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# Mediating Effect of Depression in the Relationship Between Health-Related Quality of Life and Pain of the Elderly with Physical Dysfunction

This study aimed to determine the effect of depression between the health-related quality of life and pain in elderly persons with physical disabilities. A total of 111 patients who were treated at hospital B (Seoul, Daejeon, Daegu, Gwangju, and Busan) participated in the Survey. The SF-36 Health Assessment was used to determine the quality of life of subjects, the Korean version of the Geriatric Depression Scale-Short form to assess the level of depression, and Numeric Rating Scale to determine the level of pain. To determine the moderating effect of depression on the relationship between quality of life and pain, simple regression analysis, and the Sobel test were performed. There was a significant negative correlation between health-related quality of life and pain ($r<-.3$, $p<.05$), and a significant positive correlation between depression and pain ($r=.251$, $p<.05$). Thus, health-related quality of life had a simple regression relationship with depression and pain. Depression also showed a mediating effect between health-related quality of life and pain. The results of this study suggest that depression mediates between pain and quality of life.

Key words: *Fall depression, Quality of life, Pain, Aged, Health*

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## INTRODUCTION

Despite the simultaneous achievements in industrialization and democratization in our contemporary society, the overall satisfaction with life and level of happiness are relatively low, making them both prominent social issues. In light of this, the National Statistical Office of South Korea has set forth quality of life indicators that go beyond the indicators previously limited to the economic sector to include indicators that improve the ability to identify quality of life or happiness [1]. One such quality of life indicator, self-rated health, is a subjective judgment of one's own health [2]. Recently, the importance of health-related quality of life has seen increased recognition [3] because not only have survey results of self-rated health shown a marked decrease from 47.7% in 2014 to 46.3% in 2016 but life expectancy by health level has decreased from 65.2 years in 2014 to 64.9 in 2016 [1]. Studies have shown 2 key factors influencing health-related quality of life are depression [4,5] and pain [4,6,7].

Depression causes people to perceive both present and future situations negatively due to intense despondent emotions and increased self-critical thoughts. Moreover, the level of activity of persons suffering from depression decreases due to their self-isolation arising from diminished interest and concern for everyday life and routine activities [8]. Pain is a sensory and emotionally unpleasant experience felt from actual or potential tissue damage or in connection to such damage [9]. Such pain negatively impacts one's level of depression [10,11], as a representative psychological problem, because it not only exacerbates physical symptoms but also restricts social life due to increased bed rest and reduced activities [12]. Accordingly, there is an obvious relationship between pain and depression [13,14].

The relationship between depression and health-related quality of life has been consistently found in numerous studies [5,15,16]; however, findings regarding the relationship between pain and health-related quality of life have been inconsistent. Byeon and Kim [16] stated that pain and depression are key factors that influence health-related quality of life, while Kojima et al. [6] and Lu et al. [7] contended that pain is an important factor influencing the quality of life. However, Eom et al. [5] and Ruta et al. [17] argued that while health-related quality of life correlates with depression, no significant relationship could be identified between pain and health-related quality of life. Based on these studies, it can be inferred that pain control positively influences depression and health-related quality of life; however, it is not certain whether such influence is caused from the direct effect of pain or an effect mediated by depression. Research on this uncertainty is also lacking. Accordingly, the present study attempted to determine the mediating effect of depression in the relationship between health-related quality of life and pain on elderly people with physical disabilities.

## SUBJECTS AND METHODS

### Subjects

The present study involved 111 elderly patients with physical disabilities of B hospital in Seoul, Daejeon, Daegu, Gwangju, and Busan. Each patient participated in the study through an interview-based survey. To identify the demographic characteristics of the subjects a survey containing a questionnaire with 13 items, including gender, age, education level, economic level, family relations, and religion, as used. The SF-36 (Short Form Survey-36) was used to determine health-related quality of life, while the Geriatric Depression Scale was used to investigate the level of depression.

Those who scored 75 points or less on Modified Barthel Index, agreed with the purpose of the study, and were capable or understanding and responding to the questionnaire were selected as subjects. A total of 183 questionnaires were distributed; of those only 111 questionnaires provided data sufficient for use in the final analysis.

### Survey

(1) Health-related quality of life (SF-36)

The SF-36 used to evaluate the subjects' health-related quality of life was originally developed by Ware and Sherbourne [18] and later modified and supplemented by Kim. [19] The SF-36 gathered information about the demographic characteristics related to general health perception and thoughts, social function, role limitations due to emotional problems, and mental health. In addition, the survey included one item on the participants' perception of any changes in physical condition. The scores for each item was converted to 0-100 points, and the average of the sum of these scores was used for the analysis.

