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Assessment of quality of life, treatment practices, and associated factors among children of atopic dermatitis patients at all Africa leprosy, TB and rehabilitation training center (A.L.E.R.T): a prospective observational study

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Abstract

Background Atopic dermatitis (AD) is the most common chronic skin disease in children. It adversely affects child's physical health, daily functioning, and overall quality of life (QoL), impacting not only the child but also their families. There is a paucity of data in Ethiopia about treatment practices and QoL among children with AD. Thus, this study aimed to assess QoL, treatment practice, AD symptom control statues and associated factors for QoL among children with AD at ALERT dermatovenerology unit, Addis Ababa, Ethiopia.

Method Prospective observational study was employed on 403 patients. Structured questionnaire and Child Dermatology Life Quality Index (CDLQI) tool were used to collect the data. Descriptive statistics and multivariable logistic regression model were used to analyze the data.

Results The mean (± SD) age of participants was 8.04 (± 3.40) years. Topically applied readymade medicine, antihistamine and emollient were given for (55.6%, *n* = 224), (24.3%, *n* = 98) and (75.8%, *n* = 305) participants, respectively. The mean (± SD) QoL was 8.42(± 3.57) indicating moderate effect. Domain of itching, dressing and sleeping was the utmost affected QoL. Three-fourths (76.9%, *n* = 310) of patients had their AD symptoms controlled. Caregivers who were government employees [AOR = 4.9, 95% CI: 1.22, 19.71, *P* = 0.02], daily labourer caregivers [AOR = 7.3, 95% CI: 1.15, 45.7, *P* = 0.03] and, those with moderate AD [AOR = 2.8, 95 % CI: 1.59, 4.96, P = <0.001] were significantly associated with QoL, as well as caregivers with very low (≤ 860) [AOR = 0.09, 95% CI: 0.01, 0.68, *P* = 0.02], low (861–1500) monthly income [AOR = 0.20, 95% CI: 0.05, 0.90, *P* = 0.03].

Conclusion Patients with AD had a moderate QoL based on their CDLQL score. Three-fourths of the study participants who experienced AD-related symptoms had them controlled after 4 weeks of treatment. Among the

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CDLQI domains, itching and scratching, dressing problems and sleeping problems were the most affected. Caregiver employment status, monthly income, moderate type of AD and facial involvement were significantly associated with QoL outcomes.

Keywords Atopic dermatitis (AD), Quality of life (QoL), Child dermatology life quality index (CDLQI), All Africa leprosy, TB, And rehabilitation training center (ALERT), Ethiopia

Background

According to the definition of the American Academy of Dermatology (AAD), Atopic dermatitis (AD) is a widespread, persistent, itchy, inflammatory skin disease that impacts individuals of all age group. However, it is more common in children [1–3] with a wide range of severity and skin barrier defects [4]. AD ranked as the 15th non-fatal with the largest disease burden among skin diseases [5]. It impacted up to 2.4% of the world's population. According to the recent findings, the prevalence of AD is increasing in Africa, and ranges from 4.7 to 23% [6, 7].

AD doesn't respond to various treatment approach, and many patients will experience a chronic course of the disease. However, various treatment approaches exist to alleviate the exacerbations of the disease, reducing the duration, and degree of the flare [8]. In most patients with mild-to-moderate case of AD, management can be achieved by restoration of the skin through emollient use, avoidance of typical AD triggers, employing specific behavioural strategies to reduce scratching, implementing antibacterial measures, and using of topical and/or systemic anti-inflammatory drugs. Overall, the use of emollient is essential and fundamental of effective approach for managing AD [8, 9].

Results from multiple studies demonstrated that AD has a large impact on social functioning, mental health, physical health, emotional health and vitality regardless of the age of the patient. In generally, AD has as large impact on QoL of patients as other common chronic illness and dermatologic disease [10]. This ailment has a notably clinical and humanistic burden on patient-reported symptoms and QoL measures. It also demonstrated that AD can lead to anxiety and depression. Alongside its significant economic burden [11]. The existing global treatment practices and the unmet needs of individual with moderate-to-severe AD managed with systemic therapies are inadequately reported [12].

Western nations have carried out substantial research on various treatment options and HRQoL (Health-Related Quality of Life) among AD patients and provided their recommendations. Nonetheless, these findings cannot be directly extrapolated to the Africa context, particularly in Ethiopia, due to differences in genetic composition, environmental condition, economic statues, cultural influences, health care access, and medicine availability [13].

AD is becoming a rising public health issue in developing countries, like those in Africa. Nevertheless, these continents are not sufficiently depicted in dermatology literature, and there is limited information available regarding the increasing burden of AD. Consequently, this disease place strain on health care resources, access to treatment, and patient QoL [14]. Moreover, AD patients and their families encountered challenges in their social, clinical, and academic achievements [15], as well as in their economic, occupational, personal and emotional aspects [16]. Collectively, these factors increase both direct and indirect health care expenses and lower national productivity [17]. On top of that, there remains a lack of adequate data regarding the impact of AD on the QoL patients [14], as well as the efficacy standard anti- AD treatment in non-white ethnic populations [18]. Moreover, in Ethiopia, little is known regarding the treatment practices, impact of AD on patients' QoL, as well as contributing factors for QoL among individuals with AD. Therefore, since the necessary data is lacking, this study aims to evaluate the treatment practices, QoL, status of AD symptom control, and accompanying factors that impact the quality of life among patients with AD at the A.L.E.R.T centre Dermatovenerology Unit.

Materials and methods

Study setting

This study was carried out at ALERT Comprehensive Specialized Hospital, Dermatovenerology Unit. It is located at the capital city of Ethiopia, Addis Ababa at 7 km southwest on the way to Jimma Road in Kolfe Keranio sub city in Addis Ababa, Ethiopia. This Hospital delivers extensive clinical services in traumatology, gynaecology, tuberculosis, dermatovenerology, leprosy treatment, plastic and reconstructive surgery, ophthalmology, paediatric and neonatal intensive care unit (NICU), orthopaedics surgery in the country.

