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New approaches to ending skin problems in persons with fecal incontinence: a systematic review

Dilek Aygin[1], Hilal Kaynak Aydoğmuş[2], Cansu Kubilay[2], Büşra Ecem Kumru[2]

[1] Department of Surgical Nursing, Faculty of Health Sciences, Sakarya University, Sakarya, Türkiye; [2] Institute of Health Sciences, Sakarya University, Sakarya, Türkiye

Objective. To conduct a systematic review of the current literature on products used in preventing and managing skin problems in individuals diagnosed with fecal incontinence.
Methods. The Medline Complete, Cochrane Library, Ovid, Google Scholar, PubMed, Scopus, Science Direct and Taylor & Francis databases along with Ethos, Open Dissertation and Openthesis databases were used to scan the literature. The methodology for the study was structured in the PICOS format and according to the PRISMA checklist.
Results. This systematic review included a total of 10 articles published between 2012 and 2022 that met the predefined inclusion criteria for Randomized Controlled Trials (RCTs), Quasi-Experimental Studies (QES), and Interventional Studies. Absorbent products were chosen to prevent and manage the skin problems of most of the patients. In addition to absorbent products, creams, barrier films, barrier cloths, barrier sprays, incontinence briefs containing a spiral-shaped fiber moistened with an alkaline solution, silicone-bordered foam dressings and one-piece drainable fecal pouches were used.
Conclusions. The investigations showed that over-hydration of the epidermis can be controlled with absorbent products, which are also effective in preventing and managing incontinence-associated dermatitis (IAD). The use of new absorbent products or increasing awareness of frequent pad changes may have a positive impact. Additionally, cleansing agents, barrier creams, films, cloths, sprays, incontinence briefs with spiral-shaped fiber moistened with alkaline solution, silicone-bordered foam dressings, and one-piece drainable fecal pouches were found to be effective.

Key words: fecal incontinence, feces, dermatitis, skin abnormalities, skin care

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Correspondence
Hilal Kaynak Aydoğmuş
E-mail: hilal.kaynak@ogr.sakarya.edu.tr

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INTRODUCTION

Fecal incontinence refers to the inability of the anal sphincters to control the expulsion of gas and feces, characterized by the involuntary passage of stool. This condition can occur in individuals of all age groups due to nerve damage, spinal injuries, trauma, wounds or cerebrovascular events [1]. Involuntary passage of stool two or more times in the last month at inappropriate times and places is a significant problem for aging individuals

and one that leads to social issues and high costs [2]. Fecal incontinence affects 23.2%-36.6% of rest home residents [3] and constitutes a common aging-related health problem that is the cause of various adverse skin issues – from skin irritations to dermatitis and from infections to skin ulcers [4]. The condition significantly reduces and complicates the healing potential of the skin, representing a high-cost risk that can also lead to possible health hazards [4,5].

Incontinence can increase symptoms of depression and anxiety in individuals and cause a decline in the quality of life. Persons with incontinence can develop many psychological issues such as agitation, anxiety, depression and loss of self-esteem [6]. Fecal incontinence can lead not only to psychological problems but also to physical symptoms such as impaired skin integrity. Incontinence-related skin problems may cause discomfort, significant pain, burning, tingling and itching and increase the risk of cutaneous infection. The most common skin infection is candidiasis [7]. Patients with this condition may become physically unrecognizable and socially isolated due to the bad odors emitted from the site of the infection [6,8].

In particular, bedridden patients with fecal incontinence are at high risk for skin injuries [5,9]. When fecal incontinence is manifested in the form of watery feces, the condition can progress to various degrees of injury, from superficial skin irritations to serious skin issues [10]. Despite the various barrier creams, absorbent incontinence products/cloths, dressings, pads, barrier films, incontinence briefs, fecal collectors and other preventive strategies used, the prevalence and incidence of fecal incontinence-related skin problems remain high [11]. The prevalence of incontinence-associated dermatitis (IAD) has been reported to be between 5.2-21.3% among residents of rest homes, varying around 7.6% among patients under acute care [11]. The incidence of IAD is 5.5% among those living in rest homes, and between 17-23.9% among inpatients in intensive care units. Developing effective and protective methods of caring and managing IAD is of vital importance [13,14].

It is known that prolonged contact with irritants such as feces increases skin hydration and forms a foundation for skin ailments. It has been shown that persons with incontinence-associated skin issues exhibit a higher degree of skin hydration than those without such problems [15]. This leads to skin irritations, dermatitis, skin inflammations, skin ulcers and other ailments. Fecal incontinence-associated skin problems manifests as a serious and complex time-consuming and costly condition that lowers quality of life [11,16].

Preventing and managing fecal incontinence-associated skin problems should encompass all patients who live with the condition. The management of fecal incontinence begins with the management of fluids during patient care and treatment and the use of other noninvasive behavioral methods that include nutritional and bowel training techniques. The condition may present problems for individuals with functional or passive incontinence who have difficulty controlling their bowel movements. Products such as absorbent incontinence cloths, pads, adult briefs or diapers are useful in protecting the skin from exposure to the consequences of incontinence [17]. These products limit the time of the skin's exposure to incontinence, preventing overhydration and contributing to healing or preventing the worsening of skin issues [14,15,18].

Failure to regularly change fecal incontinence products, neglecting skin hygiene, disregarding the benefits of moisturizing and protective creams, neglecting to use anti-dermatitis creams, absorbent products, barrier films or foam dressings, leaving the skin exposed to fecal irritants and changes in the skin microclimate are factors that increase the probability of developing skin issues [19]. Studies that have examined the effect of products used in the prevention and management of skin problems in aging individuals have demonstrated that such products can affect the skin microclimate and change skin surface pH, notably damaging the skin's barrier function [7,20]. Older adults with incontinence therefore need products that will help to prevent and manage skin problems.

Our study is a systematic review of research that has explored the effectiveness of products used in the prevention and management of skin problems in individuals diagnosed with fecal incontinence.

