Effects of structured patient education in adults with atopic dermatitis: Multicenter randomized controlled trial

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Background: Atopic dermatitis (AD) is a chronic relapsing skin disease prevalent in 1% to 3% of adults in Western industrialized countries.

Objective: We sought to investigate the effectiveness of educational training in an outpatient setting on coping with the disease, quality of life, symptoms, and severity in adults with AD.

Methods: In this German prospective, randomized controlled multicenter study, adult patients with moderate-to-severe AD were educated by referring to a comprehensive 12-hour training manual consented by a multiprofessional study group from different centers (Arbeitsgemeinschaft Neurodermitisschulung für Erwachsene [ARNE]). Patients were randomly allocated to the intervention or waiting control groups. Study visits were performed at baseline and after 1 year (1 year of follow-up). Primary outcomes were defined as a decrease in (1) "catastrophizing cognitions" with respect to itching (Juckreiz-Kognitions-Fragebogen questionnaire), (2) "social anxiety" (Marburger Hautfragebogen questionnaire), (3) subjective burden by symptoms of the disease (Skindex-29 questionnaire), and (4) improvement of disease signs and

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symptoms assessed by using the SCORAD index at 1 year of follow-up. Data were analyzed on an intention-to-treat basis. Results: At 1 year of follow-up, patients from the intervention group (n = 168) showed a significantly better improvement compared with the waiting group (n = 147) in the following defined primary study outcomes: coping behavior with respect to itching ($P < .001$), quality of life assessed by using the Skindex-29 questionnaire ($P < .001$), and the SCORAD index ($P < .001$).

Conclusions: This is the first randomized, controlled multicenter study on patient education in adult AD. The ARNE training program shows significant beneficial effects on a variety of psychosocial parameters, as well as AD severity. (J Allergy Clin Immunol 2017;140:845-53.)

Key words: *Atopic dermatitis, adulthood, patient education, multiprofessional, psychosocial, disease severity, quality of life, coping*

Abbreviations used

AD: Atopic dermatitis
ARNE: Arbeitsgemeinschaft Neurodermitisschulung für Erwachsene
DLQI: Dermatological Life Quality Index
GADIS: German Atopic Dermatitis Intervention Study
HADS-D: German version of the Hospital Anxiety and Depression Score
JKF: Juckreiz-Kognitions-Fragebogen
MHF: Marburger Hautfragebogen
QoL: Quality of life
PO-SCORAD: Patient-oriented SCORAD

Atopic dermatitis (AD) is a chronic relapsing skin disease affecting 1% to 3% of adults in Western industrialized countries. Most of these patients have had AD since childhood. Early disease manifestation, more severe disease in childhood, atopic comorbidities, and a positive family history for atopic disease have been identified as risk factors for persisting AD.[1] The course and clinical manifestation of the disease are characterized by a broad interindividual and intraindividual variability because the pathogenesis of AD is multifactorial. Many topical and systemic treatment options for AD are now available because of new insights into the adaptive and innate immune responses involved in AD during the last decade.[2,3] According to current guidelines, therapy for AD should comply with a 4-step regimen.[4,5] Continued use of emollients is recommended for all patients with AD also in the absence of visible skin inflammation.[5] Further treatment options comprise the use of a variety of anti-inflammatory and antipruritic agents, such as topical corticosteroids, topical calcineurin inhibitors, UV therapy, or intake of systemic immunosuppressants. Individually relevant trigger factors for the disease, such as concomitant relevant sensitizations to inhalant[6] or food[7] allergens but also climate (humidity and aridity), atopic comorbidities, or critical impairment of quality of life (QoL),[8] should be taken into account. In a survey on the quality of health care for AD in Germany, including 1678 adults with AD, emollients and topical corticosteroids were reported as the most frequently used treatments.[9] Interestingly, the treatment-related burden was rated as low by the majority of patients in this study. By contrast, burden by disease symptoms, such as sleeplessness caused by itching, was reported by 26.6% of patients and considered relatively high. Indeed, patients with AD describe their itch symptoms also as "pain" or "heat sensation."[10]

In view of this, physicians often face manifold requirements that usually cannot be fulfilled in everyday outpatient practice. As a consequence, local health care for patients with AD is still insufficient.[11] These circumstances might also contribute to poor adherence to prescribed treatment with frequent use of complementary medicine.[12,13] However, the lowest therapeutic benefit was assessed in patients treated with alternative medicine, as has been published in a retrospective cohort study with more than 1500 adults with AD.[14] Moreover, in a study focusing on health-related QoL, patient satisfaction, and adherence, rating of treatment adherence in adults with AD by dermatologists was greater than 80%, whereas self-reported adherence to medical recommendations was less than 30%.[15] Encouraging adherence is therefore recommended as an integral part in the management of difficult-to-treat AD.[16]

In patient-education programs for chronic diseases mainly in childhood and adolescence, empowerment of either patients or their parents has shown long-term beneficial effects on both psychological and disease parameters.[17] For adult AD, only a few smaller single-center studies on patient education have been performed.[18-20] Results from a recently published systematic review on evidence from specific theory-based education in patients with chronic skin diseases indicate the need for more large randomized controlled studies in this field.[21]

The aim of the present randomized controlled multicenter study was to investigate the effects of a patient-education program in an outpatient setting on coping with the disease, QoL, and disease severity in adult AD. The training program was conceptualized and conducted by a multiprofessional team (Arbeitsgemeinschaft Neurodermitisschulung für Erwachsene [ARNE] study group) highly experienced in adult AD to ensure that the wide spectrum of all potentially relevant disease aspects was considered.

