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# Hand eczema treatment: Change behaviour with text messaging, a randomized trial

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## Abstract

**Background:** Irritant contact dermatitis is the most common type of hand eczema. Effective treatment usually involves avoidance of irritants and use of appropriate topical medication. In this study, the effectiveness of using text messaging addressing preventive behaviours and appropriate medication adherence was evaluated.

**Methods:** Patients who were admitted to Istanbul Training and Research Hospital Dermatology Department March 1, 2015 to July 31, 2015, and diagnosed with hand eczema were enrolled. Patients were randomly divided into the SMS group and the non-SMS group. Text messages were sent to the mobile phones of the patients in the SMS group. Severity of hand eczema, compliance to treatment, patients' information level, adherence to preventive behaviours, and the protective behaviour score were evaluated at baseline, and at the 4th and 8th week.

**Results:** Eighty-one patients with hand eczema were included in the study. After 8 weeks, the decrease in the Hand Eczema Severity Index score was 70.2% (SD 35.2) in the SMS group and 38.9% (SD 67.7) in the non-SMS group ( $P = .017$ ). Sending SMS to patients increased the use of moisturizer. There was no statistically significant difference in other behaviours.

**Conclusion:** This study demonstrated that text messaging improves the treatment success and specifically the frequency of moisturizer use in patients with hand eczema.

## KEYWORDS

Irritant Contact Dermatitis, Patient Compliance, Secondary Prevention, Text Messaging

## 1 | INTRODUCTION

Hand eczema is a common, often chronic, recurrent disease that significantly affects quality of life. Irritant contact dermatitis, the most common type of hand eczema, is due to repetitive exposure to irritants.<sup>1,2</sup> In daily life, irritating factors are often not strong enough to cause hand eczema in the short term. Therefore, the unfavourable conditions may not be noticed by patients. However, hand eczema

develops as a result of prolonged and repeated exposure to irritants.<sup>3</sup> Effective treatment usually involves avoidance of the irritants and appropriate use of topical medication.<sup>2</sup>

Patients with hand eczema need training and counselling on treatment use, exacerbating factors, and preventive measures.<sup>3,4</sup> The recommendations offered in dermatology outpatient clinics to hand eczema patients have been found to be insufficient to provide a change in behaviours towards protective habits.<sup>5,6</sup> Because hand eczema is often considered an occupation-related disease, most studies for secondary prevention have been performed with high-risk occupational groups.

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Those studies have identified methods to improve the prognosis of hand eczema. They described prevention programmes that were structured with multidisciplinary teams, role models, and training. The aim of the programmes was to increase the patients' compliance with the treatment and to provide self-management skills. In this way, patients' adoption of secondary prevention measures may reduce the frequency of recurrence of hand eczema.<sup>6-12</sup>

Short message service (SMS or text messaging) has been effective in improving treatment compliance and promoting behaviour changes for many chronic diseases in recent years.<sup>13-18</sup> To the best of our knowledge, there is no study investigating the effectiveness of SMS for hand eczema patients. In this study, we evaluated the effectiveness of using SMS to inform patients with hand eczema about preventive behaviours and appropriate medication adherence.

## 2 | METHODS

A controlled, randomized approach was used to evaluate the effect of SMS on treatment compliance and behaviour changes in hand eczema patients. Patients who were admitted to the Istanbul Training and Research Hospital Dermatology Department from March 1, 2015 to July 31, 2015 and diagnosed with hand eczema (irritant contact dermatitis subtype) were enrolled. The criteria for inclusion in the study were being 18–70 years of age, having graduated from primary school and a higher education level, having a negative patch test result, and being able to use the mobile phone SMS. The study protocol was approved by the Institutional Ethics Committee of the Istanbul Training and Research Hospital. Written informed consent was obtained from the patients.

Patients were randomized into two groups in an unblinded fashion: those who would receive SMS and those who would not ([http://www.e-picos.com/randomizer\\_rpg.php](http://www.e-picos.com/randomizer_rpg.php)). At the first meeting, each patient was informed verbally by a doctor, for approximately 5 minutes, about hand eczema and protective measures. All patients were then provided with a written form with information about eczema. Topical corticosteroids (mometasone furoate 0.1% ointment) and moisturizers (Vaseline) were prescribed for the patients. Topical corticosteroids were recommended to be used twice per day for 4 weeks and moisturizers were recommended to be used at least twice per day for 8 weeks. Information and reminder text messages were sent twice daily for 4 weeks to the mobile phones of the patients in the SMS group. Text messages provided information about skin care, skin protection, prevention of

irritant contacts, and reminding and motivating medication usage (Data S1). Patients were evaluated at 4 and 8 weeks follow-up.

