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QOL in Asthma

Health Related Quality of Life in relation to Asthma - Data from a Cross Sectional Study

Jae Ho Chung¹, Chang Hoon Han^{2,*}

¹Department of Internal Medicine, International St. Mary's Hospital, Catholic Kwandong University College of Medicine, Incheon, Republic of Korea

²Department of Internal Medicine, National Health Insurance Service Ilsan Hospital, Goyang, Republic of Korea

*Corresponding Authors: Chang Hoon Han, MD, Address: Chang Hoon Han, MD; Department of Internal Medicine, National Health Insurance Service Ilsan Hospital, 100-lsan-ro, Ilsan-donggu, Goyang-shi Kyunggi-do, Republic of Korea, 10444 Tel.: +82 31 900 3293; fax: +82 31 900 0343. E-mail: hch7001@hanmail.net

ABSTRACT

Objectives: The aim of this study was to examine the effect of adult asthma on health-related quality of life (HRQoL) and psychological factors using the results of a cross-sectional nationwide survey. **Methods:** Data were obtained from 229,131 participants (5,989 with asthma and 223,142 without asthma) in the 2010 Korean Community Health Survey. We compared EuroQol (EQ)-5D and EQ-visual analogue scale (VAS) scores after adjusting for sociodemographic and psychosocial factors, as well as for comorbidities. Multiple logistic regression analysis was used to explore determinants of the lowest quartile HRQoL in the asthma group.

Results: The mean EQ-5D and EQ-VAS scores were significantly lower in the asthma group (EQ-5D, 0.82; EQ-VAS, 64.2) compared with the non-asthma group (EQ-5D, 0.90; EQ-VAS,

73.2) ($P < 0.001$). The multivariate odds ratio (OR) for the lowest quartile of EQ-VAS in the asthma group versus the non-asthma group was 1.17 (95% confidence interval (CI), 1.04–1.32) and the OR for the lowest quartile of EQ-5D in the asthma group versus the non-asthma group was 1.47 (95% CI, 1.18–1.84). Asthma subjects were more likely than those without asthma to have some or severe problems with pain (OR, 1.34; 95% CI, 1.16–1.56) and anxiety/depression (OR, 1.08; 95% CI, 1.03–1.56).

Conclusion: We found that asthma was associated with impaired HRQoL, particularly with some or severe problems with anxiety/depression.

Keywords

Asthma, QoL

INTRODUCTION

Asthma is a chronic disease of the upper respiratory tract that occurs as a result of bronchial hyperinflammation and airway hyperresponsiveness. Patients with this disease have a high risk of asthma-associated mortality and hospitalization and experience significant impairment in their quality of life (QoL) (1). QoL and its assessment have become increasingly important in healthcare, especially in the field of chronic diseases such as asthma. Therefore, international guidelines for asthma treatment aim to improve the QoL of patients by achieving and maintaining long-term control of the disease, minimizing symptoms, and improving physical, psychological, and social function. Indeed, improvements in health-related quality of life (HRQoL) may be more reflective of treatment success, compared with physiological endpoints such as spirometric measures of lung function (2). Several questionnaires for the assessment of HRQoL have been created. Some are used for specific diseases, others are used more generally (3). The EuroQol five-dimensional (EQ-5D) questionnaire is a good tool for measuring HRQoL, is applicable not only to healthy people but also to patients with specific diseases, its effectiveness and reliability with respect to asthma have been proven (3) and it is considered useful for cross-sectional studies (4). To date, there have been few reports on the association between asthma and HRQoL using the EQ-5D index (5) (6). To our knowledge, there is no study of the association between asthma and HRQoL using the EQ-5D index in a Korean population. In the present study, we examined the association between asthma and HRQoL and compared it with HRQoL in the general Korean population using data from a nationwide population-based health survey (The 2010 Korean Community Health Survey). **This assessment of HRQoL in**

asthma patients study might be helpful for healthcare providers, eventually leading to the development of health education and prevention programs for improving HRQoL in asthma.

