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ORIGINAL

Proposal for an algorithm for identification of dermatopathies in the neonatal period

Propuesta de algoritmo para la identificación de dermatopatías en el período neonatal

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ABSTRACT

The study of dermatopathies in newborns is understood as skin diseases or affections that are observed and affect newborns and have a diversity in form and severity according to their presentations, which are caused by infectious, environmental and genetic factors, so it is important to know the characteristics for immediate attention and prevention.The aim of the study is to propose an algorithm for the identification of dermatopathies in the neonatal period based on the infrequency or evaluation carried out by pediatricians or dermatologists in hospitals in the Ica region. The method responds to holistic projective research of an applied type that corresponds to the mixed approach of the socio-critical paradigm; The study sample comprised clinical histories and expert doctors. For the first, observation sheets were taken with the validity of the content and, for the experts, interviews and focus groups that allowed the elaboration of the proposals. The results showed the specific theoretical characteristics (observable manifestations) for each dermatopathy. In addition, its use will allow the doctor or specialist to detect the neonatal dermatopathy for better follow-up. It is concluded that the proposal deals with a structure in which it presented clinical characteristics or manifestations of each of the dermatopathies with the purpose of being used by professionals for their location and registration.

Keywords: Skin Diseases; Neonatal Period; Algorithm; Dermatology.

RESUMEN

El estudio de las dermatopatías en el recién nacido se entiende como las enfermedades o afecciones de la piel que se observan y afectan a los recién nacidos y tienen una diversidad en forma y gravedad de acuerdo a sus presentaciones, las cuales son causadas por factores infecciosos, ambientales y genéticos, por lo que es importante conocer las características para su atención inmediata y prevención.El objetivo del estudio es proponer un algoritmo para la identificación de dermatopatías en el periodo neonatal basado en la infrecuencia o evaluación realizada por pediatras o dermatólogos en hospitales de la región Ica. El método responde a una investigación proyectiva holística de tipo aplicada que corresponde al enfoque mixto del paradigma sociocrítico; La muestra de estudio comprendió historias clínicas y médicos expertos. Para las primeras se tomaron fichas de observación con validez de contenido y, para los expertos, entrevistas y grupos focales que permitieron la elaboración de las propuestas. Los resultados mostraron las características teóricas específicas (manifestaciones observables) para cada dermatopatía. Además, su uso permitirá al médico o especialista detectar la dermatopatía neonatal para un mejor seguimiento. Se concluye que la propuesta trata de una estructura en la que presentó características clínicas o manifestaciones de cada una de las dermatopatías con el propósito de ser utilizada por los profesionales para su localización y registro.

Palabras clave: Enfermedades De La Piel; Periodo Neonatal; Algoritmo; Dermatología.

INTRODUCTION

The neonatal period is the first stage of life from birth to 28 days; the newborn is the main protagonist as it faces the adaptation from the intrauterine to the extrauterine environment. During this period, it is susceptible to various problems and pathologies, which it must overcome for its survival.[1] Dermatopathies, defined as skin conditions, are not alien to the problems of diagnosis and management in newborns;according to their distribution in daily practice during routine examination, these dermal lesions may be localised or generalised, as well as being of vascular or pigmented origin.[2]

Identification and diagnosis of dermatological problems in the newborn are very important to correlate with physiological adaptation situations and, above all, other associated local or systemic diseases that may alter their immediate normal homeostatic mechanisms or be a risk factor in their future growth and development.[1,2] In view of the above, and given the diversity of these skin conditions in the newborn, it is difficult to search for, recognise and diagnose them, making it necessary to propose an algorithm to guide medical and non-medical healthcare personnel in the identification of the most common dermatopathies in the newborn.

The term dermatopathy derives from two Greek roots: dermatos meaning skin and phatos meaning disease; therefore, it is defined as "skin disease" and, for this algorithm, the aspect referring to general involvement encompasses a series of manifestations such as lesions affecting the skin throughout the newborn's body. It developed the basics of general involvement dermatopathies below. The case of vernix caseosa is most frequently found in the newborn at term, and is clear.[1] The term lanugo is derived from the Latin lanugo composed of lana (wool, wool) and the suffix ugo (film, layer) (a). Although lanugo is a normal finding that is clear as a kind of fine hair present in most foetuses and newborns, the exaggerated presence of lanugo on the body surface could indicate an underlying pathology.[3,4]

