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CRITICAL REVIEW

# Injuries resulted from breastfeeding: a new approach to a known problem\*

LESÕES MAMILARES DECORRENTES DA AMAMENTAÇÃO: UM NOVO OLHAR PARA UM CONHECIDO PROBLEMA

LAS GRIETAS DEL PEZÓN SECUNDARIAS DE LA LACTANCIA MATERNA: UNA NUEVA MIRADA A UN CONOCIDO PROBLEMA

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## ABSTRACT

This study aimed at analyzing nipple trauma resulted from breastfeeding based on dermatological approach. Two integrative reviews of literature were conducted, the first related to definitions, classification and evaluation methods of nipple trauma and another about validation studies related to this theme. In the first part were included 20 studies and only one third defined nipple trauma, more than half did not define the nipple's injuries reported, and each author showed a particular way to assess the injuries, without consensus. In the second integrative review, no validation study or algorithm related to nipple trauma resulted from breastfeeding was found. This fact demonstrated that the nipple's injuries mentioned in the first review did not go through validation studies, justifying the lack of consensus identified as far as definition, classification and assessment methods of nipple trauma.

## DESCRIPTORS

Breast feeding  
Nipples  
Wounds and injuries  
Obstetrical nursing  
Review

## RESUMO

Este estudo teve como objetivo analisar o trauma mamilar decorrente da prática da amamentação sob o enfoque dermatológico. Duas revisões integrativas da literatura foram realizadas, uma relacionada a definições, classificações e método de avaliação dos traumas mamilares e outra sobre estudos de validação relacionados a essas temáticas. Na primeira foram incluídos 20 artigos e apenas um terço conceituou o trauma mamilar, mais da metade não definiu as lesões mamilares relatadas e cada autor demonstrou uma forma particular de avaliação das lesões, sem que houvesse consenso. Na segunda, nenhum estudo de validação ou algoritmo relacionado ao trauma mamilar decorrente da amamentação foi encontrado. Este achado demonstrou que as lesões citadas na primeira revisão não passaram por estudos de validação com especialistas, o que explica as discordâncias identificadas em relação à definição, classificação e métodos de avaliação dos traumas mamilares.

## DESCRITORES

Aleitamento materno  
Mamilos  
Ferimentos e lesões  
Enfermagem obstétrica  
Revisão

## RESUMEN

Este estudio tuvo como objetivo analizar las grietas del pezón causadas por el amantamiento bajo el enfoque dermatológico. Se realizaron dos revisiones integradoras de la literatura, una relacionada con definiciones, clasificaciones y métodos de evaluación de las lesiones en el pezón y otra sobre los estudios de validación relacionadas a esas temáticas. En la primera se incluyeron 20 artículos y sólo un tercio de los estudios definió el trauma del pezón, más de la mitad no definió las lesiones del pezón reportadas y cada autor demostró una forma particular de evaluación de las lesiones, sin consenso. En la segunda revisión, no se encontró ningún estudio de validación y algoritmo relacionado con lesiones en el pezón causadas por la lactancia materna. Este hecho demuestra que las lesiones del pezón mencionadas en la primera revisión no pasaron por los estudios de validación, explicando las inconsistencias identificadas en relación a los métodos de evaluación, definición y clasificación de lesiones en el pezón.

## DESCRIPTORES

Lactancia materna  
Pezones  
Heridas y traumatismos  
Enfermería obstétrica  
Revisión

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## INTRODUCTION

Nipple trauma is a common cause for the abandonment of breastfeeding, by causing pain and discomfort to postpartum women. It is estimated that between 80 and 96% of women experience some degree of pain in the first week after labor<sup>(1-3)</sup>. Among the associated factors identified in researches, we highlight primiparity, the absence of the partner, engorged and turgid breasts conditions, protruding and/or malformed and depigmented nipples, inadequate latch and positioning of the neonate<sup>(4-5)</sup>.

In the literature, different forms of definition, classification and evaluation are observed for nipple trauma. However, a dermatological approach to this injuries is still missing. For some scholars in dermatology<sup>(6)</sup>, knowing and understanding what are the injuries, conducting an assessment, understanding the causes and risk factors for their development allow the entire health team to implement effective prevention and treatment actions.

Even though it is not possible to prevent the occurrence of an injury, it is essential to understand the interventions that accelerate the healing process, reducing the risk of harm and complications. In this sense, the recognition and description of nipple trauma, as well as the use of an appropriate assessment instrument, either a scale or a score, need to be well defined, so that the diagnosis of injuries is effective and enable an appropriate intervention.

Given the above, the following questions arose: What are the existing definitions on nipple trauma? How are the injuries classified and assessed? Is there a consensus among authors about these issues? If so, is there validation studies?

Thus, this study aimed to analyze nipple trauma under a dermatological approach. To this end, two specific objectives were proposed: to analyze the publications available in the literature about definitions, classifications and methods for evaluation of nipple trauma and analyze validation studies related to nipple injuries from breastfeeding practice.

