A Randomized Double-blind Study on the Efficacy of 20% VCO Cream versus a Commercial Emollient for Atopic Dermatitis in Children

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ABSTRACT

Objective. To assess the effects of a formulated 20% VCO cream on symptoms of atopic dermatitis in children relative to a commercial emollient with skin barrier protective property indicated for dry, itchy skin.

Methods. In a randomized, double-blind, pilot study, pediatric patients with atopic dermatitis according to the modified Hanifin and Rajka criteria were enrolled and assigned to use either formulated VCO cream or commercial emollient. Treatments were applied twice daily for four (4) weeks. Outcome measures were investigator- and patient-assessed clinical efficacy based on Severity Scoring of Atopic Dermatitis (SCORAD) severity index, and incidences of documented adverse events.

Results. Twenty-nine patients were recruited in the study and in an intention-to-treat analysis, mean SCORAD indices were reduced by 41.79% and 29.77% in the VCO cream group and commercial emollient group, respectively. Both study groups showed significant reduction in the mean subjective SCORAD index relating to pruritus and sleep loss. Mean objective SCORAD index, based on intensity items and total surface with eczema, was also significantly improved in the VCO cream group after four weeks of product usage. The study products were generally well-tolerated, with minor adverse events reported for the VCO cream group.

Conclusion. Results of the study suggest that application of VCO at 20% in a cream formulation is more effective than the tested commercial emollient in alleviating symptoms of AD in children.

Key Words: atopic dermatitis, children, pilot study, virgin coconut oil

INTRODUCTION

Atopic dermatitis (AD) is a common chronic disorder characterized by xerosis, eczematous lesions, and pruritus. It affects mostly children and is known to adversely influence the quality of life (QoL) of patients.[1] Topical corticosteroids are the gold standard of anti-inflammatory therapy in AD. However, use of corticosteroids is associated with cutaneous effects like skin atrophy, purpura, striae, telangiectasia, focal hypertrichosis, and acneiform or rosacea-like eruptions. The application of potent corticosteroids on large areas of the body for prolonged periods may even lead to systemic effects like pituitary-adrenal axis suppression and retardation of growth in children.[2] Recent developments in the understanding of the pathophysiology of the epidermal barrier has led to the exploration of alternative, non-steroid therapies that control pruritus, suppress inflammation and/or repair skin barriers.[3] The regular use of emollients is prescribed for active

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disease flares, in combination with topical anti-inflammatory agents, and as maintenance therapy in AD.[4-6]

Virgin coconut oil (VCO) is a naturally-derived ingredient known to possess moisturizing and anti-inflammatory properties.[7] In a clinical trial among patients with mild to moderate xerosis, VCO was shown to be as safe and effective as mineral oil in alleviating symptoms of skin dryness.[8] A moisturizing lotion incorporated with VCO-loaded solid lipid particles (VCO-SLPs) increased skin moisture and enhanced skin elasticity in healthy subjects.[9] Preliminary studies have shown that topical application of pure VCO improved SCORAD (SCORing Atopic Dermatitis - a clinical tool for assessing the severity of atopic dermatitis) severity index values, transepidermal water loss, and skin capacitance in pediatric AD patients.[10] It also significantly reduced objective SCORAD severity index and *Staphylococcus aureus* colonization in adult AD patients.[11]

A systematic review identified the Severity Scoring of Atopic Dermatitis (SCORAD) index as one of the most suitable instruments for disease severity evaluation in AD.[12] The SCORAD index employs an assessment tool to determine (a) the extent of the disease, (b) the intensity according to erythema, edema/papules, oozing/crust, excoriation, lichenification, and dryness, and (c) subjective symptoms based on pruritus and sleep loss.[13]

The use of VCO as main active ingredient in an emollient product for AD has not yet been reported. Formulation of VCO into a suitable dosage form is important to make administration easier and thereby improve patient compliance. The authors developed a 20% VCO cream and sought to assess its effects on symptoms of childhood atopic dermatitis relative to a commercial emollient using the SCORAD assessment tool.

