Parental knowledge of moisturizers and their application to infants with eczema in Hangzhou, China

Yunling Li, MD\textsuperscript{a}, Huiwen Zheng, MD\textsuperscript{a}, Yin Li, MM\textsuperscript{a}, Wei Li, MM\textsuperscript{a}, Xiaoxuan Guo, MM\textsuperscript{a}, Zhongfa Lv, MD\textsuperscript{b,∗}

Abstract
Parental knowledge regarding the role of moisturizers in restoring the skin barrier, as well as regular and long-term use of moisturizers, is critical in the treatment of infantile eczema and the prevention of relapse.

The parents of children with eczema were enrolled in this study. Their knowledge of the role, use, and effect of moisturizers on their children, as well as their concerns regarding moisturizers were surveyed.

A total of 350 parents were enrolled in this study. Two hundred fifty-two parents (72%) knew that eczema requires moisturizers to restore the skin barrier. Among these 252 parents, 175 parents (50.0%) knew that moisturizers can restore the skin barrier. Only 27 parents (27/175, 15.4%) of them knew that moisturizers can improve eczema. Overall, 69.4% used moisturizers; of these, 75.3% used only moisturizers on the face, 87.2% on dry areas of face and other body parts, and only 6.6% on the entire body. Furthermore, 13.2% used topical moisturizers in the long-term; 62.6% used moisturizers 1 to 2 times per day, while 5.4% used moisturizers once every few days. A total of 80.7% discontinued moisturizers immediately after improvement in dryness, and 75.3% reported skin dryness despite moisturizer usage. Among parents of children who used moisturizers, 16.5% were worried about the side effects of moisturizers.

Despite a fair level of knowledge about moisturizers, parents of children with eczema are using them inadequately. Pediatrician should be more patient to educate parents the information on the importance of moisturizers for the improvement of eczema and prevention of recurrence.

Keywords: eczema, knowledge, moisturizer, side effects

1. Introduction
Atopic dermatitis or eczema, is the most common chronic, relapsing inflammatory disease in pediatric dermatology.\textsuperscript{[1,2]} The pathogenesis of eczema may be closely related to inheritance,

immune disorders, epidermal barrier impairment, and environmental factors.\textsuperscript{[2–4]} Epidermal barrier defects, as well as reduced levels of intercellular lipids and natural moisturizing factors, can cause epidermal barrier breakdown\textsuperscript{[2]} and lead to a predisposition or exacerbation of eczema. Therefore, restoration of the dysfunctional skin barrier has become an important component of the treatment and prevention of eczema.\textsuperscript{[5,6]} It has been shown that moisturizing can reduce itching, improve skin barrier function, reduce topical corticosteroid use, and reduce the flare rate in the treatment of eczema.\textsuperscript{[7]} However, parents of children with eczema often lack understanding of the importance of moisturizers in the treatment and prevention of recurrences of eczema, resulting in inadequate usage of moisturizers for children. Few studies investigated the knowledge of parents of children with eczema on the usage of moisturizers. In this study, we designed a questionnaire to investigate parental knowledge, application, and concerns regarding moisturizer usage.

2. Materials and methods
From October 2014 to March 2015, the parents of children with eczema who went to the dermatology clinic of the Children’s Hospital at Zhejiang University School of Medicine were recruited using a simple random sampling method. Inclusion criteria were as follows:
1) children were newly diagnosed with eczema in accordance with the Eczema Area and Severity Index; and
2) parents agreed to participate in the study. Children with other skin diseases were excluded from this study.
The enrolled parents were asked to fill in a 29-item questionnaire. The questionnaire assessed parental knowledge of the role of moisturizers in restoring the skin barrier, use of moisturizers in children with eczema, effects of moisturizers after usage, and parental concerns regarding the use of moisturizers. A physician reviewed the written questionnaire from each participant. The Ethics Committee of the Children’s Hospital at Zhejiang University School of Medicine approved this study, and informed consent was obtained from all participants. The results were expressed as simple percentages accompanied by a qualitative description of the comments.

3. Results

3.1. Characteristics of infants

The characteristics of the surveyed infants are presented in Table 1. A total of 350 parents were enrolled in this study. The average age of children with eczema was 6.8±1.2 months and 234 cases (66.9%) were boys. The average duration of eczema was 28.3±2.2 days. Mild, moderate, and severe eczema was diagnosed in 135 (38.6%), 139 (39.7%), and 76 (21.7%) cases, respectively. One hundred sixty-seven children with eczema (47.7%) had a family history of allergies.

