

## Original Article

# Adherence to topical corticosteroids and moisturisers in adults with endogenous eczema in Singapore

## 新加坡的內源性濕疹成年患者在外用皮質類固醇和潤膚霜的使用依從性

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The mainstays of treatment in endogenous eczema (EE) are topical corticosteroids (TCS) and moisturisers. This study aimed to survey the factors correlating with adherence to treatment for EE outpatients. Forty-nine-item cross-sectional interviews with 110 adult EE outpatients from the dermatology clinic at the National University Hospital, Singapore revealed that improving adherence in the non-geriatric population can be further explored; steroid phobia affects adherence to TCS; lifestyle and personal preferences affect adherence to moisturisers. Patient education on the safe and correct use of TCS and the development of moisturisers with more comfortable texture and ease of application should be considered.

外用類固醇和潤膚霜都是內源性濕疹的主要治療，本研究的目的是調查門診中的內源性濕疹成年患者在這兩種治療的使用依從性之相關聯因素。在新加坡國立大學醫院皮膚科門診內，有 110 名內源性濕疹成年患者完成了有 49 個項目的橫斷面採訪。結果揭示非老年人口群組的使用依從性有待改進，可進一步探討。另外，對類固醇的不當恐懼影響着外用類固醇的使用依從性，而生活方式和個人喜好則影響着潤膚霜的使用依從性，固教育患者安全和正確使用外用類固醇及研發質感舒服並應用方便的潤膚霜是重要的考慮範疇。

**Keywords:** Adult, eczema, medication adherence, Singapore

關鍵詞：成年人、濕疹、藥物依從性、新加坡

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## Introduction

Endogenous eczema (EE) is a chronic skin condition that may be endogenous and not related to external stimuli.<sup>1</sup> Subsets include atopic eczema (AE), xerotic eczema, hand and foot eczema. EE as a whole presents a significant disease burden in Singapore, where 67% of all eczema cases seen at a tertiary dermatological referral centre were endogenous in nature.<sup>2</sup> Also, the prevalence of EE in Singapore increased from 31% to 67% between 1973 and 1990.<sup>2</sup>

The principles of care for EE are similar to AE and typically involve a topical corticosteroid (TCS) and moisturiser. Long-term therapeutic aims include prompt management of acute exacerbations, maintenance of remission by pro-active measures, and monitoring of adherence to therapy. TCS is used for rapid resolution of AE during acute flares and might also be used in conjunction with moisturisers for long-term maintenance to prevent recurrent flares.<sup>3,4</sup> Other treatments such as topical calcineurin inhibitors, oral antihistamines, phototherapy and oral immunosuppressants may be indicated or given together with the usual treatments when required.<sup>3,4</sup>

There are few studies on EE, and there is no published data on adherence to topical therapy in EE. Research is lacking in studying non-adherence in dermatology.<sup>5</sup> A 20-year review on adherence in dermatology concluded that difficulty in measuring adherence to topical therapy among dermatology patients led to the paucity of such publications.<sup>6</sup> The available studies generally showed low adherence rates to treatment<sup>5-9</sup> and demonstrated a link between poor adherence to topical treatment and poor treatment outcomes,<sup>10-12</sup> highlighting the importance of this issue.<sup>13-15</sup>

In patients with AE, fear of TCS is being increasingly recognised,<sup>16,17</sup> and has been demonstrated to be linked with poor compliance to TCS therapy.<sup>16</sup> Many authors concluded that patient and parental education can lead to improved compliance and clinical outcomes for treating paediatric AE.<sup>13,18-20</sup> Studies have sought

to characterise barriers to adherence in paediatric AE patients by surveying their caregivers, some of which include concerns about the time-consuming nature of applying topical treatments, cost and safety of the prescribed medications.<sup>21,22</sup> Our study focuses on adherence and factors affecting adherence to treatment in adult patients with EE to address the paucity of data in this area.

## Materials and methods

### Study design

This was a cross-sectional study whereby information on the severity and nature of eczema was obtained followed by an interviewer-administered questionnaire in either the English or Chinese language.

There were two trained interviewers and all questionnaires were checked for completeness.

### Study population

One hundred and twenty-four consecutive adults aged 21 years old and over with pre-existing EE were recruited over the course of seven weeks in 2012 from the dermatology clinic of the National University Hospital. The institutional Ethics Committee approved the study (ref. no. 2012/00102, National Healthcare Group Domain Specific Review Board). A verbal informed consent was obtained from all participants, as the study was of minimal risk and involved no recording of identifiable information.

The study excluded patients with a) seborrhoeic eczema because it usually does not require long-term therapy; and b) venous eczema because it is attributable to chronic venous insufficiency, a potentially reversible cause.

There were 14 non-responders of which 10 declined participation in the survey and four were unable to communicate adequately.