METHODS

Study design

This was a multicenter randomized controlled study in Germany to determine the effects of structured educational training in an outpatient setting on psychosocial factors, objective and subjective severity of AD, and subjective perception of stress caused by AD in adults. Patients were randomized into 2 study groups. In the intervention group (training group) patients participated in an educational training program over 12 hours in an outpatient setting. Patients in the training group were educated by a multiprofessional team, whereas patients randomized into the control group were trained after all study assessments had been finalized (waiting control group). Randomization was carried out by an independent study center in Giessen that was not involved in the educational training by using computer-generated random numbers.

Patients

For the present study, patients were recruited at 15 sites throughout Germany. After oral and written informed consent, a screening visit was initially performed. Female and male subjects between 18 and 65 years of age with a diagnosis of AD according to the United Kingdom Working Party Criteria were enrolled.[22] Disease severity was scored by a dermatologist and defined as moderate to severe with a score of at least 20 points on the SCORAD index.[23] Patients who had participated previously in any patient-education

program on AD were excluded from the study. Further exclusion criteria comprised manifestation of AD on the hands only and clinically relevant psychiatric disorders, including personality disorders. Patients with other diseases judged by the patient to possibly have more effect on QoL than AD were not included either. In case of eligibility, all baseline assessments were performed at the same visit.

The study was approved by the ethics committee of Hannover Medical School (MHH, no. 5537).

Patient-education training program

After the baseline visit, patients randomized into the intervention group were educated in small training groups comprising a total of 5 to 8 participants over 12 hours (1 double lesson per session). The participants per training group were the same throughout the intervention. Training was conducted by an interdisciplinary professional team of specialists (dermatologists, psychologists or pedagogues, and dieticians) who had previously undergone study-specific qualification to ensure standardization in patient's education. Additionally, all relevant procedures of the training had been consented to by the ARNE study group, which consisted of professionals in dermatology, psychology, psychosomatics and psychotherapy, medical sociology, nutrition, and health services research. Based on this and a manual drafted by the German working group for patient education in childhood AD (Arbeitsgemeinschaft Neurodermitisschulung),[17] a manual was written for the present study. An overview of the contents for all sessions of the training course is provided in Table I.[5]

Study procedures

Study assessments were performed at baseline and 1 year after the intervention (1-year follow-up). A detailed overview on all study procedures performed is provided in Table E1 in this article's Online Repository at www.jacionline.org.

Assessment of sociodemographic data

For the present study, a patient-completed questionnaire on the sociodemographic data of the patients was conceptualized, taking into account age, sex, education, and effect of the disease on working life or vocational training.

Questionnaires on coping strategies and possible psychiatric comorbidities

Coping with the disease was assessed by using 3 questionnaires. The Juckreiz-Kognitions-Fragebogen (JKF) questionnaire[24] consists of 2 scales, which assess cognitions typical for itch: the first scale focuses on catastrophizing cognitions with respect to itching, and the second scale assesses coping.

The Marburger Hautfragebogen (MHF) questionnaire represents a validated method to assess coping and is specific for skin diseases.[25] This questionnaire is comprised of 6 scales: (1) social anxiety, (2) itch-scratch circle, (3) helplessness, (4) anxious and depressive mood, (5) QoL, and (6) information seeking.[26] The last 2 scales (5 and 6) have a low Cronbach α value (<0.71) and were not analyzed in the present study.

Lastly, the validated German version of the internationally widely accepted Hospital Anxiety and Depression Score (HADS-D) was used for assessment of possible depression and anxiety comorbidities.[27-29] The HADS contains 14 items, 7 each for both the depression and anxiety scales. A cutoff allows for identifying clinically relevant aspects of the disorders.[27]

Assessments on QoL

QoL in patients with AD was measured by using Skindex-29,[30] which consists of 29 items referring to the following disease aspects: (1) burden of symptoms, (2) social and physical functioning, and (3) emotional responses. This has also been validated in German for the diagnosis of AD.[31] Additionally, the Dermatological Life Quality Index (DLQI) was used for evaluating QoL in this study.[32]

Scoring signs and symptoms of AD

Patients of the training and waiting control groups were allowed to treat their AD signs and symptoms, as prescribed by their treating physician, without any restrictions. At each study visit, the overall severity of AD was scored by the investigator using the SCORAD index,[33] as recommended by the European Task Force on Atopic Dermatitis.[4] The subsequent corresponding objective SCORAD score was calculated without scores for subjective symptoms (itching and sleeplessness).

Additionally, AD was scored by patients applying the patient-oriented SCORAD (PO-SCORAD) index.[34,35]

Primary outcomes

Primary end points of the study were (1) a significantly higher decrease in "catastrophizing cognitions" with respect to itching (JKF questionnaire), (2) a significantly higher decrease in "social anxiety" (MHF questionnaire), (3) a significantly better improvement in subjective burden by symptoms of the disease (Skindex-29 questionnaire), and (4) a significantly better improvement in overall disease severity (skin signs and symptoms) (SCORAD index) in the training group compared with the waiting control group from baseline to 1-year follow-up.

