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Pain, Depression, and Health-related Quality of Life of Older Haenyeos (Women Divers)

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Abstract

This study aimed to provide basic data in order to develop effective intervention plans to improve the health-related quality of life of older haenyeos (professional female free divers). The study's participants consisted of older haenyeos (≥ 65 years old) from seven fishing villages on Jeju Island, Korea. Data were collected using a questionnaire-based survey method, and the responses of 149 participants were analyzed. The participants' mean pain score was 2.43 out of 5 points and their mean score for health-related quality of life was 61.18 out of 100 points. Depression was the strongest factor influencing health-related quality of life; other influencing factors included pain, the number of drug side effects, number of drugs prescribed, age, and diving time. Intervention plans for chronic-disease management and self-management programs tailored to the characteristics of older haenyeos are needed for the effective control of depression, pain, and improvement in their health-related quality of life.

Keywords: Haenyeo, pain, quality of life, diver

Introduction

Haenyeos are professional female divers in Korea who harvest seafood by deep-sea diving without using an air feeder or an assisted-breathing apparatus. Their diving method is called breath-hold diving, whereby they dive approximately 20 m underwater while holding their breath for about 2 min to harvest seafood before resurfacing. Haenyeos engage in multiple diving sessions throughout the day (Lee & Lee, 2014; Park et al., 2016).

According to the Survey of Professional Diving Fishermen, 4,005 haenyeos were registered on Jeju Island, Korea in 2016. There were only 12 haenyeos younger than 40 years of age, 46 in their 40s, 403 in their 50s, 1,246 in their 60s, 1,734 in their 70s, and 564 older than 80 years of age. Hence, approximately 88.4% of the entire haenyeo population is 60 years of age or older (Jeju Special Self-Governing Province, 2016). Apart from the occupational hazards, advancing age may also affect the health of haenyeos (Kim, Choi, & Kim, 2015; Lee, 2015; Park et al., 2016).

Review of Literature

Health problems, including headaches, dizziness, middle-ear diseases, muscle aches, and

arthritis, are prevalent among older haenyeos on Jeju Island due to the nature of their occupation, which demands repetitive breath-hold dives. Haenyeos take pain relievers prior to diving to prevent these symptoms (Kim & Kim, 2018; Mun, Lee, & Seo, 2014). A study of haenyeos reported that 11.4% of them suffer from chronic headaches, and most of them regularly take several types of medications to relieve headaches, earaches, and dizziness (Choi, Lee, Kang, Kang, & Bae, 2008; Kim & Kim, 2017). Moreover, about 70% of the haenyeo population have been found to be analgesic abusers, which highlights the serious health risks confronting haenyeos (Choi et al., 2008; Koh, Cho, Yang, & Kim, 2015). Furthermore, depression is a common health problem for elderly people in

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general; the more chronic diseases they have, the more depressed they are (Jeong & Kim, 2013; Lee & Yang, 2010; Lim, 2014), and the higher the pain that they experience, the more depressed they become (Lee & Moon, 2015). Hence, aging haenyeos are likely to experience a vicious cycle of chronic diseases, depression, and pain. One study revealed that haenyeos who were depressed had cognitive dysfunction and suffered more somatic symptoms compared to a nonhaenyeo depressed group (Park et al., 2016).

Recent advances in health interventions and technology, along with increases in income, have prolonged the human lifespan for many groups, and drawn attention to the possibility of living healthier lives in their later years, thereby underscoring the importance of health-related quality of life (HrQoL) (Lee & Bin, 2011). One study revealed that limitation of activity was the most influential factor for HrQoL in Korean elderly (Park & Choi, 2017). HrQoL was significantly higher among elderly individuals without musculoskeletal disorders in the Korean community (Lee & Bin, 2011; Lee & Yang, 2010). Specifically, they found that the number of musculoskeletal disorders had significant effects on HrQoL. Haenyeos suffer from musculoskeletal pain and 93.7% of the haenyeos have more than one musculoskeletal symptom (Kim et al., 2016; Koh et al., 2015), which probably has an adverse effect on their HrQoL.