Sociodemographic information of the patients was recorded. Severity of hand eczema was evaluated with the Hand Eczema Severity Index (HECSI).<sup>19</sup> Treatment success was accepted as a decrease of 50% or more in the HECSI score. In addition, the patients rated the severity of their hand eczema on the 5-point visual analogue scale (VAS) graded as 0: no eczema, 1: very mild, 2: mild, 3: moderate, 4: severe, 5: very severe. Compliance to the treatment was assessed as the frequency of medication use. Patients' knowledge levels were evaluated with an eczema assessment questionnaire. The eczema assessment questionnaire is designed as a true/false choice questionnaire consisting of 20 questions about preventive measures, exacerbating factors, and hand eczema. An example of a question is, "Washing hands too often can cause hand eczema (True/ False)". Patients received 1 point for each correct answer. Preventive behaviours were evaluated in terms of the frequency of hand washing, use of moisturizer, gloves, liquid soap, cologne, wet wipes, and by the protective behaviour score (Table 1). There is no standard scale to measure protective habits. The protective behaviour score was based on the irritation exposure score developed by Jungbauer.<sup>20</sup> Cultural habits, such as use of cologne or wet wipes, and protective behaviours, such as the use of moisturizers and gloves, were added to the scoring. Severity of hand eczema, compliance to the treatment, patients' information level, adherence to preventive behaviours, and the protective behaviour score were evaluated at follow-up (Table 2).

SPSS version 15.0 (SPSS; Chicago, Illinois) for Windows was used for statistical analysis. Descriptive statistics for categorical variables, numbers and percentages were given as mean (SD) and median for numerical variables. The independent 2-group comparisons were made with the Mann-Whitney *U* test if the Student's *t* test was not appropriate concerning the normal distribution assumption. The relationships between the numerical variables were examined by Spearman's correlation analysis. For dependent group analysis, the paired *t* test was used where the numerical variables provided normal distribution conditions, otherwise the Wilcoxon test was used for 2 groups, and the Friedman test was used for more than 2 groups. Subgroup analysis was performed with the Wilcoxon test and interpreted with the Bonferroni correction. The ratios of the categorical variables between the groups were tested by chi square tests, except in

**TABLE 1** Protective behaviour score

| Behaviour    | 0 points       | 1 point         | 2 points      |
|--------------|----------------|-----------------|---------------|
| Moisturizing | Never          | Occasionally    | Frequently    |
| Hand washing | 0–10 times/day | 11–20 times/day | >20 times/day |
| Gloves       | Never          | Occasionally    | Frequently    |
| Liquid soap  | Frequently     | Occasionally    | Never         |
| Cologne      | Frequently     | Occasionally    | Never         |
| Wet wipes    | Frequently     | Occasionally    | Never         |

**TABLE 2** Parameters used for evaluation and follow-up schedule

| Parameters                                                                                | Baseline | 4th week | 8th week |
|-------------------------------------------------------------------------------------------|----------|----------|----------|
| HECSI and VAS                                                                             | ✓        | ✓        | ✓        |
| Eczema assessment questionnaire                                                           | ✓        | ✓        |          |
| Compliance to the treatment                                                               |          | ✓        |          |
| Frequency of hand washing, moisturizer, gloves, liquid soap, cologne, and wet wipes usage | ✓        | ✓        | ✓        |
| Protective behaviour score                                                                | ✓        | ✓        | ✓        |

Note: HECSI, Hand Eczema Severity Index; VAS, visual analogue scale.

sparse data situations, where Monte Carlo simulation was performed. Statistical significance was accepted as  $P < .05$ .

### 3 | RESULTS

Eighty-one patients with hand eczema were included in the study. Patients were randomly divided into two groups; 42 patients were allocated to the SMS group, and 39 to the non-SMS comparison group. In the 4th week of follow-up, 35 patients from the SMS group and 35 from the non-SMS group were still participating. In the 8th week of follow-up, 23 patients from the SMS group and 17 from the non-SMS group still participated. Table 3 shows the sociodemographic characteristics of the patients.