Secondary end points

As secondary end points, an improvement in coping strategies further assessed by using the second scale of the JKF questionnaire ("coping") and another 3 scales of the MHF questionnaire (ie, itch-scratch circle, helplessness, and anxious and depressive mood) and by using the HADS-D in the training group from baseline to 1 year after patient education was defined.

Further secondary end points of the study were a change in QoL, as recorded by the 2 remaining scales of the Skindex-29 ("social and physical functioning" and "emotional responses") and by the DLQI.

Finally, an improvement in the subjective assessment of disease severity after the training measured by using the PO-SCORAD index was defined as a secondary end point.

Statistical analyses

The sample size estimation and power calculation were based on results from Staab et al,[17] who investigated the effects of a patient-education program for children. They reported effect sizes *(f)* of between 0.275 and 0.375 for similar variables (SCORAD score, catastrophizing cognitions, social anxiety). Our own estimation was based on the lowest effect size that occurred in this study ($f = 0.275$). With an α value of 0.025 (1-tailed) and an overall power of 0.80, a total sample size of 210 adult patients (105 in each group) for the tested primary end points was needed (or about 310 for an expected dropout rate of 20% to 30% for the 1-year follow-up).

Statistical analysis was performed with IBM SPSS Statistic software (version 24 for Windows; IBM, Armonk, NY). Analysis of covariance was conducted to compare differences in the outcome variables (1-year follow-up − baseline) between the 2 arms (covariate = baseline values of the respective variable). Data were analyzed by using intention-to-treat analysis, with values of noncompleters imputed by using the multiple imputation method for primary outcome variables. Data for secondary outcomes were analyzed only for completers.

RESULTS

Number of subjects and population for analysis

A total of 315 patients with AD were eligible for inclusion in the present study and randomized either in the training group (n = 168) or the waiting control group (n = 147). Some subjects who had been assigned to the control group were not further assessed and followed by the corresponding study centers, probably because the patients from this group could not be motivated to appear even for the first study visit.

TABLE I. Overview on the sessions of the ARNE training program and their content

Session	Subject area	Content
1	Dermatology (2 h)	Social gathering/compilation of expectations of the participants for the program Atopic dermatitis: definitions, clinic, (patho-) physiology, trigger factors, aspects of allergy, itch-scratch-cycle Introduction of a diary on itch symptoms
2	Psychological aspects (2 h)	Discussion of the diary Repeated training on reducing itch symptoms Discussion on stress symptoms and coping strategies Relaxation exercises and exchange of experience on this Training on structured problem solving
3	Dermatology (1 h)	Discussion of the diary Basic skin therapy Skin care, including washing and cosmetics Diagnosing allergy in patients with AD
	Nutritional aspects (1 h)	Adverse food reactions in patients with AD: definitions, presentation, diagnosis, and therapy of different pathomechanisms, including food allergy Risk factors of elimination diet Allergy prevention: nutritional aspects
4	Dermatology (2 h)	Discussion of the diary Repeating contents of sessions 1 and 3 Discussion on the severity of skin symptoms and therapeutic options, according to a multistep concept[5] Short-term relaxation exercise Complications in patients with AD Open discussion on complementary treatment methods
5	Psychological aspects (2 h)	Discussion of the diary Discussion on behavioral training aspects for an improvement in self-confidence and communication followed by exercises Relaxation exercise
6	Psychological aspects (1 h)	Discussion of the diary and of coping strategies learned during this educational training Exchange of experience Strategies on prevention of relapses and on handling relapses Imagination exercise against itch
	Dermatology (1 h)	Information on sociomedical aspects (eg, occupational aspects, rehabilitation, and reduced earning capacity) Discussion on open questions Feedback

One hundred twenty-nine patients of the training group and 104 patients who had been randomly assigned to the waiting control group completed the study according to the protocol. A detailed overview of the numbers of study patients initially included, dropouts, and completers is provided in Fig 1.

Sociodemographic and baseline characteristics

At baseline, patients who participated in the educational training program did not differ significantly from those in the waiting control group regarding sociodemographic data and parameters defined as primary end points for the present study (Table II). With respect to the same variables, completers did not differ from noncompleters either (see Table E2 in this article's Online Repository at www.jacionline.org).

Primary end points

Results on coping strategies. Data analysis of the scales "catastrophization" (JKF) and "social anxiety" (MHF), referring to itch cognitions and coping strategies, revealed higher beneficial effects in the training group compared with the waiting control group: patients of the training group showed a significantly higher decrease in catastrophizing cognitions with respect to itching compared with patients from the waiting control group ($P < .001$, $f = 0.21$; Fig 2, *A*). However, no significantly higher reduction in social anxiety in participants of the training program was achieved ($P = .06$ [not significant]; Fig 2, *B*).

Results on QoL measured by using Skindex-29. With regard to changes in QoL measured by using Skindex-29, a significantly higher decrease in subjective burden by symptoms caused by AD in the training group than in the waiting control group could be observed ($P < .001$, $f = 0.20$; Fig 3).

