


RESEARCH ARTICLE

Development and validation of a questionnaire to evaluate the knowledge, attitude, behaviour and care preference of family members of Chinese older adults related to palliative care

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Abstract

Aim: To develop and validate a questionnaire on knowledge, attitude, behaviour and care preference of family members of Chinese older adults related to palliative care.

Design: A descriptive study design and STROBE checklist were applied in this research.

Methods: The theoretical framework of the questionnaire was knowledge–attitude–behaviour model. An additional dimension of palliative care preference of family members was set up in the questionnaire. Items were generated from a rapid review of international literature and interviews with 61 family members of the older adults living either in an aged care service organization or the community. The content validity was examined by five experts. A preliminary questionnaire with 69 items was then set up, and its psychometric property was assessed.

Results: A final version of questionnaire with 42 items under four dimensions was constructed. The content validity index of the overall questionnaire was 0.93 and of each item ranged 0.80–1.00. The factor loading of all items was higher than 0.50 as per exploratory and confirmatory factor analysis; the average variance extracted for each dimension was higher than 0.50; the composite reliability was higher than 0.90; and the absolute value of the correlation coefficient of each dimension was <0.50 and less than the square root of the average variance extracted. The Cronbach's alpha value and the split-half reliability value of the overall questionnaire were 0.93 and 0.97, respectively.

Conclusions: This questionnaire has good validity and reliability, but needs further testing in multi-centered settings.

KEYWORDS

attitude, behaviour, care preference, family member, knowledge, older adult, palliative care, questionnaire development, reliability, validity

1 | INTRODUCTION

China is facing a challenging transition to caring for the world's largest older adult population socially due to decreased sufficiency of family function in terms of fulfilling a traditional duty of looking after loved seniors (Fan, 2011). The newest statistical data showed that older people aged 60 and above in China had reached 264 million in 2020, accounting for 18.70% of the total population (Ning, 2021). Such figures are estimated to rise to 500 million and 27.9%, respectively, by 2050 (Guo, 2020). As a result, aged care services have been increasingly established across the country to take over elderly caring responsibilities of many families.

End stage of life is an inevitable process of human living. Ageing population causes increased number of older adults who die each year. In addition, population ageing drives the worldwide epidemic of chronic diseases (Prince et al., 2015). Research shows that age is a major risk factor for most cancers and chronic diseases (Hoffe & Balducci, 2012) and the number of older adults with cancer or chronic disease is expected to increase rapidly in the upcoming decades (Hernandez & Hsu, 2017). A global decomposition analysis showed that a substantial and increased proportion of mortality for chronic disease occurs in older adults (Cheng et al., 2020; Prince et al., 2015).

As such, the demand for palliative care in both institutional and community settings is anticipated to increase, especially among those with cancer, extreme frailty, major organ failure and end-stage chronic illnesses. It has been reported that there were more than 5.6 million people who needed palliative care and 67.1% of them was aged 50 or over (Connor, 2020).

To be a crucial part of integrated, people-centred aged care services, palliative care takes a greatly important role in preventing and relieving sufferings of older adults with life-threatening diseases or conditions through early detection, comprehensive assessment and treatment of distressing physical and psychological symptoms (World Health Organization, 2021). It improves the quality of life of the older adults and their family members (World Health Organization, 2018). The holistic and proactive model of geriatric palliative care can provide emotional support and enhance early symptom control (Gemmell et al., 2021).

Although palliative care is beneficial to the older people and their families in need, such a kind of service has not been commonly received by them. In general, only 14% of patients who need palliative care have received some of the services globally (World Health Organization, 2021). A study showed that about 33%–38% of end-of-life patients took meaningless treatments (Cardona-Morrell et al., 2016). In China, it has been estimated that about five million people experience a dying process each year (Su, 2019), but only 50,000 people had received palliative care, accounting for only one per cent (Su, 2019). The most common reasons reported for the low acquisition of palliative care were that the availability of service was limited; and people often lacked awareness and knowledge of or positive attitude towards it and preferred to choose life-support

treatments for a dying patient (Akiyama et al., 2016; Gemmell et al., 2021; Taber et al., 2019).

In China, when an older patient suffers from a life-threatening or incurable disease, his/her family members usually become primary caregivers and make end-of-life treatment decisions for the patient (Evans & Ume, 2012; Ge & Mordiffi, 2017). Previous research found that 99.7% of palliative care medical decisions for patients were signed by their family members (Li et al., 2018). Their opinions and attitudes have played a leading role in making complicated decisions over medical treatments (Leung & Chan, 2020; Wu et al., 2021). While palliative care has not been essentially used in the local care settings, it is necessary to understand how the family members of older adults as potential key decision-makers of treatment understand, perceive and will do with this type of services so that appropriate care and education activities can be planned and delivered. Knowledge-attitude-behaviour (KAB) survey is a popular method to gather information on what is known, believed and done in relation to a particular topic (World Health Organization & Stop TB Partnership, 2008). In the present study, we developed a KAB questionnaire related to palliative care, targeting on these survey subjects and tested the psychometric properties of the questionnaire.

