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RESEARCH ARTICLE

The Factors Predicting the Health-Related Quality of Life Among Persons with Chronic Obstructive Pulmonary Disease in Public Health Region 4, Thailand: A Mixed-Methods Study

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Abstract:

Background:

Health-Related Quality Of Life (HRQOL) is an important consideration for persons with Chronic Obstructive Pulmonary Disease (COPD). This convergent parallel mixed-methods study aimed to examine the factors predicting HRQOL and to explore a comprehensive in-depth understanding of the factors associated with HRQOL in persons with COPD.

Methods:

For the quantitative arm, simple random sampling consisted of 240 persons with COPD in Public Health Region 4, Thailand and self-reported questionnaires were employed and analyzed by using SPSS version 22.0 software. For the qualitative arm, purposive sampling consisted of 30 participants that were interviewed and the transcripts analyzed using content analysis. Subsequently, a side-by-side joint display table was used to merge the data.

Results:

Social support was the strongest predictor of HRQOL, followed by nutritional status, pulmonary function, and functional performance with $R^2 = 0.801$, $p = 0.00$. The participants perceived that social support can create encouragement, build convenience, and offer good recommendations. They also reported that the effects of COPD included poor nutritional status, deteriorating lung function, and activity limitations resulting in inadequate self-care in people living with COPD. Although age and gender were not found to be significant predictors of HRQOL, the participants perceived that differences in age and gender did not predict the prognosis of the disease.

Conclusion:

Four factors were seen to be significant predictors of HRQOL and potential explanations for the identification of the factors predicting HRQOL. Nurses and healthcare teams can modify the predicting factors and implement appropriate care leading to increased HRQOL in persons with COPD.

Keywords: Health-related quality of life, Chronic obstructive pulmonary disease, Personal factors, Social support, Pulmonary function, Functional performance.

1. INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of morbidity and mortality worldwide. The World Health Organization (WHO) estimated the global COPD morbidity rate to be approximately 210 million persons, and the mortality rate was over 3 million persons, making it the

fourth leading cause of death [1]. Persons with COPD usually suffer from multiple concurrent symptoms due to chronic bronchitis and emphysema, which may contribute to airflow obstruction [2]. Dyspnea is the most frequently-cited distressing symptom,and tends to exacerbate over time and can result in social isolation and emotional reactions to symptoms with potential long-term effects on Health-Related Quality Of Life (HRQOL) [2, 3].HRQOL in persons with COPD has been defined as an individual's perception of the effects of COPD,

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conceived as dynamic and multidimensional, involving the physical, psychological, and social dimensions [3 - 6]. The framework of this study was based on Ferrans and colleague's HRQOL model, which revised Wilson and Cleary's HRQOL model and added the construct of biological function, which is influenced by both individual and environmental characteristics [4, 5].

The HRQOL among persons with COPD at Saraburi Hospital in Public Health Region 4, Thailand was mostly at a moderate level, and they reported that their physical well-being was at a high level while their psychological and social well-being was at a moderate level [6]. Similarly, the factor with the greatest impact on HRQOL was the psychosocial impact, while the factor with the least impact on HRQOL was the activity component [5, 7, 8]. Most previous research focused on quantitative methods, showing that multiple factors are related to HRQOL in persons with COPD, including personal factors, social support, pulmonary function, and functional performance [4 - 6, 8]. However, it is necessary to understand how these four factors affect the person's perception of HRQOL because few studies have focused on both quantitative and qualitative methods investigating the relationships of HRQOL in persons with COPD. In reality, the relationships of HRQOL are complex and involve the interplay of multidimensional factors.Understanding and explaining the relationships of the factors that affect HRQOL will facilitate appropriate care for persons with COPD [5, 8, 9]. Thus, this study highlights these mixed methods, aimed at examining the factors predicting HRQOL and exploring a comprehensive in-depth understanding of the factors associated with HRQOL. Consequently, a clear understanding of these factors associated with HRQOLrelated to COPD will inform the development of care interventions that will improve HRQOL in this population.