MATERIALS AND METHODS

Study design and setting

The study protocol was approved by the Graduate School Ethics Review Committee, University of Santo Tomas. This was a randomized, double-blind, pilot clinical trial performed to evaluate the effects of a formulated 20% VCO cream in comparison to a commercial emollient with skin barrier protective effects indicated for dry, itchy skin in improving AD symptoms in children, as measured by SCORAD index values. Signed and dated written informed consent were obtained from one parent/guardian for children less than 7 years old, and signed and dated written assent were obtained from subjects aged 7 to 18 with signed endorsement of their parent/guardian. The study was conducted over a two-month period through a community-based dermatology clinic in Navotas City, Philippines.

Participants

Pediatric patients (male/female, aged 1-18 years old) with AD according to the modified Hanifin and Rajka criteria[9] were enrolled in the study. Patients who were under any medication, or had other skin disorders were excluded.

To detect an effect size of 1.137 in the mean subjective SCORAD scores with two-sided level of significance and 80% power of the statistical test, a minimum of 9 participants were included in each study group. This effect size was based on the report of Padilla-Evangelista and co-workers,[10] where mean scores before and after treatment with VCO were 6.51 (SD=3.08) and 2.12 (SD=2.33), respectively. G*Power 3.12 was used in the calculations.

Intervention

Subjects were randomized using Microsoft Excel program and assigned to receive either formulated 20% VCO cream (composed of water, VCO, cetyl acohol, hydroxyethyl acrylate/sodium acryloyldimethyltaurate copolymer and squalane and polysorbate 60, ceteth-6, sodium benzoate, and citric acid) or a commercial emollient (composed of water, *Olea europeae* fruit oil, glycerin, pentylene glycol, *Olus* oil, *Elaeis guineensis* oil, hydrogenated lecithin, squalane, betaine, palmitamide MEA, sarcosine, acetamide MEA, hydroxyethylcellulose, carbomer, sodium carbomer, and xanthan gum).

The chosen comparator emollient is a non-steroid first-line treatment commonly prescribed by dermatologists in clinical practice for the management of atopic dermatitis symptoms in the Philippines. Patients and/or the accompanying parent/guardian were interviewed. Clinical evaluation was done by a dermatologist before treatment (baseline), and at weeks 1, 2, and 4 using the standard SCORAD Index Evaluation Form.

Study products were supplied in 50-gram coded white plastic jars and dispensed by study pharmacist. The patient's parents were instructed to apply the assigned cream on affected skin areas twice daily, in the morning and at night. Follow-up visits were conducted to allow dermatologist examination, compliance check, product replenishment, and photograph documentation. Efficacy was evaluated by another dermatologist using objective SCORAD parameters for total surface with eczema, and intensity items (erythema, edema, oozing, excoriation, lichenification, and dryness). Patient assessment was based on subjective SCORAD parameters of pruritus, and sleep loss.

Outcomes

The primary outcome was to compare the change in mean objective and subjective SCORAD scores between the formulated VCO Cream and the commercial emollient after four weeks of use. The secondary outcome was to determine tolerability of formulated VCO cream based on incidences of documented adverse events (AE).

Statistical analysis

Mean age of two groups were compared using Student's t-test, while gender association was made with Fisher's exact

test. Comparison of categorical data between groups utilized Mann-Whitney U-Test. Change in parameter scores from baseline within treatment groups was evaluated by Wilcoxon Signed Rank Test. All analyses were performed with significance level of 0.05.

RESULTS

Participant characteristics

Of the 40 individuals screened, 29 met the entry criteria and were randomized to the treatment (VCO, n=15), and control (commercial, n=14) (Figure 1). Among these, 6 were considered lost to follow-up due to non-appearance in any scheduled visits, while 5 were withdrawn because of protocol violation, adverse events, and consent withdrawal.

Using an intention-to-treat analysis, all 29 patients were included in the full analysis. For all missing values, last observation was carried forward. Baseline scores for defining parameters of the VCO cream and commercial emollient groups were comparable (p>0.05) (Table 1).

SCORAD index values

Mean overall SCORAD indices were reduced by 41.79% in the VCO cream group, and by 29.77% in the commercial emollient group (Table 2). Subjective symptoms of pruritus and sleep loss significantly improved after four weeks of treatment in both groups.

There was also observed reduction in the mean objective SCORAD scores, represented by intensity of eczema and total surface with eczema, but was only significant for the VCO cream group (p=0.008) (Table 3).

Most patients observed that their skin was less dry and itchy, and became softer and smoother with use of the study products. Visible improvement in intensity of eczema was observed in patients who presented with more severe symptoms at the start of the study. Representative photographs of subjects from both study groups before and after treatment are shown in Figure 2.

