Original Article

Functional Status, Supportive Care Needs, and Health-Related Quality of Life in Advanced Lung Cancer Patients Aged 50 and Older

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ABSTRACT

Objective: This study aimed to examine the levels of functional status, supportive care needs, and health-related quality of life (HRQOL), and their relationships reported by advanced lung cancer patients aged 50 and older. **Methods:** A cross-sectional descriptive correlational study was conducted with 103 participants recruited from a cancer center in Singapore. Functional status, supportive care needs, and HRQOL were measured using validated instruments. Descriptive statistics were used to describe the sample profiles. Univariate and multivariate regression analyses were adopted to determine factors that were associated with HRQOL. **Results:** About 70.9% of participants were dependent in at least one instrumental activities of daily living (IADL). The mean number of unmet needs rated by participants was 9 (range = 0–28). The top three ranked items with moderate-to-severe unmet needs were "not being able to do things you used to do" (28.2%), "fear about cancer spreading" (25.3%), and "lack of energy/tiredness" (25.2%). Higher IADL scores were significantly associated with better HRQOL, whereas higher levels of supportive care needs, particularly in psychological domain significantly predicted poorer HRQOL in most domains. **Conclusions:** This study found that poor functional status and unmet supportive care needs are common in advanced lung cancer patients. Psychological needs and functional status are associated with patients' HRQOL. Future interventions incorporating functional assistance and psychological support may increase HRQOL in this population.

Key words: Functional status, health-related quality of life, instrumental activities of daily living, Lung cancer, supportive care needs

Introduction

Lung cancer is the most commonly diagnosed cancer globally, with an estimated 2.1 million new cases in 2018.[1] Nearly 95% of lung cancers are found in patients after 50 years old and mostly at advanced stages.[2,3] These

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patients generally have limited treatment options and very poor prognosis with a median survival time of 12 months.[4] They are also vulnerable to physical, psycho-social, and functional impairment due to disease and treatment.[5-7] Maximizing health-related quality of life (HRQOL) and thereby becomes, especially important for this population.

HRQOL is a multidimensional concept representing patients' perceived impact of disease and its treatment on functional health. Lung cancer patients generally have lower levels of HRQOL in the physical and emotional domains than those of healthy controls.[8,9] Nonetheless, HRQOL ratings in different domains may vary according to patients' sociodemographic and clinical characteristics, including age, gender, marital status, ethnicity, staging and duration of disease, surgery, receipt of adjuvant treatment, and comorbidity.[8-11] As these factors are nonmodifiable, supportive care for lung cancer patients has focused on improving HRQOL through managing physical and psychological symptoms.[12] However, little attention has been directed to the issues of poor functional status and unmet supportive care needs, which may signal new directions for optimizing HRQOL for patients.

Functional status is operationalized as an individual's ability to perform activities of daily living.[13] According to a systematic review (n = 43 studies), 36.7% and 54.6% of cancer patients reported difficulties in performing basic and instrumental activities of daily living (IADL), respectively.[14] Furthermore, these patients are prone to experience decline in functional status over time.[7,15] However, few studies have examined the association between functional status and HRQOL among lung cancer patients.

The assessment of supportive care needs by health-care providers aims to identify patients' desire for actual services or resources in satisfying physical and daily living, psychological, sexual, patient care as well as health system and information needs.[16] Unmet needs often occur when patients perceive a lack of care or support that is necessary to achieve optimal well-being.[16] Lung cancer patients have greater supportive care needs as compared to those with other cancer types and rate the highest unmet needs in physical and psychological domains.[17,18] Despite mounting evidence suggests that greater care needs are associated with impaired HRQOL in cancer patients,[19] little is known specifically for lung cancer patients.

For lung cancer patients at advanced stages, the goal of cancer treatments and care is to ensure the benefit of HRQOL. A better understanding of the relationships between functional status, supportive care needs, and HRQOL would assist health care providers in identifying a vulnerable subgroup of patients for timely intervention. Therefore, this study aimed to examine the levels of functional status, supportive care needs and HRQOL, and their relationships reported by advanced lung cancer patients aged 50 and older.

Methods

Study design

This is a cross-sectional descriptive correlation study.

