of Nursing Sun, He; Tianjin University,
Primary Subject Heading:	Nursing
Secondary Subject Heading:	Occupational and environmental medicine
Keywords:	knowledge, attitude, self-efficacy, elderly caregivers, nursing homes, China

Knowledge, attitude and self-efficacy of elderly caregivers in Chinese nursing homes: a cross-sectional study in Liaoning province

Huijun Zhang

Affiliated institution: 1, School of Pharmaceutical Science and Technology, Tianjin University, Tianjin, China; 2, School of Nursing, Jinzhou Medical University, Jinzhou, Liaoning province, China

E-mail: 13904069606@163.com

He Sun （Corresponding author）

Affiliated institution: School of Pharmaceutical Science and Technology, Tianjin University, Tianjin, China

E-mail: 18768429445@163.com

Abstract

Objectives This study aimed to investigate the perceptions of elderly caregivers in Chinese nursing homes and associated factors in regard to the knowledge, attitude about old adults and self-efficacy.

Setting A cross-sectional questionnaire survey was conducted on twelve nursing homes in Liaoning province, China.

Participants A total of 403 caregivers from 12 nursing homes were surveyed.

Outcome measures A Self-administered questionnaire composed of the Palmore's Facts on Aging Quiz I, the Kogan's Attitude Old People Scale, Generalized Self-efficacy Scale and background characteristics of participants was used for data collection. An average score for knowledge, attitude and self-efficacy was calculated. In addition, these scores were tested the differences across the different groups with adaptation of Student's t-tests and analysis of variance. Multivariable linear regression models were established to estimate the associated factors.

Results The participating caregivers reported a relative low score on knowledge about the elderly (10.42±2.79), attitude toward old people (127.85±14.36) and self-efficacy (27.12±4.9). Multivariable regression analysis showed respondents with high-level educational level (β=0.232, *95%CI:* 0.827 to 0.907), receiving pro-job training (β=0.196, *95% CI*: 0.121 to 1.169) and high job satisfaction (β=0.358, 370, *95% CI*: 0.123 to 1.875, 0.110 to 1.283) gave a positive rating on knowledge. The caregivers who employed as formal staff (β=0.136, *95%CI*: 0.016 to 7.670), earned a higher income (β=0.214, *95%CI*: 0.009 to 4.561) and had an interest in working with the elderly (β=0.191, *95%CI*: 0.018 to 2.808) tended to develop a positive attitude toward the old, but a negative association appeared for the female (β=-0.112, *95%CI:* -1.753 to -0.010) and those with longer work experience (β=-0.130, *95%CI:* -2.827 to -0.018). those caregivers who were older(β=0.205, *95%CI*:

0.039 to 3.427), received pro-job training(β=0.165, *95%CI*: 0.053 to 2.934), had an interest in working with old adults(β=0.154, *95%CI:* 0.004 to 2.085), a high job satisfaction (β=0.174, *95%CI*:0.026 to 3.548)and perceived a better health status of the old(β=0.290, 0.447, *95%CI*: 0.059 to 2.700, 0.053 to 1.211) gave a positive rating on self-efficacy.

Conclusion

Overall, knowledge about the elderly, attitude toward old people and self-efficacy of elderly caregivers in Chinese nursing homes were the low level. Differentiated factors associated with these attributes suggest some targeted intervention actions should be given a priority.

Strengths and limitations of this study

- This study is among the first to understand perception of caregivers in Chinese nursing homes on knowledge about aging, attitude toward the old and self-efficacy.
- Multivariable linear regression models were established, identifying multi-faceted factors associated with caregivers-perceived knowledge, attitude and self-efficacy.
- Using widely accepted scales (FAQ 1, KAOP and GSE) for data collection made results of present study more reliable.
- The samples of this study were collected from only one province located in the northeastern region of China. Caution needs to be taken when generalizing the findings to China or other countries as well.

Introduction

The phenomenon of population ageing has been highlighted around the world, especially in China. According to the National Bureau of Statistics of China (2017), the elderly population aged 60 and over has reached 240 million, accounting for 17.3% of the total population[1 2]. By 2050, this number is expected to climb to 450 million, accounting for 33% of its total population[3]. In other word, China will become the country with the largest number of old people in the world. Obviously, such growth in population aging will result in dramatically increased needs for the long-term care.

Influenced by Chinese traditional culture, elderly people prefer to live with their children, and taking care for the elderly is regarded as the responsibility of the family[4]. However, a growing migration from rural to urban areas, especially among young people, and the shrinking average family size due to China's one-child policy [5 6] have changed mainstream informal family-based caregiving model for older adults. Consequently, more old people were sent to nursing homes (NHs) for a professional aged care.

Over the past few years, Chinese government made a great effort to support the development of the aged care service industry and invested a lot into NHs. To date, there are approximately 155,000 different type of NHs across Mainland China including old age homes, retirement departments, residential care facilities, welfare institutes, and geriatric hospitals. However, health workers in NHs are great shortage and lack formal vocational training[3]. As a result, low-level caregiving skills and poor quality of health care become an urgent issue attracting a wide range of attention[7 8]. Although

Chinese government launched "Basic Standards for Service Quality of Aged Agencies" in 2017, quality of nursing services for the elderly is still not guaranteed [9]. Providing high-quality aged care services seem to pose a huge challenge in coping with China's aging society.

Elderly caregivers in NHs, as the front-line health care workers, spend much time with the old people and have a direct effect on health care delivery[10]. However, holding a negative attitude and misunderstanding about aging often created an adverse impact on provision of health care behavior and ultimately lead to bad health outcomes demonstrated in other studies[11 12]. In addition to attitude and knowledge, Self-efficiency, defined as "people's beliefs about their capabilities to exercise control over events that effect their lives"[13], is another widely recognized factor associated with health works´ behavior in the care delivery. Generally, high self-efficacy is associated with positive feelings about one's self, which facilitate cognitive processes and work achievement as well as confidence and motivation[14]. Therefore, giving an emphasis on knowledge, attitude and self-efficacy of caregivers is widely accepted as beneficial attempts for providing high-quality aged care services.

Many studies conducted in western countries revealed social workers, health care workers and nursing students tended to have a bad attitude, misconception, inadequate knowledge and lowest priority to consider working with the older[15-18]. However, there is paucity in the literature involved in low- and middle-income Asian countries, including China. Furthermore, there are great practical significance to understand knowledge, attitude and self-efficacy of elderly caregivers in NHs with a sharp increase in needs for aged care in China.

This study aimed to investigate the perceptions of caregivers and associated factors in regard to knowledge about aging, attitude toward the elderly and self-efficacy.

Method

Setting and sampling

A cross-sectional quantitative survey was conducted on Liaoning province located in the northeastern region of China with the population over 60 years old accounts for 22.65% of the total population[19].

We adopted a multistage sampling strategy. Firstly, three cities were selected from three different geographical zones: Shenyang representing central, Jinzhou representing west and Dandong representing east. Then, four NHs (two for large size, two for small size) were selected randomly in each city according to their organization code, which resulted in 12 participating NHs. Finally, a half of caregivers were planned to considered as the sample in each selected NHs.

Data were collected over the period from November 1, 2015 to May 31, 2016. Two to four trained investigators assigned to each selected nursing home were required to invite caregivers working in different departments. The participants were asked to read the informed consent letter and gave oral consent before they filled out the questionnaires. We approached potential participants across the entire working time to maximize the chance of capturing a representative sample.

Due to the fact there is no standardized definition for NHs in Mainland China, NHs in this study were included in residential long-term care facilities in Mainland China that mainly admit people who are 60 years and older. A qualified elderly caregiver usually needs receive a 3-5 years professional training in China. Currently, caregivers in Chinese NHs mainly include physicians, nurses and allied health workers. In this study, the caregivers who provided direct care for the elderly were eligible to participate in the investigation. Simultaneously, participants have worked in the

selected NHs for more than one year and they are voluntarily participated in the survey.

Ultimately, about 800 caregivers were invited to participate this investigation, and 480 participants (60.0%) filled in and returned the questionnaire. After excluding questionnaires with uncompleted key item, 403 (83.9%) left were valid for the data analysis (Figure 1). According to formula proposed by Peduzzi et al [20 21], the minimum sample size is at least 10 times *K*, where *K* is the number of predictors in the regression model. Obviously, this sample size would be large enough for us to perform multivariable linear regression analyses for a model containing 18 dichotomous independent variables (Table 1).

(Figure 1 should be here)

Measurement

We adopted Palmore's Facts on Aging Quiz I (FAQ 1), the Kogan's Attitude Old People Scale (KAOP) and Generalized Self-efficacy Scale (GSE) to measure knowledge about old people, attitude toward the elderly and self-efficacy of caregivers, respectively. In addition, the information about characteristics of the caregivers and their work environment were also collected by a self-developed questionnaire.

Facts on Aging Quiz I (FAQ I) developed by Palmore (1990) has been widely used to assess the subjects´ (including caregivers) physical, mental and social knowledge about aging, as well as some of the most common misconceptions about aging[15 22]. FAQ 1 is composed of 25 statements, for example "old people tend to react slower than young people", "Older people are not as efficient as young people". The participants responded by stating whether a statement is true (T) or false (F) and are assigned a score of 1 if answer is right, otherwise a score of 0. Therefore, the total scores ranged from 0 to 25, with a higher score representing better knowledge about the elderly. Chinese

language version of FAQ 1 introduced by Wang and his colleagues was found to possess adequate reliability (Cronbach's α=0.68)[23].

KAOP, developed by Kogan in 1961, has been used to measure attitude toward the aged in many studies. This scale contains 34-item with 17 negative (KAOP-) and 17 (KAOP+) positive statement, for example, "most the elderly gets set in their ways and are unable to change", and "it is very easy to get on with the elderly". Each item in scale adopted 6-point Likert (strongly disagree = 1, disagree = 2, slightly disagree = 3, slightly agree = 5, and strongly agree = 6). The scores on the statement presented negatively had to be reversed in order to estimate the total score. The total scores for the KAOP is from 34 to 204, with higher scores representing positive attitude toward the aged [24]. For the Chinese version of KAOP, the Cronbach's alpha was 0.82 for the total scale, indicating it is a fully reliable instrument[25].

GSE developed by Zhang and Schwarzer in 1995 is used widely to measure a general sense of perceived self-efficacy [26]. The 10 items of the GSE are scored on a 4-point scale (not at all true=1, hardly true=2, moderately true=3, exactly true=4) and yield scores that range from 10 to 40 with a high score present indicating a greater self-efficacy. A Cronbach's alpha value of 0.89 for the Chinese version of the GSE indicated this instrument tool has a high reliability for our study population[2].

In the last part of the questionnaire, some closed-ended questions were design to collect some information about background characteristics of participating caregivers and their work environment. General demographic characteristics including age, gender and educational level were investigated (Table 1). In addition, some questions about caregivers´ work environment were also asked. For examples, "how many years have you been working in this nursing home (work tenure)";

"is your nursing home public or private (ownership of nursing home); located in rural or urban (work place)" (Table 1). Employment type of caregivers in Chinese nursing homes includes the formal and informal employee. Formal employee means to be hired by the government and their wage was paid by national finance. Informal employee refers to those caregivers who signed the labor contract with nursing homes and their wage comes from the profits of the institution[27]. Also, we captured the information on pre-job training (yes/no), interest in working with the aged (yes/no) and job satisfaction (not /generally /very satisfied) (Table 1). Meanwhile, we measured perceived health status of the elderly from caregivers by asking "how rate overall health status of the elderly you served in the past month (complete/partial/with no disability)?" (Table 1). These were identified as independent variables in the regression model based on previous studies[15 28 29].

Data analysis

A score on each item of FAQ 1, KAOP and GSE were added up, respectively. According to the guidance on use of each scale, every item was given a same weight[23 26 30]. Then, an average score was calculated to evaluate the level of knowledge, attitude and self-efficacy.

Since Kolmogorov-Smirnov (K-S) test showed *p*-value for knowledge, attitude and self-efficacy scores exceeded 0.10, the data of these three variables were normally distributed. Student's t-tests (for two-group comparisons) or analysis of variance (for multiple-group comparisons) were performed to test the statistical differences in these scores across the different groups. Then, multivariable linear regression models were established to identify the factors associated with knowledge, attitude and self-efficacy scores serving the characteristics of respondents as independent variables. We used the ENTER approach in the modelling, with a *p* value of less than

0.05 being considered as statistically significant. We also conducted logistic regression analyses for sensitivity test by recoding the knowledge, attitude and self-efficiency scores into dichotomous variables (using average values as a cut-off point).

A double entry strategy was adopted to ensure the accuracy of data input by using the EpiData 3.1. All statistical analyses were performed using IBM SPSS Statistics V.22.0.

Patient and Public Involvement

Because this study focused on knowledge about aging, attitude toward the elderly and self-efficacy, patients were not directly involved in the survey.

Results

Characteristics of respondents

Of the 403 respondents, 89.8% were the female. 70.5% of respondents aged more than 40. Only 20.3% of caregivers in our study have completed bachelor degree or above. More than half of respondents had work tenure of less than 3 years (55.1%) and worked in the urban setting (61.8%). The majority (86.8%) was employed as informal employee. Only 10.7% earned a monthly income more than 3000 Chinese yuan. 68.0% and 85.4% of respondents reported they received pre-job training and had an interest in elderly care, respectively (Table 1).

Knowledge, attitude toward the elderly and self-efficacy

Overall, a relatively low of knowledge (10.42±2.79), attitude (127.85±14.36) and self-efficacies (27.12±4.91) scores measured by FAQ 1, KAOP and GSE respectively were observed among elderly caregivers in nursing homes.

Table1 showed the differences in scores of knowledge, attitude and self-efficacy rated by caregivers

with different characteristics. Male respondents gave a higher score on attitude than the female (p<0.05). The caregivers with an older age showed a greater self-efficacy compared to younger population (p<0.05). Those respondents with middle educational level gave a higher score on knowledge than other two groups (p<0.05). In addition, a high score on knowledge and attitude was presented among caregivers working in public NH (p<0.05). Formal employee showed a better performance on knowledge, attitude and self-efficacy(p<0.05). Scores of attitudes increased with a rise of monthly salary (p<0.001). Those who received pro-job training reported a higher score on knowledge and self-efficacy (p<0.05). Higher scores on attitude and self-efficacy were given by respondents with an interest in elderly care (p<0.05). Scores on all three domains varied across different level of job satisfaction (p<0.05).

Table1 differences in scores of knowledge, attitude and self-efficacy among different characteristics caregivers

Variables	N (%)	FAQ 1 scores		KAOP scores		Self-efficacy scores	
		Mean ± SD	*p*-value	Mean ± SD	*p*-value	Mean ± SD	*p*-value
Gender			0.055		0.034		0.890
Male	41 (10.2)	11.22±3.09		132.30±15.75		27.02±4.21	
Female	362 (89.8)	10.33±2.75		127.31±14.13		27.13±4.98	
Age(years)			0.070		0.909		0.004
30-39	119 (29.5)	10.37±2.70		128.22±14.13		26.33±4.19	
40-49	141 (35.0)	10.83±2.96		127.93±15.07		26.70±5.41	
50≤	143 (35.5)	10.07±2.66		127.45±13.93		28.18±4.79	
Educational level			0.046		0.276		0.927
Junior high school or below	225 (55.8)	10.23±2.90		126.93±13.78		27.09±4.83	

Secondary high school	96 (23.8)	11.04±2.77		129.72±14.08		27.03±5.20	
Bachelor degree or above	82 (20.3)	10.23±2.44		128.16±16.11		27.30±4.81	
Work tenure (years)			0.858		0.172		0.355
1-3	222 (55.1)	10.47±2.87		129.70±15.43		27.44±5.02	
4-6	114 (28.3)	10.44±2.81		128.55±10.61		26.76±4.64	
7≤	67 (16.6)	10.25±2.53		126.68±14.72		26.68±4.96	
Ownership of nursing home			0.033		0.032		0.708
Public	132 (32.8)	14.24±2.99		133.94±15.91		26.99±4.61	
Private	271 (67.2)	10.51±2.69		127.80±13.58		27.18±5.05	
Work place			0.127		0.862		0.296
Urban	249 (61.8)	10.26±2.84		127.94±15.20		27.32±4.96	
Rural	154 (38.2)	10.69±2.71		127.69±12.95		26.78±4.82	
Employment type			0.037		0.011		0.042
Informal employee	350 (86.8)	10.24±2.81		127.05±14.20		25.33±4.47	
Formal employee	53 (13.2)	15.40±2.56		135.63±15.96		27.66±5.22	
Monthly income (¥)			0.466		<0.001		0.975
< 2000	160 (39.7)	10.21±2.81		126.52±15.21		27.05±5.24	
2000-3000	200 (49.6)	10.56±2.74		127.13±12.71		27.16±4.91	
> 3000	43 (10.7)	10.60±3.00		136.11±15.59		27.18±3.51	
Pre-job training			0.040		0.106		0.001
No	129 (32.0)	10.01±2.95		126.16±14.38		25.91±4.62	
Yes	274 (68.0)	10.62±2.70		128.64±14.31		27.69±4.94	

The health status of the elderly			0.868	0.602		<0.001
Complete disability	34 (8.4)	10.21±2.21		125.49±14.11	26.32±4.34	
Partial disability	219 (54.3)	10.42±2.79		127.98±13.50	27.62±5.17	
No disability	150 (37.2)	10.49±2.92		128.19±15.63	30.64±5.41	
Interest in working with the aged			0.273	0.019		0.022
No	58 (14.4)	9.88±2.72		123.74±14.15	25.68±4.66	
Yes	344 (85.4)	10.51±2.80		128.60±14.28	27.34±4.91	
Job Satisfaction			0.001	0.033		0.001
Not satisfied	34 (8.4)	8.68±2.77		121.97±16.80	25.14±5.42	
Generally satisfied	151 (37.5)	10.66±2.49		127.70±13.29	26.42±4.94	
Very satisfied	218 (54.1)	10.54±2.91		128.86±14.51	27.91±4.66	

Factors associated with knowledge, attitude and self-efficacy: results of multivariable linear regression analyses

Table 2 showed results of three multivariable linear regression models to analyze factors associated with knowledge, attitude and self-efficacy.