#### 3.1 | Evaluation of the clinical severity of hand eczema using the Hand Eczema Severity Index and the visual analogue scale

Initially, the HECSI score (mean  $\pm$  SD) of 42 patients in the SMS group was 15.1 (SD 12.7) and the HECSI score of 39 patients in the non-SMS

group was 11.7 (SD 8.7). In the 8th week follow-up the HECSI score of 23 patients in the SMS group was 4.7 (SD 8.3) and the HECSI score of 17 patients in the non-SMS group was 5.8 (SD 7.0). After 8 weeks, the decrease in the HECSI score was 70.2% (SD 35.2) in the SMS group ( $n = 23$ ) and 38.9% (SD 67.7) in the non-SMS group ( $n = 17$ ) ( $P = .017$ ). In the current study, treatment success was accepted as a decrease of 50% or more in the HECSI score. Treatment success was 87.0% ( $n = 20/23$ ) in the SMS group. This was statistically significantly higher ( $P = .006$ ) than the non-SMS group ( $n = 8/17$ ), which had a treatment success rate of 47.1% (Table 4). At the 8th week of follow-up, the decrease in VAS averages was statistically significant in both groups ( $P < .001$  for both). No statistically significant difference was found between the groups when the VAS values of the patients at baseline, the decrease of VAS values from baseline to the 4th week, and baseline to 8th week were compared ( $P = .37$ ;  $P = .65$ ;  $P = .27$ , respectively) (Table 5).

#### 3.2 | Assessment of knowledge level

All the patients in the SMS group and 88.2% of the patients in the non-SMS group stated that they had sufficient knowledge about the

**TABLE 3** Sociodemographic characteristics of patients in the SMS group and non-SMS group

| Characteristic             |                            | Hand eczema           |                     | P-value |
|----------------------------|----------------------------|-----------------------|---------------------|---------|
|                            |                            | SMS group             | Non-SMS group       |         |
| Age Mean $\pm$ SD/Median   |                            | 36.6 $\pm$ 11.9 /37.5 | 38.0 $\pm$ 11.7 /37 | .54     |
| Sex, n (%)                 | Male                       | 24 (57.1)             | 20 (51.3)           | .60     |
|                            | Female                     | 18 (42.9)             | 19 (48.7)           |         |
| Profession, n (%)          | Housewife                  | 6 (14.3)              | 11 (28.2)           | .54     |
|                            | Health service             | 2 (4.8)               | 0 (0.0)             |         |
|                            | Cleaning services          | 1 (2.4)               | 3 (7.7)             |         |
|                            | Accounting/bank worker     | 4 (9.5)               | 3 (7.7)             |         |
|                            | Food industry              | 5 (11.9)              | 4 (10.3)            |         |
|                            | Retired                    | 2 (4.8)               | 3 (7.7)             |         |
|                            | Textile worker             | 3 (7.1)               | 1 (2.6)             |         |
|                            | Other                      | 19 (45.2)             | 14 (35.9)           |         |
| History of atopy, n (%)    | None                       | 36 (85.7)             | 35 (89.7)           | .99     |
|                            | Asthma                     | 3 (7.1)               | 3 (7.7)             |         |
|                            | Allergic rhinitis          | 2 (4.8)               | 1 (2.6)             |         |
|                            | Atopic dermatitis          | 0 (0.0)               | 0 (0.0)             |         |
|                            | Asthma + allergic rhinitis | 1 (2.4)               | 0 (0.0)             |         |
| HECSI Mean $\pm$ SD/Median |                            | 15.1 $\pm$ 12.7 /11.5 | 11.7 $\pm$ 8.7 /9   | .38     |
| Disease duration, n (%)    | $\leq 3$ months            | 10 (23.8)             | 5 (12.8)            | .49     |
|                            | 3–6 months                 | 1 (2.4)               | 3 (7.7)             |         |
|                            | 6–12 months                | 5 (11.9)              | 7 (17.9)            |         |
|                            | 1–3 years                  | 11 (26.2)             | 7 (17.9)            |         |
|                            | 3–6 years                  | 9 (21.4)              | 8 (20.5)            |         |
|                            | $\geq 6$ years             | 6 (14.3)              | 9 (23.1)            |         |
| Symptoms at work, n (%)    | Yes                        | 30 (71.4)             | 19 (48.7)           | .037    |
|                            | No                         | 12 (28.6)             | 20 (51.3)           |         |