Setting and participants

Between December 2015 and January 2016, eligible participants were recruited using convenience sampling from a national cancer center in Singapore. Inclusion criteria were as follows: (1) aged 50 or above, (2) a diagnosis of lung cancer (Stage III–IV), and (3) being able to speak or read English/Chinese. Participants were excluded if they had psychiatric and cognitive disorders (e.g., schizophrenia and dementia). The sample size was estimated using a power analysis where a medium correlation coefficient is 0.3, power is 0.8, and alpha is 0.05,[20] thus at least 85 participants were required.

Measures

Functional status was measured using two scales, including the Eastern Cooperative Oncology Group Performance Scale (ECOG-PS) and the Lawton and Brody's index of IADL. The ECOG-PS is a single-item measure of an individual's ability to perform daily and physical activities. It is rated from 0 (fully active) to 5 (dead). As the most commonly used cutoff for ECOG-PS is 2, a score of ≥2 indicates poor functional status.[21] The scale is reported with good predictive validity and inter-rater reliability.[22,23] The ECOG-PS score of each patient is rated based on a general impression of his or her activity by oncology nurses and extracted from his/her medical record by the researcher.

The Lawton and Brody's index of IADL was used to assess the level of functional dependence when an individual performs IADLs.[24] It includes eight items, covering the ability to use the telephone, shopping, food preparation, housekeeping, doing household laundry, transportation, taking medications as prescribed, and managing personal finances. Each item is scored as either 0 (dependent) or 1 (independent). Scores of all eight items are summed to yield a total score (range: 0–8), with a higher score indicating better functional status. IADL dependency is defined if a total score is <8.[7] Considerable evidence exists supporting good reliability and validity of the scale and the Chinese version of the scale has a Cronbach's alpha of 0.87.[25,26]

Supportive care needs were assessed using the 34-item Supportive Care Needs Survey Short Form (SCNS-SF34). The SCNS-SF34 consists of five domains: psychological

(10 items), health system and information (11 items), physical and daily living (5 items), patient care and support (5 items), and sexuality (3 items).[16] Each item is rated on a 5-point scale (1 = not applicable, 2 = satisfied, 3 = low need, 4 = moderate need, 5 = high need), with a score of ≥3 indicating the presence of an unmet needs and a score of ≥4 representing a unmet needs at moderate-to-severe level[27] Domain scores are calculated by adding up scores of related items and transformed into a 0–100 scale based on the instrument guide.[27] Psychometric properties of the English and Chinese versions of the SCNS-SF34 are well-documented; with Cronbach's alphas ranging between 0.88–0.96 and 0.75–0.92, respectively.[16,28]

HRQOL was evaluated using the European Organization for Research and Treatment of Cancer Quality of Life Core 30 Questionnaire (EORTC QLQ-C30) in conjunction with its lung cancer module (EORTC QLQ-L13).[29,30] The EORTC QLQ-C30 is a 30-item cancer-specific HRQOL scale and incorporates five functional domains (physical, role, emotional, cognitive, and social), three symptom scales (fatigue, nausea/vomiting, and pain), six single items (dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulty), and a global health scale.[29] The EORTC QLQ-L13 is a 13-item scale measuring dyspnea and other symptoms resulting from lung cancer and its treatment.[30] According to the scale scoring guideline, each functional domain or symptom scale/item is transformed on a 0–100 scale. Higher scores represent either better HRQOL on functional scales/global health scale, or worse symptoms on symptom scales/items. The English versions of the EORTC QLQ-C30 and the EORTC QLQ-LC13 demonstrated good reliability and validity.[29,30] The Chinese versions of the two scales are reported with good internal consistency reliability (Cronbach's alpha >0.7) as well as established convergent validity and contrasted-group validity.[31]

Sociodemographic and clinical data were obtained from patient self-reports or medical records. Sociodemographic characteristic included age, gender, marital status, ethnicity, education level, employment status, and religion. Clinical data were cancer stage, time since diagnosis, surgery, systematic treatment, number of comorbidities, and type of caregivers.

Data collection procedure

Participants were identified through nurse managers in various departments of the cancer center, including an outpatient clinic, ambulatory treatment unit, and radiotherapy clinic. After screening the eligibility of patients who attended oncologist consultations, nurse managers referred eligible participants to the researcher with participants' consent for study briefing. Once participants agreed to join, they were asked to sign on the consent forms. Questionnaires were subsequently administered either by the participants or using face-to-face interviews by the researcher.