Knowledge about older people

Respondents with bachelor degree or above (β=0.232, *95%CI:* 0.827 to 0.907) gave a higher score in FAQ I than those only completing junior high school or below. People who revived a pre-job training (β=0.196, *95% CI*: 0.121 to 1.169) were more likely to report a higher score on knowledge. Job satisfaction (β=0.358, 370, *95% CI*: 0.123 to 1.875, 0.110 to 1.283) had a proportional relationship with the knowledge.

Attitudes towards older people

The attitude scores in KAOP were higher for those who were employed as formal employee (β =0.136, *95%CI*: 0.016 to 7.670), earned more wages (β=0.214, *95%CI*: 0.009 to 4.561), and had an interest in working with the aged (β=0.191, *95%CI*: 0.018 to 2.808), but the female (β=-0.112, *95%CI:* -1.753 to -0.010) and respondents with more than 7 years´ work experience (β=-0.130, *95%CI:* -2.827 to -0.018) reported a low score.

Self-efficacy of caregivers

A higher self-efficacy score in GSE was observed in caregivers who were older (β=0.205, *95%CI*: 0.039 to 3.427), received a pre-job training (β=0.165, *95%CI*: 0.053 to 2.934), had the interest in working with aged (β=0.154, *95%CI:* 0.004 to 2.085) and job satisfaction(β=0.174, *95%CI*:0.026 to 3.548), and perceived a better health status of the elderly they served (β=0.290, 0.447, *95%CI*: 0.059 to 2.700, 0.053 to 1.211).

In addition, a moderate association[31] between knowledge and attitude scores (r=0.233, p<0.05), attitude and self-efficacy scores (r=0.150, p<0.05) was tested by Pearson correlation calculations. However, correlation coefficient between knowledge and self-efficacy was not statistically significant (r=0.034, p>0.05).

Table 2 Predictors of knowledge, attitude and self-efficacy: multivariable linear regression models

Variables		FAQ 1 scores		KAOP scores		Self-efficacy scores	
		β	*95%CI*	*β*	*95%CI*	*β*	*95%CI*
Gender							
	Male	Ref.		Ref.		Ref.	
	Female	-0.082	(-1.646, 0.176)	-0.112*	(-1.753, -0.010)	0.011	(-1.269, 1.813)
Age(years)							

30-39	Ref.		Ref.		Ref.	
40-49	0.110	(-0.143, 1.345)	-0.017	(-4.468, 3.125)	0.095	(-0.363, 2.153)
50≤	-0.018	(-0.961, 0.629)	-0.043	(-5.362, 2.750)	0.205*	(0.039, 3.427)
Education level						
Junior high school or below	Ref.		Ref.		Ref.	
Secondary high school	0.102	(-0.020, 1.410)	0.076	(-1.217, 6.078)	0.015	(-1.086, 1.331)
Bachelor degree or above	0.232*	(0.027, 0.907)	-0.013	(-5.121, 3.721)	0.023	(-1.313, 1.617)
Working tenure(years)						
1-3	Ref.		Ref.		Ref.	
4-6	-0.005	(-0.642, 0.620)	0.094	(-0.389, 6.053)	-0.089	(-2.105, 0.029)
7≤	-0.056	(-1.131, 0.421)	-0.130*	(-2.827, -0.018)	-0.048	(-2.146, 0.478)
Ownership of nursing home						
Public	Ref.		Ref.		Ref.	
Private	0.032	(-0.417, 0.770)	-0.001	(-2.827, 3.227)	0.057	(-0.308, 1.698)
Work place						
Urban	Ref.		Ref.		Ref.	
Rural	0.054	(-0.155, 0.987)	-0.022	(-3.617, 2.211)	-0.003	(-0.993, 0.939)
Employment type						
Informal employee	Ref.		Ref.		Ref.	
Formal employee	0.109	(-0.035, 1.150)	0.136*	(0.016, 7.670)	0.102	(-1.313, 0.689)
Monthly income (¥)						
< 2000	Ref.		Ref.		Ref.	

2000-3000	0.015	(-0.461, 0.752)	-0.004	(-3.610, 2.578)	0.014	(-1.050, 1.001)
> 3000	0.036	(-0.742, 1.221)	0.214**	(0.009, 4.561)	-0.004	(-1.890, 1.429)
Pre-job training						
No	Ref.		Ref.		Ref.	
Yes	0.196*	(0.121, 1.169)	0.056	(-1.301, 5.280)	0.165*	(0.053, 2.934)
The health status of the elderly						
Complete disability	Ref.		Ref.		Ref.	
Partial disability	0.001	(-1.032, 0.994)	0.114	(-1.885, 8.457)	0.447**	(0.059, 2.700)
No disability	0.010	(-1.069, 1.026)	0.084	(-2.931, 7.759)	0.290*	(0.053, 1.211)
Interest in working with the aged						
No	Ref.		Ref.		Ref.	
Yes	0.080	(-0.358, 1.230)	0.191*	(0.018, 2.808)	0.154*	(0.004, 2.085)
Job Satisfaction						
Not satisfied	Ref.		Ref.		Ref.	
Generally satisfied	0.358**	(0.123, 1.875)	0.081	(-0.293, 7.808)	0.052	(-1.103, 2.469)
Very satisfied	0.370**	(0.110, 1.283)	0.109	(-2.508, 8.275)	0.174*	(0.026, 3.548)
F	2.378**		2.344*		3.740**	
R^2	0.116		0.114		0.171	
Adjusted R^2	0.105		0.109		0.155	

Note * $p<0.05$; ** $p<0.001$

Discussion

With an accelerated increase in elderly population, meeting the increasing needs for professional

aged healthcare poses a great challenge for Chinese government. This study assessed the knowledge, attitude about the aging and self-efficacy of elderly caregivers working in Chinese NHs. In comparison to other countries or regions[28 30 32], a much lower level of knowledge, attitude and self-efficacy were observed. At initial stage of NHs development in China, a severe shortage of qualified health workers and insufficient professional training resulted in the majority of caregivers experienced difficulties in providing healthcare services for the elderly[3]. Additionally, a lower income and negative expectations for career development also created an adverse impact on their work performance[33].

Consistent with other studies[18 30 34], the results found the caregivers who received a higher level education and pro-job training gave a high score on knowledge about the elderly. A possible reason is that long-term education and professional training not only improved their working ability, but can teach more knowledge and further correct misunderstanding about aging. In addition to these two factors, the high-level job satisfaction was also found to be associated with knowledges due to the fact that this driving force factor can encourage staff to learn more in relation to their works demonstrated in other study [35].

With respect to attitude toward the elderly, this study indicated the female were more likely to have a negative attitude comparing with male, which was inconsistent with other studies[15 36]. The potential explanation is the burden that women in Chinese traditional family take more responsibilities for cultivating the children and taking care of old people resulted in female caregivers developing bad attitudes. Additionally, previous study indicated gender discrimination in the workplace often resulted in unequal treatment for the female in terms of wages and career advancement[37 38]. Therefore, it is expected that the female caregivers tend to hold an adverse attitude.

Work tenure was associated negatively with attitudes can be explained by the fact long-term work in the same position can increase burnout[39], thus resulting in negative emotion to works.

Similar to other study[40], those employed as formal staff had a positive attitude toward the elderly than informal one. This finding is mainly related to the unequal salary system in Chines NHs. Due to the fact that wages of formal employee were paid by government revenues, this part of people often obtain more benefits (such as social insurances) than others, whereas they finished the same works [41]. Therefore, it should be acknowledged that such unfair payback for informal staff explains their negative attitudes towards works. Similarly, the finding that KAOP scores increased with a rise of income also reflects the important role of economic factor in improving work enthusiasm and performance of caregivers [42]. Moreover, caregivers with interests in working with the aged tended to hold positive attitudes. A possible explanation is a good interest in their job can alleviate the perceived work stress and further reduce prejudice against the elderly [43 44].

The present study found that the age of caregivers, in line with previous study, had a positive relationship with self-efficacy [45]. The older age often means an increase in life and work experiences, and accordingly improved people's beliefs about their capabilities. Naturally, those received a pro-job training are expected to possess an improved work skill in handling workload and overcoming obstacles , which therefore enhances self-perception on personal efficacy[46].

The perceived health status of the aged from caregivers is also responsible for variation of self-efficacy scores. Understandably, providing services for the old adults without disability represents a reduced difficulty for caregivers in comparison to the disabled [47]. Thus, this group are more likely to perceive a high-level self-efficiency. Meanwhile, the finding on a positive association of self-efficiency with interest in working with the old and high-level job satisfaction indicated these factors

are able to evoke enthusiastic attitudes toward works, and thereby improving self-confidences in coping with work difficulties.

Actually, the positive correlations among knowledge, attitude and self-efficacy presented in this study agrees with "knowledge-attitude-practice (KAP)" theory[48 49]. Knowing a right knowledge about aging is beneficial for caregivers to develop an optimistic attitude toward the old people[48]. Accordingly, a positive attitude is also good for the improvement of people's beliefs about their capabilities[49]. Therefore, these closed connections provided an implication that the effective workforce management for caregivers should take knowledge, attitude and self-efficacy into account synthetically.

Limitation

There are some limitations in this study should be mentioned. Firstly, 403 sample sizes from Liaoning province in present study were limited to reflect comprehensive situation of China, despite it is enough for data analysis. Caution needs to be taken when generalizing the findings. Additionally, exploratory variables in this study mainly contained demographics and working environment characteristics of caregivers despite the selection of these variables was supported by literature and interviews. However, institutional-level factors potentially influencing perceptions of caregivers, such as the number of employees and elderly in NHs, were not selected since the data is not available. It also explains why the R^2 of regression models is relatively low. Therefore, a further study covering factors at different levels can be considered. Finally, readers should be aware that participants may report what they think the researcher wants to know rather than the truth by using a self-reporting questionnaire, which resulted in their responses can be idealized to meet socially acceptable norms.

Conclusion

This study sheds some light on caregivers-perceived knowledge, attitude about the elderly and self-efficacy in Chinese NHs, and identify their associated the characteristics and work environment factors. A relatively poor-level knowledge, attitude and self-efficacy suggest some targeted actions should be placed on improvement of these attributes.

Firstly, professional training for aged care should be conducted to improving knowledge and abilities of elderly caregivers. Secondly, a performance-based pay system can be considered to encourage caregivers to develop a positive attitude. For example, old people's satisfaction with service can be used as a performance evaluation indicator; an equal payment system for informal and formal employee should be designed. Thirdly, fostering an interest in working with the elderly can also be taken into account. For instance, opening nursing curricula for caregivers to diminish misconceptions about aging and emphasize the potential for job satisfaction arising from working with older people.

Ethics approval and consent to participate

Our study was approved by the ethics committee of Jinzhou Medical University (JMU00001078-15088)

Consent for publication

Consent for publication was obtained from persons we investigated in this study.

Availability of data and material

The data sets analyzed during this study are available from the corresponding author on reasonable

request

Competing interests

The authors declare that they have no competing interests.

Funding

This work was supported by Liaoning Provincial Social Science Project (NO.2019lslktyb-067)

Authors' contributions

All authors made significant contributions to the study. HZ conceptualized this study and analyzed the data. Moreover, she wrote the first draft of the manuscript. HS interpreted the results and revised the manuscript. The final version submitted for publication was read and approved by all authors.

Acknowledgements

The authors gratefully acknowledge all interviewees participating in this study.

Reference

1. Wu M, Li SX, Zhang NJ, et al. Nursing home research in Jinan, China: a focus group approach. *International Journal of Public Policy* 2012;1(8):21-30.

2. Fua F, Lianga Y, Anb Y, et al. Self-efficacy and psychological well-being of nursing home residents in China: the mediating role of social engagement. *Asia Pacific Journal of Social Work and Development* 2018;28(2):128-40.

3. Song Y, Anderson RA, Corazzini KN, et al. Staff characteristics and care in Chinese nursing homes: A systematic literature review. *International Journal of Nursing Sciences* 2014;1(4):423-36.

4. Chan YK, Lee RPL. Network Size, Social Support and Happiness in Later Life: A

Comparative Study of Beijing and Hong Kong. *Journal of Happiness Studies* 2006;7(1):87-112.

5. Wong YC, Leung J. Long-term care in China: issues and prospects. *J Gerontol Soc Work* 2012;55(7):570-86.

6. Zhan HJ. Population Aging and Long-Term Care in China. *Generations* 2013;37(1):53-58.

7. Hao Q, Wu S, Ying L, et al. Current dilemmas of nursing homes in Chengdu: a cross-sectional survey. *Journal of the American Medical Directors Association* 2012;13(4):406.e9-06.e12.

8. Feng Z, Liu C, Guan X, et al. China's Rapidly Aging Population Creates Policy Challenges In Shaping A Viable Long-Term Care System. *Health Affairs* 2012;31(12):2764-73.

9. Zhang H. Who will care for our parents? Changing boundaries of family and public roles in providing care for the aged in urban China. *Care Management Journals* 2007;8(1):1-10.

10. Lee AC, Wong AK, Loh EK. Score in the Palmore's Aging Quiz, knowledge of community resources and working preferences of undergraduate nursing students toward the elderly in Hong Kong. *Nurse Educ Today* 2006;26(4):269-76.

11. Fagerberg I, Ekman S-L. Caring for elderly patients: a longitudinal study of Swedish nursing students' narratives. *Health Care in Later Life* 1998(3):258-71.

12. Kim O-N, Oh J-w, Kim Y-S, et al. Impacts of Perceived Health Status and Self-efficacy in Hospital Nurses on their Health Promoting Behaviors. *Advances in information Sciences and Service Sciences* 2014;6(11):139-44.

13. Bandura A. Perceived Self-Efficacy in Cognitive Development and Functioning1993.

14. Chris G. Stress, coping and burn-out in nursing students. *International Journal of Nursing Studies* 2010;47(10):1299-309.

15. Hweidi IM, Alhassan MA. Jordanian nurses' attitudes toward older patients in acute care settings. *International Nursing Review* 2010;52(3):225-32.

16. Gallagher S, Bennett KM, Halford JC. A comparison of acute and long-term health-care personnel's attitudes towards older adults. *International Journal of Nursing Practice* 2010;12(5):273-79.

17. Jacelon CS. Attitudes and behaviors of hospital staff toward elders in an acute care setting *Applied Nursing Research* 2002;15(4):227-34.

18. Yenişehir S, Karakaya MG. Knowledge and practice of nursing home caregivers about urinary incontinence. *European Geriatric Medicine* 2019;10(1):99-105.

19. Network CY. The growth rate of the elderly population in Liaoning Province slowed down in 2017, and the population of young and old people increased rapidly. 2017 [Available from: https://sh.qihoo.com/9715f9adce7664579?cota=1&refer_scene=so_1&sign=360_e39369d1.

20. P Peduzzi , J Concato , Feinstein A. Importance of events per independent variable in proportional hazards regression analysis. II. Accuracy and precision of regression estimates. *Journal of Clinical Epidemiology* 2007;30(4):618-26.

21. Peduzzi, Peter Concato, Kemper J. A Simulation Study of the Number of Events per Variable in Logistic Regression Analysis. *Journal of Clinical Epidemiology* 1996;49(12):1373-9.

22. Kane RL. Ageism: Negative and Positive 2nd Edition. *Journal of Public Health Policy* 2000;21(2):247-49.

23. Wang CC, Liao WP, Yuan SC, et al. The Chinese version of the Facts on Aging Quiz scale: reliability and validity assessment. *International Journal of Nursing Studies* 2010;47(6):742-52.

24. Wang CC, Liao WC, Kao MC, et al. Taiwanese medical and nursing student interest levels in and attitudes towards geriatrics. *Annals of the Academy of Medicine Singapore* 2009;38(3):230.

25. Yen CH, Liao WC, Chen YR, et al. A Chinese version of Kogan's Attitude Toward Older People Scale: reliability and validity assessment. *International Journal of Nursing Studies* 2009;46(1):38-44.

26. Schwarzer R, Bäßler J, Kwiatek P, et al. The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the General Self-efficacy Scale. *Applied Psychology* 2010;46(1):69-88.

27. Fang LC. Informal employment and gender implications in China: the nature of work and employment relations in the community services sector. *International Journal of Human Resource Management* 2006;17(8):1471-87.

28. Doherty M, Mitchell EA, O'Neill S. Attitudes of Healthcare Workers towards Older People in a Rural Population: A Survey Using the Kogan Scale. *Nursing Research & Practice* 2011;2011(1):352627.

29. Hu SH, Yu YM, Chang WY, et al. Social support and factors associated with self-efficacy among acute-care nurse practitioners. *Journal of Clinical Nursing* 2017;27(2):876-82.

30. Lambrinou E, Sourtzi P, Kalokerinou A, et al. Attitudes and knowledge of the Greek nursing students towards older people. *Nurse Educ Today* 2009;29(6):617-22.