Study design and period

A prospective observational study was designed using a two-pronged approach. The first step involved patient interviews and chart reviews, followed by an evaluation of AD symptom improvement after 4 weeks of treatment. The study was conducted from December 1, 2022 to May 30, 2023.

Eligibility criteria

Inclusion and exclusion criteria

All children with AD who were receiving treatment at the ALERT Dermatovenerology Unit during the study period, aged 5 to 16 years old, had active follow-up and had been receiving anti-AD treatment for the last 4 weeks were included in the study. However, children under five years old, and those with mental health problems, hearing impairments or any other serious health problems, as well as those with chronic skin disease like psoriasis, acne vulgaris, seborrheic dermatitis, vitiligo and dermatophytosis, who didn't respond ≥ 2 CDLQI questions and were unable to give consent and assent to participate were excluded from this study.

Sample size determination and sampling techniques

The sample size was calculated using a single population proportion formula. Since no previous study had been conducted on the HRQoL among children with AD in Ethiopia, the proportion was assumed to be 50%. Therefore, the sample size was determined to be 384, with an additional 10% of contingency for non-response, drop outs and refusals to participate, bringing the final sample size to 422. To select study participants, we used a systematic random sampling method. The sampling interval (K^{th}) was calculated by dividing the total number of children with AD seen at Dermatovenerology Unit before the study period (January1st to June 31, 2022) by the intended sample size (1728/ 422). The first child was then selected at every fourth interval of study participants. After excluding participants who did not meet the inclusion criteria, 403 study participants were included in the final analysis.

Data collection instruments

Data was collected by using an interviewer administered questionnaire. Moreover, the data collection tool was designed by reviewing related published articles to capture the relevant socio-demographic and clinical characteristics, therapeutic intervention, and AD pruritus pattern and overall AD symptoms improvement and quality of life. The QoL was assessed using child dermatology life quality index (CDLQI) questionnaires.

Children's Dermatology Life Quality Index (CDLQI) tool is applicable for 5 to 16 years old. This tool demonstrated high validity and reliability ranging from good to excellent and also the first instrument to assess skin related QoL. It was widely used for more than 80 countries and was translated into more than 110 languages including Amharic [19]. It contains a 10 QoL inquiry with 6 subdomains; symptoms and feelings (questions 1 and 2), leisure (questions 4, 5 and 6), school or holidays (question 7), personal relationships (questions 3 and 8), sleep (question 9) and treatment (question 10). Every question of the CDLQI is responded to with 'only a little,' 'quite a lot,' or 'very much,' and assigned scored 0, 1, 2 or 3, respectively. The sole exception to this scoring method is question 7, where the possible responses 'very much' is substituted with 'prevented school,' and the question is scored in the same manner from, 0–3 [20, 21]. The proposed classification for the score reflecting impairment in QoL due to AD includes: no effect (0–1 score), small effect (2–6 score), moderate effect (7–12 score), very large effect (13–18 effect), and extremely large effect (19–30 score).CDLQI scores ranging from 0 to 5 were viewed as indicating no effect on QOL, whereas scores of 6 or higher were seen as indicating an "impact on QOL." [22]. The severity of AD was evaluated using objective SCORAD, which contain extent and intensity of the AD lesions, divided into three levels: < 15 mildly sever, 15–40 moderately sever, > 40 severely affected [23].

Data collectors and quality assurance

One trained clinical pharmacist was supervisor, and one dermatologist trainer working in Dermatovenerology Unit was involved in data collection procedure. The CDLQI questionnaire was validated on 200 AD children before conducting this study. To keep the quality of data, supervisor and data collectors was trained for 2 days with regard to data collection, sampling strategy, ethical principles and data handling methods before the actual involvement of data collection. Pre-test was done on 5% ($n = 15$) of AD patients, before 2 weeks of real time periods for data collection to secure the consistency and understandability of the checklist. After pretest, the final data collection tool was advanced with some correction after a deep evaluation of feedbacks obtained during the pre-test periods. The pre-tested patients were excluded from the analysis.

Data analysis and interpretation

Collected data were initially checked manually for completeness and consistency by supervisors during data collection and then rechecked at the office by the principal investigator before data entry. The data were entered into the Epi Info Version 7 database and exported to Statistical Package for Social Science (SPSS) version 25 for analysis. Descriptive statistics in SPSS were used to compute mean and standard deviation for continuous variables and frequency and percentage for categorical variables to summarize the results. Results were presented using texts, tables and figures.

All statistical methods for variables were checked to ensure they met test assumptions using Pearson correlation test. Variables with a correlation coefficient of > 0.7 were considered for the final model. Missing data were handled using the list-wise deletion method. Variables with P-values < 0.2 in the univariate analysis were