Statistical analysis

Data were entered and analyzed using the SPSS 24.0 software (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to describe the sociodemographic and clinical characteristics and main study variables of the sample. To investigate factors that were associated with HRQOL, univariate and multivariate analyses were adopted. Univariate analyses were performed to investigate the associations between HRQOL (including global health and five functional domains only) with selected sociodemographic and clinical characteristics (based on prior literature),[9-11,13,18] functional status and supportive care needs. Student's *t*-tests or Pearson's correlation tests were used when appropriate. Those variables with $P < 0.25$ in univariate analyses were considered as candidate variables for stepwise multivariate regression analyses. The variance inflation factors of the independent variables are <2, thus no multicollinearity among study variables was detected. All statistical tests were two-sided, and $P < 0.05$ was considered statistically significant.

Ethical approval

The Institutional Ethical Committee of the hospital approved the study. All participants signed the informed consent forms before commencement of the study. They were informed of the voluntary participation and the right to withdraw from the study anytime, as well as the right of keeping personal information data confidential.

Results

Participant characteristics

A total of 103 participants consented to join the study and the mean age was 65.1 (SD = 7.5, range = 50–83). Majority of them was married (85.4%), diagnosed with Stage IV (87.4%) and had not received surgery (85.2%). The sociodemographic and clinical profiles of the participants are depicted in Table 1.

Functional status

About 43.7% ($n = 45$) of participants had an ECOG-PS score of ≥2 and 70.9% ($n = 73$) was dependent in at least one IADL. The most frequently affected IADLs were shopping ($n = 56$, 54.4%) followed by food preparation ($n = 55$, 53.4%).

Supportive care needs

Participants rated the highest mean ratings of supportive care needs in the physical and daily living domain (38.0 ± 20.9)

Table 1: Patient profiles (n = 103)

Characteristics	*n* (%)
Sociodemographic	
Age, mean±SD	65.1±7.5
Gender	
Male	66 (64.1)
Female	37 (35.9)
Marital status	
Single/widowed/divorced/separated	18 (17.5)
Married	85 (82.5)
Ethnicity	
Non-Chinese (Malay, Indian, and others)	15 (14.6)
Chinese	88 (85.4)
Education level	
Primary or less	50 (48.5)
Secondary	34 (33.0)
Tertiary	19 (18.5)
Employment status	
Full-time/part-time/self employed	21 (20.4)
Unemployed	17 (16.5)
Retired	65 (63.1)
Religion	
Buddhism	40 (38.8)
Taoism	21 (20.4)
Christian	12 (11.7)
Muslim	8 (7.8)
Catholic	4 (3.9)
Hinduism	3 (1.8)
Free thinker	15 (14.6)
Clinical characteristics	
Number of comorbidities, mean±SD	1.1±0.7
Cancer stage	
Stage III	13 (12.6)
Stage IV	90 (87.4)
Time since diagnosis (year)	
<1	67 (65.0)
≥1	36 (35.0)
Surgery	
Yes	18 (17.5)
No	85 (82.5)
Systematic treatment	
Chemotherapy only	66 (64.1)
Chemotherapy and radiotherapy	37 (35.9)
Type of caregivers	
Self	28 (27.2)
Spouse	45 (43.7)
Children	20 (19.4)
Domestic helper	10 (9.7)

SD: Standard deviation

and psychological domain (34.6 ± 20.7), whereas the sexuality domain (5.3 ± 9.7) had the lowest level of needs.

The mean number of unmet needs rated by participants was 9 (range = 0–28). Almost all of participants reported at least one unmet needs; 36%, 19%, 20%, 17%, and 5% reported 1–5, 6–10, 11–15, 16–20, and >20 unmet needs, respectively. All SCNS-SF34 needs items sorted by domains are presented in Table 2. The top three ranked items with moderate-to-severe unmet needs were "not being able to do things you used to do" (28.2%), "fear about the cancer spreading" (25.3%), and "lack of energy/tiredness" (25.2%). which were from either physical and daily living domain or psychological domain.