METHODS

This systematic review is based on the PICOS format, such that P (Population): Adults with a diagnosis of fecal incontinence; I (Intervention): Products used in the prevention and management of skin problems (anti-dermatitis creams, pads, fecal collectors, barrier films); C (Comparator(s)): The use of products not aimed at the prevention or management of fecal incontinence; O (Outcome(s)): Developing or preventing the incidence of incontinence-associated dermatitis (IAD) incidence; S (Study Design): Randomized Controlled Trials (RCT's), quasi-experimental studies and interventional studies.

This literature review was carried out in the Medline Complete, Cochrane Library, Ovid, Google Scholar, PubMed, Scopus, Science Direct, Taylor & Francis and the Ethos, Open Dissertation and Openthesis databases. The scan was executed with Turkish and English keywords. Medical Subject Headings (MeSH) was used to determine English keywords and the Turkish Science Terms Dictionary [Türkçe Bilim Terimleri Sözlüğü

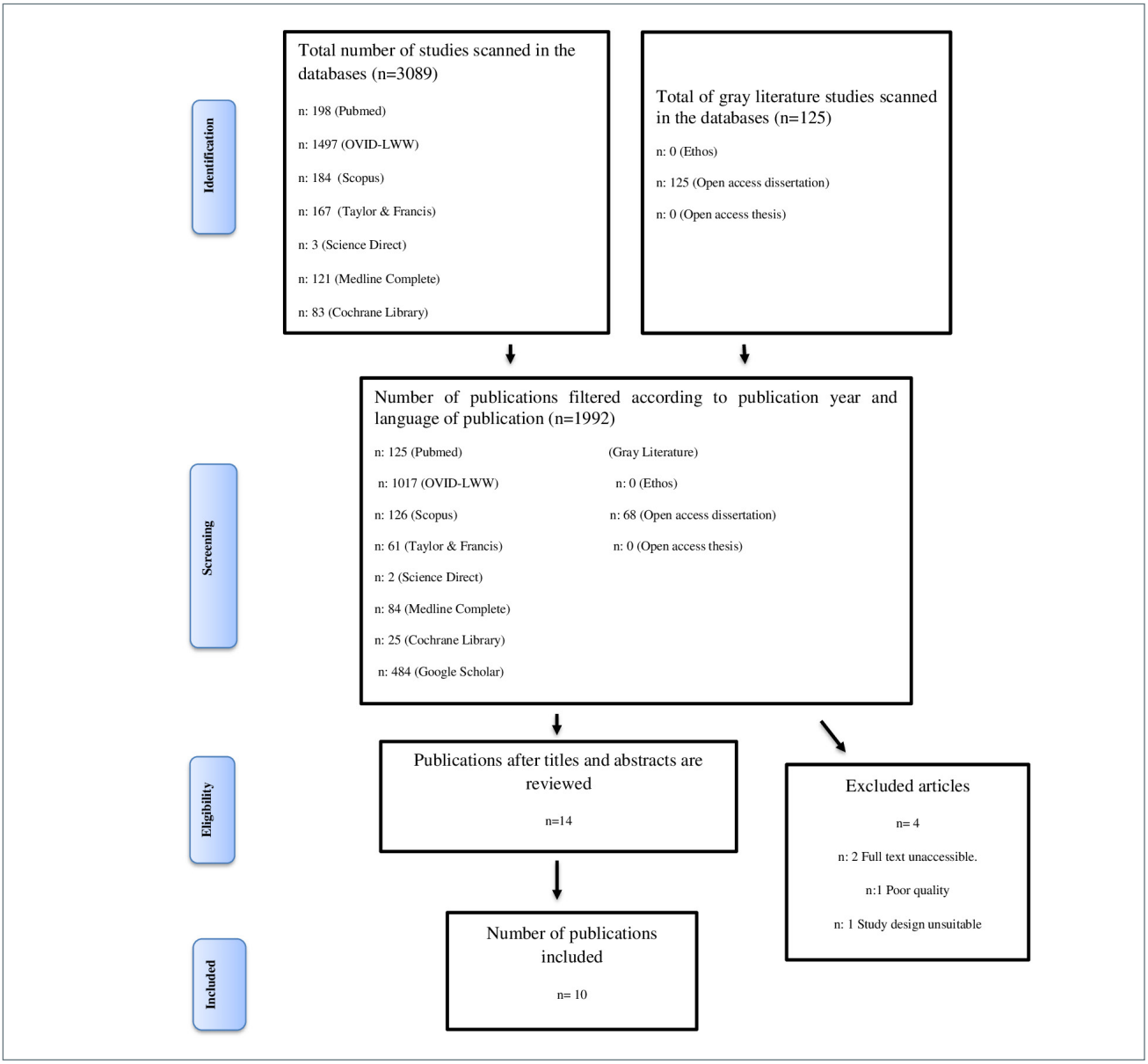

Figure 1. PRISMA chart of literature scan. This flowchart summarizes the screening process of studies for inclusion, showing the number of records identified, filtered, excluded, and finally included (n = 10) based on PRISMA guidelines.

(TBT)] for determining Turkish keywords. The keywords used to search for keywords regarding patients with fecal incontinence were "Fecal incontinence", "feces", "dermatitis", "irritants", "skin abnormalities", and "skin care". Keyword combinations were searched for in the form of ("Fecal incontinence" OR "Bowel incontinence") AND (dermatitis OR irritants OR "incontinence associated dermatitis") AND care. The search was carried out between January-July 2022, with the final search taking place on July 3, 2022. The flow chart for the scan of the literature can be seen in Figure 1. This systematic review was conducted and reported in accordance with the PRISMA 2020 guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), and the PRISMA checklist was used to ensure transparent and comprehensive reporting (Fig. 2) [21].