METHODS

Study participants

The data used in this study were obtained from the 2010 KCHS (<https://chs.cdc.go.kr/chs/index.do>), which was undertaken by the Korea Centers for Disease Control and Prevention (KCDC). The KCHS, a nationwide cross-sectional health interview survey conducted annually since 2008, investigates patterns in disease prevalence and morbidity, as well as personal lifestyle and health-related behaviors, in adults aged 19 years or older. The sample size for the KCHS is 900 participants in each of 253 community units, including 16 metropolitan areas and provinces. The KCHS anticipates a total of 227,700 survey participants per year, but the actual number of respondents approximates to 230,000. The KCHS has a two-stage sampling process. The first stage involves the selection of a sample area (urban village/hamlet/rural village) as a primary sampling unit according to the number of households in the area using a probability, proportional to the size sampling technique. In the second stage, sample households are selected in each sample area (urban village/hamlet/rural village) using systematic sampling methods. This process ensures that sample units are representative of the entire population (Z). For the sample to be statistically representative of the population, data from the survey are weighted based on the sample design. The KCHS uses interviewers trained in computer-assisted personal interviewing techniques to collect information. The KCHS is conducted by an interviewer who visits the selected sample households and conducts one-on-one

interviews with all adults aged ≥ 19 years using an indirect entry method. The interview takes approximately 20–30 min/person.

The Institutional Review Board of the KCDC approved the study protocol (2010-02CON-22-P), and all participants provided written informed consent. In total, 229,229 individuals participated in the 2010 survey. This study was based on 229,131 participants, excluding 99 with insufficient data to confirm a diagnosis of asthma. The diagnosis of asthma was based on an answer of “yes” to the question “Were you diagnosed with asthma by a physician?”, to avoid the bias associated with subjective assessment. The final analysis identified 5,989 individuals who had been diagnosed with asthma by a physician.

Socioeconomic and Demographic factors

Age, household income, residency region, occupation, and marital status were included as sociodemographic factors in the analysis. Household income was grouped into four household income quartiles. Education level was categorized into four groups: elementary school or lower, middle school, high school, and college or higher. The residency regions were categorized into urban or rural. Occupational status was divided into employed and unemployed (including housewife and student). Individuals who had smoked five packs (100 cigarettes) or more in their lifetime and currently smoked were classified as ‘smokers’, whereas others belonged to the ‘never-smoker’ group (8). Individuals were defined as risky drinkers if they reported 12 or more binge drinking episodes (consumption of five or more alcoholic beverages in a single day) during the previous year (9). Marital status was categorized as ‘married’ or ‘other’ (single, separated, divorced, or widowed). Regular exercise was defined as routine walking on at least five occasions per week for at least 30 min each time or engaging in regular moderate (at least five

times per week for 30 min) or strenuous (at least three times per week for 20 min) exercise, as defined by the American College of Sports Medicine Guidelines (10), during the survey period. Sleep time refers to self-reported data in response to the question, “How many hours do you usually sleep per day?”. Responses were categorized into five groups: ≤ 5 , 6, 7, 8, or ≥ 9 h. We considered ≤ 5 h as ‘short sleep’ and ≥ 9 h as ‘long sleep’ (11). Participants reported their level of stress as none, mild, moderate, or severe. Depression was screened using the Korean version of the World Health Organization (WHO) Composite International Diagnostic Interview-Short Form (CIDI-SF), which has been validated as a cost-effective screening instrument that can be easily integrated into health surveys (12). The WHO CIDI-SF includes questions such as “In your lifetime, have you ever had 2 weeks or more when nearly every day you felt sad, blue, or depressed?” To assess depression, subjects answered “yes” or “no” to a question regarding whether they had experienced a depressive mood for 2 or more continuous weeks during the previous year. Diabetes mellitus (DM), hypertension, and stroke were determined by a self-administered questionnaire, as follows: “Have you ever been diagnosed with DM/hypertension/stroke by a doctor? Yes or no?”