2 | BACKGROUND

KAB is an important theoretical model in health behaviour and education, which is based on a notion that knowledge acquisition will heighten attitude and then causes behaviour change (Schrader & Lawless, 2004; Xu et al., 2010). The model has been widely applied to assess health-related beliefs and behaviours in the context of specific illnesses or treatments (Lotfi et al., 2019). However, previous studies on KAB relating to palliative care mainly focused on health professionals and older people. For example, a Vietnamese study investigated the KAB of 251 nurses working in three oncology wards by applying three validated self-administrated questionnaires developed by previous researchers, namely the Expertise and Insight Test for Palliative Care (Adriaansen & van Achterberg, 2004), the Attitude Towards Care of the Dying Scale B (Mastroianni et al., 2015) and the Palliative Care Nursing Self Competence Scale (Tsao et al., 2019). The internal consistency of these instruments was reported with good results as their Cronbach's alpha was 0.718, 0.716 and 0.970, respectively. Teleshova (2020) also conducted a study to assess 88 nurses' knowledge and attitudes towards palliative care in the Republic of Kazakhstan using the Rotterdam MOVE2PC questionnaire developed by Witkamp and colleagues through Webropol online survey (Witkamp et al., 2013). These questionnaires were translated and adapted for a local use following WHO guidelines. The internal consistency reliability of the Rotterdam MOVE2PC questionnaire was tested with a good result (Cronbach's alpha = 0.899) (Witkamp et al., 2013). In addition, Harden et al. (2017) have conducted a study to assess the KAB of oncology nurses before and after an educational programme.

Using a revised version of the EOLC-ICU scale with 12 knowledge questions, five attitude questions and 11 behaviour questions developed by Montagnini et al. (2012). The reliability and validity data were not available as per author's report. Zeng et al. (2013) developed a questionnaire to evaluate the knowledge and attitude of palliative care for people with cancer. Six dimensions including personal attitudes towards death and dying, attitude towards the implementation of palliative care, self-evaluation of knowledge in palliative care, the cognition and support of palliative care, attitude of education about death or palliative care, attitude towards current situation of palliative care in hospitals were included in this questionnaire with twenty items. This questionnaire has good validity and reliability (Cronbach's alpha = 0.918) and was used by Ma et al. (2017) to investigate 300 older patients. Lu et al. (2014) constructed a questionnaire without testing validity and reliability to evaluate the knowledge of palliative care for the 458 older people in rural area with six items.

Family members have been paid attention by palliative care research with regard to a range of issues such as their burden, experience, care quality, grief, needs, care satisfaction, relationships and quality of life (Cohen, 2014; Cohen et al., 2005; Dumont et al., 2008; Grande et al., 2017; Heyland et al., 2013; Higginson et al., 2010; Jordan et al., 2005). However, there is a lack of study investigating the KAB of family members of older adults related to palliative care. This study was conducted to develop a survey instrument to focus on these aspects. It is believed that understanding their levels of KAB and care preference by using this instrument will provide implications for the establishment of family-centred palliative care services in the local settings.

3 | METHODS

This is a descriptive study on the development and validation of KAB survey questionnaire for family members of older adults related to palliative care. The Strengthening the Report of the Observational Studies in Epidemiology (STROBE) checklist (STROBE, 2022) was followed to conduct and report this research work.

3.1 | Questionnaire development

3.1.1 | Item generation

According to the KAB model, the questionnaire contains three components: knowledge, attitudes and behaviour of the family members in relation to palliative care (Kim et al., 1969). An additional dimension of palliative care preference was set up for a purpose of further providing implications for appropriate care design.

Items in accordance with the four dimensions were generated from a rapid review of relevant domestic and international literature and qualitative interviews with 61 conveniently sampled family members of older people living either in the community or an

aged care institution located in southern China. Survey items about knowledge were formulated mainly based on the WHO definition of palliative care (World Health Organization, 2021). Open-ended interview questions about attitude and behaviour and care preference were developed for the qualitative interviews to derive items relating to what the family members may think and do with palliative care and what specific care activities they want to receive.

3.1.2 | Content validity testing

The content validity was assessed to determine whether the items derived could adequately represent the content of the questionnaire in terms of achieving the survey purpose (Polit & Beck, 2006). In this research, five experts, who were specialized in life and death education, aged care, oncological nursing and social work in palliative care, were invited by an email to participate in the work. It was suggested that a minimum of three and a maximum of 10 experts should be asked to assess the relevancy of each question item (Boparai et al., 2018), so the number of experts was considered adequate for the content validity testing. These experts were asked to evaluate the relevancy of the items and the four dimensions using a 4-point Likert scale with possible responses of "4 = Very relevant, 3 = Relevant to the research content, but requires minor revisions, 2 = Must be modified otherwise irrelevant, 1 = Not relevant at all" (Boparai et al., 2018; Polit & Beck, 2006). The content validity index (CVI) was calculated to determine the content validity level. It was calculated as the number of experts who give a rating of either 3 or 4, divided by the total number of experts who rated the item. CVI was calculated at each item level and the overall questionnaire level, namely I-CVI and S-CVI/Ave, respectively. The latter was the mean value of former of all items. When a CVI was higher than 0.79, it represented great relevancy of the item; when it was between 0.70 and 0.79, the item needed revision; when the value was <0.70, the item was considered to eliminate (Koohi et al., 2021).

3.1.3 | Formation of a preliminary questionnaire

After the completion of content validity analysis, a preliminary questionnaire was established. Scoring criteria for each question item of Knowledge dimension was set up to collect dichotomous data as one point was given to a "Yes" answer and zero point was given to an answer of "No" or "Uncertain." For each item of Attitude, Behaviour and Care Preference dimensions, a 5-point Likert scale was used as "1 = Totally Disagree, 2 = Relatively Disagree, 3 = Generally Agree, 4 = Relatively Agree, 5 = Totally Agree."

3.1.4 | Pilot testing

A pilot testing of the questionnaire was undertaken to determine the clarity and understandability of all items. It involved 15 family

members of older adult selected from the community, using a convenience sampling method. The participants' advice on the expression of question items was collected if any. After then, a group discussion was conducted to refine the items in accordance with the advice received.