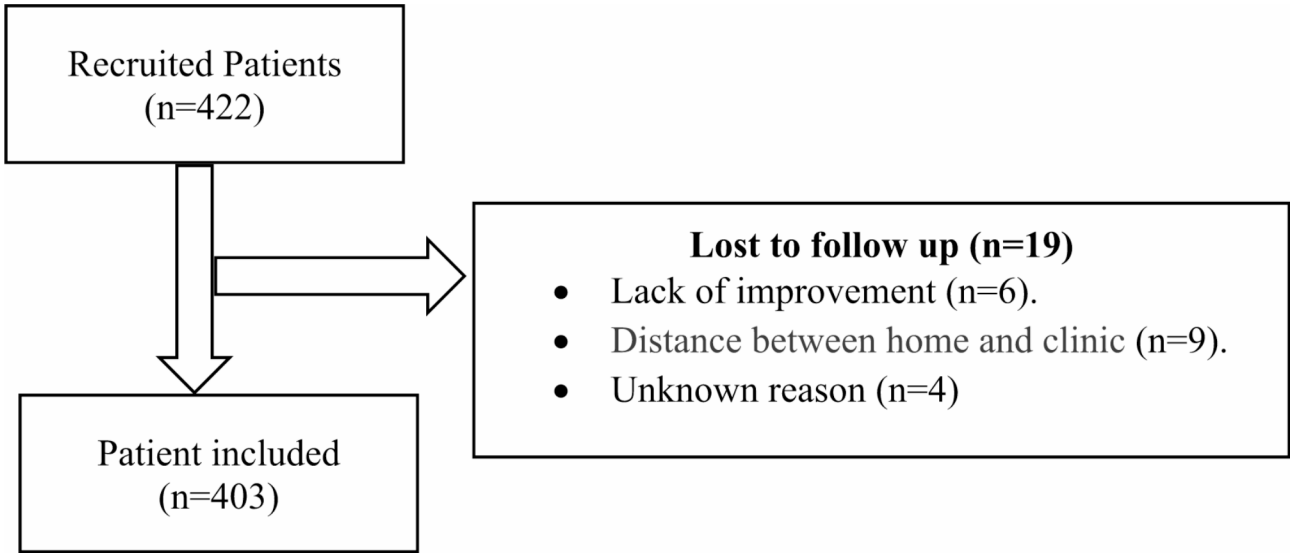

Fig. 1 Patient disposition flow chart of AD patients attending at ALERT comprehensive specialized hospital, Dermatovenerology Unit, Addis Ababa, Ethiopia, from September 01, 2022 to February 28, 2023 ($n=403$)

Table 1 Socio-demographic characteristics of AD patients attending at ALERT comprehensive specialized hospital, dermatovenerology unit, addis Ababa, Ethiopia, from September 01, 2022 to February 28, 2023 ($n=403$)

Variable	Category	Number	Percent
Sex	Female	216	53.6
	Male	187	46.4
Age (in years)	5 Years	166	41.2
	6–10 Years	131	32.5
	11–16 Years	106	26.3
Residences area	Rural	89	22.1
	Urban	314	77.9
Children caregiver	Mother	255	63.3
	Father	126	31.3
	Grandmother	9	2.2
	Grand father	2	0.5
	Other*	11	2.7
Children educational level	Pre-school	188	46.7
	Primary school	195	48.4
	Secondary school	20	5.0
Caregiver educational level	Primary school	90	22.3
	Secondary school	112	27.8
	Higher education	201	49.9
Care giver employment statues	Housewife	142	35.2
	Gov. employee	159	39.5
	Farmer	15	3.7
	Day labourer	23	5.7
	Merchant/self-employed	60	15.9
Care giver Monthly income (ETB)***	Very low (≤ 860)	142	35.2
	Low (861–1500)	7	1.7
	Average (1501–3000)	41	10.2
	Above average (3001–5000)	66	16.4
	High (≥ 5001)	147	36.5

ETB; Ethiopian birr, * NGO institution female guardian, elderly sister elderly brother and legal guardian ***As per the Ethiopian civil service civil servant's monthly salary scale

included in the multiple binary logistic regressions to control for confounders. The significance level was set at a p–value ≤ 0.05 and results were reported as odds ratios (OR) with 95% confidence intervals.

Results

Sociodemographic characteristics of study participants

Overall, 422 children with AD were recruited for this study, of which 19 patients (4.5%) were lost to follow up. A total of 403 study subjects were included in the final analysis (Fig. 1).

Female patients accounted for more than half (53.6%, $n=216$) of the study participants. The mean (± SD) age of the participants was 8.04 (± 3.40) years, ranging from 5 to 16 years. Within this age group, the most commonly affected age was 5 years (41.2%, $n=166$). More than three-fourth of the study participants (77.9%, $n=314$) lived in urban areas. Among the caregivers, 63.3%, ($n=255$) were mothers. Regards to educational level, nearly half of the study participants (46.7%, $n=188$) and caregivers (49.9%, $n=201$) were attending preschool and higher education, respectively. Of the total, 39.5% ($n=159$) of the caregivers were government employees and 36.5% ($n=147$) caregivers earned a monthly income of ≥ 5001 birrs (Table 1).

Clinical characteristics of study participants

As depicted in Table 2, the mean (± SD) age of study participants at the time of AD diagnosis was 4.79 (± 3.85) years with ages ranging from 1 to 16 years. Nearly half (49.1%, $n=198$) of the AD diseases occurred at a mid-onset (beginning at 3–7 years) and the three-fourths (76.4%, $n=308$) of cases of AD had a duration of less than

Table 2 Clinical characteristics of AD patients on observation at ALERT comprehensive specialized hospital, dermatovenerology unit, addis Ababa, Ethiopia, from September 01, 2022 to February 28, 2023 ($n=403$)

Variable	category	*n* (%)	Mean + SD	Range
Types of Atopy	Pure AD	341 (84.6%)	1.15 ± 0.361	
	Mixed AD	62 (15.4%)		
Duration of AD (Years)	< 5Years ≥ 5 Years	308 (76.4%)	2.235 ± 0.424	
		95 (23.6%)		
Age at onset of AD diagnosis (Years)	Early onset	153 (38.0%)	4.785 ± 3.85	1–16
	Mid onset	168 (41.7%)		
	Late onset	82 (20.3%)		
Current AD phase	Acute phase	104 (25.8%)		
	Sub- Acute phase	170 (42.2%)		
	Chronic phase	129 (32.0%)		
AD characteristics	Lesional type	114 (28.3%)		
	Non lessional type	289 (71.7%)		
AD severity categories (SCORAD)	Mild (0–14)	145(36.0%)	20.20 ± 10.63	1.90–56.30
	Moderate (15–40)	232(57.6%)		
	Sever (> 40)	26 (6.5%)		
Affected body parts	Flexural surfaces of extremities	99 (24.6%)		
	Extensor surfaces of extremities	66 (16.4%)		
	Face (forehead, cheeks, chin)	56 (13.9%)		
	Mixed body site	182 (45.2%)		
Number of Family Positive for atopy	One of the parents	112 (27.8%)		
	Both parents	9 (2.2%)		
	None	282 (70%)		
Positive Family history atopy	Atopic eczema Allergic rhinitis Bronchial asthma	29 (7.2%)		
	Negative family history of atopy	25 (6.2%)		
		67 (16.6%)		
		282(70.0%)		
Patient Co-morbidity	Respiratory	53	13.2	
	Non-respiratory	15	3.7	
	No-comorbidity	335	83.1	
Medical illness history of caregiver	HIV/AIDS	2 (0.5%)		
	Asthma	51(12.7%)		
	Epilepsy	0 (0%)		
	Hypertension	15 (3.7%)		
	Diabetic mellitus	5 (1.2%)		
	Others*	7 (1.7%)		
	No history of medical illness	323 (80.1%)		