Epidermolytic ichthyosis, a word derived from the Greek ichthýs = fish and osis referring to disease, is a condition, also known as ichthyosiform erythroderma or epidermolytic hyperkeratosis where the skin shows a scaly fishlike appearance with an area characterised by hyperkeratosis and vacuolar degeneration of the upper epidermis coupled with obvious skin fragility with blistering and erythroderma at birth. This results from an autosomal dominant disorder of keratinisation caused by mutations in KRT1 and KRT10.[5,6] Physiological desquamation appears as a superficial desquamation that is often limited to the upper and lower limbs and ankles during the first two days after birth or spreads in a progressive generalised manner; it may become generalised during the first two weeks of life and subside after this time.[7] Miliaria or eccrine miliaria, also known as sweat or heat rash, is a very common transient skin disorder in newborns who are very diaphoretic and live in warm and humid climates; an internal blockage of the eccrine gland duct, which determines the type of miliaria that will develop causes it.[8,9] Cases referred to as erythema toxiconeonatorum manifest a diverse pattern of lesions within which wheals, papules, erythema and pustules are seen; however, micro-pustules and papules of a yellowish colouring surrounded by an erythematous halo are often found. It has been associated as a reaction to meconium soaked skin or an allergic reaction to clothing that resolves within the first two weeks of life.[10]

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The term dermatopathy is derived from two Greek roots: dermatos meaning skin and phatos meaning disease; therefore, it is defined as "skin disease" and, for this algorithm, the general involvement aspect encompasses several manifestations such as lesions affecting the skin over its entire length on the newborn's body. The basics of general involvement dermatopathies are developed below. The case of vernix caseosa is most frequently found in the newborn at term and is evidenced by the following.[1] The term lanugo is etymologically derived from the Latin lanugo composed of lana (wool, wool) and the suffix ugo (film, layer) (a). Although lanugo is a normal finding that is clear as a kind of fine hair present in most foetuses and newborns, the exaggerated

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Involved dermatopathies are lesions that affect the skin to a limited extent only one or a few specific areas of the skin on the neonate's body. The various types are described below. Neonatal cephalic pustulosis is a benign skin eruption seen in 20 % of neonates from the third week, diagnosed as showing multiple inflammatory papule or pustule-like lesions with an absence of comedones and a distribution limited to the face, especially the cheeks, which is important for diagnosis in most cases.[12,13] Cases of milia and nappy rash manifest as whitish micro-papules whose aetiology is associated with retention of keratin and sebaceous material at the level of hair follicles, on the cheeks and nose, either (primary milia) or secondary to other processes (secondary milia); It must evaluate their distribution and quantity. Most of these lesions resolve in the first weeks of life.[14,15,16] Seborrhoeic dermatitis is a condition of non-pruritic accumulation of yellowish scaly areas that occur on the scalp, face and body folds. The exist of cradle cap is one of the first lesions within the first two weeks of life, showing the imminent development of seborrhoeic dermatitis. This lesion resolves within the first year of life.[17,18] Oral inclusion cysts, also called palatal cysts, are small, opaque, whitish-yellow, keratin-filled cysts (milia-like) next to the mid-palatine raphe and without mucous glands; present in the oral mucosa of almost 90 % of newborns. Epstein's pearls are the epithelial remnants of the dental follicle when found on the palate, and Bohn's nodules when found on the vestibular or lingual surfaces of the alveolar ridge. It resolves within a few months after birth.[19,20] The rare epidermal inclusion cyst occurring on the foreskin and ventral surface of the penis and scrotum with a size of 1 cm is called a raphe cyst, which is solitary, with the penile shaft being the most common location. Its diagnosis is clinical and, if in doubt, histopathological confirmation may be considered. Occasionally, it may increase in volume during infancy, causing surgical removal due to size or added infection.[21,22] Suction blisters are solitary epidermal inclusion cysts that appear on the foreskin and ventral surface of the penis and scrotum, with an approximate size of 1 cm; their diagnosis is clinical and if there is any doubt, histopathological confirmation rules it out.