### Study instruments

The attending dermatologists specified the nature of eczema and graded its severity using the

Investigator's Global Assessment (IGA) scale during the consultation.

Investigator's Global Assessment grades the disease from clear, almost clear, mild, moderate, severe to very severe disease on a scale of 0 to 5.<sup>23</sup>

The 10-item Dermatology Life Quality Index (DLQI) developed and validated by Finlay and Khan was used to assess quality of life (QoL).<sup>24</sup> The DLQI score is calculated by summing the scores of its 10 questions. The maximum score is 30 and the minimum is 0. The scores represent the effect of the skin disease, in this study EE, on the QoL. A score of 0-1 indicates that there is no effect at all on the patient's life, 2-5 a small effect, 6-10 a moderate effect, 11-20 a very large effect and 21-30 an extremely large effect. It can be analysed under six different domains, namely symptoms and feelings, daily activities, leisure, work and school, personal relationships, and treatment.

Twenty-one items on demographics and medical details were obtained from the patients (Appendix 1).

### Data analysis

Data was processed using Microsoft Excel XL and Predictive Analytics Software version 18. The Pearson's chi-squared test was used to compare proportional data. A probability ( $p$ ) <0.05 was considered statistically significant.

## Results

The questionnaires of 110 participants were analysed.

### Characteristics of study population (Table 1)

There was a slight male predominance (58.2%), mainly Chinese (86.4%), and the median age was 56 (range of 21-79).

The majority of the patients had non-specific EE (37.3%) and AE (36.4%); followed by xerotic

eczema (20.0%), and then palmoplantar eczema (4.5%), dyshidrotic eczema (0.9%), and prurigo nodularis (0.9%). At the point of the survey, most patients had mild eczema (44.5%). Almost all patients were using TCS (98.2%) and moisturiser (90.9%).

**Table 1.** Characteristics of outpatients with EE (n=110)

Variable	No. (%)
Gender	
Male	64 (58.2)
Female	46 (41.8)
Age group	
Median (range)	55.50 (21-79)
21-29	22 (20.0)
30-39	10 (9.1)
40-49	14 (12.7)
50-59	19 (17.3)
60-69	19 (17.3)
70-79	26 (23.6)
Ethnic group	
Chinese	95 (86.4)
Malay	6 (5.5)
Indian	5 (4.5)
Others	4 (3.6)
Type of endogenous eczema	
Non-specific endogenous	41 (37.3)
Atopic	40 (36.4)
Xerotic	22 (20.0)
Palmoplantar	5 (4.5)
Dyshidrotic	1 (0.9)
Prurigo nodularis	1 (0.9)
Severity of eczema (IGA)	
Clear (0)	8 (7.3)
Almost clear (1)	17 (15.5)
Mild (2)	49 (44.5)
Moderate (3)	27 (24.5)
Severe (4)	9 (8.2)
Application of TCS	
Yes	108 (98.2)
Application of moisturiser	
Yes	100 (90.9)

EE, Endogenous Eczema; TCS, Topical Corticosteroid; IGA, Investigators' Global Assessment

### **Adherence and barriers to adherence**

*Adherence and barriers to adherence to TCS (n=108) (Table 2).*

More than half of the patients (54.6%) stopped applying TCS upon subjective improvement of their skin, while 43.5% even forgot to apply TCS. Carelessness was defined as not applying the cream over all lesional areas or laziness to apply TCS. This was identified in 30.6% of participants, most of whom were careless once a week/month (87.9%).

The most commonly cited barriers to adherence were concerns about side-effects of TCS (36.1%), and not finding it useful in managing eczema (27.8%).

*Adherence and barriers to adherence to moisturiser (n=100) (Table 2).*

While the ideal frequency of application of moisturiser varies according to patients' preference and skin condition, as well as doctors' knowledge, preference, and clinical experience, we routinely recommend a minimum standard of twice daily application. Using this criterion, slightly more than half of the patients had inadequate application of moisturiser (52.0%). Close to half of the patients even forgot to apply moisturiser (46.0%). One-third of the patients stopped applying moisturiser upon subjective improvement. Less than one-third of the patients applied moisturiser infrequently (24.0%), usually using it once a week/month (79.2%). Most patients (88.0%) used moisturiser after a shower and at bedtime when it was most convenient.

The most commonly cited barriers to adherence were feeling of discomfort on the skin (27.0%), not finding it useful in managing eczema (23.0%) and cost deterring them from using it (23.0%).

### **Factors affecting adherence (Table 3 and Table 4)**

The non-geriatric population was more likely to forget to use TCS (52.1% vs. 25.7%,  $p=0.010$ )

and more likely to have inadequate application of moisturiser (59.1% vs. 38.2%,  $p=0.048$ ). Despite not reaching statistical significance, the non-geriatric population was less adherent for all other items measuring adherence. Those with xerotic eczema were more likely to have adequate application of moisturiser (20.0% vs. 60.0%,  $p=0.001$ ). Those without chronic medical problems were more likely to forget to use TCS (56.5% vs. 33.9%,  $p=0.019$ ).

