

# THE VALIDITY AND RELIABILITY STUDY OF THE TURKISH VERSION OF THE SCALE FOR ASSESSING THE SEVERITY OF UNCOMPLICATED DIAPER DERMATITIS IN INFANTS

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**Received:** 12.04.2022; **Accepted:** 25.05.2023; **Available Online Date:** 30.09.2023

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**Cite this article as:** Keskin E, Akcay-Didisen N. The Validity and Reliability Study of The Turkish Version of The Scale for Assessing The Severity Of Uncomplicated Diaper Dermatitis In Infants. J Basic Clin Health Sci 2023; 7: 21-29.

## ABSTRACT

**Purpose:** The aims of this study was to validate adapt and evaluate a scale for assessing the severity of uncomplicated diaper dermatitis for infants in Turkey.

**Material and Methods:** The scale's items assess severity of erythema and irritation, extent of diaper dermatitis, papules and pustules, and open skin. Analysis was based on a convenience sample of 150 participants in Turkey.

**Results:** The rate of using wet wipes for babies' bottom care was significantly high among the parents, accounting for 90.7 %. The content validity index of the scale was .98. The item-total score correlation values ranged from .725 to .898, and the Cronbach's alpha for the entire scale was .81.

**Conclusion:** As a result of the analyzes and evaluations, the scale is a valid and reliable measurement tool for Turkish society. It may advisable to use the scale in studies of the severity of diaper dermatitis in infants. Strengths and limitations as well as practical applications and implications of the scale for research were discussed.

**Keywords:** Diaper dermatitis, infant, reliability, validity

## INTRODUCTION

Diaper dermatitis is skin disorder with a high incidence among infants (1,2,3). Diaper dermatitis is frequently seen in the diapered area (perianal-perineal-gluteal region, inguinal region, upper thighs or skin folds enclosed by diapers). It is an acute inflammatory skin reaction caused by factors that include dampness, irritation, exposure to urine and feces, bacterial or yeast (fungal) infections and friction (3,4,5,6,7,8). Diaper dermatitis is also called diaper rash, napkin dermatitis and nappy rash (2,9)

The incidence of diaper dermatitis does not vary by race or gender. Up to one-third of infants may exhibit clinical symptoms of diaper dermatitis at some time during their infancy. Studies report that 7-35% of all babies get diaper rash at the age of 9-12 months (3,5,6,9,10,11,12,13). It is less common in infants who are breastfed than those who eat solid foods or drink cow milk (5,14).

The leading cause of diaper dermatitis is prolonged exposure of the skin to urine and feces (6,13). Long-term exposure of the skin to friction, excessive dampness, high pH and high enzymatic activity due

to diapers endangers the epidermal barrier functions (2,4,10). Due to dampness, the epidermal barrier functions deteriorate, causing easier absorption of irritants. In addition, biotin and zinc deficiency, inappropriate skin cleansing products, microorganisms including especially *Candida* species, antibiotics and nutritional factors are other causes of diaper rash (9). If left untreated, it can become chronic, which can cause infants to feel sensitivity, pain and discomfort as well as high levels of parental anxiety (1,9,12,14,15,16,17).

There are two types of diaper dermatitis: complicated and uncomplicated. Dry skin is the initial symptom of uncomplicated diaper dermatitis. Local asymptomatic mild erythema may occur in its initial phase. Erythema, mild maceration, and edema also occur in the early stages (9,18). Mild erythema begins to progress together with the onset of papules affecting the diapered area. Erythema and maceration increase as the lesions begin to spread. Maceration affecting a larger skin surface, and skin rashes causing mild erythema, exudation, ulcer or lesions may occur in later stages. Skin erosions, papules, pustules and open wounds may appear in severe cases (5,9,15). Later, complicated diaper dermatitis occurs. *C. albicans* and bacteria are likely to cause secondary infections (18). This is less than 77% in diaper dermatitis and 4% in healthy babies. *C. albicans* colonization is often observed in diaper dermatitis that lasts longer than 72 hours. Skin rashes with erythema, pustules and papules are inevitable in complicated diaper dermatitis due to *C. albicans*. They cause lesions extending to the folding areas of the skin and even to the extremities of the diapered area, causing red skin rashes and open or bleeding sores. The severity of the infections parallels the severity of diaper dermatitis. Children with oropharyngeal candidiasis are also at risk of candidal diaper dermatitis due to excessive *C. albicans* in their feces (1,5,15,19). Therefore, it is very important to consider the diaper dermatitis of infants who are being monitored or treated in medical environments (1,2,14,15).