2. MATERIALS AND METHODS

2.1. Design and Participants

A convergent parallel mixed-methods design was conducted in Public Health Region 4 from August to December 2018. Public Health Region 4 is one of the Public Health Regions in Thailand, where 9,146 persons were living with COPD in 2018. A multi-stage sampling procedure was used to determine a representative sample of the research participants in order to obtain a total of eight hospitals as follows: Pathum Thani Hospital; Thammasat University Hospital; Bang Yai Hospital; Bang Bua Thong Hospital; Sing Buri Hospital; Phrom Buri Hospital; Pra Na Khon Sri Ayutthaya Hospital; and Sena Hospital. Cross-sectional study design was used in the quantitative phase to examine the predictors among personal factors (age, gender, and nutritional status), social support, pulmonary function, and functional performance regarding HRQOL. The simple random sampling consisted of 240 persons with COPD that had come for follow-up at the chest clinics in the hospitals and whose characteristics met the following inclusion criteria: diagnosis with COPD and at least 40 years of age or over; no symptoms potentially affecting the ability to respond to the questions, and good command of spoken Thai language and willingness to participate in this study. Additionally, descriptive qualitative design was used in

the qualitative phase in order to explore a comprehensive in-depth understanding of the factors associated with HRQOL. The purposive sampling for this phase consisted of 30 participants, including 15 participants with high SGRQ-C scores and 15 participants with low SGRQ-C scores with consideration given to those that had completed the data collection during the quantitative phase.

2.2. Data and Materials

Data collection was conducted following the approval of the institutional review board (IRB)of Thammasat University(project no 086/2561) regarding the research settings, procedures, and anonymity of the participants, as well as the consent forms for the participants. Participants in the quantitative phase spent approximately 30 minutes responding to the six study questionnaires. Firstly, demographic data focused on age, gender, religion, marital status, and education level. Secondly, the St. George's Respiratory Questionnaire for COPD patients (SGRQ-C) was used to measure HRQOL, in which higher scores meant higher levels of perceived effects of COPD leading to lower levels of HRQOL [10]. Thirdly, the value of the Fat-Free Mass Index (FFMI) was used to measure nutritional status, in which lower values indicated lower levels of nutritional status. Fourthly, the Multidimensional Scale of Perceived Social Support (MSPSS) was used to measure self-perceived social support, where the lower scores indicated lower levels of social support. Fifthly, the value of Peak Expiratory Flow Rate (PEFR) was used to measure pulmonary function where higher values indicated lower levels of airflow limitation leading to higher levels of pulmonary function. Finally, the Functional Performance Inventory Short Form (FPI-SF) was used to measure functional performance, where lower scores indicated lower levels of functional performance [11]. The Cronbach alpha coefficient of the SGRQ-C, MSPSS, and FPI-SF questionnaires was 0.914, 0.870, and 0.928, respectively.

Data collection during the qualitative phase was conducted in a private room at the chest clinics. Participants that were willing to participate in this phase spent approximately 30 minutes responding to the nine interview questions. The semi-structured interview guide was composed of the individual perceptions of the six predictor variables associated with HRQOL. The researcher created trustworthiness in order to ensure the rigor of the study. Firstly, the researcher created credibility by spending adequate time with the participants and accomplished member checking of all of the interview questions, audio records, and hand notes to make certain that the data were complete and accurate. The researcher created dependability by evaluating the research process and data analysis process with three qualitative research experts and a dissertation committee audit. The confirmability of the study was created through the confirmation of the data derived from the participants' perceptions without researcher bias. Lastly, the researcher provided a detailed description of the findings that could be applicable for healthcare teams and other researchers.