The proportion of those who stopped applying TCS upon subjective improvement was higher in those with educational qualifications of secondary school or above (64.1% vs. 32.0%,  $p=0.010$ ), those who were familiar with TCS (63.8% vs. 38.5%,  $p=0.011$ ) and those who were concerned about its side effects (74.4% vs. 43.5%,  $p=0.002$ ).

The proportion of those who stopped applying moisturiser upon subjective improvement was higher in males (43.1% vs. 19.0%,  $p=0.012$ ), those who complained of discomfort from TCS (55.6% vs. 24.7%,  $p=0.014$ ) and those who felt that it was too time-consuming (54.5% vs. 26.9%,  $p=0.015$ ).

No statistically significant relationship was noticed between severity of EE, concurrent skin condition(s), family history of EE, previous consultation with other doctors, paying status, number of consultations and adherence to TCS or moisturiser.

### **Adherence, barriers to adherence and QoL (Table 5)**

There was no statistical correlation between QoL and adherence, with the exception of those with poor compliance with TCS (9.1% vs. 90.9%,  $p=0.029$ ).

The proportion of those affected by EE increased in those who complained of skin discomfort from TCS (96.3% vs. 71.6%,  $p=0.008$ ), those who had decreased compliance due to concerns about side effects of TCS (89.7% vs. 71.0%,  $p=0.025$ ), and those who found it time-consuming to apply a moisturiser (100.0% vs. 71.8%,  $p=0.005$ ).

## Discussion

### **Achieving adherence in the non-geriatric population**

The younger patients (below 55 years) had lower adherence for all variables, to both TCS and moisturisers reaching statistical significance in

forgetting to use TCS and inadequate frequency of moisturiser use. A worldwide observational study showed that poor adherence to acne treatment was correlated with young age.<sup>25</sup> Our study appears to be the first to demonstrate a similar age-adherence correlation in EE patients.

**Table 2.** Adherence and barriers to adherence to TCS and moisturiser

Variable	TCS	Moisturiser
	n=108	n=100
	No. (%)	No. (%)
<b>Adherence</b>		
Forget		
Yes	47 (43.5)	46 (46.0)
No	61 (56.5)	54 (54.0)
Careless		
Yes, every time	5 (4.6)	5 (5.0)
Yes, once a week	12 (11.1)	6 (6.0)
Yes, once a month	16 (14.8)	13 (13.0)
No	75 (69.4)	76 (76.0)
Stop		
Yes	59 (54.6)	33 (33.0)
No	49 (45.4)	67 (67.0)
Frequency of application		
Inadequate	NA	52 (52.0)
Adequate		48 (48.0)
Time of application		
Undesirable	NA	12 (12.0)
Desirable		88 (88.0)
<b>Barriers to adherence</b>		
It is uncomfortable on your skin		
Neutral/disagree/strongly disagree	81 (75.0)	73 (73.0)
Agree/strongly agree	27 (25.0)	27 (27.0)
The cost deters you from using it		
Neutral/disagree/strongly disagree	87 (80.6)	77 (77.0)
Agree/strongly agree	21 (19.4)	23 (23.0)
Too much time is required to it		
Neutral/disagree/strongly disagree	83 (76.9)	78 (78.0)
Agree/strongly agree	25 (23.1)	22 (22.0)
You do not find the it useful in managing eczema		
Neutral/disagree/strongly disagree	78 (72.2)	77 (77.0)
Agree/strongly agree	30 (27.8)	23 (23.0)
Concerns about the side effects decreases your desire to use them		
Neutral/disagree/strongly disagree	69 (63.9)	NA
Agree/strongly agree	39 (36.1)	

