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4   **Title Page**

5   **Title: Association between social support and frailty among older people with depressive disorders**

6   **Running title:** Social support and frailty in older people with depression

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30   **Title: Association between social support and frailty among older people with depressive disorders**

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32

33   **Abstract**

34   **Objectives**: This study aimed at examining the association between social support and frailty status, specifically

35   amongst older people with depressive disorders.

36   **Methods:** It was conducted in older people, aged 65 and over, with depressive disorders at the Psychiatry

37   Outpatient Unit of Songklanagarind Hospital, Thailand. The main independent variable, level of social support,

38   was assessed using the Inventory of Social Support Behaviours (ISSB) – Thai. The main dependent variable,

39   frailty status, was assessed via the adapted Fried Frailty Phenotype. Bivariate and ordinal regression analyses were

40   conducted to examine the relationships between variables.

41   **Results:** In our study sample, 32% of the 147 participants were considered frail, 51% pre-frail, and 17% robust.

42   From the ordinal regression analysis, four variables—social support score, current depressive symptoms, level of

43   education, and key family caregivers—were statistically significantly associated with frailty status. The odds of

44   having pre-frailty and frailty were statistically significantly reduced by a factor of 0.99, or around 1.0 percent, for

45   each 1-point increment of the social support scale (Ordinal OR 0.99, 95% CI = 0.97-0.99, p-value = 0.015).

46   **Conclusions:** Social support interventions should be designed to influence multiple items of the social support

47   scale at the same time, which might, therefore, have a substantial effect on frailty status among the older

48   population.

49   **Clinical implications:** We recommend a regular practice that focuses not only on biological (i.e., prescribing

50   medications) and psychological aspects (i.e., providing psychotherapy) but also on the social dimension of older

51   people living with frailty and depressive disorders.

52   **Key words:** aged; caregivers; depression; family; frailty; social support.

1. Introduction

In today's aging global society, older people tend to live longer, yet they may spend the majority of their twilight years with declining physical and mental function (Divo, Martinez, & Mannino, 2014). Frailty is a condition related to the ageing process. It is defined as a decrease in one's physiological capacity to respond sufficiently to external stressors; thus, it is associated with an increased risk of negative health outcomes such as falls, disability, hospitalization, institutionalization, and death (Fried et al., 2001; Wang et al., 2019). In previous studies, frailty has been reported to affect 10.7 percent of people aged over 65 years, while 41.6 percent of this population group could be considered in a pre-frailty condition (Collard, Boter, Schoevers, & Oude Voshaar, 2012). The prevalence of frailty is even higher (26.1 percent) in people aged over 85 years. Nonetheless, the degree of frailty in an individual is not constant and generally changes over time. That is, it can be improved, remain stable, or worsen (Kojima, Taniguchi, Iliffe, Jivraj, & Walters, 2019). Previous studies have suggested that frailty might be reversible with the implementation of exercise programs or hormone treatment (Apostolo et al., 2018; Tarazona-Santabalbina et al., 2016). The traditional concepts of frailty have focused mainly on physical aspects. However, the psychological, social and spiritual aspects of frailty are increasingly being emphasized (Clegg, Young, Iliffe, Rikkert, & Rockwood, 2013; Sieber, 2017). This indicates the possibility of employing interventions targeting other aspects of frailty beside the physical ones.

Furthermore, approximately 10-25 percent of older people suffer from depression (Anantapong, Pitanupong, & Werachattawan, 2017; Anantapong, Pitanupong, Werachattawan, & Aunjitsakul, 2017; Forlani et al., 2014). Depression has been found in concurrence with frailty in more than 10 percent of older people (Vaughan, Corbin, & Goveas, 2015). Indeed, older people with depressive disorders are at risk to develop frailty and, subsequently, other worse health outcomes (Vaughan et al., 2015). It has been established that the lack of social support associates with increasing depressive symptoms and poorer physical health (Taylor & Lynch, 2004). Some social support interventions could, in fact, reduce depressive symptoms (Pfeiffer, Heisler, Piette, Rogers, & Valenstein, 2011). Social support, therefore, may also be able to prevent or delay frailty among older people with depressive disorders.