Occasionally, it may increase in volume during infancy, leading to surgical removal due to size or added infection.[23,24] ***Aplasia cutis*** is a rare congenital dermatosis characterized by the localized or generalized absence of the epidermis, dermis and, sometimes, subcutaneous cellular tissue that manifests as a solitary lesion at the vertex of the scalp in 80 % of cases. Although most cases have a spontaneous resolution, there are lesions whose location and atypical clinical features should prompt further studies to find adjacent tissue abnormalities, which may have a fatal disease course.[25,26] ***Epidermal nevi*** are benign, hamartomatous skin growths that are present at birth in most cases or develop during early childhood. Initially, they appear as patchy, subtle, linear and/or thin plaques that can also be warty papules, colored or united, and of a brown or skin color. After a few years, around puberty, they darken and thicken. The management of this dermatopathy is complicated, so early diagnosis is important.[27,28] ***Nevus sebaceous***, also known as *Jadassohn's sebaceous nevus or organoid nevus*, is a type of benign skin hematoma located on the scalp. It presents as a plaque-like lesion with defined borders of oval, round or linear shape, thin thickness, yellow or orange coloration that overgrows during childhood or even puberty.[29]

The so-called **vascular dermatopathies** refer to lesions affecting the cutaneous blood vessels and are clinically manifested by inflammation, edema, erythema or necrosis in the affected skin area of the newborn's body (a) (b). These include the following. ***Salmon patch*** known as macular spot, stork bite or angel's kiss; it comprises single or multiple macular lesions or patches of reddish or light pink coloration. Such lesions occur in 50 % of neonates, on the eyelid, glabella and midline of the nape of the neck [4,6] and less frequently on the scalp, nose, lips and back. They regress within one to two years, although some lesions, especially those on the back of the neck, may persist for some years without showing significant improvement.[30,31] ***Cutis marmorata*** is a rare capillary malformation that is found at birth manifesting as a persistent erythematous lesion as macule-like lesions with a purple to dark red reticulated vascular pattern with telangiectatic areas and, in some, vein

prominence.[8,32] It can be focal, which is the most common form found in 60 % of children, or generalized. In most cases, the prognosis is good, with over 50 % of patients experiencing a clinical improvement in the first years of life.[33] ***Port-wine stain or nevus flammeus*** is the second most common congenital vascular malformation in a diverse location; but it manifests unilaterally or segmentally respecting the midline.[34] Clinically, a deep red to purple patch-like lesion is observed due to ectatic capillaries and venules in the dermis. *Nevus flammeus* does not involute over the years, and grows proportionally with the child, resulting in progressive darkening and becoming hypertrophic or nodular if untreated.[35] Rare benign vascular tumors that are present and fully developed at birth correspond to a **congenital hemangioma** that clinically present as plaques with protrusions or exophytic masses of varied coloration such as purple, red and even pale red, on the head, neck or extremities. Few cases require treatment and are aesthetic.[2] **Nevus anemicus** is a vascular birthmark, which may become more prominent on age. Clinically, a hypopigmented patch-like lesion is observed that scratching or direct stimulation does not alter. Its association has been described in patients with neurofibromatosis type 1 and tuberous sclerosis complex; therefore, its correct identification is crucial.[36,37] **Depigmented nevus**, also called *acromic nevus*, is a congenital hypomelanosis in which a serrated-edged, hypopigmented, serrated-bordered, stationary course lesion is seen in both sexes and in all races. In most cases, it does not require treatment, as it regresses.[38,39]

Pigmentary dermatopathies are lesions that affect the pigmentation and skin color of specific areas of the skin on the newborn's body. There are the following types. ***Mongolian spot*** is a congenital dermal melanocytosis of greater frequency in newborns that is located in the sacro-gluteal region, followed by the shoulders as a bluish-gray hyperpigmented patch with irregular edges, although it can also have a greenish-blue or brownish coloration; that between 6 to 10 years, most of it will have disappeared. There are marked ethnic differences in prevalence, as it is seen in about 90 % of Asian newborns, over 60 % of black neonates, over 50 % of Hispanic newborns and in less than 10 % of white neonates.[40] It is prudent to document such lesions at least at the initial physical examination, as this will help to avoid confusion with hematomas in case of suspected child abuse.[2,12,41] ***Transient hyperpigmentation*** corresponds to rare pigmented areas associated in their pathophysiology with intrauterine flexion or other induced stimulation. It is one of the benign transient dermatopathies of the newborn, reported in the literature. In neonates with darker skin coloration, hyperpigmentation has been observed on the genitalia, axillae, in a linear pattern on the lower hemiabdomen, on the nail bases and even around the areolas. It can also be expressed as horizontal hyperpigmented bands on the back, knees and abdominal folds.