3.2 | Questionnaire validation

3.2.1 | Sample/participants

A questionnaire validation study was conducted among participants recruited through convenient sampling. The inclusion criteria for the participants were as follows: a) family member of older adult (aged 60 or over) who lived either in an aged care facility or community; b) aged 18 or over; and c) voluntarily completing the online questionnaire. The exclusion criteria were as follows: a) the career of the older adult who has an employment relationship with the older people; b) having cognitive impairment; c) having communication difficulties. The sample size was estimated to be five to TE times of the quantity of items in the questionnaire with a consideration of a drop rate of 10% (Cattell, 1978). Thus, at least 384 family members were considered to be sufficient for the study.

3.2.2 | Data collection

The questionnaire was created in electronic format using the Sojump software (<https://www.wjx.cn/>). Then, data collection was carried out via an online survey from June 2021 to August 2021 via sending a QR code or internet link of the questionnaire generated from the Sojump platform to social media networks such as WeChat and QQ. The participants were provided with information explaining the purpose of the survey and were reassured to have their personal information confidential. They could only proceed to answer the survey questions by clicking "Consent" button located at the bottom of the information page as the front page of the online questionnaire. When family members agreed to participate voluntarily and finished the questionnaire seriously, a raffle gift of a red packet with 2-5 RMB would be sent to them by Sojump system.

For the purpose of quality control of the research, before data collection, a training was undertaken for investigators to reduce variations in their personal understanding of the question items so that they could answer participants' any questions raising correctly. After all questionnaires were returned, they were screened for any filling problems. For example, when time spent to fill out the questionnaire was <180s, the data case was removed because it was too rushing to fill out the survey. We also screened out the data case if the participant's general information was unrealistic; all the item options were the same; or missing values were higher than 10% of total items in a data case.

3.3 | Data analysis

SPSS 20.0 and AMOS 24.0 software were used to perform statistical analysis of the data. A series of data analysis procedures, including item analysis, exploratory factor analysis, confirmatory factor analysis and internal consistency reliability testing were undertaken to test the validity and reliability of the questionnaire. Confidence level for all analyses in this study was 95%. Missing data were handled by the linear trend method.

3.4 | Item analysis

Critical ratio analysis and correlation coefficient method were employed for item analysis. The critical ratio was calculated to determine whether there was a system error with data collected. To do this, the questionnaires received were sorted into a high group with a total score ranked in the top 27% and a low group with a total score ranked in the bottom 27%. The independent-sample *T* test was used to assess the difference in scores on each item between the two groups. If an item had no statistically significant difference ($p \geq .05$) in the mean score between the two groups, it indicated that the item had poor discrimination and was considered to delete (Wu, 2010a).

The correlation coefficient (*r*) between each item and the total score of corresponding dimensions were calculated to determine the strength of relationship between the two variables. An item was considered to delete when the correlation coefficient value was lower than 0.40 and/or *p* value of the test was $\geq .05$ (Ebel, 1965; Wu, 2010a).

3.5 | Construct validity testing

To test the construct validity of the questionnaire, exploratory factor analysis and confirmatory factor analysis were carried out. Items of Knowledge dimension were analysed separately from those of other dimensions because of different scoring systems used (dichotomous and 5-Likert scoring method, respectively). For this process, questionnaire data were divided into two equal parts randomly with one part used for item analysis and exploratory factor analysis and the other part used for confirmatory factor analysis.

Exploratory factor analysis was conducted to determine the initial factor structure of the questionnaire (Trager et al., 2021). To do this, we used principal component analysis with varimax orthogonal rotation to extract common factors. Prior to conduct exploratory factor analysis, two tests, Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity, were performed. These two measures were used to determine whether a data sample was adequate for exploratory factor analysis (Bismark Kwao Nkansah, 2018; Noor UI et al., 2016). When the value of KMO was >0.80 or the *p* value of Bartlett's Test of Sphericity was <0.05 , it meant that the questionnaire had adequate samples for the analysis and the variables (dimensions and items) were suitable for factor analysis (Wu, 2010a). In the next

step of extracting common factors using principal component analysis with varimax orthogonal rotation, criteria for the retaining of common factor extracted included: a) eigenvalues >1; b) cumulative percentage variance of all common factors was higher than 50.00%; c) each common factor had three or more items; d) the factor loading of all items should be higher than 0.45; e) the common factors and the items were suitable to the original construct (Wu, 2010a). If one of these criteria was not met, the construct of the questionnaire should be adjusted again. As such, multiple rounds of exploratory factor analysis might be performed until all criteria were met.

Confirmatory factor analysis was carried out to verify the results of the exploratory factor analysis (Trager et al., 2021). In the analysis, dimensions of the questionnaire were taken as latent variables and items were taken as observation variables to establish a model where model fitting index was calculated to assess a construct validity of the questionnaire. This included baseline comparison measures and parsimony-adjusted measures. To judge the degree of the model fit, χ^2/df of the model should be <5.00, and the baseline comparisons measures (incremental fit index (IFI), Tucker-Lewis index (TLI) and fitting index (CFI)) should be higher than 0.90, while the parsimony-adjusted measures (parsimony comparative fit index (PCFI) and parsimony normed fit index (PNFI)) should be higher than 0.50 (Wu, 2010b). Besides, the factor loading of each item should be higher than 0.50 and the root mean square error of approximation (RMSEA) should be <0.08 (Wu, 2010b).