Additionally, there is limited information on frailty and its characteristics among older populations in Asian countries, especially regarding psychosocial aspects, which might vastly differ from those in Western societies (Dent et al., 2017). Research on the association between social support and frailty among older people with depressive disorders is also scarce. Therefore, we aimed to explore the association between social support and frailty among older people with depressive disorders, especially in the Asian context.

2. Methods

2.1 Participants

One hundred and forty-seven older people with depressive disorders participated in this study. All of them were outpatients at the Psychiatric Outpatient Clinic of Songklanagarind Hospital, a tertiary, university hospital in the South of Thailand. The data collection was conducted from August, 2017 to April, 2018.

2.2 Procedure and study design

89   A cross-sectional, quantitative research approach with a pre-designed questionnaire was used in this study. A
90   simple random sampling strategy was employed on a list obtained from the medical registry system containing all
91   patients aged 65 years and over, who were diagnosed with and followed up for depressive disorders according to
92   the International Statistical Classification of Diseases and Related Health Problems (ICD)-10; the disorders
93   included the major depressive disorder, dysthymia, and mixed anxiety and depressive disorder. At their regular
94   appointment, those who visited the Psychiatric Outpatient Clinic were assessed for eligibility and invited to
95   participate in the study. Patients aged 65 and over, diagnosed with a depressive disorder, and able to communicate
96   in Thai were included in the study. The exclusion criteria were: previous diagnosis of dementia, Parkinson's
97   disease, or stroke; previous record of having a Mental Status Examination (TMSE) score lower than 18; patients
98   with terminal illness; inability to walk during data collection; incompetent person with stroke; and unwillingness
99   to participate.

100   *2.3 Measures*

101   *2.3.1 Frailty*

102   The main dependent variable in this study was frailty status. Currently, there is no gold standard for diagnosing
103   frailty. The Fried Frailty Phenotype was adopted in this study. According to this idea, frailty is composed of
104   physiological syndromes, which are measured by an individual's current biological status and performances (Fried
105   et al., 2001). This concept chiefly focuses on the physical dimension of frailty (Clegg et al., 2013) and might be
106   used to test the interconnectedness of bio-psychosocial-spiritual dimensions of frailty and social support.

107   The Fried Frailty Phenotype scale is an ordinal variable. The presence of three or more of the following five
108   characteristics would be classified as having frailty; one or two of them would indicate having pre-frailty; and the
109   presence of none of the characteristics would mean the person is robust (Table 1). The adapted measurements for
110   this study were reviewed by experts in the field of Geriatrics and Rehabilitation to ensure the face validity of the
111   questionnaire.

112   **<insert Table 1>**

113   *2.3.2 Social Support*

114   Social support is generally described as the existence or availability of people whom we can rely on, and who let
115   us know that they care about, value, and love us. According to previous studies, conceptually, social support
116   should include one or more of the following components: emotional support, integration, tangible (instrumental)
117   help, and information support (Krause & Markides, 1990). The Inventory of Social Support Behaviours - Thai
118   version (ISSB – Thai, modified version) was adopted to assess the level of social support the participants
119   experienced. This is a 35-item questionnaire. The dimensions of social support were assigned to three subscales:
120   informational (guidance), emotional, and tangible support. The response for each item ranged from 1 (never
121   received) to 5 (received about everyday), with a total possible score ranging from 35 to 175. A higher score
122   indicates greater support. The reliability of the ISSB - Thai version is 0.94 (Nirattharadon, Phancharoenworakul,
123   Gennaro, Vorapongsathorn, & Sitthimongkol, 2005).

124   *2.4 Covariates*

125   The covariates of interest in this study were socio-demographic variables (age, sex, income), most recent diagnosis

126   of depressive disorders (according to the ICD-10, recorded by an attending psychiatrist and retrieved from a

127   computerized medical registry), physical comorbidities (a self-report of having any comorbidities other than

128   mental health disorders—for example, hypertension, diabetes mellitus, cardiovascular disease), and

129   polypharmacy (a self-report of taking five or more medications at the time). All participants were assessed for

130   their cognitive function using TMSE (cut-off <23, currently having cognitive impairment) (Train The Brain