Improvement of signs and symptoms of AD. Beyond psychological and behavioral effects, patient education also led to a significantly better improvement in disease signs and symptoms as assessed by the investigator by using the SCORAD index ($P < .001$, $f = 0.20$; Fig 4, *A*). With respect to the different items of the SCORAD index, statistical analysis revealed a significantly higher reduction in both disease signs measured by using the objective SCORAD ($P < .001$, $f = 0.22$; Fig 4, *B*) and PO-SCORAD ($P < .05$, $f = 0.12$; Fig 4, *C*) indices. Correlation between the PO-SCORAD and SCORAD indices was an r value of 0.61 at baseline and 0.71 at follow-up.

The proportion of patients who showed an improvement in disease severity defined as a 30% to 100% reduction and 50% to 100% reduction in SCORAD index score, as well as in objective SCORAD score, from baseline to 1 year of follow-up was significantly higher in the training group compared with that in

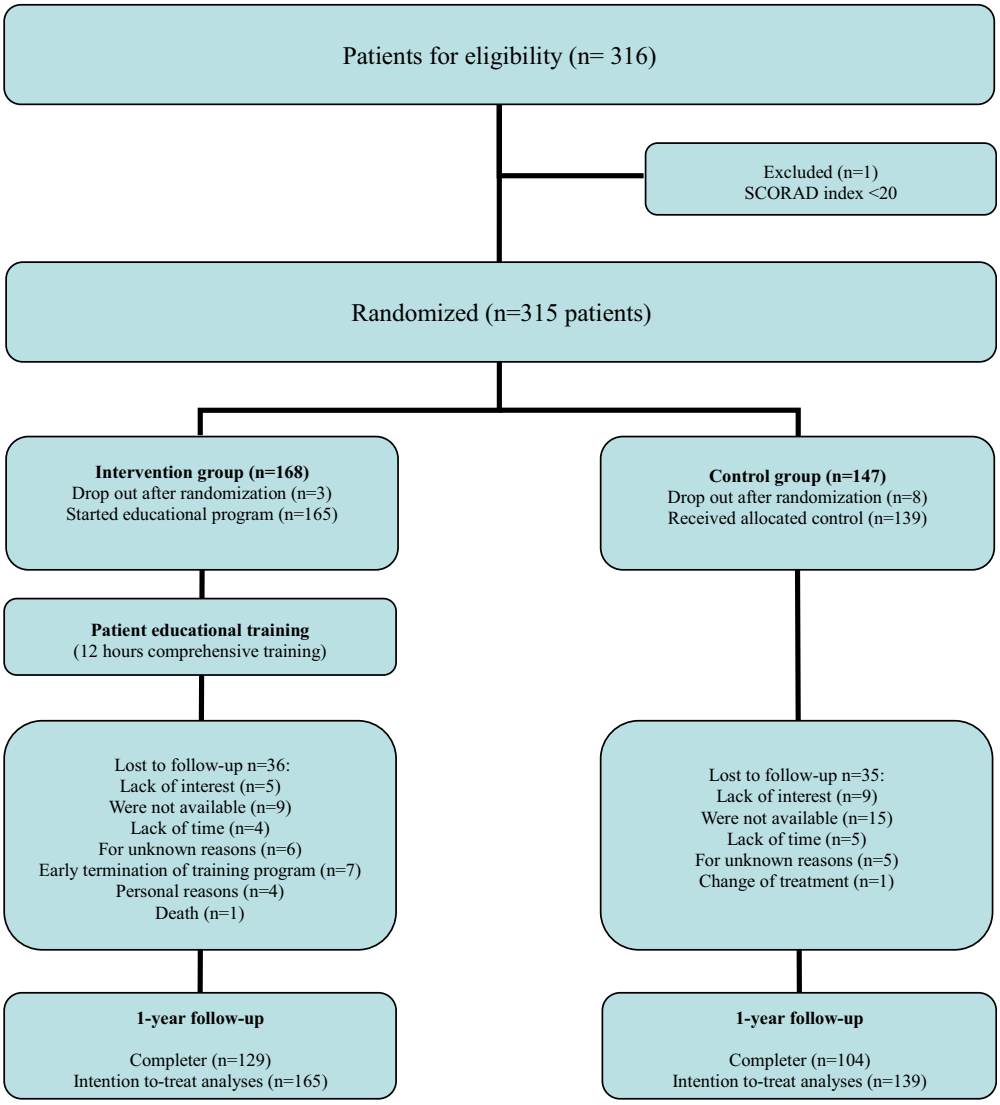

FIG 1. Flow of patients through the trial (CONSORT diagram).

the waiting control group ($P < .01$, see Fig E1 in this article's Online Repository at www.jacionline.org).

Results from primary data analysis of completers. With regard to the data obtained from completers only, differences between the training and waiting control groups were significant for all defined primary end points of the study (data not shown), except for the first scale of the MHF questionnaire ("social anxiety") with a P value of .074 and SCORAD symptoms with a P value of .17.

Secondary analysis

An overview of the results from data on all secondary end points of this study is provided in Table III.

Results on coping behavior. Statistical analysis on coping strategies assessed by using the second scale of the JKF questionnaire ("coping") and the scales "itch-scratch cycle" and "helplessness" of the MHF questionnaire revealed a significantly better improvement in the training group compared with the waiting control group (Table III). By contrast, no significant changes could be found regarding data assessed by using the HADS-D questionnaire.