In addition, convergent validity and discriminant validity were tested to further represent the construct validity (Zinbarg et al., 2018). Convergent validity was represented by the factor loading of each observation variable, the average variance extracted (AVE) of each latent variable (dimension) and the composite reliability (CR). The latter two were calculated based on the former. All of these measures should have a value higher than 0.50 to indicate good intrinsic quality of model and good convergent validity of the questionnaire (Wang et al., 2013; Wu, 2010b).

Discriminate validity demonstrated that the dimensional variable construct was different from another dimensional construct (Zinbarg et al., 2018). In this study, discriminate validity was analysed by the value of the correlation coefficient between each dimensional latent variable. The value of correlation coefficient between each two-dimensional variables (dimensions) should be less than the square root of average variance extracted with statistical significance ($p < .01$) to indicate a good discriminate validity of the questionnaire (Wu, 2010b).

3.6 | Reliability testing

Two methods were used to examine the internal consistency reliability of the questionnaire. Firstly, a Cronbach's alpha coefficient for the overall questionnaire and each of three dimensions with a Likert scale (Attitude, Behaviour and Care Preference) was calculated with an expected value of at least 0.70 to indicate adequate internal consistency (Wu, 2010a). When it had a value of 0.90 or more,

it meant that the reliability was excellent (George & Mallery, 1998). For the dimension of Knowledge with dichotomous data, the Kuder-Richardson Formula 20 (KR-20) was applied. The value for KR-20 ranges from 0.00 to 1.00 and a value of 0.70 indicates reasonable reliability (Zach, 2022; Cortina, 1993).

Split-half reliability was tested. To do this, the items of the questionnaire were divided into two groups with one group consisting of even-numbered questions and the other group consisting of odd-numbered questions under each dimension. Then, the total scores of the two groups were calculated, respectively, for correlation analysis using Spearman-Brown formulation: $R = 2r/(r+1)$. The higher the split-half reliability, the higher the internal consistency of the questionnaire. R value of 0.70 or more indicated an acceptable level of reliability (Perri et al., 2018; Wu, 2010a).

4 | RESULTS

4.1 | Preliminary questionnaire

Based on the literature review, interviews with the 61 family members of older adults ($n = 61$) and expert panel discussions ($n = 5$), a preliminary survey questionnaire was set up with a total of 69 items under four dimensions: Knowledge, Attitude, Behaviour and Care Preference. The number of items under the four dimensions was 16 (A1–A16), 21 (B1–B21), 14 (C1–C14) and 18 (D1–D18), respectively.

4.2 | Content validity

The I-CVIs of all items ranged 0.80–1.00. The S-CVI/Ave of the overall questionnaire was 0.93. These indicated that the questionnaire had good content validity.

4.3 | Construct validity

We received a total of 1,038 questionnaires, of which, 1,010 were properly completed, accounting for 97.30% of the total questionnaires. These 1010 family members were from nine provincial areas of China.

The participants' age ranged from 18 to 90. Their average age was 27.5 ± 9.40 . Detailed social-demographic characteristics of these family members are shown in Table 1.

4.3.1 | Item analysis

Detailed results of critical ratio analysis are presented in supplementary Table S1. Items B19, C3, C9 and C12 had statistically insignificant difference in scores between the high and low groups ($p > .05$), indicating that these items needed to be removed prior to proceeding to the subsequent analysis.

TABLE 1 Socio-demographic information of participants

Variables	Total (n)	Per cent (%)	Variables	Total (n)	Per cent (%)
Sex	Male	31.30	Relationship with older adult	Brothers or sisters	15
	Female	68.70		Spouse	2
Education	Postgraduate	18.30	Living place	Son or daughter	172
	Under graduate	51.00		Daughter-in-law or son-in-law	43
	Diploma	22.40		Grandchildren	687
	Senior high school or technical secondary school	5.30		Relative	91
	Junior high school	2.60		Countryside	211
	Primary school	0.30		Villages or towns	132
Occupation	No education	0.10	County	122	
	Full-time job	66.60	City	545	
	Part-time job	6.40	Guangdong	691	
	unemployed	25.20	Beijing	19	
	Retired	1.80	Gansu	30	
			Hebei	38	
Marital status	Unmarried	75.00	Hunan	56	
	Married	24.00	Jiangxi	68	
	Divorced	0.50	Liaoning	38	
	Widowed	0.60	Sichuan	46	
Religious belief	Yes	9.60	Zhejiang	24	
	No	90.40			

In relation to correlation coefficient method, the correlation coefficient values of items B14, B15, B16, B17, B18, B20 and C4 were lower than 0.40, indicating a lack of good distinguishing effect (Table S2). Therefore, these items were removed.

4.3.2 | Exploratory factor analysis

For Knowledge dimension, the KMO value was 0.94 and the Bartlett's Test of Sphericity χ^2 was 3582.84 ($p < .01$), which meant that all the variables were suitable for factor analysis. In the first round of exploration, although three common factors were extracted (eigenvalues >1), their cumulative percentage variance was 57.73%; the factor loading of all items belonging to the three common factors was higher than 0.40; there were only two items belonging to the third common factor; and the three common factors were not consistent with the original construct of the dimension. Therefore, the construct of these items should be re-explored.

After four times of exploration, items A5, A10, A2 and A4 were deleted and then a common factor was extracted by principal component analysis with an eigenvalue of 6.08 (>1.00). The cumulative percentage variance of the common factor was 50.69%. There were 12 items belonging to this common factor. The factor loading of the 12 items was higher than 0.45 (Table 2). Therefore, this common factor with the 12 items was suitable to the original construct of the dimension.