RTI: Respiratory tract infection, SCORAD: Scoring Atopic Dermatitis *Hyperthyroidism, chronic GI upset, hemorrhoids, sinuses, Gout, cataract and leprosy

5 years. The majority (84.6%, $n=341$) of had the pure AD, (37.5%, $n=75$) had the sub-acute type, and 71.7% ($n=289$) had non-lesion type of AD. Regarding disease severity, more than half (57.6%, $n=232$) had moderate AD. Moreover, concerning to the affected body parts, 45.2% ($n=182$) of AD patients had mixed body site involvement which was the most predominantly affected sites.

In Table 2, a positive family history of atopy was reported in 27.8% ($n=112$) of the participants' parents. Nearly one-third (30%, $n=121$) had a family history of bronchial asthma. The majority (83.1%, $n=335$) of participants and caregivers (80.1%, $n=323$) had no history of medical illness at the time of presentation (Table 2).

Atopic dermatitis treatment approach

Table 3 shows the Atopic dermatitis treatment approach of the study participants. More than half (55.6%, $n=224$) of participants used topically applied non- compounded medicine, while the remaining participants (44%, 179) used topically applied compounded medicine. Out of users of topically applied non-compounded medicine, a total of 34.2% ($n=138$) used it with emollients, and 7.9% ($n=32$) used it without emollients. Among the users of topically applied non-compounded medicine, nearly half (49.4%, $n=199$) used topical corticosteroids and a small number (6.2%, $n=25$) were used topical calcineurin inhibitor. Mometasone furoate was the most frequently utilized topical corticosteroid (26.8%, $n=108$) (Fig. 2).

Regarding the topically applied compounded medicine, salicylic acid with betamethasone (15.6%, $n=63$) was the most commonly prescribed treatment approach while the least often prescribed treatment approach was urea with betamethasone and salicylic acid with clobetasol, each accounting for 0.2% of participants.

Table 3 Anti-atopic dermatitis treatment pattern of AD patients on attending at ALERT comprehensive specialized hospital, dermatovenerology unit, addis Ababa, Ethiopia, from September 01, 2022 to February 28, 2023 ($n=403$)

List of prescribed treatment modalities	*n* (%)
Topically non- compounded and emollients	139 (34.5%)
Topically compounded, systemic therapy and emollients	33 (8.2%)
Topically non- compounded only	32 (7.9%)
Topical compounded only	31 (7.7%)
Both topically compounded and systemic therapy	12 (3.0%)
Both topically compounded and emollients	103 (25.6%)
Both topically non compounded, systemic therapy and emollients	43(10.7%)
Both topically non- compounded and systemic therapy	10(2.5%)
Compounded medicine	
Salicyclic Acid + Betamethasone + White soft paraffin	63 (15.6%)
Betamethasone + White soft paraffin	47 (11.7%)
Mometasone + White Soft Paraffin	24 (6.0%)
Salicyclic Acid + Urea + Betamethasone + White soft paraffin	21 (5.2%)
Salicyclic Acid + Urea + Mometasone + White soft paraffin	10 (2.5%)
Salicyclic Acid + Mometasone + White soft paraffin	5 (1.2%)
Clobetasol + white soft paraffin	4 (1.0%)
Fusidic acid + Mometasone + White soft paraffin	3 (0.7%)
Urea + Betamethasone + White soft paraffin	1 (0.2%)
Salicyclic Acid + Clobetasol + White soft paraffin	1(0.2%)

*Topically applied Mixed (compounded) medicine. Example: 3% Salicylic Acid + 30-gram Betamethasone Dipropionate + 60-gram White soft paraffin

Systemic antihistamine therapy along with other treatment modalities was prescribed for 24.4% ($n=98$) of study participants as reported in Table 3. Among these treatment approaches, second generation antihistamine medications, including Loratadine (8.9%, $n=36$), Desloratadine (8.7%, $n=35$), and Cetirizine (6.0%, $n=24$) were the most often prescribed systemic treatment modalities, while chlorpheniramine (0.7%, $n=3$) was the least utilized.

Of the total participants, three-quarters (75.8%, $n=305$) were prescribed emollients. Out of those who received emollients, half of the study participants were prescribed paraffin-based emollient (53.3%, $n=215$), liquid paraffin (19.1%, $n=77$), white soft paraffin (1.0%, $n=4$), and other types of emollients with different dosage forms were prescribed for 2.2% ($n=9$) of study participants.