Health-related quality of life

As shown in Table 3, the mean global health score was 57.2 (standard deviation [SD] = 21.4). Among five functional domains of EORTC QLQ-C30, cognitive functioning had the highest mean score of 86.4 (SD = 20.3), and while role functioning had the lowest mean score of 63.6 (SD = 24.7). For the symptom scales, the top highest mean score items were insomnia (34.6 ± 28.7), financial difficulty (34.0 ± 28.0), and fatigue (32.8 ± 23.6). In the EORTC QLQ-L13 scale, the highest mean scores were noted for the items coughing (43.0 ± 25.0) and dyspnea (25.6 ± 19.6).

Predictors of health-related quality of life

Univariate and multivariate analysis results are shown in Table 4. Variables showing $P < 0.25$ in univariate analyses, including marital status (being married), ethnicity (Chinese), cancer stage (Stage IV), receipt of surgery (yes), number of comorbidities, ECOG-PS score (≥2), IADL scores, and supportive care needs (excluding sexual domain) were tested as candidate predictors of HRQOL in multivariate analysis.

Multivariate analyses revealed that global health was significantly predicted by cancer stage only. Regarding physical functioning, IADL score (β = 3.84, $P < 0.001$) was significantly associated with better physical functioning, whereas higher levels of physical (β = –0.21, $P < 0.05$) and psychological needs (β = –0.23, $P < 0.05$) predicted poorer physical functioning. Role functioning was found to be significantly and positively associated with IADL score (β = 4.55, $P < 0.01$) and being married (β = 13.36, $P < 0.01$), but was negatively related to greater physical needs (β = –0.35, $P < 0.01$). For emotional functioning, participants with receipt of surgery (β = –10.38, $P < 0.05$), comorbidities (β = –4.93, $P < 0.05$), and psychological needs (β = –0.71, $P < 0.001$) tended to report poorer emotional functioning. Concerning cognitive and social functioning, IADL score and psychological needs were found as significant factors ($P < 0.05$–0.001). In addition, health system and information needs were significantly and negatively associated with cognitive functioning (β = –0.29, $P < 0.001$).

Discussion

This is one of the few studies to investigate the relationships between functional status, supportive care

Table 2: Prevalence of unmet needs as measured by 34-item supportive care needs survey short form ($n=103$) [n (%)]

Items	Not applicable	Satisfied	Low need	Moderate/severe need
Physical and daily living domain				
Pain	37 (35.9)	41 (39.8)	19 (18.4)	6 (5.8)
Lack of energy/tiredness	16 (15.5)	14 (13.6)	47 (45.6)	26 (25.2)
Feeling unwell a lot of the time	19 (18.4)	23 (22.3)	38 (36.9)	23 (22.3)
Work around the home	20 (19.4)	31 (30.1)	29 (28.2)	22 (21.4)
Not being able to do things you used to do	19 (18.4)	25 (24.3)	30 (29.1)	29 (28.2)
Psychological domain				
Anxiety	32 (31.1)	20 (19.4)	36 (35.0)	15 (14.6)
Feeling down or depressed	27 (26.2)	20 (19.4)	36 (35.0)	20 (19.4)
Feelings of sadness	27 (26.2)	20 (19.4)	36 (35.0)	20 (19.4)
Fears about the cancer spreading	22 (21.4)	21 (20.4)	35 (34.0)	25 (25.3)
Worry that the results of treatment are beyond your control	32 (31.1)	22 (21.4)	34 (33.0)	15 (14.6)
Uncertainty about the future	34 (33.0)	27 (26.2)	26 (25.2)	16 (15.5)
Learning to feel in control of your situation	34 (33.0)	29 (28.2)	28 (27.2)	12 (11.7)
Keeping a positive outlook	30 (29.1)	34 (33.0)	30 (29.1)	9 (8.7)
Feelings about death and dying	27 (26.2)	18 (17.5)	43 (41.7)	15 (14.6)
Concerns about the worries of those close to you	24 (23.3)	20 (19.4)	39 (37.9)	20 (19.4)
Sexual domain				
Changes in sexual feelings	27 (26.2)	18 (17.5)	43 (41.7)	15 (14.6)
Changes in sexual relationships	90 (87.4)	12 (11.7)	0 (0)	1 (1.0)
Being given information about sexual relationships	71 (68.9)	30 (29.1)	2 (1.9)	0 (0)
Patient care domain				
More choice about which cancer specialist you see	56 (54.4)	39 (37.9)	6 (5.8)	2 (1.9)
More choice about which hospital you attend	57 (55.3)	44 (42.7)	2 (1.9)	0 (0)
Reassurance by medical staff that the way you feel is normal	39 (37.9)	52 (50.5)	10 (9.7)	2 (1.9)
Hospital staff attending promptly to your physical needs	32 (31.1)	49 (47.6)	21 (20.4)	1 (1.0)
Hospital staff acknowledging and showing sensitivity to your feelings and emotional needs	36 (35.0)	48 (46.6)	17 (16.5)	2 (1.9)
Health system and information				
Being given written information about the important aspects of your care	45 (43.7)	49 (47.6)	8 (7.8)	1 (1.0)
Being given information about aspects of managing your illness and side effects at home	46 (44.7)	43 (41.7)	11 (10.7)	3 (2.9)
Being given explanations of those tests for which you would like explanations	46 (44.7)	52 (50.5)	3 (2.9)	2 (1.9)
Being adequately informed about the benefits and side effects of treatments before your choose to have them	44 (42.7)	53 (51.5)	5 (4.9)	1 (1.0)
Being informed about your test results as soon as possible	44 (42.7)	44 (42.7)	12 (11.7)	3 (2.9)
Being informed about cancer which is under control or diminishing	44 (42.7)	46 (44.7)	10 (9.7)	3 (2.9)
Being informed about things you can do to help yourself to get well	43 (41.7)	42 (40.8)	14 (13.6)	4 (3.9)
Having access to professional counseling if you, family or friends need it	55 (53.4)	37 (35.9)	9 (8.7)	2 (1.9)
Being treated like a person not just another case	52 (50.5)	43 (41.7)	7 (6.8)	1 (1.0)
Being treated in a hospital or clinic that is as physically pleasant as possible	51 (49.5)	46 (44.7)	5 (4.9)	1 (1.0)
Having one member of hospital staff with whom you can talk to about all aspects of your condition, treatment and follow-up	50 (48.5)	38 (36.9)	11 (10.7)	4 (3.9)