2.3. Data Analysis

The quantitative data were analyzed using SPSS version

22.0 software, and descriptive statistics were used to test the demographic data, six predictor variables, and HRQOL. Four steps of hierarchical stepwise multiple regression analysis were used to examine the predictability of HRQOL by using six predictor variables. During the first step, personal factors included age, gender, and nutritional status, all of which were entered into the first model. The second step involved adding social support to the regression model, and the third step involved adding pulmonary function to the regression model. During the fourth step, the researcher added functional performance to the regression model. The qualitative data were analyzed using ATLAS.ti version 8.0 software and content analysis was used to provide a conceptualized comprehensive in-depth understanding of the factors associated with HRQOL. The content analysis consisted of the following three main steps [12]. Firstly, the data obtained from the interviews were transcribed verbatim in the original Thai version and then translated into an English version by a bilingual expert. Secondly, the findings were submitted according to the following three steps: open coding, creating categories, and abstraction. The researcher listened to the audio recordings of the interview data, repeatedly read the transcripts, and wrote memos and generated initial codes. Next, the researcher grouped all of the relevant coded statements into broader categories and reviewed and refined the categories and sub-categories to make certain that the coded statements were relevant to each category [12]. The last process involved producing the report, where the researcher wrote up the findings. A side-by-side display table was used to merge the data from the analysis, first presenting the quantitative results, and then providing the qualitative findings involving either confirmation or disconfirmation of the statistical results.

3. RESULTS

3.1. Demographic Characteristics of the Participants

Two hundred and forty persons with COPD participated in the quantitative phase. The age ranged from 44 to 92 years, with a mean age of 68.80 years (SD = 9.49). Most of the participants were males(85.00%), unemployed (68.30%), and lived with their extended families (78.30%), while approximately 7.10 percent lived alone. Similarly, 30 persons with COPD participated in the qualitative phase. Their ages ranged from 44 to 83 years, with a mean age of 70.07 years (SD = 9.05). Most of the participants were males(83.33%), unemployed (86.70%), and lived with their extended families (86.60%), while approximately 6.70 percent lived alone.

3.2. Factors Predicting Health-related Quality of Life

Two hundred and forty persons with COPD participated in completing the six research instruments examining the factors predicting HRQOL. Among the four steps of the regression model, social support (β = -0.412) was found to be the strongest predictor of HRQOL, followed by nutritional status (β = -0.320), pulmonary function (β = -0.210), and functional performance (β = -0.125), which were interpreted at a high level (R^2 = 0.801, p = 0.00) as shown in Tables **1** and **2**. These results indicated that higher levels of social support, nutritional status, pulmonary function, and functional performance were correlated with lower SGR-C scores and lower levels of

perceived effects of COPD. Consequently, higher levels of four of the above factors were correlated with better HRQOL in persons with COPD. However, neither age(β = -0.008, p = 0.80) nor gender (β = -0.037, p = 0.21) was a significant predictor of HRQOL.

3.3. Qualitative Findings for the Factors Associated with HRQOL

Thirty persons with COPD responded to the nine interview questions, which explored a comprehensive in-depth understanding of the factors associated with HRQOL. The findings revealed that all of the predictor variables could ultimately be grouped into six categories that emerged during the data analysis: social support, nutritional status, pulmonary function, functional performance, age, and gender. A side-by-side joint display table was used to merge the data of the quantitative and qualitative results. These integrated findings were discussed and organized into six predictor variables as shown in Table **3**. The findings of this study revealed that social support, nutritional status, pulmonary function, and functional performance were significant predictors of HRQOL. The above findings were consistent with the qualitative findings, which can explain a comprehensive in-depth understanding of the factors related to HRQOL. Each factor is fully described below.