For the rest three dimensions, the KMO value of all the items was 0.96. The Bartlett's Test of Sphericity χ^2 of the items was 21,557.38

($p < .01$). It meant that the items were suitable for factor analysis. In the first round of exploration analysis, five common factors were extracted with eigenvalues >1.00 . The cumulative percentage variance of all items was 71.46%. All the factor loading of items were higher than 0.45. However, the fifth common factor only had two items. The construct of these five common factors was not consistent with the original construct. Hence, the items should be adjusted. After eight rounds of exploration, the items C8, B21, B10, B9, B11, B12, C7 and B6 were deleted one by one.

In the ninth round of exploration, three common factors were extracted from the remaining items with their eigenvalues of 17.59, 4.72 and 1.74, respectively, by the principal component analysis. Their percentage of variance was 39.93, 18.17 and 12.66, respectively. The cumulative percentage variance of the three factors was 70.76%. There were more than three items under each common factor. The factor loading of the items was higher than 0.50 (Table 3). These factors were consistent with the original construct and items of the questionnaire.

As a result of the exploratory factor analysis, a total of 46 items was retained and placed in four dimensions.

4.3.3 | Confirmatory factor analysis

To conduct confirmatory factor analysis for the dimension of Knowledge, the dimension was used as a latent variable and its 12 items were used as observation variables to establish a model. The result showed that the model of Knowledge latent variable fitted

TABLE 2 Exploratory factor loading of knowledge items

Item	Content	Factor Loading
A1	Palliative care is for older adult who suffer from life-threatening or incurable diseases	0.51
A3	Palliative care neither prolongs their life or accelerate their death	0.57
A6	Palliative care can prevent and relieve physical and psychological symptoms of older adult who are at end stage of life	0.77
A7	Palliative care addresses spiritual care needs of older adult	0.58
A8	Palliative care addresses social care needs of older adult	0.51
A9	Palliative care aims to improve the quality of life of older adult	0.81
A11	Palliative care is provided by professionally trained health and other related professionals	0.71
A12	Palliative care can be performed in combination with life-support treatments	0.71
A13	Palliative care is person-centred	0.85
A14	Palliative care is family-centred	0.68
A15	Palliative care maintains the dignity of older adult during a dying process	0.86
A16	Palliative care provides support to older adult and their families, such as psychological counselling and respite care	0.85

TABLE 3 Exploratory factor loading of attitude, behaviour and care preference items

Item	Content	Item Factor Loading of Common Factor		
		Factor 1	Factor 2	Factor 3
B1	I think I need to try our best to treat the older adult and have no need for palliative care	-0.13	0.77	0.04
B2	I think palliative care means giving up the life of older adult	-0.16	0.82	-0.03
B3	I think the principles of palliative care is in conflict with my philosophical belief	-0.18	0.89	-0.08
B4	I think palliative care is meaningless or useless	-0.23	0.87	-0.05
B5	I think that a healthcare institution provides palliative care because the doctors did not do their best to treat the older adult	-0.20	0.89	-0.03
B7	I think choosing palliative care for the older adult is not a choice of fulfilling filial piety	-0.17	0.90	-0.08
B8	I think palliative care is to curse the older adult to die early	-0.21	0.86	-0.09
B13	I think being alive is always better than death, so continuing life-support is necessary	0.00	0.60	-0.10
C1	I would seek opinion from the older adult to decide whether to choose palliative care	0.49	-0.18	0.50
C2	Before choosing palliative care, I would analyse the actual situation and make rational judgement	0.53	-0.22	0.57
C5	If there is no point to have continuing support, I would definitely choose palliative care for the older adult	0.32	-0.13	0.69
C6	When there is no cure for the older adult, I would make palliative care decision	0.39	-0.20	0.71
C10	I would follow the doctor's advice to choose palliative care for the older adult	0.30	0.02	0.68
C11	When I have decisional dilemma, I would seek opinions from my relatives and/or friends	0.08	0.19	0.59
C13	When deciding whether to choose palliative care, I would communicate and negotiate with other family members	0.48	-0.13	0.60
C14	If relatives or friends around me choose palliative care for the older adult, I would respect and support their decisions	0.44	-0.14	0.67
D1	I hope that all healthcare institutions provide palliative care for the older adult	0.69	-0.12	0.33
D2	I hope that older adult can get palliative care provided by professionals at home	0.77	-0.16	0.30
D3	I hope that healthcare institutions provide palliative care in a warm environment	0.79	-0.14	0.27
D4	I hope that older adult can die in a warm home rather than in a cold hospital ward	0.81	-0.16	0.17
D5	I hope that healthcare institutions can provide high-quality palliative care for older adult and their families	0.86	-0.15	0.23
D6	I hope that palliative care is covered by medical insurance	0.85	-0.14	0.24
D7	I hope that older adult are surrounded by families during a dying process	0.88	-0.18	0.22
D8	I hope that before palliative care is delivered, the older adult are assessed by health professionals for how long they can live	0.82	-0.13	0.23
D9	I hope there are relevant laws and regulations to clearly define who can receive palliative care	0.69	-0.01	0.15
D10	When making a palliative care decision, I hope there is a family conference	0.89	-0.18	0.24
D11	I need support and understanding from my family and friends when making a palliative care decision	0.85	-0.18	0.29

TABLE 3 (Continued)

D12	When making a palliative care decision, I hope I am given some time for consideration	0.80	-0.16	0.22
D13	I hope that I am informed early by health professionals about the medical condition or how much hope of survival that the older adult has so that we can accept the dying of the older adult	0.81	-0.17	0.24
D14	When making a palliative care decision, I hope health professionals communicate with me effectively	0.87	-0.20	0.26
D15	When making a palliative care decision, I hope I can get support from health professionals	0.86	-0.16	0.25
D16	When making a palliative care decision, I hope that health professionals clearly tell me the benefit and risk of different medical options	0.88	-0.18	0.21
D17	I hope that health professionals can guide me how to take care of a dying older adult	0.87	-0.22	0.24
D18	When taking care of a dying older adult for a longer time, I hope that I can have respite care from health professionals	0.72	-0.14	0.27