Health related quality of life domains

The overall mean (± SD) score of CDLQI was 8.42 (± 3.57) out of 30. 62% (n = 248) of study participants experienced a moderate effect, while only 2% (n = 7) had an extremely large effect. This signifies that children with AD had a moderate effect on their QoL (Fig. 3). The current study's findings showed that the Q1 domain (itchy, scratchy, sore or painful) had the highest impact on QoL, with a mean (± SD) score of 1.83 (± 0.78) out of 3. Three-fifths of participants (40.7%) reported that their QoL impact was "only a little", while 35.7% reported it was "quite a lot". Conversely, the Q6 domain (avoided swimming or other sports activities) showed the lowest QoL impact with a mean score of 0.27 (± 0.48), and the highest percentage (74.2%) of study participants indicated that its QoL impact was "Not at all". Similarly, the impact of AD on the Q8 domain (teasing /bullying) recorded the lowest score, with a mean score of 0.35 (± 0.50) out of 3. More than three-fifths (65.5%) of study participants indicated that their QoL impact was "Not at all ". In comparison, the highest percentage (37.2%) of study participants

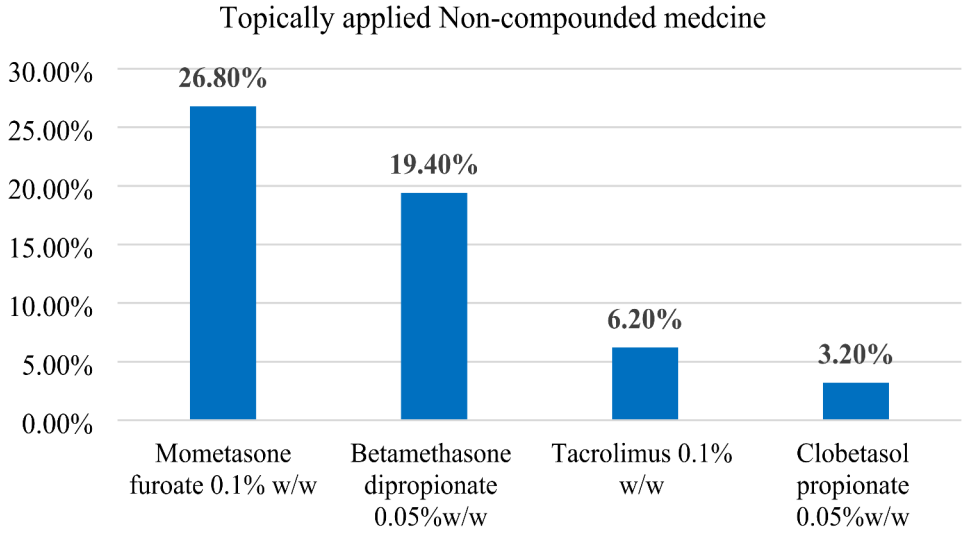

Fig. 2 Topically applied non-compounded medicine among AD patient attending at ALERT comprehensive specialized hospital, Dermatovenerology Unit, Addis Ababa, Ethiopia, from September 01, 2022 to February 28, 2023 ($n=403$)

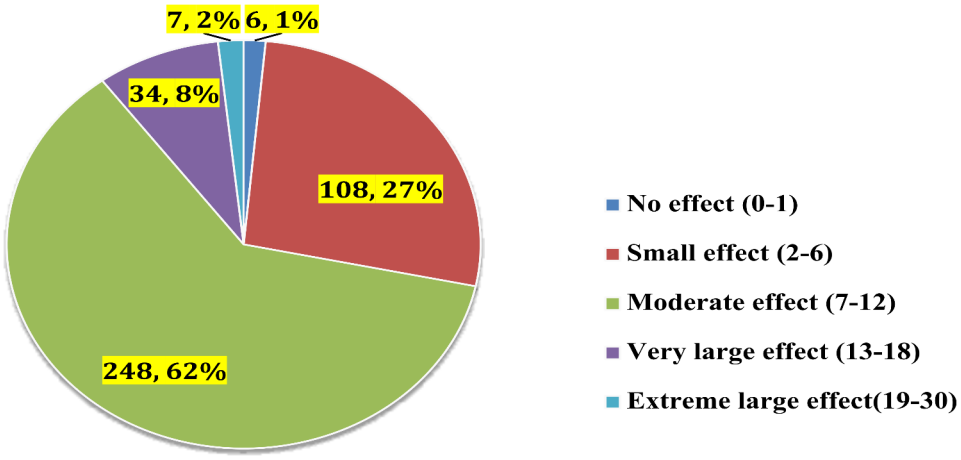

Fig. 3 The overall effect of CDLQI distribution among AD patient attending at ALERT comprehensive specialized hospital, Dermatovenerology Unit, Addis Ababa, Ethiopia, from September 01, 2022 to February 28, 2023 ($n=403$)

described that having AD had only a little impact on the Q4 domain (dressing clothes/shoes), with a mean (± SD) score of 1.76 (± 0.92). Similar results were observed regarding the impact on sleeping. Nearly half (51.4%) of the study participants reported that their QoL impact was "only a little" with a mean score of 1.47 (± 0.84). These data, along with the remaining question scores and percentages are shown in Table 4.

AD symptoms pattern and improvement statues

According to the Hanifin & Rajka diagnostic criteria, all study participants were assessed for symptoms of pruritis. Localized pruritus (75.7%, $n=305$) was the most commonly observed symptom, followed by generalized pruritus (24.3%, $n=98$). According to the severity of AD-related pruritus, acute and chronic types were observed in 49.4% ($n=199$) and 50.6% ($n=204$) of study participants, respectively. Dry skin (70.7%, $n=285$) and inflamed skin (6.5%, $n=26$) were also observed at the initial presentation (Fig. 4). After a 4-week treatment observation period, 76.9% ($n=310$) of study participants had their AD related symptoms controlled, while 23.1% experienced uncontrolled AD symptoms.

Factors associated with quality of life

Bivariate logistic analysis revealed that caregiver educational level, job level, monthly income, AD classification and severity, affected body site, types of medicine use, pruritus distribution and severity have all passed with a p- value < 0.25 to the multivariable logistic regression analysis model. Variables such as being a government employee, daily laborer, having a low, very low and above average monthly income, moderate AD and facial involvement were declared statistically significant at $P<0.05$ in association with QoL. The likelihood of having poor QoL among government workers [AOR = 4.9, 95% CI: 1.22, 19.71, $P=0.02$] and daily laborers [AOR = 7.3, 95% CI: 1.15, 45.7, $P=0.03$] were 4.9 and 7.3 times higher compared to housewives, respectively. Caregivers who earned very low (≤ 860 birr) [AOR = 0.09, 95% CI: 0.01, 0.68, $P=0.02$], low (861–1500 birr) [AOR = 0.20, 95% CI: 0.05, 0.90, $P=0.03$] and above average (3001–5000 birr) [AOR = 0.18, 95% CI: 0.04, 0.75, $P=0.03$] were less likely to have poor quality of life compared to those who were highly paid (> 5001 birr). Patients with moderate AD [AOR = 2.8, 95% CI: 1.59, 4.96, P = < 0.001] had, on average, 2.8 times lower quality of life compared to those with mild AD (Table 5).