Although there is a variety of assessment tools in the literature, all of them are subjective (20). There is no tool used in Turkey to evaluate the severity of uncomplicated diaper dermatitis. The rapid and visual evaluation of uncomplicated diaper dermatitis is very important for pediatric nurses to be able to make decisions and take proper approach and measures as early as possible (6,7)

The scale developed by Buckley in 2016 is used to assess the severity of uncomplicated diaper dermatitis in infants. It has four items: severity of erythema and irritation, extent of diaper dermatitis, papules and pustules, and open skin. It is a free, easy-to-use and systematic scale (21). This study was conducted to examine the validity and reliability of the Turkish version of the scale for assessing the severity of uncomplicated diaper dermatitis in infants.

## MATERIAL AND METHODS

### Aim and type of the study

The aims of this study was to validate adapt and evaluate a scale for assessing the severity of uncomplicated diaper dermatitis for infants in Turkey.

### Research question

1. The Scale for Assessing the Severity of Uncomplicated Diaper Dermatitis in Infants a valid and reliable tool for Turkish society?

### Study Setting

The population of the present study comprised infants under 2 years old who presented to the neonatal polyclinic of a university hospital in Izmir between July 2018 and December 2018 and met the study's inclusion criteria.

### The population and sample of the study

Of the infants, 150 whose parents agreed to participate in the study were included in the sample of the study. In the literature, it is reported that the sample size should be a minimum of five-fold or ideally ten-fold the number of the items in the scale (22,23,24,25). In the present study, it was planned to include 40 infants, which corresponds to the 10 fold the total number of the 4 items of the scale, but then it was decided to include more increase to increase the generalization of the study and the study was conducted with 150 infants (25).

Inclusion criteria;

- 0-24 months babies followed in the neonatal outpatient clinic
- Volunteered to participate in the study

Exclusion criteria;

- Babies with a skin disease involving the diaper area

### Data collection tools

The Infant Information Form and the Scale for Assessing the Severity of Uncomplicated Diaper

**Table 1.** The validity and reliability tests performed in this study

<b>Validity</b>	Language Validity Content Validity
<b>Reliability</b>	Internal Consistency and Item Analysis Internal Consistency and Cronbach's Alpha Reliability Coefficient

Dermatitis in Infant were used to collect the study data.

**The Infant Introductory Information Form**

This form was prepared by the researchers based on the literature (14,20,21) and consists of 10 questions about gender, birth weight, birth height, gestational age, cause of hospitalization, infection, antibiotic use, type of nutrition, and methods of urinary and fecal cleansing. In Table 2, these data are indicated by numbers and percentages.

**The Scale for Assessing the Severity of Uncomplicated Diaper Dermatitis in Infants**

The scale was developed by Buckley et al. (2016) is used to assess how severe uncomplicated diaper dermatitis in infants. It has four items; severity of erythema and irritation, extend of diaper dermatitis, papules and pustules and open skin. The minimum and maximum possible scores to be obtained from the scale were 0 and 6 respectively. While the score for the item severity of erythema and irritation ranges from 0 to 3, it ranges from 0 to 1 for all the other items. Lower scale scores indicate less severe diaper dermatitis, and higher scores indicate more severe diaper dermatitis. The Cronbach's alpha was 0.702 in the original study (21).

The sample form for evaluating the scale is given in Figure 1. Item scoring scores are located on the right of each picture. (21).

**A. Severity of erythema and irritation**

The severity of erythema is assessed using guidelines. Colors are not used in most descriptions of the severity of erythema because the skin tones of infants can vary greatly. However, bright red areas indicate severe erythema regardless of skin tone.

**B. Extent of diaper dermatitis**

The severity of diaper dermatitis is determined by

using a scale score for erythema, papules or pustules, or open skin in the affected area. This is calculated using the scale and visual estimates of the general area ratios of the figures. This is done using Figure 1A for rashes in the perianal-perineal-gluteal region, and Figure 1B for the wider diapered area (the perianal-perineal-gluteal regions, inguinal area, upper thighs or skin folds enclosed by diapers). Instead of direct measurement, this approach was adopted for a number of reasons. It is important to evaluate each item separately to assess the severity of diaper dermatitis. The scale can be used to assess severity easily and quickly with no need for direct measurements.