HRQoL measures

HRQoL was evaluated using the EQ-5D questionnaire. The EQ-5D is a brief, self-completed instrument for describing and evaluating quality of health states defined by the EQ-5D index. The EQ-5D asks respondents to simply “mark an X on the scale to indicate how your health is today” and then to “write the number you marked on the scale in the box below.” The descriptive system comprises five dimensions: (1) mobility, (2) self-care, (3) usual activities, (4) pain/discomfort, and (5) anxiety/depressive mood. Responses within each dimension were

divided into EQ-5D score categories: no problem, moderate problem, or extreme problem. Average scores of the EQ-5D index were calculated to assess HRQoL, which is a preference-based health status index (13) (14).

HRQoL should be interpreted with caution because it has socially and culturally dependent characteristics (15). Because the preference weights of Koreans are markedly different from those of Caucasians, we used Korean-specific preference weights to generate EQ-5D index scores (14). We were unable to measure HRQoL using tools other than the EQ-5D and EQ-VAS. The most frequently used generic HRQoL questionnaires are the Short-Form Health Surveys (SF-36) and EQ-5D. The EQ-5D is a generic HRQoL questionnaire that, although not specific for asthma, is considered valid for cross-sectional population studies of patients with this disease (4).

Average scores of the EQ-5D index ranged from -0.17 to 1 , where 1 indicates no problem in any of the five dimensions, zero indicates death, and negative values indicate health statuses worse than death. In addition, respondents assessed their health status using a visual analogue scale (VAS). The VAS recorded the respondent's self-rated health on a 20-cm vertical scale with endpoints labeled "the best health you can imagine" and "the worst health you can imagine." This information can be used as a quantitative measure of health as judged by the individual respondent. The scores ranged from 0 (worst imaginable health state) to 100 (best imaginable health state) (16).

Data analysis

All sampling and weight variables used in the present study were stratified, and SPSS survey procedures (SPSS Inc., Chicago, IL, USA) were used for all statistical analyses to ensure

appropriate estimates and standard errors. Survey sample weights were used for all statistical procedures to produce non-biased estimates for the descriptive and analytical data analyses. Descriptive statistical methods were used to examine the basic characteristics of the study population, and numbers and percentages were reported for each variable. All clinical characteristics were compared using chi-square tests for categorical variables. Means of continuous variables were compared between groups using Student's t-test. Wilcoxon's rank-sum test was used to compare family income, education, stress, and sleep between groups. **Some confounding factors such as gender, age, body mass index (BMI) (17), number of co-morbid medical problems and physical activity (18) also lower HRQoL.** P-values < 0.05 were considered statistically significant. A multivariate logistic regression analysis was also performed, adjusting for age, sex, BMI, co-morbid diseases, income status, residency, education level, marital status, alcohol, smoking, and regular exercise.

RESULTS

Of the 229,131 respondents, 5,989 (2.6%) reported that they had been diagnosed with asthma. The characteristics of participants with and without asthma are shown in Table 1.

The mean age of the asthma group was significantly higher than that of those without asthma. Sex, smoking, alcohol drinking, regular exercise, marital status, employment status, household income, education level, marital status, BMI, and the presence of co-morbid diseases (diabetes, hypertension, and stroke) were also significantly different between the two groups.

Table 2 shows the associations between asthma and psychological health and QoL parameters. Asthma group was related to short (≤ 5 h) or long (≥ 9 h) sleep durations ($P < 0.001$). The level of

severe psychological stress, self-reported depressive symptoms lasting more than 2 weeks in a row, and a diagnosis of depression by a doctor were significantly higher in the asthma group than in the non-asthma group. The mean EQ-5D index and EQ-VAS scores were significantly lower in the asthma group than in the group without asthma. The mean EQ-5D index score was 0.82 (95% confidence interval (CI), 0.74–0.91) for those with asthma group and 0.90 (95% CI, 0.82–0.99) for those without asthma group ($P < 0.001$). The mean EQ-VAS score was 64.2 (95% CI, 55.7–73.6) for those with asthma and 73.2 (95% CI, 64.7–82.3) for those without asthma ($P < 0.001$). The asthma group also presented a higher proportion of participants who reported “some or severe problems” in all five dimensions of the EQ-5D, in comparison with the non-asthma group. In total, 39.4% of those with asthma group had problems with mobility, 16.8% with self-care, 33.2% with usual activities, 51.0% with pain/discomfort, and 25.6% with anxiety/depression; for subjects without asthma group, the percentages were 14.8%, 5.1%, 11.9%, 24.2%, and 11.3%, respectively.