31. Benesty J, Chen J, Huang Y, et al. Pearson Correlation Coefficient. In: Cohen I, Huang Y, Chen J, et al., eds. Noise Reduction in Speech Processing. Berlin, Heidelberg: Springer Berlin Heidelberg 2009:1-4.

32. Tierney AJ, Lewis SJ, Vallis J. Nurses' knowledge and attitudes towards older patients admitted to acute orthopaedic wards. *Journal of Orthopaedic Nursing* 1998;2(2):67-75.

33. Gaugler JE, Mittelman MS, Hepburn K, et al. Predictors of change in caregiver burden and depressive symptoms following nursing home admission. *Psychol Aging* 2009;24(2):385-96.

34. Scerri A, Scerri C. Nursing students' knowledge and attitudes towards dementia — A questionnaire survey. *Nurse Education Today* 2013;33(9):962-68.

35. Humphris GM, Turner A. Job satisfaction and attitudes of nursing staff on a unit for the elderly severely mentally infirm, with change of location. *Journal of Advanced Nursing* 1989;14(4):298.

36. Sung KT. Respect for Elders: Myths and Realities in East Asia. *Journal of Aging & Identity* 2000;5(4):197-205.

37. Zhou X, Zhang J, Song X. Gender Discrimination in Hiring: Evidence from 19,130 Resumes in China. *Mpra Paper* 2013

38. Shaffer MA, Joplin JRW, Bell MP, et al. Gender Discrimination and Job-Related Outcomes: A Cross-Cultural Comparison of Working Women in the United States and China ☆☆☆. *Journal of Vocational Behavior* 2000;57(3):395-427.

39. Lamb HR. Staff burnout in work with long-term patients. *Hospital & Community Psychiatry* 1979;30(6):396-8.

40. P S. Interactions of nurses with elderly patients: relationship to nurses' attitudes and to formal activity periods. *Journal of Advanced Nursing* 2010;18(1):14-19.

41. Zuo H. Formal and Informal Employment in China: Probability of Employment and Determinants of Monthly Wages. *Australian Economic Review* 2013;46(4):405-23.

42. Idrees Z, Xinping X, Shafi K, et al. Effect of salary, training and motivation on job performance of employees. *American Journal of Business, Economics and Management* 2015;3(2):55-58.

43. Undergraduate Nursing Students and the Elderly: an Assessment of Attitudes in a Turkish University. Apha Meeting and Exposition; 2017.

44. Monnot MJ, Beehr TA. Subjective well-being at work: Disentangling source effects of stress and support on enthusiasm, contentment, and meaningfulness. *Journal of Vocational Behavior* 2014;85(2):204-18.

45. Li J, He Z, Luo Y, et al. Perceived Transcultural Self-Efficacy of Nurses in General Hospitals in Guangzhou, China. *Nursing Research* 2016;65(5):371-79.

46. Hendrix CC, Landerman R, Abernethy AP. Effects of an individualized caregiver training intervention on self-efficacy of cancer caregivers. *West J Nurs Res* 2013;35(5):590-610.

47. Uysal A, Albayrak B, Koçulu B, et al. Attitudes of nursing students toward people with disabilities. *Nurse Educ Today* 2014;34(5):878-84.

48. Howell D, Butler L, Vincent L, et al. Influencing nurses' knowledge, attitudes, and practice

in cancer pain management. *Cancer Nursing* 2000;23(1):55.

49. Pan HH, Shih HL, Wu LF, et al. Path modeling of knowledge, attitude and practice toward palliative care consultation service among Taiwanese nursing staff: a cross-sectional study. *Bmc Palliative Care* 2017;16(1):42.

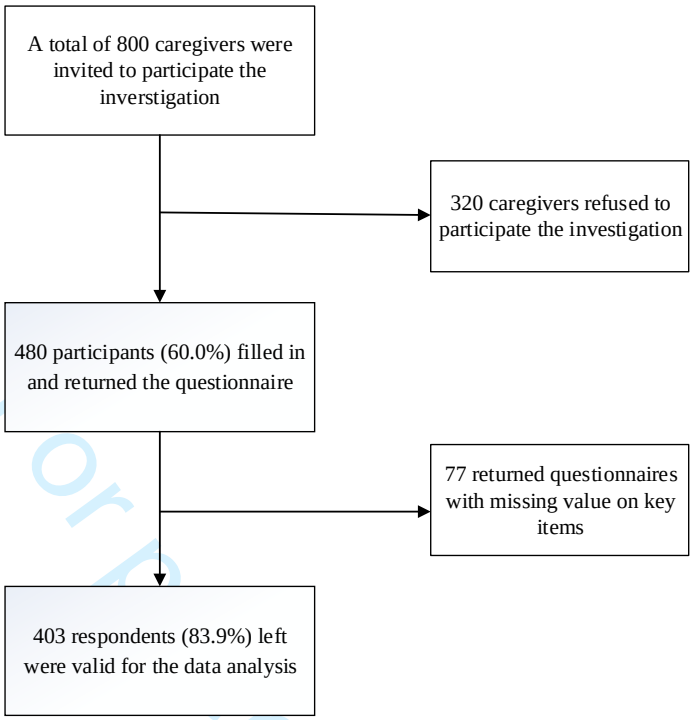

Figure 1 The process for sample screening

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Page1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Page2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	Page5
Methods			
Study design	4	Present key elements of study design early in the paper	Page5-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Page6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page7
Bias	9	Describe any efforts to address potential sources of bias	Page6
Study size	10	Explain how the study size was arrived at	Page6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page7-8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Page8
		(*b*) Describe any methods used to examine subgroups and interactions	Page8
		(*c*) Explain how missing data were addressed	Page6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page9-11
		(b) Give reasons for non-participation at each stage	Not applicable
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page9-11
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	Page9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Page 12-15
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Page15-17
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Knowledge, attitude and self-efficacy of elderly caregivers in Chinese nursing homes: a cross-sectional study in Liaoning province

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029869.R2
Article Type:	Original research
Date Submitted by the Author:	03-Sep-2019
Complete List of Authors:	Zhang, Huijun; Tianjin University, School of Pharmaceutical Science and Technology; Jinzhou Medical University, School of Nursing Sun, He; Tianjin University,
Primary Subject Heading:	Nursing
Secondary Subject Heading:	Occupational and environmental medicine
Keywords:	knowledge, attitude, self-efficacy, elderly caregivers, nursing homes, China

Knowledge, attitude and self-efficacy of elderly caregivers in Chinese nursing homes: A cross-sectional study in Liaoning province

Huijun Zhang

Affiliated institution: 1, School of Pharmaceutical Science and Technology, Tianjin University, Tianjin, China; 2, School of Nursing, Jinzhou Medical University, Jinzhou, Liaoning province, China

E-mail: 13904069606@163.com

He Sun （Corresponding author）

Affiliated institution: School of Pharmaceutical Science and Technology, Tianjin University, Tianjin, China

E-mail: 18768429445@163.com

Abstract

Objectives This study aimed to investigate the perceptions of elderly caregivers in Chinese nursing homes (NHs) and associated factors with regard to knowledge, attitude about elderly and self-efficacy.

Setting A cross-sectional questionnaire survey was conducted on 12 NHs in Liaoning province, China.

Participants A total of 403 caregivers from 12 NHs were surveyed.

Outcome measures Data were collected using a self-administered questionnaire composed of the Palmore's Facts on Aging Quiz I, the Kogan's Attitude Old People Scale, Generalised Self-efficacy Scale and background characteristics of participants. An average score for knowledge, attitude and self-efficacy was calculated. Differences across groups were evaluated using Student's *t*-test and ANOVA. Multivariable linear regression models were established to estimate the associated factors.

Results The participating caregivers reported a relative low score on knowledge about the elderly (10.42±2.79), attitude toward old people (127.85±14.36) and self-efficacy (27.12±4.9). Multivariable regression analysis showed that respondents who had high educational level (β=0.232, 95% CI: 0.027 to 0.907), received pre-job training (β=0.196, 95% CI: 0.121 to 1.169) and had high job satisfaction (β=0.358, 0.370; 95% CI: 0.123 to 1.875 and 0.110 to 1.283) gave a positive rating on knowledge. Caregivers who were employed as formal staff (β=0.136, 95% CI: 0.016 to 7.670), earned a high income (β=0.214, *95%CI*: 0.009 to 4.561) and had an interest in working with the elderly (β=0.191, *95% CI:* 0.018 to 2.808) tended to develop a positive attitude towards the elderly. However, caregivers who were female (β=−0.112, 95% CI: −1.753 to −0.010)

and had long work experience (β=−0.130, 95% CI: −2.827 to −0.018) developed negative perception. Caregivers who were older (β=0.205, 95% CI: 0.039 to 3.427), received pre-job training (β=0.165, 95% CI: 0.053 to 2.934), had an interest in working with the elderly (β=0.154, *95%CI:* 0.004 to 2.085), had high job satisfaction (β=0.174, 95% CI: 0.026 to 3.548) and perceived improved health status for the elderly (β=0.290, 0.447; 95% CI: 0.059 to 2.700 and 0.053 to 1.211) gave a positive rating on self-efficacy.

Conclusion

Knowledge about the elderly, attitude toward old people and self-efficacy of elderly caregivers in Chinese NHs were at low levels. Some targeted intervention programs, such as conducting a professional training for aged care and fostering an interest in working with the elderly, should be given a priority for improving these attributes.

Strengths and limitations of this study

- This study is amongst the first to understand the perception of caregivers in Chinese nursing homes on knowledge about aging, attitude toward the elderly and self-efficacy.
- Multivariable linear regression models were established and used to identify multifaceted factors associated with the perceived knowledge, attitude and self-efficacy of caregivers.
- Using widely accepted scales (FAQ 1, KAOP and GSE) for data collection contributed to the reliability of the results.
- The samples were collected from only one province located in the north-eastern region of China. Caution needs to be taken when generalising the findings to China or other countries.

Introduction

Population ageing has been highlighted worldwide, especially in China. According to the National Bureau of Statistics of China (2017), the elderly population aged 60 years and higher has reached 240 million, accounting for 17.3% of the total population[1 2]. By 2050, this number is expected to increase up to 450 million, accounting for 33% of the total population[3]. Hence, China will become the country with the largest number of old people in the world. Such growth in population aging will result in significantly increased needs for long-term care.

Influenced by traditional Chinese culture, elderly people prefer to live with their children, and taking care for the elderly is regarded as the responsibility of the family[4]. However, the rising migration from rural to urban areas, especially amongst young people, and the shrinking average family size due to China's one-child policy[5 6] have changed the mainstream informal family-based caregiving model for older adults. Consequently, old people are being sent to nursing homes (NHs) for professional aged care.

Over the past few years, the Chinese government made a great effort to support the development of the aged care service industry and invested into NHs. Approximately 155,000 different types of NHs exist across Mainland China and include old age homes, retirement departments, residential care facilities, welfare institutes and geriatric hospitals. However, health workers in NHs have shortage of or lack formal vocational training[3]. As a result, low-level caregiving skills and poor health care quality become an urgent issue and have attracted a wide range of attention[7 8]. Although the Chinese government launched the 'Basic Standards for Service Quality of Aged Agencies' in 2017, the quality of nursing services for the elderly is still not guaranteed[9]. Providing high-quality aged care services seem to pose a huge challenge in coping with China's aging

society.

Elderly caregivers in NHs, as the front-line health care workers, spend considerable time with old people and have a direct effect on healthcare delivery[10]. However, holding a negative attitude and misunderstanding about aging often create an adverse impact on provision of health care behaviour and ultimately lead to poor health outcomes[11 12]. In addition to attitude and knowledge, self-efficacy which is defined as 'people's beliefs about their capabilities to exercise control over events that affect their lives'[13] is another widely recognised factor associated with health workers' behaviour in care delivery. In general, high self-efficacy is associated with positive feelings about one's self, which facilitate cognitive processes and work achievement as well as confidence and motivation[14]. Therefore, giving an emphasis on knowledge, attitude and self-efficacy of caregivers is beneficial in providing high-quality aged care services.

Many studies conducted in Western countries revealed that social workers, healthcare workers and nursing students tend to have poor attitude, misconception, inadequate knowledge and lowest priority to consider working with elderly[15-18]. However, there is paucity in the literature involved in low- and middle-income Asian countries, including China. Understanding the knowledge, attitude and self-efficacy of elderly caregivers in NHs and the significant increase in needs for aged care in China has practical significance.

This study aimed to investigate the perceptions of caregivers on knowledge about aging, attitude toward the elderly and self-efficacy and their associated factors.

Method

Setting and sampling

A cross-sectional quantitative survey was conducted on Liaoning province located in the north-eastern region of China, where people aged over 60 years account for 22.65% of the total population[19].

We adopted a multistage sampling strategy. Firstly, three cities were selected from three different geographical zones, namely, Shenyang representing central, Jinzhou representing west and Dandong representing east. Four NHs (two for large size, two for small size) were selected randomly in each city according to their organisation code. Twelve NHs were selected to participate. Finally, half of the caregivers were considered as samples in each selected NH.

Data were collected from November 1, 2015 to May 31, 2016. Two to four trained investigators assigned to each selected NH were required to invite caregivers working in different departments. The participants were asked to provide informed consent letter and oral consent before they filled out the questionnaires. We approached potential participants across the entire working time to maximise the chance of capturing a representative sample.

Considering that NH has no standardised definition in Mainland China, this study defined it as an institution included in residential long-term care facilities in Mainland China that mainly admit people aged 60 years or higher. A qualified elderly caregiver usually needs to receive 3–5 years of professional training in China. In this study, caregivers who had direct contact with the elderly were eligible to participate in the investigation. These caregivers included physicians, nurses and allied health workers. Participants should have worked in the selected NHs for more than 1 year and voluntarily participated in the survey.

Approximately 800 caregivers were invited to participate in this investigation, and 480 participants (60%) filled in and returned the questionnaires. After excluding questionnaires with

uncompleted key items, 403 (83.9%) were considered valid for data analysis (Figure 1). According to formula proposed by Peduzzi et al. [20 21], the minimum sample size is at least $10\times K$, where K is the number of predictors in the regression model. This sample size would be sufficiently large for multivariable linear regression analyses for a model containing 18 dichotomous independent variables (Table 1).

(Figure 1 should be here)

Measurement

We adopted Palmore's Facts on Aging Quiz I (FAQ 1), the Kogan's Attitude Old People Scale (KAOP) and Generalised Self-efficacy Scale (GSE) to measure knowledge about old people, attitude toward the elderly and self-efficacy of caregivers, respectively. Data about characteristics of the caregivers and their work environments were also collected by a self-developed questionnaire.

FAQ I developed by Palmore (1990) has been widely used to assess the subjects' (including caregivers) physical, mental and social knowledge about aging as well as some of the most common misconceptions about aging[15 22]. FAQ 1 is composed of 25 statements, such as 'old people tend to react slower than young people' and 'old people are not as efficient as young people.' The participants responded by stating whether a statement is true (T) or false (F); a score of 1 is assigned if the answer is right, otherwise the score is 0. Therefore, the total scores range from 0 to 25, with a high score representing high knowledge about the elderly. The Chinese version of FAQ 1 introduced by Wang et al.[23] has adequate reliability (Cronbach's α=0.68).

KAOP, which is developed by Kogan in 1961, has been used to measure attitude towards the elderly in many studies. This scale contains 34 items with 17 negative (KAOP-) and 17 (KAOP+)

positive statements. Examples of the statements are as follows: 'most the elderly gets set in their ways and are unable to change,' and 'it is very easy to get on with the elderly.' Each item is scored using a six-point Likert scale (strongly disagree=1, disagree=2, slightly disagree=3, slightly agree=5 and strongly agree=6). The scores on the statement presented negatively should be reversed to estimate the total score. The total scores for the KAOP range from 34 to 204, with high scores representing positive attitude towards the elderly[24]. For the Chinese version of KAOP, the Cronbach's α is 0.82 for the total scale, indicating that it is a fully reliable instrument[25].

GSE, which was developed by Zhang and Schwarzer in 1995, is used widely to measure a general sense of perceived self-efficacy [26]. The 10 items of the GSE are scored on a four-point scale (not at all true=1, hardly true=2, moderately true=3 and exactly true=4). The total scores range from 10 to 40, with a high score indicating high self-efficacy. A Cronbach's α value of 0.89 for the Chinese version of the GSE indicates that this instrument has high reliability for the study population[2].

In the last part of the questionnaire, some close-ended questions were designed to collect information about the background characteristics of the participating caregivers and their work environment. General demographic characteristics including age, gender and educational level were also investigated (Table 1). Various questions about caregivers' work environment were also asked. These questions include the following examples: 'how many years have you been working in this NH (work tenure)' and 'is your NH public or private (ownership of NH); located in rural or urban (work place)' (Table 1). The employment type of caregivers in Chinese NHs includes formal and informal employees. Formal employees are hired by the government, and their wages are paid by the National Finance Department. Informal employees are caregivers who signed the

labour contract with NHs, and their wages come from the profits of the institution[27]. We also obtained information on pre-job training (yes/no), interest in working with the elderly (yes/no) and job satisfaction (not /generally/very satisfied). Meanwhile, we measured the perceived health status of the elderly from caregivers by asking 'how rate overall health status of the elderly who you served in the past month (complete/partial/with no disability)' (Table 1). These factors were identified as independent variables in the regression model[15 28 29].