Severity scores for incontinence-associated dermatitis in adults are assigned according to the size of directly measured areas, but this approach is considered inappropriate for assessing infants because their size varies widely by postnatal week, making direct measurement an inaccurate approach. For example, an area of 25 cm<sup>2</sup> might be considered extensive in a 1.5 kg preterm infant, but it would be considered less so in at one year old. Therefore, Figure 1 is quite important for assessing the extent of diaper dermatitis (21). Figure 1 is an example form for calculating total severity scores, and item scores are located to the right of each picture (21).

**C. Papules and pustules**

This item enables the researcher to determine whether the number of papules or pustules is many or only a few or none.

**D. Open skin**

This item receives a score of 0 for superficial open skin and a score of 1 for skin openings caused by friction, injuries and diaper dermatitis.

This scale was designed to assess the severity of uncomplicated diaper dermatitis in infants. Irritation, abrasions, open skin or other wounds judged to result from friction as a result of vigorous cleaning, acid burns or other causes should not be taken into consideration in the assessment of diaper dermatitis severity.

**Data collection method**

The purpose of the study was explained to the parents. Their written informed consent indicating that they allowed their children to participate in the study was obtained. The study data related to the infants

**Table 2.** Sociodemographic data of the babies participating in the research (n=150)

<b>Sociodemographic Data of Infants</b>	<b>n</b>	<b>%</b>
<b>Sex</b>		
Famela	76	50.7
Male	74	49.3
<b>Birth weight (gram)</b>		
Extreme low birth weight (<1000 gr)	5	3.3
Very low birth weight (1000-1500 gr)	16	10.7
Modarely low birth weight (1500-2500 gr)	19	12.7
Normal birth weight (2500-4000 gr)	90	60.0
Advence birth weight (>4000 gr)	20	13.3
<b>Gestation age (week)</b>		
<38 week (preterm)	70	46.7
38-42 week (term)	76	50.7
>42 week (postterm)	4	2.7
<b>Antibiotic treatments</b>		
Yes	81	54.0
No	69	46.0
<b>Nutrition form</b>		
Breastfed	66	44.0
Formula	48	32.0
Supplement food	2	1.3
Breastfed + Formula	32	21.3
Breastfed + Supplement food	2	1.3
<b>Diaper changes (on day)</b>		
3-4/day	8	5.3
5-7/day	71	47.3
8-10/day	71	47.3
<b>Urine cleaning</b>		
With water and cotton	12	8.0
With water and soap	2	1.3
Using wet wipes	136	90.7
<b>Stool cleaning</b>		
With water and cotton	12	8.0
With water and soap	2	1.3
Using wet wipes	136	90.7
<b>Total</b>	<b>150</b>	<b>100.0</b>

included in the study sample were collected in the polyclinic examination rooms.

#### Data analysis

The SPSS 25.0 was used to analyze the study data. P-values < 0.05 were considered statistically

significant. The internal consistency of the scale was determined using the Cronbach's alpha, and the effect of each item on total scores were determined by checking the item-total score correlation coefficients.

**Table 3.** Item-total score correlations of the scale for assessing the severity of uncomplicated diaper dermatitis in infants

<b>The Scale for Assessing the Severity of Uncomplicated Diaper Dermatitis in Infants</b>	<b>r</b>	<b>p</b>
<b>Item 1.</b> Severity of erythema and irritation	0.898	0.000*
<b>Item 2.</b> Extent of diaper dermatitis	0.767	0.000*
<b>Item 3.</b> Papules and pustules	0.859	0.000*
<b>Item 4.</b> Open skin	0.725	0.000*

(\* $p < .001$ )

### Ethical aspects of the study

Before starting the study, Buckley's permission to adapt the scale into Turkish was obtained by e-mail. Then, necessary written approval and permission of the ethics committee (Date: 18.05.2018, No: 20.478.486) and the institution (number: 181205) where the study was conducted were obtained. The aim of the study was explained to the parents of infants who were included in the study, and their verbal and written informed consent was obtained.

The scale is a measurement tool developed with the aim of digitizing the cognitive, affective, behavioral, educational, reactive, judgmental and mood characteristics of the units, which are known, felt but not observed. With scales, abstract data can be converted into concrete data by giving numerical values. Two essential features of a good measurement tool are validity and reliability. The validity and reliability tests performed in this study are given in the table 1.

### RESULTS

In this study, 50.7% of the infants were female, and 49.3% were male. Of them, 60% had normal birth weights, and 50.7% were born in the normal gestation week. Of them, 54% were receiving antibiotic treatments, 44% were only breastfed and 53.3% were being fed with formula. The frequency of daily diaper changes was 3-4 times for 3.5% of the infants, 5-7 times for 7.3%, and 8-10 times for 47.3%. The rate of using wet wipes for babies' bottom care was significantly high among the parents, accounting for 90.7% (Table 2).