3.2. Understanding the roles of moisturizers in treating eczema

A total of 252 parents (72%) were aware that the skin of children with eczema required moisturizers to restore the skin barrier, and 175 parents (50.0%) knew that moisturizers restored the skin barrier. Only 27 parents (15.4%) among the 175 parents knew that moisturizers could improve eczema, and only 30 parents (17.5%) among the 175 parents knew that moisturizers could reduce skin sensitivity. Moreover, 35 parents (10.0%) knew that topical moisturizers are an important part of eczema management, but only 30 parents (8.6%) knew that long-term moisturizer usage can prevent the recurrence of eczema. Only 10 parents (2.9%) believed that moisturizers should be used on the entire body for children with eczema, whereas 56 parents (16.0%) thought that moisturizers should never be used for children with eczema (Table 2).

3.3. Application of moisturizers in children with eczema

Of the 350 children surveyed, 243 parents (69.4%) used moisturizers, but 183 parents (51.7%) only used moisturizers on the face of their children; 212 parents (60.0%) used moisturizers only on the dry areas of their children’s face and other body parts, and only 16 parents (4.6%) used moisturizers on the entire body of their children. Among the 243 parents who used moisturizers on their children, 196 parents (80.7%) discontinued moisturizers immediately when skin dryness improved and only 13.2% used moisturizers long-term. Creams were reported to be used by 53.9% of children with eczema and lotions, oils, and sprays were reported by 27.6%, 11.1%, and 7.4%, respectively. The frequency of moisturizer usage in the surveyed children with eczema was as follows: 62.6%, 21.0%, 6.6%, 4.5%, and 5.4% used moisturizers 1 to 2, 3 to 4, 5 to 6, and 7 to 8 times/day, and once every few days, respectively. A total of 209 parents (60.6%) initiated the application of moisturizers on their child only when the skin was dry (Table 3).

3.4. Efficacy of moisturizers and parental concerns

Among the 243 parents who applied moisturizer on their child, 217 parents (89.3%) reported that moisturizers improved their child’s eczema; 182 parents (74.9%) reported a reduction in corticosteroid usage in their child after moisturizer application. A total of 202 parents (83.1%) reported reduced severity of the eczema at each relapse, and 197 parents (81.1%) reported a shorter duration of eczema onset after moisturizer application. Of the 32 parents whose children used moisturizers long-term,
Table 3

| Questionnaire                                               | Number (n) | Percentage (%) |
|-------------------------------------------------------------|------------|----------------|
| Did you use moisturizers on your child                      | 243        | 69.4           |
| Yes                                                         | 107        | 30.6           |
| Did you discontinue moisturizers immediately after improvement of dryness on your child | Yes | 196 | 80.7 |
| No                                                         | 47         | 19.3           |
| Did you use the moisturizers for your child for long-term   | Yes        | 32             | 13.2 |
| No                                                         | 211        | 86.8           |
| Which moisturizers formulation did you use on your child    | Cream      | 131            | 53.9 |
| Lotions                                                    | 67         | 27.6           |
| Oils                                                       | 27         | 11.1           |
| Sprays                                                     | 18         | 7.4            |
| How many times per day did you use moisturizers on your child | 1–2 times | 152 | 62.6 |
| 3–4 times                                                  | 51         | 21.0           |
| 5–6 times                                                  | 16         | 6.6            |
| 7–8 times                                                  | 11         | 4.5            |
| Once every few days                                        |             |                 |
| Did you use moisturizers on your child only when the skin was dry | Yes | 209 | 86.0 |
| No                                                         | 34         | 14.0           |
| Was eczema of your child improved after using moisturizers  | Yes        | 217            | 89.3 |
| No                                                         | 26         | 10.7           |
| Did long-term use of moisturizers reduce the recurrence of eczema on your child | Yes | 30 | 93.8 |
| No                                                         | 2          | 6.3            |
| Did moisturizers reduce the amount of topical corticosteroid usage of your child | Yes | 182 | 74.9 |
| No                                                         | 61         | 25.1           |
| Did moisturizers reduce the severity of the eczema in your child | Yes | 202 | 83.1 |
| No                                                         | 41         | 16.9           |
| Did moisturizers shorten the duration of the eczema onset in your child | Yes | 197 | 81.1 |
| No                                                         | 46         | 18.9           |
| Did your child still have dry skin when used moisturizers   | Yes        | 183            | 75.3 |
| No                                                         | 60         | 24.7           |
| Did eczema exacerbate when your child use moisturizers      | Yes        | 33             | 13.6 |
| No                                                         | 210        | 86.4           |
| Did the skin of your child dry quickly after discontinuation of moisturizers | Yes | 178 | 73.3 |
| No                                                         | 65         | 26.7           |