Previous studies on haenyeos have mostly focused on their use of analgesics before dives (Kim & Kim, 2018; Mun et al., 2014) or the status of the public welfare services they receive (Kim & Hwang, 2012; Mun et al., 2014). Only a few studies have examined health management experiences (Kim & Kim, 2017), musculoskeletal pain, depression, and their effects on haenyeos' quality of life (Kim et al., 2016; Kim & Kim, 2017; Koh et al., 2015). The Jeju Island haenyeo culture was listed as a UNESCO humanity cultural heritage in 2016 (Jung & Lee, 2017; Kim & Kim, 2018). To preserve the cultural heritage of aging haenyeos, it is necessary to monitor and manage their health problems, especially in their elderly population.

Thus, the purpose of this study was to examine the effects of pain and depression on HrQoL in older haenyeos and to lay a foundation for the development of customized health-education programs to improve their HrQoL. The specific aims of this study were to examine: (1) the general and diving-related characteristics, pain, depression, and HrQoL of the participants; (2) differences in pain, depression, and HrQoL in relation to the participants' general and diving-related characteristics; and (3) the correlations between pain, depression, and HrQoL.

Method

Study Design

This descriptive study used a cross-sectional design to assess pain, depression, and HrQoL in older haenyeos and identify other factors that affect their HrQoL.

Setting and Samples

Haenyeos who were 65 years of age or older, residing on Jeju Island in Korea, and who did not have any medical condition that would prevent them from communicating with the researchers were enrolled in this study. The G*power 3.1 Program (Faul, Erdfelder, Lang, & Buchner, 2007) indicated that the required sample size for a significance level of $\alpha = 0.05$, power $(1 - \beta) = 0.80$, effect size = 0.15, and 12 variables was 127 participants. Assuming a 20% withdrawal rate, 159 participants were recruited, from which 149 participants were included for analysis (response rate = 93.7%, which is complete answer). The data was collected using face-to-face interviews in conjunction with a structured questionnaire.

Ethical Considerations

This study was approved by the Institutional Review Board (No. IRB-2015-034-001) of Jeju University to ensure the ethical protection of study participants. Participants provided written informed consent after receiving an explanation of the study purpose, and being informed of their right to withdraw their participation at any time and that there would be no disadvantage if they refused to participate. Data collected were coded and secured according to the IRB and university's policies to ensure participants' confidentiality.

Measures

General and diving-related characteristics:

Data were collected on participants' age, highest level of education, cohabitation (alone, spouse, and other family), religion, length of diving career (in years), duration of a single dive (in seconds), weight of the lead belt (worn on the waist to aid diving), types of chronic diseases, types of prescription and nonprescription drugs used, and experiences of side effects of drugs used.

Pain: To measure pain, the participants' perceived headaches, earaches, and pain in musculoskeletal areas were measured using 10 items, with each item rated on a 5-point scale (1 = "no pain at all," 2 = "mild pain," 3 = "moderate pain," 4 =

“severe pain,” and 5 = “extremely severe pain”). The pain scale is based on Koh et al. (2015) and a previous literature review (Kim et al., 2015; Park et al., 2016), and was then revised by the researchers themselves. The average score of the 10 items was used to measure pain, with a higher score indicating more severe pain. The reliability (Cronbach’s alpha) of this scale was 0.84 in this study.

Depression: To measure depression, the Geriatric Depression Scale, Short Form (GDS-SF), Korean version by Kim, Choe, and Chae (2009) was used. The original tool was developed by Sheikh and Yesavage (2008). This measure has 15 items, with each item rated as a yes or no response (1 = Yes, 0 = No), and item scores are summed to create a total score. The total score is used to categorize participants into three groups: normal = 0–5, mild = 6–10, and severe = 11–15. The reliability of this tool at the time of its development was 0.88. The reliability (Kuder–Richardson Formula 20) of this tool was 0.83 in this study.