TCS, Topical Corticosteroid

**Table 3.** Relationship between adherence to TCS and other variables

Variable	Use of TCS (n=108)					
	Forget No. (%) n=47 (43.5%)	p-value	Careless No. (%) n=33 (30.6%)	p-value	Stop No. (%) n=59 (54.6%)	p-value
<b>Demographics</b>						
Gender						
Males	28 (43.8)	0.953	20 (31.3)	0.850	32 (50.0)	0.244
Females	19 (43.2)		13 (29.5)		27 (61.4)	
Age group						
Non-geriatric	38 (52.1)	<b>0.010</b>	25 (34.2)	0.229	41 (56.2)	0.644
Geriatric	9 (25.7)		8 (22.9)		18 (51.4)	
Retirement status						
Non-retiree	36 (48.6)	0.113	25 (33.8)	0.282	43 (58.1)	0.284
Retiree	11 (32.4)		8 (23.5)		16 (47.1)	
Educational attainment						
Primary or none	10 (40.0)	0.686	6 (24.0)	0.417	8 (32.0)	<b>0.010</b>
Secondary and above	37 (44.6)		27 (32.5)		51 (61.4)	
Ethnic group						
Chinese	41 (44.1)	0.767	29 (31.2)	0.725	52 (55.9)	0.504
Malay/Indian/Others	6 (40.0)		4 (26.7)		7 (46.7)	
Main language spoken						
English	25 (49.0)	0.275	18 (35.3)	0.312	32 (62.7)	0.109
Chinese/Malay/Tamil	22 (38.6)		15 (26.3)		27 (47.4)	
<b>Medical details</b>						
Other skin condition						
Yes	9 (42.9)	0.946	7 (33.3)	0.758	10 (47.6)	0.472
No	38 (43.7)		26 (29.9)		49 (56.3)	
Chronic medical problem(s)						
No	26 (56.5)	<b>0.019</b>	14 (30.4)	0.981	30 (65.2)	0.057
Yes	21 (33.9)		19 (30.6)		29 (46.8)	
Severity of EE						
Clear	2 (28.6)	0.647	2 (28.6)	0.993	6 (85.7)	0.170
Almost clear and mild	30 (46.2)		20 (30.8)		36 (55.4)	
Moderate and severe	15 (41.7)		11 (30.6)		17 (47.2)	
Nature of EE						
Xerotic	7 (31.8)	0.215	4 (18.2)	0.158	9 (40.9)	0.147
Non-Xerotic	40 (46.5)		29 (33.7)		50 (58.1)	
Family history of EE						
Yes	12 (38.7)	0.522	13 (41.9)	0.103	15 (48.4)	0.408
No	35 (45.5)		20 (26.0)		44 (57.1)	

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**Table 3.** Relationship between adherence to TCS and other variables (cont'd)

	<b>Use of TCS (n=108)</b>					
	<b>Forget No. (%) n=47 (43.5%)</b>	<b>p-value</b>	<b>Careless No. (%) n=33 (30.6%)</b>	<b>p-value</b>	<b>Stop No. (%) n=59 (54.6%)</b>	<b>p-value</b>
<b>Health utilisation</b>						
Consulted other doctors						
Yes	27 (42.9)	0.870	22 (34.9)	0.244	34 (54.0)	0.870
No	20 (44.4)		11 (24.4)		25 (55.6)	
Paying status						
Private	12 (50.0)	0.468	6 (25.0)	0.503	16 (66.7)	0.179
Subsidised	35 (41.7)		27 (32.1)		43 (51.2)	
Number of consultations						
Less than or equals to 5	19 (39.6)	0.461	17 (35.4)	0.327	27 (56.3)	0.762
More than 5	28 (46.7)		16 (26.7)		32 (53.3)	
<b>Knowledge of TCS</b>						
Understand what is a topical steroid						
No	19 (48.7)	0.413	8 (20.5)	0.088	15 (38.5)	<b>0.011</b>
Yes	28 (40.6)		25 (36.2)		44 (63.8)	
TCS is used for inflammation of the skin						
N/D/SD	22 (46.8)	0.545	13 (27.7)	0.566	22 (46.5)	0.152
A/SA	25 (41.0)		20 (32.8)		37 (60.7)	
<b>Barriers to adherence</b>						
It is uncomfortable on your skin						
N/D/SD	31 (38.3)	0.057	24 (29.6)	0.717	41 (50.6)	0.147
A/SA	16 (59.3)		9 (33.3)		18 (66.7)	
The cost of the TCS deters you from using it						
N/D/SD	37 (42.5)	0.673	24 (27.6)	0.173	48 (55.2)	0.818
A/SA	10 (47.6)		9 (42.9)		11 (52.4)	
Too much time is required to apply the TCS prescribed						
N/D/SD	34 (41.0)	0.329	23 (27.7)	0.242	45 (54.2)	0.875
A/SA	13 (52.0)		10 (40.0)		14 (56.0)	
You do not find the TCS useful in managing eczema						
N/D/SD	30 (38.5)	0.087	20 (25.6)	0.074	45 (57.7)	0.303
A/SA	17 (56.7)		13 (43.3)		14 (46.7)	
Side-effects of TCS deters you from using them						
N/D/SD	30 (43.5)	0.991	17 (24.6)	0.076	30 (43.5)	<b>0.002</b>
A/SA	17 (43.6)		16 (41.0)		29 (74.4)	
You prefer other treatments, such as Traditional Chinese Medicine						
N/D/SD	42 (43.8)	0.891	31 (32.3)	0.268	31 (32.3)	0.268
A/SA	5 (41.7)		2 (16.7)		2 (16.7)	

TCS, Topical Corticosteroid; EE, Endogenous Eczema; N/D/SD, Neutral/Disagree/Strongly Disagree; A/SA, Agree/Strongly Agree