Table 4

| Questionnaire                                               | Number (n) | Percentage (%) |
|-------------------------------------------------------------|------------|----------------|
| Did you worry about side effects when used moisturizers on your child | Yes | 40 | 16.5 |
| No                                                         | 203        | 83.5           |
| Is it because of the concern about side effects that you did not apply moisturizers to your child | Yes | 62 | 57.9 |
| No                                                         | 45         | 42.1           |
| Is it because of the concern about side effects that you did not apply moisturizers to your child for long-term | Yes | 161 | 76.3 |
| No                                                         | 50         | 23.7           |
| Do you think your child experience side effects from moisturizers | Yes | 46 | 18.9 |
| No                                                         | 197        | 81.1           |
| Which side effect                                          | Sooting    | 12             | 26.1 |
| Erythema                                                   | 26         | 56.5           |
| Folliculitis                                                | 8          | 17.4           |

30 parents (93.8%) reported a reduction in the number of flares. However, 183 parents (75.3%) reported that their child still had dry skin, regardless of moisturizer application. A total of 33 parents (13.6%) reported that their child’s eczema was exacerbated after moisturizer application and 73.3% reported that their child’s skin dried quickly after the discontinuation of moisturizers (Table 3). Among the 107 parents who did not use moisturizers on their children, 62 parents (57.9%) reported concerns regarding the side effects of moisturizers. Among the 211 parents who did not use moisturizers long-term on their children, 161 parents (76.3%) reported concerns regarding the side effects of moisturizers. Among the 227 parents who did not apply moisturizers on their child’s entire body, 172 parents (75.8%) reported concerns regarding the side effects of moisturizers. Among the 243 parents who applied moisturizers on their children, 46 parents (18.9%) reported that their child experienced side effects: 12 (26.1%), 26 (56.5%), and 8 (17.4%) children experienced a stinging sensation, erythema, and folliculitis, respectively (Table 4).

4. Discussion

Parental understanding of moisturizers influences their use of moisturizers for infants with eczema and impacts the amount as well as the frequency of application. Our study showed that most parents (72%) knew that the skin of children with eczema required moisturizers to repair the skin barrier, and half parents (50%) knew that moisturizers can repair the skin barrier. However, few parents (7.7%) knew that moisturizers can improve eczema. Only 7.4% parents knew that moisturizers could reduce skin sensitivity and only 8.6% knew that moisturizers could reduce relapses of eczema with long-term usage. Our study also showed that a few parents (16.0%) thought that children with eczema should not use moisturizers. These results indicate that few parents fully understand the role of moisturizers in the treatment and prevention of eczema and that parents often neglect the importance of moisturizing in eczema management.

The efficacy of moisturizers depends on the dosage, frequency of use, and appropriate formulation. We found that the skin of most children (75.3%) with eczema remains dry despite the use of moisturizers, which suggests that there may be an incorrect.
Physicians play a central role in health education, and compliance with moisturizer usage will be enhanced through health education. A British study showed that educating parents in the proper use of moisturizers led to an 800% increase in the quantity of moisturizers used, a decrease in the severity of eczema, and a decrease in the percentage of patients needing moderate or potent topical steroids. Physicians should help parents of children with infantile eczema to better understand the importance and necessity of moisturizer application in the treatment and prevention of eczema flares. Physicians should explain that the regular use of moisturizers can reduce exacerbations of eczema, decrease the need for topical corticosteroids, shorten treatment time, reduce the number of eczema flares, and prolong the time to eczema flares. Moreover, physicians should provide adequate knowledge to parents regarding the frequency of application and the amount, formulation, and adverse effects of moisturizers, to ensure that parents apply moisturizers regularly and appropriately to their child with eczema.

This study was limited in that it was a single-center investigation. Besides, since this is an observational study, the association between different moisturizer usage and the prognosis was not investigated. Further randomized controlled studies including a larger number of parents of children with eczema from multiple centers and different types of institutions (e.g., children’s hospitals, primary or secondary care facilities) should be performed.

In conclusion, our study suggested that despite a fair level of knowledge about moisturizers, parents of children with eczema are using them inadequately. Pediatrician should be more patient to educate parents the information on the importance of moisturizers for the improvement of eczema and prevention of recurrence.

Author contributions

YLL and ZFL conceived and designed the experiments, and wrote the manuscript. HWZ, YL, WL, and XXG performed the experiment and collected the data. All authors have given approval to the final version of the manuscript.

