Evaluating the Scales Used To Diagnose Incontinence-Associated Dermatitis: A Systematic Review

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ABSTRACT

OBJECTIVE: To investigate the scales used in the diagnosis of incontinence-associated dermatitis (IAD), including the risk factors included in the scales, their reliability and validity, and in which patient groups the scales have been applied.

DATA SOURCES: The relevant studies were screened retrospectively using five MeSH (Medical Subject Headings) keywords in various combinations. Seven international databases were screened between March and July 2019. In total, 2,908 studies published between 2009 and 2019 were evaluated.

STUDY SELECTION: Inclusion criteria for studies were as follows: written in English, published between 2009 and 2019, and investigated a scale developed to diagnose IAD (quantitative studies, randomized controlled studies, or meta-analyses). Studies were excluded if they did not examine scales for diagnosing IAD or were not in English. Nine studies were included in this review: five studies on scale development, one scale revision, one scale reliability study, and two Turkish validity and reliability studies.

DATA EXTRACTION: The study methods, sample characteristics, interventions, validity and reliability analyses, risk factors in the scales, and subdimensions of the scales were examined for each of the nine included studies.

DATA SYNTHESIS: Study samples were composed of nurses, healthcare professionals, patients, or individuals living in a nursing home and ranged in size from 9 to 823 participants. Most data were collected from hospital-wide clinics. The scales used investigated redness, rash, skin loss, incontinence type, infection symptoms, skin color, edema, patient experience, pain, and perineal care habits. Both validity and reliability of the scales were examined in eight of the studies; in one study, only reliability was examined because the scale validity was shown in previous research. Moreover, sensitivity and specificity were indicated in one study.

CONCLUSIONS: There are several competent scales in the literature with proven validity and reliability that can be used to diagnose IAD.

KEYWORDS: dermatitis, incontinence, methodological studies, risk assessment, skin care

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INTRODUCTION

Moisture-associated skin damage occurs as a result of long-term exposure to a source of moisture, such as urine, stool, sweat, wound drainage, saliva, or mucus. Incontinence-associated dermatitis (IAD) is one of the four clinical types of moisture-associated skin damage and is considered preventable, although common.[1,2] Untreated IAD lesions can cause excision and rapid skin deterioration, leaving skin susceptible to infection.

Van Damme et al[3] examined which risk factors caused IAD in older adults living in a nursing home. The incidence of IAD (category 1–2) was 30%, and skin damage (IAD category 2) developed in 6% of the older adults included in their study. The older adults who developed IAD were less mobile and more exposed to friction. Based on these findings, the authors recommended that caregivers be careful to detect and prevent IAD development.[3] In a study performed in an acute care setting (N = 5,342), Gray and Giuliano[4] reported an overall IAD prevalence of 21.3%, but a prevalence of 45.7% among patients with incontinence. In addition, fungal rash was present in 14.8% of the patients, and pressure injury in the sacral region was found in 17.1% of the patients. Pressure injury risk was increased in patients with IAD who were not mobilized.[4] In a study investigating risk factors in intensive care patients, Van Damme et al[5] found that diabetes, smoking, age, fecal incontinence, high fever, and low oxygen saturation were risk factors in the development of IAD. Moreover, in a study examining the relationship between fecal incontinence and pressure injury, Park and Choi[6] emphasized that proactive precautions must be taken to reduce the risk and development of pressure injury in patients with IAD risk. Further, Coyer and Campbell[7] undertook a systematic review on the prevalence and incidence of IAD and confirmed that intensive care nurses should have the requisite knowledge to prevent and manage IAD.[7]

Practitioners should use both clinical observation and patient history to assess IAD. In patients with urinary or fecal incontinence, skin should be systematically assessed

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for IAD at least once per day (more often with frequent incontinence). Skin folds—including the perineum and perineal area, gluteal region, waist, lower abdomen, and thighs—should be assessed for peeling, maceration, erythema, lesions, and symptoms of infection.[8] When nurses identify early symptoms of skin damage, rapid intervention can improve patient outcomes during the care process.[1] In their study, Coyer et al[9] generated and systematically implemented a bundle of care with existing evidence-based practices. They observed that IAD development was delayed in intensive care patients on whom the bundle was implemented. They also noted that systematic, frequent skin assessment and taking precautions to prevent IAD were of central importance in preventing IAD in this vulnerable patient group.[9] In a qualitative analysis of nurses' knowledge levels, Strehlow et al[10] reported that nurses experienced difficulty in diagnosing and grading IAD in older adults and that there were inconsistencies in the interventions implemented and products used during treatment.