Most cases involute within the first year of life, but it is believed that the statistics on its occurrence are not real, as it is under-reported because it is not correctly identified.[42,43] **Melanocytic nevi** are small to medium-sized, solitary, tan to black skin lesions with irregular borders, also known as common childhood skin moles. It is estimated that 1 to 3 % of newborns present these lesions, being the large or giant variant (larger than 20 cm) infrequent (1/20000 births). Therefore, they require periodic monitoring and regular skin surveillance to prevent potential complications.[44,45] Hyperpigmented macules that may be found at birth or that may appear during the infant stage are known as **café-au-lait spots** because of a light to dark brown coloration that have a multiple form of presentation and even grow in number and diameter with age, with the trunk and extremities being the most frequent sites of presentation.[12] Although solitary lesions are common in the population and are inherited as an autosomal dominant; multiple spots accompanied by other manifestations may show a possible underlying genetic disorder and require further evaluation.[46] The aim of the study is to propose an algorithm for the identification of dermatopathies in the neonatal period based on the infrequency or evaluation carried out by pediatricians or dermatologists in hospitals in the Ica region.

METHODS

The research corresponds to the mixed approach supported by the socio-critical paradigm of the holistic projective type that comprises four stages: 1) the diagnostic stage, 2) the substantiation of diagnostic results and elements of the proposal, 3) the design of the proposal and 4) the validity of the proposal of the theoretical algorithm for the identification of dermatopathies. The sample for the diagnostic stage was 1382 clinical histories of neonates; for this purpose, the data collection form was used, which was subjected to content validity by expert judgment. The results showed that the identification of dermatopathies in two hospitals is still scarce. The sample for the validity of the proposal was 4 specialists. The research is part of a research project which, as a procedure, was submitted to and approved by the ethics committee; likewise, for data collection, informed consent was requested.

Informed consent: the written informed consent used in the research was signed by the mothers of the neonates.

RESULTS AND DISCUSSION

From table 1, it was observed that 66,2 % of the neonates presented dermatopathies of general involvement;

20 %, local involvement; 11 %, vascular and 2,7 %, pigmentary in the regional hospital of Ica; while 52,8 % general involvement, 16,2 % local involvement, 28 % vascular and 2,5 % pigmentary in the Augusto Hernandez hospital. The identification of dermatopathies during the early neonatal period was observed more frequently in the regional hospital of Ica with 1098 cases, compared to 284 cases in the Augusto Hernandez hospital.

Table 1. Dermatopathies during the early neonatal period in the regional hospital of Ica and the Augusto Hernández hospital

Dermatopathies	Ica Regional Hospital		Augusto Hernández Hospital	
	Frequency	Porcentage	Frequency	Porcentage
General commitment	727	66,2 %	150	52,8 %
Local involvement	220	20,0 %	46	16,2 %
Vascular	121	11,0 %	81	28,5 %
Pigmented	30	2,7 %	7	2,5 %
Total	**1098**	**100,0 %**	**284**	**100,0 %**

Results of the proposed theoretical algorithm

The proposal deals with a structure in which the characteristics or clinical manifestations of each of the dermatopathies are presented in order to be used by professionals for their localization and registration (figure 1) .

Figure 1. Dermatopathies in neonates

In order to identify **dermatopathies of general involvement** during the early neonatal period, the fundamental characteristics of the semiological evaluation of each one of them are detailed below. To identify ***vernix caseosa***, a thick, white, viscous solution covering the newborn will be identified, which is required for diagnosis.[2] With ***lanugo***, it is required to identify fine, soft, unpigmented hair covering the newborn.[4] The identification of erythematous areas of generalized distribution with scaly areas, blisters and erosions in the folds of the newborn is necessary for the diagnosis of ***epidermolytic ichthyosis***.[6] Desquamation of a

localized or generalized type will allow diagnosis of ***physiologic desquamation*** of early neonates.[2] To diagnose ***miliaria***, papular and vesicular lesions in skin folds, upper trunk, neck and head should be clear.[9] In ***erythema toxicum***, papular and pustular lesions on a diffuse erythematous base should be identified.[11] (figure 2)