3.3.1. Social Support

The first integration of the findings concerns the relationship between social support and HRQOL. Social support was a significant predictor of HRQOL (β = -0.412, p = 0.00), which was consistent with the qualitative findings regarding the following three categories. All of the participants perceived that social support encouraged them, thereby giving them more spirit to live with COPD. Additionally, social support made their lives more convenient and safe because the participants perceived that they were receiving care, assistance with their housework, and help with expenses. Half of them perceived that they were receiving accurate recommendations about taking medications, exercising, quitting smoking, and avoiding exacerbation triggers, as seen in the following statement: "My friends listen to my problems and gives me good advice, my children to help me with heavy housework, and the doctor and nurses recommended that I quit smoking, and my symptoms are much better now" (P. 3, 74-year-old female).

3.3.2. Nutritional Status

The second integration finding concerns the relationship between nutritional status and HRQOL. Nutritional status was a significant predictor of HRQOL (β = -0.320, p = 0.00), which was consistent with the qualitative findings following the two categories. Sixteen of the thirty participants perceived that the effects of COPD caused them to receive insufficient nutrients and their symptoms to become more severe, which led them to perceive weight loss. Thirteen of the thirty participants reported eating little per meal, but more frequently, and eating nutritious foods and avoiding foods that caused exacerbations, as indicated in the following statement: "If I eat more, I feel discomfort. So, I eat a little at a time, but I eat frequently and consume healthy foods" (P. 26, 73-year-old male).

Table 1. Relationships between age, gender, nutritional status, social support, pulmonary function, functional performance and HRQOL (N = 240).

No.	Variable	1	2	3	4	5	6	7
1	Age	1.000	-	-	-	-	-	-
2	Gender-Female	.029 (.657)	1.000	-	-	-	-	-
3	Nutritional Status	-.104 (.109)	-.141 (.029)	1.000	-	-	-	-
4	Social Support	-.043 (.509)	-.063 (.332)	.643 (.000)	1.000	-	-	-
5	Pulmonary Function	-.046 (.479)	.021 (.745)	.609 (.000)	.580 (.000)	1.000	-	-
6	Functional Performance	-.383 (.000)	-.077 (.235)	.526 (.000)	.569 (.000)	.473 (.000)	1.000	-
7	HRQOL	.099 (.127)	.039 (.550)	-.771 (.000)	-.807 (.000)	-.703 (.000)	-.620 (.000)	1.000

Note. $p < .05$

Table 2. Hierarchical stepwise multiple regression analysis between predictors and HRQOL (N = 240).

Predictor Variables	Model 1				Model 2				Model 3				Model 4			
	b	β	t	p	b	β	t	p	b	β	t	p	b	β	t	p
Constant Term	83.746				80.600				75.734				82.180			
Step 1 Personal Factors																
1. Age	.018	.020	.482	.630	.029	.032	1.020	.309	.031	.034	1.151	.251	-.007	-.008	-.254	.800
2. Gender-Female	-1.687	-.072	-1.723	.086	-1.338	-.057	-1.774	.077	-.801	-.034	-1.122	.263	-.872	-.037	-1.242	.215
3. Nutritional Status	-3.644	-.779	-18.662	.000	-2.037	-.436	-10.397	.000	-1.590	-.340	-7.958	.000	-1.494	-.320	-7.511	.000
Step 2																
4. Social Support					-.479	-.529	-12.777	.000	-.413	-.457	-11.182	.000	-.373	-.412	-9.616	.000
Step 3																
5. Pulmonary Function									-.113	-.228	-5.736	.000	-.104	-.210	-5.304	.000
Step 4																
6. Functional Performance													-2.459	-.125	-3.032	.003
R	.755				.874				.891				.895			
R^2	.601				.764				.793				.801			
R Change	.601				.164				.029				.008			
F	118.271				163.264				32.903				9.191			
Significant F	.000				.000				.000				.003			

Note: $p < .0$

Table 3. Integration of the findings on the six predictor variables and HRQOL.

