Original Research

Estimation of Health Utilities Based on the Response to Treatment in Atopic Dermatitis: a Population-based Study

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ABSTRACT

Purpose: This study estimated utility weights based on the response to treatment for atopic dermatitis in the general population.

Methods: The Korean general population aged 20−60 years was stratified by using a random sampling method based on age and sex. Two hypothetical health states of atopic dermatitis were developed: response to treatment and no response to treatment. Health utility values were estimated by using time trade-off (TTO) based on a period of 10 years, TTO based on life expectancy, and EuroQol 5-Dimension (EQ-5D) including a visual analog scale (VAS). The mean utility value and 95% CI were derived, and comparisons of subgroups using the *t* test and ANOVA were performed. We conducted a multilevel analysis after controlling the sociodemographic variables to consider repeated measures.

Findings: A total of 155 participants were included in the survey. Their mean age was 39.7 years; 58.7% of participants were women. The mean health utility values for response and no response using TTO based on 10 years were 0.847 and 0.380, respectively. The estimated health utility values of response and no response were 0.865 and 0.476 using TTO based on life expectancy, and 0.814 and 0.279 using EQ-5D. For VAS, the response and no response were 0.744 and 0.322. After controlling the covariates, the important factors that affected utility values were response and no response to treatment ($P < 0.001$).

Implications: This study showed that the utility weights of people with no response to atopic dermatitis treatment were lower compared with response from the general population. Health care providers should therefore consider symptom control as an important factor affecting the quality of life of those with atopic dermatitis. (*Clin Ther*. 2019;41:700−713)

Key Words: atopic dermatitis, EQ-5D, quality of life, time trade-off, utility weights, visual analog scale.

INTRODUCTION

Atopic dermatitis is a chronic inflammatory skin disease that includes skin lesions and itching.[1] Its prevalence is 15%−25% for all age groups, especially in Western countries, and it commonly occurs during infancy or childhood.[2] The annual number of adults with atopic dermatitis estimated about 2%−3% in Western countries.[3] Some studies reported up to 10%.[4] In South Korea, the prevalence of adult patients with atopic dermatitis was 3.4% according to the 2016 Korea National Health and Nutrition Examination Survey.[5] The number of inpatients with atopic dermatitis in South Korea

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increased from 759 in 2007 to 1264 in 2011, and the reported annual rate of increase in severe atopic dermatitis was 13.6%.[6] As the disease's severity increases, comorbidities appear, including allergic and ophthalmic diseases such as asthma, allergic rhinitis, conjunctivitis, alopecia, skin infection, cataracts, keratoconus, and glaucoma, as well as cutaneous conditions such as bleeding, skin cracks, and secondary infections. Incidence of mental diseases, such as sleep disorders and anxiety, and the burden of disease were increased. Annual medical costs associated with severe dermatitis were higher than with mild atopic dermatitis (incremental medical cost of $7313 per patient). The annual medical cost of mild atopic dermatitis was $10,156.[7]

The symptoms of atopic dermatitis occur on any body part, including the face, neck, and ears, and recurrences are frequent.[1] Patients have difficulties with interpersonal relationships and their social life, and they experience mental health problems such as nervousness and depression. As a result, patients with atopic dermatitis are more likely to experience suicidal ideation than the general population; in fact, 1 in 5 patients with severe atopic dermatitis has considered suicide.[8]

Atopic dermatitis leads to a low quality of life because of its physical, social, and psychological aspects. The focus of treatment for atopic dermatitis should be on improving the overall quality of life by alleviating symptoms and preventing deterioration and recurrence. It is therefore important to assess improvements in quality of life after treatment for atopic dermatitis. However, many previous studies estimated the quality of life regardless of response to treatment, although this factor could highly affect quality of life in patients with atopic dermatitis.[9–11] Studies on the quality of life, especially utility weights, of people with and without a response to treatment have been limited. In addition, studies measuring the quality of life of adults with atopic dermatitis are limited; however, many studies have focused on the quality of life of children with atopic dermatitis,[12–15] even though the number of adults with atopic dermatitis has recently increased.