SCNS-SF34: 34-item Supportive Care Needs Survey Short Form

needs, and HRQOL among patients with advanced lung cancer. The study showed that 43.7% of the patients had an ECOG-PS score s2 and 70.9% was dependent in at least one IADL. This is partly in line with a study showing that 69.9% of lung cancer patients was IADL-dependent and 30.2% had poor functional status as measured by ECOG-PS scale.[32] When compared with those (33.8% for ECOG-PS and 62.9% for IADL, respectively) reported in another study of advanced lung cancer patients, the results of this study are higher.[7] Inconsistent findings across studies might be due to different patient profiles as our patients are younger (65.1 vs. 77 vs. 76 years old) and exclusively diagnosed at an advanced stage (100% vs. 77.2% vs. 86.6%). We also found that the most frequently affected IADLs were shopping and food preparation; both of which are household tasks requiring the physical and cognitive function to perform, suggesting the patients' needs for assisted services in household management to maintain an independent living in the community.

Almost all of the patients in this study had at least one unmet needs and the mean number of unmet needs was 9. This is higher than a study of lung cancer patients reporting

Table 3: Mean scores of health-related quality of life ($n=103$)

Measures	Mean±SD
EORTC QLQ C30	
Global health	57.2±21.4
Functional scale	
Physical functioning	73.9±19.7
Role functioning	63.6±24.7
Emotional functioning	75.1±22.9
Cognitive functioning	86.4±20.3
Social functioning	65.2±24.2
Symptom scale/item	
Fatigue	32.8±23.6
Nausea/vomiting	14.1±21.5
Pain	21.4±22.2
Dyspnea	27.5±26.2
Insomnia	34.6±28.7
Appetite loss	27.2±26.7
Constipation	19.1±24.2
Diarrhea	5.5±15.6
Financial difficulty	34.0±28.0
EORTC QLQ LC13	
Dyspnea	25.6±19.6
Coughing	43.0±25.0
Hemoptysis	1.9±7.9
Sore mouth	9.1±18.2
Dysphagia	9.4±17.1
Peripheral neuropathy	17.5±22.3
Alopecia	15.2±24.6
Pain in chest	11.7±16.6
Pain in arm or shoulder	13.9±21.7
Pain in other parts of body	10.7±21.5