TABLE 4 Confirmatory factor loading of latent variable of knowledge

Path			Factor loading	AVE	CR
A6	<--	Knowledge	0.71	0.54	0.91
A8	<--	Knowledge	0.51		
A9	<--	Knowledge	0.73		
A11	<--	Knowledge	0.67		
A12	<--	Knowledge	0.64		
A13	<--	Knowledge	0.87		
A14	<--	Knowledge	0.71		
A15	<--	Knowledge	0.85		
A16	<--	Knowledge	0.84		

well (Table S3). However, the factor loading of items A1, A3 and A7 was lower than the standard value of 0.50 (Wu, 2010b) and the average variance extracted of Knowledge latent variable was lower than 0.50, which indicated bad convergent validity. Therefore, the model required adjustment to achieve more stable model construct.

After deletion of items A1, A3 and A7, the model fit indices, χ^2 value was 81.77, *df* was 27.00, χ^2/df was 3.03, the root mean square error of approximation (RMSEA) was 0.06; the incremental fit index (IFI) was 0.98, Tucker–Lewis index (TLI) was 0.97, fitting index (CFI) was 0.98, parsimony comparative fit index (PCFI) was 0.73, and parsimony normed fit index (PNFI) was 0.73. All these values represented a good model fitting effect.

The factor loading of the remaining items was higher than 0.50, their average variance extracted (AVE) was higher than 0.50, and the composite reliability (CR) was higher than 0.90 (Table 4). These indicated good convergent validity of the dimension. The standardization path of the Knowledge latent variable is shown in Figure 1.

For confirmatory factor analysis of other dimensions, the dimensions were used as latent variables and its 34 items were used as observation variables to establish a model. The model fit indices of the three dimensions indicated that model had an ideal fitting

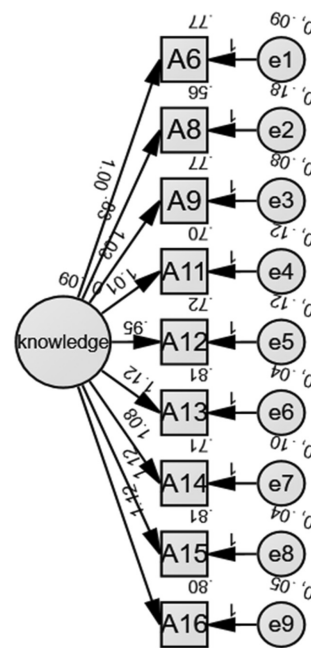


FIGURE 1 Standardization path of latent variable of knowledge of confirmatory factor analysis.

effect. Detailed information is shown in Table S4. The average variance extracted of the three latent variables was higher than 0.70, and their composite reliability was higher than 0.90. However, the factor loading of the observed variable C11 was <0.50, indicating bad convergent validity. Therefore, the item was considered to remove.

For discriminate validity, the square root of average variance extracted of each of three latent variables >0.70, and the value of the correlation coefficient (*r*) between each two of latent variables was less than the square root of average variance extracted ($p < .01$) indicating a good discriminate validity of these variables.

After deleting C11, the model fit indices, χ^2 value was 2437.83, *df* was 492.00, χ^2/df was 4.96, the root mean square error of

approximation was 0.09, the incremental fit index was 0.90, Tucker–Lewis index was 0.89, comparative fit index was 0.90, parsimony comparative fit index was 0.84, and parsimony normed fit index was 0.81. These values indicated that the index of model fit became better than the previous results.

Furthermore, the factor loading of each observation variable was higher than 0.70 and the average variance extracted of each latent variable was higher than 0.60. The composite reliability values of the three dimensions were all higher than 0.90. Detailed results are shown in Table 5. These results reflect good convergent validity of the dimensions of the questionnaire.

In relation to discriminate validity, the square root of average variance extracted of each of three latent variables was higher than 0.75, and the value of the correlation coefficient (r) between each

two of latent variables was less than the square root of average variance extracted ($p < .01$), indicating good discriminate validity. Detailed information is shown in Table S5. The standardized path of Attitude, Behaviour and Care Preference latent variables is presented in Figure 2.