131   Forum Committee, 1993), and depressive symptoms using the Thai Geriatric Depression Scale (TGDS) (cut-off

132   >5, currently having depression) (Wongpakaran & Wongpakaran, 2012; Wongpakaran, Wongpakaran, &

133   Reekum, 2013).

134   *2.5 Ethical considerations*

135   All procedures involving human subjects were approved by the Human Research Ethics Committee (HREC),

136   Faculty of Medicine, Prince of Songkla University (reference number: REC-60-196-03-1) and complied with the

137   1964 Helsinki declaration and its later amendments or comparable ethical standards. All the data collection was

138   conducted by the researchers and trained research assistants. All information was kept confidential and in a secure

139   place. Before collecting the data, the eligible participants were informed about the objectives and procedures of

140   the study and asked to sign the written informed consent form by themselves.

141   *2.6 Data analysis*

142   This study used the R software for data analysis (R Development Core Team, 2012). The demographic data were

143   presented descriptively—proportion or percentage for categorical data, and mean and standard deviation for

144   continuous data. A bivariate analysis was conducted to find potential candidates for the subsequent multivariate

145   analysis (p-value <0.2). The main dependent variable was frailty status, which was an ordinal variable. Thus, an

146   ordinal logistic regression using a backward stepwise method, with a p-value for inclusion of 0.05, was performed

147   to explore the association between social support, the covariates, and frailty status. The ordinal logistic regression

148   is a constrained regression model, in which the coefficients (log of odds ratios) are constrained to be monotonous

149   (Espinosa & Hennig, 2018). The coefficients of all independent variables are shared by two cut-points of the

150   dependent variable (Virasakdi, 2012)—in this case, prefrailty and frailty. In other words, with robust as a reference

151   group, at the first cut-point, the coefficient of having prefrailty is similar to having frailty at the second cut-point

152   of the dependent variable. The ordinal logistic model was chosen as the scale of frailty status was somewhat

153   arbitrary and subjective. The level of significance of 0.05 was used in this study.

154   **3. Results**

155   One hundred and forty-seven participants were enrolled in this investigation. As shown in Table 2, almost three

156   quarters were diagnosed with major depressive disorders (F32 and F33) according to ICD-10. The attending

157   psychiatrists recorded the codes of the participants' diagnosis into the computerized medical registry. The records

158   were sometimes inconsistent and not regularly updated to reflect the patients' current clinical condition. As shown

159   in Table 3, of the 147 participants, 60 (40.8 percent) had current depression (TGDS >5), and 29 participants (19.7

160   percent) had cognitive impairment (TMSE <23). Half of the older people with depressive disorders in this study

161   had pre-frailty, and one-third of them had frailty. The proportion of female participants with frailty was higher

162   than that of their male counterparts, yet the male group had a higher proportion of pre-frailty. Nearly half of the

163   participants had attained a primary-school educational level or less. The participants were mainly taken care of

164   by their daughter, spouse, or partner. Only the participants cared for by their sons had a higher proportion of

165   having frailty compared to the participants receiving care from other caregivers; among the latter, pre-frailty was

166   predominant. Eighty percent of the participants relied on the Civil Servant Benefit Scheme for their medical

167   expenses, either due to their own employment or as beneficiaries of their adult children. One-third of them

168   regularly used at least one platform of social media. Over 80 percent of the participants had at least one

169   comorbidity. Polypharmacy (5 medications or more) was found in over half of the participants.

170   **<insert Table 2>**

171   **<insert Table 3>**

172   A bivariate analysis was performed to explore the association between frailty status and potential associated

173   variables to be included in the ordinal logistic regression analysis at a later stage. As shown in Table 4, we found

174   a statistically significant association between the frailty status of older people with depressive disorders and

175   current depressive symptoms (TGDS, cut-off >5), cognitive score (TMSE, cut-off <23), level of education, key

176   family caregiver, social media use, and polypharmacy (p-value <0.05).

177   **<insert Table 4>**

178   Eight independent variables from the bivariate analysis were included in the ordinal logistic regression study (p-

179   value <0.2, including age and sex). Although, according to the bivariate analysis, the cognitive score (TMSE) of

180   the sample was associated significantly with frailty, there was a value of zero for the cognitive scores in one

181   subgroup (robust group). It, therefore, could not be included in the ordinal regression analysis. The backward

182   stepwise regression analysis was performed, and only 4 independent variables remained in the final model—social

183   support score (ISSB Thai version), current depressive symptoms, level of education, and key family caregiver

184   (Table 5).

