Submitted: 19 September, 2023 Accepted: 25 October, 2023 Published: 30 April, 2024 DOI:10.22514/jomh.2024.059

ORIGINAL RESEARCH

JOMH Journal of Men's Health

Changes in depression and suicidal thoughts in bereaved older men: insights from a Korean study

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Abstract

The escalating elderly population has highlighted mental health concerns, especially the impacts post-bereavement. This study investigated depression trajectories post-bereavement and their relation to suicidal thoughts among elderly South Korean males, considering demographic variables. Using data from the 7th to 16th Korea Welfare Panel Study (2012–2021), depression was measured *via* the CES-D (Center for Epidemiological Studies-Depression) scale, and suicidal thoughts were annually identified. Results revealed two post-bereavement depression trajectories: a predominant "Maintenance Type" (79.4%), showing persistent depression, and a "Decreasing Type" (20.6%), where depression reduced over time. Individuals in the "Maintenance Type", often living alone, exhibited a higher risk of suicidal ideation. These findings emphasize the need for tailored interventions addressing social isolation and enhanced community support for the elderly to improve mental well-being.

Keywords

Bereavement; Depression; Older male adults; Suicidal thoughts

1. Introduction

According to the World Health Organization (WHO) [1], one person dies by suicide every 40 seconds worldwide; furthermore, the highest rate of suicide is in the elderly population over 65 years-of-age. On a global level, male adults have more than twice the likelihood of dying by suicide when compared to female adults [2], thus indicating an urgent need for research and intervention relating to the issues associated with suicide in older male adults.

A major factor influencing suicides among older male adults is the loss of a spouse. In contemporary times, the majority of the baby boomer generation and the preceding generation in Korea preferred living with their spouse, with only 6% wishing to live with their children [3]. Therefore, the loss of a spouse often leads to living alone; this accelerates social isolation and exclusion [4]. This social disconnection and isolation can increase the risk of suicide with advancing age; notably, the loss of a spouse can significantly aggravate the risk of suicide [5, 6]. Notably, the loss of a spouse can exert significant impact on suicidal thoughts in older male adults when compared to females [7, 8]. Previous research by Blazer & Koening [9] reported indicated higher levels of suicidal thoughts in older male adults, attributing this to the lack of preparedness for bereavement as women generally have a longer life expectancy than men. Furthermore, men tend to be more reluctant to express their emotions when compared to women. Therefore, even if they have many social acquaintances, they often have fewer confidants with whom they can share their deep thoughts and feelings. This can lead to greater challenges when adjusting after the loss of a spouse [10]. In a previous study, Moyers [11] hypothesized that men, who generally received support from their spouses throughout their lives, struggle to adapt to managing life by themselves after a loss, potentially leading them to choose suicide as a last resort.

The loss of a spouse is frequently cited as a primary reason for the worsening symptoms of depression; this is a known precursor to suicidal thoughts [12, 13]. In older adults who are unable to maintain sufficient social networks and support bases, the likelihood of impulsive actions increases with escalating depression and stress following the loss of a spouse, thus generating a higher propensity for suicidal thoughts [14]. In particular, numerous earlier studies have shown that older male adults not only experience a greater impact from the loss of a spouse when compared to females but also experience a significantly higher level of depression; this correlation was only minimal in older females [12, 15, 16]. Lund *et al.* [15] attributed this phenomenon to the challenges that older males face in undertaking chores that were previously performed by their deceased spouses, thus leading to depression. Furthermore, a cross-national study by Jadhav and Weir [17] reported that males experienced longer durations of depression when compared to females post-bereavement in all of the countries studied. Moreover, depression has been identified as the factor most closely associated with suicidal thoughts [18]. Previous analyses of individuals who attempted suicide reported that the majority of these subjects were experiencing depression at the

time of the suicide attempt, thus demonstrating a significant relationship between depression and suicide [19, 20].

On the other hand, according to a study by Oh and Kim [21], variables such as age, education level, and living arrangements were closely related to suicidal thoughts in older adults, with income and geographical location also being cited as influential factors [22]. Therefore, a multifaceted approach that considers the characteristics of older age is necessary when investigating suicidal thoughts in bereaved older adults.