EORTC QLQ C30: European Organization for Research and Treatment of Cancer Core-30-item quality of life questionnaire, EORTC QLQ LC13: European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Lung Cancer module, SD: Standard deviation

that 78% of them had at least one unmet needs; although, the average number of unmet needs is similar across two studies (9 vs. 8).[33] Furthermore, participants reported the greatest unmet needs in the physical and daily living domain and psychological domain. This is a consistent finding in the literature, highlighting a priority for support in these two domains when a diagnosis of lung cancer is made.[17,33,34]

Consistent with the literature, the role functioning had the lowest mean score among the five domains of HRQOL.[8,35,36] The mean scores of HRQOL were comparable or better when compared with the reference values by the EORTC organization or published data on the same population, with one exception (social functioning).[8,35,36] Poor social functioning of patients identified from this study is not surprising as this reflects patients' limitations in doing social and work-related activities associated with advanced disease and complex treatments.

This study showed the higher scores for symptoms, including fatigue, insomnia, cough, and dyspnea, all of which are common symptoms experienced by lung cancer patients.[8,10] Noteworthy, the mean score of the item financial difficulties was much higher than published data in Western countries.[8,35] Although similar findings have been previously reported in China and India,[36,37] where social welfare systems are not well-established, this is not expected in a developed country alike to Singapore. A previous study in Singapore reported that old cancer patients, particularly those on target therapies or complementary and alternative medicine reported medical costs higher than expected.[38] As data on financial impact of cancer in Singapore are limited, more study is needed.

In line with the literature, cancer stage was found as a significant factor of global health.[10,37] We found that IADL score significantly predicted HRQOL in four of five domains except for emotional functioning, but ECOG-PS was not a significant factor of HRQOL in any domain. Evidence suggests that deficits in IADLs can occur earlier in the trajectory of the disease, whereas disability in daily and physical activities of living is often present until the disease is progressed.[15] Thus, decline in IADLs may be early signs of functional impairment, consequently deteriorating HRQOL.

Among the five needs domains, only physical and daily living, psychological, and health system and information needs were significantly associated with poorer HRQOL in at least one domain. These results lend further support to the accumulating evidence that addressing supportive care needs could maximize the HRQOL of lung cancer patients.[14] Noteworthy, patients with greater psychological needs had poorer HRQOL in most domains. Thus, when planning for palliative or supportive care for this population, psychological needs should be prioritized.

Limitations

This study has a few limitations. First, the generalizability of the study findings might be limited as the study was conducted on a conveniently selected small sample from a cancer center in Singapore. Second, the study was a cross-sectional survey with data collected at one time point, thus a dynamic understanding of inter-relationships among variables is impossible. Finally, although the Lawton and Brody's IADL index is the most widely used scale for measuring functional status in cancer patients,[14] this might be subjected to bias due to its potential gender differences in IADLs. For example, laundry and food preparation are considered as female tasks, particularly in Asian culture.

Implications for nursing practice

To improve HRQOL of advanced lung cancer patients, supportive care needs are recommended to be integrated as part of routine assessments by health care providers for the early identification of a subgroup of patients for timely

Table 4: Associations between health-related quality of life, functional status, and unmet supportive care needs ($n=103$)