185   **<insert Table 5>**

186   When taking 'being robust' as the reference group, the odds of having pre-frailty were statistically significantly

187   reduced by a factor of 0.99, or around 1.0 percent, for each 1-point increment of the social support scale; the same

188   was true for having frailty. Higher levels of education were also negatively associated with having pre-frailty and

189   frailty. In contrast, the odds of having pre-frailty and frailty were increased by a factor of 3.32 if the participant

190   was suffering from depression (current depression, TGDS >5). Compared to living on one's own, older people

191   living with their spouse, partner, or other family members had higher odds of having pre-frailty and frailty.

192   **4. Discussion**

193   To the best knowledge of the researchers, this is the first study examining the association of social support with

194   frailty, specifically among older people with depressive disorders. One-third of the older people with depressive

195   disorders in this study had frailty, which is a high proportion compared to that of the general population reported

196   in previous studies (Collard et al., 2012; Fried et al., 2001). The bi-directional causality between frailty and

197   depression would be a plausible reason for this (Soysal et al., 2017). The prevalence of pre-frailty was even higher.

198 More than half of the participants had pre-frailty, which can be detected early. Moreover, certain interventions
199 can help prevent the progression to frailty. A recent study reported that around 18 percent of elderly participants
200 with pre-frailty developed frailty over a 3.9-year period (Kojima et al., 2019). Indeed, the transition to frailty
201 status among older people has been shown to associate with depressive symptoms (Chang et al., 2019).

202 We found that the level of social support was associated with frailty status in older people with depressive
203 disorders. According to previous studies, social support could predict future physical frailty among older people
204 in general (Ding, Kuha, & Murphy, 2017). Interventions that include social support to prevent frailty in older
205 people have been shown to reduce the risk of depression (Monteserin et al., 2010); however, more evidence on
206 this is required (Apostolo et al., 2018; Dedeyne, Deschodt, Verschueren, Tournoy, & Gielen, 2017). Evidence
207 regarding the role of social support interventions in preventing frailty, especially among older people with
208 depression, is surprisingly scant. According to this study's findings, an increase in social support was statistically
209 significantly associated with a decrease in the odds of having pre-frailty and frailty in older people with depressive
210 disorders. From the current study, this association should be interpreted with caution in terms of its clinical
211 usefulness as the strength of the association was very weak (odds ratio = 0.99). However, we acknowledge that
212 the odds ratio in this study was indicative of an association between an increase in each point of the social support
213 scale and frailty status. In other words, we found that a one-point increase in the social support scale (range from
214 35 to 175) was associated with a one-percent decrease in the odds of having prefrailty and frailty. In reality, a
215 single social support intervention is likely to target multiple domains of social support (Dam, de Vugt,
216 Klinkenberg, Verhey, & van Boxtel, 2016), which might, therefore, influence many items of the social support
217 scale at the same time. Regarding the social support scale used in this study, any intervention promoting the
218 informational, emotional, and tangible support provided with considerable frequency could have a significant and
219 substantial effect on frailty status among older people with depressive disorders. The association between the level
220 of social support and frailty, however, can be bi-directional. The interventions aimed to prevent or delay frailty in
221 older people could also improve their social function, although evidence about this remains inconclusive (Dedeyne
222 et al., 2017; Tarazona-Santabalbina et al., 2016).

223 Social support interventions could vary and be mapped into different schemes of classification (Hogan, Linden,
224 & Najarian, 2002). It could be an intervention involving either a group or an individual. A direct provision of
225 social support, i.e., informational, emotional, and tangible support, can be a mode of delivery. Meanwhile, social-
226 skill training, which can enable older people to obtain social support by themselves, can be another approach.
227 These interventions can be provided by family members, friends, peers, as well as professional teams. The design
228 of the interventions would rely on available resources, healthcare systems, and social and cultural norms (Chao,
229 2012; Hogan et al., 2002). Frailty has been shown to be improved and even be reversed by some social support
230 interventions (Apostolo et al., 2018; Liu, Ng, Seah, Munro, & Wee, 2019). The provision of appropriate social
231 support could help frail older people gain access to healthcare professionals and services, which would, in turn,
232 protect them against deteriorating conditions (Bindels et al., 2015). However, in some previous studies, the
233 interventions employed to provide social support failed to show enough evidence regarding the advantages of
234 social support in preventing or reversing frailty (Apostolo et al., 2018; Metzelthin et al., 2013). Perhaps a large
235 variation among these studies in the components of each social support intervention, measurement of frailty and