Utility could be measured in various groups such as the general population, patients, and health care providers. Health utility values are recommended measurements for the general population in the guidelines of cost-effectiveness studies.[16–18] Measuring health utility values in patients can help in their understanding of the disease. However, when patients adapt to their disease, they might report higher utility values than the general population.[18] In some cases, patients evaluate the utility weights higher than the general population; in general, however, it is known that patients evaluate utilities lower than or similar to the general population.[19–21] Gandjour[22] noted that the heath utility values of patients with chronic disease could be overestimated because patients might have adapted to their health status. Atopic dermatitis is a chronic disease that usually occurs during childhood,[1,2] and most patients with this condition have not experienced good health. In the economic perspective, the utility values recommend based on preferences of the general population because the amount of resource should be allocated to the general population.[16,17]

Moreover, in the general population, direct methods of assessments have been recommended over indirect methods of measurements.[17] The direct method is to measure preference directly onto the utility scale, whereas the indirect method is based on mapping preferences onto the utility scale indirectly by using a generic health questionnaire. To calculate utilities in the indirect method, the equation called tariff or weight is needed.[23] Among the direct methods, the standard gamble was recommended as the gold standard because of its reflection of real-world situations, including uncertainties.[17] Standard gamble estimates utilities for the health state by comparing a specific number of years in the health state that we want to measure for a certain gamble offering 2 reference outcomes (typically full health for the same number of years and immediate death).[24] However, the time trade-off (TTO) method is preferred in some cases because participants had difficulty understanding the concept of probabilities, and the implementation was easy.[25,26] The utility value of TTO was derived to select t years in a specific health state to x years in full health.[24] Moreover, the EuroQol 5-Dimension (EQ-5D), which is an indirect method, was used to measure health utility values. EQ-5D is a generic measure using simple description and a single index value.[27] The validity, discriminatory ability, and reliability of EQ-5D were good in general population and patients.[28–30] We therefore additionally measured utilities by using the EQ-5D.

The goal of the present study was to estimate the utility weights of people with response to treatment and people

with no response to treatment for atopic dermatitis from the perspective of the general population.

SUBJECTS AND METHODS

Study Population and Survey Procedure

A sample (N = 155) was recruited from the Korean general population aged 20−60 years. The sample size was based on a previous study that estimated the utility weights of people with atopic eczema and included 139 participants ($\alpha = 0.05$ [two-sided]; width = 0.05; SD = 0.05).[31] We aimed to include ~150 participants because of the possibility of missing data. A stratified random sampling method based on age that reflected the total population of South Korea was used, and each stratified cell included >30 participants. The proportions of male and female participants were based on the distribution of atopic dermatitis (*International Classification of Diseases, Tenth Revision*, code L20) in South Korea from 2010 to 2016 (40% men and 60% women).[32] The Public Institutional Bioethics Committee designated by the Ministry of Health and Welfare approved the study protocol, including the study design, interview questionnaire, and informed consent form (P01-201805-22-006). Written informed consent was obtained from all participants.

We conducted a gang survey in May 2018, in which several participants could attend one facility at one time with the help of a moderator.[33] The process is similar to a face-to-face survey with an investigator. The only difference in a gang survey is that the participants gather at a specific time and specific facility at the same time, whereas in the face-to-face survey, individuals were asked one at a time. In our study, the survey was conducted by 1 moderating group. The main investigator explained the health utility questionnaire, and 4 investigators assisted the participants with the questions. Participants answered by self-report measure. This method can minimize bias in consistency and allows investigation of complicated issues that can be difficult to explain. The survey was conducted 4 times with ~40 participants.

HEALTH STATES AND QUESTIONNAIRE

Descriptions of atopic dermatitis and hypothetical health states were developed from the results of an in-depth interview of 20 dermatologists and 10 patients with atopic dermatitis in Seoul and its metropolitan area of South Korea to clearly reflect the health status of patients with atopic dermatitis. In addition, the scenario has been confirmed by 3 consultations with a specialist on atopic dermatitis, which included a detailed explanation of the disease and pictures. Before the main survey, we conducted a pilot survey involving 33 participants from the general population to test the questionnaire and to determine if any likely adjustments or revisions were necessary.

The questionnaire comprised 3 parts: participants' health; estimation of utility values for health states in atopic dermatitis using TTO, 5-level EQ-5D (EQ-5D-5L), and a visual analog scale (VAS); and socioeconomic characteristics of the participants. Participants answered questions regarding 2 hypothetical health states of atopic dermatitis: response to treatment (scenario 1, response) and no response to treatment (scenario 2, no response). They answered the questions while considering the hypothetical health conditions as their own health conditions.