Data analysis

Scores on each item of FAQ 1, KAOP and GSE were added. According to the guidance on the use of each scale, every item was given the same weight[23 26 30]. Average score was calculated to evaluate the levels of knowledge, attitude and self-efficacy.

The Kolmogorov–Smirnov test showed that the *p*-values for knowledge, attitude and self-efficacy scores exceeded 0.10; as such, data of these variables were normally distributed. Student's *t*-test (for two-group comparisons) or ANOVA (for multiple group comparisons) was performed to determine statistical differences in scores across different groups. Multivariable linear regression models were established to identify factors associated with knowledge, attitude and self-efficacy scores, and serving the characteristics of respondents as independent variables.

In model establishment, we used the ENTER approach (all independent variables are forced into the regression models) because of two reasons: first, we tend to explain the variations in knowledge, attitude and self-efficacy scores instead of predicting them. This approach allowed us to observe the parameters of these factors that are not significantly associated with the dependent variables. Second, all independent variables in the model have been studied in other countries[15 28].

To compare our results with those reported in other countries, we added all independent variables into the regression model. We also conducted logistic regression analyses for sensitivity test by recoding the knowledge, attitude and self-efficacy scores into dichotomous variables (Supplementary Table).

A double entry strategy was adopted to ensure the accuracy of data input by using EpiData 3.1. All statistical analyses were performed using IBM SPSS Statistics V.22.0.

Patient and Public Involvement

This study focused on knowledge about aging, attitude towards the elderly and self-efficacy; thus, patients were not directly involved in the survey.

Results

Characteristics of respondents

Of the 403 respondents, 89.8% were female. A total of 70.5% of the respondents aged more than 40 years. Only 20.3% of the caregivers had bachelor's degree or above. More than half of respondents had working tenure of <3 years (55.1%) and worked in urban setting (61.8%). The majority of the participants (86.8%) were employed as informal employees. Only 10.7% earned a monthly income of >3000 Chinese yuan. A total of 68.0% and 85.4% of respondents reported that they received pre-job training and had an interest in elderly care, respectively (Table 1).

Knowledge, attitude toward the elderly and self-efficacy

Overall, relatively low scores for knowledge (10.42±2.79), attitude (127.85±14.36) and self-efficacy (27.12±4.91) were measured by FAQ 1, KAOP and GSE, respectively, amongst caregivers in NHs.

Table1 shows the differences in the scores of knowledge, attitude and self-efficacy rated by caregivers with different characteristics. Male respondents gave higher scores on attitude than female ones (p<0.05). Older caregivers showed higher self-efficacy than younger ones (p<0.05). Respondents with middle educational level gave higher scores on knowledge than the two other groups (p<0.05). Caregivers working in public NHs had high scores on knowledge and attitude (p<0.05). Formal employees showed better performance in terms of knowledge, attitude and self-efficacy (p<0.05). Scores for attitude increased with increasing monthly salary (p<0.001). Participants who received pre-job training reported high scores for knowledge and self-efficacy (p<0.05). Respondents interested in elderly care gave high scores for attitude and self-efficacy (p<0.05). Scores for the three domains varied across different job satisfaction levels (p<0.05).

Table 1 Differences in knowledge, attitude and self-efficacy scores amongst different characteristics of caregivers

Variables	N (%)	FAQ 1 scores		KAOP scores		Self-efficacy scores	
		Mean ± SD	*p*-Value	Mean ± SD	*p*-Value	Mean ± SD	*p*-Value
Gender			0.055		0.034		0.890
Male	41 (10.2)	11.22±3.09		132.30±15.75		27.02±4.21	
Female	362 (89.8)	10.33±2.75		127.31±14.13		27.13±4.98	
Age (years)			0.070		0.909		0.004
30–39	119 (29.5)	10.37±2.70		128.22±14.13		26.33±4.19	
40–49	141 (35.0)	10.83±2.96		127.93±15.07		26.70±5.41	
≤50	143 (35.5)	10.07±2.66		127.45±13.93		28.18±4.79	
Educational level			0.046		0.276		0.927
Junior high school or below	225 (55.8)	10.23±2.90		126.93±13.78		27.09±4.83	

Secondary high school	96 (23.8)	11.04±2.77		129.72±14.08		27.03±5.20	
Bachelor degree or above	82 (20.3)	10.23±2.44		128.16±16.11		27.30±4.81	
Work tenure (years)			0.858		0.172		0.355
1–3	222 (55.1)	10.47±2.87		129.70±15.43		27.44±5.02	
4–6	114 (28.3)	10.44±2.81		128.55±10.61		26.76±4.64	
≤7	67 (16.6)	10.25±2.53		126.68±14.72		26.68±4.96	
Nursing home ownership			0.033		0.032		0.708
Public	132 (32.8)	14.24±2.99		133.94±15.91		26.99±4.61	
Private	271 (67.2)	10.51±2.69		127.80±13.58		27.18±5.05	
Work place			0.127		0.862		0.296
Urban	249 (61.8)	10.26±2.84		127.94±15.20		27.32±4.96	
Rural	154 (38.2)	10.69±2.71		127.69±12.95		26.78±4.82	
Employment type			0.037		0.011		0.042
Informal employee	350 (86.8)	10.24±2.81		127.05±14.20		25.33±4.47	
Formal employee	53 (13.2)	15.40±2.56		135.63±15.96		27.66±5.22	
Monthly income (¥)			0.466		<0.001		0.975
<2000	160 (39.7)	10.21±2.81		126.52±15.21		27.05±5.24	
2000–3000	200 (49.6)	10.56±2.74		127.13±12.71		27.16±4.91	
>3000	43 (10.7)	10.60±3.00		136.11±15.59		27.18±3.51	
Pre-job training			0.040		0.106		0.001
No	129 (32.0)	10.01±2.95		126.16±14.38		25.91±4.62	
Yes	274 (68.0)	10.62±2.70		128.64±14.31		27.69±4.94	

Health status of the elderly			0.868	0.602		<0.001
Complete disability	34 (8.4)	10.21±2.21		125.49±14.11	26.32±4.34	
Partial disability	219 (54.3)	10.42±2.79		127.98±13.50	27.62±5.17	
No disability	150 (37.2)	10.49±2.92		128.19±15.63	30.64±5.41	
Interest in working with elderly people			0.273	0.019		0.022
No	58 (14.4)	9.88±2.72		123.74±14.15	25.68±4.66	
Yes	344 (85.4)	10.51±2.80		128.60±14.28	27.34±4.91	
Job satisfaction			0.001	0.033		0.001
Not satisfied	34 (8.4)	8.68±2.77		121.97±16.80	25.14±5.42	
Generally satisfied	151 (37.5)	10.66±2.49		127.70±13.29	26.42±4.94	
Very satisfied	218 (54.1)	10.54±2.91		128.86±14.51	27.91±4.66	

Factors associated with knowledge, attitude and self-efficacy: results of multivariable linear regression analyses

Table 2 shows the results of the three multivariable linear regression models for analysis of factors associated with knowledge, attitude and self-efficacy.

Knowledge about older people

Respondents with bachelor's degree or above (β=0.232, 95% CI: 0.027 to 0.907) gave higher scores in FAQ I than those who completed junior high school or below. People who received pre-job training (β=0.196, 95% CI: 0.121 to 1.169) were more likely to report high scores for knowledge.

Job satisfaction (β=0.358, 0.370; 95% CI: 0.123 to 1.875 and 0.110 to 1.283) had proportional relationship to knowledge.

Attitudes toward older people

The attitude scores in KAOP were high for those who were employed as formal employee (β=0.136, *95% CI:* 0.016 to 7.670), earned high wages (β=0.214, 95% CI: 0.009 to 4.561) and had an interest in working with aged people (β=0.191, 95% CI: 0.018 to 2.808). However, female (β=−0.112, 95% CI: −1.753 to −0.010) and respondents with more than 7 years of work experience (β=−0.130, 95% CI: −2.827 to −0.018) reported low scores.

Caregiver self-efficacy

A high self-efficacy score in GSE was observed in caregivers who were older (β=0.205, 95% CI: 0.039 to 3.427), received pre-job training (β=0.165, 95% CI: 0.053 to 2.934), had interest in working with the elderly (β=0.154, 95% CI: 0.004 to 2.085), had high job satisfaction (β=0.174, 95% CI: 0.026 to 3.548) and perceived improved health status of the elderly they served (β=0.290, 0.447; 95% CI: 0.059 to 2.700 and 0.053 to 1.211).

A moderate association[31] between knowledge and attitude scores (r=0.233, p<0.05) and between attitude and self-efficacy scores (r=0.150, p<0.05) was tested by Pearson correlation calculations. The correlation coefficient between knowledge and self-efficacy was not statistically significant (r=0.034, p>0.05).

Table 2 Factors associated with knowledge, attitude and self-efficacy: multivariable linear regression models

Variables	FAQ 1 scores			KAOP scores			Self-efficacy scores		
	β	95% CI	*p*	*β*	95% CI	*p*	*B*	95% CI	*p*
Gender									
Male	Ref.			Ref.			Ref.		
Female	−0.082	(−1.646, 0.176)	0.102	**−0.112**	**(−1.753, −0.010)**	**0.026**	0.011	(−1.269, 1.813)	0.818

Age (years)									
30–39	Ref.			Ref.			Ref.		
40–49	0.110	(−0.143, 1.345)	0.102	−0.017	(−4.468, 3.125)	0.792	0.095	(−0.363, 2.153)	0.131
≤50	−0.018	(−0.961, 0.629)	0.791	−0.043	(−5.362, 2.750)	0.534	**0.205**	**(0.039, 3.427)**	**0.002**
Education level									
Junior high school or below	Ref.			Ref.			Ref.		
Secondary high school	0.102	(−0.020, 1.410)	0.067	0.076	(−1.217, 6.078)	0.170	0.015	(−1.086, 1.331)	0.772
Bachelor degree or above	**0.232**	**(0.027, 0.907)**	**0.018**	−0.013	(−5.121, 3.721)	0.840	0.023	(−1.313, 1.617)	0.708
Working tenure (years)									
1–3	Ref.			Ref.			Ref.		
4–6	−0.005	(−0.642, 0.620)	0.923	0.094	(−0.389, 6.053)	0.071	−0.089	(−2.105, 0.029)	0.075
≤7	−0.056	(−1.131, 0.421)	0.290	**−0.130**	**(−2.827, −0.018)**	**0.044**	−0.048	(−2.146, 0.478)	0.344
NH ownership									
Public	Ref.			Ref.			Ref.		
Private	0.032	(−0.417, 0.770)	0.528	−0.001	(−2.827, 3.227)	0.984	0.057	(−0.308, 1.698)	0.242
Work place									
Urban	Ref.			Ref.			Ref.		
Rural	0.054	(−0.155, 0.987)	0.286	−0.022	(−3.617, 2.211)	0.663	−0.003	(−0.993, 0.939)	0.956
Employment type									
Informal employee	Ref.			Ref.			Ref.		
Formal employee	0.109	(−0.035, 1.150)	0.052	**0.136**	**(0.016, 7.670)**	**0.012**	0.102	(−1.313, 0.689)	0.069
Monthly income (¥)									

<2000	Ref.			Ref.			Ref.		
2000–3000	0.015	(−0.461, 0.752)	0.784	−0.004	(−3.610, 2.578)	0.939	0.014	(−1.050, 1.001)	0.796
>3000	0.036	(−0.742, 1.221)	0.516	**0.214**	**(0.009, 4.561)**	**<0.001**	−0.004	(−1.890, 1.429)	0.936
Pre-job training									
No	Ref.			Ref.			Ref.		
Yes	**0.196**	**(0.121, 1.169)**	**0.047**	0.056	(−1.301, 5.280)	0.305	**0.165**	**(0.053, 2.934)**	**0.002**
Health status of elderly									
Complete disability	Ref.			Ref.			Ref.		
Partial disability	0.001	(−1.032, 0.994)	0.987	0.114	(−1.885, 8.457)	0.214	**0.447**	**(0.059, 2.700)**	**<0.001**
No disability	0.010	(−1.069, 1.026)	0.910	0.084	(−2.931, 7.759)	0.362	**0.290**	**(0.053, 1.211)**	**0.001**
Interest in working with elderly									
No	Ref.			Ref.			Ref.		
Yes	0.080	(−0.358, 1.230)	0.122	**0.191**	**(0.018, 2.808)**	**0.039**	**0.154**	**(0.004, 2.085)**	**0.013**
Job satisfaction									
Not satisfied	Ref.			Ref.			Ref.		
Generally satisfied	**0.358**	**(0.123, 1.875)**	**<0.001**	0.081	(−0.293, 7.808)	0.393	0.052	(−1.103, 2.469)	0.572
Very satisfied	**0.370**	**(0.110, 1.283)**	**<0.001**	0.109	(−2.508, 8.275)	0.278	**0.174**	**(0.026, 3.548)**	**0.044**
F	2.378		0.001	2.344		0.001	3.740		<0.001
R^2	0.116			0.114			0.171		
Adjusted R^2	0.105			0.109			0.155		

Note: Figures in bold letters/numbers indicate coefficients with statistical significance

Discussion

The rising of the elderly population has led to challenges for the Chinese government in meeting the increasing needs for professional healthcare for aged people. This study assessed the knowledge and attitude about the aging and self-efficacy of caregivers working in Chinese NHs. Low levels of knowledge, attitude and self-efficacy were observed in the present study compared with those in other countries or regions[28 30 32]. At the initial stage of NH development in China, severe shortage of qualified health workers and insufficient professional training resulted in difficulties of the majority of caregivers in providing healthcare services for the elderly[3]. Low income and negative expectation for career development also adversely influenced the work performance of caregivers[33].

Consistent with other studies[18 30 34], the present results found that caregivers who received higher level education and pre-job training gave higher scores for knowledge about the elderly. A possible reason is that long-term education and professional training not only improved the working ability of caregivers but can also teach additional knowledge and further correct their misunderstanding about aging. In addition to the two factors, high job satisfaction level was also associated with knowledge given that this driving force factor can encourage staff to learn additional information relative to their work[35].

With respect to attitude toward the elderly, this study indicated the females were more likely to have negative attitude compared with males, inconsistent with other studies[15 36]. The potential explanation is that women in Chinese traditional families take additional responsibilities in cultivating children and taking care of old people; as such, female caregivers tend to develop poor attitude. Additionally, gender discrimination in the workplace often results in unequal treatment

for females in terms of wages and career advancement[37 38]. Therefore, female caregivers tend to have poor attitude. The negative association of work tenure with attitude can be explained by the fact long-term work in the same position can result in burnout[39], leading to negative emotion toward work.

Similar to other study[40], caregivers employed as formal staff had positive attitude towards the elderly than informal employees. This finding could be mainly due to the unequal salary system in Chinese NHs. Considering that the wages of formal employees are paid by government revenues, they often obtain more benefits (such as social insurances) than the others although they have the same work load[41]. Therefore, this unfair payback system for informal staff explains their negative attitude towards their work. Similarly, the KAOP scores increased with increasing income, reflecting the important role of economic factors in improving the work enthusiasm and performance of caregivers [42]. Caregivers interested in working with the elderly tended to have positive attitude. A possible explanation for this phenomenon is the fact that interest in their job can alleviate perceived work stress and further reduce prejudice against the elderly [43 44].

In this study, the age of caregivers had a positive relationship to self-efficacy, consistent with previous results[45]. Old age often indicates an increase in life and work experiences and, accordingly, improved people's beliefs about their capabilities. Caregivers who received pre-job training are expected to possess improved work skills in handling workload and overcoming obstacles, thereby enhancing their self-perception on personal efficacy[46].

The perceived health status of the elderly evaluated by caregivers is also responsible for the variations in self-efficacy scores. Providing services for the old adults without disability decreases difficulty for caregivers compared with caring for disabled ones [47]. Thus, this group of caregivers

is more likely to perceive a high level of self-efficacy. Meanwhile, the positive association of self-efficacy with interest in working with old and job satisfaction indicated these factors can evoke enthusiastic attitude towards work, thereby improving self-confidence in coping with work difficulties.

The positive correlations amongst knowledge, attitude and self-efficacy presented in this study agreed with "knowledge–attitude–practice" theory[48 49]. Knowing the correct knowledge about aging is beneficial for caregivers to develop an optimistic attitude toward elderly people[48]. Accordingly, positive attitude is beneficial for improving people's beliefs about their capabilities[49]. Therefore, these closed associations indicated that the effective workforce management for caregivers should take knowledge, attitude and self-efficacy into account.

Limitation

This study has several limitations. Firstly, the 403 samples from Liaoning province were limited to reflect the comprehensive situation in China. This sample size also affected the width of 95% CI in the regression models, although it is sufficient for data analysis. Caution needs to be taken when generalising the findings. Secondly, exploratory variables mainly included demographics and working environment characteristics of caregivers although the selection of these variables was supported by previous studies and interviews. However, institutional-level factors potentially influencing the perceptions of caregivers, such as number of employees and elderly in NHs, were ignored because data are unavailable. As such, the R^2 of the regression models was relatively low. Therefore, further studies should cover factors at different levels. Thirdly, readers should be aware that participants may report what they believe the researcher wants to know instead of the truth.

Hence, the use of a self-reporting questionnaire could lead to idealised responses to meet socially acceptable norms.

Conclusion

This study provides insights on the knowledge, attitude about the elderly and self-efficacy of caregivers in Chinese NHs and identify their associated characteristics and work environment factors. Relatively poor knowledge level, attitude and self-efficacy suggest that several targeted actions should be implemented to improve these attributes.