236   social support, study design, as well as social and cultural expectations towards such interventions could explain
237   the inconsistencies of the findings.

238   Overall, the demographic characteristics among the participants in this study's three groups were similar, with the
239   exception of educational level attainment. Unexpectedly, sex and age were not significantly associated with pre-
240   frailty and frailty. In the general population, the prevalence of frailty increases with age and is more common
241   among women than men (Clegg et al., 2013; Collard et al., 2012). It could be assumed that this study's participants
242   across the three groups of frailty status were pretty similar regarding their unmodifiable demographic
243   characteristics—sex and age—and the admission bias might not have been associated with frailty status. Our
244   findings were consistent with existing evidence suggesting that higher educational levels are negatively related to
245   having pre-frailty and frailty (Dury et al., 2017); nevertheless, this was not apparent in a dose-dependent fashion.

246   Compared to living on one's own, we found that being dependent on other people, either a spouse/partner or other
247   family members/friends, was associated with having pre-frailty and frailty. However, due to time constraints and
248   this being a sensitive topic, we did not explore whether living on one's own was actually due to the individual's
249   ability to live independently or having no one to rely on despite one's poor health status. Therefore, this finding
250   should be interpreted with caution. In previous studies, a smaller social network size, together with loneliness,
251   was associated with an increased risk for frailty and depression (Gale, Westbury, & Cooper, 2018; Makizako et
252   al., 2018). In addition, generally, people with frailty can live independently long before their condition progresses
253   and eventually leads to the loss of their independence (Rockwood et al., 2005). Since, in this study, living on one's
254   own was associated with having less pre-frailty and frailty, we would interpret this finding as the likely ability of
255   the individuals to still live on their own and/or them either not being frail yet or being less frail, which was not a
256   surprise to us.

257   In accordance with the well-established fact of the extreme rarity of formal, institutional, long-term care provided
258   to this demographic group in Thailand, we found that the majority of the dependent older people in this study
259   relied on their spouse and/or children as their key family caregiver. In fact, filial duty is a long-valued norm in
260   Asian societies that still shapes the parent-child relationship patterns as well as the living arrangements of older
261   people (Chan, 2010; Knodel & Chayovan, 2009; Ugargol & Bailey, 2018). Informal caregivers like family
262   members and relatives, thus, remain a primary source of social care for older people with functional limitations
263   in Asia (Chan, 2010; Jang, Avendano, & Kawachi, 2012). Although having a strong family network appears to
264   be a strength of Asian societies, the availability of such informal caregivers is becoming increasingly jeopardized
265   by the growth of the ageing population, the women's participation in the workforce, and modernization of
266   lifestyles in general (Jang et al., 2012; Knodel & Chayovan, 2009; Ugargol & Bailey, 2018).

267   Additionally, compared to Western developed countries, the populations of many Asian countries are aging more
268   rapidly (He, Goodkind, & Kowal, 2016). These countries, which include Thailand, might not be ready in terms of
269   the availability of professional caregivers, financial support, and formal long-term care facilities. This can become
270   a serious problem in the near future. Nonetheless, in many Western countries, there is currently a major shift from
271   an institution- to a home- and community-based model of long-term care (Lehnert, Gunther, Hajek, Riedel-Heller,
272   & Konig, 2018; Stuart & Weinrich, 2001). This aims to promote the ability of older people to live at home as long
273   as possible, which has been found to be beneficial to their quality of life. Concerning the traditional Asian strong

274 family networks and the community-based care model often employed, the health and social care policies for frail
275 older people in Asia should, therefore, aim to establish a stronger formal social-care network to support the
276 existing family networks and enable frail older people to live at home with a good standard of care. These could
277 be achieved, for example, via the availability of home-care services, professional caregivers, teleconsultations,
278 and day-care facilities. Furthermore, based on the bivariate analysis results, the significant association of using
279 social media with lower levels of frailty might suggest a potential benefit of this technology in enabling social
280 support and enlarging the social network for older people at risk.