use of medication at the 4th weeks follow-up. No statistically significant difference in the number of patients who had sufficient knowledge was shown between groups ( $P = 0.11$ ). In the SMS group, patients' knowledge test score was 9.4 (SD 3.4) at the first visit and 14.8 (SD 3.4) at the 4th week of follow-up. In the non-SMS group, patients' knowledge test score was 10.6 (SD 3.4) at the first visit and 14.6 (SD 3.9) at the 4th week of follow-up. A statistically significant increase was found in the knowledge test scores of both groups when baseline and 4th weeks were compared ( $P < 0.001$  for both). When the change in level of the knowledge test scores were compared, it was 5.9 (SD 4.4) in the SMS group and 4.7 (SD 4.2) in the non-SMS group, but no statistically significant difference was found the between groups ( $P = 0.23$ ).

### 3.3 | Evaluation of compliance with treatment and protective behaviours

Adherence to treatment was evaluated at the 4th week of follow-up; 52.9% of the patients in the SMS group and 64.7% of the non-SMS group stated that they forgot or did not use the treatment at least once. There was no statistically significant difference in the number of patients who forgot the use of medication ( $P = 0.33$ ). There was a statistically significant increase in the use of moisturizer in the SMS group at both the 4th and 8th weeks compared with baseline ( $P < 0.001$  and  $P = 0.020$ ). There was a statistically significant increase in the frequency of using a moisturizer only in the 4th weeks in the non-SMS group, but no significant change was observed in the 8th

**TABLE 4** Comparison of Hand Eczema Severity Scores in the SMS and non-SMS groups

|                                                     | SMS group             |    | Non-SMS group        |      |            |
|-----------------------------------------------------|-----------------------|----|----------------------|------|------------|
| HECSI baseline, Mean $\pm$ SD/Median, n             | 15.1 $\pm$ 12.7<br>42 | 12 | 11.7 $\pm$ 8.7<br>39 | 9    | $P = .38$  |
| HECSI 4th week (Mean $\pm$ SD, Median)              | 8.5 $\pm$ 9.6         | 6  | 7.5 $\pm$ 6.6        | 6    | $P = .76$  |
| HECSI (0–4th week change %) (Mean $\pm$ SD, Median) | 35.5 $\pm$ 69.6       | 50 | 30.5 $\pm$ 56.2      | 50   | $P = .38$  |
| 4 weeks treatment success <sup>a</sup> n (%)        | 18/35 (51.4)          |    | 18/35 (51.4)         |      | $P > .99$  |
| HECSI 8th week (Mean $\pm$ SD, Median)              | 4.7 $\pm$ 8.3         | 2  | 5.8 $\pm$ 7.0        | 5    | $P = .019$ |
| HECSI (0–8th week change %) (Mean $\pm$ SD, Median) | 70.2 $\pm$ 35.2       | 82 | 38.9 $\pm$ 67.7      | 44.4 | $P = .017$ |
| 8 weeks treatment success <sup>a</sup> n (%)        | 20/23 (87.0)          |    | 8/17 (47.1)          |      | $P = .006$ |

<sup>a</sup>Treatment success was defined as a  $\geq 50\%$  decrease in Hand Eczema Severity Index (HECSI).

|                             | Non-SMS group |        | SMS group     |        | P-value |
|-----------------------------|---------------|--------|---------------|--------|---------|
|                             | Mean $\pm$ SD | Median | Mean $\pm$ SD | Median |         |
| VAS                         | 3.3 $\pm$ 1.5 | 3      | 3.3 $\pm$ 1.4 | 3      | 0.37    |
| $\Delta 1$ VAS (0–4th week) | 2.1 $\pm$ 1.5 | 2      | 1.8 $\pm$ 1.2 | 2      | 0.65    |
| $\Delta 2$ VAS (0–8th week) | 1.4 $\pm$ 1.4 | 1      | 1.9 $\pm$ 1.5 | 1      | 0.27    |
|                             | $P < 0.001$   |        | $P < 0.001$   |        |         |

Note:  $\Delta$ : Indicates the difference in the visual analogue scale (VAS).