Firstly, professional training for aged care should be conducted to improve the knowledge and abilities of caregivers. Secondly, a performance-based pay system can be considered to encourage caregivers to develop a positive attitude. For example, old people's satisfaction with service can be used as a performance evaluation indicator; an equal payment system for informal and formal employee should be designed. Thirdly, fostering an interest in working with the elderly, such as opening nursing curricula for caregivers to diminish misconceptions about aging and emphasise the potential for job satisfaction from working with older people, can also be considered.

Ethics approval and consent to participate

Our study was approved by the ethics committee of Jinzhou Medical University (JMU00001078-15088)

Consent for publication

Consent for publication was obtained from persons we investigated in this study.

Availability of data and material

The data sets analysed during this study are available from the corresponding author on reasonable request

Competing interests

The authors declare that they have no competing interests.

Funding

This work was supported by Liaoning Provincial Social Science Project (NO.2019lslktyb-067)

Authors' contributions

All authors made significant contributions to the study. HZ conceptualized this study and analysed the data. Moreover, she wrote the first draft of the manuscript. HS interpreted the results and revised the manuscript. The final version submitted for publication was read and approved by all authors.

Acknowledgements

The authors gratefully acknowledge all interviewees participating in this study.

References

1. Wu M, Li SX, Zhang NJ, et al. Nursing home research in Jinan, China: a focus group approach. *International Journal of Public Policy* 2012;1(8):21-30.

2. Fua F, Lianga Y, Anb Y, et al. Self-efficacy and psychological well-being of nursing home residents in China: the mediating role of social engagement. *Asia Pacific Journal of Social Work and Development* 2018;28(2):128-40.

3. Song Y, Anderson RA, Corazzini KN, et al. Staff characteristics and care in Chinese nursing homes: A systematic literature review. *International Journal of Nursing*

Sciences 2014;1(4):423-36.

4. Chan YK, Lee RPL. Network Size, Social Support and Happiness in Later Life: A Comparative Study of Beijing and Hong Kong. *Journal of Happiness Studies* 2006;7(1):87-112.

5. Wong YC, Leung J. Long-term care in China: issues and prospects. *J Gerontol Soc Work* 2012;55(7):570-86.

6. Zhan HJ. Population Aging and Long-Term Care in China. *Generations* 2013;37(1):53-58.

7. Hao Q, Wu S, Ying L, et al. Current dilemmas of nursing homes in Chengdu: a cross-sectional survey. *Journal of the American Medical Directors Association* 2012;13(4):406.e9-06.e12.

8. Feng Z, Liu C, Guan X, et al. China's Rapidly Aging Population Creates Policy Challenges In Shaping A Viable Long-Term Care System. *Health Affairs* 2012;31(12):2764-73.

9. Zhang H. Who will care for our parents? Changing boundaries of family and public roles in providing care for the aged in urban China. *Care Management Journals* 2007;8(1):1-10.

10. Lee AC, Wong AK, Loh EK. Score in the Palmore's Aging Quiz, knowledge of community resources and working preferences of undergraduate nursing students toward the elderly in Hong Kong. *Nurse Educ Today* 2006;26(4):269-76.

11. Fagerberg I, Ekman S-L. Caring for elderly patients: a longitudinal study of Swedish nursing students' narratives. *Health Care in Later Life* 1998(3):258-71.

12. Kim O-N, Oh J-w, Kim Y-S, et al. Impacts of Perceived Health Status and Self-efficacy in Hospital Nurses on their Health Promoting Behaviors. *Advances in information*

Sciences and Service Sciences 2014;6(11):139-44.

13. Bandura A. Perceived Self-Efficacy in Cognitive Development and Functioning1993.

14. Chris G. Stress, coping and burn-out in nursing students. *International Journal of Nursing Studies* 2010;47(10):1299-309.

15. Hweidi IM, Alhassan MA. Jordanian nurses' attitudes toward older patients in acute care settings. *International Nursing Review* 2010;52(3):225-32.

16. Gallagher S, Bennett KM, Halford JC. A comparison of acute and long-term health-care personnel's attitudes towards older adults. *International Journal of Nursing Practice* 2010;12(5):273-79.

17. Jacelon CS. Attitudes and behaviors of hospital staff toward elders in an acute care setting *Applied Nursing Research* 2002;15(4):227-34.

18. Yenișehir S, Karakaya MG. Knowledge and practice of nursing home caregivers about urinary incontinence. *European Geriatric Medicine* 2019;10(1):99-105.

19. Network CY. The growth rate of the elderly population in Liaoning Province slowed down in 2017, and the population of young and old people increased rapidly. 2017 [Available from:https://sh.qihoo.com/9715f9adce7664579?cota=1&refer_scene=so_1&sign=360_e39369d1.

20. P Peduzzi , J Concato , Feinstein A. Importance of events per independent variable in proportional hazards regression analysis. II. Accuracy and precision of regression estimates. *Journal of Clinical Epidemiology* 2007;30(4):618-26.

21. Peduzzi, Peter Concato, Kemper J. A Simulation Study of the Number of Events per

Variable in Logistic Regression Analysis. *Journal of Clinical Epidemiology* 1996;49(12):1373-9.

22. Kane RL. Ageism: Negative and Positive 2nd Edition. *Journal of Public Health Policy* 2000;21(2):247-49.

23. Wang CC, Liao WP, Yuan SC, et al. The Chinese version of the Facts on Aging Quiz scale: reliability and validity assessment. *International Journal of Nursing Studies* 2010;47(6):742-52.

24. Wang CC, Liao WC, Kao MC, et al. Taiwanese medical and nursing student interest levels in and attitudes towards geriatrics. *Annals of the Academy of Medicine Singapore* 2009;38(3):230.

25. Yen CH, Liao WC, Chen YR, et al. A Chinese version of Kogan's Attitude Toward Older People Scale: reliability and validity assessment. *International Journal of Nursing Studies* 2009;46(1):38-44.

26. Schwarzer R, Bäßler J, Kwiatek P, et al. The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the General Self-efficacy Scale. *Applied Psychology* 2010;46(1):69-88.

27. Fang LC. Informal employment and gender implications in China: the nature of work and employment relations in the community services sector. *International Journal of Human Resource Management* 2006;17(8):1471-87.

28. Doherty M, Mitchell EA, O'Neill S. Attitudes of Healthcare Workers towards Older People in a Rural Population: A Survey Using the Kogan Scale. *Nursing Research & Practice* 2011;2011(1):352627.

29. Hu SH, Yu YM, Chang WY, et al. Social support and factors associated with self-efficacy among acute-care nurse practitioners. *Journal of Clinical Nursing* 2017;27(2):876-82.

30. Lambrinou E, Sourtzi P, Kalokerinou A, et al. Attitudes and knowledge of the Greek nursing students towards older people. *Nurse Educ Today* 2009;29(6):617-22.

31. Benesty J, Chen J, Huang Y, et al. Pearson Correlation Coefficient. In: Cohen I, Huang Y, Chen J, et al., eds. Noise Reduction in Speech Processing. Berlin, Heidelberg: Springer Berlin Heidelberg 2009:1-4.

32. Tierney AJ, Lewis SJ, Vallis J. Nurses' knowledge and attitudes towards older patients admitted to acute orthopaedic wards. *Journal of Orthopaedic Nursing* 1998;2(2):67-75.

33. Gaugler JE, Mittelman MS, Hepburn K, et al. Predictors of change in caregiver burden and depressive symptoms following nursing home admission. *Psychol Aging* 2009;24(2):385-96.

34. Scerri A, Scerri C. Nursing students' knowledge and attitudes towards dementia — A questionnaire survey. *Nurse Education Today* 2013;33(9):962-68.

35. Humphris GM, Turner A. Job satisfaction and attitudes of nursing staff on a unit for the elderly severely mentally infirm, with change of location. *Journal of Advanced Nursing* 1989;14(4):298.

36. Sung KT. Respect for Elders: Myths and Realities in East Asia. *Journal of Aging & Identity* 2000;5(4):197-205.

37. Zhou X, Zhang J, Song X. Gender Discrimination in Hiring: Evidence from 19,130 Resumes in China. *Mpra Paper* 2013

38. Shaffer MA, Joplin JRW, Bell MP, et al. Gender Discrimination and Job-Related Outcomes: A Cross-Cultural Comparison of Working Women in the United States and China ☆ ☆☆. *Journal of Vocational Behavior* 2000;57(3):395-427.

39. Lamb HR. Staff burnout in work with long-term patients. *Hospital & Community Psychiatry* 1979;30(6):396-8.

40. P S. Interactions of nurses with elderly patients: relationship to nurses' attitudes and to formal activity periods. *Journal of Advanced Nursing* 2010;18(1):14-19.

41. Zuo H. Formal and Informal Employment in China: Probability of Employment and Determinants of Monthly Wages. *Australian Economic Review* 2013;46(4):405-23.

42. Idrees Z, Xinping X, Shafi K, et al. Effect of salary, training and motivation on job performance of employees. *American Journal of Business, Economics and Management* 2015;3(2):55-58.

43. Undergraduate Nursing Students and the Elderly: an Assessment of Attitudes in a Turkish University. Apha Meeting and Exposition; 2017.

44. Monnot MJ, Beehr TA. Subjective well-being at work: Disentangling source effects of stress and support on enthusiasm, contentment, and meaningfulness. *Journal of Vocational Behavior* 2014;85(2):204-18.

45. Li J, He Z, Luo Y, et al. Perceived Transcultural Self-Efficacy of Nurses in General Hospitals in Guangzhou, China. *Nursing Research* 2016;65(5):371-79.

46. Hendrix CC, Landerman R, Abernethy AP. Effects of an individualized caregiver training intervention on self-efficacy of cancer caregivers. *West J Nurs Res* 2013;35(5):590-610.

47. Uysal A, Albayrak B, Koçulu B, et al. Attitudes of nursing students toward people with disabilities. *Nurse Educ Today* 2014;34(5):878-84.

48. Howell D, Butler L, Vincent L, et al. Influencing nurses' knowledge, attitudes, and practice in cancer pain management. *Cancer Nursing* 2000;23(1):55.

49. Pan HH, Shih HL, Wu LF, et al. Path modeling of knowledge, attitude and practice toward palliative care consultation service among Taiwanese nursing staff: a cross-sectional study. *Bmc Palliative Care* 2017;16(1):42.

Figure1 legend: The process for sample screening: 800 samples were filtered to 403

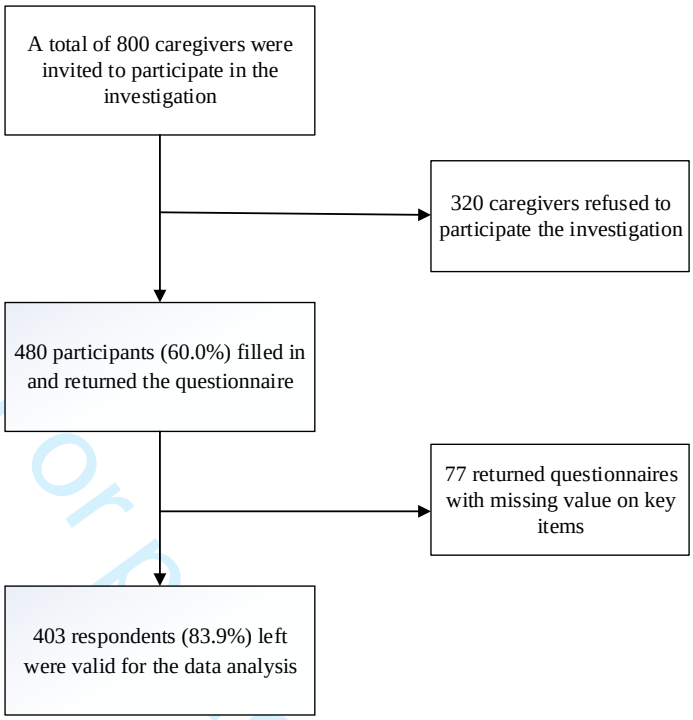

Figure 1 The process for sample screening

Supplementary Table

Logistic regression models were established for sensitivity test by recoding the knowledge, attitude and self-efficacy scores into dichotomous variables (using average values as a cut-off point: encoding 1 for those greater than the mean, otherwise 0). Table 1 showed factors associated with knowledge, attitude and self-efficacy are same as the results from multivariable linear regression analyses.

Table 1 Results from logistic regression models

Variables	FAQ 1 scores			KAOP scores			Self-efficacy scores		
	OR	*95%CI*	*p*	*OR*	*95%CI*	*p*	*OR*	*95%CI*	*p*
Gender									
Male	Ref.			Ref.			Ref.		
Female	0.489	(0.239, 1.004)	0.051	**0.839**	**(0.042, 0.938)**	**0.023**	1.191	(0.579, 2.447)	0.635
Age(years)									
30-39	Ref.			Ref.			Ref.		
40-49	1.626	(0.919, 2.877)	0.095	0.990	(0.559, 1.754)	0.973	1.260	(0.702, 2.262)	0.439
50≤	0.840	(0.547, 1.543)	0.573	1.221	(0.666, 2.241)	0.518	**1.810**	**(1.069, 3.378)**	**0.003**
Education level									
Junior high school or below	Ref.			Ref.			Ref.		
Secondary high school	0.917	(0.471, 1.784)	0.799	1.013	(0.589, 1.742)	0.963	0.894	(0.511, 1.562)	0.693
Bachelor degree or above	**1.751**	**(1.009, 3.038)**	**0.046**	0.889	(0.459, 1.723)	0.728	1.143	(0.585, 2.235)	0.696
Working tenure(years)									
1-3	Ref.			Ref.			Ref.		
4-6	0.841	(0.519, 1.363)	0.843	1.600	(0.876, 2.925)	0.126	0.719	(0.436, 1.184)	0.195
7≤	0.662	(0.339, 1.142)	0.125	**0.628**	**(0.006, 0.835)**	**0.047**	0.686	(0.369, 1.276)	0.234
Ownership of NHs									
Public	Ref.			Ref.			Ref.		
Private	0.899	(0.568, 1.423)	0.650	1.145	(0.725, 1.808)	0.561	1.246	(0.780, 1.989)	0.358
Work place									
Urban	Ref.			Ref.			Ref.		
Rural	1.130	(0.729, 1.751)	0.584	0.899	(0.582, 1.388)	0.630	0.891	(0.569, 1.395)	0.613
Employment type									
Informal employee	Ref.			Ref.			Ref.		
Formal employee	1.130	(0.729, 1.751)	0.869	**1.694**	**(1.352, 2.887)**	**0.011**	0.910	(0.468, 1.773)	0.783
Monthly income (¥)									
< 2000	Ref.			Ref.			Ref.		
2000-3000	1.100	(0.688, 1.758)	0.691	0.758	(0.477, 1.204)	0.241	1.052	(0.650, 1.702)	0.838
> 3000	1.133	(0.441, 1.986)	0.862	**3.021**	**(1.330, 6.862)**	**0.008**	1.163	(0.540, 2.503)	0.700

Pre-job training									
No	Ref.			Ref.			Ref.		
Yes	**1.421**	**(1.065, 2.336)**	**0.043**	1.022	(0.626, 1.669)	0.931	**2.616**	**(1.548, 4.421)**	**<0.001**
The health status of the elderly									
Complete disability	Ref.			Ref.			Ref.		
Partial disability	1.226	(0.337, 1.566)	0.415	1.440	(0.665, 3.118)	0.354	**1.225**	**(1.097, 2.700)**	**0.001**
No disability	1.151	(0.339, 1.665)	0.481	1.301	(0.586, 2.889)	0.581	**1.330**	**(1.139, 2.798)**	**0.012**
Interest in working with the aged									
No	Ref.			Ref.			Ref.		
Yes	1.307	(0.707, 2.418)	0.393	**2.069**	**(1.105, 3.873)**	**0.023**	**1.381**	**(1.021, 2.646)**	**0.030**
Job Satisfaction									
Not satisfied	Ref.			Ref.			Ref.		
Generally satisfied	**2.481**	**(1.053, 5.846)**	**0.038**	1.878	(0.804, 4.384)	0.145	1.439	(0.576, 3.592)	0.435
Very satisfied	**2.137**	**(1.915, 4.991)**	**0.035**	1.668	(0.719, 3.871)	0.234	**1.905**	**(1.072, 4.699)**	**0.041**
χ^2	35.118		0.014	33.362		0.015	46.818		<0.001
R^2	0.111			0.106			0.147		

Note: Figures in bold indicate coefficients with statistical significance

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Page1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Page2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	Page5
Methods			
Study design	4	Present key elements of study design early in the paper	Page5-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Page6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page7
Bias	9	Describe any efforts to address potential sources of bias	Page6
Study size	10	Explain how the study size was arrived at	Page6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page7-8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Page8
		(*b*) Describe any methods used to examine subgroups and interactions	Page8
		(*c*) Explain how missing data were addressed	Page6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page9-11
		(b) Give reasons for non-participation at each stage	Not applicable
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page9-11
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	Page9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Page 12-15
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Page15-17
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Knowledge, attitude and self-efficacy of elderly caregivers in Chinese nursing homes: a cross-sectional study in Liaoning province

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-029869.R3
Article Type:	Original research
Date Submitted by the Author:	05-Oct-2019
Complete List of Authors:	Zhang, Huijun; Tianjin University, School of Pharmaceutical Science and Technology; Jinzhou Medical University, School of Nursing Sun, He; Tianjin University,
Primary Subject Heading:	Nursing
Secondary Subject Heading:	Occupational and environmental medicine
Keywords:	knowledge, attitude, self-efficacy, elderly caregivers, nursing homes, China

Knowledge, attitude and self-efficacy of elderly caregivers in Chinese nursing homes: A cross-sectional study in Liaoning province

Huijun Zhang

Affiliated institution: 1, School of Pharmaceutical Science and Technology, Tianjin University, Tianjin, China; 2, School of Nursing, Jinzhou Medical University, Jinzhou, Liaoning province, China

E-mail: 13904069606@163.com

He Sun （Corresponding author）

Affiliated institution: School of Pharmaceutical Science and Technology, Tianjin University, Tianjin, China

E-mail: 18768429445@163.com

Abstract

Objectives This study aimed to investigate the perceptions of elderly caregivers in Chinese nursing homes (NHs) and associated factors with regard to knowledge, attitude about elderly and self-efficacy.