281 Notwithstanding that all participants were diagnosed with depressive disorders, only 40.8 percent of them had
282 depression at the time of data collection. This finding was consistent with those of previous studies, which have
283 suggested that depressive symptoms increase the risk of frailty and vice versa (Soysal et al., 2017). We
284 intentionally chose TGDS to assess depressive symptoms in order to be specific to the older population and avoid
285 overlapping with the CEDS items in the Fried Frailty Phenotype. However, frailty and depression are sometimes
286 difficult to distinguish absolutely as they share some conceptual components and phenomena (Vaughan et al.,
287 2015). Hence, this association might need to be interpreted with caution. Similarly, based on the bivariate analysis,
288 cognitive impairment (TMSE lower than 23) was associated with pre-frailty and frailty, which also aligned with
289 the findings of previous studies (Ding et al., 2017). Unfortunately, the ordinal logistic regression analysis could
290 not be performed as there was no one in the robust group with cognitive impairment. These results, however, can
291 highlight the importance of mental and psychological assessment in determining frailty status/stage, and they
292 further support the multidimensional model of frailty (Anantapong & Tinker, 2019; Sieber, 2017).

293 *4.1 Limitations and conclusion*

294 As this study employed a cross-sectional design, no causal relationships or conclusions could be drawn. However,
295 the exploratory approach can ground future research to further examine any emerged findings from this study,
296 both quantitatively and qualitatively. In fact, this research involved a quantitative study using a lengthy
297 questionnaire, so some contextual but relevant information had to be omitted. This could be rectified by a
298 qualitative approach, especially about contextual information on social support and its impact on psychosocial
299 and spiritual wellbeing. The study was conducted only in older people with depressive disorders; future studies
300 can benefit from the same analysis in older people in general or with other mental disorders. It might also be
301 interesting to conduct a follow-up study to determine whether treatments for depression could reduce frailty or
302 influence the associations between social support and frailty. Additionally, despite their importance, both the size
303 and source of social support might not have been explored extensively in this study. At the time of the study
304 design, we emphasized heavily the functionality aspect of social support as we thought it would contribute to a
305 conceptual explanation of how social support works in modulating the frailty status regarding each type of support
306 —informational, emotional, and tangible. However, we acknowledge that our sample size was too small to do so.

307 In conclusion, the prevalence of pre-frailty and frailty in the older people with depressive disorders participating
308 in this study was considerably high. This requires an active and specific management for this population. An
309 increase in each social support score was negatively associated with the odds of having pre-frailty and frailty,
310 which indicated that social support could be a protective factor. Its scope encompassed informational, emotional
311 and tangible social support. Interventions promoting these aspects of social support in older people with depressive

312 and/or other mental health disorders should be developed and studied further. The identified associations in this
313 research can be candidates for future studies and indicators for prioritizing populations in need.

314

315 **Clinical implications**

316 • High prevalence of pre-frailty and frailty among older people with depression should draw the
317 attention of mental health professionals to the assessment and management of frailty.
318 • Social support interventions should be designed and provided to promote multiple domains of social
319 support.
320 • We recommend a regular practice that focuses not only on biological (i.e., prescribing medications)
321 and psychological aspects (i.e., providing psychotherapy) but also on the social dimension of older
322 people living with frailty and depressive disorders.