Atopic dermatitis was described through review of previous studies and included both overall descriptions and specific descriptions by using the dimensions of 2 scenarios (response and no response). The definition, causes, symptoms, severity, disease progression, treatment goal, and the characteristics of atopic dermatitis in adult patients were included in the overall description. The specific description included the general symptoms,[31,34,35] comorbidities such as infection, eye disease, and allergic disease,[36−41] effect on sleep,[31,42] effect on mental health,[8,34,43] and effect on usual activities.[31,34,42,44,45] Each component was described by the health status of response and no response (Table I). The scenario was similar to a previous study about atopic eczema[31]; however, our scenario added a detailed explanation according to the characteristics and health states of patients with atopic dermatitis in South Korea.

VARIABLES

Health Utility Measures

TTO

The TTO, which was developed by Torrance,[25] is a direct method of measuring health utility values. The participants selected either the x period with perfect health or the t period with a health status scenario. The utility value was estimated to find the x period with trade-off t, and then x/t was calculated as the utility value.[17] For example, if a participant

Table I. Description of health status.

Variable	Health Status	
	Response	No Response
General characteristics	Response to treatment; transient symptom when trigger factors were contacted	No response to treatment; persistent symptoms; severe symptom when trigger factors were contacted
Symptoms	Mild itching, scaling, and fissures in small portion of the inner hand, medial side of the knees, neck, and face; exacerbation rare	Severe itching, scaling, fissure, lichenification, bleeding, and pain in large portion of back, leg, thigh, and face; frequently relapsing or persistent disease
Comorbidities	Low risk of skin infection and eye disease (eg, cataract and retinal detachment)	High risk of skin infection, eye disease (eg, cataract and retinal detachment), and allergic disease (eg, asthma, allergic rhinitis, conjunctivitis)
Effect on sleep	Mild sleep disturbance	Persistent sleep disturbance; lack of sleep
Effect of mental health	Generally little effect on self-esteem and stress	Substantial impact on self-esteem and stress; frequently experience depression; suicidal ideation in 10%
Effect on usual activities	Little effect on daily activities, leisure, and work; rarely affected by occupation with skin-irritating activities	Substantial impact on daily activities, leisure, and work; intermittent sick leave; highly affected by occupation with skin-irritating activities

answered that 4 years of life with perfect health was the same as 10 years of life with a health status scenario, the utility weight was then 0.4 (4 of 10). Several previous studies used a base period of 10 years because participants were able to understand it better.[46,47] However, the specific time frame that could be used as the gold standard was not determined.[48] Therefore, TTO was also estimated by using the life expectancy period of the general population. This period was set as 45 years because the median age of the survey population was 40 years (range, 20–60 years) based on the 2016 Life Table of South Korea.[49]

EQ-5D

The EQ-5D was developed by the EuroQol group and is an indirect method of measuring utility values with the tariff. It has been widely used as a multi-attribute utility instrument; the 3-level (EQ-5D-3L) version was commonly used in clinical trials before the EQ-5D-5L was developed by Herdman et al.[50] The EQ-5D-3L had some limitations caused by the high ceiling effect when trying to detect differences in health status or improvements in an individual's health.[51–53] Therefore, the present survey included the EQ-5D-5L, and the utility values were calculated by using the Korean value set.[30] The EQ-5D comprises 5 dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) and 5 levels (none, slight, moderate, severe, and extreme problems). Participants use 1 level to describe each dimension.

The EQ-5D also included the VAS. The EQ-VAS was used to measure individual's preference with a 100-point scale. Participants marked their own health status or hypothetical health status on the scale. Although this tool was not used to measure health utility values, it could be used as an ancillary instrument because of the following: lack of theoretical foundation, no choice-based values, end-point aversion, and context bias.[54,55] The values ranged from 0 to 100 and were transformed to 0 to 1 for comparisons with other instruments.

DEMOGRAPHIC VARIABLES

The following socioeconomic variables were included in the survey: age, sex, education, monthly household income, health insurance, employment status, and presence of atopic dermatitis, allergic disease, or other skin disease. The participant's own health status was measured by using the 5-point Likert scale (very healthy, healthy, normal, poor, and very poor), EQ-5D-5L, and VAS.