Table 3 presents the differences in psychological health and HRQoL between the subjects with and without asthma group after adjusting for age (Model 1) and for age, sex, BMI, co-morbid diseases, income status, residency, education level, marital status, alcohol, smoking, and regular exercise (Model 2). In both models, asthma group was more likely than those without asthma to have some or severe problems with pain (Model 1: odds ratio (OR), 1.38; 95% CI, 1.28–1.49, Model 2: OR, 1.34; 95% CI, 1.16–1.56) and anxiety/depression (Model 1: OR, 1.13; 95% CI, 1.04–1.23, Model 2: OR, 1.08; 95% CI, 1.03–1.56). The multivariate OR for the lowest quartile of EQ-VAS in the asthma group versus the non-asthma group was 1.32 (95% CI, 1.25–1.41) in Model 1 and 1.17 (95% CI, 1.04–1.32) in Model 2, and the OR for the lowest quartile of EQ-5D

in the asthma group versus the non-asthma group was 1.28 (95% CI, 1.14–1.44) in Model 1 and 1.47 (95% CI, 1.18–1.84) in Model 2.

DISCUSSION

In the overall Korean population, we found that asthma was associated with poor HRQoL when assessed with the EQ-5D questionnaire even after adjusting for sociodemographics and co-morbid conditions. A secondary finding of this study was that subjects with asthma showed greater odds of having some or severe problems with anxiety/depression.

Although there is a well-known relationship between asthma and psychological factors, the influence of psychological stress on the health of asthma patients and the determinant factors of psychological stress are not well established (19). Our study showed that asthma group with anxiety/depressive symptoms reported worse HRQoL. This is consistent with other observed studies, where asthma patients with anxiety and/or depression had worse QoL (20) (21) (22). Our previous study (23) showed that asthma group experienced more severe stress, a depressive mood lasting longer than 2 weeks, suicidal ideations, and a greater number of suicide attempts than non-asthma patients.

The mean EQ-VAS score in our study was 64.2 in asthma group. In a study by Burström et al. (24), the mean EQ-VAS score was 85 in asthma patients. **The EQ-VAS self-rating records the respondent's own assessment of their health status. So the lower EQ-VAS score in our study may reflect the low self-assessment of asthma status compared with other studies.**

Our study also showed that a short sleep duration (≤ 5 h) was associated with poor HRQoL in asthma group. Poor quality sleep has been reported in asthma patients and may have a negative effect on lung function, daytime activities, and QoL (25) (26) (27). Sleep disturbances are

common in asthma patients and are associated with poor HRQoL. Therefore, clinicians caring for asthma patients may need to take a more detailed sleep history for such patients.

There are several limitations to our study. First, the cross-sectional study design prevented us from determining an exact cause-and-effect relationship. Future prospective studies are required to better elucidate the causal relationships between asthma and HRQoL. Second, the diagnosis of asthma was based on a self-reported questionnaire only, and thus the reliability of the diagnosis may be controversial. Third, we were unable to measure HRQoL using tools other than the EQ-5D and EQ-VAS. The most frequently used generic HRQoL questionnaires are the Short-Form Health Surveys (SF-36) and EQ-5D. The EQ-5D is a generic HRQoL questionnaire, and although not specific for asthma it is considered valid for cross-sectional population studies of patients with this disease (4).