Variables	Global health of EORTC QLQ 30				Functional domains of EORTC QLQ C30							
					Physical				Role			
	Univariate analysis		Multivariate analysis		Univariate analysis		Multivariate analysis		Univariate analysis		Multivariate analysis	
	Mean (SD)/ correlation	*P*	β (SE)	*P*	Mean (SD)/ correlation	*P*	β (SE)	*P*	Mean (SD)/ correlation	*P*	β (SE)	*P*
Sociodemographic variables												
Age	−0.14	NS	NE	NE	−0.11	NS	NE	NE	−0.06	NS	NE	NE
Gender												
Male (ref)	55.70 (19.90)				73.9 (20.0)				61.6 (24.6)			
Female	56.31 (24.01)	0.752	NE	NE	73.7 (19.4)	0.952	NE	NE	67.1 (24.7)	0.280	NE	NE
Marital status												
Single/widowed/divorced/ separated (ref)	64.35 (23.54)				69.6 (20.9)				54.6 (26.7)			
Married	55.69 (20.70)	0.882	NE	NE	74.8 (19.5)	0.320	NE	NE	65.5 (24.0)	0.090	13.36 (5.41)	<0.01
Ethnicity												
Non-Chinese (Malay/ Indian/others) (ref)	52.78 (19.07)				74.3 (19.8)				65.3 (23.7)			
Chinese	57.96 (21.73)	0.420	NE	NE	71.1 (19.8)	0.563	NE	NE	53.3 (28.3)	0.081	NS	NS
Clinical variables												
Cancer stage												
Stage III (ref)	70.51 (15.45)				77.4 (18.2)				60.3 (28.5)			
Stage IV	55.28 (21.47)	<0.05	−15.24 (6.19)	<0.05	73.3 (20.0)	0.486	NE	NE	64.1 (24.2)	0.604	NE	NE
Time since diagnosis												
<1 year (ref)	54.47 (23.07)				75.1 (18.9)				65.2 (24.9)			
≥1 year	58.57 (17.98)	0.637	NE	NE	71.5 (21.3)	0.374	NE	NE	60.7 (24.3)	0.377	NE	NE
Surgery												
No (ref)	56.96 (21.85)				72.8 (19.8)				63.3 (24.4)			
Yes	58.33 (19.39)	0.806	NE	NE	78.5 (19.1)	0.271	NE	NE	64.8 (26.8)	0.818	NE	NE
Systematic treatment												
Chemotherapy only (ref)	56.06 (22.58)				73.1 (18.3)				62.4 (25.0)			
Chemotherapy and radiotherapy	59.23 (19.12)	0.472	NE	NE	75.1 (22.3)	0.623	NE	NE	65.8 (24.2)	0.506	NE	NE
Number of comorbidities	−0.01	NS	NE	NE	−0.260	<0.01	NS	NS	−0.176	NS	NE	NE
Functional status												
ECOG PS												
0-1 (ref)	55.89 (21.58)				81.8 (15.8)				71.3 (23.5)			
≥1	58.89 (21.20)	0.483	NE	NE	63.6 (19.7)	<0.001	NS	NS	53.7 (22.7)	<0.001	NS	NS
IADL scores	−0.08	NS	NE	NE	0.581	<0.01	3.84 (0.96)	<0.001	0.448	<0.01	4.55 (1.33)	<0.01
SCNS SF-34												
Physical and daily living	−0.04	NS	NE	NE	−0.571	<0.01	−0.21 (0.10)	<0.05	−0.454	<0.01	−0.35 (0.11)	<0.01
Psychological	−0.07	NS	NE	NE	−0.581	<0.01	−0.23 (0.10)	<0.05	−0.400	<0.01	NS	NS
Sexual	−0.08	NS	NE	NE	−0.054	NS	NE	NE	−0.096	NS	NE	NE
Patient care	−0.05	NS	NE	NE	−0.190	NS	NE	NE	−0.096	NS	NE	NE
Health system and information	−0.09	NS	NE	NE	−0.184	NS	NE	NE	−0.028	NS	NE	NE
R^2			0.06				0.470				0.320	

Contd...

Table 4: Contd...