Health-related Quality of Life: Participants’ HrQoL was measured using the Korean version of the Short-Form-36 Health Survey (SF-36), originally developed by Ware and Kosinski (2001). The SF-36 consists of four Physical Component Summary (PCS) measures and four Mental Component Summary (MCS) measures. The four PCS measures are Physical Function (PF), Role limitation–Physical (RP), Bodily Pain (BP), and General Health (GH). The four MCS measures are Role limitation–Emotion (RE), Mental Health (MH), Social Function (SF), and Vitality (VT). The reliability (Cronbach’s alpha) of this tool at the time of its development was 0.65–0.94, and it was 0.59–0.94 in this study. The HrQoL scores ranged from 0 to 100 points and were analyzed using the Quality Metric Health Outcomes (TM) Scoring Software 4.0. A higher score indicates higher total HrQoL.

Data Collection and Analysis

Seven fishing villages were selected for data collection based on the distribution of haenyeos in the Jeju region. Data were collected from January 3, to February 13, 2016. Surveys took approximately 20–30 minutes to complete per participant.

The collected data were analyzed using the SPSS WIN 18.0 program. Descriptive statistics, *t*-tests, and ANOVAs were used to analyze the levels of, and differences in participants’ general and diving-related characteristics, pain, depression, and HrQoL. The Scheffé test was used as a post-hoc test. Correlations among pain, depression, and HrQoL were analyzed using Pearson’s correlation coefficient, and the factors affecting HrQoL were identified through stepwise multiple regression.

Results

General and Diving-related Characteristics

The participants’ general and job-related features were as follows (Table 1). The mean age was 72.4 years, with the greatest number of participants aged 70–79 years old ($n = 82$, 55.0%). More than one-third (35.6%) had no schooling, 78.6% identified as Buddhists, 42.3% lived only with their spouses, and 29.5% lived with their families.

The mean length of the participants’ diving careers was 49.63 years, and the mean duration of a single dive was 51.54 seconds. The mean weight of the participants’ lead belts was 4.94 kg: 45.6% used a 3–4-kg belt and 33.6% used a 5–6-kg belt. The most common chronic disease (63.1%) was arthritis/neuralgia, and the majority reported having 1–2 comorbidities (56.4%). Almost 6 out of 10 (59.7%) were taking prescription drugs for arthritis/neuralgia, and the average number of prescription drugs taken was 2.82 ($SD = \pm 1.73$). With regard to nonprescription drugs, 72.5% were taking Neusun powder (acetaminophen and caffeine anhydrous) and 28.2% experienced one or more side effects (skin rash, dizziness, gastrointestinal disorder, edema, and hand tremor) from the drugs.

Degree of Pain, Depression, and HrQoL

The most severe pain experienced by participants, as rated on a 5-point scale, was located in the lower back ($M = 3.46$, $SD = \pm 1.19$), followed by the head ($M = 3.07$, $SD = \pm 0.96$), feet ($M = 3.00$, $SD = \pm 1.39$), and shoulders ($M = 2.81$, $SD = \pm 1.32$). The mean depression score was 6.12 points ($SD = \pm 3.80$). The number of participants in the mild category was 50 (33.6%) and in the severe category was 30 (20.1%). The mean total HrQoL score was 61.18 points ($SD = \pm 18.81$). Among the subscales, SF had the highest mean score (76.43), followed by BP, RP, RE, MH, PF, GH, and VT (Table 2).

Pain, Depression, and HrQoL in Relation to General and Diving-related Characteristics: For pain, there were significant differences between participants related to religion, cohabitation, weight of the lead belt, number of chronic diseases, number of prescription drugs, number of nonprescription drugs, and number of drug side effects. For depression, there were significant differences between participants related to diving time, number of prescription drugs, and number of drug side effects. Participants’ HrQoL showed significant differences related to age, length of diving career, duration of a single dive, weight of the lead belt, number of chronic diseases, number of prescription drugs, and drug side effects (Table 3).