HRQoL should be interpreted with caution because it has socially and culturally dependent characteristics (15). Because the preference weights of Koreans are markedly different from those of Caucasians, we used Korean-specific preference weights to generate EQ-5D index scores (14). Fourth, although there were a number of statistically significant findings, these should be interpreted with caution because our study had a very large sample size. Finally, this cross-sectional study was inherently constrained by the retrospective use of an existing health dataset, and we did not assess the severity of asthma (although the dataset does include several variables of interest). Therefore, future prospective studies including the severity of asthma are required to clarify whether disease-specific HRQoL tools to assess the association between asthma and HRQoL might prove useful if a prospective design were possible.

Despite these limitations, the strength of our study lies in the fact that the data were obtained from a nationwide population survey with a high response rate (93.8%) and therefore provided representative information on the Korean population.

In conclusion, we found that asthma was associated with impaired HRQoL, in particular the presence of some or severe problems with anxiety/depression. The analyses show that asthma could potentially lead to a deterioration in HRQoL; therefore, therapeutic approaches should have a greater focus on improving anxiety/depression. Our findings suggest the need for physicians to screen for HRQoL and provide psychosocial support, as well as interventions for the management of asthma patients, which could eventually lead to the successful development of health education and prevention programs.

Conflict of interest

The authors declare no conflict of interest

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Author contributions

All authors contributed conception, analysis, interpretation, revising, and final approval of the manuscript. JH Chung served as a principal investigator and had full access to all of the data in the study. CH Han take responsibility for the integrity of the data and the accuracy of the data analysis.

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Table 1. Sociodemographic and Clinical Characteristics of the Study Sample by asthma status

	No asthma (n=223142)	Asthma (n=5989)	P-value
Age (years)	50.0 ± 0.1	61.0± 0.2	<0.001
Sex (Male %)	121129 (54.3)	3469 (57.9)	<0.001
Smoking status			<0.001
Smoker	81824 (36.7)	2455 (41.0)	
Non-smoker	141262 (63.3)	3532 (59.0)	
Risky Alcohol drinking	56426 (25.3)	910 (15.3)	<0.001
Regular exercise	21835 (33.2)	550 (26.4)	<0.001
Marital status			<0.001
Married	152397 (68.4)	3644 (60.9)	
Other (Single,divorced,separated,widowed)	70474 (31.6)	2339 (39.1)	
Job	126163 (60.4)	2399 (42.0)	<0.001
Family income			<0.001
Low	60153 (20.6)	2667 (48.6)	
Moderate-low	55651 (27.4)	1150 (21.0)	
Moderate-high	38830 (18.6)	654 (11.9)	
High	49389 (24.3)	1017 (18.5)	
Residency			<0.001
Rural	98782 (44.3)	3021 (50.4)	
Urban	124360 (55.7)	2968 (49.6)	
Education			<0.001
≤Elementary	57996 (26.1)	3098 (51.9)	

Middle school	25820 (11.1)	723 (12.1)	
High school	66145 (29.7)	1102 (18.5)	
≥ College	72609 (32.6)	1049 (17.6)	
Body mass index, kg/m²	22.9 ± 0.1	23.2 ± 0.1	<0.001
Diabetes Mellitus	17506 (7.8)	824 (13.0)	<0.001
Hypertension	46775 (21.0)	2184 (36.5)	<0.001
Stroke	4314 (1.9)	282 (4.7)	<0.001

Values are presented as number (%) or mean ± SD.

Regular exercise was defined as moderate or strenuous exercise performed on a regular basis (>30 min at a time five times per week for moderate exercise; >20 min at a time five times per week for strenuous exercise) or walking >30 min at a time more than five times per week.

Table 2. Comparison of the psychological health, EQ-5 Dimensions, EQ-VAS, and EQ-5D index according to asthma status