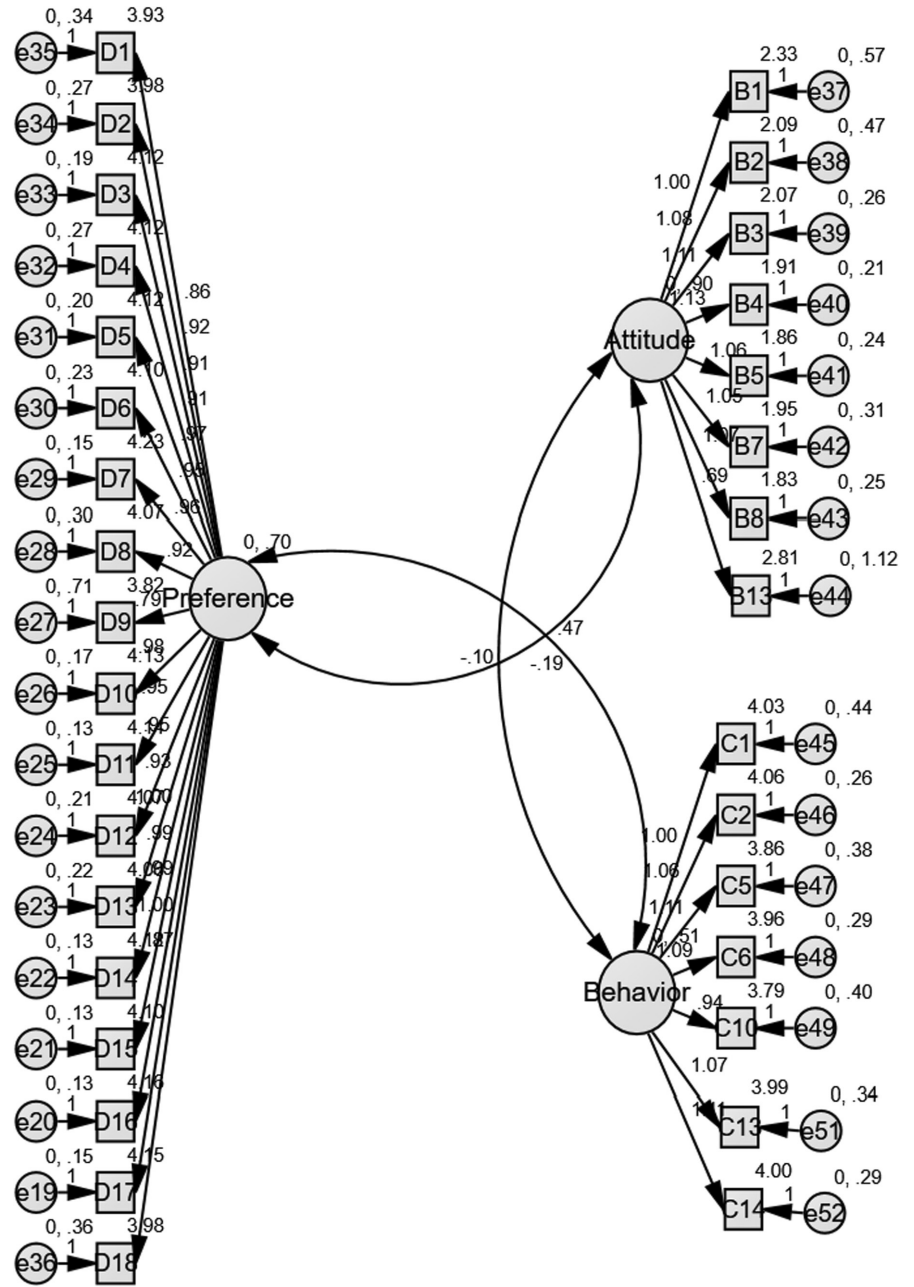
4.4 | Reliability

The Cronbach's alpha of the overall questionnaire was 0.93. It was 0.94, 0.91 and 0.98 for the Attitude, Behaviour and Care Preference dimensions, respectively. The KR-20 value of Knowledge dimension was 0.90. The split-half reliability of the overall questionnaire was 0.97, while it was 0.79, 0.91, 0.94 and 0.98 for Attitude, Behaviour

Path			Factor loading	AVE	CR		
B1	<--	Attitude	0.78	0.70	0.95		
B2	<--	Attitude	0.83				
B3	<--	Attitude	0.90				
B4	<--	Attitude	0.92				
B5	<--	Attitude	0.90				
B7	<--	Attitude	0.87				
B8	<--	Attitude	0.90				
B13	<--	Attitude	0.53				
C1	<--	Behaviour	0.73			0.62	0.92
C2	<--	Behaviour	0.83				
C5	<--	Behaviour	0.79				
C6	<--	Behaviour	0.82				
C10	<--	Behaviour	0.73				
C13	<--	Behaviour	0.79				
C14	<--	Behaviour	0.83				
D17	<--	Care Preference	0.91	0.73	0.98		
D16	<--	Care Preference	0.92				
D15	<--	Care Preference	0.92				
D14	<--	Care Preference	0.92				
D13	<--	Care Preference	0.86				
D12	<--	Care Preference	0.87				
D11	<--	Care Preference	0.91				
D10	<--	Care Preference	0.89				
D9	<--	Care Preference	0.62				
D8	<--	Care Preference	0.81				
D6	<--	Care Preference	0.86				
D5	<--	Care Preference	0.88				
D4	<--	Care Preference	0.82				
D3	<--	Care Preference	0.87				
D2	<--	Care Preference	0.83				
D1	<--	Care Preference	0.78				
D7	<--	Care Preference	0.90				
D18	<--	Care Preference	0.77				

TABLE 5 Confirmatory factor loading of latent variables of attitude, behaviour, care preference

FIGURE 2 Standardization path of latent variable of attitude, behaviour and care preferences of confirmatory factor analysis.



and Care Preference dimensions, respectively. These indicated good reliability of the questionnaire.

Based on these validation procedures, a final version of the questionnaire with 42 items was established. The process of the questionnaire development and validation is shown in Figure 3.

5 | DISCUSSION

This study was carried out to develop and validate the questionnaire for assessing the knowledge, attitude and behaviour of Chinese family members of older adult, and their care preference in relation to palliative care. The KAB model as a widely applied theoretical framework should be useful for obtaining an understanding of people's healthcare service-seeking behaviour (Kim

et al., 1969), so meets our research purpose of examining the potential of palliative care acceptance of our survey subjects. Under this framework, specific question items were generated deductively and inductively from relevant domestic and international literature and qualitative interviews with 61 family members of older adults. At concrete questionnaire dimension level, WHO definition of palliative care provided basic and comprehensive meaning of what palliative care is, which informed the establishment of question items of Knowledge dimension. These questions could help explore how the family members understood palliative care properly. Besides, questions about Attitude, Behaviour and Care Preference developed based on relevant international literature and interview data could sensitively and sufficiently reflect how Chinese family members commonly perceive and will do about palliative care for their loved ones.