**Table 4.** Relationship between adherence to moisturisers and other variables (n=100)

Variable	Adherence to moisturiser									
	Forget n=46 (46.0) No. (%)	p-value	Careless n=24 (24.0) No. (%)	p-value	Stop n=33 (33.0) No. (%)	p-value	Inadequate application n=52 (52.0) No. (%)	p-value	Undesirable time of application n=12 (12.0) No. (%)	p-value
<b>Demographics</b>										
Gender										
Females	20 (47.6)	0.782	10 (23.8)	0.970	8 (19.0)	<b>0.012</b>	19 (45.2)	0.249	4 (9.5)	0.517
Males	26 (44.8)		14 (24.1)		25 (43.1)		33 (56.9)		8 (13.8)	
Age group										
Non-Geriatric	34 (51.5)	0.123	17 (25.8)	0.566	22 (33.0)	0.921	39 (59.1)	<b>0.048</b>	8 (12.1)	0.959
Geriatric	12 (35.3)		7 (20.6)		11 (32.4)		13 (38.2)		4 (11.8)	
Ethnic group										
Chinese	6 (40.0)	0.613	2 (13.3)	0.294	3 (20.0)	0.245	8 (53.3)	0.911	1 (6.7)	0.491
Malay/Indian/Others	40 (47.1)		22 (25.9)		30 (35.3)		44 (51.8)		11 (12.9)	
Main language spoken										
English	24 (47.1)	0.828	10 (19.6)	0.294	19 (37.3)	0.356	23 (45.1)	0.159	5 (9.8)	0.491
Chinese/Malay/Tamil	22 (44.9)		14 (28.6)		14 (28.6)		29 (59.2)		7 (14.3)	
Educational level										
Primary and below	11 (45.8)	0.985	4 (16.7)	0.335	8 (33.3)	0.968	10 (41.7)	0.245	3 (12.5)	0.931
Secondary and above	35 (46.1)		20 (26.3)		25 (32.9)		42 (55.3)		9 (11.8)	
<b>Medical details</b>										
Other skin condition										
No	38 (47.5)	0.547	18 (22.5)	0.482	27 (33.8)	0.750	42 (52.5)	0.841	10 (12.5)	0.758
Yes	8 (40.0)		6 (30.0)		6 (30.0)		10 (50.0)		2 (10.0)	
Other chronic medical problem(s)										
No	19 (47.5)	0.806	7 (17.5)	0.214	12 (30.0)	0.602	21 (52.5)	0.935	3 (7.5)	0.258
Yes	27 (45.0)		17 (28.3)		21 (35.0)		31 (51.7)		9 (15.0)	
Nature of EE										
Xerotic	11 (55.0)	0.367	5 (25.0)	0.907	6 (30.0)	0.750	4 (20.0)	<b>0.001</b>	3 (15.0)	0.644
Non-Xerotic	35 (43.8)		19 (23.8)		27 (33.8)		48 (60.0)		9 (11.3)	
Severity of EE										
Clear	4 (50.0)	0.056	2 (25.0)	0.995	3 (37.5)	0.848	6 (75.0)	0.172	0 (0.0)	0.530
Almost clear and mild	32 (55.2)		14 (24.1)		20 (34.5)		32 (55.2)		8 (13.8)	
Moderate and Severe	10 (29.4)		8 (23.5)		10 (29.4)		14 (41.2)		4 (11.8)	

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**Table 4.** Relationship between adherence to moisturisers and other variables (n=100) (cont'd)