DATA ANALYSIS

The frequencies and percentages of the general characteristics of participants were calculated. The mean utility value and 95% CI according to the instruments were estimated. In addition, a subgroup analysis was conducted based on socioeconomic status, presence of atopic-related disease, and participant's own health status. Comparisons of subgroups were performed by using the *t* test and ANOVA. To detect the critical factors for utility values, a multilevel regression including response/no response, age, sex, education level, monthly household income, employment status, insurance, and presence of atopic dermatitis was performed. The participants in the present survey repeatedly answered questions about each scenario so that the answers might be correlated. If this repeated answer was not considered, the results could then have been overestimated.[56,57] We therefore performed a multilevel analysis considering the repeated measure. This study used a significance level of 0.05. The statistical analysis was conducted by using STATA version 12.0 (Stata Corp LLC, College Station, Texas).

RESULTS

A total of 155 participants were included in the survey (Table II). Their mean age was 39.7 years, and 58.7% of the participants were women. Most participants graduated college or had further education after college and a household income between >4 million and ≤8 million Korean won (61.9%). Most had National Health Insurance. Employed individuals comprised 50.9% and students/homemakers comprised 44.5% of the participants. Atopic dermatitis, allergic diseases, and other skin diseases were found in 12.3%, 32.9%, and 16.8%, respectively. The mean health utility value of the

Table II. General characteristics of participants (N = 155). Values are given as mean (SD) unless otherwise indicated.

Characteristic	Value
Age, y	
20–29	35 (22.6%)
30–39	43 (27.7%)
40–49	38 (24.5%)
50–59	39 (25.2%)
Sex	
Male	64 (41.3%)
Female	91 (58.7%)
Education	
High school or less	8 (5.2%)
College or more	147 (94.8%)
Monthly household income, won	
≤4 million	37 (23.9%)
>4 million to ≤6 million	48 (30.9%)
>6 million to ≤8 million	48 (31.0%)
>8 million	22 (14.2%)
Health insurance	
NHI district subscriber	66 (42.6%)
NHI employee subscriber	84 (54.2%)
Medical aid	5 (3.2%)
Employment status	
Employed	79 (50.9%)
Student/homemaker	69 (44.5%)
Unemployed	7 (4.5%)
Disease*	
Atopic dermatitis	19 (12.3%)
Allergic disease†	51 (32.9%)
Other skin disease‡	26 (16.8%)
No atopic, allergic, or skin disease	85 (54.8%)
Current health status§	
Healthy or better	99 (63.9%)
Normal or worse	56 (36.1%)
EQ-5D-5L	0.88 (0.09)
VAS	0.81 (0.80)

EQ-5D-5L = 5-level EuroQol 5-Dimension; NHI = National Health Insurance; VAS = visual analog scale.
* Duplicate responses are possible.
† Allergic rhinitis, allergic conjunctivitis, allergic asthma, or allergy to food, dust, or pollen.
‡ Eczema, psoriasis, itching, urticaria, acne, contact dermatitis, seborrheic dermatitis, keloid dermatitis, and athlete's foot.
§ The categories of current health status comprised very healthy, healthy, normal, poor, and very poor.

participants was 0.88 according to the EQ-5D-5L and 0.81 according to VAS.

The mean health utility values for the response health status and no response health status based on the TTO of 10 years were 0.847 and 0.380, respectively; the difference was 0.467 (95% CI, 0.434-0.499) (Table III). The health utility values for the response and no response health states based on the TTO of life expectancy were higher than those of TTO of 10 years (response, 0.865; no response, 0.476 in TTO based on life expectancy); however, the difference between people with response and people with no response health status in the TTO based on life expectancy was lower (mean, 0.389; 95% CI, 0.350-0.428). The EQ-5D-5L values for people in the response group and people in the no response group, however, were lower than the TTO values based on 10 years (response, 0.814; no response, 0.279), and the difference was high (mean, 0.535; 95% CI, 0.513-0.557). The 95% CIs of utility values of the differences between the response and no response health status according to the 3 instruments (TTO based on 10 years, TTO based on life expectancy, and EQ-5D) overlapped, and thus there were no significant differences. The CIs of the response health status overlapped for 2 TTO periods, but the CIs obtained by using 3 instruments (TTO based on 10 years, TTO based on life expectancy, and EQ-5D) for the no response health status did not overlap.