Table 1. General and Diving-related Characteristics of the Participants (N = 149)

Variables	Categories	n (%)	M ± SD
Age (years)	65–69	53 (35.6)	72.40 ± 5.16
	70–79	82 (55.0)	
	≥80	14 (9.4)	
Educational level	Uneducated	53 (35.6)	
	Dropout of elementary school	39 (26.1)	
	Elementary school	49 (32.9)	
	Middle school	8 (5.4)	
Religion	None	16 (10.7)	
	Buddhism	117 (78.6)	
	Others (Christianity, etc.)	16 (10.7)	
Cohabitation	Alone	42 (28.2)	
	With Spouse	63 (42.3)	
	With family	44 (29.5)	
Length of diving career (years)	≤39	14 (9.4)	49.63 ± 8.92
	40–49	48 (32.2)	
	50–59	56 (37.6)	
	≥60	31 (20.8)	
Duration of a single dive (seconds)	≤30	63 (42.3)	51.54 ± 20.94
	31–60	65 (43.6)	
	≥61	21 (14.1)	
Weight of lead belt	3–4 kg	68 (45.6)	4.94 ± 1.06
	5–6 kg	50 (33.6)	
	≥7 kg	31 (20.8)	
Chronic diseases [†]	Arthritis/neuralgia	94 (63.1)	
	Hypertension	36 (24.2)	
	Cataracts	21 (14.1)	
	Digestive diseases	13 (8.7)	
	Others	44 (29.5)	
Prescription drugs [†]	Arthritis/neuralgia medicine	89 (59.7)	
	Cold medicine	66 (44.3)	
	Anti-inflammatory analgesic medicine	31 (20.8)	
	Antihypertensive medicine	29 (19.5)	
	Others	49 (32.9)	
Nonprescription drugs [†]	Neusun powder [‡]	108 (72.5)	
	Cold medicine	38 (25.5)	
	Otalgia medicine	28 (12.1)	
	Nutritional supplements	23 (15.4)	
	Health drinks	23 (15.4)	
	Others	51 (34.2)	

(Continued)

	0	24 (16.1)	
Number of chronic diseases	1–2	84 (56.4)	1.86 ± 1.33
	≥3	37 (27.5)	
	0	9 (6.0)	
Number of prescription drugs	1–2	60 (40.3)	2.82 ± 1.73
	≥3	56 (37.6)	
	0	11 (7.4)	
Number of nonprescription drugs	1–2	104 (69.8)	1.93 ± 1.55
	≥3	34 (22.8)	
	0	107 (71.8)	
Number of drug side effect	≥1	42 (28.2)	

†Multiple responses.

‡Acetaminophen and caffeine anhydrous.

Table 2. Pain and Health-related Quality of Life of the Participants (*N* = 149)

Variables	Categories	<i>n</i> (%)	<i>M</i> ± <i>SD</i>
Pain	Mean pain score		2.43 ± 0.74
	Lower back		3.46 ± 1.19
	Headache		3.07 ± 0.96
	Foot		3.00 ± 1.39
	Shoulder		2.81 ± 1.32
	Hand		2.32 ± 1.15
	Arm		2.28 ± 1.14
	Earache		1.96 ± 1.22
	Tinnitus		1.85 ± 1.14
	Eye		1.79 ± 0.92
	Neck		1.78 ± 1.01
	Depression	Mean depression score	
Normal		69 (46.3)	
Mild		50 (33.6)	
Severe		30 (20.1)	
HrQoL	Total HrQoL score		61.18 ± 18.81
	Social Function (SF)		76.43 ± 21.03
	Bodily Pain (BP)		66.65 ± 22.58
	Role limitation–Physical (RP)		65.90 ± 25.98
	Role limitation–Emotion (RE)		62.58 ± 30.75
	Mental Health (MH)		61.98 ± 19.46
	Physical Function (PF)		59.29 ± 24.06
	General Health (GH)		49.17 ± 20.28
	Vitality (VT)		47.44 ± 22.84

Note: HrQoL = health-related quality of life.