Discussion

This observational study, conducted in aspecialized dermatology setting, provides information on the quality of life, treatment practices, status of AD symptom control, and associated factors among children with AD using the validated CDLQI instrument. The study revealed that, the total mean (± SD) CDLQI score was 8.44(± 4.20), indicating a moderate impact on patients' QoL. This finding is consistent with studies conducted in Thailand 7.5 [24], China 7.7 [25], Malaysia 8.0 [26], Singapore 8.5 [27], Turkey 8.97 [28], Iran 9.44 [29], and Ivory Coast 9.9 [30]. Furthermore, our results are also consistent with a meta-analysis conducted by Olsen et al. [31]. Conversely, our finding was lower than the study done in Serbia, which found an average of 17.11, indicating a very large effect [20]. One potential explanation may be that the current study included all AD patients, while in Serbia, only patients with moderate to severe forms of AD were included. On the other hand, our finding was higher than that of studies done in Brazil 5.4 [32], the USA 5.8 [33], and Korea 6.6, indicating to small effects. One reason for this discrepancy could be that the number of study participants in Brazil and Korea was small and only mild to

Table 4 Mean and response rate of CDLQI score among AD patient attending at ALERT comprehensive specialized hospital, dermatovenerology unit, Addis Ababa, Ethiopia, from September 01, 2022 to February 28, 2023 ($n=403$)

CDLQI	mean (± SD)	Response	*n* (%)
Over the last week, how itchy, Scratch, sore or painful has your skin been?	1.83 (±0.78)	Very much	95 (23.6)
		Quite a lot	144(35.7)
		Only a little	164(40.7)
		Not at all	0 (0)
Over the last week, how embarrassed or self-conscious up set or sad have you been because of your skin?	0.34 (±0.52)	Very much	8 (2.0)
		Quite a lot	30 (7.4)
		Only a little	189(46.9)
		Not at all	176(43.7)
Over the last week, how much has your skin interfered your friendship?	0.68 (±0.69)	Very much	2(0.5)
		Quite a lot	10(2.5)
		Only a little	172(42.7)
		Not at all	219(54.3)
Over the last week, how much have you change or whom different special cloths / shoes because of your skin?	1.76 (±0.92)	Very much	108(26.8)
		Quite a lot	118(29.3)
		Only a little	150(37.2)
		Not at all	27(6.7)
Over the last week, how much has your skin trouble affected going out, playing or doing hobbies?	0.42(±0.52)	Very much	0(0)
		Quite a lot	6(1.5)
		Only a little	156(38.7)
		Not at all	241(59.8)
Over the last week, how much have you avoided swimming or other sports because of your skin trouble?	0.27(±0.53)	Very much	1(0.2)
		Quite a lot	4(1.0)
		Only a little	99(24.6)
		Not at all	299(74.2)
Last week was it school time? If school time, over the last week, how much did your skin problem affect your school work? OR Last week was it holiday time? How much, over the last week, has your skin problems interfered with your enjoyment of the holiday?	0.34(±0.52)	Very much	0(0)
		Quite a lot	9(2.2)
		Only a little	120(29.8)
		Not at all	274(68.0)
Over the last week, how much trouble have you had because of your skin with other people calling your names, teasing, bulling, asking questions or avoiding you?	0.35(±0.50)	Very much	0(0)
		Quite a lot	4(1.0)
		Only a little	135(33.5)
		Not at all	264(65.5)
Over the last week, how much has your sleep been affected by your skin problems?	1.47(±0.84)	Very much	58(14.4)
		Quite a lot	105(26.1)
		Only a little	207(51.4)
		Not at all	33(8.2)
Over the last week, how much of a difficult has the treatment of your skin been?	0.80(±0.85)	Very much	27(6.7)

moderate participants were enrolled in the USA. Another possible reason for the discrepancy might be the limited accessibility of dermatology centers, dermatology experts, essential medicines, and devices for AD diagnosis and care in our context [14].

As per the domain of the CDLQI questionnaire, 72% of the study participants found that AD had a considerable impact on their QoL. Of those, 62% experienced a moderate effect, 8% a very large effect and 2% an extreme very large effect.This finding is consistent with a study done in Brazil, where 72% of participants were affected (38% with a moderate effect, 34% with a large effect) [34], and in Iran, where 65% of participants were affected (38% with a moderate effect, 27% with a large effect) [29].

When it comes to the CDLQI sub scale responses, different studies have reported varying results. The majority of studies have showed that feelings and educational activities were the most and least reported sub scales, respectively [35]. In this study, the highest reported CDLQI subscales were feelings and sleeping problems. However, disturbances in swimming/sports activities were the least affected CDLQI components. This result is in line with studies done in Iran [29] and Malaysia [26].

Different types of medicated and non-medicate therapeutic approaches were prescribed for the management of AD. Emollient therapy is a cornerstone for the management and prevention of AD [36]. In this study, two-thirds (78.9%, $n=318$) of the study participants were found to be prescribed emollient therapy along with other therapeutic approaches. This finding was higher than that of a study done in Brazil (56.9%) [32].This discrepancy might be due to the fact that two third of the current study participants had dryness and crusted skin.