## METHOD

The integrative literature review was used as a methodological framework; the method allows simultaneous inclusion of quasi-experimental and experimental research, theoretical and empirical literature, providing a rich sample of studies and contributing to a more complete understanding of the topic of interest<sup>(7)</sup>.

For the development of this research, we conducted two integrative reviews: the first, called integrative review one (IR-1) and the second, integrative review two (IR-2), adopting six steps of development for each, such as: formulation of research question, selection of researches to compose the sample and definition of inclusion and exclusion criteria for the studies, definition of the information to be extracted from studies or data collection, evaluation

or analysis of the included studies, interpretation of results and presentation of the review. To guide the IR-1, we formulated the following research question: What are the definitions, classifications and assessments of nipple injuries from breastfeeding? For IR-2: Are there validation studies of nipple injuries from breastfeeding?

The search was conducted in Medline (Medical Literature Online), Lilacs (Literature Latin American and Caribbean Health Sciences), PMC (PubMed Central), EMBASE (Excerpta Medica Database) and SciVerse Scopus, between January 2010 and October 2012. Initially, no date or language restriction was used. In IR-1, the following terms and/or words were used, as described in the data of Chart 1.

**Chart 1** - Words and/or terms used in IR-1 - Sao Paulo, 2013

Database	Terms or words
MEDLINE	1. <i>nipples</i> [word] and <i>sore</i> [word] 2. <i>nipples</i> [word] and <i>trauma</i> [word] 3. <i>nipples</i> [word] and <i>pain</i> [word]
PUBMED Central	1. <i>nipples/injuries</i> [mesh term] 2. <i>nipples</i> [mesh term] and <i>pain</i> [mesh term] 3. <i>nipples</i> [mesh term] and <i>sore</i> [word] 4. <i>nipples/injuries</i> [mesh term] and (evaluation or classification or signs and symptoms [unitermo mesh] or treatment outcome [mesh term])
LILACS	1. <i>mamilos</i> [word] and <i>dor</i> [word] 2. <i>mamilos</i> [word] and <i>lesões</i> [word] 3. <i>mamilos</i> [word] and <i>trauma</i> [word]
EMBASE	1. <i>nipples</i> [word] and <i>pain</i> [word] and breast feeding [term] 2. <i>nipples/injuries</i> [term]
SciVerse Scopus	1. <i>nipples</i> [term/expanded] and <i>pain</i> [term/expanded] and breast feeding [term/expanded] 2. <i>nipples/injuries</i> [term/expanded]

In IR-2, the following words and/or terms were used as described in Chart 2.

**Chart 2** - Words and/or terms used in IR-2 - Sao Paulo, 2013

Database	Terms or words
MEDLINE	1. <i>validation studies</i> [publication type] and <i>injuries</i> [descriptor of subject] and <i>nipples</i> [word] 2. <i>reproducibility of results</i> [descriptor of subject] and <i>wounds</i> [word] and <i>nipples</i> [word] 3. <i>validation studies</i> [publication type] and <i>breast feeding</i> [word] 4. <i>validation studies as topic</i> [descriptor of subject] and <i>injuries</i> [descriptor of subject] and <i>nipples</i> [word]
PUBMED Central	1. <i>validation studies</i> [publication type] or <i>validation studies as Topic</i> [mesh term] and <i>lesions</i> [word] and <i>nipples</i> [word] 2. <i>validation studies</i> [publication type] and <i>lesions</i> [word] and <i>nipples</i> [word]
LILACS	1. <i>feridas</i> [word] and <i>confiabilidade</i> [word] and <i>mamilos</i> [word] 2. <i>reprodutibilidade dos testes</i> [descriptor de assunto] and <i>feridas</i> [word] and <i>mamilos</i> [word]

Inclusion criteria for the IR-1 were: primary studies and up to date articles, which presented in the title or abstract of the publication one or more of the following words: *trauma mamilar, lesão mamilar, fissura mamilar, dor mamilar, problemas na amamentação, dificuldades na amamentação, manejo clínico de problemas na amamentação ou avaliação da amamentação*. We considered the translations: *nipple trauma, nipple pain, sore nipple, wound nipple, fissures, cracked nipple, nipple damage, nipple injury, breastfeeding problems* and *breastfeeding management or measures*, considering the term *sore* which can be translated as lesion or pain in Portuguese. The studies selected presented the topic nipple injuries, in its classification or assessment forms.

Inclusion criteria for IR-2 were: primary studies, available in the databases searched, which presented in the title or abstract of the publication one or more words: *adaptação, validação, confiabilidade, reprodutibilidade, construção ou elaboração de escalas, lesões, ferida, mamilos*, and its translations: *adaptation, validation, reliability, development, lesions, wound e nipples*. We attempted to select studies that presented the adaptation of a validated tool or the elaboration and validation of a new instrument related to the topic nipple injury from the breastfeeding. In both reviews, articles could be in English, Spanish, German and Portuguese languages.

Exclusion criteria common to the two reviews were: lack of abstract, unavailability to recover studies from countries in Latin America and the Caribbean and publications type letter, point of views or response from authors.