Table 3. Differences in Health-related Quality of Life According to Participants' General and Diving-related Characteristics (N = 149)

Variables	Categories	Pain			Depression			HrQoL		
		M ± SD	t/F	P	M ± SD	t/F	P	M ± SD	t/F	P
Age (years)	65-69	2.39 ± 0.77			5.16 ± 3.61			68.28 ± 19.59 ^a		
	70-79	2.52 ± 0.64	0.44	.640	6.54 ± 3.74	2.81	.063	57.65 ± 17.49 ^b	6.42	.002
	≥80	2.41 ± 0.82			7.21 ± 4.38			54.93 ± 16.18 ^c		(a > b, c)
	Uneducated	2.60 ± 0.66			7.15 ± 3.86			55.73 ± 16.23		
Educational level	Dropout of elementary school	2.32 ± 0.69	2.14	.097	5.61 ± 3.76	2.41	.069	63.50 ± 19.60	2.41	.069
	Elementary school	2.40 ± 0.79			5.30 ± 3.42			64.91 ± 18.16		
	Middle school	2.01 ± 0.94			6.75 ± 4.83			63.06 ± 28.68		
Religion	None	2.97 ± 0.87 ^a			6.62 ± 3.89			54.11 ± 21.73		
	Buddhism	2.37 ± 0.68 ^b	5.22	.006	6.00 ± 3.89	0.24	.784	61.52 ± 18.11	1.62	.201
	Others	2.27 ± 0.84 ^c		(a > b, c)	6.43 ± 3.14			65.70 ± 20.16		
	Alone	2.36 ± 0.80 ^a		.005	6.05 ± 4.01			60.92 ± 20.05		
Cohabitation	With spouse	2.64 ± 0.68 ^b	5.46	(a, c < b)	6.38 ± 3.63		.748	61.45 ± 16.27	0.01	.988
	With family	2.18 ± 0.68 ^c			5.82 ± 3.93	0.29		61.04 ± 21.30		
	≤39	2.38 ± 0.75			5.57 ± 2.95			67.23 ± 20.86 ^a		
Length of diving career (years)	40-49	2.61 ± 0.81	1.78	.153	5.70 ± 3.95	1.17	.320	65.99 ± 18.14 ^b	6.40	<.001
	50-59	2.27 ± 0.74			6.00 ± 3.98			62.17 ± 17.45 ^c		(a,b>c,d)
	≥60	2.45 ± 0.56			7.22 ± 3.53			49.19 ± 16.71 ^d		
	≤30	2.57 ± 0.69			6.36 ± 3.64 ^a			54.98 ± 17.42 ^a		
Duration of a single dive (seconds)	31-60	2.36 ± 0.76	2.39	.095	6.53 ± 3.78 ^b	3.61	.029	62.27 ± 17.23 ^b	11.88	<.001
	≥61	2.21 ± 0.69			4.09 ± 3.89 ^c		(a, b > c)	76.36 ± 18.99 ^c		(a, b < c)
Weight of lead belt	3-4 kg	2.19 ± 0.72 ^a			5.58 ± 4.02			66.77 ± 18.33 ^a		
	5-6 kg	2.67 ± 0.71 ^b	7.37	.001	6.32 ± 3.53	1.51	.224	60.54 ± 17.43 ^b	9.53	<.001
	≥7 kg	2.57 ± 0.65 ^c		(a < b, c)	6.96 ± 3.67			49.95 ± 17.25 ^c		(a, b > c)
Number of chronic diseases	0	1.94 ± 0.71 ^a	8.59	<.001	5.16 ± 4.19	2.09	.127	71.30 ± 21.31 ^a	10.75	<.001
	1-2	2.44 ± 0.70 ^b		(a < b, c)	5.94 ± 3.73			63.08 ± 16.75 ^b		(a, b > c)
	≥3	2.69 ± 0.70 ^c			7.04 ± 3.61			51.34 ± 17.26 ^c		
Number of prescription drugs	0	2.22 ± 0.92 ^a			5.44 ± 4.44 ^a			65.44 ± 18.78 ^a		
	1-2	2.08 ± 0.70 ^b	10.45	.001	5.21 ± 3.95 ^b	3.05	.030	68.88 ± 19.74 ^b	8.68	<.001
	3-4	2.72 ± 0.67 ^c		(c,d>b,a)	6.48 ± 3.62 ^c		(a, b, c < d)	57.38 ± 16.67 ^c		(a,b>c,d)
	≥5	2.70 ± 0.52 ^d			7.79 ± 3.03 ^d			49.17 ± 11.96 ^d		
Number of nonprescription drugs	0	2.01 ± 0.54 ^a			5.45 ± 4.36			63.64 ± 23.98		
	1-2	2.38 ± 0.68 ^b	4.55	.012	6.08 ± 3.62	0.29	.749	62.58 ± 17.60	1.65	.196
	≥3	2.71 ± 0.86 ^c		(a < b, c)	6.44 ± 4.23			56.07 ± 20.26		
Number of drug side effects	0	2.28 ± 0.68	-3.05	.003	5.28 ± 3.56	-4.58	<.001	66.48 ± 17.73	6.12	<.001
	≥1	2.67 ± 0.72			8.26 ± 3.60			47.67 ± 14.31		