**TABLE 5** Comparison of visual analogue scale in the SMS and non-SMS groups

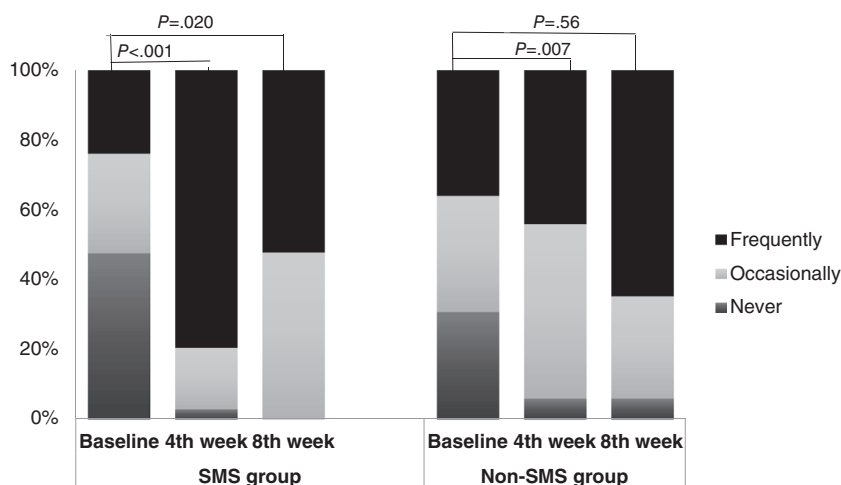


**FIGURE 1** Variation of the frequency of using moisturizer in the SMS and non-SMS groups

| Behaviours   | Baseline        |    |               |    | 4th week  |    |               |    | 8th week  |    |               |    |      |
|--------------|-----------------|----|---------------|----|-----------|----|---------------|----|-----------|----|---------------|----|------|
|              | SMS group       |    | Non-SMS group |    | SMS group |    | Non-SMS group |    | SMS group |    | Non-SMS group |    |      |
|              | n               | %  | n             | %  | N         | %  | N             | %  | n         | %  | n             | %  |      |
| Hand washing | Frequency       |    |               |    |           |    |               |    |           |    |               |    |      |
|              | 0-5 times/day   | 6  | 14.3          | 3  | 7.7       | 6  | 17.6          | 9  | 26.5      | 3  | 13            | 4  | 23.5 |
|              | 6-10 times/day  | 14 | 33.3          | 10 | 25.6      | 17 | 50            | 11 | 32.4      | 16 | 69.6          | 10 | 58.8 |
|              | 11-20 times/day | 18 | 42.9          | 14 | 35.9      | 9  | 26.5          | 11 | 32.4      | 2  | 8.7           | 2  | 11.8 |
| Moisturizing | >20 times/day   | 4  | 9.5           | 12 | 30.8      | 2  | 5.9           | 3  | 8.8       | 2  | 8.7           | 1  | 5.9  |
|              | Never           | 20 | 47.6          | 12 | 30.8      | 1  | 2.9           | 2  | 5.9       | 0  | 0             | 1  | 5.9  |
|              | Occasionally    | 12 | 28.6          | 13 | 33.3      | 6  | 17.6          | 17 | 50        | 11 | 47.8          | 5  | 29.4 |
|              | Frequently      | 10 | 23.8          | 14 | 35.9      | 27 | 79.4          | 15 | 44.1      | 12 | 52.2          | 11 | 64.7 |
| Gloves       | Never           | 25 | 59.5          | 15 | 38.5      | 18 | 52.9          | 15 | 44.1      | 8  | 34.8          | 4  | 23.5 |
|              | Occasionally    | 7  | 16.7          | 11 | 28.2      | 3  | 8.8           | 4  | 11.8      | 6  | 26.1          | 4  | 23.5 |
|              | Frequently      | 10 | 23.8          | 13 | 33.3      | 13 | 38.2          | 15 | 44.1      | 9  | 39.1          | 9  | 52.9 |
|              |                 | 20 | 47.6          | 21 | 53.8      | 30 | 88.2          | 26 | 76.5      | 20 | 87            | 16 | 94.1 |
| Wet wipes    | Occasionally    | 13 | 31            | 14 | 35.9      | 3  | 8.8           | 8  | 23.5      | 3  | 13            | 1  | 5.9  |
|              | Frequently      | 9  | 21.4          | 4  | 10.3      | 1  | 2.9           | 0  | 0         | 0  | 0             | 0  | 0    |
|              | Never           | 32 | 76.2          | 28 | 71.8      | 32 | 94.1          | 29 | 85.3      | 22 | 95.7          | 16 | 94.1 |
|              | Occasionally    | 7  | 16.7          | 9  | 23.1      | 2  | 5.9           | 3  | 8.8       | 1  | 4.3           | 0  | 0    |
| Cologne      | Frequently      | 3  | 7.1           | 2  | 5.1       | 0  | 0             | 2  | 5.9       | 0  | 0             | 1  | 5.9  |
|              | Never           | 11 | 26.2          | 8  | 20.5      | 25 | 73.5          | 21 | 61.8      | 18 | 78.3          | 11 | 64.7 |
|              | Occasionally    | 5  | 11.9          | 3  | 7.7       | 8  | 23.5          | 8  | 23.5      | 2  | 8.7           | 5  | 29.4 |
|              | Frequently      | 26 | 61.9          | 28 | 71.8      | 1  | 2.9           | 5  | 14.7      | 3  | 13            | 1  | 5.9  |