Despite the necessity to elucidate the relationship between bereavement, depression and suicidal thoughts in older male adults and the need to provide empirical evidence for appropriate intervention, previous studies have either explored the relationships between variables without distinguishing gender [23, 24] or have scarcely focused exclusively on bereaved older male adults. Existing studies also have limitations in terms of delineating the relationship between depression and suicidal thoughts in bereaved older adults, either investigating levels of depression and suicidal thoughts in isolation or analyzing only trends in the severity of depression without distinguishing different types of depression changes.

In the present study, we focused on elderly men in South Korea, a country that has been reported to have the highest suicide rate for several years. Over the past 20 years, South Korea's suicide rate has consistently ranked 1st or 2nd among countries that are members of the OECD (Organization for Economic Cooperation and Development), which aims for international economic cooperation [25]. According to the recently released OECD Data (2023), Korea ranks first with 24.1 suicides per 100,000 people; Lithuania was reported as the second highest at 18.5, making it the only country recording over 20 individuals [26]. Moreover, an analysis of suicide rate by age group revealed that in Korea, the rate for older adults in their 60s was 30.1, while that of adults in their 70s was 38.8; in those aged 80 years and above, the suicide rate reached 62.6, the highest level reported in OECD countries [27]. As of 2020, in South Korea, the suicide rate for elderly men is reported to be over three-fold higher than that of women [28]. Of course, conducting research solely on elderly men in South Korea might not align with the circumstances of other countries. However, a study on widowed elderly men in Korea, where the suicide issue is severe, will hold significant importance in this field of research.

Consequently, in the present study, we investigated the relationships between suicidal thoughts and changes in depression types in the context of time progression following bereavement, alongside demographic characteristics, by analyzing and categorizing the levels of depression in bereaved older male adults. This research holds significant value in identifying the trends of depression changes and verifying their relationships with suicidal thoughts in bereaved older male adults. The hypotheses of this study are as follows: first, that there will be different types of depression trajectories in widowed elderly men, and second, that the types of depression changes in widowed elderly men will influence suicidal thoughts.

2. Methods

2.1 Data

This study aimed to categorize the changes in depression experienced by bereaved older male adults immediately after the loss of a spouse and to investigate the relationship between these changes and suicidal thoughts. Our analysis utilized the 7th to 16th Korea Welfare Panel Study (KoWePS), conducted between 2012 and 2021. The KoWePS aims to understand the living conditions and welfare needs of various population groups and to contribute to policy circulation by evaluating the efficacy of policy implementations and facilitating the formation of new policies and systematic improvements. The KoWePS has conducted surveys on an annual basis since 2012; the survey period is typically from March to June. The target population of the Aging Research Panel Survey is national residents, and the first survey involved 14,463 individuals. The survey method is the computer-assisted Personal Interviewing (CAPI) using a notebook, and samples were taken using the stratified cluster sampling method. In the present study, 364 individuals aged 65 years and above (the criteria used to define "elderly" according to South Korea's Elderly Welfare Law) were selected for the analysis of more than three years of changes in depression post-bereavement from 2012 (7th) to 2021 (16th). For depression, changes needed to be estimated; therefore, only cases that responded for a minimum of three years were set as the subjects of this study. Cases that responded to survey questions related to depression for less than three years were excluded.

2.2 Variables

2.2.1 Independent variables

The independent variable was depression and utilized a modified version of the abbreviated CES-D (Center for Epidemiological Studies-Depression) scale by Kohout *et al.* [29] (1993). The CES-D is a self-reporting tool that is used to measure the level of depressive symptoms, and the abbreviated CES-D used in this study, which was developed by Radloff [30] and later condensed into 11 items by Kohout *et al.* [29], aims to reduce the burden on respondents. Kohout *et al.* [29] confirmed a high correlation ($r = 0.88$, $p < 0.001$) between the CES-D and CES-D 10 Boston version, thus validating its reliability. At the time of its development, the tool's reliability was defined by a Cronbach's α of 0.80. This tool is also commonly used in studies investigating the association between depression and suicidal thoughts in the elderly, thus making it the most suitable choice for validating this type of research [31, 32]. In this study, we considered the average variable of 11 depression items. Depression was measured using a 4-point scale: 1 = very rarely, 2 = occasionally, 3 = often, 4 = mostly, with higher scores indicating more severe levels of depression. As the time of bereavement varied between cases, it was not appropriate to investigate changes in depression based on the year of the KoWePS. Therefore, we established the immediate post-bereavement time as the first phase to monitor changes in depression following bereavement. From 2012 to 2021, the Cronbach's α for depression ranged from 0.811 to 0.881, thus confirming that there were no issues with its reliability.