The reading, translation and data collection of the included studies were performed using a previously developed instrument. After these steps, ordering, summarization and analysis of the results in a descriptive manner was performed, highlighting the most significant studies.

## RESULTS

### First integrative review (IR-1).

We identified 1.375 publications in IR-1. Removing duplicates and applying the selection criteria, 63 references

remained. Then, we proceeded to read the publications in full, resulting a final sample of 20 studies.

The selected studies were published between 1986 and 2013, with a predominance of 1997. The research question began to be answered in 1986 in England by Professor and physician Barrie Herd, followed by Professor and nurse Vera Vinha, in Brazil, in 1987.

Regarding the languages in which the researches were published, we found six references in Portuguese and 14 in English, with the studies origin countries, Brazil, United States of America, Canada, Italy, Iran, Germany, Australia and England. There was a predominance of studies produced in Brazil, followed by the United States of America and Canada, suggesting a national interest in the study of the subject of nipple trauma. In only one study, it was not possible to identify the country of origin of the publication.

The 20 studies included in the sample contained the following designs: retrospective and prospective cohort (2), descriptive exploratory (1), case-control (2), randomized clinical trial - double blind (10) experimental (2) and experience report (3).

Among the journals in which the studies were published, there was a predominance of the Journal of Human Lactation and the Journal of Obstetrics, Gynecologic and Neonatal Nursing (three studies); both international and which receive Nursing manuscripts. From national origin, articles were published in the *Revista da Escola de Enfermagem da USP, Acta Paulista de Enfermagem, Revista Brasileira de Enfermagem, Revista Femina* (one study) and the *Jornal de Pediatria* (two studies).

Regarding the academic background of the first author, Nursing was prevalent by performing the majority of studies (12), followed by medical area (6) and Nutrition (1). In one of the studies, it was not possible to identify the academic background of the first author. The Breastfeeding remains an area of Nursing action and the topic nipple trauma is increasingly studied by nurses in Brazil, the United States of America and Canada.

In Chart 3 the studies included in the sample of IR-1 are presented and the information presented on its definitions, classifications and assessment methods of nipple trauma.

**Chart 3** - Included studies in the sample and data presented on the nipple trauma - Sao Paulo, 2013

No	Included studies	Definition	Classification	Assessment method
E1	Chaves MEA, Araújo AR, Santos SF, Pinotti M, Oliveira LS. LED phototherapy improves healing of nipple trauma: a pilot study . Photomedicine and Laser Surgery. 2012; 30(3):172-78. <sup>(8)</sup>	Lesions characterized by disruption of the skin in the nipple-areola region.	Abrasion: are excoriation of the skin, occurs exposing a portion of the dermis. Cracked skin: superficial skin lesions with involvement of the epidermis. Fissure: slit-like lesion, with involvement to the upper dermis.	Clinical examination to assess the presence of nipple trauma and use of photographic image enlarged to calculate the area damaged by planimetry.

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No	Included studies	Definition	Classification	Assessment method
E2	Abou-Dakn M, Fluhr JW, Gensch M, Wöckel A Positive effect of HPA lanolin versus expressed breastmilk on painful and damaged nipples during lactation. <i>Skin Pharmacol Physiol.</i> 2011;24(1):27-35. <sup>(9)</sup>	Macroscopically detectable skin lesions.	Fissures, ulceration and erosion without reporting concept of injury.	Nipple trauma score (NTS): validated by interobserver agreement index of 0.88 in the Goodman's gamma test. 0- Nipple with no visible changes in the microscopic skin. 1-Presence of erythema or edema, or a combination of both. 2-Surface harm with or without crusting in smaller area of 25% of the surface of the nipple. 3- Surface harm with or without crusting in greater area of 25% of the surface of the nipple. 4 Partial-thickness injury with or without crusting less than 25% of the area of the nipple surface. 5-Partial-thickness injury with or without crust formation in an area greater than 25% of the nipple area.
E3	Coca KP, Gamba MA, Silva RS, Abrão ACFV. Fatores associados ao trauma mamilar na maternidade. <i>Jornal de Pediatria.</i> 2009;85(4):341-5. <sup>(4)</sup>	Any presence of injury or pathological change in the skin.	Fissures, excoriation, erosions, ecchymosis, marks and blisters, no concept of the lesions.	Clinical examination using a magnifying glass to evaluate the presence of nipple trauma.
E4	Coca KP, Gamba MA, Silva RS, Abrão ACFV. A posição de amamentar determina o aparecimento do trauma mamilar? <i>Revista da Escola de enfermagem da USP.</i> 2009; 43(2):446-52. <sup>(5)</sup>	Solution of continuity of the skin in the nipple-areola region.	Fissures, excoriation, erosions, vesicles and tear, no report of concept.	Clinical examination using a magnifying glass to evaluate the presence of nipple trauma.
E5	Coca KP, Abrão ACFV. Avaliação do efeito da lanolina na cicatrização dos traumas mamilares. <i>Acta Paul. Enferm.</i> 2008; 21(1): 11-16. <sup>(10)</sup>	Solution of continuity of the skin in the nipple-areola region.	Opted not to differentiate the various types of trauma.	Clinical examination, using magnifying glass and measurement of the lesion, after breastfeeding in centimeters, with tape measuring.
E6	Melli MS, Rashidi MR, Nokhoodchi A, Tagavi S, Farzadi L, Sadaghat K, Tahmasebi Z, Sheshvan MK. A randomized trial of peppermint gel, lanolin ointment, and placebo gel to prevent nipple crack in primiparous breastfeeding women. <i>Med Sci Monit.</i> 2007; 13(9):406-11. <sup>(11)</sup>	Presence of lesions in the nipple-areola region.	Mild nipple damage: 1-2 mm. Moderate nipple damage: 3-9 mm. Severe nipple damage, with or without yellow color visible nipple: greater than 10 mm.	Clinical examination and measurement of cracked skin injury width in millimeters.
E7	Shimoda GT, Silva IA, Santos JLF. Características, frequência e fatores presentes na ocorrência de lesão de mamilos em nutrízes. <i>Rev Bras Enferm.</i> 2005; 58(5):529-34. <sup>(12)</sup>	Not reported.	Not reported.	Clinical examination to assess the presence of nipple trauma.
E8	Weigert EML, Giugliani E RJ, França MCT, Oliveira LD, Bonilha A, Espírito Santo LC, Köhler CVF. Influência da técnica de amamentação nas frequências de aleitamento materno exclusivo e lesões mamilares no primeiro mês de lactação. <i>J Pediatr.</i> 2005; 81(4):310-6. <sup>(13)</sup>	Not reported.	Fissures, blister, ecchymosis and marks, no report of injuries of the concept.	Clinical examination to assess the presence of nipple injury.
E9	Dodd V, Chalmers C. Comparing the use of hydrogel dressings to lanolin ointment with lactating mothers. <i>J Obstet Gynecol Neonatal Nurs.</i> 2003;32(4):486-94. <sup>(14)</sup>	Not reported.	Not reported.	Phone call and evaluation as response of participants.