Results on further items on QoL. One year after the training, QoL was affected by the disease to a significantly lesser degree in the intervention group compared with the waiting control group, as could also be demonstrated by means of data analysis of both further scales of the Skindex-29 ("social and physical functioning" and "emotional responses") but not the DLQI (Table III).

DISCUSSION

This is the first large randomized controlled multicenter study providing evidence for long-term beneficial effects of patient education on adult AD. Through participation in the ARNE educational training program in an outpatient setting, significant improvement of the majority of primary and secondary end points could be achieved. Trained patients had significant benefits with respect to coping with the disease and a variety of parameters for QoL. Remarkably, 1 year after the educational intervention, a

TABLE II. Baseline characteristics for groups receiving an educational intervention in AD (training group) or no education (waiting control group)

Variable	Training group	Waiting control group	*P* value
Adult patients	n = 165	n = 139	
Age (y), mean (SD)	35.10 (12.08)	33.95 (11.85)	.45
Sex			
Male	65/40.1%	49/36.3%	
Female	97/59.9%	86/63.7%	.50
Education			
Low	69/42.1%	60/43.8%	
High	95/57.9%	77/56.2%	.76
Comparison baseline values			
Catastrophization, JKF (SD)	20.46 (9.90)	20.70 (9.36)	.83
Social anxiety/avoidance, MHF (SD)	39.94 (14.56)	37.46 (12.42)	.12
Burden by symptoms, Skindex-29 (SD)	61.20 (17.70)	61.56 (16.70)	.86
SCORAD (SD)	47.89 (15.40)	48.56 (16.78)	.72
Objective SCORAD (SD)	39.32 (13.03)	39.79 (13.84)	.76
PO-SCORAD (SD)	53.58 (20.67)	54.12 (19.96)	.82

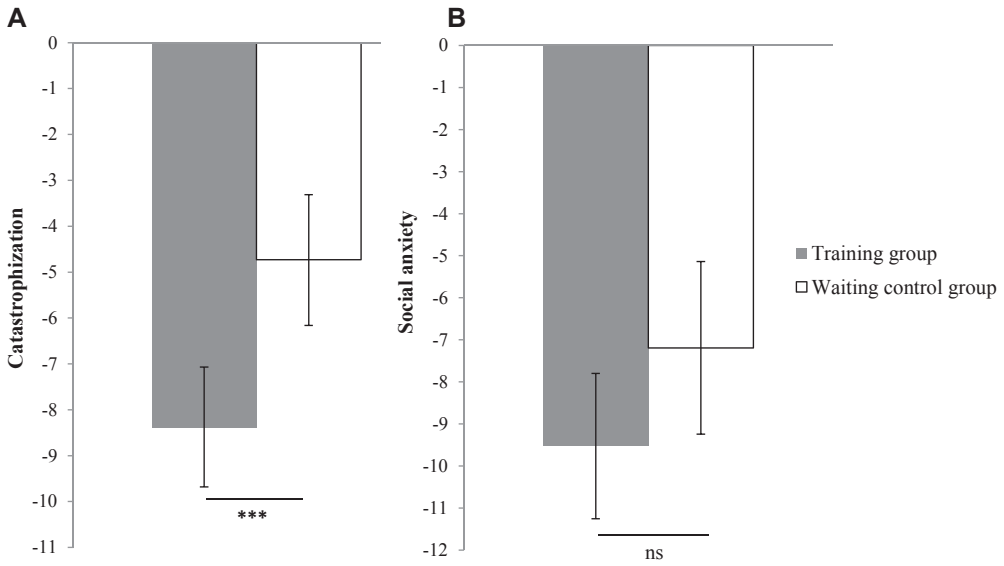

FIG 2. A, Decrease of catastrophization with respect to itch assessed by using the JKF questionnaire with estimated marginal means (95% CIs) of differences in the training and waiting control groups (baseline versus 1-year follow-up). ***$P < .001$. **B,** Reduction in social anxiety assessed by using the MHF questionnaire with estimated marginal means (95% CIs) of differences in the training and waiting control groups (baseline vs 1 year of follow-up). *ns,* Not significant.

significant reduction in objective and subjective disease severity compared with that in the waiting control group could also be observed.

For adults with AD, limited knowledge on the disease and evidence-based treatment options for AD has been reported.[36] Moreover, a reduced QoL in adults with AD has been demonstrated to be accompanied by a high "willingness to pay."[37] As a consequence, patients with adult AD are at high risk for remaining in a vicious cycle of insufficient therapy and persistent disease activity, leading to further chronification of AD. These facts indicate the need for interventions that effectively empower adults with AD.