2.2.2 Dependent variables

The dependent variable was the presence of suicidal thoughts, as determined by the use of the question, "Have you had thoughts of suicide in the past year?". A response of 0 was used for those without suicidal thoughts, and 1 was used for those with suicidal thoughts.

2.2.3 Control variables

In this study, we set factors that are known to influence suicide in the elderly as control variables, including household income [33], area of residence [34], educational level and cohabitation status [35], and the presence of disability [36]. The control variables in this study were sociodemographic characteristics, including age (a continuous variable), equivalent household income (a continuous variable), education (elementary school or below = 0, middle school or above = 1), place of residence (large city = 0, small/medium city = 1), living alone (not living alone = 0, living alone = 1), and disability status (non-disabled = 0, disabled = 1). The equivalent household income was obtained by dividing the household income by the square root of the number of household members; this was then log-transformed to achieve a normal distribution. With regards to the area of residence, cities were categorized as large cities, while counties were categorized as small and medium-sized cities. Individuals were considered to have a disability if they were registered with city, county or district offices according to Article 29 of the "Disability Welfare Law".

2.3 Statistical analysis

Data were analyzed by SPSS version 27.0 (SPSS Inc., Chicago, IL, USA) and M-plus version 8.0 (Muthén & Muthén, Los Angeles, CA, USA). First, descriptive statistics were acquired to demonstrate sociodemographic characteristics and the characteristics of the main variables for all subjects. Second, to identify the types of depression changes in bereaved older male adults, we conducted Growth Mixture Modeling (GMM); this method relaxes the assumption of a single population, and acknowledges the possibility of subpopulations with distinct characteristics within the entire population [37]. GMM estimates the number of unobserved latent groups from repeatedly measured longitudinal data and identifies different trajectories for each group as well as the factors that explain these trajectories [38]. The number of latent groups in the growth mixture model is determined by analysis based on a single group model (1-class model) consistent with the results of the latent growth curve model. The model increases the number of groups one-by-one until a k-group model (the k-class model) is derived, and then assesses whether a model with k groups is more appropriate than a model with k-1 groups. This assessment is performed using model fit indices (Information Criteria: IC), sample composition ratios for subgroups, and comprehensive considerations of the research questions and theoretical basis. In GMM, the optimal number of change types was determined by *p*-values for the AIC (Akaike's Information Criteria), BIC (Bayesian Information Criteria), SSABIC (Sample-Size Adjusted BIC), Entropy, and BLRT (Bootstrapped Likelihood Ratio Test). For the AIC, BIC and SSABIC, a smaller index value indicates a better fit of the model. In this study, we aimed to select the model exhibiting the smallest AIC, BIC and SSABIC values whenever possible. Entropy represents the clarity of latent group classification; values closer to 1 indicate more accurate classification. The BLRT is a method used to select a better model by considering the likelihood ratio between the k-1 group model and the k group model. If the BLRT value is statistically significant, the null hypothesis supporting the k-1 group is rejected, thus implying that the k group model is more appropriate. Thirdly, Chi-squared analysis and independent sample *t*-tests were conducted to identify differences in sociodemographic characteristics according to the types of depression changes. Finally, we conducted binary logistic regression analysis to confirm the relationship between the types of depression changes and suicidal thoughts in bereaved older male adults.

3. Results

3.1 Descriptive statistics

The sociodemographic characteristics and suicidal thoughts of the study participants are shown in Table 1. With regards to educational background, 257 individuals (70.6%) were educated at elementary school or below, and 107 individuals (29.4%) were educated at middle school or higher. Further analysis showed that 109 individuals (29.9%) lived in large cities, while 255 individuals (70.1%) resided in small and medium-sized cities. In total, 111 individuals (30.5%) were co-habiting, while 253 individuals (69.5%) were living alone. There were 313 individuals (86.0%) without disability and 51 individuals (14.0%) with disability. The mean age was 76.29 $\pm$ 5.95 years (mean $\pm$ SD (Standard Deviation)) and the equalized annual income was 10,604.79 $\pm$ 7844.69 US dollars. Analysis of suicidal thoughts revealed that 327 individuals (89.8%) had not experienced suicidal thoughts, while 37 individuals (10.2%) had, thus indicating that the majority had not experienced suicidal thoughts.