Note: HrQoL = health-related quality of life.

Factors Affecting HrQoL

As expected, HrQoL was negatively correlated with pain ($r = -0.47, p < 0.001$), and with depression ($r = -0.74, p < 0.001$) (Table 4). Upon finding that there were significant differences in HrQoL, we entered the following variables into a stepwise regression to identify the factors that predicted HrQoL. Depression was found to have the strongest association with HrQoL ($\beta = -0.58$), followed by diving time ($\beta = 0.17$), the number of prescription drugs used ($\beta = -0.15$), total period of diving ($\beta = -0.14$), pain ($\beta = -0.12$), and number of drug side effects ($\beta = -0.12$). The explanatory power of the final regression model was 68.0%; the Durbin–Watson value was 1.742, with a tolerance limit of 0.661–0.830, indicating no residual autocorrelations. The variance inflation factors did not exceed 10 (range = 1.205–1.513), indicating no multicollinearity, thereby satisfying the assumptions of the regression model (Table 5).

Discussion

The objective of this study was to provide basic data for developing an effective intervention program to improve the quality of life of older haenyeos by understanding the effect of pain and depression on their HrQoL. The mean age of the participants in this study was 72.4 years and the age distribution was similar to that reported by the Survey of Professional Diving Fishermen (Jeju Special Self-Governing Province, 2017). The survey found that 37.5% of participants were in their 60s and 44.2% were in their 70s. In our sample, 35.6% were in their 60s and 55.0% were in their 70s. Therefore, these results should shed light on the aging of the haenyeo population. The average age of the subjects was higher than the average age of 65.9–68 in other previous studies (Koh et al., 2015; Lee et al., 2015). The Survey of Professional Diving Fishermen (Jeju Special Self-Governing Province, 2017) found that there had been no new recruits younger than 30 years of age during 2011–2015, and there were only six new recruits aged 30–39 years during that timeframe, resulting in a total of 10 haenyeos between 30 and 39 years of age. Such statistics indicate that there have been hardly any new Haenyeo recruits in recent years (Jeju Special Self-Governing Province, 2017; Lee et al., 2015; Lee & Lee, 2014).