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489 **All tables**

490 **Table 1** Fried Frailty Phenotype (Fried et al., 2001) and its adapted measurements used in this study

Characteristics	Measurements (adapted for this study)
Unintentional weight loss	Self-reported (more than 5 percent over the past year)
Self-reported exhaustion	Two items from CES–D scale-Thai
Weakness	Grip strength using dynamometer (gender-specific cut-off)
Slow walking speed	15-feet distance (gender-specific cut-off at a medium height)
Low physical activity	Global Physical Activity Questionnaire (GPAQ) version 2-Thai

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493 **Table 2** Diagnosis of participants' depressive disorders according to ICD-10 (N=147)

ICD-code	Diagnosis	No. (%)
F32	Depressive episode	74 (50.4)
F33	Recurrent depressive disorder	34 (23.1)
F34.1	Dysthymia	22 (15.0)
F41.2	Mixed anxiety and depressive disorder	13 (8.8)
F43.2	Adjustment disorder with depressed mood	4 (2.7)

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512 **Table 3** Demographic characteristics of older people with depressive disorders (N = 147)

Characteristics	Robust No. (row %)	Pre-frail No. (row %)	Frail No. (row %)	Total No. (%)
Number of participants	25 (17.0)	75 (51.0)	47 (32.0)	147 (100)
Sex				
Male	6 (14.6)	26 (63.4)	9 (22.0)	41 (100)
Female	19 (17.9)	49 (46.2)	38 (35.8)	106 (100)
Age (years), mean ±SD	69.5 ±3.4	71.7 ±5.4	72.7 ±6.3	71.6 ±5.5
(min, max)	(65, 79)	(65, 88)	(65, 93)	(65, 93)
Current depression				
No (TGDS ≤ 5)	22 (25.3)	47 (54.0)	18 (20.7)	87 (100)
Yes (TGDS > 5)	3 (5.0)	28 (46.7)	29 (48.3)	60 (100)
Cognitive impairment				
No (TMSE ≥ 23)	25 (21.2)	62 (52.5)	31 (26.3)	118 (100)
Yes (TMSE < 23)	0 (0.0)	13 (44.8)	16 (55.2)	29 (100)
Level of education				
No formal education	0 (0.0)	3 (50.0)	3 (50.0)	6 (100)
Primary school	5 (7.5)	34 (50.7)	28 (41.8)	67 (100)
High school	7 (25.0)	14 (50.0)	7 (25.0)	28 (100)
Associate's diploma	3 (30.0)	4 (40.0)	3 (30.0)	10 (100)
Bachelor's degree or higher	10 (27.8)	20 (55.6)	6 (16.7)	36 (100)
Marital status				
Single	1 (16.7)	4 (66.7)	1 (16.7)	6 (100)
Married/partner	17 (18.3)	47 (50.5)	29 (31.2)	93 (100)
Divorced/separated	2 (15.4)	6 (46.2)	5 (38.5)	13 (100)
Widowed	5 (14.3)	18 (51.4)	12 (34.3)	35 (100)
Key family caregiver				
Living on one's own	8 (34.8)	10 (43.5)	5 (21.7)	23 (100)
Spouse/partner	8 (18.2)	27 (61.4)	9 (20.5)	44 (100)
Son	3 (10.3)	11 (37.9)	15 (51.7)	29 (100)
Daughter	6 (13.3)	23 (51.1)	16 (35.6)	45 (100)
Sibling	0 (0.0)	2 (50.0)	2 (50.0)	4 (100)
Grandchild	0 (0.0)	1 (100)	0 (0.0)	1 (100)
Other	0 (0.0)	1 (100)	0 (0.0)	1 (100)
Religion				
Buddhism	25 (18.5)	67 (49.6)	43 (31.9)	135 (100)
Islam	0 (0.0)	8 (66.7)	4 (33.3)	12 (100)
Healthcare insurance				

Civil Servant Benefit Scheme	20 (17.1)	65 (55.6)	32 (27.4)	117 (100)
Thai Universal Health Coverage Scheme	1 (10.0)	4 (40.0)	5 (50.0)	10 (100)
Self-provided insurance	4 (22.2)	4 (22.2)	10 (55.6)	18 (100)
Disability benefit	0 (0.0)	2 (100)	0 (0.0)	2 (100)

Monthly income (Thai Baht)			
Individual, mean $\pm$SD (min, max)	14210 $\pm$15574.4 (0, 60000)	11240 $\pm$11080.6 (0, 53000)	8375 $\pm$8105.6 (600, 30000)	10845.9 $\pm$11276.9 (0, 60000)
Family, mean $\pm$SD (min, max)	32190 $\pm$26811.3 (0, 100000)	33530 $\pm$90638.9 (600, 791000)	25950 $\pm$32175.9 (600, 200000)	30908.9 $\pm$68151.4 (0, 791000)