	<b>Adherence to moisturiser</b>									
	<b>Forget</b>	<b>p-value</b>	<b>Careless</b>	<b>p-value</b>	<b>Stop</b>	<b>p-value</b>	<b>Inadequate application</b>	<b>p-value</b>	<b>Undesirable time of application</b>	<b>p-value</b>
	<b>n=46 (46.0)</b>		<b>n=24 (24.0)</b>		<b>n=33 (33.0)</b>		<b>n=52 (52.0)</b>		<b>n=12 (12.0)</b>	
	<b>No. (%)</b>		<b>No. (%)</b>		<b>No. (%)</b>		<b>No. (%)</b>		<b>No. (%)</b>	
<b>Family history of EE</b>										
Yes	32 (45.7)	0.930	11 (15.7)	<b>0.003</b>	26 (37.1)	0.178	36 (51.4)	0.861	8 (11.4)	0.788
No	14 (46.7)		13 (43.3)		7 (23.3)		16 (53.3)		4 (13.3)	
<b>Health utilisation</b>										
<b>Consulted other doctors</b>										
Yes	20 (45.5)	0.923	8 (18.2)	0.227	12 (27.3)	0.280	33 (58.9)	0.118	3 (6.8)	0.158
No	26 (46.4)		16 (28.6)		21 (37.5)		19 (43.2)		9 (16.1)	
<b>Paying status</b>										
Private	12 (50.0)	0.652	4 (16.7)	0.335	6 (25.0)	0.339	15 (62.5)	0.238	1 (4.2)	0.176
Subsidised	34 (44.7)		20 (26.3)		27 (35.5)		37 (48.7)		11 (14.5)	
<b>Number of consultations</b>										
≤5	20 (47.6)	0.782	13 (31.0)	0.166	16 (38.1)	0.356	23 (54.8)	0.638	6 (14.3)	0.543
>5	26 (44.8)		11 (19.0)		17 (29.3)		29 (50.0)		6 (10.3)	
<b>Knowledge of moisturiser</b>										
<b>Moisturiser is used for patients with dry skin</b>										
N/D/SD	8 (32.0)	0.105	6 (24.0)	1.000	3 (12.0)	<b>0.010</b>	14 (56.0)	0.644	1 (4.0)	0.155
A/SA	38 (50.7)		18 (24.0)		30 (40.0)		38 (50.7)		11 (14.7)	
<b>Patients with eczema have dry skin</b>										
N/D/SD	11 (50.0)	0.670	5 (22.7)	0.874	7 (31.8)	0.894	11 (50.0)	0.832	2 (9.1)	0.634
A/SA	35 (44.9)		19 (24.4)		26 (23.3)		41 (42.6)		10 (12.8)	
<b>Barriers to adherence</b>										
<b>Moisturiser is uncomfortable on the skin</b>										
N/D/SD	28 (38.4)	<b>0.012</b>	16 (21.9)	0.423	18 (24.7)	<b>0.004</b>	35 (47.9)	0.182	11 (15.1)	0.121
A/SA	18 (66.7)		8 (29.6)		15 (55.6)		17 (63.0)		1 (3.7)	
<b>The cost of the moisturiser deters you from using it</b>										
N/D/SD	38 (49.4)	0.578	16 (20.8)	0.168	23 (29.9)	0.223	40 (51.9)	0.985	67 (87.0)	0.578
A/SA	8 (34.8)		8 (34.8)		10 (43.5)		12 (52.2)		21 (91.3)	
<b>Too much time is required to apply moisturiser</b>										
N/D/SD	32 (41.0)	0.060	16 (20.5)	0.124	21 (26.9)	<b>0.015</b>	38 (48.7)	0.216	10 (12.8)	0.634
A/SA	14 (63.6)		8 (36.4)		12 (54.5)		14 (63.6)		2 (9.1)	
<b>You do not find the moisturiser useful in managing eczema</b>										
N/D/SD	23 (29.9)	0.223	20 (26.0)	0.398	23 (29.9)	0.223	44 (57.1)	0.060	8 (10.4)	0.365
A/SA	10 (43.5)		4 (17.4)		10 (43.5)		8 (34.8)		4 (17.4)	

EE, Endogenous Eczema; N/D/SD, Neutral/Disagree/Strongly Disagree; A/SA, Agree/Strongly Agree.

**Table 5.** Relationship between DLQI and adherence and barriers to adherence to TCS and moisturisers in outpatients

Variable	Effect on QoL					
	For TCS n=108		p-value	For moisturiser n=100		p-value
	No effect at all n=24 (22.2%) No. (%)	Small, moderate, large, extremely large n=84 (77.8%) No. (%)		No effect at all n=22 (22.0%) No. (%)	Small, moderate, large, extremely large n=86 (88.0%) No. (%)	
<b>Adherence</b>						
Forget						
Yes	7 (14.9)	40 (85.1)	0.108	11 (23.9)	35 (76.1)	0.670
No	17 (27.9)	44 (72.1)		11 (20.4)	43 (79.6)	
Careless						
Yes	3 (9.1)	30 (90.9)	<b>0.029</b>	4 (16.7)	20 (83.3)	0.469
No	54 (72.0)	21 (28.0)		18 (23.7)	58 (76.3)	
Stop						
Yes	12 (20.3)	47 (79.7)	0.605	6 (18.2)	27 (81.8)	0.518
No	12 (24.5)	37 (75.5)		16 (23.9)	51 (76.1)	
Frequency of application						
Adequate	NA			13 (27.1)	35 (72.9)	0.238
Inadequate				9 (17.3)	43 (82.7)	
Time of application						
Desirable	NA			4 (33.3)	8 (66.7)	0.312
Undesirable				18 (20.5)	70 (79.5)	
<b>Barriers to adherence</b>						
It is uncomfortable on your skin						
N/D/SD	23 (28.4)	58 (71.6)	<b>0.008</b>	19 (26.0)	54 (74.0)	0.110
A/SA	1 (3.7)	26 (96.3)		3 (11.1)	24 (88.9)	
The cost deters you from using it						
N/D/SD	22 (25.3)	65 (74.7)	0.119	20 (26.0)	57 (74.0)	0.079
A/SA	2 (9.5)	19 (90.5)		2 (8.7)	21 (91.3)	
Too much time is required to it						
N/D/SD	22 (26.5)	61 (73.5)	0.051	22 (28.2)	56 (71.8)	<b>0.005</b>
A/SA	2 (8.0)	23 (92.0)		0 (0.0)	22 (100.0)	
You do not find the it useful in managing eczema						
N/D/SD	19 (24.4)	59 (75.6)	0.389	16 (20.8)	61 (79.2)	0.590
A/SA	5 (16.7)	25 (83.3)		6 (26.1)	17 (73.9)	
Concerns about the side effects decreases your desire to use them						
N/D/SD	20 (29.0)	49 (71.0)	<b>0.025</b>	NA		
A/SA	4 (10.3)	35 (89.7)				