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No	Included studies	Definition	Classification	Assessment method
E10	Livingstone V, Stringer LJ. The treatment of staphylococcus infected sore nipples: a randomized comparative study. <i>J Hum Lact.</i> 1999; 15(3):241-46. <sup>(15)</sup>	When there is evidence of disruption in skin integrity.	Cracked skin, fissures and ulceration, no report of concept.	Scale 1-3 points: not reported the result of parametric test. 1 - No pain, intact skin surface. 2-Persistent pain, the injured surface with no signs of healing skin. 3-Persistence of pain, the injured skin surface with greater extent with purulent exudate.
E11	Centuori S, Burmaz T, Ronfani L, Fragiaco M, Quintero S, Pavan C, Davanzo R, Cattaneo A. Nipple care, sore nipples, and breastfeeding: a randomized trial. <i>J Hum Lact.</i> 1999; 15(2): 125-30. <sup>(16)</sup>	Presence of nipple or breast tissue lesions.	Erythema, edema, vesicles and fissures no report of concept.	Clinical examination to assess the presence of nipple injury.
E12	Brent N, Rudy SJ, Redd B, Rudy TE, Roth LA. Sore nipples in breast-feeding women: a clinical trial of wound dressings vs conventional care. <i>Arch Pediatr Adolesc Med.</i> 1998; 152(11):1077-82. <sup>(17)</sup>	Not reported.	Erythema, edema, crusting, ecchymosis peeling and blister, no report of concept.	Scale of zero to 2 points: did not report the result of the parametric test. 0 - no lesion; 1 - slight injury; 2 - severe injury. The size of the nipples and the lesions were measured in millimeters and photographed.
E13	Lavergne NA. Does application of tea bags to sore nipples while breastfeeding provide effective relief? <i>J Obstet Gynecol Neonatal Nurs.</i> 1997; 26(1):53-8. <sup>(18)</sup>	Not reported.	Not reported.	Phone call and evaluation as response of participants on the conditions of the nipple skin.
E14	Duffy EP, Percival P, Kershaw E. Positive effects of an antenatal group teaching session on postnatal nipple pain, nipple trauma and breast feeding rates. <i>Midwifery.</i> 1997; 13(4):189-96. <sup>(19)</sup>	Not reported.	Not reported.	Nipple Trauma Index (NTI) consisted of three parts, with a score of zero to 34, the highest score being the lowest nipple trauma. It was reported the result of parametric test. Part 1: provides information on the condition of the nipple. Part 2: provides data on the nipple secretion. Part 3: provides evaluation of the woman over her nipples.
E15	Cable B; Stewart M; Davis J Mt. Nipple wound care: a new approach to an old problem. <i>J Hum Lact.</i> 1997; 13(4):313-8. <sup>(20)</sup>	Not reported.	Not reported.	Location: the nipple-areolar junction on the side or end of the nipple or the areola as a clock hours (eg: 12 hours). Depth of the affected tissue: tissue involvement. Lesion size: length and width using a plastic instrument in millimeters or centimeters. Visible features: evaluated by redness, exudate (color, type and quantity), edema, epithelialization, and conditions of the skin around the lesion. Not visible characteristics: odor and pain assessment.
E16	Ziemer MM, Cooper DM, Pigeon JG. Evaluation of a dressing to reduce nipple pain and improve nipple skin condition in breastfeeding women. <i>Nurs Res.</i> 1995; 44 (6): 347-51. <sup>(21)</sup>	Not reported.	Edema, erythema, blister, white, yellow or dark marks, peeling, ecchymosis, crusting and fissures, no report of concept.	Lesions were evaluated by enlarged photographic image. For the evaluation of crusts was used to calculate area by planimetry. For erythema and fissures, 4-point scale: zero-none, 1 - mild, 2 - moderate and 3-severe. For other types of injury was evaluated by clinical examination of its presence or absence.
E17	Ziemer MM, Pigeon JG. Skin changes and pain in the nipple during the 1st week of lactation. <i>J Obstet Gynecol Neonatal Nurs.</i> 1993;22(3):247-56. <sup>(22)</sup>	Not reported.	Erythema, edema, fissures, blister, inflamed areas, crusting, peeling, ecchymosis, white, yellow or dark marks, no report of injuries concept.	Lesions were evaluated by enlarged photographic image.