The study protocol was certified in PROSPERO (ID: CRD42022347187)

DETERMINING THE TIME FRAME OF THE LITERATURE REVIEW

The literature review was limited to the years 2012-2022

Section and Topic	Item	Checklist Item	Location in Manuscript
TITLE	1	Identify the report as a systematic review.	Title page
ABSTRACT	2	Provide a structured summary.	Abstract
INTRODUCTION	3	Describe the rationale for the review.	Introduction
INTRODUCTION	4	Provide an explicit statement of the objectives.	Introduction
METHODS	5	Specify inclusion and exclusion criteria.	Table I & Methods
METHODS	6	Describe all information sources.	Methods
METHODS	7	Present full search strategies.	Methods
METHODS	8	Specify selection process.	Methods
METHODS	9	Specify data collection process.	Methods
METHODS	10	List and define all variables.	Methods
METHODS	11	Specify methods used to assess risk of bias.	Bias Risk in Individual Studies
METHODS	12	Specify effect measures.	Methods
METHODS	13	Describe methods for synthesis.	Methods
RESULTS	14	Give numbers of studies screened and included.	Figure 1
RESULTS	15	Describe characteristics of included studies.	Table II
RESULTS	16	Present assessments of risk of bias.	Table III–V
RESULTS	17	Present results of individual studies.	Results
RESULTS	18	Present results of syntheses.	Results
DISCUSSION	23	Summarize main findings and strength of evidence.	Discussion
DISCUSSION	24	Discuss limitations of the evidence and review.	Discussion
OTHER INFORMATION	27	Report availability of data and materials.	End of manuscript

Figure 2 PRISMA 2020 checklist. This checklist documents that the review was conducted and reported in accordance with the PRISMA 2020 guidelines. Each item is matched with the corresponding section of the manuscript.

in order to reflect current practices for skin problems associated with faecal incontinence. This period represents a time when clinical guidelines related to the topic were updated, significant developments occurred in care approaches, and methodologically robust studies were published. Therefore, the selected time frame aims to increase the validity and clinical relevance of the review.

Participants

Studies with individuals with fecal incontinence were accepted into the study. Because of the differences between infant and adult/older adult skin functions, studies on diaper-related infantile dermatitis were not included and the focus of the study was instead on only those articles dealing with participants of ages 18 and over who were impacted with fecal incontinence-associated skin problems. The study sample comprised samples from studies conducted in hospitals, long-term care facilities, nursing homes and other clinical settings. Outside of fecal incontinence-associated skin problems, interventional studies conducted with patients with wounds or pressure ulcers were not included since these types of injuries have different pathophysiologies and treatment options.

Table I. Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
•Individuals with fecal incontinence •Persons age 18 and over •English or Turkish publications •Published between 2012-2022 •Access to full text •Randomized Controlled Trials (RCTs), Quasi-experimental trials/ Nonrandomized Experimental Trials (QETs) and interventional studies	•Individuals with no fecal incontinence •Wounds unrelated to incontinence •Interventional studies of individuals with pressure ulcers •Qualitative studies •Systematic reviews, meta-analyses •Gray literature •Presentations •Study protocols •Studies whose full texts could not be accessed •Articles not published either in English or Turkish •Studies of poor quality

Table II. Quality assessment scores of independent evaluators.

Authors/year/country	Methodological quality assessment evaluator 1	Methodological quality assessment evaluator 2	Final decision of evaluators
Glass et al. (2021) Singapore	10/13	13/13	11/13
Coyer et al. (2020) Australia	9/13	11/13	10/13
Kon et al. (2017) Japan	8/13	11/13	9/13
Francis et al. (2017) U.S.	7/13	9/13	8/13
Shin et al. (2012) Korea	7/13	7/13	7/13
Bliss et al. (2017) U.S.	6/9	9/9	7/9
Brunner et al. (2012)/ U.S.	7/9	8/9	8/9
Kyung Hee Park (2014) South Kore	7/9	8/9	7/9
Zhou X et al. (2017)	6/9	6/9	6/9
Bakarat et al. (2018) Australia	5/9	7/9	6/9

U.S.: United States, Korea: Republic of Korea, Final Decision of Evaluators: Average of scores given by two evaluators, Scoring Format: X/13 or X/9 indicates the number of criteria met out of 13 or 9 total items assessed, depending on the evaluation tool used.

Types of interventions

Studies that explored the effectiveness of products used in the prevention and management of incontinence-associated dermatitis (IAD) (anti-dermatitis creams, fecal collectors, pads, barrier films) were considered. In this context, studies on preventing or managing IAD and protecting and improving the quality of the skin were regarded as appropriate for inclusion in this systematic review. On the other hand, studies on devices used in the prevention of fecal incontinence were excluded from the review.

Bias risk in individual studies

All of the texts of the studies included in the review were independently and methodologically reviewed by two researchers (Fig. 1). The Joanna Briggs Institute Critical Appraisal Tools for Use in JBI Systematic Reviews: The Checklist for Randomized Controlled Trials and the Checklist for Quasi-Experimental Studies were used to assess the quality of the studies included in this systematic review. The selection criteria were rated on the basis of Yes (1 point), No (0 points), Unclear (0 points) and Not applicable (0 points) [21]. Total quality scores are shown in Tables II, III and IV. The assessments made by the authors independently of each other were compared and a consensus was reached whenever there were differences of opinion.

RESULTS

Key words were used in the first part of the literature scan. A total of ten electronic databases were searched for English and Turkish publications published in 2012-2022, three of which were identified as gray literature. The number of publications found in the scan of the databases was 3089 + 125 (gray literature). After filtering according to language and year of publication, the total number of studies was 1992. These studies were reviewed according to their titles and abstracts and 14 full texts with suitable study designs were systematically organized using the Mendeley reference management program. The number of cases studied in the randomized controlled trials (RCTs) and interventional research was limited (Tab. II). After a quality analysis, 10 studies on the

Table III. Methodological review of randomized controlled trials.