DLQI, Dermatology Quality Life Index; QoL, Quality of Life; TCS, Topical Corticosteroids; N/D/SD, Neutral/Disagree/Strongly Disagree; A/SA, Agree/Strongly Agree.

Patients without co-existing chronic medical problems tended to be younger patients, and these patients demonstrated lower adherence. Conversely, geriatric patients with co-existing chronic medical problems recognised the value of adherence to medical therapy because of their prior medical encounters. Higher adherence was evident with TCS therapy for these patients as well, as those without co-existing chronic medical problem(s) were more likely to forget to apply TCS ( $p=0.019$ ). This was supported by the finding that there was a higher proportion of the non-geriatric population with no chronic medical illness (19.4% vs. 80.6%,  $p=0.001$ ).

Higher adherence to moisturisers was also demonstrated in patients with xerotic-type eczema, which is understandable as the primary pathology is overt xerosis. As such, inadequate moisturiser application was significantly increased in patients with non-xerotic eczema ( $p=0.001$ ). Among the non-geriatric population, the majority had non-xerotic eczema (25.0% vs. 63.6%,  $p<0.001$ ). Accordingly, in the geriatric population, with co-existing chronic medical problems and xerotic eczema were both more prevalent, but it is unclear if there is any possible relationship.

Patients view moisturiser therapy in a different light from TCS therapy. Unlike with TCS usage, those with chronic medical problems were not more adherent with moisturiser therapy than those without any chronic medical problems (45.0% vs. 47.5%,  $p=0.806$ ). Instead, males ( $p=0.012$ ) and those who felt that moisturisers were uncomfortable on the skin ( $p=0.004$ ) and that moisturiser application was too time-consuming ( $p=0.025$ ) had a higher chance of stopping moisturisers with subjective improvement. This suggests that those with chronic medical issues perceive TCS as the core component of their treatment regimen while moisturisers are seen as less important. Thus, there is less unidirectional adherence with moisturiser therapy compared to TCS. Lifestyle or personal preferences may have an influence but this may also be a reflection of the fact that TCS typically require a prescription while moisturisers can be bought over-the-counter. Thus, moisturisers may not be perceived as important as TCS in the treatment of EE even

though moisturisers form the basis of maintenance treatment. Alternatively, it can be argued that patients who present at the clinic are more likely to be experiencing acute flares, and the application of TCS is more important than the application of moisturisers in the acute stage relative to when the disease process is in remission, when the usage of moisturiser is more important than TCS. Subsequently, adherence to TCS affected QoL, whereas adherence to moisturiser did not affect QoL.

Finally, the discomfort of moisturisers could be attributed to the hot and humid climate of Singapore.

### **Severity of EE**

In contrast to the findings on adherence to topical treatment in acne<sup>25</sup> and psoriasis<sup>26</sup> patients, we found an absence of correlation between the severity of EE and treatment adherence. This finding reinforces the importance of inculcating and routinely monitoring adherence in all our EE patients regardless of their clinical severity and our pre-conceived notions that it would influence patients' therapeutic adherence.

### **Steroid phobia**

Topical corticosteroids should only be stopped when the acute flare of EE has subsided completely, and not when only improvement is seen. In fact, it has been shown that twice-weekly use of TCS on "hot spots" after visible clearance of eczema prolongs remission. Of the participants, 36.1% were concerned about the side-effects of TCS, 27.8% of the participants felt that TCS was not useful in managing eczema, and more than half of the patients surveyed had stopped TCS after subjective improvement in their skin condition. The knowledge questions revealed that those who were familiar with TCS, were more likely to be aware of TCS side-effects (80.0% vs. 54.3%,  $p=0.007$ ). Indeed, participants concerned about the side-effects of TCS were more likely to stop using TCS with subjective improvement in skin condition ( $p=0.002$ ). This could lead to poor symptom control, and eventually lower patient satisfaction. It is well-known that those with steroid phobia tend to be less compliant to TCS.<sup>16,17</sup>