**TABLE 7** Comparison of protective behaviour scores in the SMS and non-SMS groups

| Protective Behaviour Score |               |        |                |        |         |
|----------------------------|---------------|--------|----------------|--------|---------|
|                            | SMS group     |        | Non-SMS group  |        | P-value |
|                            | Mean $\pm$ SD | Median | Mean $\pm$ SD  | Median |         |
| Baseline                   | 6.4 $\pm$ 1.9 | 7      | 6.6 $\pm$ 2.2  | 6      | 0.67    |
| 4th week                   | 9.7 $\pm$ 1.5 | 10     | 8.9 $\pm$ 2.1  | 9      | 0.13    |
| 8th week                   | 9.8 $\pm$ 1.5 | 10     | 10.1 $\pm$ 2.1 | 11     | 0.28    |
| P-value                    | <0.001        |        | <0.001         |        |         |

week ( $P = 0.007$  and  $P = 0.56$ , respectively) (Figure 1). When protective behaviours were compared, only the use of moisturizer in the 4th week was higher in the SMS group than in the non-SMS group (Table 6). There was no difference in protective behaviour scores during follow-up between the groups (Table 7).

## 4 | DISCUSSION

Daily skin care, protection of the skin from irritant substances, and proper use of medications are important in the management of hand eczema. However, the implementation and maintenance of these behaviours in daily life depends on patient awareness. Therefore, secondary prevention programmes have been organized to raise the awareness of hand eczema patients. Recent studies have shown that these programmes are superior to classic care.<sup>6-11</sup>

The fact that almost everyone uses mobile phones makes it easy to reach the targeted audience effectively by SMS, and the positive effects of SMS on topical drug use, aggravating factors, healthy behaviour, and lifestyle have been shown by meta-analysis.<sup>18</sup> Acne and psoriasis studies have suggested that informing with SMS is a promising tool for long-term treatment of the disease.<sup>16,17</sup> The current study is the first to determine the effect of SMS on disease severity, treatment compliance, and protective habits in hand eczema patients.

In this study, the clinical severity of hand eczema was measured by the HECSI, an objective evaluation method. In the SMS group, the decrease in the HECSI score was 35.5% at 4 weeks follow-up and 70.2% at 8 weeks follow-up. The HECSI score decrease in the non-SMS group was 30.5% at 4 weeks follow-up and 38.9% at 8 weeks follow-up. In both groups, eczema severity decreased, but no statistically significant difference was observed between the groups in the first 4 weeks. This may have been due to the similar use of corticosteroids for treatment in the first 4 weeks in both groups. However, the improvement in the SMS group at the 8th week of follow-up was statistically significantly higher than that of the non-SMS group. This result indicates that the effect of SMS on clinical improvement persisted after the SMS period. The improvement after the topical corticosteroid treatment period can only be achieved with positive protective habits. This suggests that text messaging has a lasting effect on behaviour change. In the study of van Gils et al, the decrease in the HECSI score in the 26-week follow-up was 51% in the integrated care group and 32% in the usual care group, and the difference

was found to be significant, as it was in the present study.<sup>7</sup> Mollerup et al reported that improvement in the HECSI results of the patients who were followed up in the hospital was better than that of the patients followed up in the clinic.<sup>6</sup> We evaluated the compliance of treatment with topical corticosteroids in this study. As in the study of Mollerup et al, no difference was found between the compliance of the groups to the treatment.<sup>6</sup>