	Glass et al. (2021)	Coyer et al. (2020)	Kon et al. (2017)	Francis et al. (2017)	Shin et al. (2012)
1. Was real randomization carried out in the appointment/removal of the participants to/from the treatment groups?	√	√	√	√	√
2. Was the assignments to the treatment groups kept secret?	√	√	×	?	?
3. Were the treatment groups similar in the beginning?	√	√	√	√	√
4. Were the participants blinded when being appointed to/included in the treatment group?	?	√	?	?	?
5. Were the treatment providers blinded to being appointed to the treatment group?	?	?	×	×	×
6. Were the evaluators blinded to the groups/ treatment groups?	√	?	?	?	?
7. Were the treatment groups handled the same outside of the intervention?	√	√	√	√	√
8. Was the follow-up completed? If not, were the differences between the groups sufficiently defined and analyzed?	√	√	√	√	√
9. Were the participants analyzed in the groups they were randomized to?	√	√	√	√	√
10. Were the results measured in the same way in the treatment groups?	√	√	√	√	?
11. Were the results reliably measured?	√	×	?	?	?
12. Were the appropriate statistical analyses used?	?	?	√	?	√
13. Is the study design appropriate, is there any deviation in terms of the conduct of the study or from the standard RCT design (individual randomization, parallel groups)?	√	√	√	√	√
Total evaluation	10	9	8	7	7

Symbols: √: Yes (Criterion met), ×: No (Criterion not met), ?: Unclear or not specified in the study
RCT: randomized controlled trial

incidence of skin problems, their severity and healing and the parameters of the physiological functions of the skin were included in the systematic review (Fig. 1). Additionally, five of these studies were randomized controlled studies, one was experimental research, and four were quasi-experimental studies. The total number of cases in the 10 articles amounted to 1148. The various characteristics of the studies can be found in Table V.

Justification for Time Frame Limitation

Limiting the search to the past ten years (2012-2022) was intentional and based on the aim to include the most up-to-date and clinically relevant research. Advances in clinical practices, diagnostic techniques, and skin care technologies have significantly evolved over the past decade. Therefore, focusing on recent literature ensures that the findings reflect current standards and practices. Including older studies could have introduced outdated methodologies or interventions that are no longer in use, potentially skewing the relevance and applicability of the review.

General characteristics of the randomized controlled trials

The randomized controlled studies were published in 2012, 2017, 2020 and 2021 in Singapore, Australia, Japan, the U.S. and Korea. The numbers of participants in the studies were between 20-462 individuals; 635 cases had been reported on. The monitoring and treatment periods in the studies were between 4-14 days. In two of the studies, the participants comprised those in the intensive care units, a medical center, a nursing home and others in medical surgery units. There were no studies with individuals in the home care setting

Table IV. Methodological review of experimental and quasi-experimental studies.

	Bliss et al. (2017)	Brunner et al. (2012)	Kyung Hee Park (2014)	Zhou et al. (2017)	Bakarat et al. (2018)
1. Are the "causes" and "effects" clear in the study? (That is, there should be no confusion about which variable is prioritized)	√	√	√	√	√
2. Were the participants compared in the groups similar?	√	√	√	√	√
3. Were participants who were receiving similar treatment/care for reasons outside of exposure or intervention included in the comparison groups?	×	√	×	?	×
4. Was there a control group?	√	×	√	√	√
5. Were there results for repeated measurements before and after the intervention or exposure (pretest and posttest)?	√	√	√	√	?
6. Were the follow-ups complete? If not, were the differences between the groups sufficiently defined and analyzed?	√	√	√	√	√
7. Were the results measured in the same way in the compared groups?	√	√	√	√	√
8. Were the results reliably measured?	?	?	?	?	?
9. Were the appropriate statistical analyses used?	?	√	√	?	?
Total evaluation	6	7	7	6	5

Symbols: √: Yes (Criterion met), ×: No (Criterion not met), ?: Unclear or not reported

(Tab. II). Individuals who had skin problems related to fecal incontinence were included. In most of the studies reviewed, the effect of typically used absorbent products, dermatitis-preventive creams and barrier films on maintaining skin integrity was the focus of interest.

In the study by Glass et al. (2021), two different skin cleansing and protective regimes were compared in terms of the extent to which each caused skin healing in cases of incontinence-associated dermatitis and how each prevented further deterioration of the skin. The authors found no significant difference between using 3M Cavilon No-rinse Skin Cleanser and Conveen Easi Cleanse but both treatments were observed to increase the chance of improving IAD by an average of 1.5 times within seven days compared to the controls [23]. Cover et al. (2020) found in their study that cyanoacrylate-based waterproof skin protectant that forms a long-lasting barrier film on the skin reduced the incidence of IAD by one-third [24]. Another study revealed that the use of 3M Cavilon Skin Barrier Cream containing acrylate terpolymer in addition to standard care (using a moist towel at each pad change, a moisturizer once a day and applying protective skin cleanser) showed on the 14th day that moisturizing and protective barrier films reduced inflammation, improved hydration of the stratum corneum and lowered cutaneous pH, thereby indicating that this technique could be effective in the treatment of mild IAD [25].

In the study conducted by Francis et al. (2017), the authors assessed the effectiveness of super-absorbent single-use waterproof underpads that prevent moisture and allow the skin to breathe and of reusable absorbent underpads in preventing incontinence associated dermatitis (IAD). The results of the study indicated no significant difference between groups of IAD cases but revealed that stays at the hospital had been shortened[5]. Another study of single-use underpads showed that when chemical fibers were added, in comparison to two-ply uncoated paper layers made of thermomechanical pulp fiber, the single-use pads kept the skin more moist and resulted in a higher level of transepidermal fluid loss. The uncoated paper application was found to help prevent extreme moisture in the skin, keep the area of the sacrum dry in bedridden patients, showing that it would be effective in preventing the development of IAD. It was also reported in the same study that nurses were advised to use uncoated paper to keep moisture under control in the routine care of their patients [26].