Predictor Variables	Standardized Coefficients (β)	Qualitative Categories	Sub-categories
Age	β = -.008, p = .80	Differences in age were unable to predict disease prognosis.	a. Effects of COPD in adulthood b. Effects of COPD in old age
Gender	β = -.037, p = .21	Differences in gender were unable to predict disease prognosis.	a. Effects of COPD in women b. Effects of COPD in men
Nutritional Status	β = -.320, p = .00	- Effects of COPD caused persons to receive insufficient nutrients. - Self-care with regard to food consumption	a. Perceiving less weight because of the effects of COPD b. Body requires more energy c. Symptoms of receiving insufficient nutrients a. To control food consumption as appropriate

(Table 3) cont.....

Predictor Variables	Standardized Coefficients (β)	Qualitative Categories	Sub-categories
Social Support	β = -.412, *p* = .00	- Social support created convenience. - Social support created encouragement. - Social support helped the participants receive good recommendations.	a. Living was facilitated by family members, friends, and healthcare providers. a. Encouragement was received from family members, friends, and healthcare providers. a. Good recommendations were received from family members, friends, and healthcare providers.
Pulmonary Function	β = -.210, *p* = .00	- Lung function worsened - Dealing with the degeneration of lung function	a. Lung function got worse causing physical symptoms. b. Lung function got worse causing psychological symptoms. a. Experience with physical self-care b. Experience with psychological self-care
Functional Performance	β = -.125, *p* = .00	- Weariness caused by the degenerative disease - Dealing with the degeneration of functional performance	a. Experience with activity limitations b. Emotional changes c. Fearing going outside the home a. Self-care with regard to functional performance

3.3.3. Pulmonary Function

The third integration of the findings concerns the relationship between pulmonary function and HRQOL. The pulmonary function can be considered a significant predictor of HRQOL (β = -0.210, *p* = 0.00), which was consistent with the qualitative findings that lung function worsens as patients cope with degenerative lung function. All of the participants perceived that their lung function became worse. They had greater self-care in terms of dealing with the degeneration of their lung function in reducing and preventing their symptoms, as stated in the following: "I have sticky mucous that makes me cough every day and I feel irritable, thereby I take medications and drink warm water every day to drive out sticky mucous" (P. 27, 80-year-old male).

3.3.4. Functional Performance

The fourth integration of the findings concerns the relationship between functional performance and HRQOL. Functional performance was found to be a significant predictor of HRQOL (β = -0.125, *p* = 0.00), which was consistent with the qualitative findings following the two categories. Twenty of the thirty participants perceived becoming weary as a result of the degenerative disease. As symptoms increased in severity, functional performance diminished, thereby causing activity limitations and a likelihood to become easily fatigued when performing activities urgently. Thirteen of the thirty participants reported performing self-care in their daily activities by performing the activities themselves, and performing the activities slowly and to the best of their ability, as can be seen in the following statement: "If I have to perform activities requiring a lot of force, I get tired, thereby I had to remind myself to do activities slowly" (P. 20, 76-year-old male).

3.3.5. Age

The fifth integration of the findings concerns the relationship between age groups and HRQOL. However, age was not a significant predictor of HRQOL (β = -0.008, *p* = 0.80), which was consistent with the qualitative findings, where the participants perceived that a difference in age was not a predictor of the prognosis of the disease. This category can be summarized based on the effects of COPD in adulthood and old age. Twenty of the thirty participants reported that having COPD affected their burdens, duties, and responsibilities, while symptoms were found to be significant among the elderly with COPD, as seen in the following statement: "The younger persons say I get tired easily when I do hard work, while older persons are difficult to treat" (P. 19, 72-year-old male).

3.3.6. Gender

The sixth integration of the findings concerns the relationship between gender and HRQOL. However, gender was not seen to be a significant predictor of HRQOL (β = -0.037, *p* = 0.21), which was consistent with the qualitative findings; the participants perceived that differences in gender did not predict the prognosis of the disease. This category can be summarized in terms of the effects of COPD in women and men. Half of the participants reported that women with COPD had a greater number of concurrent symptoms, while the men had more severe symptoms and effects of COPD, as stated in the following: "Men have more severe symptoms of the disease, but women have multiple concurrent symptoms" (P. 25, 72-year-old female).