The identification and observation of risk factors for IAD contribute to the planning of preventive nursing interventions. Multiple measurement instruments have been developed to examine risk factors in diagnosing IAD.[8] However, they are not commonly used by nurses.[11] Although these instruments have been tested for validity, there is still a lack of evidence regarding clinical decision-making and improvement of nursing care, limiting their use in daily practice.[8] In the present study, the researchers evaluate the competence of the scales used to diagnose IAD, examining the risk factors included in the scales, their reliability and validity, and in which patient groups the scales have been applied.

METHODS

The researchers retrospectively and systematically screened and reviewed the relevant studies in the literature between March and July 2019. Databases were rescreened and upgraded May 26 and 27, 2020. The researchers searched Cochrane Library, Web of Science, EBSCOhost, Scopus, PubMed, ScienceDirect, and Wiley Online Library databases for relevant articles using several combinations of keywords including "dermatitis," "incontinence," "tool," "scale," and "instrument." Table 1 details the number of articles found per database.

Research Questions

1. What scales are used for the diagnosis of IAD?
2. On which types of participants are the IAD diagnostic scales used?
3. Which risk factors are included in the scales?
4. Are the scales used for IAD diagnosis valid?
5. Are the scales used for IAD diagnosis reliable?

Study Selection

Inclusion criteria for studies were as follows: written in English, published between 2009 and 2019, and investigated a scale developed to diagnose IAD (quantitative studies, randomized controlled studies, or meta-analyses). Studies were excluded if they did not examine scales for diagnosing IAD or were not in English. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses—2009[12] guide was used during the examination of studies.

A total of 2,908 studies were identified (Table 1), and two reviewers independently examined the titles and abstracts of these articles. After review, 2,861 did not meet the inclusion criteria and were excluded from the study. The remaining 47 studies were retrieved in their entirety and further reviewed by two independent reviewers. Of these 47 studies, 38 were excluded: 34 were identical, 2 were experimental model studies conducted on animals, and 2 were in other languages. In addition, one article included a summary in English but the main text was in Turkish; this study was included because the native language of the researchers is Turkish. As a result, nine studies were included in this review.

Data Extraction

Study methods, sample characteristics, interventions, validity and reliability analyses, risk factors in the scales, and subdimensions of the scales were examined and recorded for each of the nine articles included in this review (Figure).

RESULTS

Characteristics of the Included Studies

All nine studies were research articles published in refereed journals. Four of the studies were published in 2018, and one each was published in 2010, 2013, 2014, 2016, and 2017 (Table 2).

Two of the included studies[13,14] were Turkish validity and reliability studies of previously developed scales. In addition, one study[15] was a revision of a previously developed scale, and another study[16] was an interobserver agreement study of previously developed scales. The other five studies[17–21] were scale development studies, with sample sizes ranging from 9[20] to 823.[19]

Regarding the characteristics of the samples, three studies included nurses,[14,15,17] one study included nurses and patients,[16] four studies included patients,[13,18,20,21] and one study included healthcare professionals[19] (Table 2). Data were collected in hospitals in seven of the studies[13–15,17–20] and in nursing homes in the other two.[16,21]

Studies on Previously Developed Scales. Two of the included studies were validity and reliability studies that adapted scales developed in different languages/cultures into Turkish. Sargın et al[13] carried out a Turkish validity

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Table 1. DATABASES WHERE STUDIES WERE SCREENED

Databases Used for Literature Search	No. of Studies Identified	No. of Studies Not Meeting the Inclusion Criteria	No. of Studies Meeting the Inclusion Criteria
The Cochrane Library	18	17	1
Web of Science	110	101	9
EBSCOhost	599	583	16
Scopus	124	120	4
PubMed	71	66	5
ScienceDirect	655	652	3
Wiley Online Library	1,331	1,322	9
Total	2,908	2,861	47

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and reliability study of the Michigan Incontinence Symptom Index (M-ISI) on 100 women with urinary incontinence. Aydin and Kaya[14] adapted the Incontinence Associated Dermatitis Assessment Scale (IADAS) to Turkish with a sample of 65 nurses.