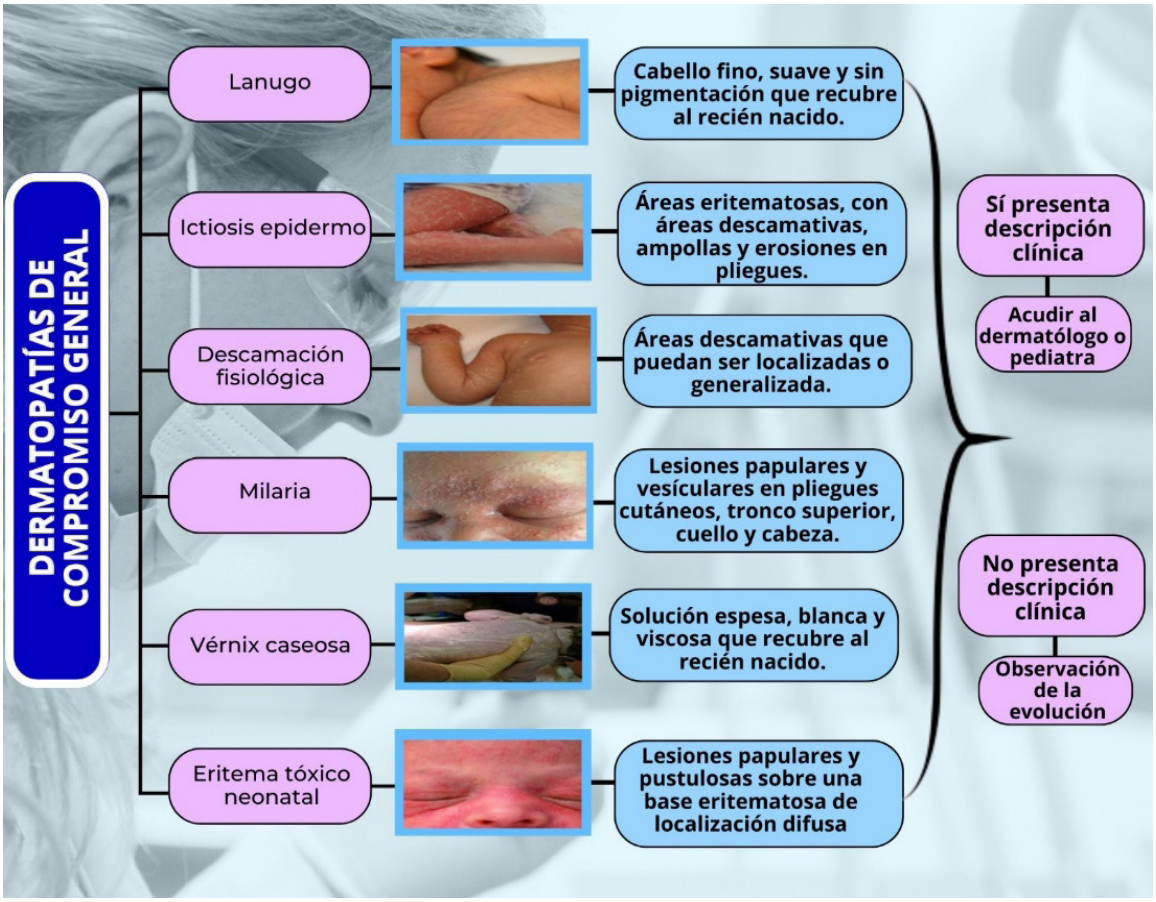

Figure 2. Identification of dermatopathies of general involvement

Identifying cases of ***dermatopathies with local involvement*** during the early neonatal period, the following manifestations should be taken into account. With ***cephalic pustulosis***, papular and pustular lesions on the face, especially the cheeks, should be identified.[13] Cases of ***milia*** can be diagnosed by the presence of white papular lesions with a thin border on the nose and cheeks.[8] Regarding ***diaper rash***, erythematous and scaly lesions in the diaper area is evidenced and the diagnosis can be made.[16] The diagnostic evaluation of ***seborrheic dermatitis*** manifests as a yellowish scaly crust-like lesion, adherent to the scalp.[18] Cases of ***oral inclusion cysts*** are diagnosed by small yellowish-white cyst-like lesions on the oral mucosa.[20] Cases of ***raphe cysts*** are manifested by small yellowish cyst-like lesions at the level of the foreskin, penis or scrotum.[22] The presence of oval-shaped erosions or vesicles or blisters on the wrists, hands or fingers are evidence for diagnosing cases of ***suction blisters***.[24] The diagnosis of an ***aplasia cutis*** manifests an ulcer-like lesion located on the scalp.[26] The diagnosis of ***epidermal nevus*** requires the presence of wart-like papular lesions that coalesce to form a skin-colored or brownish plaque.[28] ***Sebaceous nevus*** requires the presence of a raised orange-yellow plaque-like lesion with distinct borders located on the scalp.[30] (figure 3)