Therefore, the finding of this study found that social support, nutritional status, pulmonary function, and functional performance were significant predictors of HRQOL, which was consistent with the qualitative findings and can provide a comprehensive in-depth understanding of the factors associated with HRQOL. However, neither age nor gender was a significant predictor of HRQOL, and the findings from the qualitative data provide associations and potential explanations for extensive knowledge of age, gender, and HRQOL in persons with COPD.

4. DISCUSSION

4.1. Social Support

Most of the participants had high levels of social support; persons with moderate levels of social support had high levels

of the perceived effects of COPD that likely led to poor HRQOL compared with persons with COPD that had high levels of social support. With the same results, most persons with moderate to very severe COPD needed the help of a caregiver to accomplish daily tasks. They needed social support, including practical support with their finances and recreational life, in addition to maintaining independence with the help of their families and close relationships [8, 13]. Therefore, that social support was a significant predictor of HRQOL, and that the participants perceived that social support created encouragement and convenience, and they received good recommendations. The participants reported receiving the most support from family members, followed by support from healthcare providers and friends (their close friends and neighbors). They reported strong agreement that their family members were willing to offer emotional support (37.90%) and tried to help with daily activities (32.90%), and the healthcare providers cared for their feelings (35.40%) and were real sources of comfort to the participants (28.70%) while reporting with neutrality that they could trust their friends when things went wrong (35.00%) in addition to sharing their joys and sorrows (33.80%). This caused the participants to breathe better and to have no need to go to the hospital before their appointment dates. This is supported by the findings, where social support was seen to be positively correlated with fewer acute exacerbations (AEs), reduced hospitalizations, and increased HRQOL among persons with COPD [3, 14]. Similarly, living with others and having social support were positively correlated with physical activity and improved dyspnea management. The participants recommended that healthcare providers apply social support to the interventions, which can facilitate appropriate care for persons with COPD [13 - 15]. Interestingly, persons with COPD living alone tended to develop the disease and to rely on healthcare providers for support. This also agreed with the study of Raksayot and Sitthiban, who found that the intervention program that consisted of social networks, social support, and the patient's self-care over 12 weeks was able to effectively reduce the readmission rate [16]. Nurses and healthcare teams should assess social support for persons with COPD, after that plan participatory intervention programs in caring for them.

4.2. Nutritional Status

Most of the participants had normal levels of nutritional status, and persons with a cachexia level of nutritional status had high perceived effects of COPD and poor HRQOL, while normal nutritional status indicated good HRQOL. Nutritional status was a significant predictor of HRQOL, where the participants perceived that the effects of COPD caused them to receive insufficient nutrients and self-care concerning food consumption. This was supported by the results. In other words, persons with severe to very severe COPD had malnutrition, and a significant decrease in their mean FFMI values was observed with increasing severity of COPD [7, 17]. Lack of social support and inadequate dietary intake were the commonly-cited reasons for malnutrition and have been identified as major risk factors for the decline of functional performance and poor HRQOL among persons with COPD [2, 18]. Consequently, the patients in this group require more self-care concerning food consumption by eating small amounts of healthy foods frequently, including high-fat and low-carbohydrate diets, and fruits and vegetables, to improve pulmonary function, prevent acute exacerbations, muscle strength, and exercise tolerance, leading to the enhancement of their functional performance and HRQOL [1, 19]. However, some of the participants reported that nutritional care was often overlooked both by themselves and their families. In this regard, it is challenging for the nurse and the healthcare team, especially nutritionists, to increase nutritional care, which should involve both the assessment of nutritional status and the encouragement of nutrition education programs in persons with COPD.