### Validity of The Scale for Assessing the Severity of Uncomplicated Diaper Dermatitis in Infants Language Validity

Two faculty members who are experts in the field and one English linguist separately translated the scale into Turkish and reached a consensus on the scale items by working together. The scale was translated back into English by two English linguists. The researchers and the translators re-examined together the original scale and the scales obtained using back translation. They agreed on the translation of each item and finalized the Turkish version of the scale. They agreed on the items in the scale.

### Content Validity

The researchers consulted experts to validate the scale's content and scope. For this purpose, the Turkish version of the scale was shared with 10 faculty members who are experts in the field. After obtaining their evaluations, the scale was revised with a few corrections. Then, the content validity index was used to evaluate the experts' opinions about the scale's content validity (26). The experts were asked to evaluate the items according to their suitability, using the following scoring: 1=not suitable, 2=slightly suitable (but needs to be expressed better), 3=suitable (but needs minor corrections), and 4=very suitable. The content validity index ranged between 0.90 and 1.00 for the scale items and was 0.98 for the entire scale. After the language and content validity of the scale was obtained, a pilot study was conducted using 10 babies to test the clarity of the scale items. Those who participated in the pilot study were not included in the study. The pilot study data indicated that the Turkish version of the scale was applicable.

### Internal Consistency and Item Analysis

The item-total score correlations ranged between  $r = 0.725$  and  $0.898$ , and a positive and statistically highly significant relationship was found between them ( $p <$

**Total severity score = 0**



Item scores:  
Erythema = 0  
Area = 0  
Papules/pustules = 0  
Open skin = 0



Item scores:  
Erythema = 0  
Area = 0  
Papules/pustules = 0  
Open skin = 0

**Total severity score = 1**



Item scores:  
Erythema = 1  
Area = 0  
Papules/pustules = 0  
Open skin = 0



Item scores:  
Erythema = 1  
Area = 0  
Papules/pustules = 0  
Open skin = 0

**Total severity score = 2**



Item scores:  
Erythema = 1  
Area = 0  
Papules/pustules = 0  
Open skin = 1

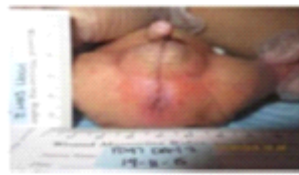


Item scores:  
Erythema = 2  
Area = 0  
Papules/pustules = 0  
Open skin = 0

**Total severity score = 3**

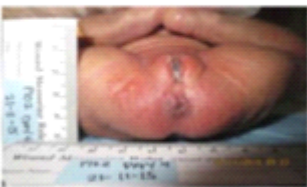


Item scores:  
Erythema = 2  
Area = 1  
Papules/pustules = 0  
Open skin = 0



Item scores:  
Erythema = 2  
Area = 0  
Papules/pustules = 1  
Open skin = 0

**Total severity score = 4**



Item scores:  
Erythema = 2  
Area = 1  
Papules/pustules = 1  
Open skin = 0



Item scores:  
Erythema = 2  
Area = 0  
Papules/pustules = 1  
Open skin = 1

**Total severity score = 5**



Item scores:  
Erythema = 2  
Area = 1  
Papules/pustules = 1  
Open skin = 1



Item scores:  
Erythema = 3  
Area = 1  
Papules/pustules = 0  
Open skin = 1

**Total severity score = 6**



Item scores:  
Erythema = 3  
Area = 1  
Papules/pustules = 1  
Open skin = 1



Item scores:  
Erythema = 3  
Area = 1  
Papules/pustules = 1  
Open skin = 1

Figure 1. Visual Evaluation of the Scale (Buckley ve ark.,2016)

**Table 4.** Internal consistency and item analysis of the scale for assessing the severity of uncomplicated diaper dermatitis in infants

The Scale for Assessing the Severity of Uncomplicated Diaper Dermatitis in Infants	Number of Questions	Min and Max Scores	X ± SD	Cronbach's Alpha Coefficient
All Items	10	0-6	2.76 ± 1.92	0.81
Severity of erythema and irritation	4	0-3	1.70 ± 0.82	0.73
Extent of diaper dermatitis	2	0-1	0.20 ± 0.40	0.80
Papules and pustules	2	0-1	0.34 ± 0.47	0.78
Open skin	2	0-1	0.52 ± 0.67	0.78

scale items was high and enough to measure the same variable. Item 4 (open skin) had the lowest item-total score correlation (0.725), whereas item 1 (severity of erythema and irritation) had the highest item-total score correlation (0.898).