The present review also included one revision of a previously developed scale[15] and one interobserver agreement study[16] of a previously developed scale. Bliss et al[15] developed the Revised Incontinence-Associated Skin Damage Severity Instrument (IASD.D.2) in 2018; the study included three different nurse groups and tested the validity and reliability of the revised measure. Braunschmidt et al[16] examined interobserver agreement to test the reliability of the Incontinence-Associated Dermatitis Intervention Tool-D (IADIT-D). In this study, 38 nurses (who were divided into groups of two for comparison) analyzed 381 individuals who were living in a nursing home. The IADIT was developed by Junkin and Selekof[22] in 2008. This scale was not included because it was not available within the time period of the study. The German IADIT-D was developed by Steininger et al[23] in 2012 but was excluded from this review because it was not in English (Table 2).

Scale Development Studies. The five included scale development studies were carried out by Borchert et al,[17] Suskind et al,[18] Beeckman et al,[19] and Van den Bussche et al[20,21] (Table 2). Borchert et al[17] developed the IADAS in a study in which 347 nurses participated with the aim of developing a new instrument describing IAD and its severity. The M-ISI was developed by Suskind et al[18] to be an easy-to-use, clinically significant, and approved scale for evaluating the severity and discomfort of urinary incontinence. The M-ISI scale was used in a study with 764 participants who were divided into five groups. Beeckman et al[19] included a large sample of 823 healthcare professionals to develop an internationally approved scale for assessing the severity of IAD, the Ghent Global IAD Categorization Tool (GLOBIAD). Van den Bussche et al[20] developed the Ghent Global IAD Monitoring Tool (GLOBIAD-M). They examined nine patients affected by IAD over the course of 36 observations to create their incontinence monitoring scale. The same research group also developed another scale: the Minimum Data Set for Incontinence-Associated Dermatitis (MDS-IAD) in a study that collected epidemiologic data and assessed the quality of care of 108 individuals living in a nursing home (Table 2).[21]

IAD Risk Factors Examined by the Scales

The IAD scales examined redness, rash, skin loss, incontinence type, infection symptoms, skin color, edema, patient experience, pain, and perineal care habits. Moreover, the IADS, IADIT-D, GLOBIAD, IASD.D.2, and GLOBIAD-M included photographs or illustrations to aid with visual assessments (Table 2).

Figure. STUDY FLOW DIAGRAM

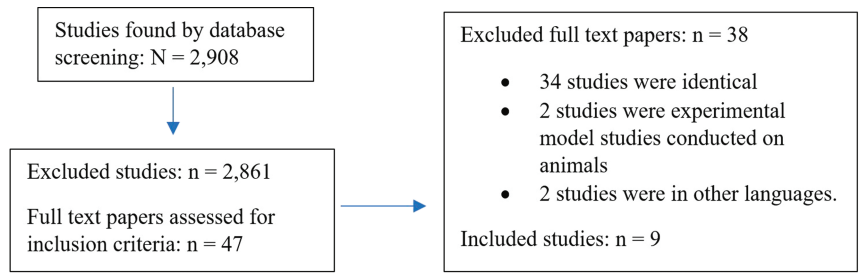

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Table 2. CHARACTERISTICS OF THE SCALES (STUDIES) EXAMINED

Study	Scale	Method	N	Intervention/ Practice	Validity Analysis	Reliability Analysis	Result	Risk Factors/ Subscales/ Examined Characteristics of the Scale
Borchert et al,[17] 2010	The Incontinence-Associated Dermatitis and Its Severity Instrument (IADS)	Methodological, scale validity and reliability study	347 nurses	Both verbal and illustrated descriptions were developed for skin traits, redness, skin loss, and rash following literature search, and were revised by experts to provide content validity. Nurses assessed case scenarios using the IADS scale.	Criterion validity was not examined. A consensus was provided between the wound care nurses for case scenarios ($P = .006$). The compliance between three professional evaluators was 0.91 ($P = .008$).	Interobserver ICC of the scale was 0.98 ($P = .006$).	The scale showed good validity and interobserver compliance and met a need in both research and clinical settings.	13 body regions were identified. Each body region was enumerated on the picture. - Redness: Color tinting was done for the light- and dark-skinned patients. - Skin loss: There are both verbal and illustrated descriptions. There is a description with photograph to discriminate pressure injury from IAD. - Rash: There are both verbal and illustrated descriptions. There is a description with photograph to discriminate fungal rash from IAD.
Braunschmidt et al,[16] 2013	The interrater reliability of the Incontinence-Associated Dermatitis Intervention Tool-D (IADIT-D)	Interobserver compliance study	38 nurses, 381 individuals living in nursing homes	Nurses evaluated individuals living in the nursing home using the scale in groups of two.	No validity analysis was performed in this study because its validity was previously proven.	Interobserver compliance was 84%. Item fit was identified to be between 0.70 and 0.83. Compliance was 0.94 for risk assessment and 0.76 for classification.	Interobserver compliance was good; authors concluded that it was reliable for use in long-term care institutions.	Five categories: - One item for high risk - Three items for IAD severity - One item for IAD complication Verbal descriptions and one photograph are included