Setting A cross-sectional questionnaire survey was conducted on 12 NHs in Liaoning province, China.

Participants A total of 403 caregivers from 12 NHs were surveyed.

Outcome measures Data were collected using a self-administered questionnaire composed of the Palmore's Facts on Aging Quiz I, the Kogan's Attitude Old People Scale, Generalised Self-efficacy Scale and background characteristics of participants. An average score for knowledge, attitude and self-efficacy was calculated. Differences across groups were evaluated using Student's *t*-test and ANOVA. Multivariable linear regression models were established to estimate the associated factors.

Results The participating caregivers reported a relative low score on knowledge about the elderly (10.42±2.79), attitude toward old people (127.85±14.36) and self-efficacy (27.12±4.9). Multivariable regression analysis showed that respondents who had high educational level (β=0.212, *95% CI:* 0.193 to 0.824), received pre-job training (β=0.193, *95%CI*: 0.081 to 1.169) and had high job satisfaction (general satisfaction: β=0.345, *95%CI*: 0.223 to 1.875; very satisfaction: β=0.322, *95%CI*: 0.210 to 1.283) gave a positive rating on knowledge. Caregivers who were employed as formal staff (β=0.155, *95%CI*: 0.116 to 1.670), earned a high income (β=0.214, *95%CI*: 0.117 to 1.461) and had an interest in working with the elderly (β=0.141, *95%CI:* 0.088 to 1.508) tended to develop a positive attitude towards the elderly. However,

caregivers who were female (β=−0.110,*95%CI*: −1.751 to −0.080) and had long work experience (β=−0.130, *95%CI*: −1.527 to −0.110) developed negative perception. Caregivers who were older (β=0.215, *95% CI*: 0.139 to 1.027), received pre-job training (β=0.143, *95%CI*: 0.113 to 1.024), had an interest in working with the elderly (β=0.154, *95%CI*: 0.114 to 1.015), had high job satisfaction (β=0.177, *95%CI*: 0.116 to 1.223) and perceived better health status for the elderly (partial disability:β=0.437, *95%CI*: 0.259 to 1.600; no disability: β=0.288, *95% CI*: 0.153 to 1.211) gave a positive rating on self-efficacy.

Conclusion

Knowledge about the elderly, attitude toward old people and self-efficacy of elderly caregivers in Chinese NHs were at low levels. Some targeted intervention programs, such as conducting a professional training for aged care and a performance-based payment system, should be given a priority for improving these attributes.

Strengths and limitations of this study

- This study is amongst the first to understand the perception of caregivers in Chinese nursing homes on knowledge about aging, attitude toward the elderly and self-efficacy.
- Multivariable linear regression models were established and used to identify multifaceted factors associated with the perceived knowledge, attitude and self-efficacy of caregivers.
- Using widely accepted scales (FAQ 1, KAOP and GSE) for data collection contributed to the reliability of the results.
- The samples were collected from only one province located in the north-eastern region of China. Caution needs to be taken when generalising the findings to China or other countries.

Introduction

Population ageing has been highlighted worldwide, especially in China. According to the National Bureau of Statistics of China (2017), the elderly population aged 60 years and higher has reached 240 million, accounting for 17.3% of the total population[1 2]. By 2050, this number is expected to increase up to 450 million, accounting for 33% of the total population[3]. Hence, China will become the country with the largest number of old people in the world. Such growth in population aging will result in significantly increased needs for long-term care.

Influenced by traditional Chinese culture, elderly people prefer to live with their children, and taking care for the elderly is regarded as the responsibility of the family[4]. However, the rising migration from rural to urban areas, especially amongst young people, and the shrinking average family size due to China's one-child policy[5 6] have changed the mainstream informal family-based caregiving model for older adults. Consequently, old people are being sent to nursing homes (NHs) for professional aged care.

Over the past few years, the Chinese government made a great effort to support the development of the aged care service industry and invested into NHs. Approximately 155,000 different types of NHs exist across Mainland China and include old age homes, retirement departments, residential care facilities, welfare institutes and geriatric hospitals. However, health workers in NHs have shortage of or lack formal vocational training[3]. As a result, low-level caregiving skills and poor health care quality become an urgent issue and have attracted a wide range of attention[7 8]. Although the Chinese government launched the 'Basic Standards for Service Quality of Aged Agencies' in 2017, the quality of nursing services for the elderly is still not guaranteed[9]. Providing high-quality aged care services seem to pose a huge challenge in coping with China's aging

society.

Elderly caregivers in NHs, as the front-line health care workers, spend considerable time with old people and have a direct effect on healthcare delivery[10]. However, holding a negative attitude and misunderstanding about aging often create an adverse impact on provision of health care behaviour and ultimately lead to poor health outcomes[11 12]. In addition to attitude and knowledge, self-efficacy which is defined as 'people's beliefs about their capabilities to exercise control over events that affect their lives'[13] is another widely recognised factor associated with health workers' behaviour in care delivery. In general, high self-efficacy is associated with positive feelings about one's self, which facilitate cognitive processes and work achievement as well as confidence and motivation[14]. Therefore, giving an emphasis on knowledge, attitude and self-efficacy of caregivers is beneficial in providing high-quality aged care services.

Many studies conducted in Western countries revealed that social workers, healthcare workers and nursing students tend to have poor attitude, misconception, inadequate knowledge and lowest priority to consider working with elderly[15-18]. However, there is paucity in the literature involved in low- and middle-income Asian countries, including China. Understanding the knowledge, attitude and self-efficacy of elderly caregivers in NHs and the significant increase in needs for aged care in China has practical significance.

This study aimed to investigate the perceptions of caregivers on knowledge about aging, attitude toward the elderly and self-efficacy and their associated factors.

Method

Setting and sampling

A cross-sectional quantitative survey was conducted on Liaoning province located in the north-eastern region of China, where people aged over 60 years account for 22.65% of the total population[19].

We adopted a multistage sampling strategy. Firstly, three cities were selected from three different geographical zones, namely, Shenyang representing central, Jinzhou representing west and Dandong representing east. Four NHs (two for large size, two for small size) were selected randomly in each city according to their organisation code. Twelve NHs were selected to participate. Finally, half of the caregivers were considered as samples in each selected NH.

Data were collected from November 1, 2015 to May 31, 2016. Two to four trained investigators assigned to each selected NH were required to invite caregivers working in different departments. The participants were asked to provide informed consent letter and oral consent before they filled out the questionnaires and the questionnaires were given to the investigators right after completion. We approached potential participants across the entire working time and selected a half of caregivers in each nursing home to maximise the chance of capturing a representative sample.

Considering that NH has no standardised definition in Mainland China, this study defined it as an institution included in residential long-term care facilities in Mainland China that mainly admit people aged 60 years or higher. A qualified elderly caregiver usually needs to receive 3–5 years of professional training in China. In this study, caregivers who had direct contact with the elderly were eligible to participate in the investigation. These caregivers included physicians, nurses and allied health workers. Participants should have worked in the selected NHs for more than 1 year and voluntarily participated in the survey.

Approximately 800 caregivers were invited to participate in this investigation, and 480 participants (60%) filled in and returned the questionnaires. We recorded the reasons for non-participation. Overall, these people had on idea about purpose of our study or no time to participate the survey. After excluding questionnaires with uncompleted key items, 403 (83.9%) were considered valid for data analysis (Figure 1). α level (type I error rate) at 0.05 and β level (statistical power) at 0.8 were used to conduct a power analysis. We found such sample size is enough large for data analysis. According to formula proposed by Peduzzi et al. [20 21], the minimum sample size is at least $10\times K$, where K is the number of predictors in the regression model. This sample size would also be sufficiently large for multivariable linear regression analyses for a model containing 18 dichotomous independent variables (Table 1).

(Figure 1 should be here)

Measurement

We adopted Palmore's Facts on Aging Quiz I (FAQ 1), the Kogan's Attitude Old People Scale (KAOP) and Generalised Self-efficacy Scale (GSE) to measure knowledge about old people, attitude toward the elderly and self-efficacy of caregivers, respectively. Data about characteristics of the caregivers and their work environments were also collected by a self-developed questionnaire.

FAQ I developed by Palmore (1990) has been widely used to assess the subjects' (including caregivers) physical, mental and social knowledge about aging as well as some of the most common misconceptions about aging[15 22]. FAQ 1 is composed of 25 statements, such as 'old people tend to react slower than young people' and 'old people are not as efficient as young people.' The participants responded by stating whether a statement is true (T) or false (F); a score

of 1 is assigned if the answer is right, otherwise the score is 0. Therefore, the total scores range from 0 to 25, with a high score representing high knowledge about the elderly. The Chinese version of FAQ 1 introduced by Wang et al.[23] has adequate reliability (Cronbach's α=0.68).

KAOP, which is developed by Kogan in 1961, has been used to measure attitude towards the elderly in many studies. This scale contains 34 items with 17 negative (KAOP-) and 17 (KAOP+) positive statements. Examples of the statements are as follows: 'most the elderly gets set in their ways and are unable to change,' and 'it is very easy to get on with the elderly.' Each item is scored using a six-point Likert scale (strongly disagree=1, disagree=2, slightly disagree=3, slightly agree=5 and strongly agree=6). The scores on the statement presented negatively should be reversed to estimate the total score. The total scores for the KAOP range from 34 to 204, with high scores representing positive attitude towards the elderly[24]. For the Chinese version of KAOP, the Cronbach's α is 0.82 for the total scale, indicating that it is a fully reliable instrument[25].

GSE, which was developed by Zhang and Schwarzer in 1995, is used widely to measure a general sense of perceived self-efficacy [26]. The 10 items of the GSE are scored on a four-point scale (not at all true=1, hardly true=2, moderately true=3 and exactly true=4). The total scores range from 10 to 40, with a high score indicating high self-efficacy. A Cronbach's α value of 0.89 for the Chinese version of the GSE indicates that this instrument has high reliability for the study population[2].

In the last part of the questionnaire, some close-ended questions were designed to collect information about the background characteristics of the participating caregivers and their work environment. General demographic characteristics including age, gender and educational level were also investigated (Table 1). Various questions about caregivers' work environment were also

asked. These questions include the following examples: 'how many years have you been working in this NH (work tenure)' and 'is your NH public or private (ownership of NH); located in rural or urban (work place)' (Table 1). The employment type of caregivers in Chinese NHs includes formal and informal employees. Formal employees are hired by the government, and their wages are paid by the National Finance Department. Informal employees are caregivers who signed the labour contract with NHs, and their wages come from the profits of the institution[27]. We also obtained information on pre-job training (yes/no), interest in working with the elderly (yes/no) and job satisfaction (not /generally/very satisfied). Meanwhile, we measured the perceived health status of the elderly from caregivers by asking 'how rate overall health status of the elderly who you served in the past month (complete/partial/with no disability)' (Table 1). These factors were identified as independent variables in the regression model[15 28 29].

Data analysis

Scores on each item of FAQ 1, KAOP and GSE were added. According to the guidance on the use of each scale, every item was given the same weight[23 26 30]. Average score was calculated to evaluate the levels of knowledge, attitude and self-efficacy.

The Kolmogorov–Smirnov test showed that the *p*-values for knowledge, attitude and self-efficacy scores exceeded 0.10; as such, data of these variables were normally distributed. Student's *t*-test (for two-group comparisons) or ANOVA (for multiple group comparisons) was performed to determine statistical differences in scores across different groups. Multivariable linear regression models were established to identify factors associated with knowledge, attitude and self-efficacy scores, and serving the characteristics of respondents as independent variables.

In model establishment, we used the ENTER approach (all independent variables are forced into the regression models) because of two reasons: first, we tend to explain the variations in knowledge, attitude and self-efficacy scores instead of predicting them. This approach allowed us to observe the parameters of these factors that are not significantly associated with the dependent variables. Second, all independent variables in the model have been studied in other countries[15 28]. To compare our results with those reported in other countries, we added all independent variables into the regression model. In order to assess fit of the regression models, we used plots of residuals against the covariates (Supplementary Figure 1-3). We also conducted logistic regression analyses for sensitivity test by recoding the knowledge, attitude and self-efficacy scores into dichotomous variables (Supplementary Table).

A double entry strategy was adopted to ensure the accuracy of data input by using EpiData 3.1. All statistical analyses were performed using IBM SPSS Statistics V.22.0.

Patient and Public Involvement

This study focused on knowledge about aging, attitude towards the elderly and self-efficacy; thus, patients were not directly involved in the survey.

Results

Characteristics of respondents

Of the 403 respondents, 89.8% were female. A total of 70.5% of the respondents aged more than 40 years. Only 20.3% of the caregivers had bachelor's degree or above. More than half of respondents had working tenure of <3 years (55.1%) and worked in urban setting (61.8%). The majority of the participants (86.8%) were employed as informal employees. Only 10.7% earned a

monthly income of >3000 Chinese yuan. A total of 68.0% and 85.4% of respondents reported that they received pre-job training and had an interest in elderly care, respectively (Table 1).

Knowledge, attitude toward the elderly and self-efficacy

Overall, relatively low scores for knowledge (10.42±2.79), attitude (127.85±14.36) and self-efficacy (27.12±4.91) were measured by FAQ 1, KAOP and GSE, respectively, amongst caregivers in NHs.

Table 1 shows the differences in the scores of knowledge, attitude and self-efficacy rated by caregivers with different characteristics. Male respondents gave higher scores on attitude than female ones (p<0.05). Older caregivers showed higher self-efficacy than younger ones (p<0.05). Respondents with middle educational level gave higher scores on knowledge than the two other groups (p<0.05). Caregivers working in public NHs had high scores on knowledge and attitude (p<0.05). Formal employees showed better performance in terms of knowledge, attitude and self-efficacy (p<0.05). Scores for attitude increased with increasing monthly salary (p<0.001). Participants who received pre-job training reported high scores for knowledge and self-efficacy (p<0.05). Respondents interested in elderly care gave high scores for attitude and self-efficacy (p<0.05). Scores for the three domains varied across different job satisfaction levels (p<0.05).

Table 1 Differences in knowledge, attitude and self-efficacy scores amongst different characteristics of caregivers

Variables		N (%)	FAQ 1 scores		KAOP scores		Self-efficacy scores	
			Mean ± SD	*p*-Value	Mean ± SD	*p*-Value	Mean ± SD	*p*-Value
Gender				0.055		0.034		0.890
	Male	41 (10.2)	11.22±3.09		132.30±15.75		27.02±4.21	
	Female	362 (89.8)	10.33±2.75		127.31±14.13		27.13±4.98	

Age (years)			0.070	0.909		0.004
30–39	119 (29.5)	10.37±2.70		128.22±14.13	26.33±4.19	
40–49	141 (35.0)	10.83±2.96		127.93±15.07	26.70±5.41	
≤50	143 (35.5)	10.07±2.66		127.45±13.93	28.18±4.79	
Educational level			0.046	0.276		0.927
Junior high school or below	225 (55.8)	10.23±2.90		126.93±13.78	27.09±4.83	
Secondary high school	96 (23.8)	11.04±2.77		129.72±14.08	27.03±5.20	
Bachelor degree or above	82 (20.3)	10.23±2.44		128.16±16.11	27.30±4.81	
Work tenure (years)			0.858	0.172		0.355
1–3	222 (55.1)	10.47±2.87		129.70±15.43	27.44±5.02	
4–6	114 (28.3)	10.44±2.81		128.55±10.61	26.76±4.64	
≤7	67 (16.6)	10.25±2.53		126.68±14.72	26.68±4.96	
Nursing home ownership			0.033	0.032		0.708
Public	132 (32.8)	14.24±2.99		133.94±15.91	26.99±4.61	
Private	271 (67.2)	10.51±2.69		127.80±13.58	27.18±5.05	
Work place			0.127	0.862		0.296
Urban	249 (61.8)	10.26±2.84		127.94±15.20	27.32±4.96	
Rural	154 (38.2)	10.69±2.71		127.69±12.95	26.78±4.82	
Employment type			0.037	0.011		0.042
Informal employee	350 (86.8)	10.24±2.81		127.05±14.20	25.33±4.47	
Formal employee	53 (13.2)	15.40±2.56		135.63±15.96	27.66±5.22	
Monthly income (¥)			0.466	<0.001		0.975

<2000	160 (39.7)	10.21±2.81		126.52±15.21		27.05±5.24	
2000–3000	200 (49.6)	10.56±2.74		127.13±12.71		27.16±4.91	
>3000	43 (10.7)	10.60±3.00		136.11±15.59		27.18±3.51	
Pre-job training			0.040		0.106		0.001
No	129 (32.0)	10.01±2.95		126.16±14.38		25.91±4.62	
Yes	274 (68.0)	10.62±2.70		128.64±14.31		27.69±4.94	
Health status of the elderly			0.868		0.602		<0.001
Complete disability	34 (8.4)	10.21±2.21		125.49±14.11		26.32±4.34	
Partial disability	219 (54.3)	10.42±2.79		127.98±13.50		27.62±5.17	
No disability	150 (37.2)	10.49±2.92		128.19±15.63		30.64±5.41	
Interest in working with elderly people			0.273		0.019		0.022
No	58 (14.4)	9.88±2.72		123.74±14.15		25.68±4.66	
Yes	344 (85.4)	10.51±2.80		128.60±14.28		27.34±4.91	
Job satisfaction			0.001		0.033		0.001
Not satisfied	34 (8.4)	8.68±2.77		121.97±16.80		25.14±5.42	
Generally satisfied	151 (37.5)	10.66±2.49		127.70±13.29		26.42±4.94	
Very satisfied	218 (54.1)	10.54±2.91		128.86±14.51		27.91±4.66	

Factors associated with knowledge, attitude and self-efficacy: results of multivariable linear regression analyses

Table 2 shows the results of the three multivariable linear regression models for analysis of factors associated with knowledge, attitude and self-efficacy.