Adverse events

The study products were generally well-tolerated. One subject in the VCO cream group reported transient, localized reddening and mild itching on Day 3 of application, which did not recur with continued use of the cream. Two subjects in the VCO cream group dropped-out due to reported localized urticaria after a few days of product use, which resolved spontaneously. No adverse events were reported for the commercial moisturizing cream group.

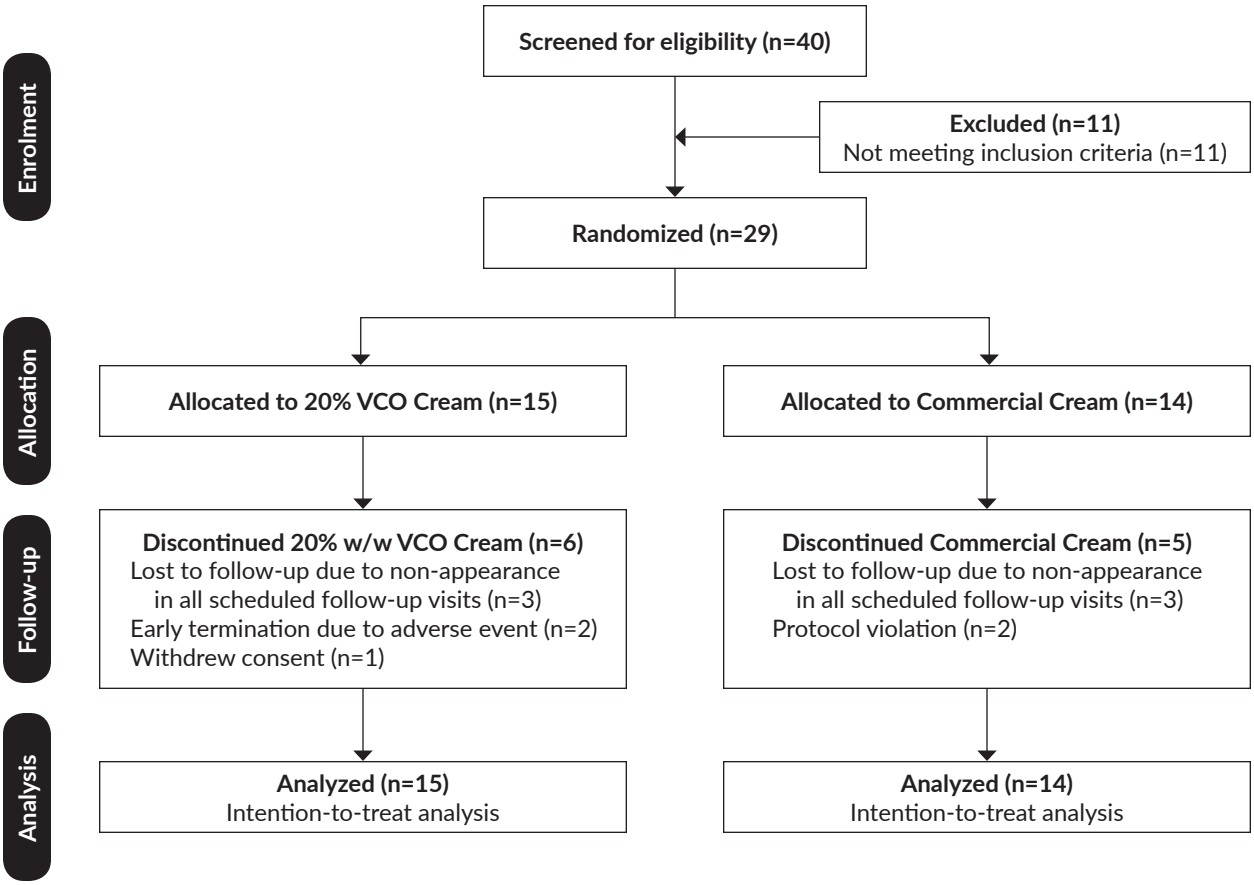

Figure 1. Flow Diagram of Subject Disposition.