Patients must have the correct knowledge to apply protective measures in daily life. In the present study, the knowledge levels of the patients about eczema and preventive measures were evaluated at the beginning and at the 4th week of follow-up with an eczema assessment questionnaire. A statistically significant increase was found in the knowledge level of the patients who received and who did not receive SMS, and no difference was shown between the groups. These results indicated that brief interviews and oral and written information were apparently sufficient to inform patients and that SMS did not contribute to the knowledge level of patients. In the study of Held et al, the level of knowledge was higher in the patients who received training.<sup>8</sup> Since the knowledge levels were evaluated only at the end of the follow-up period, evaluating the baseline information levels and the increase in the level of knowledge was not possible. As in the study of Ibler et al, no difference was found between the groups in terms of patient information levels.<sup>10</sup> In contrast to this study, however, van der Meer et al found that the knowledge level of patients in the Hands4u programme, a multifaceted implementation strategy, was significantly higher than the control group. This study demonstrated the importance of role models in bringing knowledge and behaviour change to healthcare workers.<sup>9</sup>

The percentage of patients in the SMS group who used the moisturizer frequently increased from 23.3% to 79.4% in the first 4 weeks and decreased to 52.2% in the next 4 weeks. SMS was sent to the patients for the first 4 weeks, and a significant increase was found in the use of moisturizer during this period. No SMS was sent for the next 4 weeks, and the frequency of moisturizer usage at the 8th week of follow-up had decreased compared to the 4th week of follow-up, although the frequency of use was still higher than the initial level. Patients had knowledge that they should use the moisturizer frequently, but the use of moisturizers decreased when the SMS was not delivered. These findings suggest that reminders via SMS increased the use of moisturizer.

When the frequency of moisturizer usage of the groups was compared in the 8th week of follow-up, the use of moisturizer in the

group receiving SMS was found to have increased. No difference was found in the group that did not receive SMS. Clinical improvement in the group receiving SMS was also better. No difference was found between the patients' topical treatment use, knowledge levels, or other habits. Better clinical improvement in the group receiving SMS may have been explained by the more frequent use of moisturizer in this group. In brief, sending SMS to patients was found to increase the use of moisturizer, which increased treatment success.

In this study, patients receiving SMS adopted other protective measures, except the use of gloves. Most patients who did not use gloves stated that they did not need to use them because they were not performing wet work nor had any contact with irritants. Since the effect of SMS on the use of gloves was evaluated through patients who attended to the dermatology outpatient clinic, the effect could not be shown as intended. This effect should be evaluated in patients within a risk group or in occupational hand eczema patients.

The avoidance of irritant substances and the application of protective measures indicated the compliance of patients with protective behaviours. No standard scale has been developed to measure this compliance. In this study, a protective behaviour score was calculated to evaluate compliance with protective habits. In both groups, the protective behaviour score was statistically significant at the 4th and 8th weeks of follow-up compared to baseline. No statistically significant difference in the mean protective behaviour score was found between the SMS and non-SMS groups. Van der Meer et al evaluated the adaptation to protective behaviours with another scale. The scale was based on performing wet work for less than 2 hours per day, washing hands less than 20 times per day, not using body lotion, not wearing jewellery during work, and using a moisturiser at least 6 times per day. The scores of the patients in the Hands4u programme were higher.<sup>9</sup> Jungbauer et al evaluated the exposure to irritant substances by scoring the frequency of daily handwashing, the wet time of the hands, and the frequency of exposure of the hands to detergent or soap. The use of gloves was not assessed because the gloves could be a good preventive measure, but could also be an irritant factor when used for prolonged periods of time.<sup>20</sup> In the present study, no difference was detected between the groups when the compliance was evaluated with the protective behaviour score. However, when the habits were evaluated one by one, a difference was found between the use of moisturizer; this difference was related to clinical improvement. If the assessment was made with the protective behaviour score alone, the effect of the moisturizer could be overlooked. This result suggested that a standard, valid, and reliable scale is needed to measure protective habits in hand eczema.