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No	Included studies	Definition	Classification	Assessment method
E18	Walker M, Driscoll JW. Sore nipples: the new mother's nemesis. <i>MCN Am J Matern Child Nurs.</i> 1989;14(4):260-5. <sup>(23)</sup>	Not reported.	Sensitive nipples: strong pink color. Sore nipples: reddened skin, with or without bruising at the base of the nipple, burning sensation or throbbing pain. Nipple with altered integument: the presence of abrasion, blister, cracked skin, fissure and ecchymosis.	Not reported.
E19	Vinha VHP, Pelá NTR, Shimo AKK, Scochi CGS. Trauma mamilar: proposta de tratamento. <i>Femina.</i> 1987; 15 (5): 370-8. <sup>(24)</sup>	Not reported.	Adequate nipples: presenting complete and perfect structure. Fissured nipples: presenting linear, superficial ulceration with involvement of the dermis, located in the nipple-areola junction or on the surface of the nipple, being: small: measuring up to 3 mm; average: measuring up to 5 mm large: greater than 5 mm, bleeding can occur. Excoriated nipples: skinned surface or epidermis elevated. Nipples eroded: present surface wear.	Not reported.
E20	Herd B, Feeney JG. Two aerosol sprays in nipple trauma. <i>The Practitioner.</i> 1986; 230(1411):31-8. <sup>(25)</sup>	Not reported.	Not reported.	Scale 0-6 points: not reported the result of parametric test. Zero - normal nipple, 1 - light sensitivity with no visible signs of injury; 2 - redness and warmth; 3-bleeding; 4 - cracked skin; 5 with abscess.

## Second integrative review (IR-2)

In the IR-2, we identified 52 publications, but none was included, because it did not analyzed the researched topic. Most of the studies-related validation of scales or index on breastfeeding, as self-efficacy and confidence in breastfeeding, the risk of early weaning, breastfeeding assessment, evaluation of attachment during breastfeeding, evaluation of women on the support provided on breastfeeding, evaluation of oral-motor characteristics of preterm and validation of the diameter of the nipple and measures of tongue movement of the newborn.

One study<sup>(26)</sup> from a reference used in the first step of this research indicated to a research that developed a score for assessing cracked skin nipple during breastfeeding, but this was not identified in databases or archives in the journals publication or by searching other countries.

## DISCUSSION

### First integrative review (IR-1)

This review sought to identify in the studies definition, classification and assessment of nipple trauma and discuss them from a dermatological perspective, more specifically, of elementary skin lesions.

### Definition of nipple trauma

In only eight of the twenty publications<sup>(4-5,8-11,14-15)</sup>, nipple trauma was defined; the concepts presented were similar in terms of disruption, lesion and injury to seven authors<sup>(5,8-11,14-15)</sup>. One author<sup>(4)</sup> presented a broader definition of nipple trauma, referring to the pathological change of the skin. Thus, nipple trauma is considered as injuries type ecchymosis, blisters and marks. For a researcher<sup>(27)</sup>, pathological skin changes are vascular lesions, changing in color, texture and shape of the skin. From the dermatological approach<sup>(28-30)</sup>, lesions refer to color, contents (liquid, solid) and thickness changes.

In assistance to women with nipple trauma, it is highlighted the existence of injury of erythema type, particularly in the early breastfeeding, often accompanied by increased sensitivity of the nipple-areola region or acute pain. It is suggested so that the nipple trauma is considered to be ruled by an alteration of the normal anatomy of the nipple skin, as the presence of a primary skin lesion caused by the change in color, thickness or liquid contents and not only as a solution of continuity in the skin.