4.3. Pulmonary Function

Most of the participants were classified with moderate stages of COPD, and persons with very severe COPD had high perceived effects of COPD and poor HRQOL compared with other stages of COPD. This was supported by the results in that airflow limitations in persons with COPD are progressive, involving the value of forced vital capacity (FVC) and forced expiratory volume in one second, while (FEV_1) and PEFR show a significant decrease [2, 8, 20]. Pulmonary function, therefore, can be considered a significant predictor of HRQOL, as the participants perceived that their lung function worsened as they coped with their degenerative lung function. Similarly, the pathophysiology of COPD involving both airflow obstruction and parenchymal destruction can lead to obstructed airflow that decreases lung compliance and hyperinflation [1, 2] and thereby increases the work of breathing and results in respiration difficulty with long-term effects on fatigue, sleep alterations, emotional reactions, memory function decline, and respiratory muscle weakness [7, 21]. Interestingly, the self-care experience involving both the exacerbation and remission period was as follows: first, the most useful methods during the exacerbation period were making minimum body movements, managing dyspnea, reducing the airway obstruction, and receiving assistance and advice from family members and others. Second, the most useful methods during the remission period were preventing the aggravation of dyspnea by using prescribed drugs and inhalers, avoiding exposure to allergy triggers, and performing daily activities as usual [22]. It can be concluded, therefore, that pulmonary function is correlated with functional performance and HRQOL among persons with COPD [20, 23]. However, most of the participants reported that self-care using pharmacological strategies was used more frequently than self-care using non-pharmacological strategies. Pulmonary rehabilitation is one of the non-pharmacological strategies and the main method used by persons with COPD, including energy conservation techniques, breathing techniques, exercise training, and secretion clearance strategies [1, 2, 24]. Nurses and healthcare teams, especially physical therapists, should employ pulmonary rehabilitation programs involving both physical and psychological training to improve pulmonary function.

4.4. Functional Performance

The majority of the participants had high levels of functional performance, and persons with low levels of

functional performance had high perceived effects of COPD and a likelihood to have poor HRQOL compared with those that had high levels of functional performance. The multiple factors contributing to functional performance included the following: physiological factors, including the severity of the disease, body composition, and pulmonary function; physical symptom clusters, including dyspnea, fatigue, and insomnia; psychological symptom clusters involving both anxiety and depression; and psychological factors involving both self-efficacy and health perception [25 - 27]. Functional performance, therefore, was found to be a significant predictor of HRQOL, where the participants perceived becoming weary as a result of the degenerative disease and dealing with the degeneration of functional performance. Some of them reported performing a light exercise with some difficulty and being unable to walk fast for more than 20 minutes due to shortness of breath (44.60%), and going to religious ceremonies with some difficulty (49.60%). This was supported by the results, thereby indicating that a reduction in physical activity can lead to a loss of previous role identification, and an inability to earn a living and social isolation [7, 23]. Interestingly, the difficulties in performing activities restrict interactions with the environment, thereby leading to a tendency for decreased spiritual activities and poor HRQOL among persons with COPD [8, 11]. With the same results, the study discussed how to lower the performance of physical activities during the exhalation phase of respiration, which is believed to reduce the respiratory rate and prolong the duration of exhalation, thereby leading to a decrease in dyspnea [18, 27]. Moreover, the exercise program with palunglompranover eight weeks was able to effectively reduce dyspnea and increase daily performance [28]. Nurses and healthcare teams can be used as evidence to develop home-based exercise programs to promote increased exercise capacity and perform activities and functional performance in persons with COPD.