	No asthma (n=223142)	Asthma (n=5989)	P-value
Sleep duration, h			<0.001
≤5	31697 (14.2)	1344 (22.5)	
6	61850 (27.7)	1516 (25.3)	
7	72926 (32.7)	1540 (25.7)	
8	46212 (20.7)	1142 (19.1)	
≥9	10285 (5.7)	1142 (19.1)	
Psychological stress (severe, %)	44699 (20.1)	1483 (24.8)	<0.001
Depressed mood (2 weeks in a row, %)	12036 (5.4)	683 (11.4)	<0.001
Depression diagnosis (yes, %)	4963 (2.2)	340 (5.7)	<0.001
Psychological counseling (yes, %)	1656 (2.9)	195 (5.5)	<0.001
EQ-5D index score, mean (95% CI)	0.90 (0.82-0.99)	0.82 (0.74-0.91)	<0.001
EQ-5D visual analog score, mean (95% CI)	73.2 (64.7-82.3)	64.2 (55.7-73.6)	<0.001
EQ-5D			
Problem with mobility (no., %)			<0.001
No problem	189891 (85.1)	3628 (60.6)	
Some problems	31767 (14.2)	2194 (36.6)	
Severe problems	1443 (0.6)	166 (2.8)	
Problem with self-care (no., %)			<0.001
No problem	211718 (94.9)	4988 (83.3)	
Some problems	9846 (4.4)	854 (14.3)	
Severe problems	1553 (0.7)	147 (2.5)	
Problem with usual activity (no., %)			<0.001<0.001
No problem	196643 (88.1)	3998 (66.8)	
Some problems	24243 (10.9)	1761 (29.4)	
Severe problems	2235 (1.0)	230 (3.8)	
Problem with pain/discomfort (no., %)			<0.001

No problem	169179 (75.8)	2933 (49.0)	
Some problems	49023 (22.0)	2503 (41.8)	
Severe problems	4909 (2.2)	533 (9.2)	
Problem with anxiety/depression (no., %)			<0.001
No problem	197809 (88.7)	4479 (74.4)	
Some problems	23331 (10.5)	1331 (22.3)	
Severe problems	1818 (0.8)	198 (3.3)	

Values are presented as number (%) or mean $\pm$ SD.

Table 3. Adjusted Odds Ratio of asthma for psychological health, EQ-VAS and some or severe problems in EQ-5D Dimensions.

	No asthma	Asthma	
	Model 1	OR (95% Confidence interval)	P-value
Sleep duration (≤ 5 hr)	Reference	1.23 (1.16-1.32)	<0.001
Depressed mood (2 weeks in a row)	Reference	1.44 (1.31-1.57)	
EQ-VAS (lowest quartile, %)	Reference	1.32 (1.25-1.41)	<0.001
EQ-5D (lowest quartile, %)	Reference	1.28 (1.14-1.44)	<0.001
EQ-5D			
EQ-1 (some or severe): physical activity	Reference	1.08 (0.97-1.21)	0.197
EQ-2 (some or severe): self-control	Reference	1.09 (0.99-1.19)	0.094
EQ-3 (some or severe): daily activity	Reference	1.06 (1.28-1.49)	0.256
EQ-4 (some or severe): pain	Reference	1.38 (1.28-1.49)	<0.001
EQ-5 (some or severe): anxiety/depression	Reference	1.13 (1.04-1.23)	0.009
	Model 2		
Sleep duration (≤ 5 hr)	Reference	1.16 (1.03-1.31)	0.017
Depressed mood (2 weeks in a row)	Reference	1.32 (1.11-1.56)	0.001
EQ-VAS (lowest quartile, %)	Reference	1.17 (1.04-1.31)	0.009
EQ-5D (lowest quartile, %)	Reference	1.47 (1.18-1.84)	0.001
EQ-5D			
EQ-1 (some or severe): physical activity	Reference	1.09 (0.88-1.35)	0.443
EQ-2 (some or severe): self-control	Reference	1.16 (0.99-1.37)	0.067
EQ-3 (some or severe): daily activity	Reference	0.96 (0.79-1.15)	0.666
EQ-4 (some or severe): pain	Reference	1.34 (1.16-1.56)	<0.001
EQ-5 (some or severe): anxiety/depression	Reference	1.08 (1.03-1.56)	0.314

Model 1; age adjustment; Model 2; age, sex, BMI, co-morbid diseases, income status, residency, education level, marital status, alcohol, smoking and regular exercise adjustment. CI: confidence interval, EQ-VAS: visual analog scale.