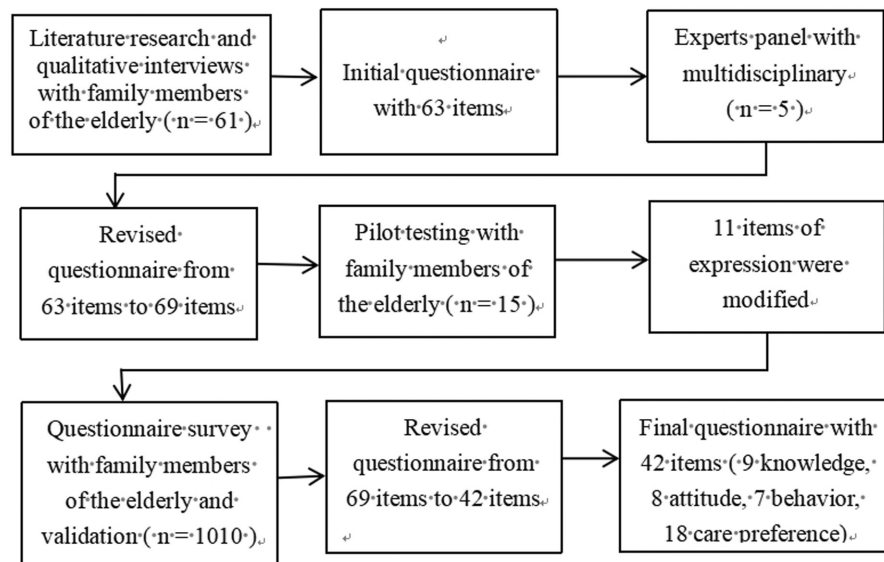


FIGURE 3 Questionnaire development process.

The validation of the questionnaire followed a series of rigorous procedures involving item analysis and testing of validity and reliability.

Data were collected based on an online questionnaire survey, which made it difficult to calculate a response rate. However, large responses ($n = 1010$) from a variety of areas were received with good distributions of socio-demographic characteristics among the participants, which can better reflect various perceptions of family members of older adult among different social groups. Based on data collected, a series of step-by-step approaches to psychometric property testing were executed to measure the validity and reliability of the questionnaire such as critical ratio analysis, correlation coefficient analysis, exploratory factor analysis, confirmatory factor analysis, split-half reliability testing and Cronbach's alpha measures. Several adjustments were made as per testing results. Consequently, a number of items were removed, leaving a final version of 42-item questionnaire in four dimensions including Knowledge (9 items), Attitude (8 items), Behaviour (7 items) and Care Preference (18 items). After validation, good validity and reliability of the questionnaire were eventually established.

The questionnaire contributes to significant research on KAB of family members of older people in relation to palliative care in China. It addresses the decision-making over palliative care service utilization through providing a tool to seek the family members' perspectives, which are potential key determinants of acceptance of palliative care. Such investigation is significant in the current situation of ageing population in China where essential palliative care services have not been adequately established or used and significant amount of very sick older people who require relief from sufferings and improvement of their quality of life. The study will fill in a gap of previous research that mainly focused on KAB of older people and health professionals in relation to palliative care (Perri et al., 2018; Spruit et al., 2018; Wu et al., 2020).

The questionnaire will enable caregivers to design appropriate care or education interventions so that family-centred care needs can be met and the older patients' suffering can be relieved.

5.1 | Limitation of the study

Several limitations exist in this research. Firstly, a convenient sampling method via the online survey has decreased the representativeness of the study participants, though a large size was achieved. The mean age of participants was quite young (27 ± 9.40), decreasing the representativeness of our study samples. This was probably due to a lack of social media software literacy with middle-based or more order family members. Besides, all the participants and experts were from China, resulting in less applicability of the questionnaire for western countries due to cultural diversities among them.

6 | CONCLUSION

A newly developed and validated questionnaire on the KAB of family members of older adult in relation to palliative care is presented in this study report. The development and validation of the questionnaire has followed a series of scientific procedures. The questionnaire could be a valuable tool for practitioners to design appropriate and family-centred palliative care services. Further research needs to be carried out to further validate the questionnaire based on random, stratified sampling or multi-centre investigations.

6.1 | Relevance to clinical practice

The questionnaire can be applied to assess the level of knowledge, attitude, behaviour and care preference of family members as key treatment decision-makers of older people in relation to palliative care. Based on this, appropriate family-centred care interventions or programmes can be established so that very ill older adults' distressing sufferings are relieved and their quality of life is maintained.

AUTHOR CONTRIBUTIONS

Ning Wang has designed the research project and guided the data collection and analysis and participated in the drafting and significantly revising of the paper. Data were collected by Xiaofen Wu, Xiran Li, Ting Su, Lijie Wang, Jiayi Zhang and Shuang Wang. Data were analysed by Xiaofen Wu, Jin Liang and Qiuna Huang. Xiaofen Wu drafted paper. Rihui Xiang have provided important contribution to the construction of content of the paper and made review significant revision. All authors have reviewed and agreed with the content of the paper.

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CONFLICT OF INTEREST

None declared.

DATA AVAILABILITY STATEMENT

The data of this study are not publicly shared due to the responsibility for the integrity of data and the ethical consideration.

ETHICAL APPROVAL

The Ethics Committee of Southern Medical University approved this study ([2020] NO.008).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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