For parents with children with AD or for diseased adolescents with AD, there is already an international consensus for implementation of disease-specific education into patients' treatment.[38] From a previously published randomized controlled German multicenter study (German Atopic Dermatitis Intervention Study [GADIS]), there is evidence of significant beneficial effects of a multidisciplinary educational intervention for parents and their children and for adolescents on a variety of parameters, such as coping, QoL, and the severity of AD.[17] In this ARNE multicenter study we adapted selected elements that had been proved effective in GADIS and the study published by Ehlers et al.[18] Patient education was also performed in small consistent groups with 5 to 8 participants to encourage exchange of knowledge and experiences, as well as mutual support. The ARNE training was conducted by a multiprofessional team, and the majority of members of the

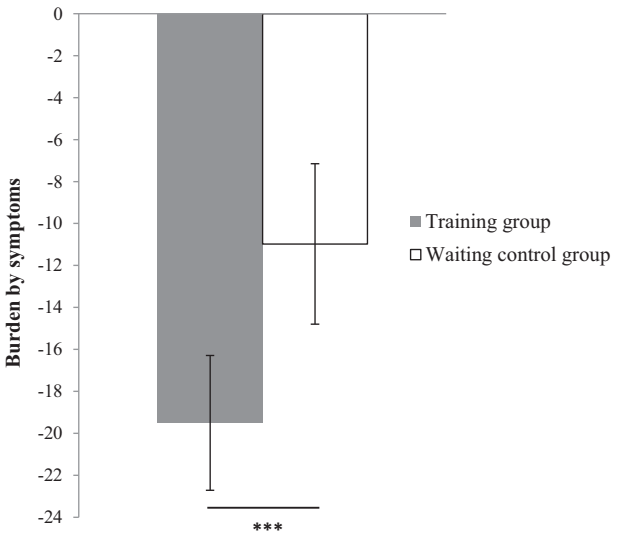

FIG 3. Reduction in burden by symptoms caused by AD assessed by using the Skindex-29 questionnaire with estimated marginal means (95% CIs) of differences in the training and waiting control groups (baseline vs 1 year of follow-up; missing data = 3). ***$P < .001$.

ARNE study group were experienced in both disease management and patient education.

The ARNE study program aimed to empower the patients in evidence-based treatment options. For determination of overall disease severity by the investigator, extensively validated scoring instruments have been used: for both the SCORAD index[23] and the corresponding objective SCORAD index, adequate validity, responsiveness, and interobserver reliability have been reported by the Harmonizing Outcome Measures for Eczema initiative.[39,40] The PO-SCORAD index was chosen as an instrument for self-assessment of AD signs and symptoms because this also represents a validated tool.[34,35] Remarkably, participation in the training led to a greater improvement in both objective and subjective disease severity. In previous interventional studies on AD, a difference of at least 10 SCORAD points has been defined to reflect a relevant change in the disease severity.[41] In our study a mean reduction of more than 17 points in SCORAD scores and 14 points in objective SCORAD scores was calculated, thus clearly indicating a statistically and clinically significant improvement of the disease after patient education. By contrast, a mean decrease of less than 10 points in SCORAD scores and less than 8 points in objective SCORAD scores was calculated for the waiting control group. Moreover, data analysis from the PO-SCORAD index revealed a significantly higher decrease in the training group than in the waiting control group, with a mean decrease of 16 versus 10 points in the waiting control group.

Considering most adult patients have had the disease for many years, there was a clear consensus within the ARNE study group that because of the chronic course of AD, psychosomatic aspects should be considered for the training concept. This approach is supported by data from previous studies: psychological treatments, such as autogenic training and cognitive-behavioral therapy, had been proved effective for an improvement of skin symptoms in patients with AD.[18,42,43] With regard to predictors of benefit from an educational intervention, a lack of adequate coping abilities in parents with children with AD has been identified.[44] For the diagnosis of a burnout syndrome in adults with AD, a significant influence on QoL and, moreover, an impairment of treatment success could be determined.[45]

In view of this, primary outcomes predefined for the study protocol referred to an improvement of psychological parameters followed by a reduction of the disease severity. Therefore a special focus of the ARNE training program was placed on psychological issues, such as coping strategies, structured problem solving, and handling relapses (Table I), making up more than 40% of the educational training program. Indeed, the ARNE study program led to a significantly better improvement in coping strategies compared with the waiting control group, as measured by using the JKF and MHF questionnaires.

With regard to depressive symptoms, an association with asthma in adults independent of anxiety symptoms has been demonstrated.[46] Although in the present study depression and anxiety measurements were different between the education and waiting control groups, this did not reach the level of significance. This might indicate that depression and anxiety disorders are not specifically focused by the atopic educational training, which is not comparable with a specific psychotherapy. However, we also achieved a significant improvement in coping with itch, which was assessed by using the MHF questionnaire. This observation is consistent with data from GADIS clearly indicating that coping behavior but also QoL parameters seem to play a major role in subjective impairment of itch.[47]

Because QoL parameters in adults with AD are more severely limited than observed for other chronic diseases in this age group, further primary and secondary study end points of the study focused on improvement of QoL.[48] The ARNE training program comprised a total of 6 double lessons, including phases of distributed (individual or cooperative) learning. In GADIS this learning concept has been demonstrated to effectively support changes in disease-related behavior, finally supporting an improvement of QoL parameters.[17] The Skindex-29 questionnaire focuses on subjective disease symptoms and was selected as a suitable method for the present study because it has been validated for determination of QoL in patients with AD,[30] also in the German language.[31] After participation in the ARNE training program burden by symptoms caused by AD assessed by using the Skindex-29 questionnaire was significantly more reduced compared with the waiting control group.

The 2 remaining scales of the Skindex-29 questionnaire and the DLQI were used to evaluate further aspects of QoL. In the 1-year follow-up, data analysis of the remaining 2 scales of the Skindex-29 but also from the overall Skindex-29 revealed a significantly higher reduction of impairment in QoL by AD compared with those who had not received the training.