Table 1. Demographic characteristics of the study population (n=29)

Characteristics	20% VCO Cream (n=15)	Commercial Emollient (n=14)	*p*-value
Age (years)	6.40±5.05	5.29±4.16	0.524 [(a)]
Gender: Female	7 (46.7%)	10 (71.4%)	1.000 [(b)]
SCORAD index at baseline, mean±SD			
Overall	32.95±16.89	30.37±17.27	0.727 [(c)]
Intensity and extent (objective)	25.69±13.56	23.44±13.06	0.662 [(c)]
Pruritus and sleep loss (subjective)	7.27±6.08	6.93±6.40	0.913 [(c)]

(a) p-values based on Student's t-test
(b) p-values based on Fischer's exact test
(c) p-values based on Mann-Whitney U test

Table 2. Individual SCORAD scores for clinical trial respondents

A. VCO Cream

Patient Code	Objective SCORAD		Subjective SCORAD		Total SCORAD	
	Baseline	Post-treatment	Baseline	Post-treatment	Baseline	Post-treatment
ADP-03	11.5	9.3	3.0	1.0	14.5	10.3
ADP-05	7.6	7.6	0.0	0.0	7.6	7.6
ADP-10	19.1	19.1	4.0	4.0	23.1	23.1
ADP-11	11.7	11.7	4.0	4.0	15.7	15.7
ADP-12	42.6	8.5	0.0	0.0	42.6	8.5
ADP-16	15.8	15.8	2.0	2.0	17.8	17.8
ADP-17	44.2	19.7	1.0	0.0	45.2	19.7
ADP-18	39.6	39.4	15.0	7.0	54.6	46.4
ADP-19	26.4	3.5	11.0	0.0	37.4	3.5
ADP-21	34.3	34.3	10.0	10.0	44.3	44.3
ADP-22	26.1	26.1	8.0	8.0	34.1	34.1
ADP-23	13.3	7.4	8.0	0.0	21.3	7.4
ADP-24	24.7	11.2	8.0	0.0	32.7	11.2
ADP-27	50.2	17.9	20.0	13.0	70.2	30.9
ADP-28	18.2	7.2	15.0	0.0	33.2	7.2
			Average Total SCORAD Index Values		32.95	19.18
			Net Change in SCORAD Index Values		41.79%	

B. Commercial Emollient

Patient Code	Objective SCORAD		Subjective SCORAD		Total SCORAD	
	Baseline	Post-treatment	Baseline	Post-treatment	Baseline	Post-treatment
ADP-01	3.9	7.2	0.0	0.0	3.9	7.2
ADP-02	15.2	15.2	4.0	4.0	19.2	19.2
ADP-04	15.8	11.7	5.0	6.0	20.8	17.7
ADP-06	24.9	25.1	17.0	3.0	41.9	28.1
ADP-07	19.7	21.5	0.0	0.0	19.7	21.5
ADP-08	16.3	12.8	0.0	0.0	16.3	12.8
ADP-09	41.6	12.5	12.0	2.0	53.6	14.5
ADP-13	17.9	7.2	11.0	0.0	28.9	7.2
ADP-14	8.0	10.7	0.0	0.0	8.0	10.7
ADP-15	24.7	28.8	2.0	0.0	26.7	28.8
ADP-20	42.8	3.5	16.0	0.0	58.8	3.5
ADP-25	39.8	39.8	10.0	10.0	49.8	49.8
ADP-26	15.7	15.7	15.0	15.0	30.7	30.7
ADP-29	41.9	41.9	5.0	5.0	46.9	46.9
			Average Total SCORAD Index Values		30.4	21.3
			Net Change in SCORAD Index Values		29.77%	

Table 3. Mean values for clinical parameters at baseline and post-treatment

Measure	20% VCO Cream			Commercial Emollient		
	Baseline	Post-treatment	*p*-value*	Baseline	Post-treatment	*p*-value*
Objective SCORAD	25.69	15.91	0.008	23.44	18.11	0.262
Subjective SCORAD	7.27	3.27	0.011	6.93	3.21	0.046