### Classification of nipple trauma

Studies of the sample described as nipple lesion: erythema, ecchymosis, white, yellow, or dark marks, bruising, edema, blister, vesicle, fissures, cracked skin, erosion, excoriation,

ulceration, abrasion, crusting and peeling<sup>(4-5,8-9,13,15-17,21-24)</sup>. It was observed the presence of similarities and discrepancies in the nomenclature of these lesions in 12 of the 20 publication of the sample. More than half of the studies (16) did not set the nipple injuries and there was disagreement as to the form of description of nipple damage and impairment of the injured tissue.

**Elementary primary skin lesions** were cited as erythema, ecchymosis, bruising, vesicle and blister<sup>(4-5,13,16-17,21-23)</sup>. According to scholars<sup>(28-31)</sup>, the lesion type erythema may exist among nipple trauma, with agreement for the presence of an alteration of the normal color of the skin of the nipple to pink or red. In clinical practice, there is an area of hyperemia without solution of continuity of the skin. In this sense, how to identify this type of injury, when does the normal color of the nipple go from pink to black? How to identify a lesion of red color in black skin? For the classification of nipple trauma, would not be necessary, besides the color, the addition of other morphological features of the lesion? Certainly, because when performing the clinical examination in black skin the coloration accents to dark red or purplish, being essential to exclude the presence of some kind of water volume.

The injury type ecchymosis may exist within the nipple trauma. However, the way it is described in the literature<sup>(28-31)</sup>, it could reach more than half of the nipple area, since its diameter is presented on average from 1.5 to 2.0 cm<sup>(32)</sup>. In clinical practice, ecchymosis is characterized by dermatology, as difficult to be identified.

Regarding injury type bruising, there is agreement on the presence of a blood collection, with increased injury<sup>(28-30)</sup>. However, what would be its appearance on the nipple surface? Can this type of injury be considered nipple injury resulting from breastfeeding? In clinical practice, this injury is more difficult to observe during breastfeeding.

For a group of researchers<sup>(28-30,33)</sup>, the vesicle can be conceptualized as an elevated lesion with liquid content and changing the shape of the skin, it may be of physiological skin color, white, yellow or crimson. In clinical practice, this type of injury is frequently observed between the nipples.

Regarding blisters, the way it is described in the literature<sup>(28-31)</sup>, it would reach more than half of the nipple area. It is believed that the authors may have used the sample word blister as a generic term and that injury would be displayed as vesicle by the mother, and not a blister, which was neither measured, nor conceptualized.

Regarding **elementary secondary skin lesions** were cited edema, cracked skin, fissure, erosion, excoriation and ulceration<sup>(4-5,8-9,13,15-17,21-25)</sup>. According to researchers<sup>(28-30)</sup>, edema type of injury is defined as the presence of change in skin, alteration of the consistency and color of the skin itself or pink. In clinical practice, it is observed

distended area of the skin without solution of continuity, with alteration of thickness and hardened of physiological skin color or pinkish, sometimes brilliant. Edema can be considered a result of nipple trauma of breastfeeding because besides being characterized as an elementary skin lesion, it is referred by researchers in breastfeeding and observed in clinical practice. In some women, their appearance is secondary to erythema, suggesting a progression of trauma severity.

With regard to injury type fissure, there is the presence of differences and similarities regarding the conceptualization, shape, affected tissue, size and location, when comparing the sample and literature studies. Fissure was defined in the studies as linear ulceration<sup>(24)</sup> and superficial lesion<sup>(27)</sup>. In a dermatological perspective, this is an elementary secondary skin lesion, but it is not an ulceration, because it does not reach deep tissue<sup>(28,30)</sup>. A reference in breastfeeding<sup>(31)</sup> classifies fissure as an erosion of partial thickness, a solution of continuity in the skin involving the destruction of the epidermis to the lower layer of the dermis. However, the European Pressure Ulcer Advisory Panel and the National Pressure Ulcer Advisory Panel recommended that the term erosion of partial thickness should not be used to describe skin fissures, maceration or ulceration, because it is primarily a categorization developed for pressure ulcers<sup>(34)</sup>.

In five of the studies selected<sup>(9,24,27-29)</sup>, fissure was defined as a solution of continuity with linear tissue loss or cleft type. But with respect to the affected tissue, a researcher in breastfeeding<sup>(27)</sup> claimed that in fissure, skin loss occurs; while to another research, the affected tissue may be epidermis and it may be the dermis<sup>(33)</sup>. Among others<sup>(8,24,28-29,31)</sup>, the tissues affected in fissure are the epidermis and dermis, the upper layer<sup>(8)</sup> or even lower layer of the dermis<sup>(31)</sup>. It appears, therefore, that there is lack of consensus regarding the cutaneous involvement of fissure, if it only affects the epidermis or epidermis and dermis.

In clinical practice, different sizes of fissures may be observed, however, it is difficult to define, upon inspection, the depth of the affected tissue. How to identify the loss of the epidermis, or even in a part of the dermis in nipple fissures if the skin in the mammary papilla is approximately 0.5 mm thick<sup>(35)</sup>? Thus, the clinical examination, even with a magnifying glass, there may be difficulty in identifying the tissue involvement.