Regarding the pharmacological therapeutic approach, more than half (55.6%) of the study subjects utilized topically applied non compounded medicine. Of this therapeutic approach, almost half (49.4%) of the study participants were prescribed topical steroids. This finding is in line with observational studies done in Italy (45.7%) [37], Egypt (45.9) [38] and Brazil (51%) [32]. This is due to the fact that topical steroids are the first line therapeutic approach for both adults and children to treat inflammatory symptoms, acute flares and pruritus symptoms of AD [39].

Extemporaneous compounding of medicine is a commonly utilized therapeutic approach for paediatric dermatological patients in developing countries [40]. Evidence has showed that compounding corticosteroids with emollients is an effective treatment modality for paediatrics AD [41]. Our study revealed that the most common and least prescribed topical compounded medicines contained salicylic acid with corticosteroids (15.6%, $n=63$) and urea with corticosteroids (0.2%, $n=1$), respectively. This might be because both salicylic acid and urea have penetration enhancing and water retaining effects, which influence the skin's pH and enhance the effectiveness of topically administered steroid medication [42]. In addition, prescribing compounded medicine plays an important role in managing chronic and unresponsive cases

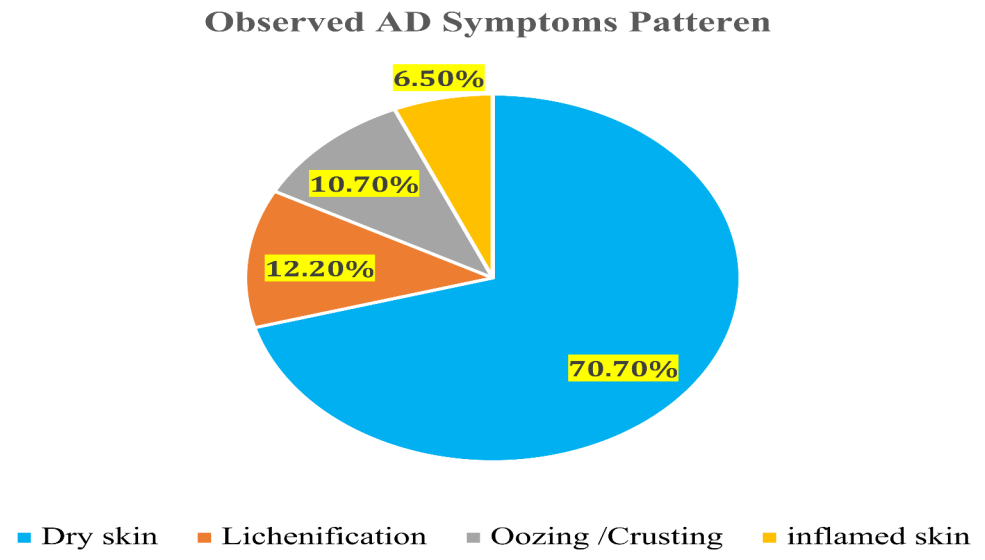

Fig. 4 Observed AD symptoms pattern among AD patient attending at ALERT comprehensive specialized hospital, Dermatovenerology Unit, Addis Ababa, Ethiopia, from September 01, 2022 to February 31, 2023 ($n=403$)

of AD [43]. Antihistamines are frequently prescribed to manage AD related pruritus symptoms and improve patient sleep quality [44]. In this study, second generation antihistamines were prescribed for 17.6% ($n=71$) of study participants. This finding is consistent with a retrospective study done in the USA (19.9%) [45] and a cross-sectional study conducted in Brazil (21.6) [32].

In this study, 71.9% ($n=310$) of study participants had their AD symptoms controlled with different types of anti- AD treatment approaches. This finding closely aligns with a retrospective study done in Korea (70.6%) [46]. However, a 6 month prospective study and multicenter retrospective analysis in Japan [47, 48] showed that the rate of AD symptom control among children using topical corticosteroids and emollients was 52% and 40%, respectively. This discrepancy may be due attributed to the use of different therapeutic approaches. In our research, a variety of treatment approaches were utilized, while the study in Japan focused solely on topically applied corticosteroids. Another reasons for the differences may be the characteristics of the study participants such as avoidance of triggering factors, compliance status, and the dosage form in which the corticosteroids are delivered.

Identifying of possible indicators of poor QoL in children with AD is crucial for comprehending the whole picture of the disease and developing effective monitoring strategies. In this study, multivariable analysis demonstrated that caregiver employment status (government employee and daily laborer) were independent factors associated with poor QoL compared to house wives. This finding was supported by study in Nigeria [49]. Nevertheless, it contradicts a study conducted in Singapore [50, 51]. The differences observed may be attributed to variations in socioeconomic status, caregiver life style and QoL measurement.

According to this study, having moderate AD was found to be an independent factor for having a poorer QoL than mild AD. This finding is consistent with studies conducted in Singapore and Thailand [50, 52], which suggest that moderate to severe AD patients experience sleep deprivation and marked pruritus.

We found that caregivers with low, very low and above average monthly income were less likely to have a poorer quality of life as compared to highly paid caregiver. This is in line with a study done in Nigeria [49]. Indicating that the QoL of children is associated with family socioeconomic status. Caregivers who earn low monthly incomes may have a greater financial burden in covering the expenses of medical care. Consequently, when creating a treatment strategy for children with AD and enhancing their QoL, particular attention must be paid to families from low-income households. Aside from the above associated variables, our study did not find any age related, clinical related or treatment related factors association with QoL. However, a study done in Singapore revealed that older children are associated with poor QoL [50]. This discrepancy may be linked to adjustments in confounding variables, variations in sample size and differences in participant age groups.