General features of experimental and quasi-experimental studies

This review includes an experimental study conducted in the U.S. in 2017 and quasi-experimental studies carried out in the U.S., South Korea, China and Australia in 2012, 2021, 2017 and 2018, respectively. The number of participants in these studies varied between 26-259

Table V. Features of studies on the effectiveness of products used in the prevention and management of skin problems in adults with a diagnosis

Author(s)-year & country	Type of study	Aim of study	Measures used	Sample size and characteristics	
Glass et al. 2021/ Singapore	RCT	Comparative evaluation of two different skin cleansing and protection regimes on improving and preventing further skin deterioration in incontinence-associated dermatitis	Braden Scale Bristol Stool Scale GLOBIAD Scale	n:84 1. Treatment group: 23 2. Treatment group: 37 Controls: 24 Mostly Chinese individuals, average age in each group 75 and over, BMI within normal range (13.3-14.2 kg/ m^2)	
Coyer et al. 2020/Australia	RCT	Testing durable cyanoacrylate skin protectant barrier film and assessing its applicability in preventing incontinence-associated dermatitis in critical patients	Skin Zone Assessment Tool Bristol Stool Scale	n: 36 Intervention Group: 18 Controls: 18 Ages 59 ± 13.9 50% obese, 67% male and 36% smokers. Stay in intensive care at least 5 days. Age 18 and over	
Kon et al. 2017/ Japan	RCT	Assessing the healing effect of a moisturizing and protectant skin barrier cream in dealing with the severity of incontinence-associated dermatitis	Bristol Stool Scale	n: 33 Intervention: 18 Control: 15 Average age above 80	
Francis et al. 2017/U.S.	RCT	Assessing whether single-use and reusable absorbent underpads can make a difference in the development of incontinent-associated dermatitis and hospital-related pressure wounds in adults	Braden Scale Moisture subscale	n: 462 Intervention: 210 Controls: 252 Significantly more women in the intervention group (66% vs. 50% ($p < .001$). Average age 65 and over, individuals similar in terms of age and ethnic background	
Brunner et al. 2012/U.S.	Nonran-domized compar-ative cohort (quasi-experimental) study	Evaluating the effectiveness and cost-effectiveness of two skin products in preventing the development of incontinence-associated dermatitis.	Braden Scale	n: 64 nA: 33 nB: 31 Average age: 67.3 (18- 88 years). 67.2% male (n = 43) and 32.8% female patients (n = 21)	
Bliss et al. 2017/U.S.	Experi-mental	Evaluating the effectiveness of Incontinence briefs containing a spiral-shaped fiber.	Incontinence-associated Skin Damage and Severity (IASD.D)	n: 26 Average age: 87, 77% female (n = 20). Most are considered overweight according to BMI	

s of fecal incontinence

	Products used in the elimination of skin problems	Monitoring and treatment time	Findings
	Two different skin cleansing and protection regimes were used in the study: 1. 3M Cavilon No-Rinse Skin Cleanser: This product combines a layer of protective liquid acrylic terpolymer containing moisturizer with 3M Cavilon Advanced Skin Protectant 2. Conveen Easi Cleanse: This skin cleanser contains a barrier cream formulated on a moisturizing zinc oxide base	Patients were monitored for a seven-day treatment period or until discharged (whichever came first)	IAD improvement in Group T1: 8 (34%), 12 (34%) in Group T2, and 5 (21%) in the control group. Compared to controls, probability of improvement in seven days in Groups T1 and T2 was 1.54 and 1.55 times higher, respectively (p = 0.66). The conclusion therefore was that the treatment method in both treatment groups increased the probability of improving IAD in seven days as compared to the controls
	Intervention Group: 3M Cavilon Advanced Skin Protectant (Minneapolis, Minnesota) is an ultra-thin, transparent, waterproof and unremovable barrier film made of polymeric cyanoacrylate solution designed to protect healthy or damaged skin for up to 7 days Controls: Standard care, routine skin cleansing (daily bed bath)	Patients were monitored for the seven-day treatment period	4 persons in the control group, 2 in the intervention group were found to have IAD. A comparison of the control and intervention groups revealed a decrease in the incidence of IAD by one-third (17% versus 11%, respectively)
	Intervention Group: Treated with Standard care + (3M Cavilon Skin Barrier Cream). The cream contains an acrylate terpolymer and dimethicone combined with isopropyl palmitate (a skin softener that strengthens the skin's moisture barrier), working as a skin protectant Control Group Standard care (a wet towel was used at each pad changing; a moisturizer and protective skin cleanser were used once a day)	Patients were monitored for a 14-day treatment period, and all data were collected on the study's 1st and 14th days. The cream was applied 3 times a day (8 a.m., 2 p.m., 8 p.m.) following changes of absorbent products	It was found that the intervention group recorded a lower erythema index than the controls on the 14th day (p = .004). Multivariate analysis showed that the skin barrier cream increased hydration in the stratum corneum (p = .031), decreased skin pH (p = .020) and displayed significant relationships between erythema values (p = .018) It was observed that the skin barrier cream with its moisturizing and protective features reduced inflammation, improved hydration in stratum corneum and decreased cutaneous pH, demonstrating that it could be effective in the treatment of mild IAD
	Single-use underpads were used in the intervention group. (Featuring an anti-moisture and breathable back layer of super-absorbent material) The control group used reusable underpads (quilted, medium absorbent and waterproof with polyvinyl chloride) Single-use pads, designed for adults of up to 300 (136 kg)	Patients were monitored for an average seven- day treatment period	Patients treated with single-use underpads had a lower rate of pressure sores (4.8% vs. 11.5%; p = .02). The hospital stay of those using the single-use underpads was less (p = .02). Cases of incontinence-associated dermatitis (IAD) did not display significant differences between groups (17.1% vs. 12.9%; p = .022)
	Product A: a one-step cloth impregnated with a 3% dimethicone formula used for cleansing, moisturizing and forming a barrier. Product B: A Prodnet-brand, two-step cleansing and moisturizing barrier film spray containing a polymer solution, pH-balanced and not needing rinsing.	Patients were monitored for an average four/five- day treatment period	It was found that there were no significant differences between the two product groups in terms of age distribution, BRASS index, gender, skin tone, number of urinary and/or fecal incontinence attacks, or degree of skin deterioration. Cost per working day was $2.67 for Product A vs. $6.59 for Product B (p = .006). The time it took for skin deterioration was [n = 6; 91.1 hour) in Product A and longer in Product B [n = 6; 213.3 hours (p = .045).
	Incontinence briefs containing a spiral-shaped fiber moistened with alkaline solution	Skin pH measurements were taken for three days. Patients were monitored for an average treatment day	Skin pH exposed to the incontinence briefs containing a spiral-shaped fiber was significantly more acidic compared to industrial-standard underpants not containing the spiral-shaped fiber (mean = 5.7). When the fiber was moistened with the same alkaline solution, mean pH was 6.4. Since alkaline skin pH is a risk factor for incontinence-associated dermatitis (IAD), the results show that the briefs containing the spiral-shaped fiber can be of help in preventing IAD