Knowledge about older people

Respondents with bachelor's degree or above (β=0.212, *95% CI*: 0.193 to 0.824) gave higher scores in FAQ I than those who completed junior high school or below. People who received pre-job training (β=0.193, *95%CI*:0.081 to 1.169) were more likely to report high scores for knowledge. But this result could have the uncertainty due to a wide confidence interval. Those who were generally (β=0.345, *95% CI*: 0.223 to 1.875) and very satisfied (β=0.322, *95% CI:* 0.210 to 1.283) with their jobs also gave a positive rating on knowledge.

Attitudes toward older people

The attitude scores in KAOP were high for those who were employed as formal employee (β=0.155, *95% CI:* 0.116 to 1.670), earned high wages (β=0.214, *95% CI*: 0.117 to 1.461) and had an interest in working with aged people (β=0.141, *95% CI*: 0.088 to 1.508). However, it was assumed that the association between KAOP scores and interest in working with aged people was not stable because 95% confidence interval was relatively wide. Additionally, female (β=−0.110, *95% CI*: −1.751 to −0.080) and respondents with more than 7 years of work experience (β=−0.130, *95% CI*: −1.527 to −0.110) reported low scores.

Self-efficacy

A high self-efficacy score in GSE was observed in caregivers who were older (β=0.215, *95% CI*: 0.139 to 1.027), received pre-job training (β=0.143, *95% CI*: 0.113 to 1.024), had interest in working with the elderly (β=0.154 , *95% CI*: 0.114 to 1.015), had high job satisfaction (β=0.177, *95% CI*: 0.116 to 1.223). In addition, better health status of the elderly (partial disability:β= 0.437, *95% CI*: 0.259 to 1.600; no disability: β=0.288, *95% CI*: 0.153 to 1.211) caregivers served was also associated with self-efficacy scores significantly.

A moderate association[31] between knowledge and attitude scores (r=0.233, p<0.05) and between

attitude and self-efficacy scores (r=0.150, p<0.05) was tested by Pearson correlation calculations. The correlation coefficient between knowledge and self-efficacy was not statistically significant (r=0.034, p>0.05).

Table 2 Factors associated with knowledge, attitude and self-efficacy: multivariable linear regression models

Variables	FAQ 1 scores			KAOP scores			Self-efficacy scores		
	β	95% CI	*p*	*β*	95% CI	*p*	*B*	95% CI	*p*
Gender									
Male	Ref.			Ref.			Ref.		
Female	−0.081	(−1.646, 0.176)	0.102	**−0.110**	**(−1.751, −0.080)**	**0.022**	0.010	(−1.169, 1.813)	0.812
Age (years)									
30–39	Ref.			Ref.			Ref.		
40–49	0.109	(−0.143, 1.345)	0.110	−0.017	(−4.448, 3.105)	0.792	0.085	(−0.323, 2.013)	0.141
≥50	−0.011	(−0.951, 0.619)	0.731	−0.013	(−5.362, 2.750)	0.534	**0.215**	**(0.139, 1.027)**	**0.003**
Education level									
Junior high school or below	Ref.			Ref.			Ref.		
Secondary high school	0.100	(−0.019, 1.391)	0.057	0.071	(−1.207, 5.078)	0.160	0.014	(−1.086, 1.331)	0.771
Bachelor degree or above	**0.212**	**(0.193, 0.824)**	**0.027**	−0.023	(−4.021, 2.721)	0.740	0.031	(−1.310, 1.611)	0.608
Working tenure (years)									
1–3	Ref.			Ref.			Ref.		
4–6	−0.006	(−0.601, 0.520)	0.923	0.093	(−0.379, 4.053)	0.061	−0.079	(−1.105, 0.129)	0.065
≥7	−0.051	(−1.231, 0.441)	0.290	**−0.130**	**(−1.527, −0.110)**	**0.044**	−0.058	(−1.146, 0.378)	0.304
NH ownership									

Public	Ref.			Ref.			Ref.		
Private	0.062	(−0.317, 0.570)	0.413	−0.041	(−1.427, 1.127)	0.784	0.067	(−0.408, 1.001)	0.202
Work place									
Urban	Ref.			Ref.			Ref.		
Rural	0.062	(−0.065, 0.787)	0.186	−0.032	(−1.617, 1.211)	0.063	−0.013	(−0.873, 0.739)	0.706
Employment type									
Informal employee	Ref.			Ref.			Ref.		
Formal employee	0.119	(−0.135, 1.050)	0.067	**0.155**	**(0.116, 1.670)**	**0.011**	0.099	(−1.013, 0.539)	0.089
Monthly income (¥)									
<2000	Ref.			Ref.			Ref.		
2000–3000	0.023	(−0.361, 0.622)	0.684	−0.004	(−3.610, 2.578)	0.939	0.019	(−1.040, 1.081)	0.736
>3000	0.036	(−0.742, 1.221)	0.218	**0.214**	**(0.117, 1.461)**	**<0.001**	−0.003	(−1.930, 1.329)	0.906
Pre-job training									
No	Ref.			Ref.			Ref.		
Yes	**0.193**	**(0.081, 1.169)**	**0.043**	0.046	(−1.311, 4.360)	0.315	**0.143**	**(0.113, 1.024)**	**0.002**
Health status of elderly									
Complete disability	Ref.			Ref.			Ref.		
Partial disability	0.004	(−1.002, 0.894)	0.917	0.114	(−1.885, 8.457)	0.214	**0.437**	**(0.259, 1.600)**	**<0.001**
No disability	0.011	(−1.069, 1.026)	0.410	0.084	(−2.931, 7.759)	0.362	**0.288**	**(0.153, 1.211)**	**0.001**
Interest in working with elderly									
No	Ref.			Ref.			Ref.		
Yes	0.080	(−0.358, 1.230)	0.122	**0.141**	**(0.088, 1.508)**	**0.039**	**0.154**	**(0.114, 1.015)**	**0.012**

Job satisfaction									
Not satisfied	Ref.			Ref.			Ref.		
Generally satisfied	**0.345**	**(0.223, 1.875)**	**<0.001**	0.079	(−1.293, 3.108)	0.323	0.052	(−1.103, 2.469)	0.572
Very satisfied	**0.322**	**(0.210, 1.283)**	**<0.001**	0.098	(−1.108, 3.275)	0.388	**0.177**	**(0.116, 1.223)**	**0.043**
F	2.478		0.001	2.744		0.001	3.848		<0.001
R^2	0.118			0.122			0.161		
Adjusted R^2	0.105			0.109			0.155		

Note: Figures in bold letters/numbers indicate coefficients with statistical significance. 500 bootstrapping replications were used.

Discussion

The rising of the elderly population has led to challenges for the Chinese government in meeting the increasing needs for professional healthcare for aged people. This study assessed the knowledge and attitude about the aging and self-efficacy of caregivers working in Chinese NHs. Low levels of knowledge, attitude and self-efficacy were observed in the present study compared with those in other countries or regions[28 30 32]. At the initial stage of NH development in China, severe shortage of qualified health workers and insufficient professional training resulted in difficulties of the majority of caregivers in providing healthcare services for the elderly[3]. Low income and negative expectation for career development also adversely influenced the work performance of caregivers[33].

Consistent with other studies[18 30 34], the present results found that caregivers who received higher level education and pre-job training gave higher scores for knowledge about the elderly. A possible reason is that long-term education not only improved the working ability of caregivers

but can also teach additional knowledge and further correct their misunderstanding about aging. Despite association of knowledge scores with pre-job training was significant in our model, this result could be not stable and needs further research. It may be due to the effect of short-term training is not significant. In addition to the two factors, high job satisfaction level was also associated with knowledge given that this driving force factor can encourage staff to learn additional information relative to their work[35].

With respect to attitude toward the elderly, this study indicated the females were more likely to have negative attitude compared with males, inconsistent with other studies[15 36]. The potential explanation is that women in Chinese traditional families take additional responsibilities in cultivating children and taking care of old people; as such, female caregivers tend to develop poor attitude. Additionally, gender discrimination in the workplace often results in unequal treatment for females in terms of wages and career advancement[37 38]. Therefore, female caregivers tend to have poor attitude. The negative association of work tenure with attitude can be explained by the fact long-term work in the same position can result in burnout[39], leading to negative emotion toward work.

Similar to other study[40], caregivers employed as formal staff had positive attitude towards the elderly than informal employees. This finding could be mainly due to the unequal salary system in Chinese NHs. Considering that the wages of formal employees are paid by government revenues, they often obtain more benefits (such as social insurances) than the others although they have the same work load[41]. Therefore, a performance-based pay system can be considered to encourage caregivers to develop a positive attitude. For example, old people's satisfaction with service can be used as a performance evaluation indicator; an equal payment system for informal and formal

employee should be designed.

Additionally, The KAOP scores increased with increasing income, reflecting the important role of economic factors in improving the work enthusiasm and performance of caregivers [42]. Although caregivers interested in working with the elderly tended to have positive attitude in this study, this result has an uncertainty possibly due to the fact that effects other factors (such as burnout, work stress) are not controlled[43 44].

In this study, the age of caregivers had a positive relationship to self-efficacy, consistent with previous results[45]. Old age often indicates an increase in life and work experiences and, accordingly, improved people's beliefs about their capabilities. Caregivers who received pre-job training are expected to possess improved work skills in handling workload and overcoming obstacles, thereby enhancing their self-perception on personal efficacy[46]. Therefore, professional training for aged care should be conducted to improve the knowledge and abilities of caregivers.

The perceived health status of the elderly evaluated by caregivers is also responsible for the variations in self-efficacy scores. Providing services for the old adults without disability decreases difficulty for caregivers compared with caring for disabled ones [47]. Thus, this group of caregivers is more likely to perceive a high level of self-efficacy. Meanwhile, the positive association of self-efficacy with interest in working with old and job satisfaction indicated these factors can evoke enthusiastic attitude towards work, thereby improving self-confidence in coping with work difficulties.

The positive correlations amongst knowledge, attitude and self-efficacy presented in this study agreed with "knowledge–attitude–practice" theory[48 49]. Knowing the correct knowledge about aging is beneficial for caregivers to develop an optimistic attitude toward elderly people[48].

Accordingly, positive attitude is beneficial for improving people's beliefs about their capabilities[49]. Therefore, these closed associations indicated that the effective workforce management for caregivers should take knowledge, attitude and self-efficacy into account.

Limitation

This study has several limitations. Firstly, the 403 samples from Liaoning province were limited to reflect the comprehensive situation in China. This sample size also affected the width of 95% CI in the regression models, although it is sufficient for data analysis. Caution needs to be taken when generalising the findings. Secondly, exploratory variables mainly included demographics and working environment characteristics of caregivers although the selection of these variables was supported by previous studies and interviews. However, institutional-level factors potentially influencing the perceptions of caregivers, such as number of employees and elderly in NHs, were ignored because data are unavailable. As such, the R^2 of the regression models was relatively low. Therefore, further studies should cover factors at different levels. As the outcome measurement is not on an interval scale, there may be concern about using linear regression in the main analyses. However, we obtained similar results in a sensitivity analysis using logistic regression with a cut point at the mean for each score, and so this provides some support for the approach used. Thirdly, readers should be aware that participants may report what they believe the researcher wants to know instead of the truth. Hence, the use of a self-reporting questionnaire could lead to idealised responses to meet socially acceptable norms.

Conclusion

This study provides some insights on the knowledge, attitude about the elderly and self-efficacy of

caregivers in Chinese NHs and identify their associated characteristics and work environment factors.

Overall, caregivers working in Chinese NHs have a poor rating on knowledge about aging, attitude toward the elderly and self-efficacy. Factors associated with these attributes mainly include gender, age, educational level, income, working tenure, employment type, pre-job training, health status of elderly, interest in working with elderly and job satisfaction.

Ethics approval and consent to participate

Our study was approved by the ethics committee of Jinzhou Medical University (JMU00001078-15088)

Consent for publication

Consent for publication was obtained from persons we investigated in this study.

Availability of data and material

Data are available upon reasonable request

Competing interests

The authors declare that they have no competing interests.

Funding

This work was supported by Liaoning Provincial Social Science Project (NO.2019lslktyb-067)

Authors' contributions

All authors made significant contributions to the study. HZ conceptualized this study and analysed the data. Moreover, she wrote the first draft of the manuscript. HS interpreted the results and revised the manuscript. The final version submitted for publication was read and approved by all authors.

Acknowledgements

The authors gratefully acknowledge all interviewees participating in this study.

References

1. Wu M, Li SX, Zhang NJ, et al. Nursing home research in Jinan, China: a focus group approach. *International Journal of Public Policy* 2012;1(8):21-30.

2. Fua F, Lianga Y, Anb Y, et al. Self-efficacy and psychological well-being of nursing home residents in China: the mediating role of social engagement. *Asia Pacific Journal of Social Work and Development* 2018;28(2):128-40.

3. Song Y, Anderson RA, Corazzini KN, et al. Staff characteristics and care in Chinese nursing homes: A systematic literature review. *International Journal of Nursing Sciences* 2014;1(4):423-36.

4. Chan YK, Lee RPL. Network Size, Social Support and Happiness in Later Life: A Comparative Study of Beijing and Hong Kong. *Journal of Happiness Studies* 2006;7(1):87-112.

5. Wong YC, Leung J. Long-term care in China: issues and prospects. *J Gerontol Soc Work* 2012;55(7):570-86.

6. Zhan HJ. Population Aging and Long-Term Care in China. *Generations* 2013;37(1):53-58.

7. Hao Q, Wu S, Ying L, et al. Current dilemmas of nursing homes in Chengdu: a cross-sectional survey. *Journal of the American Medical Directors Association* 2012;13(4):406.e9-06.e12.

8. Feng Z, Liu C, Guan X, et al. China's Rapidly Aging Population Creates Policy Challenges

In Shaping A Viable Long-Term Care System. *Health Affairs* 2012;31(12):2764-73.

9. Zhang H. Who will care for our parents? Changing boundaries of family and public roles in providing care for the aged in urban China. *Care Management Journals* 2007;8(1):1-10.

10. Lee AC, Wong AK, Loh EK. Score in the Palmore's Aging Quiz, knowledge of community resources and working preferences of undergraduate nursing students toward the elderly in Hong Kong. *Nurse Educ Today* 2006;26(4):269-76.

11. Fagerberg I, Ekman S-L. Caring for elderly patients: a longitudinal study of Swedish nursing students' narratives. *Health Care in Later Life* 1998(3):258-71.

12. Kim O-N, Oh J-w, Kim Y-S, et al. Impacts of Perceived Health Status and Self-efficacy in Hospital Nurses on their Health Promoting Behaviors. *Advances in information Sciences and Service Sciences* 2014;6(11):139-44.

13. Bandura A. Perceived Self-Efficacy in Cognitive Development and Functioning1993.

14. Chris G. Stress, coping and burn-out in nursing students. *International Journal of Nursing Studies* 2010;47(10):1299-309.

15. Hweidi IM, Alhassan MA. Jordanian nurses' attitudes toward older patients in acute care settings. *International Nursing Review* 2010;52(3):225-32.

16. Gallagher S, Bennett KM, Halford JC. A comparison of acute and long-term health-care personnel's attitudes towards older adults. *International Journal of Nursing Practice* 2010;12(5):273-79.

17. Jacelon CS. Attitudes and behaviors of hospital staff toward elders in an acute care setting *Applied Nursing Research* 2002;15(4):227-34.

18. Yenişehir S, Karakaya MG. Knowledge and practice of nursing home caregivers about urinary incontinence. *European Geriatric Medicine* 2019;10(1):99-105.

19. Network CY. The growth rate of the elderly population in Liaoning Province slowed down in 2017, and the population of young and old people increased rapidly. 2017 [Available from:https://sh.qihoo.com/9715f9adce7664579?cota=1&refer_scene=so_1&sign=360_e39369d1.

20. P Peduzzi , J Concato , Feinstein A. Importance of events per independent variable in proportional hazards regression analysis. II. Accuracy and precision of regression estimates. *Journal of Clinical Epidemiology* 2007;30(4):618-26.

21. Peduzzi, Peter Concato, Kemper J. A Simulation Study of the Number of Events per Variable in Logistic Regression Analysis. *Journal of Clinical Epidemiology* 1996;49(12):1373-9.