This study has several strengths. The large sample size provides a good representation of children with atopic dermatitis in Ethiopia. To the best of our knowledge, this is one of the first studies on the QoL in children with atopic dermatitis. However, it also has a few limitations. Firstly, the study was conducted at a single specialized dermatology center, which may limit the generalizability of the findings to other settings or populations. Secondly,

Table 5 Factors associated with QoL among AD patient attending at A.L.E.R.T comprehensive specialized hospital, dermatovenerology unit, addis Ababa, Ethiopia, from September 01, 2022 to February 31, 2023 ($n=403$)

Variable	CDLQI score *n* (%)		OR (95% CI)		*P*-value
	< 5	≥ 6	Crud	Adjusted	
Caregiver educational level					
Primary education	24(26.6)	66(73.4)	0.79(0.44,1.42)	0.99(0.51,1.97)	0.99
Secondary education	25(22.3)	87(77.7)	0.59(0.36,1.01)	0.71(0.38,1.35)	0.30
Higher education	37(18.4)	164(81.6)	1.00 (Ref.)	1.00 (Ref.)	
Job categories					
Government employee	33(20.8)	126(79.2)	1.23(0.76,2.11)	4.9(1.22,19.71)	**0.02**
Farmer	6(40)	9(60)	0.55(0.18,1.64)	1.29(0.26,5.57)	0.81
Daily laborer	2(8.7)	21(91.3)	2.44(0.69.8.67)	7.32(1.15,45.7)	**0.03**
Merchant/self-employed	15(23.4)	49(76.6)	0.87(0.45,1.66)	3.79(0.84,16.93)	0.08
Housewife	30(21.1)	112(78.9)	1.00 (Ref.)	1.00 (Ref.)	
Caregiver monthly income					
Very low (≤ 860)	30(21.1)	112(78.9)	0.92(0.54,1.57)	0.09(0.01,0.68)	**0.02**
Low (861–1500)	3(42.9)	4(57.1)	0.23(0.05,1.18)	0.20(0.05,0.90)	**0.03**
Average (1501–3000)	10(24.4)	31(75.6)	0.76(0.35,1.64)	0.28(0.65,1.19)	0.08
Above average (3001–5000)	13(19.7)	53(80.3)	1.16(0.58,2.34)	0.18(0.04,0.75)	**0.01**
High (≥ 5001)	30(20.4)	117(79.6)	1.00 (Ref.)	1.00 (Ref.)	
AD classification					
Acute	25(24)	79(76)	1.00 (Ref.)	1.00 (Ref.)	
Sub-acute	43(25.3)	127(74.7)	1.19(0.63,1.85)	1.12(0.59,2.10)	0.72
Chronic	18(13.9)	111(86.1)	2.15(1.11,3.85)	1.40(0.65,3.04)	0.39
AD severity					
Mild	56(38.6)	89(61.4)	1.00 (Ref.)	1.00 (Ref.)	
Moderate	30(12.9)	202(87.1)	3.92(2.43,6.33)	2.8(1.59,4.96)	**< 0.001**
Sever	5(19.2)	21(80.8)	---------	--------	0.998
Affected body site					
Flexor surface	21(21.2)	78(78.8)	1.00 (Ref.)	1.00 (Ref.)	
Extensor surface	10(15.2)	56(84.8)	1.44(0.66,3.13)	0.98(0.41,2.31)	0.95
Face	22(39.3)	34(60.7)	0.34(0.17,0.69)	0.46(0.21,1.03)	0.05
Mixed body site	33(18.1)	149(81.9)	1.21(0.67,2.2)	0.93(0.49,1.8)	0.82
Types of medicine use					
Compounded medicine	57(30.6)	129(69.4)	0.43(0.27,0.70)	0.73(0.41,1.31)	0.29
Non- compounded medicine	167(52.7)	150(47.3)	1.00 (Ref.)	1.00 (Ref.)	
Pruritus distribution					
Localized Pruritus	70(22.9)	235(77.1)	1.00 (Ref.)	1.00 (Ref.)	
Generalized Pruritus	16(16.3)	82(83.7)	1.53(0.87,2.68)	0.99(0.50,1.96)	0.98
Severity of Pruritus					
Acute	49(24.6)	150(75.4)	1.00 (Ref.)	1.00 (Ref.)	
Chronic	37(18.1)	167(81.9)	1.72(1.17,2.71)	1.21(0.68,2.17)	0.52

*- statistically significant at $P<0.05$

the study was unable to compare the QoL of children with atopic dermatitis to that of children without the condition. Thirdly, there is a possibility of information bias during data collection on QoL, as it was reported by a proxy (parent/ caregiver). Therefore, future multicenter and follow-up studies are needed to reassess our findings in a larger cohort of patients.

Conclusions

The finding of this study indicate that AD has moderate effects on children's quality of life. Among the CDLQI domains, the feeling of itching and scratching, dressing problems and sleeping problems were the most affected. However, disturbances in swimming/sports activities were the least affected components of the CDLQI. Symptom control for AD was observed in three-fourths of the study participants after 4 weeks of treatment. Caregiver employment status, caregiver monthly income, moderate

types of AD, and facial involvement were significantly associated with QoL outcomes.

Abbreviations

AAD	American Academy of Dermatology
AD	Atopic dermatitis
ALERT	All Africa Leprosy, Tuberculosis and Rehabilitation Training
AOR	Adjusted Odds Ratio
CDLQI	Child dermatology life quality index
HRQoL	Health related quality of life
MRN	Medical record number
NICU	Neonatal intensive care unit
QoL	Quality of life
SCORAD	Scoring atopic dermatitis
SPSS	Statistical Package for Social Sciences

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Author contributions
H.T designed and conducted the study, analyzed and interpreted results and drafted the manuscript. A.B.B were contributed to conception and design of the study, analysis, interpretation, supervision, drafting the manuscript and its critical review. All authors approved the final version of the manuscript to be published.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Ethical approval was received from the Ethical Review Board of the School of Pharmacy, College of Health Sciences, Addis Ababa University, (Ref.no; ERB/SOP/479/14/2022). Permission was also obtained from ALERT Comprehensive Specialized Hospital, Dermatovenerology unit with Ref.No 10.015.1/Po-56.22. In addition, informed consent was obtained from the caregiver and study participants. For the sake of anonymity, the participant's name and medical record number were not used during data collection, and all other personnel information was kept entirely secret throughout the study period.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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