Variables	Functional domains of EORTC QLQ C30											
	Emotional				Cognitive				Social			
	Univariate analysis		Multivariate analysis		Univariate analysis		Multivariate analysis		Univariate analysis		Multivariate analysis	
	Mean (SD)/ correlation	*P*	β (SE)	*P*	Mean (SD)/ correlation	*P*	β (SE)	*P*	Mean (SD)/ correlation	*P*	β (SE)	*P*
Sociodemographic variables												
Age	−0.06	NS	NE	NE	−0.04	NS	NE	NE	−0.07	NS	NE	NE
Gender												
Male (ref)	75.1 (23.6)				87.1 (20.1)				65.4 (24.5)			
Female	75.0 (22.0)	0.979	NE	NE	85.1 (20.3)	0.636	NE	NE	64.9 (23.8)	0.914	NE	NE
Marital status												
Single/widowed/divorced/ separated (ref)	74.5 (21.9)				83.3 (18.1)				63.9 (20.8)			
Married	75.2 (23.3)	0.912	NE	NE	87.1 (20.8)	0.482	NE	NE	65.5 (24.9)	0.800	NE	NE
Ethnicity												
Non-Chinese (Malay/ Indian/others) (ref)	75.1 (22.3)				86.7 (19.8)				65.7 (23.1)			
Chinese	75.0 (26.9)	0.988	NE	NE	84.4 (24.0)	0.688	NE	NE	62.2 (30.5)	0.607	NE	NE
Clinical variables												
Cancer stage												
Stage III (ref)	78.9 (22.0)				89.7 (20.0)				71.8 (24.0)			
Stage IV	74.5 (23.1)	0.529	NE	NE	85.9 (20.4)	0.529	NE	NE	64.3 (24.2)	0.295	NE	NE
Time since diagnosis												
<1 year (ref)	75.8 (22.4)				86.8 (20.2)				66.9 (23.3)			
≥1 year	73.8 (24.2)	0.690	NE	NE	85.7 (20.8)	0.782	NE	NE	62.0 (25.7)	0.331	NE	NE
Surgery												
No (ref)	72.6 (23.5)				84.9 (20.7)				63.1 (24.3)			
Yes	86.6 (16.2)	0.018	−10.38 (4.13)	<0.05	93.5 (17.3)	0.102	NS	NS	75.0 (21.6)	0.058	NS	NS
Systematic treatment												
Chemotherapy only (ref)	75.3 (22.6)				84.8 (21.2)				66.2 (23.9)			
Chemotherapy and radiotherapy	74.8 (23.9)	0.920	NE	NE	89.2 (18.5)	0.300	NE	NE	63.5 (24.8)	0.596	NE	NE
Number of comorbidities	−0.326	<0.01	−4.93 (2.29)	<0.05	−0.113	NS	NE	NE	−0.200	<0.05	NS	NS
Functional status												
ECOG PS												
0-1 (ref)	83.5 (19.0)				92.8 (13.3)				72.1 (21.3)			
≥2	64.3 (23.2)	<0.001	NS	NS	78.2 (24.6)	<0.001	NS	NS	56.3 (25.0)	<0.001	NS	NS
IADL	0.469	<0.01	NS	NS	0.452	<0.01	2.65 (1.06)	<0.05	0.477	<0.01	3.93 (1.29)	<0.01
Unmet supportive care needs												
Physical and daily living	−0.546	<0.01	NS	NS	−0.434	<0.01	NS	NS	−0.485	<0.01	NS	NS
Psychological	−0.700	<0.01	−0.71 (0.08)	<0.001	−0.527	<0.01	−0.36 (0.10)	<0.001	−0.516	<0.01	−0.43 (0.11)	<0.001
Sexual	0.078	NS	NE	NE	−0.138	NS	NE	NE	−0.002	NS	NE	NE
Patient care	−0.202	<0.01	NS	NS	−0.194	<0.05	NS	NS	−0.091	NS	NE	NE
Health system and information	−0.167	NS	NE	NE	−0.323	<0.01	−0.29 (0.11)	<0.001	−0.178	NS	NE	NE
R^2			0.538				0.369				0.329	

β: Regression coefficient; SE: Standard error of the regression coefficient; NE: Not entered into the multivariate regression model; NS: Not significant in the analysis; IADL: Lawton and Brody's index Instrumental Activity of Daily Living; SCNS-SF34: 34-item Supportive Care Needs Survey Short Form; EORTC QLQ C30: European Organization for Research and Treatment of Cancer Core-30-item quality of life questionnaire, SD: Standard deviation

intervention. Ongoing assessment of psychological needs is particularly considered as an effective strategy to ensure the adequate care that is delivered to advanced lung cancer patients. Furthermore, health-care providers should be aware of the importance of poor functional status in reducing HRQOL of patients, Great efforts should be directed to meet the patients' needs for services or help in household management. Future interventions incorporating functional assistance and psychological support may increase HRQOL in this population. There is a need for research on the type

and level of assisted services or rehabilitation programs that can improve functional status for lung cancer patients.

Conclusion

This study found that poor functional status and supportive care needs, particularly in physical and psychological domains are common in advanced lung cancer patients. Higher level of psychological needs and functional status are associated with HRQOL in most domains. These findings should be useful for health-care providers in developing appropriate supportive or palliative care interventions for patients with advanced lung cancer.

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Conflicts of interest

There are no conflicts of interest.

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