22. Kane RL. Ageism: Negative and Positive 2nd Edition. *Journal of Public Health Policy* 2000;21(2):247-49.

23. Wang CC, Liao WP, Yuan SC, et al. The Chinese version of the Facts on Aging Quiz scale: reliability and validity assessment. *International Journal of Nursing Studies* 2010;47(6):742-52.

24. Wang CC, Liao WC, Kao MC, et al. Taiwanese medical and nursing student interest levels in and attitudes towards geriatrics. *Annals of the Academy of Medicine Singapore* 2009;38(3):230.

25. Yen CH, Liao WC, Chen YR, et al. A Chinese version of Kogan's Attitude Toward Older

People Scale: reliability and validity assessment. *International Journal of Nursing Studies* 2009;46(1):38-44.

26. Schwarzer R, Bäßler J, Kwiatek P, et al. The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the General Self-efficacy Scale. *Applied Psychology* 2010;46(1):69-88.

27. Fang LC. Informal employment and gender implications in China: the nature of work and employment relations in the community services sector. *International Journal of Human Resource Management* 2006;17(8):1471-87.

28. Doherty M, Mitchell EA, O'Neill S. Attitudes of Healthcare Workers towards Older People in a Rural Population: A Survey Using the Kogan Scale. *Nursing Research & Practice* 2011;2011(1):352627.

29. Hu SH, Yu YM, Chang WY, et al. Social support and factors associated with self-efficacy among acute-care nurse practitioners. *Journal of Clinical Nursing* 2017;27(2):876-82.

30. Lambrinou E, Sourtzi P, Kalokerinou A, et al. Attitudes and knowledge of the Greek nursing students towards older people. *Nurse Educ Today* 2009;29(6):617-22.

31. Benesty J, Chen J, Huang Y, et al. Pearson Correlation Coefficient. In: Cohen I, Huang Y, Chen J, et al., eds. Noise Reduction in Speech Processing. Berlin, Heidelberg: Springer Berlin Heidelberg 2009:1-4.

32. Tierney AJ, Lewis SJ, Vallis J. Nurses' knowledge and attitudes towards older patients admitted to acute orthopaedic wards. *Journal of Orthopaedic Nursing* 1998;2(2):67-75.

33. Gaugler JE, Mittelman MS, Hepburn K, et al. Predictors of change in caregiver burden

and depressive symptoms following nursing home admission. *Psychol Aging* 2009;24(2):385-96.

34. Scerri A, Scerri C. Nursing students' knowledge and attitudes towards dementia — A questionnaire survey. *Nurse Education Today* 2013;33(9):962-68.

35. Humphris GM, Turner A. Job satisfaction and attitudes of nursing staff on a unit for the elderly severely mentally infirm, with change of location. *Journal of Advanced Nursing* 1989;14(4):298.

36. Sung KT. Respect for Elders: Myths and Realities in East Asia. *Journal of Aging & Identity* 2000;5(4):197-205.

37. Zhou X, Zhang J, Song X. Gender Discrimination in Hiring: Evidence from 19,130 Resumes in China. *Mpra Paper* 2013

38. Shaffer MA, Joplin JRW, Bell MP, et al. Gender Discrimination and Job-Related Outcomes: A Cross-Cultural Comparison of Working Women in the United States and China ☆ ☆☆. *Journal of Vocational Behavior* 2000;57(3):395-427.

39. Lamb HR. Staff burnout in work with long-term patients. *Hospital & Community Psychiatry* 1979;30(6):396-8.

40. P S. Interactions of nurses with elderly patients: relationship to nurses' attitudes and to formal activity periods. *Journal of Advanced Nursing* 2010;18(1):14-19.

41. Zuo H. Formal and Informal Employment in China: Probability of Employment and Determinants of Monthly Wages. *Australian Economic Review* 2013;46(4):405-23.

42. Idrees Z, Xinping X, Shafi K, et al. Effect of salary, training and motivation on job performance of employees. *American Journal of Business, Economics and*

Management 2015;3(2):55-58.

43. Undergraduate Nursing Students and the Elderly: an Assessment of Attitudes in a Turkish University. Apha Meeting and Exposition; 2017.

44. Monnot MJ, Beehr TA. Subjective well-being at work: Disentangling source effects of stress and support on enthusiasm, contentment, and meaningfulness. *Journal of Vocational Behavior* 2014;85(2):204-18.

45. Li J, He Z, Luo Y, et al. Perceived Transcultural Self-Efficacy of Nurses in General Hospitals in Guangzhou, China. *Nursing Research* 2016;65(5):371-79.

46. Hendrix CC, Landerman R, Abernethy AP. Effects of an individualized caregiver training intervention on self-efficacy of cancer caregivers. *West J Nurs Res* 2013;35(5):590-610.

47. Uysal A, Albayrak B, Koçulu B, et al. Attitudes of nursing students toward people with disabilities. *Nurse Educ Today* 2014;34(5):878-84.

48. Howell D, Butler L, Vincent L, et al. Influencing nurses' knowledge, attitudes, and practice in cancer pain management. *Cancer Nursing* 2000;23(1):55.

49. Pan HH, Shih HL, Wu LF, et al. Path modeling of knowledge, attitude and practice toward palliative care consultation service among Taiwanese nursing staff: a cross-sectional study. *Bmc Palliative Care* 2017;16(1):42.

Figure1 legend: The process for sample screening: 800 samples were filtered to 403

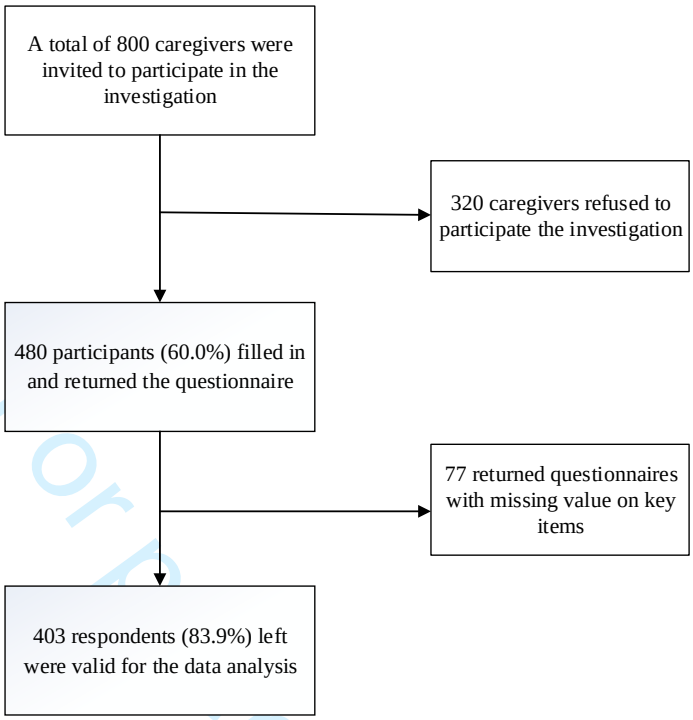

Figure 1 The process for sample screening

Supplementary Table

Logistic regression models were established for sensitivity test by recoding the knowledge, attitude and self-efficacy scores into dichotomous variables (using average values as a cut-off point: encoding 1 for those greater than the mean, otherwise 0). Table 1 showed factors associated with knowledge, attitude and self-efficacy are same as the results from multivariable linear regression analyses.

Table 1 Results from logistic regression models

Variables	FAQ 1 scores			KAOP scores			Self-efficacy scores		
	OR	*95%CI*	*p*	*OR*	*95%CI*	*p*	*OR*	*95%CI*	*p*
Gender									
Male	Ref.			Ref.			Ref.		
Female	0.489	(0.239, 1.004)	0.051	**0.839**	**(0.042, 0.938)**	**0.023**	1.191	(0.579, 2.447)	0.635
Age(years)									
30-39	Ref.			Ref.			Ref.		
40-49	1.626	(0.919, 2.877)	0.095	0.990	(0.559, 1.754)	0.973	1.260	(0.702, 2.262)	0.439
50≤	0.840	(0.547, 1.543)	0.573	1.221	(0.666, 2.241)	0.518	**1.810**	**(1.069, 3.378)**	**0.003**
Education level									
Junior high school or below	Ref.			Ref.			Ref.		
Secondary high school	0.917	(0.471, 1.784)	0.799	1.013	(0.589, 1.742)	0.963	0.894	(0.511, 1.562)	0.693
Bachelor degree or above	**1.751**	**(1.009, 3.038)**	**0.046**	0.889	(0.459, 1.723)	0.728	1.143	(0.585, 2.235)	0.696
Working tenure(years)									
1-3	Ref.			Ref.			Ref.		
4-6	0.841	(0.519, 1.363)	0.843	1.600	(0.876, 2.925)	0.126	0.719	(0.436, 1.184)	0.195
7≤	0.662	(0.339, 1.142)	0.125	**0.628**	**(0.006, 0.835)**	**0.047**	0.686	(0.369, 1.276)	0.234
Ownership of NHs									
Public	Ref.			Ref.			Ref.		
Private	0.899	(0.568, 1.423)	0.650	1.145	(0.725, 1.808)	0.561	1.246	(0.780, 1.989)	0.358
Work place									
Urban	Ref.			Ref.			Ref.		
Rural	1.130	(0.729, 1.751)	0.584	0.899	(0.582, 1.388)	0.630	0.891	(0.569, 1.395)	0.613
Employment type									
Informal employee	Ref.			Ref.			Ref.		
Formal employee	1.130	(0.729, 1.751)	0.869	**1.694**	**(1.352, 2.887)**	**0.011**	0.910	(0.468, 1.773)	0.783
Monthly income (¥)									
< 2000	Ref.			Ref.			Ref.		
2000-3000	1.100	(0.688, 1.758)	0.691	0.758	(0.477, 1.204)	0.241	1.052	(0.650, 1.702)	0.838
> 3000	1.133	(0.441, 1.986)	0.862	**3.021**	**(1.330, 6.862)**	**0.008**	1.163	(0.540, 2.503)	0.700

Pre-job training									
No	Ref.			Ref.			Ref.		
Yes	**1.421**	**(1.065, 2.336)**	**0.043**	1.022	(0.626, 1.669)	0.931	**2.616**	**(1.548, 4.421)**	**<0.001**
The health status of the elderly									
Complete disability	Ref.			Ref.			Ref.		
Partial disability	1.226	(0.337, 1.566)	0.415	1.440	(0.665, 3.118)	0.354	**1.225**	**(1.097, 2.700)**	**0.001**
No disability	1.151	(0.339, 1.665)	0.481	1.301	(0.586, 2.889)	0.581	**1.330**	**(1.139, 2.798)**	**0.012**
Interest in working with the aged									
No	Ref.			Ref.			Ref.		
Yes	1.307	(0.707, 2.418)	0.393	**2.069**	**(1.105, 3.873)**	**0.023**	**1.381**	**(1.021, 2.646)**	**0.030**
Job Satisfaction									
Not satisfied	Ref.			Ref.			Ref.		
Generally satisfied	**2.481**	**(1.053, 5.846)**	**0.038**	1.878	(0.804, 4.384)	0.145	1.439	(0.576, 3.592)	0.435
Very satisfied	**2.137**	**(1.915, 4.991)**	**0.035**	1.668	(0.719, 3.871)	0.234	**1.905**	**(1.072, 4.699)**	**0.041**
χ^2	35.118		0.014	33.362		0.015	46.818		<0.001
R^2	0.111			0.106			0.147		

Note: Figures in bold indicate coefficients with statistical significance

Supplementary Figure

We used plots of residuals against the covariates to observe fit of the regression models. From following figures, most points ranged from -2 to 2 and were generally distributed around 0, which indicates the modes have an acceptable fitness.

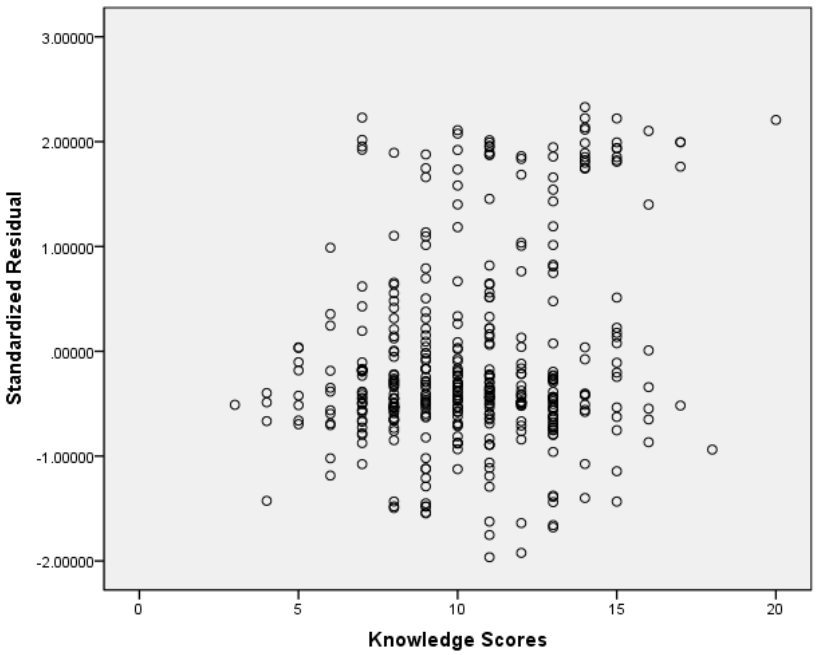

Figure 1 Scatter plot for knowledge scores and their standardized residuals

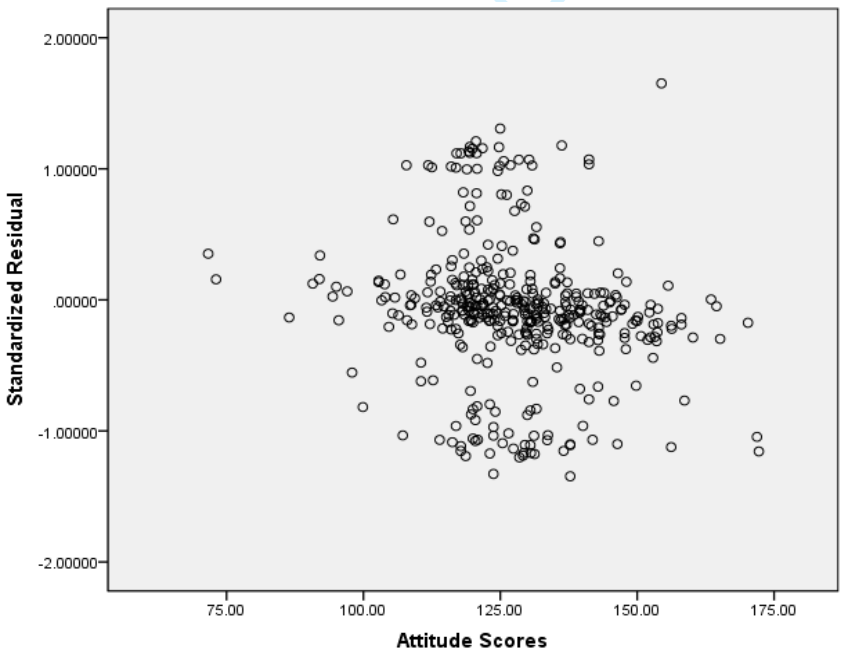

Figure 2 Scatter plot for attitude scores and their standardized residuals

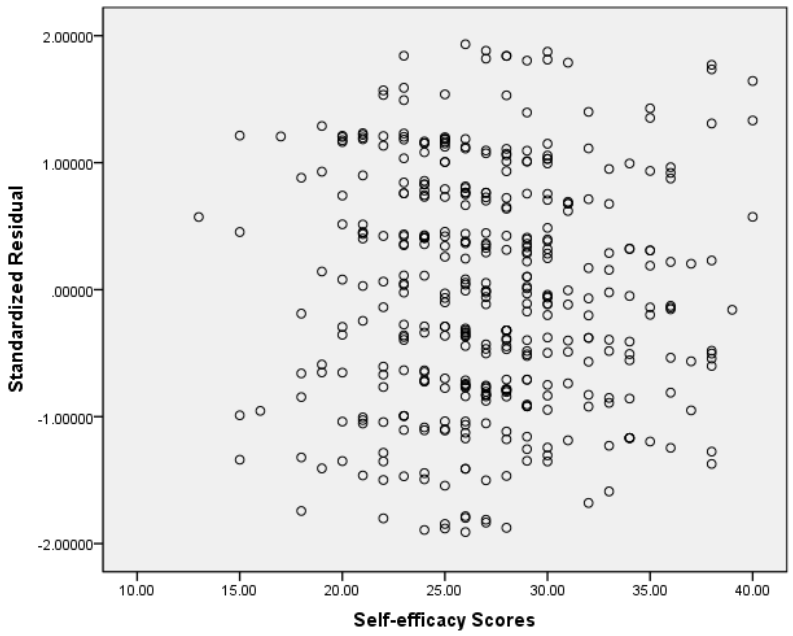

Figure 3 Scatter plot for self-efficacy scores and their standardized residuals

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Page1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Page2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	Page5
Methods			
Study design	4	Present key elements of study design early in the paper	Page5-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Page6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page7
Bias	9	Describe any efforts to address potential sources of bias	Page6
Study size	10	Explain how the study size was arrived at	Page6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page7-8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Page8
		(*b*) Describe any methods used to examine subgroups and interactions	Page8
		(*c*) Explain how missing data were addressed	Page6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page9-11
		(b) Give reasons for non-participation at each stage	Not applicable
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page9-11
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	Page9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Page 12-15
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	Page15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Page15-17
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page19

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.