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Table 2. CHARACTERISTICS OF THE SCALES (STUDIES) EXAMINED, CONTINUED

Study	Scale	Method	N	Intervention/ Practice	Validity Analysis	Reliability Analysis	Result	Risk Factors/ Subscales/ Examined Characteristics of the Scale
Suskind et al,[18] 2014	The Michigan Incontinence Symptom Index (M-ISI)	Methodological, scale validity and reliability study	Five different participating groups Focus group: 35 patients Pilot study group: 99 patients Test-retest reliability group: 45 patients Cross-sectional group: 477 women Predictable validity group: 108 women	Scale items were included in psychometric assessment in five different patient groups. Validity and reliability analyses were performed after the final scale items were generated.	Specialists and patient groups agreed on scale items. Face and content validity were provided; 24 of the 34 items were eliminated and a 10-item scale was generated. Construct validity of the scale: 0.90	Internal consistency was calculated and found to be at a good level for the whole scale (Cronbach $\alpha = .90$). Test-retest reliability was 0.86 for the whole scale.	The M-ISI has proven validity and reliability in distinct groups for assessing patients with urinary incontinence.	10 items, 3 subscales, 5-point Likert-type - Stress urinary incontinence - Urge urinary incontinence - Pad use
Sargın et al,[13] 2016	Michigan Incontinence Severity Index in a Turkish population	Methodological, Turkish validity and reliability study	100 women with urinary incontinence	Data were collected after intercultural translation and compliance study. Test-retest method was used.	Content validity index and content validity ratio were 0.97 and 1.00, respectively. It was indicated that content validity of the Turkish version of M-ISI was adequate.	Good internal consistency was observed in each subscale: Stress urinary incontinence: 0.787. Urge urinary incontinence: 0.862 Pad use: 0.832 Good test-retest reliability was shown for each subscale: Stress urinary incontinence: 0.973 Urge urinary incontinence: 0.973 Pad use: 0.979	Turkish version of the scale showed a good validity, reproducibility, and reliability.	Three subscales, 5-point Likert-type scale including 10 items Subscales: - Stress urinary incontinence - Urge urinary incontinence - Pad use

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Table 2. CHARACTERISTICS OF THE SCALES (STUDIES) EXAMINED, CONTINUED

Study	Scale	Method	N	Intervention/ Practice	Validity Analysis	Reliability Analysis	Result	Risk Factors/ Subscales/ Examined Characteristics of the Scale
Aydın and Kaya,[14] 2017	Incontinence Associated Dermatitis Assessment Scale (IADAS), Turkish version	Methodological, Turkish validity and reliability study	65 nurses	Language equivalence and content validity were examined. Nurses were trained on dermatitis development and the use of the scale and then assessed a sample case picture. Interobserver compliance was tested.	Language equivalence was provided by translation-back translation technique. Five expert opinions were taken for content validity. Content validity index was determined as 1.	Interobserver ICC of the scale was examined (ICC = 0.867, P = .001).	Interobserver compliance of the Turkish version of the scale was high.	Perineal region was divided into 13 regions were scored for redness, rash, and skin damage. Redness: No: 0 points Pink: 1 point Red: 2 points Rash: Yes: 3 points Skin damage: Yes: 4 points
Beeckman et al,[19] 2018	Ghent Global IAD Categorization Tool (GLOBIAD)	Methodological, scale validity and reliability study	823 healthcare professionals	The scale was developed with 34 experts from 13 countries in accordance with three-step Delphi technique, and tested by using photographs reflecting different IAD levels in a sample including 823 healthcare professionals from 30 countries.	A consensus was made with 34 experts to provide content validity.	Mean interobserver compliance:0.71 (CI, 0.70–0.72) Cohen κ: 0.61 (CI, 0.59–0.62) Sensitivity was 90% and specificity was 84%.	Sensitivity and specificity estimations of the scale were good and showed a high level of diagnostic accuracy for discriminating erythematous skin and skin loss.	Category 1: Permanent redness without any clinical infection symptoms Category 2: Skin loss without any clinical infection symptoms