**p-values are based on Wilcoxon Signed Rank test.*

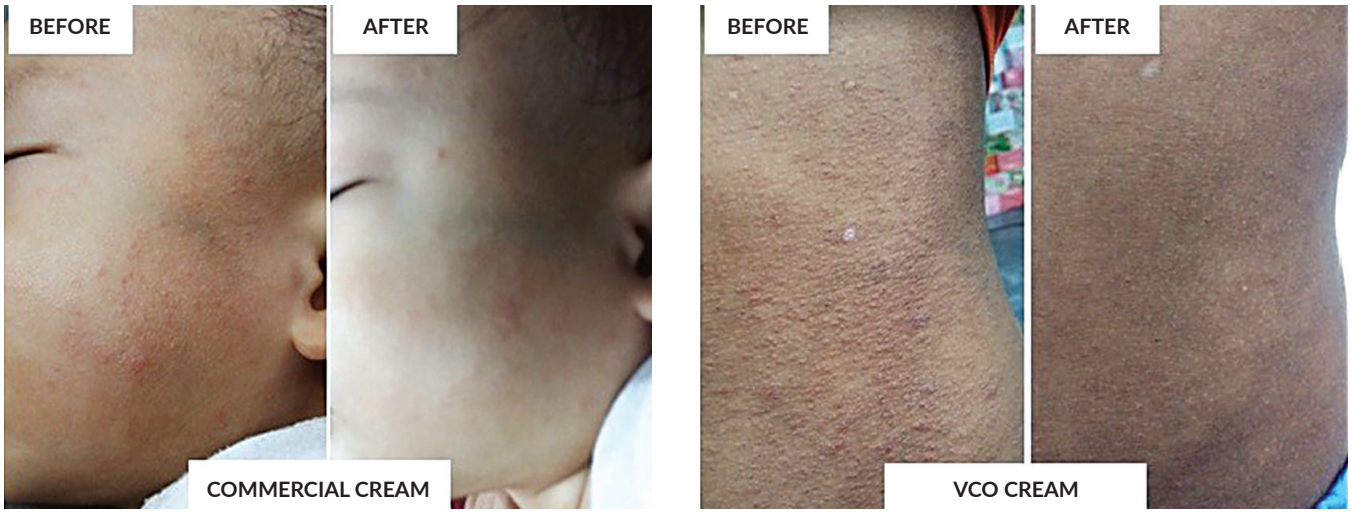

Figure 2. Representative photographs of study subjects before and after 4 weeks of treatment.

DISCUSSION

The present study revealed that both 20% VCO cream and commercial emollient significantly improved mean overall SCORAD scores, including mean subjective SCORAD values represented by pruritus and sleep loss, in pediatric AD patients. This may be attributed to the moisturizing and anti-inflammatory properties of the active ingredients in both creams. Reduction in pruritus and associated sleep loss symptoms are known to positively impact the QoL of AD patients.

Topical application of pure VCO has been reported to promote wound-healing owing to the presence of minor bioactives and antibacterial fatty acids.[14] This may partly account for the significant reduction of objective SCORAD scores, represented by intensity and total surface with eczema, seen only in the VCO cream group. Observation by patients who completed the study in both groups also support the beneficial effects of using VCO cream and the commercial emollient on skin dryness, itching, and texture.

The use of the formulated VCO cream was not associated with any serious adverse events. Definite association with treatment of the two reported cases of urticaria in the VCO cream group cannot be established since both subjects returned for follow-up only after three weeks from occurrence of reported AE, and acute urticaria is known to be of varied etiology. AE in both cases resolved spontaneously with no medical intervention.

Emollients are the mainstay for both reactive and proactive treatment approaches for AD.[15] Results of the study strongly suggest that the formulated 20% VCO cream could be a suitable non-steroid emollient to help ease associated symptoms of AD in children.

CONCLUSION

The study results provide evidence-based support that application of VCO at 20% in a cream formulation is more effective than the tested commercial emollient in alleviating symptoms of AD in children. 20% VCO cream showed a potential to be more beneficial than tested commercial emollient, although this would require validation in larger controlled trials.

A follow-up clinical trial among larger population in an institutional setting is ideal to validate the preliminary findings in this study.

It is recommended that design of study protocol is considered on minimizing study drop-outs, since ability of pediatric patients to comply with treatment regimen and follow-up visits are largely influenced by the availability of parents/guardians. The potential steroid-sparing effect of the VCO cream as an adjunct in AD therapy may also be explored.

Statement of Authorship

Castro prepared the study protocol, performed data collection and analysis, and drafted initial paper. Apostol reviewed protocol design, provided insights and oversight during conduct of clinical trial, and reviewed final paper. All authors approved the final version submitted.

Author Disclosure

All authors declared no conflicts of interest.

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