4.5. Personal Factors

Both age and gender are personal factors in persons with COPD. Most of the participants were elderly persons with COPD, and they had higher levels of perceived effects of COPD and were likely to have poorer HRQOL compared to other adults with COPD. However, age was not a significant predictor of HRQOL. This agreed with the study of Ekici *et al.*, who found that age was not correlated with HRQOL in persons with COPD [8]. The participants perceived that a difference in age was not a predictor of the prognosis of the disease. Persons with COPD in adulthood reported that they have responsibilities as family leaders that care for family expenses and COPD makes it difficult for them to be able to work in the same way. The effects of COPD cause deteriorating physical impacts and psychosocial impacts, in line with the older age among persons with COPD. Similarly, the impact of increasing age involves trouble with sleeping, dyspnea, and loss of muscle mass, resulting in a decline in functional performance and HRQOL [1, 20, 23]. However, this was different from the study of Corlateanu *et al.*, who found that both the elderly age group with COPD and the adult age group with COPD had a significantly positive correlation with HRQOL [29].

Most of the participants were males; however, women with COPD had higher levels of perceived effects of COPD and were likely to have poorer HRQOL than men. The results showed that gender was not seen to be a significant predictor of HRQOL either; the participants perceived that differences in gender did not predict the prognosis of the disease. The participants perceived that women with COPD had a greater response to multiple concurrent symptoms of the disease and this led to anxiety. Most of the men, on the other hand, exhibited smoking behaviors and duties and responsibilities toward their families, causing their symptoms of COPD to be more severe. This is supported by the results of De Torres *et al.*, who found that men and women with COPD have different coping mechanisms; women with COPD expressed more dyspnea than men, despite having the same degree of airway obstructions [30]. This also agreed with the study of Raherison *et al.*, who found that HRQOL was different in women compared with men, where chronic sputum was associated with HRQOL in women but not men, thereby resulting in the HRQOL of women being poorer than that of men with COPD [31]. Hence, nurses and healthcare teams should become more aware of the significance of age and gender, which need to be considered when planning appropriate care to increase HRQOL in persons with COPD.

5. STRENGTHS AND LIMITATIONS

The strengths of this convergent parallel mixed-methods design enabled the triangulation and integration of the results during the quantitative phase, while the findings of the qualitative method provided multiple perspectives and a comprehensive in-depth understanding of the factors associated with HRQOL in persons with COPD. However, one limitation of this study was that the differences in the participants selected during the qualitative phase were compared with the participants selected during the quantitative phase based only on the SGRQ-C scores. For the purpose of diversity, therefore, future research should consider the differences of other predictor variable scores.

CONCLUSION

HRQOL in persons with COPD is complex and involves the interplay of multidimensional factors. This mixed-methods study explored the factors predicting HRQOL and provided a comprehensive in-depth understanding of the factors associated with HRQOL in persons with COPD. The findings highlight that social support is the strongest predictor of HRQOL, followed by nutritional status, pulmonary function, and functional performance. It also emphasized that the participants perceived that the effects of COPD led to more awareness in dealing with degenerative pulmonary function, food consumption, and functional performance. Moreover, support from family members, friends, and healthcare providers created encouragement, convenience, and the receiving of good recommendations. However, individual characteristics involving both age and gender were not seen to be significant predictors of HRQOL, whereas the findings from the qualitative data provided some suggestions that age and gender are associated with HRQOL. Therefore, nurses in chest clinics and healthcare teams should encourage multidisciplinary intervention programs, including social support, nutritional

status, pulmonary function, and functional performance for promoting HRQOL in persons with COPD.

LIST OF ABBREVIATIONS

COPD   = Chronic Obstructive Pulmonary Disease

HRQOL   = Health-Related Quality of Life

SGRQ-C = St. George's Respiratory Questionnaire for COPD patients

FFMI   = Fat-Free Mass Index

PEFR   = Peak Expiratory Flow Rate

FPI-SF   = Functional Performance Inventory Short Form

MSPSS   = Multidimensional Scale of Perceived Social Support

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by IRB of Thammasat University, Thiland (the third convening of the Subcommittee of the Institutional Review Board, Health Science branch) on July 18, 2018 (Approval Number 086/2561) regarding the research settings.

HUMAN AND ANIMAL RIGHTS

Not applicable.

CONSENT FOR PUBLICATION

The persons with COPD that were willing to participate in the study signed informed consent forms.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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