(2) Korean version of the Geriatric Depression Scale-Short form (SGDS-K)

The SGDS-K, developed by Sheikh and Yesavage [20] and modified and supplemented by Jeong et al. [21] (Cronbach α = .88), was employed to determine the elderly subjects' level of depression. The SGDS-K, comprising 15 items, rates results of less than 5 points as a normal state, results of 5 to 9 points as possible depressive state, and results ten points or higher as a depressive state. As follows, the higher the scores, the greater the level of depression.

(3) Numeric Rating Scale (NRS)

To gather information about the subjects' pain, the subjects were asked about the location of pain, and the NRS was used to determine the level of pain [21], On the NRS, a score of zero signifies no pain, while a score of 10 represents unimaginable, maximum pain. In the present study, the subjects were asked to either mark their level of pain on a chart by themselves or verbalize it.

### Analysis method

For statistical analysis, a statistical package PASW version 18.0 for Windows and Microsoft Excel program were used. The significance level was set at 0.05. Descriptive analyses were performed to identify the demographic characteristics of the subjects. Pearson correlation analysis was conducted to investigate the correlation among the quality of life, level of depression, and pain. To determine the moderating effect of depression on the relationship between the quality of life and pain, simple regression analysis and the Sobel test were performed.

## RESULTS

### Demographic characteristics of the subjects

The demographic characteristics of the subjects are shown in Table 1.

**Table 1.** The demographic characteristics of the subjects (n=111)

| variables | | number (%) |
|---|---|---|
| Age (yr) | ~ 69 | 80(72.07) |
| | 70 ~ 79 | 24(21.62) |
| | 80 〈 | 7(6.31) |
| Sex | male | 72(64.87) |
| | female | 39(35.14) |
| Religion | none | 46(41.44) |
| | Buddhist | 34(30.63) |
| | Protestant | 21(18.92) |
| | Roman Catholic | 8(7.21) |
| | other | 2(1.80) |
| Spouse | yes | 63(56.76) |
| | no | 48(43.24) |
| Economic status | very good | 7(6.31) |
| | good | 15(13.51) |
| | somewhat | 41(36.94) |
| | poor | 33(29.73) |
| | very poor | 15(13.51) |
| Education level | ~elementary | 37(33.33) |
| | middle | 19(17.12) |
| | high | 27(24.32) |
| | above university | 27(24.32) |
| Duration of onset (month) | 〈 12 | 36(32.43) |
| | 12 ~ 23 | 31(27.93) |
| | 24 ~ 35 | 12(10.81) |
| | 36 ~ 47 | 8(7.21) |
| | 48 ~ 59 | 5(4.51) |
| | 60 ≦ | 19(17.12) |
| Diagnosis | stroke | 86(77.48) |
| | spinal cord injury | 10(9.01) |
| | traumatic brain injury | 1(0.90) |
| | arthritis | 4(3.60) |
| | other | 8(7.21) |
| Modified Barthel Index (score) | 0~24 | 26(23.42) |
| | 25~49 | 59(53.15) |
| | 50~74 | 26(23.42) |

### Correlations among SF-36, SGDS-K, and NRS

Significant moderate levels of negative correlations ($r<-.3$, $p<.05$) were found between SF-36 and SGDS-K, as well as between SF-36 and NRS. There was a weak positive correlation between SGDS-K and NRS ($r<.3$, $p<.05$) (Table 2).

**Table 2.** Correlations among SF-36, SGDS-K, and NRS

| | | SF-36 | SGDS-K | NRS |
|---|---|---|---|---|
| mean±SD (score) | | 37.36±17.09 | 7.09±4.96 | 4.36±2.11 |
| r(p) | SF-36 | 1 | | |
| | SGDS-K | -.59(<.01)** | 1 | |
| | NRS | -.42(<.01)** | .25(<.01)** | 1 |

*p<.05, **p<.01
SGDS-K: Korean version of the Geriatric Depression Scale-Short form; NRS: Numeric Rating Scale

### The moderating effect of SGDS-K in the relationship between SF-36 and NRS

The NRS had a significant negative influential relationship with SF-36 ($F=57.60$, $p<.05$), and its explanatory power was 34.6%. The SGDS-K also had a significant negative influential relationship with SF-36 ($F=23.00$, $p<.05$), and its explanatory power was 17.4%. The SGDS-K and NRS had a significant negative influential relationship with SF-36 ($F=39.61$, $p<.05$), and its explanatory power was 42.3% (Table 3). The SF-36 showed a simple regression relationship with SGDS-K and NRS as follows.