In the subgroup analysis grouped according to socioeconomic characteristics, most utility values did not show significant differences (Table IV). The health utility values of a few subgroups showed statistically significant differences.

For multilevel regression, response and no response to treatment were the most important factors that affected the health utility values for atopic dermatitis (Table V). Socioeconomic factors, including age, sex, education, household income, employment status, and insurance, had no significant effect on health utility values. Only the utility value of TTO based on 10 years in people with atopic dermatitis was significantly lower compared with people without atopic dermatitis (coefficient, −0.066; $P = 0.040$).

DISCUSSION

We conducted a survey regarding the utility weights of response and no response health status to treatment for atopic dermatitis from the perspective of the general population. After controlling the socioeconomic factors, the health utility value of the no response health status was significantly lower compared with that of the response health status.

This result was similar to that of a previous study. Using TTO and VAS, Schmitt et al[31] estimated the health utility values of 62 patients with atopic eczema and 139 participants in the UK general population. The median utility values of people with controlled and uncontrolled atopic eczema in the general population survey were 0.97 and 0.64, respectively; therefore, the median utility values of patients were similar to people of the general population (0.96 and 0.65 in controlled and uncontrolled atopic eczema). These results were slightly higher than our results using TTO based on 10 years (0.847 and 0.380 for the atopic dermatitis response and no response health status).

However, the differences in health states were comparable in our study and that of Schmitt et al.[31] The utility values of no response to treatment and uncontrolled health status were significantly lower compared with values from people with response to treatment and controlled status in our study and in the study by Schmitt et al after controlling for socioeconomic variables ($P = 0.04$ in the study by Schmitt et al; $P < 0.001$ in the present study).

Important factors for the health utility values were response and no response to treatment; sociodemographic factors were not significantly associated with health utility values in our study. These results were similar to those of previous trials.[28,31,58] The scenario-based survey of the general population indicated that the disease status was an important factor of health utility values, which were not greatly affected by the participant's demographic factors.

The reason for differences in absolute utility values by countries may be caused by differences in perception regarding atopic dermatitis between

Table III. Mean utility values of the hypothetical health status derived from time trade-off (TTO), 5-level EuroQol 5-Dimension (EQ-5D-5L), and visual analog scale (VAS). Values are presented as mean (SD) (95% CI).

Variable	Response	No Response	Difference
TTO based on 10 years	0.847 (0.120) (0.828−0.866)	0.380 (0.218) (0.346−0.415)	0.467 (0.207) (0.434−0.499)
TTO based on life expectancy	0.865 (0.119) (0.846−0.884)	0.476 (0.271) (0.433−0.519)*	0.389 (0.245) (0.350−0.428)*
EQ-5D-5L	0.814 (0.074) (0.802−0.826)*	0.279 (0.128) (0.259−0.299)*	0.535 (0.137) (0.513−0.557)*
VAS	0.744 (0.093) (0.729−0.758)*	0.322 (0.144) (0.299−0.345)*	0.422 (0.146) (0.399−0.445)

* P-value was calculated using t-test. The reference for each health status was TTO based on 10 years.

Western and Asian countries. Ng et al[59] reported that the social impairment in Asian adolescents with eczema was different from that in their Western counterparts. The quality of life in South Korean adults with atopic dermatitis was low, and this low quality of life was associated with stress, sleep problems, depression, and suicidal ideation.[60] Ho et al[61] recommended multidisciplinary intervention for children with atopic dermatitis in Asia. Because the disease could also negatively affect by physical and mental health of mothers so that family might be socially isolated.