The following should be considered during the assessment for identification of ***vascular dermatopathies*** of general involvement during the early neonatal period. If patchy red and whitish-pink macule-like lesions with irregular borders in various locations are identified during the evaluation of the neonate, this is a case of ***salmon patch***.[32] In cases of ***cutis marmorata***, macular or papular lesions with a symmetrical reticular mottled pattern are clear on the skin of the extremities and trunk.[33] The exist of a unilateral purplish-red patchy papular macule-like lesion on the face would indicate a case of ***nevus flammeus***.[34] In order to diagnose ***congenital haemangioma***, a single bright red or bluish papular or nodule-like lesion of varying location must be identified.[4,8] with ***nevus anaemia***, a single hypopigmented macule-like lesion with irregular borders in a varied location should be assessed.[36,37] On the other hand, a case of ***depigmented nevus*** is diagnosed as positive if there is evidence of a single, serrated-edged, hypopigmented macule-like lesion of varied location.[39] (figure 4)

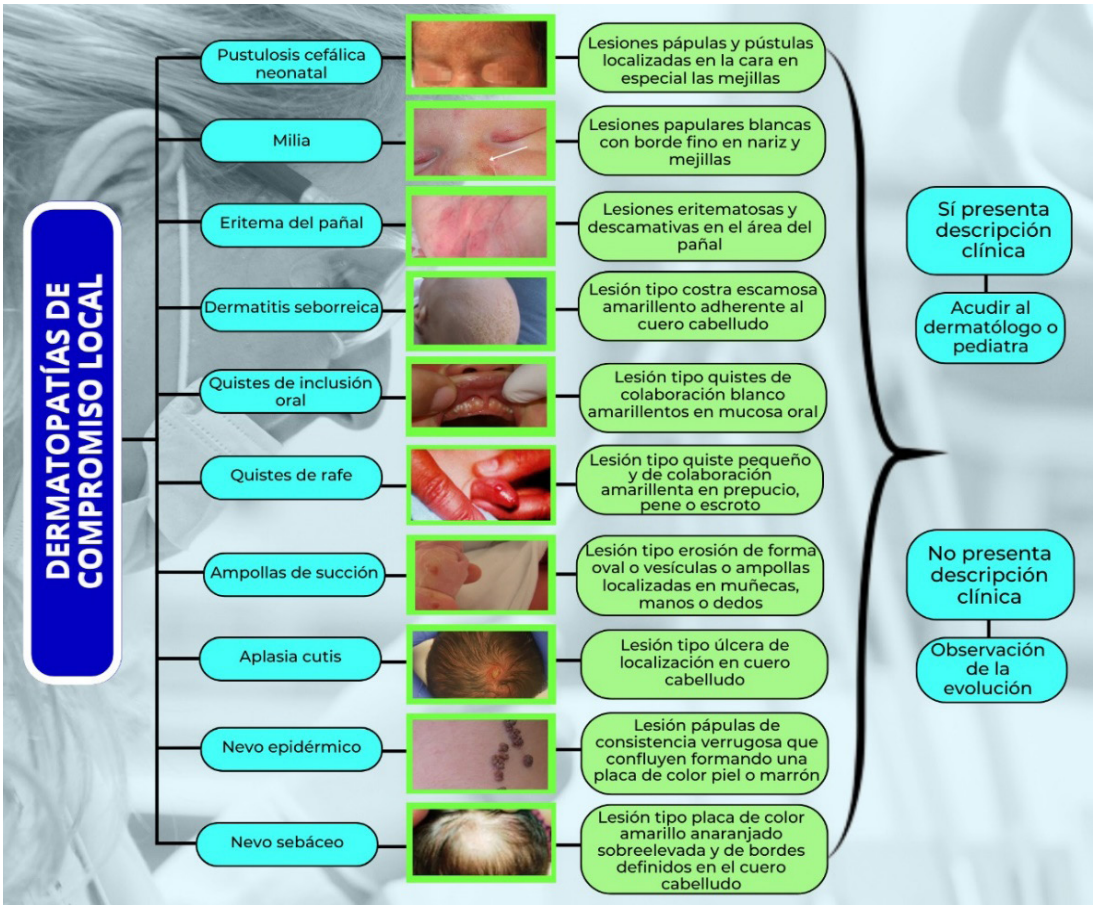

Figure 3. Identify locally involved dermatopathies

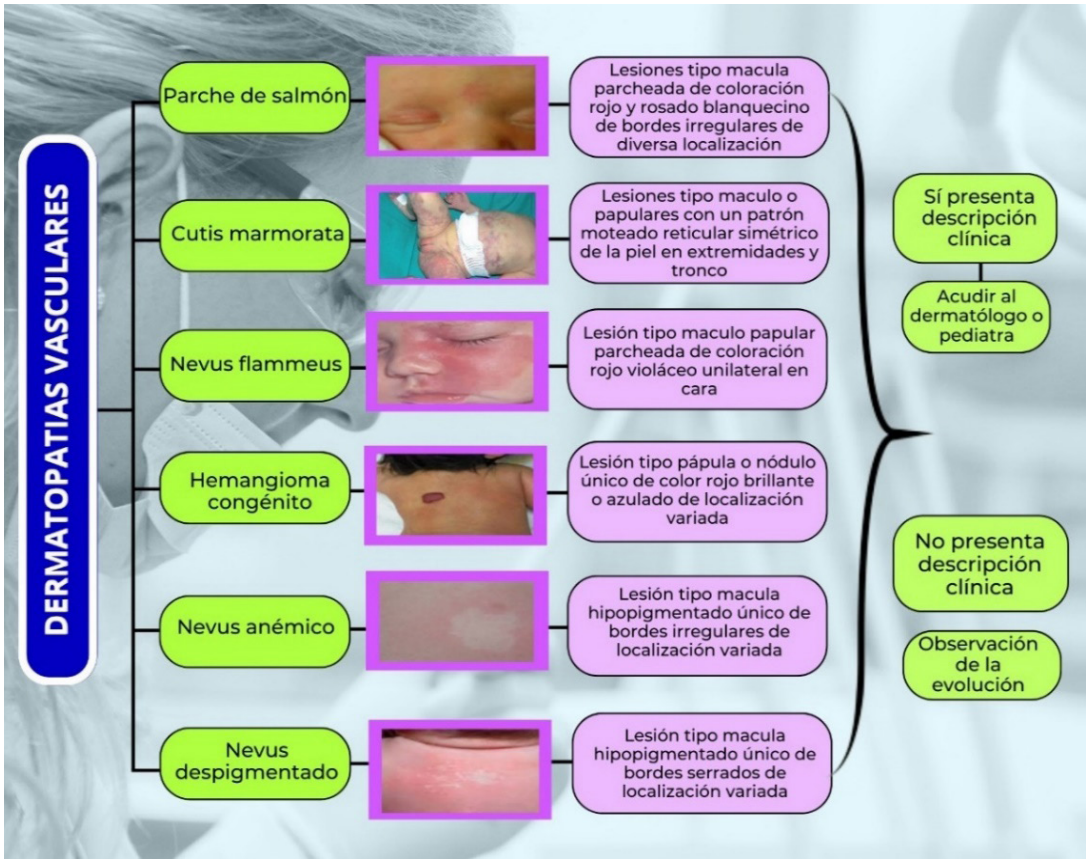

Figure 4. Identification of vascular dermatopathies

In the semiological evaluation of cases of ***pigmented dermatopathies*** during the early neonatal period, the following manifestations should be considered. In cases of ***Mongolian spot***, the presence of one or more hyperpigmented macular lesion(s) on the lumbar, sacral or lower buttock surface of dark grey, blue to blue-green colouring should be identified.[41] During the evaluation of a ***transient hyperpigmentation***, check for the presence of hyperpigmented macule-like lesions on the genitalia or fold lines.[43] In order to proceed with the diagnosis of ***melanocytic nevus***, a papular macule-like lesion, generally of large size, defined borders, rough surface and black or tan colouring in various locations, should be verified.[45] On the other hand, if the presence of one or multiple light brown macule-like lesions of various locations is identified, it would be a case of ***café-au-lait spots***.[47] (figure 5)