Our study has several strengths, such as randomization by an independent study center, a high number of participants recruited from 15 sites, and strict inclusion criteria. Moreover, patients who had previously participated in a patient-education program for AD were excluded. Based on the manual, the training was performed in a standardized manner, and we were able to provide a well-detailed description of the ARNE training program. As a limitation of the present study, a lack of blinding of the investigator needs to be noted.

Taken together, for the first time, the ARNE multicenter study demonstrates that significant improvements in coping behavior, QoL, and objective and subjective disease severity can be achieved by means of multiprofessional training in an outpatient

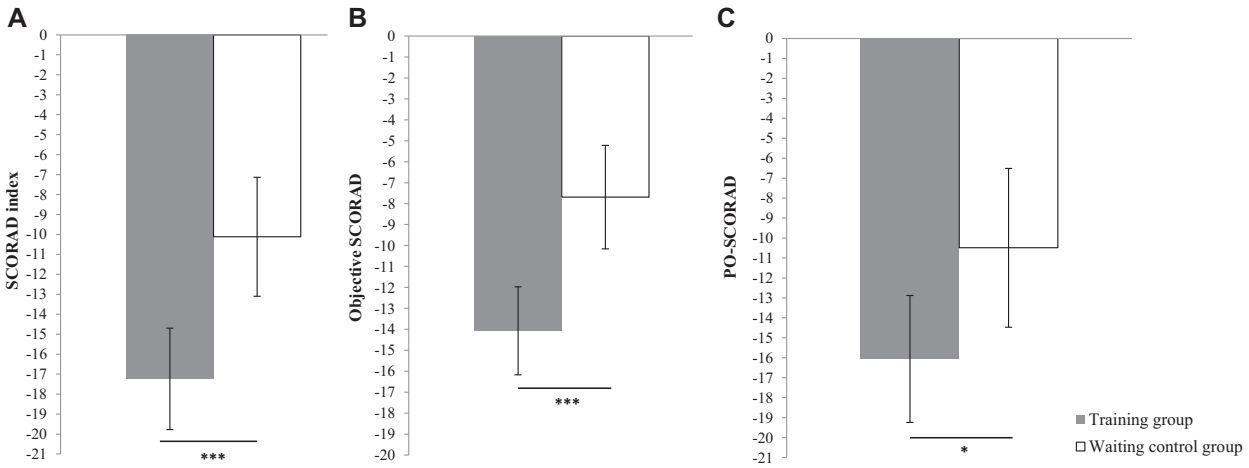

FIG 4. Reduction in signs and symptoms of AD. Results from assessment by using the SCORAD index (**A**; missing data = 4), corresponding objective SCORAD index (**B**; missing data = 2), and PO-SCORAD index (**C**; missing data = 4) with estimated marginal means (95% CIs) of differences in the training and waiting control groups (baseline vs 1 year of follow-up). *$P < .05$ and ***$P < .001$.

TABLE III. Outcome variables of the secondary analysis for completers by using analyses of covariance (covariate = baseline values) of differences between baseline and 1-year follow-up for groups receiving an educational intervention in AD or no education (estimated marginal means [95% CI])

	Intervention (n = 129)	Control (n = 104)	Intervention – control		
Outcome variables (missing data)	Estimated marginal means (95% CI) of differences (1 y of follow-up – baseline)	Estimated marginal means (95% CI) of differences (1 y of follow-up – baseline)	Estimated marginal means (95% CI) of differences (intervention – control)	*P* value	SE size *f*
Coping, JKF (3)	−0.03 (−1.17 to 1.11)	−2.97 (−4.23 to −1.71)	2.94 (1.24 to 4.65)	<.001	0.23
Itch-scratch cycle, MHF (3)	−7.15 (−8.31 to −6.00)	−3.86 (−5.13 to −2.59)	−3.29 (−5.01 to −1.57)	<.001	0.25
Helplessness, MHF (2)	−6.10 (−7.19 to −5.01)	−4.17 (−5.38 to −2.97)	−1.93 (−3.56 to −0.30)	<.05	0.15
Anxious-depressive mood, MHF (3)	−4.30 (−5.17 to −3.43)	−3.10 (−4.07 to −2.13)	−1.20 (−2.50 to 0.11)	NS	
Anxiety, HADS (2)	−1.43 (−1.96 to −0.90)	−1.25 (−1.83 to −0.66)	−0.19 (−0.98 to 0.61)	NS	
Depression, HADS (2)	−1.24 (−1.73 to −0.76)	−1.17 (−1.70 to −0.63)	−0.07 (−0.80 to 0.65)	NS	
Emotions, Skindex (2)	−21.85 (−25.02 to −18.67)	−11.98 (−15.49 to −8.47)	−9.87 (−14.61 to −5.14)	<.001	0.27
Functioning, Skindex (2)	−16.57 (−19.52 to −13.63)	−11.74 (−14.99 to −8.48)	−4.84 (−9.23 to −0.45)	<.05	0.14
Skindex overall (2)	−19.02 (−21.89 to −16.14)	−11.42 (−14.60 to −8.24)	−7.60 (−11.88 to −3.31)	<.001	0.23
DLQI (2)	−4.48 (−5.27 to −3.70)	−3.44 (−4.31 to −2.57)	−1.05 (−2.22 to 0.13)	NS	