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Table 2. CHARACTERISTICS OF THE SCALES (STUDIES) EXAMINED, CONTINUED

Study	Scale	Method	N	Intervention/ Practice	Validity Analysis	Reliability Analysis	Result	Risk Factors/ Subscales/ Examined Characteristics of the Scale
Bliss et al,[15] 2018	Revised Incontinence-Associated Skin Damage Severity Instrument (IASD.D.2)	Observational, evaluative design, validity, and reliability study	198 wound care, 67 clinical, and 34 nursing home nurses N = 299	Nurses used the IASD.D.2 to score a case that included five to nine photographs. The photographed cases were developed from a series of digital images of patients with and without IAD.	The scale, which was revised by five wound care nurses with clinical experience, was used to evaluate photographed cases. Cases were assessed independently, and content validity was ensured via consensus on scoring. Nurses were shown photographed cases and asked to score them; criterion validity was good (0.82– 0.85)	Interobserver compliance was examined in all groups. A good level of interobserver compliance was found between all nurses within each group (0.74 and 0.79)	It was determined that the IASD.D.2 showed good content and criterion validity and had a good level of interobserver compliance. The scale can help identify the severity of IAD in clinical practice.	- Four categories of IAD (normal, light, medium, and dark skin color) - Descriptions of IAD symptoms and small illustrations are included. - The body regions where IAD may occur are shown on various body types (eg, thin, obese, older adult) and skin tones.
Van den Bussche et al,[20] 2018	Ghent Global IAD Monitoring Tool (GLOBIAD-M)	Methodological, scale validity and reliability study	Nine patients affected by IAD underwent 36 observations.	Patients were examined at days 1, 3, 5, and 7. Their skin was observed and symptoms (eg, itching, pain) were assessed. The first observed photographed the IAD lesion. For interobserver compliance, the second observer independently categorized the IAD lesion and evaluated the surrounding skin for each photograph.	For the development of GLOBIAD-M, the Skin Integrity Research Group (SKINT) at Ghent University assessed each element to be included in GLOBIAD-M (yes/no).	Interobserver compliance and reliability (Cohen κ and ICCs) were examined. Interobserver compliance was 0.86 for maceration item and 0.97 for clinical infection symptoms item.	Interobserver compliance and reliability of GLOBIAD-M were good and this scale might support clinical decision making for the treatment of IAD but more validation is required with clinicians.	Daily assessment: IAD classification according to GLOBIAD (four parameters) - Permanent redness (specifying % of image) - Skin loss (specifying % of image) - Edema and maceration (two parameters) - Infection symptoms (five parameters) - Patient experience (four parameters) - Pain assessment (numerical assessment)

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Table 2. CHARACTERISTICS OF THE SCALES (STUDIES) EXAMINED, CONTINUED

Study	Scale	Method	N	Intervention/ Practice	Validity Analysis	Reliability Analysis	Result	Risk Factors/ Subscales/ Examined Characteristics of the Scale
Van den Bussche et al,[21] 2018	Minimum Data Set for Incontinence-Associated Dermatitis (MDS-IAD)	Methodological, scale validity and reliability study	108 individuals living in nursing home	A pilot study was performed after ensuring content and face validity. Following the pilot study, nurses assessed individuals living in the nursing home using the MDS-IAD.	SKINT and nurses in nursing homes reviewed each item to be included in the scale; content and face validity were provided.	Interobserver compliance was 0.68 (CI, 0.37–0.99) for urinary incontinence and 0.55 (CI, 0.27–0.82) for fecal incontinence. According to GLOBIAD, $P = .60$ for significance classification.	The scale provided valuable information on the frequency of IAD at an institutional level and education is important to improve its accurate classification and reliability.	- Type, frequency, and date of incontinence - IAD category and location: visual assessment possibility with GLOBIAD - Management of perianal region: frequency of cleaning, product use, antimicrobial agent use, toilet program

Abbreviations: CI, confidence interval; IAD, incontinence-associated dermatitis; ICC, intraclass correlation coefficient.