**Internal Consistency and Cronbach's Alpha Reliability Coefficient**

The analysis performed to test the internal consistency of the scale found that the Cronbach's alpha reliability coefficient was 0.81 for the entire scale and ranged between 0.73 and 0.80 for its items (Table 4).

**DISCUSSION**

150 infants were included in the validity and reliability study of the Scale for Assessing the Severity of Uncomplicated Diaper Dermatitis in Infants. 50.7% of babies were girls, 49.3% were boys, and 60% were born at normal birth weight and 50.7% at normal gestational weeks. It was found that the diaper dermatitis severity scores of the babies included in the sample did not differ according to the gender of the babies. The number of infants receiving antibiotic therapy is relatively higher than the others. In perineal cleaning, wet wipes are used most frequently with a rate of 90.7%. (Table 2).

Validity and reliability are the basic characteristics of a standardized scale. Validity is the ability of a scale to measure the variable, property or condition that is

intended to be measured. There are a number of criteria for testing validity (24,25). In this study, the language, content, and construct validities of the scale were examined.

The content validity index was used in the evaluation of the opinions of the experts, and it was determined that the content validity index on item basis varied between 0.90-1.00, and the content validity index on scale basis was 0.98. Content validity index is expected to be above 0.80 on both item and scale basis in publications (25). In our study, the items were left in their original form because the fit index of expert opinions was above 0.80 in all items. The expert opinions suggested that the Turkish version of the scale for assessing the severity of uncomplicated diaper dermatitis in infants is an appropriate measurement tool in terms of language and scope. Other criteria used in the reliability analysis are item-total correlation, scale means with an item deleted and reliability coefficients with an item deleted. Correlation analysis is used to test the linear relationship between two variables and to measure the degree of this relationship, if any. A positive and high correlation indicates that the items exemplify similar behaviors and have high internal consistency. Overall, the correlation is expected to be 0.30 or higher (27).

Another criterion of the reliability of a scale is internal consistency. The Cronbach's alpha reliability coefficient is preferred for evaluating internal

consistency. It is used to determine whether the scale items describe a whole with a homogeneous structure. The alpha coefficient is the mean weighted standard deviation. It is calculated by dividing the total variance of the scale items by the overall variance of the scale (27). The Cronbach's alpha coefficient shows the similarity or proximity of scale items when the total scale score is calculated by adding the scores for each item, and it ranges from 0 to 1 (28,29). However, if there is a negative correlation between the scale items, the alpha coefficient becomes negative, and the reliability model is invalidated (27). In this study, the Cronbach's alpha coefficient was 0.81 for the scale and ranged between 0.73 and 0.80 for the scale items. These high internal consistency coefficients indicate that the scale has adequate homogeneity.

## CONCLUSION

The Scale for Assessing the Severity of Uncomplicated Diaper Dermatitis in Infants is a valid and reliable scale that can be used to assess the severity of diaper dermatitis. Other scales of diaper dermatitis are limited to evaluating the severity of diaper dermatitis in all checkups and forms of baby care. This scale, which consisted of 10 questions and four items and has been adopted to Turkish culture, has strong psychometric features and significantly high internal consistency. It can be easily used to assess the severity of diaper dermatitis in infants. It may be advisable to use the scale to assess the severity of uncomplicated diaper dermatitis in infancy.

**Acknowledgement:** Acknowledgements: We would like to express our thanks to all relatives of individuals with infant who participated in the study.

**Author contribution:** The project was constructed by N.A.D., E.K., designed, N.A.D., E.K., performed experiments and analyzed the data, E.K., N.A.D. were responsible for data collection and processing, E.K., N.A.D. wrote the manuscript, and N.A.D., E.K. edited the manuscript.

**Conflict of interests:** No conflict of interest has been declared by the authors.

**Ethical approval:** Before starting the study, Buckley's permission to adapt the scale into Turkish was obtained by e-mail. Then, necessary written approval and permission of the ethics committee (Date: 18.05.2018, No: 20.478.486) and the institution (number: 181205) where the study was conducted were obtained. The aim of the study was explained to the parents of infants who were included in the study, and their verbal and written informed consent was obtained.

**Funding:** The authors received no financial support for the research.

**Peer-review:** Externally peer-reviewed.

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