In general, utility values measured with indirect methods are lower than those obtained by using direct methods.[23,31] In our study, a similar trend occurred: utility values found by using EQ-5D-5L and VAS were lower than those found by using TTO. This difference might have occurred because TTO was a trade-off between health issues and death; therefore, the TTO values could have reflected the avoidance of the extreme choice of death.[11]

The health utility values of EQ-5D is estimated based on 5 dimensions; therefore, the responsiveness and construct validity of specific diseases might have been insufficient.[62] Pereira et al[63] noted that the 5 dimensions of the EQ-5D could be limited to measuring the utility weights of those with skin diseases because it may not detect critical points pertinent to dermatologic disease compared with a specific questionnaire that focused on a specific dermatologic disease. The ceiling effect was decreased with the EQ-5D-5L because each dimension had 5 levels instead of only 3 compared with the EQ-5D-3L.[64] However, the effect remained.[29] The same tendency was also observed when the utility weights of people with skin diseases were measured.[63] Blome et al[65] analyzed the transformation between the EQ-5D and the Dermatology Life Quality Index, which is a skin disease−specific instrument, and showed that the model explained 24%−31% of EQ-5D to predict EQ-5D values with the Dermatology Life Quality Index. The authors explained that the disease-specific instrument and the general instrument are not equivalent because they are very different structurally. In addition, Lee et al reported that when using a hypothetical scenario, the direct method could relatively reflect the disease-specific health status compared with the indirect method because of the limited number of dimensions.[58]

The CIs of the health utility values of difference of response and no response health status in TTO based on 10 years and life expectancy overlapped in our study. The CI of utility values of response had also overlapped. The results of the present study indicate that the utility values according to the time frame of the TTO were not significantly different. Similarly, all differences in TTO values according to health status (mild, moderate, and severe) between 10-year and additional life expectancy did not show significant differences in the study by Matza et al.[66] There are controversies regarding the associated time frame of TTO and utility values; it is therefore hard to make a clear answer in one direction.[67] Attema et al[48] explained the controversy in that a balance between the will to reflect specific disease in real time and minimization of bias (including time preference and

Table IV. Subgroup analysis of the mean utility values according to general characteristics.

Variable	N	TTO Based on 10 Years			TTO Based on Life Expectancy			EQ-5D-5L			VAS		
		Response	No Response	Difference	Response	No Response	Difference	Response	No Response	Difference	Response	No Response	Difference
Total	155	0.847	0.380	0.467	0.865	0.476	0.389	0.814	0.279	0.535	0.744	0.322	0.422
Age (y)													
20–29	35	0.844	0.374	0.470	0.890	0.491	0.399	0.807	0.242*	0.565	0.744	0.321	0.424
30–39	43	0.845	0.327	0.518	0.838	0.429	0.410	0.804	0.267*	0.537	0.742	0.323	0.419
40–49	38	0.865	0.415	0.450	0.885	0.476	0.409	0.829	0.281*	0.548	0.771	0.331	0.440
50–59	39	0.834	0.410	0.423	0.852	0.514	0.339	0.818	0.324*	0.494	0.719	0.313	0.407
Sex													
Male	64	0.840	0.377	0.463	0.841*	0.451	0.390	0.814	0.286	0.529	0.733	0.311	0.422
Female	91	0.852	0.383	0.469	0.882*	0.493	0.389	0.814	0.275	0.539	0.751	0.330	0.422
Education													
High school or less	8	0.877	0.415	0.463	0.875	0.454	0.421	0.851	0.254	0.597	0.740	0.266	0.474
College or more	147	0.845	0.378	0.467	0.864	0.477	0.387	0.812	0.280	0.532	0.744	0.325	0.419
Monthly household income, won													
≤4 million	37	0.875	0.407	0.467	0.878	0.503	0.374	0.825	0.245	0.580*	0.766	0.329	0.436
>4 million to ≤6 million	48	0.849	0.361	0.489	0.880	0.460	0.420	0.818	0.279	0.539*	0.742	0.331	0.411
>6 million	70	0.830	0.379	0.451	0.848	0.472	0.376	0.806	0.297	0.508*	0.733	0.312	0.422
Health insurance													
NHI district subscriber	66	0.856	0.383	0.474	0.871	0.480	0.391	0.820	0.285	0.535	0.739	0.314	0.425
NHI employee subscriber	84	0.837	0.375	0.461	0.856	0.462	0.394	0.811	0.278	0.533	0.748	0.326	0.422
Medical aid	5	0.893	0.430	0.463	0.928	0.651	0.277	0.803	0.222	0.581	0.728	0.356	0.372
Employment status													
Employed	79	0.837	0.375	0.463	0.843†	0.452	0.392	0.806	0.279	0.528	0.736	0.311	0.425
Student/ homemaker	69	0.860	0.390	0.470	0.887†	0.503	0.384	0.825	0.279	0.546	0.750	0.331	0.419
Unemployed	7	0.824	0.343	0.481	0.893†	0.479	0.414	0.789	0.281	0.508	0.764	0.350	0.414