NS, Not significant.

setting. In several sessions of the training genetic predisposing aspects and trigger factors finally contributing to an impaired skin barrier function in patients with AD and the broad variety of treatment options, including their risk/benefit ratios, were extensively discussed with the participants. Therefore we suggest that a better adherence to evidence-based management strategies, such as application of anti-inflammatory therapies (topical corticosteroids, topical calcineurin inhibitors, and proactive therapy[49]) and consequent basic therapy, as well as consideration of individual allergic and nonallergic trigger factors contributed to the surprisingly stable treatment success of this short-term education. However, further studies in this field are necessary to better define which components of the training intervention are most beneficial for the patients' well-being and treatment adherence.

Regarding the findings from our study, structured patient-education programs for adults with AD should be widely implemented in outpatient care in the future and be considered before escalating to treatment options associated with a higher risk of side effects.[16] This is underlined by current guidelines on treatment of AD recommending patient education.[5,50,51]

Clinical implications: Patient education by a multiprofessional team in an outpatient setting shows significant beneficial effects on coping behavior, QOL parameters, symptoms, and the severity of AD in adulthood.

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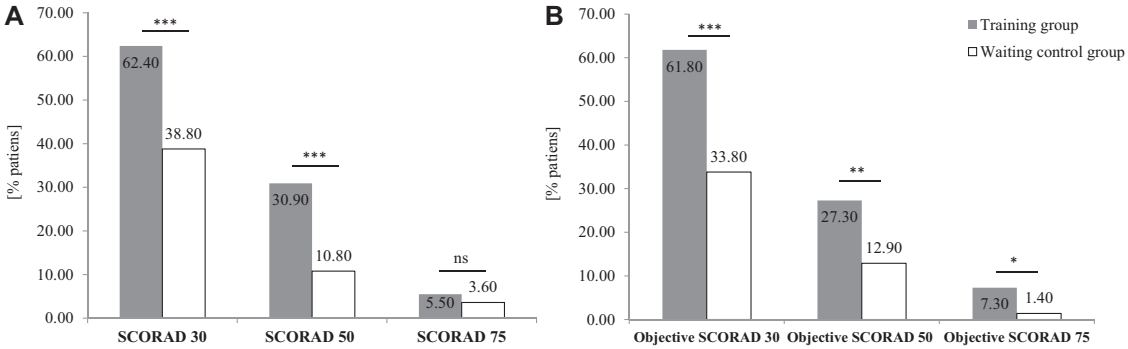

FIG E1. Change in SCORAD index **(A)** and objective SCORAD **(B)** scores from baseline versus 1 year of follow-up. Cumulative proportion of patients achieving at least 30% (SCORAD 30), 50% (SCORAD 50), and 75% (SCORAD 75) improvement in the training and waiting control groups is shown. $*P < .05$, $**P < .01$, and $***P < .001$.

TABLE E1. Overview on study procedures

	Baseline	1-y follow-up
Study procedures performed by the investigator		
Oral and written informed consent	X	
Inclusion and exclusion criteria	X	
SCORAD index (and corresponding objective SCORAD score)	X	X
Questionnaires completed by the patient		
Questionnaire on sociodemographic data	X	
JKF questionnaire (cognitions characteristic for itch symptoms)	X	X
MHF questionnaire (coping)	X	X
HADS-D	X	X
Skindex-29 questionnaire (QoL in patients with AD)	X	X
DLQI	X	X
PO-SCORAD index	X	X

TABLE E2. Baseline characteristics for completers and noncompleters for the training and waiting control groups (all $P \geq .05$)

	Training group		Waiting control group	
Variable	**Completer**	**Noncompleter**	**Completer**	**Noncompleter**
Overall	129/76.8%	39/23.2%	104/70.7%	43/29.3%
Age (y), mean (SD)	35.34 (11.99)	34.22 (12.99)	34.95 (12.17)	31.37 (10.34)
Sex				
Male	52/40.9%	13/36.1%	37/36.3%	13/38.2%
Female	75/59.1%	23/63.9%	65/63.7%	21/61.8%
Education				
Low	51/39.8%	18/50.0%	47/45.2%	13/39.4%
High	77/60.2%	18/50.0%	57/54.8%	20/60.6%
Comparison baseline values of main outcome variables				
Catastrophization, JKF (SD)	20.23 (9.73)	21.28 (10.58)	20.91 (9.15)	20.05 (10.12)
Social anxiety/avoidance, MHF (SD)	39.81 (14.26)	40.37 (15.78)	36.72 (12.13)	39.80 (13.19)
Symptoms, Skindex-29 (SD)	60.98 (16.95)	62.00 (19.47)	61.16 (16.56)	62.82 (17.32)
SCORAD index (SD)	47.37 (15.02)	50.55 (17.49)	48.18 (15.75)	48.74 (19.46)
Objective SCORAD index (SD)	39.31 (12.96)	40.25 (13.98)	39.57 (12.95)	39.43 (16.25)
PO-SCORAD index	53.04 (19.98)	55.46 (23.16)	53.83 (19.40)	54.98 (21.88)