SF-36 = −1.78 X SGDS-K + −2.33 X NRS

The SGDS-K showed a significant mediating effect ($z<-1.96$, $p<.05$) in the relationship between SF-36 and NRS (Table 4).

**Table 3.** Regression analysis of SGDS-K and NRS for SF-36 (n=111)

| Dependent variable | Independent variables | $r^2$ | F | p | B |
|---|---|---|---|---|---|
| SF-36 | SGDS-K | .35 | 57.60 | <.01** | −2.03 |
| | NRS | .17 | 23.00 | <.01** | −3.39 |
| | SGDS-K*NRS | .42 | 39.61 | <.01** | SGDS-K: −1.78<br>NRS: −2.33 |

*p<.05, **p<.01

**Table 4.** The mediating effect of SGDS-K in the relationship between SF-36 and NRS

| Independent variable | | Mediator variable | | Dependent variable | z | p |
|---|---|---|---|---|---|---|
| NRS | → | SGDS-K | → | SF-36 | −3.34 | <.01** |

*p<.05, **p<.01

## DISCUSSION

The present study was conducted to determine the mediating effect of depression in the relationship between health-related quality of life and pain on the elderly with physical disabilities. Accordingly, the results confirmed a relationship between health-related quality of life and pain in that SF-36 and NRS

showed a significant moderate negative correlation. Supporting the results of the study, Son and Seo [23] stated that pain needs to be controlled to increase the quality of life. In addition, given that 36% of the explanatory power of SGDS-K for SF-36, there was also a strong cause-and-effect relationship between depression and health-related quality of life in the present study. The cause-and-effect relationship between pain and health-related quality of life was significantly different as only 17.4% of the explanatory power of NRS was determined for SF-36. In that regard, Eom et al.5] and Ruta et al. [17] also stated that the relationship between pain and the quality of life is not decisive. In light of the findings of the present and previous studies, even though it appears that pain directly affects the quality of life with limited influence, this influence may be due to the mediating effects of other factors.

Depression in patients with physical disabilities is easily overlooked; moreover, it is difficult to make a differential diagnosis of depression due to the fact that diagnosis and interventions are focused on the patients' physical disabilities [24]. However, because depression negatively influences the quality of life, it should not be overlooked. The present study found that depression affects health-related quality of life since the SGDS-K showed a high level of explanatory power for the SF-36, a result consistent with many previous studies that reported an influence on quality of life from depression [5,15,16]. Meanwhile, depression and pain are in a mutually reciprocal relationship in which depression influences pain, and vice versa [25]. In fact, it has been reported that the higher the level of pain, the higher the level of depression [26]. In that regard, Byeon and Kim [16] stated that if any factor, including fatigue, pain, anxiety, and depression, is controlled, other symptoms will be alleviated and the quality of life will improve. The present study also found that the explanatory power of SGDS-K and NRS (42.3%) was greater than the explanatory power of SGDS-K for SF-36 (34.6%), and confirmed the mediating effect of SGDS-K in the relationship between SF-36 and NRS through the Sobel test. The direct influence of pain on health-related quality of life may be limited considering the results of the present study and previous studies, which reported pain and depression are closely related. Due to the fact that the pain affects depression significantly, it was found that pain not only directly affects health-related quality of life (even though the influence is minimal) but also influences health-related quality of life with depression as a mediator. Consequently, efforts to control pain should be made to improve health-related quality of life.

Even though drug treatment is the primary intervention method used to decrease pain and depression, the side effects of drugs can be problematic. Such a problem may be greater for patients with physical disabilities because they are likely already taking certain medicines for their chronic diseases; thus, additional intervention with drugs for pain and depression can intensify or negatively alter the side effects. Accordingly, nonpharmacological treatments are often administered alone or in combination with drugs to reduce pain and depression [27]. Based on the findings of this study, the researchers suggest that further studies on controlling pain in a greater variety of ways should be conducted to improve the health-related quality of life of patients with physical disabilities.

## CONCLUSION

The present study found that the explanatory power of SGDS-K and NRS (42.3%) was greater than the explanatory power of SGDS-K for SF-36 (34.6%), and confirmed the mediating effect of SGDS-K in the relationship between SF-36 and NRS through the Sobel test. The findings of the present study indicate that pain should be actively controlled, not only for direct positive effects but also to improves states of depression, which, in turn, can enhance the health-related quality of life of elderly persons with physical disabilities.

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