Social media use			
Yes	12 (27.3)	25 (56.8)	7 (15.9)	44 (100)
No	13 (12.6)	50 (48.5)	40 (38.8)	103 (100)

Type of social media			
Facebook TM	0 (0.0)	1 (100)	0 (0.0)	1 (100)
Facebook Messenger TM	0 (0.0)	0 (0.0)	1 (100)	1 (100)
Line TM	12 (28.6)	24 (57.1)	6 (14.3)	42 (100)

Comorbidity			
Yes	23 (18.5)	62 (50.0)	39 (31.5)	124 (100)
No	2 (8.7)	13 (56.5)	8 (34.8)	23 (100)

Polypharmacy (5 or more prescribed medications)			
Yes	12 (14.8)	36 (44.4)	33 (40.7)	81 (100)
No	13 (19.7)	39 (59.1)	14 (21.2)	66 (100)

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Table 4 Bivariate analysis of potential variables associated with frailty status among older people with depressive disorders (*p-value < 0.2, selected for the multivariate analysis) (N = 147)

Variables	Robust No. (column %)	Pre-frail No. (column %)	Frail No. (column %)	Chi-squared p-value
Social support score*				
Mean +SD	110.6 +31.0	110.4 +33.3	100.6 +29.0	
Median (IQR)	107 (100, 128)	117 (94, 134.5)	104 (82, 123)	0.149[a]
Number of participants currently having depression (TGDS > 5)*	3 (12.0)	28 (37.3)	29 (61.7)	<0.001
Number of participants having cognitive impairment (TMSE < 23)	0 (0)	13 (17.3)	16 (34)	0.006
Sex*				0.155
Male	6 (24.0)	26 (34.7)	9 (19.1)	
Female	19 (76.0)	49 (65.3)	38 (80.9)	
Age* (years), median (IQR)	69 (67, 72)	71 (67, 75)	71 (68, 77)	0.139[a]
Level of education*				0.006
Primary school or lower level	5 (20.0)	37 (49.3)	31 (66.0)	
High school or associate's diploma	10 (40.0)	18 (24.0)	10 (21.3)	
Bachelor's degree or higher level	10 (40.0)	20 (26.7)	6 (12.8)	
Monthly income (THB)				
Individual, median (IQR)	6600 (700, 25000)	10000 (1300, 15000)	4000 (1850, 15000)	0.553[a]
Family, median (IQR)	30600 (10000, 50000)	20000 (10000, 32500)	20000 (8000, 30000)	0.428[a]
Marital status				0.916[b]
Single	1 (4.0)	4 (5.3)	1 (2.1)	
Married/partner	17 (68.0)	47 (62.7)	29 (61.7)	
Divorced/separated/widowed	7 (28.0)	24 (32)	17 (36.2)	
Key family caregivers*				0.018
Living on one's own	8 (32.0)	10 (13.3)	5 (10.6)	
Spouse/partner	8 (32.0)	27 (36.0)	9 (19.1)	
Other family members	9 (36.0)	38 (50.7)	33 (70.3)	
Social media use* (yes)	12 (48.0)	25 (33.3)	7 (14.9)	0.009
Having at least one comorbidity (yes)	23 (92.0)	62 (82.7)	39 (83.0)	0.513
Polypharmacy* (yes)	12 (48.0)	36 (48.0)	33 (70.2)	0.041

[a]Kruskal-Wallis test, [b]Fisher's exact test

527 **Table 5** The final ordinal regression model of the association between social support (main independent variable)
528 and frailty status (dependent variable) among older people with depressive disorders, adjusted for current
529 depressive symptoms, level of education, and key caregiver.

Variables	Ordinal odds ratio	95% CI	p-value
Social support score (ISSB Thai version)	0.99	0.97, 0.99	0.015
Currently having depression (TGDS > 5)	3.32	1.67, 6.77	< 0.001
High school or associate's diploma	0.38	0.16, 0.88	0.014
Bachelor's degree or higher educational level	0.44	0.18, 1.03	0.030
Dependence on spouse/partner	4.00	1.18, 14.29	0.015
Dependence on other family members	5.81	1.88, 18.89	0.002

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