(*continued on next page*)

Table IV. (*Continued*)

Variable	N	TTO Based on 10 Years			TTO Based on Life Expectancy			EQ-5D-5L			VAS		
		Response	No Response	Difference	Response	No Response	Difference	Response	No Response	Difference	Response	No Response	Difference
Atopic dermatitis													
Yes	19	0.898*	0.440	0.458	0.902	0.552	0.350	0.826	0.276	0.550	0.773	0.314	0.459
No	136	0.840*	0.372	0.468	0.860	0.465	0.395	0.812	0.280	0.533	0.740	0.323	0.417
Allergic disease‡													
Yes	51	0.855	0.359	0.496	0.883	0.435	0.448*	0.803	0.267	0.536	0.739	0.305	0.434
No	104	0.843	0.390	0.452	0.856	0.496	0.360*	0.820	0.285	0.535	0.746	0.330	0.416
Other skin disease§													
Yes	26	0.839	0.394	0.445	0.870	0.541	0.328	0.814	0.315	0.499	0.764	0.346	0.418
No	129	0.848	0.377	0.471	0.864	0.463	0.401	0.814	0.272	0.542	0.740	0.317	0.423
Current health status													
Healthy	99	0.847	0.370	0.477	0.856	0.472	0.384	0.810	0.281	0.529	0.751	0.336†	0.415
Normal or worse	56	0.847	0.398	0.449	0.881	0.483	0.398	0.821	0.275	0.546	0.731	0.296†	0.435
EQ-5D-5L													
Higher than mean value	107	0.845	0.376	0.470	0.860	0.462	0.397	0.813	0.276	0.537	0.743	0.308†	0.435†
Mean value or less	48	0.850	0.390	0.460	0.877	0.506	0.371	0.817	0.286	0.531	0.745	0.353†	0.392†
VAS													
Higher than mean value	79	0.838	0.387	0.450	0.861	0.483	0.379	0.811	0.274	0.538	0.707*	0.301†	0.407
Mean value or less	76	0.856	0.373	0.483	0.869	0.469	0.400	0.817	0.285	0.532	0.781*	0.343†	0.438

EQ-5D-5L = 5-level EuroQol 5-Dimension; NHI = National Health Insurance; TTO = time trade-off; VAS = visual analog scale.
Comparisons of subgroups were performed by using the *t* test and analysis of variance.
*$P < 0.05$.
†$P < 0.01$.
‡ Allergic rhinitis, allergic conjunctivitis, allergic asthma, or allergy to food, dust, or pollen.
§ Eczema, psoriasis, itching, urticaria, acne, contact dermatitis, seborrheic dermatitis, keloid dermatitis, and athlete's foot.

Table V. Multivariable regression for factors influencing the utility values.

Variable	TTO Based on 10 Years		TTO Based on Life Expectancy		EQ-5D-5L		VAS	
	Coefficient	*P*	Coefficient	*P*	Coefficient	*P*	Coefficient	*P*
Constant*	0.850	0.000	0.865	0.000	0.819	0.000	0.751	0.000
No response	−0.467	0.000	−0.389	0.000	−0.535	0.000	−0.422	0.000
Age (20−29 y)								
30−39 y	−0.010	0.740	−0.044	0.232	0.017	0.373	0.002	0.922
40−49 y	0.040	0.217	−0.005	0.907	0.034	0.077	0.015	0.496
50−59 y	0.028	0.396	0.001	0.984	0.049	0.013	−0.018	0.422
Sex (male)								
Female	0.002	0.918	0.018	0.537	−0.006	0.662	0.008	0.650
Education (high school or less)								
College or more	0.018	0.600	0.064	0.122	−0.017	0.413	0.042	0.082
Monthly household income (≤5 million won)								
>5 million	−0.021	0.354	−0.028	0.293	0.003	0.820	−0.019	0.228
Employment status (unemployed)								
Employed	0.028	0.585	−0.018	0.761	0.002	0.946	−0.041	0.239
Student/homemaker	0.046	0.379	0.025	0.679	0.008	0.800	−0.016	0.647
Insurance (NHI)								
Medical aid	0.034	0.577	0.110	0.121	−0.029	0.412	0.017	0.689
Atopic dermatitis (no)								
Yes	−0.066	0.040	−0.047	0.214	−0.020	0.302	−0.010	0.659