Table V. *Continues.*

Kyung Hee Park 2014/South Kore	Nonran-domized compar-ative cohort (quasi-experi-mental) study	Evaluating the effect of silicone bordered foam dressing on the development of pressure ulcers and incontinence-associated dermatitis in patients under intensive care	Braden Scale Incontinence-associated Skin Damage and Severity (IASD.D)	n: 102 Intervention: 52 Controls: 50 Average age 64; more than half over 65	
Zhou et al. 2017/China	Compar-ative cohort (quasi-experimental) -study	Evaluating effect of one-piece drainable bag vs standard care in developing incontinence associated dermatitis in patients in the intensive care unit	Bristol Stool Scale, Incontinence-associated Dermatitis Intervention Tool (IAD-IT)	n: 62 Intervention: 31 Controls: 31 Average age 58 ± 20 years (mean ± SD); 51.7% women	
Shin et al. 2012/Kora	RCT	Evaluation of skin moisture and transepidermal fluid loss after the use of uncoated paper single-use underpads in patients with incontinence	Glasgow Coma Scale Corneo-meter 825 Tewameter 300	n: 20 Intervention: 10 Controls: 10 Ages 18-79, 10 males and 10 women, totaling 20 patients	
Bakarat et al. 2018/Australia	Quasi-experimental	The effect of preventive interventions on the prevalence of incontinence associated dermatitis and incontinence applications	GLOBIAD Scale	n= 259 Male: 132 Female: 124 The gender of three patients was not specified. Average age 73.2±16.8 years	

RCT: Randomized Controlled Trial, IAD: Incontinence-Associated Dermatitis, BMI: Body Mass Index, GLOBIAD: Ghent Global IAD Categorisation Tool, IASD.D: Incontinence-Associated Skin D

individuals, covering a total of 513 cases. Follow-up and treatment periods were reported as being 3 days, 7 days and 9 days; two studies did not report treatment periods. The experimental study was carried out at a rest home; two of the quasi-experimental studies took place in the intensive care unit, one was conducted at a medical center and another at a medical-surgical department (Tab. II). In two of the quasi-experimental studies, cloths containing barrier cream were used to prevent incontinence-associated skin problems or to maintain the integrity of the skin. One other study used one-piece fecal pouches while another used silicone-bordered foam dressings. An experimental study reported the use of incontinence briefs containing a spiral-shaped fiber and moistened with an alkaline solution.

Bliss et al. (2017) studied the effectiveness of incontinence briefs containing a spiral-shaped fiber, finding

	Participants in the intervention group were applied the standard pressure ulcer (PU) protective care routine and silicone bordered foam dressings (Mepilex Border, Mölnlycke Health Care, Göteborg, Sweden). Only standard PU protective care was applied to the control group	Patients were followed up throughout the nine-day treatment period. Dressings were changed every three days or more frequently when dirty or accidentally detached; surrounding skin was cleansed and dried at each change of dressing	The incidence of developing pressure ulcers (PU) in the patients assigned to the intervention group and incontinence-associated dermatitis (IAD) scores were significantly lower compared to the control group (respectively, $\chi^2 = 21.722$, $p < .001$ and $t = 2.166$, $p < .033$)
	Standard incontinence-associated dermatitis (IAD) protective care and one-piece drainable bags (fecal collector) were applied. Only standard IAD protective care was applied to the control group	Patients were followed up daily for the seven-day treatment period by two nurses	Participants in the intervention group displayed significantly lower rates of developing incontinence-associated dermatitis (IAD) compared to the controls (12.9%vs. 41.9%, $p < .05$). However, IAD severity measured with the IAD-IT bedside tool did not display any significant difference between the two groups. The perianal skin IAD rate after the pouch was removed in the study group was significantly lower than in the control group ($p < .05$)
	Uncoated paper (made of 77% mechanical pulp and 23% unprinted paper of sulfite-treated chemical pulp) was used in the intervention group. Two-ply uncoated paper sheets of the dimensions 55×39 cm, relative weight 48×8 g/m², thickness 0×9 mm and density 403 kg/m² were used A single-use polypropylene-supported underpad with a fluffy upper layer that is procured on the commercial market was applied to the control group	Average stay in hospital was 36 ± 0 days (IQR 16 ± 0-70 ± 8). Average monitoring period of patients unspecified	Skin moisture after the application of the uncoated paper was observed to be significantly less than with the application of a single-use underpad ($p < .001$). Transepidermal moisture loss after the use of uncoated (mean 11 ± 1 and standard deviation 5 ± 7 g/m²/hour), and after application of single-use underpad (mean 23 ± 2 and standard deviation 11±1 g/m²/hour, $p < .001$) showed lower values. It was concluded that applying uncoated paper to bedridden patients could prevent extreme moisture and would function as a better skin barrier in the sacrum compared to single-use underpads
	Cloths with barrier cream containing 3% dimethicone were used to cleanse, moisturize and protect the skin	Data collection period: November 2015-January 2016; Implementation: June 2016-May 2017; post-implementation: June 2017 – October 2017. Average patient follow-up time unspecified.	The prevalence of IAD was found to be significantly lower after the implementation compared to prior to the implementation ($p = .015$). The importance of cleansing, moisturizing and protecting the skin in patients who are unable to control their urination or stools with a 3-in-1 barrier cream cloth was stressed. It was reported that there was positive feedback on the effect of the product on time efficiency and improving the skin condition of incontinent patients, especially those with IAD. Instead of using the traditional method of cleansing, moisturizing and applying barrier cream, all the steps may be combined by preferring to use barrier cream cloths