References

[1] McAleer MA, Irvine AD. The multifunctional role of filaggrin in allergic skin disease. J Allergy Clin Immunol 2013;131:280–91.
[2] Agrawal R, Woodfolk JA. Skin barrier defects in atopic dermatitis. Curr Allergy Asthma Rep 2014;14:433.
[3] Kuo IH, Yoshida T, De Benedetto A, et al. The cutaneous innate immune response in patients with atopic dermatitis. J Allergy Clin Immunol 2013;131:266–78.
[4] Sullivan M, Silverberg NB. Current and emerging concepts in atopic dermatitis pathogenesis. Clin Dermatol 2017;35:349–53.
[5] Leung DY. New insights into atopic dermatitis: role of skin barrier and immune dysregulation. Allergol Int: official journal of the Japanese Society of Allergology 2013;62:151–61.
[6] Loden M. Role of topical emollients and moisturizers in the treatment of dry skin barrier disorders. Am J Clin Dermatol 2003;4:771–88.
[7] McAleer MA, Flohr C, Irvine AD. Management of difficult and severe eczema in childhood. BMJ 2012;345:e4779.
[8] van Zuuren EJ, Fedorowicz Z, Christensen R, et al. Emollients and moisturisers for eczema. Cochrane Database Syst Rev 2017;2:CD012119.
[9] Rudd MJ, Garfield K, Gaunt DM, et al. Choice of Moisturiser for Eczema Treatment (COMET): feasibility study of a randomised controlled parallel group trial in children recruited from primary care. BMJ Open 2016;6:e012021.

application of moisturizers. Studies have shown that the ingredients of moisturizers last for a relatively short time owing to sloughing as the skin comes into contact with other materials, in addition to evaporation, absorption, and metabolism. Therefore, frequent application of moisturizers is necessary. Our study demonstrated that the frequency of moisturizer usage for most children was insufficient, which did not keep the skin well moisturized and hydrated, suggesting that more frequent moisturizer application is needed. Moisturizers are available as different formulations, such as ointments, creams, lotions, gels, oils, and sprays. In our study, among the children who used moisturizers, over half of the children with eczema (53.9%) used creams; the remainder used lotions, oils, or sprays. Creams are often effective and better tolerated. Lotions have a high water content and may require more frequent application. Sprays can worsen xerosis via evaporation and should be avoided while oils are effective but messy. Environmental humidity, climate, and the degree of skin dryness should be considered in the use of moisturizers. More frequent moisturizer usage and occlusive moisturizers are needed when the skin is very dry. Children with eczema should use moisturizers more frequently during the winter and summer. Our study showed that 75.3% of children had only used moisturizers on the face; 87.3% only used moisturizers on dry parts of the body, and only 6.6% used moisturizers on the entire body. For children with eczema, skin barrier defects may play a key role in initiating but also perpetuating eczema. Therefore, moisturizers should be applied daily and continuously to the entire body in children with eczema, regardless of whether dermatitis is present and even when the skin is not dry.

Our investigation revealed that 57.9% (62/107) did not use moisturizers, 76.3% (161/212) did not use moisturizers long-term, and 75.8% (172/227) did not use moisturizers on the entire body owing to concerns about the side effects of moisturizers. This irrational fear may deter parents from consistently using moisturizers. Moisturizers generally contain active ingredients (humectants, occlusives, and emollients), excipients (emulsifiers, antioxidants, and preservatives), and other ancillary ingredients, such as fragrances. Because children with eczema are more prone to contact dermatitis compared with the normal population, non-dyed or non-fragranced moisturizers should be used by children with eczema to avoid contact dermatitis. Even when used over a large body surface area long-term, moisturizers are rarely associated with adverse effects when children avoid products with irritants such as fragrances, sodium lauryl sulphate, or other strong sensitizers.

In the present study, 33 parents (13.6%) reported that moisturizers exacerbated their child’s eczema symptoms. This might occur because the moisturizers used cause irritation in children with acute eczema or moisturizers alone were used in children with severe eczema. Owing to the chronic and recurrent nature of eczema, there are 2 important facets to eczema management, namely treatment and prevention of flares. To prevent eczema flares, frequent application of moisturizers is essential. However, when eczema is serious and does not respond well to moisturizers alone, topical corticosteroids should be used to control symptoms and inflammation.

Unsatisfactory eczema management has been attributed to a lack of correct knowledge. Our study showed that parents often do not apply moisturizers frequently in children with eczema because they lack knowledge about moisturizers.
[10] Purnamawati S, Indrastuti N, Danarti R, et al. The role of moisturizers in addressing various kinds of dermatitis: a review. Clin Med Res 2017;15:75–87.

[11] Giam YC, Hebert AA, Dizon MV, et al. A review on the role of moisturizers for atopic dermatitis. Asia Pac Allergy 2016;6:120–8.

[12] Thompson D. Promoting effective education for children with eczema. Nurs Stand 2016;30:49–57. quiz 60.

[13] Barbarot S, Stalder JF. Therapeutic patient education in atopic eczema. Br J Dermatol 2014;170(Suppl 1):44–8.

[14] Sy W, Lamb AJ. Atopic dermatitis disease education. Adv Exp Med Biol 2017;1027:179–84.

[15] Cork MJ, Britton J, Butler L, et al. Comparison of parent knowledge, therapy utilization and severity of atopic eczema before and after explanation and demonstration of topical therapies by a specialist dermatology nurse. Br J Dermatol 2003;149:582–9.