Statistical analysis of the main variable, depression, showed that the mean score of depression in the first year after bereavement was the highest at 1.89 $\pm$ 0.46 points in older adult males who experienced the loss of a spouse; the mean score in the tenth year was the lowest at 1.41 $\pm$ 0.48 points (Table 2). In other words, the depression score was highest immediately after loss and gradually decreased as time passed.

3.2 Classification of depression changes in bereaved older adult males

When applying the Growth Mixture Model, a lower value was preferred for the fit indices (AIC, BIC and SSABIC). For Entropy, a value closer to 1 was preferred. For the BLRT, a p-value < 0.05 indicates a better fit of the model. Upon estimating the growth mixture model to identify the types of depression changes in bereaved older adult males (Table 3), the fitness for each model showed that a two-type model classifying depression into two general forms exhibited the lowest values for AIC, BIC and SSABIC; furthermore, Entropy was closer to 1 when compared to other models with different types of classifications. Furthermore, only the two-type model exhibited a significant p-value in the BLRT. Three

TABLE 1. Sociodemographic characteristics and suicidal thoughts in the study participants (N = 364).

Variable	Categories	N	%
Education			
	Elementary School or below	257	70.6
	Middle School or above	107	29.4
Residential Area			
	Metropolitan Cities	109	29.9
	Small and Medium Cities	255	70.1
Living status			
	Not-living alone	111	30.5
	Living alone	253	69.5
Disability status			
	Non-disabled	313	86.0
	Disabled	51	14.0
Age (M (SD))			76.29 (5.95)
$ Equivalized Household Income (M (SD))			10,604.79 (7844.69)
Suicidal thought presence			
	Have had thoughts	327	89.8
	Have not had thoughts	37	10.2

SD: Standard Deviation.

TABLE 2. Descriptive statistics of depression (N = 364).

Year	N	Min	Max	M	SD
1st year	364	1.00	3.36	1.89	0.46
2nd year	364	1.00	3.91	1.87	0.47
3rd year	364	1.00	3.45	1.78	0.44
4th year	291	1.00	3.18	1.70	0.41
5th year	228	1.00	3.45	1.65	0.46
6th year	178	1.00	3.00	1.61	0.40
7th year	134	1.00	2.45	1.48	0.37
8th year	90	1.00	2.64	1.50	0.42
9th year	44	1.00	2.73	1.50	0.43
10th year	22	1.00	2.55	1.41	0.48

N: Sample size; M: Mean; SD: Standard Deviation.

TABLE 3. Model fit for growth mixture modeling (N = 364).

Class	Model fit					Groups
Class	AIC	BIC	SSABIC	Entropy	BLRT *p*-value	N (%)
1	2446.975	2505.433	2457.844	-	-	-
2	2440.848	2500.997	2453.890	0.910	<0.001	289 (79.4), 75 (20.6)
3	2446.848	2528.688	2462.064	0.829	0.078	291 (79.9), 72 (19.8), 1 (0.3)
4	3778.371	3880.370	3804.189	0.786	0.400	291 (79.9), 66 (18.1), 6 (1.7), 1 (0.3)

AIC: Akaike's Information Criteria; BIC: Bayesian Information Criteria; SSABIC: Sample-Size Adjusted BIC; BLRT: Bootstrapped Likelihood Ratio Test.

and four-type classifications included groups that accounted for less than 1% of the total number of cases; therefore, the two-type classification was used for all further analyses.

The changes in depression experienced by bereaved older adult males were classified into two types which reflected the characteristics of the change in pattern (Table 4 & Fig. 1). Type 1 accounted for 79.4% (n = 289) of the total number of cases analyzed. The initial value of Type 1 depression was 1.572 ($p < 0.001$), and the rate of change was −0.007, indicating a non-significant reduction. Therefore, since Type 1 showed a tendency to maintain depression from the first year to the tenth year, we referred to this as the "Maintenance Type". Type 2 depression accounted for 20.6% (n = 75) of the total number of cases analyzed; its initial value was 2.176 ($p < 0.001$), thus, indicating that the initial level of depression was significantly higher than that of Type 1. Moreover, the rate of change was −0.092 ($p < 0.001$), thus indicating a reduction. Therefore, since Type 2 depression showed a trend for a continuous reduction from the first to the tenth year, we referred to this as the "Decreasing Type".