Participants began diving when they were 10 years old and continued their professional diving careers for several decades. The mean length of their diving careers was 49.6 years, which aligns with the finding that the majority of haenyeos in the Jeonnam

area on the south coast of Korea have 40–50-year careers (Lee et al., 2015; Mun et al., 2014). In this study, haenyeos with long diving careers (>60 years) had a significantly lower quality of life than haenyeos with relatively shorter diving careers (<40 years). This finding is in line with a previous study on Jeju haenyeos (Koh et al., 2015; Lee et al., 2015). The results show that our participant population started to dive in their late teens and early 20s (Kim & Kim, 2017; Koh et al., 2015; Lee et al., 2015) when compared with haenyeos in other regions in Korea. In our study, older divers with long diving careers tended to reduce their workloads due to their reduced diving capacity (Lee et al., 2015) and exacerbations of headaches and musculoskeletal pain resulting from prolonged diving careers, which probably contributed to their lower quality of life.

Arthritis/neuralgia medications accounted for 59.7% of the prescription drugs that participants regularly used, and about 83.9% had one or more chronic diseases, which are similar to the findings in Kim et al. (2015). Approximately 28.2% of the participants experienced drug side effects, including gastrointestinal disturbances, skin rashes, dizziness, edema, and hand tremors, which is similar to the results reported in a previous study on homebound older residents (Jang, 2007; Kim & Kim, 2017). We found that those who had a higher number of chronic diseases, used more prescription drugs, and had more drug side effects and also had a lower quality of life. Chronic diseases and subsequent increases in drug use and experiences of drug side effects not only affected the quality of life of older haenyeos (Kim et al., 2016) but also exacerbated their pain. So far, very few health research on haenyeos had been conducted (Kim et al., 2016; Kim & Kim, 2018; Kim et al., 2015; Koh et al., 2015; Lee, 2015), which calls for an examination of the types of chronic diseases, severity of subsequent pain, use of drugs, and prevalence of drug side effects, and the need to develop appropriate educational and symptom-management programs to address these problems.

The mean pain score among participants was 2.43 (out of a range from 1 to 5, with 5 as the most severe pain) located in the lower back; pain was present in the head and ears as well. These results are similar to previous haenyeos' studies by Mun et al. (2014), Koh et al. (2015), and Kim et al. (2016). They reported that the most severe pain was found in the back/lower back, followed by the shoulders and ankles. These findings reveal that haenyeos are susceptible to headaches and lower-back pain.

This study showed that approximately 63.1% suffered from arthritis/neuralgia, for which they take

Table 4. Correlation Between Pain, Depression, and Health-related Quality of Life (N = 149)

	Pain	Depression	HrQoL
Pain	1		
Depression	0.45 (<0.001)	1	
HrQoL	-0.47 (<0.001)	-0.74 (<0.001)	1

Note: HrQoL = health-related quality of life.

medications, and about 72.5% are chronic Neusun powder users. Mun et al. (2014) reported high analgesic use among haenyeos with some of the popular products being Neusun powder, Panpyrin, Tylenol, and Geworin, with Neusun powder as the most popular of all. Neusun powder consists of acetaminophen and caffeine anhydrous and is associated with adverse effects, such as skin rashes, nausea, vomiting, loss of appetite, and vertigo (Korea Pharmaceutical Information Center, 2011). While being made aware of the serious side effects, haenyeos ignore advice to avoid taking too much Neusun powder and habitually take these nonprescription medications indiscriminately (Kim & Kim, 2017). Abusing painkillers for the purpose of controlling symptoms is an important risk factor for chronic headaches (Cevoli et al., 2006). Caffeine is a common ingredient in both over-the-counter and prescription headache medications (Choi et al., 2008). In our study, the most frequently used medication before diving was a combination of analgesics containing caffeine and acetaminophen, due to its accessibility as an over-the-counter medication. This necessitates education about their side effects and strategies to manage this habit.