Damage and Severity, IAD-IT: Incontinence-Associated Dermatitis Intervention Tool, PU: Pressure Ulcer

that the pH of skin exposed to these briefs was significantly more acidic than when industry-standard briefs not containing the spiral-shaped fiber was used. Since alkaline skin pH is a risk factor for incontinence-associated dermatitis (IAD), the results showed that the briefs containing the spiral-shaped fiber could be helpful in preventing IAD [26]. In a study by Kyung Hee Park (2014) conducted in a medical center in Seoul, South Korea, patients with silicone-bordered foam dressings were monitored for nine days; the patients' dressings were changed frequently every three days, when they were soiled or inadvertently separated. The surrounding skin was cleansed and dried at each change of dressing. The results of this study showed that the incontinence briefs containing a spiral-shaped fiber significantly reduced IAD [27].

Positive feedback is reported concerning the effectiveness of three-in-one barrier cream cloths in improving

the skin condition of individuals with incontinence-associated dermatitis (IAD). It has been emphasized that using barrier cream cloths instead of the traditional technique of cleansing, moistening and applying barrier cream saves both time and money [17]. On the other hand, another study has stated that barrier cream cloths do not create a significant difference in improving the skin condition of individuals with IAD [28]. Zhou et al. (2017) reported after their study in Foshan, China at an intensive care unit of the South Medical University's Shunde Hospital that following the seven-day follow-up and treatment carried out by two nurses, participants who were applied one-piece drainable pouches in addition to standard IAD protective care (delicate cleaning with a single-use moist cloth followed by the application of skin protective products), it was found that this produced a significantly reduced development of IAD compared to the group who experienced only standard care [28].

DISCUSSION

The results of this systematic review, with its focus on new approaches to the treatment of skin problems in individuals diagnosed with fecal incontinence, treatment options and quality of life, will be compared with findings in the current literature. Our review encompasses ten studies that have examined interventions concerning the use of various products to prevent skin issues in individuals diagnosed with fecal incontinence (anti-dermatitis creams, pads, fecal collectors, barrier films) and the effect of these products on the severity, incidence and healing process of dermatitis. The results in terms of the prevention or management of skin problems show that the new skin barrier creams, absorbent products, changing pads frequently, fecal collectors, barrier films, skin protection and moisturizing creams can contribute to improving skin complaints.

Avşar and Karadağ (2018) reported that noninvasive behavioral interventions (such as dietary modifications, bowel evacuation techniques, and fluid management) form the foundation for preventing and managing IAD. However, this study was not included in the systematic review because it employed a narrative design and did not provide original empirical data based on randomized or interventional methodology. For wheelchair-bound individuals, the use of absorbent incontinence products, particularly adult briefs and underpads, is commonly recommended [30]. It has also been emphasized that skin cleansing products in the form of lotions or liquid solutions are necessary to remove fecal irritants, and their regular application is advised [31]. Bilge and Kızılkaya (2018) noted that absorbent incontinence products absorb fecal matter and help prevent leakage but do not fully prevent skin contact with stool, which results in a moist environment conducive to microbial proliferation and increases the risk of irritation and infection. This study was also excluded from the current review due to its descriptive and non-interventional nature, which did not meet the inclusion criteria. These products must be changed frequently and monitored closely; nonetheless, their accessibility and affordability have made them widely used despite the absence of empirical data supporting their effectiveness in controlled research settings [32]. Motto & Milne (2017) have stated that single-use underpads with a high capacity for fluid absorption are more effective than reusable protective products in terms of reducing the severity of IAD and its incidence. Additionally, the inappropriate use of absorbent products or failure to change these products frequently has been known to possibly increase the risk of infection [17]. This finding is contrary to what is reported by the study included in our systematic review by Francis et al. (2023).

In a randomized controlled trial involving 141 participants, Beeckman et al. (2011) demonstrated that a 3-in-1 wipe impregnated with 3% dimethicone was significantly more effective in reducing IAD prevalence and improving skin lesions compared to traditional soap and water. Although this study used a rigorous experimental design, it was not included in the review because it was published prior to the selected time frame of 2012-2022 [32].

The study demonstrated that the use of this product resulted in a significant reduction in the prevalence of IAD as well as a distinct improvement in skin lesions [33]. While this finding supports the results of the study by Bakarat et al. (2018) included in our review, it conflicts with what has been reported by Brunner et al. (2012).

In the study conducted by Bermudez et al. (2023), it was recommended that the practice of drying off the skin with a towel to reduce irritation and form a barrier to the skin should be kept to a minimum and replaced by the use of a softening moisturizer and a skin protectant. It was also asserted that fecal collectors or protective hydrocolloid dressings should be used together with protective briefs, which was reported to minimize the skin's exposure to moisture, irritants and friction and reduce the prevalence of IAD [34]. Beeckman et al. (2016), who examined the effectiveness of interventions aimed at the prevention and treatment of incontinence-associated dermatitis (IAD) in their study, reported that soap and water was insufficient in preventing and treating IAD. The authors emphasized that moisturizers and skin protectants or a combination of these would be necessary and that the use of soap should be avoided [35]. Park & Kim (2014) conducted a cohort study in which a structured skin care regime was tested to see how this would impact patients with fecal incontinence. This was a cohort comparative study with 76

intensive care patients who were given a skin care regime that did not require rinsing. It was found that the regime caused a significant drop in patients' incontinence-associated dermatitis screening scores [36]. In a study by Conley et al. (2014) that monitored 99 patients with incontinence for a nine-month period, it was found that a specific skin care protocol that encouraged the use of a cleanser and a cleansing lotion containing aloe vera reduced the prevalence of moderate incontinence-associated dermatitis (IAD) [37]. Gunasegaran et al. (2023) made a comparison between treatment of incontinence-associated dermatitis with the hydrocolloid crusting method versus standard skin care. The authors discovered at the end of a seven-day monitoring period that both methods resulted in similar decreases in IAD scores. They concluded that the hydrocolloid crusting method could be used together with standard care in the treatment of IAD [38]. In the one-month data collection period of the study by Hall & Clark (2015), where the authors explored the effect of the use of a single-step cleanser, it was concluded after the clinicians received training that this one-step product could be employed in incontinence care procedures [39]. IAD rates had not changed in the study, which was a finding that was contrary to the findings of Glass et al. (2021), another study included in the review.