Regarding the size of the fissures, a publication mentions three sizes of injuries<sup>(24)</sup>. In clinical practice, measurement of the lesion in millimeters can facilitate their evaluation, since the depth is difficult to identify.

Other characteristics of injury may contribute to the diagnosis of the depth of nipples fissure, such as: the presence of bleeding, exudation, pus, crusts and even pain, because bleeding, crusting or pus can indicate the involvement of the dermis<sup>(36-37)</sup>. It is observed that a

fissure starts by the involvement of superficial layers of the skin and in the maintenance of the causal factor or in the absence of adequate treatment, the lesion deepens, affecting other layers of the skin. Regarding the cracked skin mentioned in four studies<sup>(8,11,17,23)</sup>, it is believed that it had been used as synonymous of fissure, which is also found in clinical practice.

The erosion lesion type had its definition presented only by one study<sup>(24)</sup>, as a wear surface. In a dermatological approach, erosion is a solution of continuity in the skin, with involvement of the epidermis<sup>(28-29)</sup>. For excoriation lesion type, a similar definition was presented as erosion by the same study<sup>(24)</sup>, being excoriation a superficial skinned with involvement of the epidermis. It is noteworthy that the dermatological approach, the excoriation is a type of erosion caused by friction through itching<sup>(28-29)</sup>. In this sense, inadequate suction of the child could be considered a triggering friction excoriation?

No study has defined the type of ulceration lesions, however, it is known that this lesion is secondary or deeper<sup>(27-30)</sup>, it can affect the epidermis and dermis<sup>(27)</sup> or epidermis, dermis, sometimes, subcutaneous tissue and deep tissue<sup>(28-29)</sup>. In clinical practice, it is understood that the nipple injury due to inadequate suction of the newborn during breastfeeding is superficial, occurring its aggravation from the loss of dermis. For a researcher<sup>(27)</sup>, this lesion is the result of prolonged trauma and untreated fissures.

Other nipple injuries cited, but not identified in dermatological glossaries were white, yellow or dark marks. Indeed, it is not nipple injuries, but dermatological elementary skin lesion of stain or blemish type<sup>(28-29)</sup>. One must consider, however, if the *white mark* described by the studies sample<sup>(5,13,21-22)</sup> would not be a maceration and *dark marks*, a primary skin lesion of color change.

Two studies cited abrasion as a nipple injury, defining it as an excoriation of the skin with dermal exposure<sup>(8)</sup> and skin alteration<sup>(23)</sup>. However, abrasion is the process of wear (scrape or ulceration) of skin or mucous membranes by mechanical or chemical means<sup>(38)</sup>, being non-existent as a lesion, and inadequate acceptance as nipple injury. The excoriation caused by the abrasion is present in dermatological procedures such as dermabrasion or peeling<sup>(28-30)</sup>.

Three studies cited crust as nipple injury<sup>(17,21-22)</sup>, without defining it. In dermatology, the injured area which features a crust brings the clinical appearance of a lesion that is in the healing process, resulting in platelet aggregation and blood clotting which generated a rich fibrin cap and, later, with the dryness of this cap or clot, protects the injured area<sup>(36-37)</sup>. In this sense, the crust could not be considered a nipple injury, but their existence can be characterized as a process of physiological healing of an injury.

Three studies cited crust as nipple injury<sup>(17,21-22)</sup>, without defining it. For Dermatology, crust is a process

resulting from allergy causing injuries crust type<sup>(28-30)</sup>. In clinical practice, crust is not understood as a nipple injury, being caused by allergic processes or frequent use of loath bath brush in the nipples.

Among the concepts presented for each lesion, due to the different expertise of specialists in dermatology and breastfeeding, the comparison was difficult and inaccurate, as it can be observed with respect to fissures, erosion and excoriation. In this sense, a new classification of nipple trauma needs to be proposed based on the experience of breastfeeding and dermatological approaches. Thus, it is suggested that the nipple injuries are classified into primary and secondary, being the difference between them, the appearance of a continuity solution of the skin.

### **Assessment method of nipple trauma**

In 18 of the 20 publications of the sample were described different forms of evaluation of nipple trauma. Between resources and assessment methods, it was highlighted the use of measurement instruments (scales, indexes or scores), the measurement of the lesions, the clinical examination, the use of magnifiers glasses, using enlarged photographs and telephone calls.

With respect to the application of measurement instruments, seven publications used a previously developed instrument<sup>(9,15,17,19,21-22,25)</sup>; however, only one of the clinical studies<sup>(9)</sup> reported its validity by means of the interobserver agreement index.

In eight studies, it was conducted an evaluation of the presence of nipple injury by clinical examination<sup>(4-5,8-13,16,21)</sup>; in three, with the use of magnifying glasses<sup>(4-5,10)</sup>; and in four enlarged high resolution photographs<sup>(8,17,21-22)</sup>. Currently, the use of photography is a fundamental tool in daily dermatological practice, and it can be used from simple record of lesions in dermatological examination to the illustration of a treatment outcome. However, it is necessary to have knowledge of the basics of photographic technique, including the available equipment, notions of digital technology and the establishment of a photographic routine that includes the standardization of photographs. This ensures the clinical likelihood and avoids losses by the inadequacy of photographic documentation<sup>(39)</sup>.