Similarly, we found the lead belts that haenyeos wore on their waists to aid diving had significant effects on their HrQoL, and that as the weight of the lead belts increased, so did the severity of their pain. Results further showed that the weight of the lead belts had substantial effects on lower-back pain, necessitating the use of over-the-counter medications to relieve this pain. Furthermore, we found that older and heavier (weight) divers wear a heavier lead belt to increase their diving agility (Lee & Lee, 2014). However, as they grow older, their diving ability diminishes, despite using heavier belts (Lee et al., 2015); therefore, there may be a vicious cycle, in that, the older they get, the more likely they are to have back pain.

In this study, the mean HrQoL was 61.18 points, and the highest subscale score was SF (76.43 points). This score is higher than the score reported in a study by Lim (2014) of homebound older residents (65.96 points), which may be attributable to the nature of their occupation, which requires them to interact socially and collaborate with others when diving. In contrast, their mean score on the VT subscale was quite low (47 points), which might be due to chronic headaches and musculoskeletal pain that impede haenyeos' ability to dive regularly.

In this study, the average depression score was 6.12, which is considered mild. This is similar to the results of a previous study on haenyeos (Koh et al., 2015). However, the percentage with severe and mild depression was 20.1% and 33.6%, respectively. Furthermore, this study found depression ($\beta = -0.58$) was the most significant predictor of HrQoL. The results indicated that the worse the depression, the lower the HrQoL. In the study by Park et al. (2016),

Table 5. Factors Affecting Health-related Quality of Life (N = 149)

Variables	B	SE	β	t	p
Depression	-2.85	0.26	-0.58	-10.82	<0.001
Diving time(second)	4.44	1.37	0.17	3.24	0.001
Number of prescription drugs	-1.65	0.55	-0.15	-3.01	0.003
Total diving career	-0.29	0.11	-0.14	-2.76	0.007
Pain	-3.14	1.48	-0.12	-2.12	0.035
Number of drug side effects	-2.74	1.18	-0.12	-2.32	0.022
R^2			0.68		
F (p)			55.46 (p < 0.001)		
Adj. R^2			0.69		

Note: SE = standard error; B = unstandardized regression coefficient.

the haenyeo depressed group experienced cognitive dysfunction and more somatic symptoms compared to the nonhaenyeo depressed group. As is well known, depression is a key indicator of MH and management of depression is a very important intervention for the elderly (Lee & Yang, 2010).

Furthermore, pain ($\beta = -0.12$) was another significant predictor of HrQoL, along with the number of drug side effects and the number of prescription drugs used. These results underscore the importance of pain management for haenyeos to improve their HrQoL. This is similar to the results of previous studies (Koh et al., 2015; Lee & Yang, 2010). Additionally, we need to monitor haenyeos' drug use, because the number of drug side effects and number of prescription drugs are negative predictors of their HrQoL. Therefore, customized self-management programs such as a depression-prevention program and proper medication guidance including analgesics and nonpharmacological interventions for relieving pain for haenyeos are needed. This study is important in that it provides data for the development of an effective intervention program to improve HrQoL that is tailored to older haenyeos in the seven fishing villages that we studied. However, the study's cross-sectional design precludes the verification of any causal relationships. The possibility of sampling bias also limits the ability to generalize our findings to the entire haenyeo population.

Conclusions

This study aimed to provide data for the development of an effective intervention program to improve the quality of life among older haenyeos by exploring the relationships between pain, depression, and HrQoL. Depression and pain were found to be negatively correlated with HrQoL. Furthermore, pain, the number of drug side effects, the number of prescription drugs, and duration of a single dive were significant predictors that explained 68.0% of the variance in HrQoL.

Based on our findings that older haenyeos suffer from headaches, earaches, and musculoskeletal pain due to prolonged diving, effective strategies are required for pain control and the management of chronic diseases and depression. Programs designed to promote effective self-management of symptoms should be developed. Given the ongoing physical demands of breath-hold diving, the risk for analgesic abuse, and other potential problems, older haenyeos require prevention and intervention programs that are tailored to their healthcare requirements and HrQoL.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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