Next, Chi-squared analysis and the independent sample *t*-test were conducted to investigate the differences in sociodemographic characteristics according to the types of change in depression experienced by bereaved elderly men (Table 5). Analysis showed that there was a significant difference in terms of living alone ($\chi^2 = 11.656$, $p < 0.001$) when compared between the persistent type and the decreasing type of depression changes. In other words, the persistent type was more associated with subjects who lived alone than the decreasing type. The effect size for the Chi-squared test between the types of depression change and living alone using Cramér's V was 0.179, indicating a weak effect. Other variables, such as educational level, place of residence, disability status, age and household income, did not show significant differences when compared between the two types of depression changes.

To investigate the relationship between types of depression changes and suicidal thoughts experienced by bereaved elderly men, we next conducted binomial logistic regression analysis (Table 6). The fitting of the research model was statistically significant ($\chi^2 = 29.783$, $p < 0.001$). When considering control variables, age (Coeficient (Coef.) = 0.097, $p < 0.01$) was identified as a significant determinant of suicidal thoughts. In other words, the probability of having suicidal thoughts increased as age increased. On the other hand, standardized

TABLE 4. Estimated initial values and the rates of change of depression variations by type in elderly men according to marital status.

Type	Number of Cases (%)	Parameter Estimates		Change Type
		Initial Values	Rate of Change	
Type 1	289 (79.4)	1.572***	−0.007	Maintenance
Type 2	75 (20.6)	2.176***	−0.092***	Decreasing