EQ-5D-5L = 5-level EuroQol 5-Dimension; NHI = National Health Insurance; TTO = time trade-off; VAS = visual analog scale.
* Response is the reference health status.

loss avoidance) might be needed. In addition, the authors noted that the 10-year time frame had been used more often than the life expectancy of disease or participant's own life expectancy in previous studies.[68−70]

The present study had some meaningful results. First, we calculated the differences in the values of atopic dermatitis treatment response and no response health status. Studies on the overall utility values of people with atopic dermatitis have been reported; however, studies that detected utility values according to the response to treatment were very limited. Controlling symptoms is an important factor in atopic dermatitis; therefore, measuring improvements in the utility values with respect to treatment response is meaningful. Second, the differences between the response and no response groups were estimated after controlling sociodemographic factors. In the general population, using hypothetical scenarios, the utility values of the sociodemographic variables were not significant. Response to atopic dermatitis treatment was a significant factor for health utility values in this study. Third, the TTO period was not significantly associated with health utility values. There was no gold standard for the time frame used for measuring TTO, and the evidence was limited.

Our study had some limitations. First, the sample size of the present study was not very large. However, we tried to calculate the sample size based on a previous study, and we included >30 participants per stratified cell. Patients of both sexes with atopic dermatitis in South Korea were reflected in this study. Second, the level of understanding of the scenario-based survey by the participants could have affected the results. The answers of the participants without hypothetical atopic dermatitis might have been biased. Thus, we tried to reduce the

potential bias caused by misinterpretation of the health states of participants. In this study, we referred to a previous study that reported results of in-depth interviews of 20 dermatologists and 10 patients with atopic dermatitis, and we provided detailed explanations and pictures of atopic dermatitis to participants. This might have identified the results of the subgroup analysis. The subgroup analysis of socioeconomic factors was performed, and the health utilities were not different. Third, the utility values of people with atopic dermatitis may be different between Asian and Western countries. There is more social pressure regarding appearance in Asian societies; therefore, low self-image is a severe burden. The answers reported by these participants could have reflected lower utility values compared with that of individuals in Western countries, resulting in limited generalization.

The advantage of the present study is that it estimated the health utilities based on the response to treatment for atopic dermatitis. To assess utilities from the perspective of the general population was also meaningful. We found that response to treatment is an important factor that influences quality of life with atopic dermatitis based on perspective of the general population, rather than socioeconomic characteristics. Thus, symptom control is an important factor that helps improve quality of life. Further studies are needed on the utilities for response and no response to treatment for atopic dermatitis among patients, the general population, caregivers, and health care providers to compare various perspectives.

CONCLUSIONS

The present study reported the utility weights of people with response and no response to atopic dermatitis treatment. The results have shown the difference in health utilities of people with nonresponse to treatment for atopic dermatitis compared with people with a response to treatment from the perspective of the Korean general population. Symptom control through treatment might be an important goal for health improvement in atopic dermatitis. Health care providers should therefore consider symptom control as an important factor affecting the quality of life of those with atopic dermatitis.

CONFLICTS OF INTEREST

Se-Young Park and Eun-Jin Bae are employees of Sanofi-Aventis. The authors have indicated that they have no other conflicts of interest regarding the content of this article.

Sanofi-Aventis provided financial support to conduct the research and to engage a medical writing service, and contributed to the study design and the decision to submit the manuscript for publication.

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Hyun Jin Song performed the analyses, interpreted the results, and wrote the manuscript. Hyemin Park, Sun-Young Park, Eui-Kyung Lee, and So-Young Ha contributed to the study design, data acquisition, and analysis. Se-Young Park and Eun-Jin Bae participated in the design of the study and provided analytical advice. Hyemin Ku critically appraised the manuscript. All authors had full access to the data in the study and were required to approve the manuscript for submission and publication.

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