Furthermore, those of a higher educational level, defined as secondary level of schooling or higher, were more likely to stop using TCS with subjective improvement ( $p=0.010$ ). This finding is likely because a higher proportion of those with higher educational levels were familiar with TCS (80.0% vs. 54.3%,  $p=0.007$ ) and were aware of their side effects (92.9% vs. 50.0%,  $p<0.001$ ). The proportion of those affected by EE increased in patients who were concerned about the side effects of TCS and who were less likely to use them ( $p=0.025$ ). Conversely, those with lower educational levels were more likely to engage in unidirectional compliance of the physician's directions without exceptions, as opposed to those with higher educational levels, who stopped TCS therapy on their own when they felt that their skin condition had improved. Further exploration can be given to concordance, which is the collaboration between physician and patient in coming to a consensus on treating the condition together, in this group of patients to improve therapy.<sup>27</sup>

A number of studies have discussed and examined patients who view steroids negatively or are averse to their usage due to knowledge of known TCS side-effects.<sup>16,17</sup> Our study confirms the presence of steroid phobia in Singapore. Proper education of our patients regarding the use of TCS is paramount for optimal management of EE, as using too little or early termination of usage of TCS will lead to less than desirable outcomes.

### **Limitations**

This study has several limitations. Firstly, we managed to recruit 110 patients from a single centre with EE who met all inclusion criteria and completed the questionnaires. Although the overall response rate (89%) was high, future research should strive to assess a larger number of patients with EE in a multi-centred setting to improve generalisability.

Next, other factors affecting adherence were not studied, such as the patient-prescriber relationship; healthcare system factors, which includes waiting time, patients' beliefs, attitudes and expectations;

smoking and alcohol intake; and social support were not assessed. Fear of TCS also can be further explored.

Last but not least, our study used proxy statements to reflect adherence to TCS and moisturiser. A more quantitative approach, such as the use of diaries and weighing of the creams, would have resulted in more accurate and informative data that could have been better studied for correlation to adherence. Studies have shown that patients with dermatological conditions tend to overestimate their adherence, and traditional methods of using questionnaires, dairies and weighing of creams are not as accurate as electronic measures.<sup>28-30</sup>

### **Conclusion**

Adherence impacts clinical outcomes for EE. However, given the complexity of the disease and variation in disease severity, effective management of both acute episodes and chronic lesions can be difficult. Some factors, such as patient education and effective communication, have been found to impact clinical outcomes. Our results have shown that age, gender, presence of chronic medical problems, level of education, knowledge, concerns and preferences towards TCS and moisturisers were significantly associated with adherence. An important finding was the lack of correlation between disease severity and adherence.

Finally, factors affecting adherence to TCS and moisturisers are different. This underlines the importance of using different approaches to improve compliance for TCS and moisturiser in the treatment of EE. With regard to adherence to TCS, steroid phobia is significant, whereas adherence to moisturiser is associated with lifestyle and personal preferences. In the management of EE, we need to educate our patients on the safe and proper use of TCS. Although the importance of regularly using moisturisers should be continually emphasised to our patients, it appears that therapeutic moisturisers that are pleasant as well as easy to use need to be developed.

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**Appendix 1.** Details on 39 items in questionnaire

- 9 items pertained to Demographics, such as age, gender and occupation.
- 3 items pertained to health utilisation:
  1. Paying status
  2. History of consulting other doctors
  3. Number of consultations with a dermatologist at National University Hospital
- 5 items pertained to patient's medical details:
  1. Any chronic medical problem(s) other than eczema
  2. Concurrent skin condition(s)
  3. Family history of eczema
  4. Nature of eczema
  5. Severity of eczema
- 4 items were on knowledge:
  1. Understand what is a TCS
  2. Whether TCS is used for inflammation of the skin
  3. Whether moisturiser is used for dry skin
  4. Whether patients with eczema had dry skin
- 3 items were pertained to adherence to TCS:
  1. Whether they ever forget to apply TCS
  2. Whether they are careless with, for example, not applying over the whole skin area with eczema or are too lazy to apply TCS
  3. Whether they stop applying TCS when they think that their skin is better
- 5 items pertained to adherence to moisturiser:
  1. Whether they ever forget to apply moisturiser
  2. Are careless with, for example, not applying over the whole skin area with eczema or are too lazy to apply moisturiser
  3. Whether they stop applying moisturiser when they think that their skin is better
  4. Frequency of application of moisturiser
  5. Time of application of moisturiser

Patients who said that they were careless to TCS and moisturiser were asked whether they were always careless, careless once a week, or once a month.
- 5 items were on barriers to adherence to TCS:
  1. Time required for application
  2. Cost
  3. Whether it felt uncomfortable on the skin
  4. Perception of usefulness of TCS and moisturiser in managing eczema
  5. Whether patients were concerned about the side-effects of TCS
- 4 items were on barriers to adherence to moisturiser:
  1. Time required for application
  2. Cost
  3. Whether it felt uncomfortable on the skin
  4. Perception of usefulness of moisturiser in managing eczema
- Additional barriers to treatment included:
  1. Preference for other treatments, such as Traditional Chinese Medicine