****p < 0.001.*

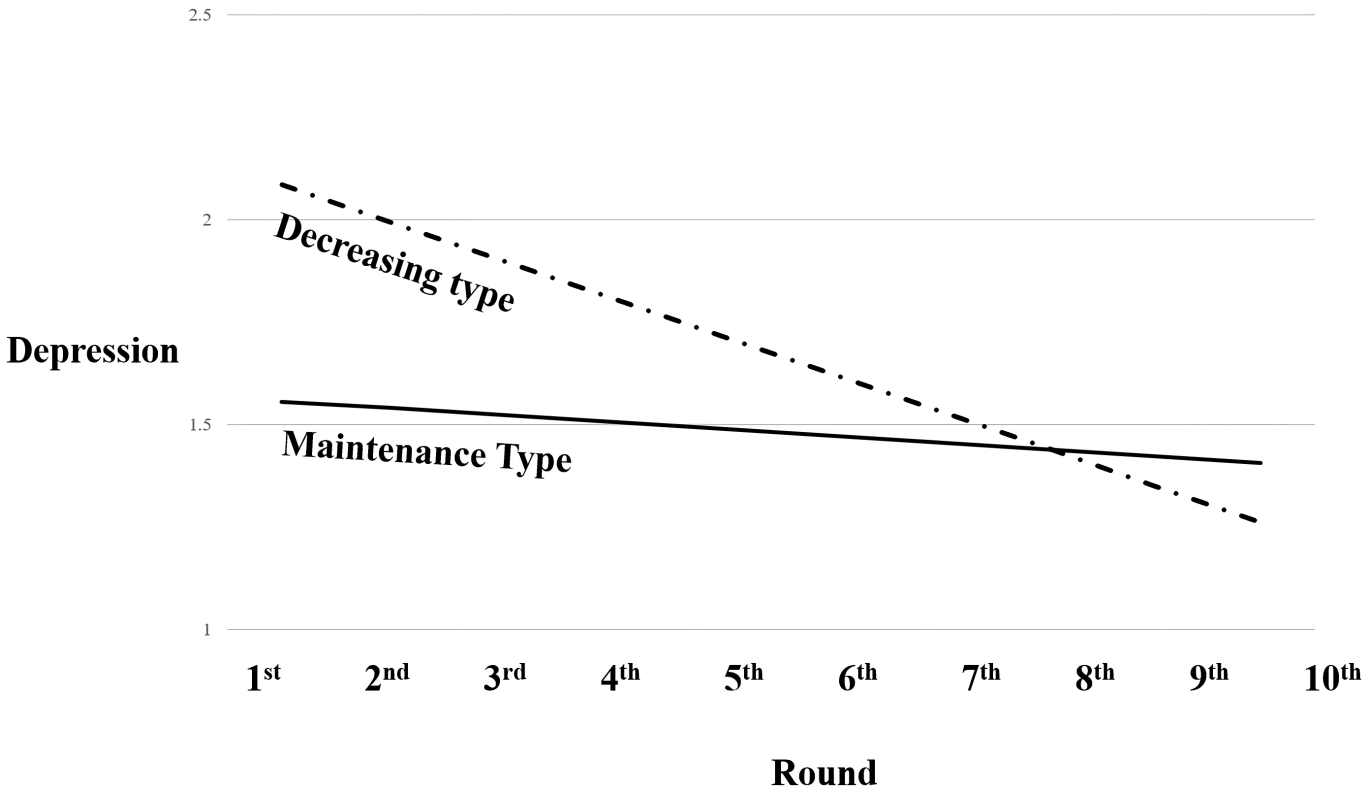

FIGURE 1. Estimation of the types of changes in depression in bereaved elderly men.

TABLE 5. Differences in sociodemographic characteristics according to types of change in depression experienced by elderly men according to marital status.

Variable	Categories	Depression Change Type				
		Maintenance type		Decreasing type		
		N	%	N	%	χ^2/t
Education						
	Elementary School or below	201	69.6	56	74.7	0.751
	Middle School or above	88	30.4	19	25.3	0.751
Residential Area						
	Metropolitan Cities	92	31.8	17	22.7	2.385
	Small and Medium Cities	197	68.2	58	77.3	2.385
Living status						
	Not-living alone	76	26.3	35	46.7	11.656***
	Living alone	213	73.7	40	53.3	11.656***
Disability status						
	Non-disabled	249	86.2	64	85.3	0.034
	Disabled	40	13.8	11	14.7	0.034
Age (M (SD))		76.20 (5.87)		76.65 (6.27)		−0.587
$ Equivalized Household Income (M (SD))		10,777.55 (8193.25)		9944.18 (6333.52)		−0.819

****p < 0.001. SD: Standard Deviation.*

TABLE 6. Relationship between the types of change in depression and suicidal thoughts experienced by widowed elderly men (N = 364).

Variables	Coef.	S.E.	*p*-value	Exp(B)
Age	0.097**	0.032	0.003	1.101
$ Equivalized Household Income (log)	0.067	0.328	0.838	1.070
Education (ref. Elementary School or below)	−0.436	0.455	0.338	0.647
Residential Area (ref. Metropolitan Cities)	−0.719	0.399	0.072	0.487
Living status (ref. Not-living alone)	0.083	0.417	0.841	1.087
Disability status (ref. Disabled)	0.658	0.439	0.134	1.930
Depression change type (ref. Maintenance type)	−1.268*	0.633	0.045	0.281
Constant	−8.283	3.510	0.018	0.000

**p < 0.05, **p < 0.01.*

income, educational level, place of residence, living alone status, and disability status were not significant determinants for suicidal thoughts in bereaved elderly men. The independent variable, type of change in depression (Coef. = −1.268, $p < 0.05$), was identified as a significant determinant of suicidal thoughts. Specifically, Exp(B) was 0.281; thus, if the type of change in depression was decreased when compared to the consistent type, the odds of experiencing suicidal thoughts decreased by 71.9%.

4. Discussion

In this study, we performed longitudinal analysis of the changes in depression in elderly men who have experienced bereavement and explored the impact of the types of changes in depression following bereavement on suicidal thoughts.

The level of depression in bereaved elderly men was highest in the first year following the loss, and showed a tendency to gradually decrease over time. This aligns with the general observation of previous studies which investigated the psychological changes experienced after bereavement and found that the levels of depression were highest immediately after losing a spouse [28].

We also demonstrated that the longitudinal changes in depression experienced by bereaved elderly men were classified into two types: persistent and decreasing. We found that 79.4% of subjects exhibited the persistent type of depression while 20.6% exhibited the decreasing type. The persistent type, where depressive symptoms last for a long period of time, and the decreasing type, which exhibits a reduction in depression over time, both exhibited a pattern that was similar to the chronic grief and resilience described in psychological and emotional studies related to spousal bereavement. These

findings portray a significant psychological change in those experiencing bereavement [29, 30]. However, this differs from a study targeting the entire elderly population in Korea who had experienced bereavement without gender distinction, where the majority, 85.5%, exhibited the decreasing type and 14.5% exhibited the increasing type [31]. In the present study, the majority of the subjects were closer to the persistent type, with a minority corresponding to the decreasing type. This difference indicates that bereaved elderly men experienced unique characteristics.