#### 4.1 | Strengths and limitations of the study

The strength of our study is the evaluation of text messaging intervention via a holistic approach. In this study, clinical severity of the disease, patients' level of knowledge, treatment compliance, and behavioural changes were examined. Patients with irritant contact dermatitis were included; allergic contact dermatitis patients with the relevant patch test

results were excluded because the study was designed to give standard information and send standard text messages to every patient. In patients with allergic contact dermatitis, personalized information should be provided and contact with the allergen should be avoided. Besides, allergic contact dermatitis may not improve if allergen contact persists, even if irritating behaviours are prevented. This may interfere with the proper assessment of the change in behaviour. It is beyond the scope of this study to assess whether text messaging that contains customized recommendations has an additional benefit.

Evaluation of the clinical severity of hand eczema by HECSI has provided objective and reliable data. Patients had to come to the hospital for data collection. Unfortunately, some patients did not return to follow-up after topical corticosteroid treatment was completed. The limitation of our study was the high loss-to-follow-up rates at 8 weeks. In future studies, it may be reasonable to consider high rates of loss to follow-up.

## 5 | CONCLUSION

According to this study, sending SMS to hand eczema patients decreased the severity of the disease and increased the use of moisturizer and treatment success. Sending SMS to patients with hand eczema may be a cost-effective solution for secondary prevention. According to the results, SMS could be a good strategy to achieve the adherence of hand eczema patients to positive behaviours. Longer follow-up studies may indicate whether this effect can be sustained.

## CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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## **Content Of Text Messages**

1. Avoid contact with detergents and chemicals that may cause hand irritation. Always wear protective gloves before handling.
2. Avoid direct contact of hands with acidic foods such as tomatoes, oranges, lemons.
3. Wash your hands with warm water, not with hot or cold water.
4. Removing the rings while doing wet work or washing your hands protects you from irritants that may be left under the rings.
5. When using your medicine and moisturizer, apply moisturizing cream first. Wait 10-15 minutes and then apply the drug.
6. After washing your hands, dry them with a soft towel and immediately moisten them.
7. Use plenty of moisturizing cream during the day and repeat frequently.
8. Do not keep your hands in water for a long time and do not wash them too often (more than 10 times).
9. Use soap bars that do not contain color or perfume.
10. If you are itching after using cream, use moisturizer in pomade form. Skin reactions are much rarer because pomades contain less preservatives.
11. When itching worsens, you can apply cold, wet dressing. Moisten soft clothes and leave for 5 min. Repeat several times a day.
12. Try not to scratch your itchy skin. Trim your nails once a week. If you can't stop scratching, cover your skin with band-aid or bandage.
13. Apply oily cream or ointment to your hands before sleeping.
14. If your hands are too dry and cracked, oily moisturizers are more suitable. 2-3 times daily application is sufficient. If you prefer to use the cream you need to apply more often.
15. You may not see immediate improvement in the first days, do not worry, continue treatment.
16. Continued use of a moisturizer when your eczema recovers, reduces the possibility of eczema recurrence.
17. Continue treatment, do not give up.
18. Vaseline, which can also be used as a moisturizer, acts as a barrier while moisturizing the hands.
19. Wearing gloves during hair shampooing reduces contact with irritants in the products.
20. Do not use liquid soap and wet wipes. Use a fragrance-free soap bar.
21. Do not stop using your moisturizer when the dryness of your hands recovers and becomes soft again. Continue to apply your moisturizing cream 2-3 times a day.
22. Remember to apply your medicines in the morning and in the evening.
23. Barrier creams protect your hands from irritant substances. Various cosmetic products are available for this purpose.
24. When your hands are crusted, removing the crusts may increase the severity of your eczema, regular moisturizing will help soften your hands.
25. If your hands are too dry and cracked, wearing cotton gloves after applying your moisturizing cream will soften your hands.
26. Moisturizers should be used more often when the air outside is cold and dry.
27. Hand eczema is not contagious. There is no risk of contamination by touching skin or fomites.