One study<sup>(40)</sup> whose objective was to evaluate the correlation between dermatological diagnoses made by observation and digital images found through parametric tests that agreement with images was lower than the face to face agreement, noting that imaging cannot replace conventional medical consultation.

The clinical examination by direct inspection with magnifying glasses may be the best way to assess nipple trauma. Besides having low cost, it allows the diagnosis at the time of consultation. In the literature, there is no



guide for evaluation of nipple clinical examination, thus the training of health professionals allows the identification of items that characterize the condition of the nipple at the consultation time.

In two studies<sup>(14,18)</sup> phone calls were used to perform the assessment as the response of participants on the conditions of the nipple skin. It is understood that this method is based on the woman's answer to the lesion does not provide a reliable assessment, since the woman cannot get a good view of their nipple itself and she is not qualified to do so, which leads to the subjectivity of the data provided. However, this method of valuation can assist in monitoring this condition.

In six studies the measurement of the nipple trauma in different ways was carried out; in three, the extent of the lesions was measured with a measuring tape in millimeters<sup>(11,17)</sup> or centimeters<sup>(10)</sup>, in other three, the injured area was calculated by planimetry<sup>(8,21-22)</sup>.

One publication<sup>(20)</sup> described some evaluation criteria: location, depth of the affected tissue, size, visible features (redness, swelling or epithelium) and not visible (pain, odor) of the lesion and appearance of the surrounding tissue. Although this research is from 1997, it brought a perspective at the nipple injury with the aid of Dermatology, considering important the detailed description of the injury to its treatment, adding that the same physiological principles happen in any injury.

For one author<sup>(41)</sup>, assessing an injury is describing it, in a way that the records are reliable to their clinical characteristics. This assessment should be performed based on the normal anatomy of the skin and tissue and in the physiology of the healing process by specifying its size, the type of tissue, the characteristics of the injured skin, the amount and characteristics of the exudate and signs of infection. For some researchers<sup>(6)</sup>, during the healing process, some apparent morphological features of the lesion may indicate its evolution or aggravation.

Anyway, it is essential to diagnose the type of lesion found by appropriate dermatological evaluation. The literature is still scarce to demonstrate how a physical examination with nipple assessment or even the nipple injury, making its assessment particular and defined by the accumulated knowledge of every healthcare professional.

This first integrative review revealed several gaps to be answered, such as: How does the nipple trauma could be defined? What injuries would be classified as nipple trauma? How could we assess a nipple trauma?

Among the nipple injuries cited, a concern about standardization and identification of trauma from the standpoint of elementary primary or secondary skin lesions was not observed. The lack of a dermatological approach in the understanding of nipple trauma results in discrepancies in the definitions, classification and evaluation, so

that, in clinical practice, its diagnosis and treatment may be compromised.

## **Second integrative review (IR-2)**

Validation studies are essential for clinical practice, as they enable the accuracy of the observed phenomena. Specifically with regard to assessment tools, their usefulness in dermatology have been recognized. In clinical practice, it guides the prevention, diagnosis and treatment of injuries. For scientific research, an assessment tool improves and fosters communication among professionals of the healthcare team, it also enables professionals to achieve their intended objectives and, consequently, to evaluate the effect of an intervention<sup>(6)</sup>.

This second review was performed to identify publications on validation studies related to definitions, classifications and assessment methods described in the IR-1. As no study has been found, we can state that the nipple trauma resulted from breastfeeding did not appear as an object of study, thus identifying a gap in this topic. This finding reveals that the definitions, classifications and assessment methods of nipple injuries in researches identified in the IR-1 have not gone through validation studies, explaining the inconsistencies identified.

## **CONCLUSION**

There was no consensus between the definition, classification and assessment methods of nipple lesions in studies of the sample of IR-1. Similarly, in the IR-2, we noted that the content identified did not go through a validation process. The lack of a standardized algorithm for evaluating and classifying nipple trauma shows the need for the development and validation of a content that may define and classify nipple trauma, allowing specific and accurate assessment.

This fact can bring several clinical implications, since, while the bias persists, observing and evaluating a nipple trauma can lead to diverse and conflicting interpretations, because of the variety, nature, shape and location, beyond the perception of each professional, considering the difference of existing knowledge. Thus, the same skin lesion can be assessed differently, have different clinical records and conducts.

The definition and classification of nipple trauma, with dermatological lesions understanding, nipple tissue specificities and breastfeeding can provide health professionals a standardized common language, helping to advance knowledge of the injury, making specific treatment for a given injury and contributing to the education and processes of decision-making of professionals and students. This new classification will serve as a foundation for other clinical research involved with the scientific evidence of a treatment for nipple trauma, with protocols of preventative and treatment care and to the causative factor of each lesion development in nipple trauma.

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