Upon investigating the relationship between the types of changes in depression and suicidal thoughts in bereaved elderly men, we found that the probability of experiencing suicidal thoughts increased as the age of bereaved elderly men increased, and when the type of change in depression was persistent rather than decreasing. This contrasts with previous studies which suggested that as people age, they adapt better to separations caused by death and experience more post-traumatic growth [32], thus demonstrating that despite the accumulation of experience, bereavement can represent a devastating event in the elderly and can have a negative impact [33]. Generally, it is known that advanced age exerts a significant impact on suicidal thoughts and behaviors [39, 40]. We also identified this relationship in the present study. However, considering that age is not the key factor distinguishing the type of change in depression change experienced by bereaved men, this variable does underscore the importance of early detection in elderly bereaved men who have a higher likelihood of successful suicide attempts. Furthermore, we found that persistent depression influences suicide; this highlights the impact of depression on suicide while emphasizing the need to be vigilant when the depression experienced after bereavement becomes chronic. Indeed, the International Classification of Diseases (ICD-11) has recently included prolonged grief disorder [41]; persistent sorrow is a condition that needs healing in itself. Specifically, if we introduce measures to distinguish prolonged grief and can identify their chronic state of sorrow early on, it would be possible to intervene more quickly in reducing the impact of persistent depression on suicide.

Considering that most bereaved elderly men exhibited the persistent type of depression, which has a greater impact on suicidal thoughts, our data indicates the necessity to focus on the experience of bereavement in men and their depression. A research team led by Yu [34], who tracked the mental health sequelae of elderly men and women who experienced bereavement for 10 years, reported that men are more vulnerable to adaptation after bereavement when compared to women. Studies that focus on gender differences when investigating the impact of bereavement showed that due to the traditional differences in gender roles, men and women may be affected by mental health through different pathways. Elderly men, who have primarily taken on the role of providing for their families, have benefited significantly, both emotionally and instrumentally, from their households. Thus, the likelihood that they experience a relatively significant loss during the bereavement of a spouse increases. Not only might they show higher levels of depression, there is also the potential for a cascade of other issues, such as a deterioration in physical health [42].

These findings challenge the prejudice that the elderly can adapt better to the death of a spouse when compared to younger individuals. In the present study, we found that elderly men who had lost their spouses harbored more suicidal thoughts as they aged. Moreover, those exhibiting the persistent type of depression change had more suicidal thoughts when compared to those who exhibited the decreasing type of depression. Considering that 80% of bereaved elderly men experienced the persistent type of depression, it is necessary to pay attention to their psychological and emotional vulnerability to prevent chronic grief disorder and other deadly outcomes, such as suicide. Health and welfare practitioners need to increase awareness to respond sensitively to the mental health issues of widowers, particularly when considering the higher rate of living alone in the persistent type when compared to the decreasing type. Thus, prioritized intervention is needed for elderly men living alone after losing their spouse. These individuals face several negative physical and mental impacts, role burdens, difficulties in family relationships, and loneliness following bereavement, often enduring these challenges alone to maintain their masculinity, without seeking help, thus amplifying secondary problems. In Asian countries, where the culture of adult children taking care and providing for their elderly parents under the banner of filial piety is prevalent, discussions on societal interventions for elderly individuals living alone have been increasing as this culture gradually fades. However, it is not that the roles of existing family members are not important. Even if adult children cannot frequently visit their bereaved parents due to spatiotemporal constraints, the frequency of communication (through phone calls, video chats and messages) has been shown to exert a positive effect in reducing the depression of bereaved elderly [43].

Nakagomi *et al.* [44] investigated whether non-familial, individual-level social capital could alleviate depression in bereaved elderly individuals, thus revealing that informal social activities and community participation exerted a greater positive effect on bereaved men living alone. These authors argued that strong support systems that foster new friendships in environments such as sports or hobby groups are becoming increasingly necessary, and particularly benefit men with low levels of social capital. Won Hye-jin and Song Shin-ae [42] approached this topic from the perspective of traditional gender roles and found that social activities were more effective in alleviating depression in men in the context of spousal bereavement. This is because men, who return to their homes after retirement, are likely to find it challenging to form relationships with those around them. The absence of a female spouse, who was traditionally responsible for forming emotional relationships, can potentially lead to emotional and social isolation for men. This underscores the significant effect that interactions with others through social activities can have.