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Validity-Reliability

Among all included studies, the reliability of interobserver compliance was examined only in the study by Braunschmidt et al.[16] In the other eight studies, both validity and reliability were analyzed. Validity and reliability results of the studies are presented in Table 2.

In the studies by Sargın et al[13] and Aydin and Kaya,[14] the researchers concluded that the Turkish forms of the M-ISI and IADAS, respectively, had good validity and reliability. In the study by Braunschmidt et al,[16] the interobserver agreement of the IADIT-D was found to be good. In addition, Bliss et al[15] concluded that the revised scale they created, IASD.D.2, provided good validity and reliability (Table 2).

Regarding the scale development studies, the scales developed by Borchert et al[17] (IADS) and Suskind et al[18] (M-ISI) had good validity and reliability. The GLOBIAD scale developed by Beeckman et al[19] showed a high level of diagnostic accuracy and was valid and reliable at good levels. Although the GLOBIAD-M scale by Van den Bussche et al[20] had good levels of validity and reliability, the researchers suggested that additional studies with clinicians would be beneficial. The MDS-IAD developed by Van den Bussche et al[21] was sufficiently valid and reliable, but training would be important for improving its accuracy in classification and reliability (Table 2).

DISCUSSION

Validity indicates whether a scale accurately measures the variables or condition of interest; validity analysis is carried out by using content validity, criterion-dependent validity, or construct validity methods.[24,25] In contrast, reliability shows that scales collect accurate data in repetitive measurements by ensuring invariance, competence, equivalence, consistency, accuracy, and determination. Invariance, interobserver agreement, or internal consistency methods are used to determine the reliability of a measurement instrument.

For determining validity, six studies investigated content validity, one assessed criterion-related validity, and two used both criterion-related validity and content validity. Content validity examines whether the scale in its entirety, as well as each item in the scale, is relevant to the content being measured. Content validity is determined by expert opinion and should always be conducted in scale development studies. The examination of content validity is also indicated in scale adaptation studies. Criterion-related validity determines the ability of a test to give the same results as those obtained by an established standard of comparison.[25] Interobserver compliance of the IADIT-D was examined by Braunschmidt et al;[16] the validity of the scale was shown in previous research. The reliability of the IADIT-D was examined after its validity was proven.

The researchers also examined the reliability methods used in the included studies and found that interobserver agreement was most common (seven studies). Other methods used to test reliability were internal consistency (two studies) and test-retest (with internal consistency reliability) methods. Interobserver agreement determines

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the agreement between the data collected by two or more trained observers based on independent observations. Independent observers measure the same condition with the same scale at the same time;[25] thus, misconceptions that may be derived from the behaviors of observers during the observations are minimized.[24] Because the scales used to diagnose IAD are based on observer skills, interobserver agreement is important for determining their reliability.

Sensitivity and specificity of a diagnostic scale report on the scale's ability to determine the presence (sensitivity) or absence (specificity) of the examined condition. Increases in the sensitivity and specificity values, which are not affected by prevalence, increase the level of accuracy in identifying the examined condition.[24] Among the studies included in the sample, only Beeckman et al[19] examined sensitivity and specificity, finding that the GLOBIAD scale had both high sensitivity and specificity. Thus, those authors concluded that the GLOBIAD scale had a high level of diagnostic accuracy in discriminating erythematous skin and skin loss.

Limitations

This systematic review was limited to nine studies that met the study inclusion criteria. Additional relevant research may have been published in the intervening years since the search was conducted.

CONCLUSIONS

All of the studies included in this review showed a sufficient level of validity and reliability, and the one study that examined sensitivity and specificity found them both to be high. Thus, the results indicate that the investigated scales—the M-ISI, IADS, IADAS, IASD.D.2, IADIT-D, GLOBIAD, GLOBIAD-M, and MDS-IAD—can all be used in clinical practice. These measures are all competent scales for IAD diagnosis with proven validity and reliability. Future research should also examine the sensitivity and specificity of these measures and others designed for a similar purpose to ensure diagnostic accuracy. ●

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