In a study by Guest et al. (2013), who set about researching the effectiveness and economic benefit of using transparent barrier film dressings in dealing with incontinence-associated dermatitis and the protection of the skin around the wound, the authors reported barrier films to be more efficient and potentially more cost-effective than petroleum salves or zinc oxide formulations [40]. Avşar & Karadağ (2018) stress the superiority of barrier films in strengthening and protecting the integrity of the skin [29], a finding that supports the research of Cover et al. (2020), also included in this review.

Chen et al. (2020) investigated the effect of teamwork on reducing the incidence of incontinence-associated dermatitis, reporting in this context that the main reasons for a rise in the incidence of IAD are factors such as improper care, a lack of adequate communication between the members of the medical team, a deficiency in the standard of care for incontinence, and a slack in providing continuous education related to this condition. The authors concluded that cooperation between the members of the medical team significantly reduced IAD incidence and improved the quality of general care [41].

In a single-group quasi-experimental study by Singh et al. (2018), who worked with 20 patients, it was reported that fecal collectors were useful in channeling fluids without leakage. It was also observed that the use of fecal collectors did not cause any patient to experience anorectal bleeding, sphincter injury or mucosal ulceration[42].

In the study by Reynolds & Haren (2012), the authors pointed out that the use of fecal collectors was an effective method, rarely causing serious complications and one whose benefits were significantly more than its risks [43]. In a study by Ousey & Gillibrand (2010), in which the authors investigated the effect of fecal collectors on reducing wound contamination, it was shown that fecal incontinence could damage skin integrity, causing deterioration and wound contamination and leading to a significant medical cost. The study suggested that to avoid this, fecal collectors should be used as an early intervention before bedsheets are exposed to wetness and fecal matter, thereby saving the patient from discomfort and embarrassing odors [44]. Echols et al. (2007) determined that although the initial cost of fecal collectors was high, the method was still cheaper compared to the cost of having to constantly change bedsheets[45]. Similarly, Keshava et al. (2007) and Morris et al. (2005) reported on the use of fecal collectors in their studies, discovering reductions in the average number of bedsheet changes and personnel costs [45,46].

This systematic review has several methodological limitations that should be taken into account. The literature search was limited to studies published in English and Turkish between 2012 and 2022, which may have introduced both language and publication date bias by excluding relevant studies published in other languages or outside the specified time frame. Additionally, the review included only randomized controlled trials, quasi-experimental, and interventional studies, thereby excluding other valuable study designs such as qualitative research, case reports, observational studies, and systematic reviews or meta-analyses. This narrow methodological focus may have resulted in the omission of important insights that could have been gained from diverse research approaches. Furthermore, studies for which full-text access was unavailable were excluded, limiting the comprehensiveness of the evidence base. The included studies also exhibited considerable heterogeneity in terms of sample sizes, outcome measures, and follow-up periods, which complicated the synthesis and comparison of results. Given these limitations (particularly those related to language, search timeframe, and study design) the findings should be interpreted with caution and further validated through future research that incorporates broader inclusion criteria, multilingual sources, and methodological diversity.

CONCLUSIONS

This systematic review analyzed 10 interventional studies (comprising five randomized controlled trials (RCTs), four quasi-experimental studies, and one experimental

study) on the effectiveness of various products used to prevent and manage skin problems in individuals with fecal incontinence. A total of 1,148 participants were included across these studies. The interventions assessed included absorbent products, barrier creams, films and sprays, silicone-bordered foam dressings, incontinence briefs containing spiral-shaped fibers moistened with an alkaline solution, one-piece drainable fecal pouches, and 3-in-1 barrier cream cloths. Among these, all ten studies qualified as interventional in nature. The five RCTs conducted by Glass et al. (2021), Coyer et al. (2020), Kon et al. (2017), Francis et al. (2017), and Shin et al. (2012) evaluated skin-protective interventions including barrier creams, cyanoacrylate-based barrier films, and single-use absorbent pads. One experimental study by Bliss et al. (2017) tested incontinence briefs containing spiral-shaped fibers. Additionally, four quasi-experimental studies by Brunner et al. (2012), Park (2014), Zhou et al. (2017), and Barakat et al. (2018) investigated interventions such as silicone-bordered foam dressings, one-piece fecal pouches, and barrier cream cloths. Each of these studies implemented targeted interventions to prevent or reduce incontinence-associated dermatitis (IAD), thereby contributing to the growing body of evidence on IAD management. Collectively, these interventional studies highlight the critical importance of managing excess skin hydration and implementing protective skin care regimens. Interventions that combine cleansing, moisturizing, and skin protection especially those that simplify routine care show promise in both clinical efficacy and cost-effectiveness. Moreover, frequent product changes, structured care protocols, and continuous training for healthcare staff emerged as key components in IAD prevention. The findings of this review support the clinical utility of evidence-based interventions in mitigating the burden of skin complications associated with fecal incontinence. However, the heterogeneity in study design, sample size, duration, and outcome measures limits the direct comparability of results. Further high-quality, large-scale interventional studies are warranted to strengthen the evidence base and guide best practices.

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Author contributions
DA, HKA,CK,BEK: research idea; design of the study, analysis of data for the study, interpretation of data for the study, drafting the manuscript, revising it critically for important intellectual content; final approval of the version to be published.

Ethical consideration
The present article is a systematic review and does not require ethics committee approval since only studies whose full texts could be accessed were included. The researchers have moreover declared that there is no conflict of interest involved in this review.

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