However, for such initiatives to be effective, it is imperative that bereaved elderly recognize their psychological and emotional problems and actively seek to build new relationships outside of their homes. Regrettably, it has been confirmed by previous research that men have a lower awareness of their own level of depression [36]. Moreover, their sorrow might not be openly expressed but instead may manifest somatically or,

especially in the elderly, overlap with other physical ailments; this makes it incredibly challenging to accurately diagnose conditions such as depression. This makes predicting mental disorders and suicidal tendencies far from straightforward. Consequently, when approaching elderly men who have experienced the loss of a spouse, we should utilize a variety of validated scales; in addition, there is a clear need for further studies to investigate the application of these scales.

Furthermore, this approach should involve specialized healthcare and social work that prioritize reaching out to these individuals, through mobile services for the elderly or hospital medical social welfare systems linking bereaved individuals to community support service centers. For instance, peer-based interventions, where volunteers from similar age groups visit and engage in phone conversations, offer emotional support, problem-solving assistance, and community resource sharing, have proven effective in combating the symptoms of depression and enhancing life satisfaction, especially among the bereaved elderly. In Spain, the program "Paths: from loneliness to participation" was initiated to alleviate loneliness among the elderly. Spearheaded by social workers and nurses at primary healthcare and social welfare centers, this program encourages peer support and community resource engagement; this strategy has reported varying levels of success. Such endeavors emphasize the need for proactive and comprehensive strategies in the health and welfare sectors.

This study had several limitations that need to be considered. Firstly, the Korean Welfare Panel Survey used in this study featured a relatively larger sampling of the low-income bracket when compared to other surveys; this could have generated biased results. In addition, other health factors can influence suicidal thoughts, but due to the limitations of secondary data, we were unable to include an appropriate set of control variables. Another limitation is that the findings of this study cannot be generalized to elderly males in other countries since analysis solely involved elderly male individuals in South Korea. Future research should include more universal data and a wider range of control variables; this may provide more accurate results.

5. Conclusions

In this study, we delineated critical insights into the fluctuating patterns of depression observed in elderly males who had lost their spouse. Our data, drawn from the analysis of 364 individuals aged 65 years and above who participated in the Korea Welfare Panel Study (KoWePS) from 2012 to 2021, highlights a significant transition in depressive states over time. These transitions clustered into two main groups: those maintaining a steady level of depression (comprising 79.4% of all cases) and those where the level of depression reduced progressively (accounting for 20.6% of all cases). The living conditions of subjects exerted significant influence on these patterns. We found that subjects who lived alone were more prone to consistent levels of depression when compared to their counterparts. Moreover, the onset of suicidal thoughts was more prominent in the group exhibiting a continuous state of depression. In light of these findings, it is paramount that we devise welfare policies and interventions that specifically target this vulnerable group in society. Our research underscores the urgent need for targeted mental health programs and support systems that particularly focus on elderly individuals residing alone. These strategies will help to mitigate the sustained levels of depression and reduce the risk of suicidal ideations. Thus, fostering an environment that ensures mental well-being and stability during the latter part of life is an essential societal obligation. The findings of this study provide a key foundation towards understanding and addressing the complex interplay of bereavement, depression and suicide risk in the elderly population, and highlights the need for continued research and strategic policymaking in this domain.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

KHJ and SHK—designed and conducted the research study. KHJ and BKK—collected and analyzed the data. KHJ, SHK and HJC—interpreted the data. KHJ, SHK, HJC and DYK—a drafted the manuscript. KHJ and HJC—revised the manuscript's content. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of Semyung University in Korea (SMU-EX-2023-09-003). Informed consent was obtained from all participants. Furthermore, the Korea Welfare Panel Study (KoWePS) receives approval from the Institutional Review Board (IRB) every year before starting its survey (https://www.koweps.re.kr:442/notice/common/view.do).

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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How to cite this article: Kyuhyoung Jeong, Sunghee Kim, Bokyung Kim, Heeran J. Cho, Daeyeon Jeong. Changes in depression and suicidal thoughts in bereaved older men: insights from a Korean study. Journal of Men's Health. 2024; 20(4): 112-120. doi: 10.22514/jomh.2024.059.