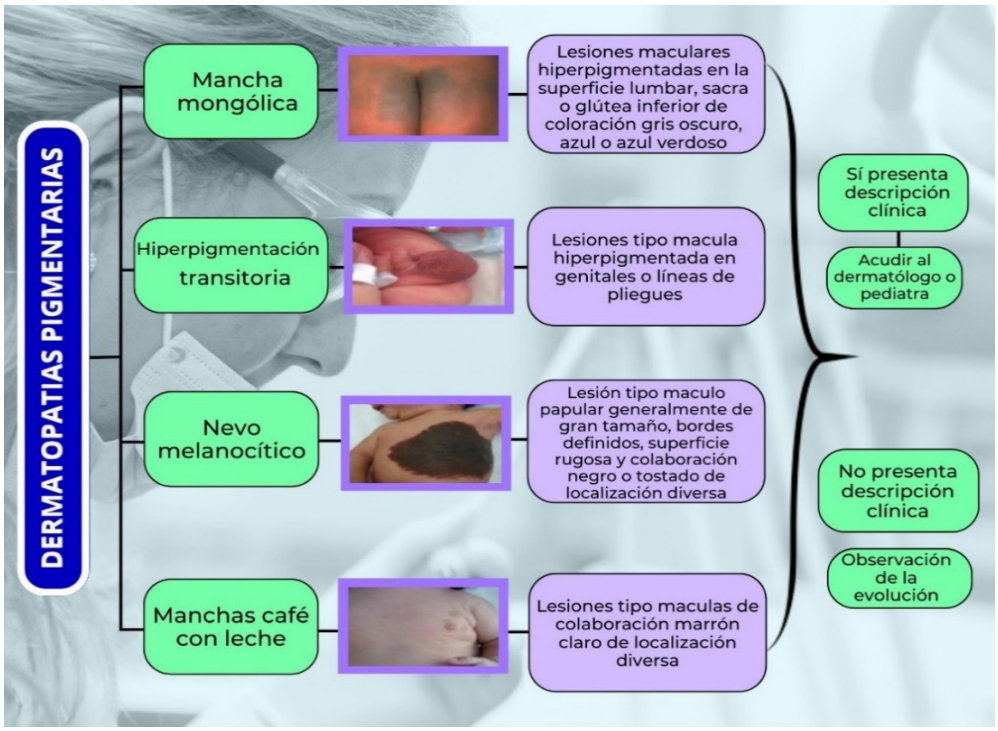

Figure 5. Identification of pigmented dermatopathies

It was observed that there was a greater predominance of neonates who presented dermatopathies of general involvement type in 66,2 %, followed by dermatopathies of local involvement type with 20,0 %, vascular with 11,0 % and pigmented with 2,7 %; similarly it was reported in several previously published studies, where Giuffrida et al, found that in 69,9 % of neonates there was a greater presence of these dermatopathies.[10] Another similar study reported by Ábrahám et al. also found a higher prevalence of these dermatoses in 60 % of the population studied.[18] The results obtained in comparison with previous studies, highlight and reinforce the need to establish a diagnostic algorithm that can help physicians to recognize the various dermatopathies seen during the neonatal period. On the other hand, previous studies found results different from those found in our study, such as the case of Techasatian et al, who found a higher prevalence of pigmented dermatopathies in 70,1 % of the population studied.[9] Another study is that of Krüger et al, who found a higher prevalence of dermatopathies of local involvement in 70 % of neonates.[8] Among previous national studies, the results are different from those found in our study, which found a greater predominance of pigmented dermatopathies in 90,1 % of the neonates studied.[48] Although other types of dermatopathies were found to be more prevalent, there is the presence of dermal pathologies considered in our algorithm; therefore, it will be important to apply this algorithm in future experimental studies and to be able to put our study into practice in order to demonstrate that it will be beneficial.

CONCLUSIONS

In the present study, according to the results got, the lack of identification and registration of dermatopathies is clear. We can conclude it is crucial to propose an algorithm for the identification of newborn dermatopathies in the neonatal period that will help us determine and diagnose dermatopathies in the newborn in a timely manner and, therefore, to manage and treat them in a timely and appropriate manner.

In view of the above, and considering that there are physiological and transitory dermatopathies such as lanugo, erythema toxicum, milia, etc., which do not pose a major risk to the newborn, early diagnosis would

help to educate parents and relatives about the behaviour and prognosis of these lesions, considering their benign nature.

There are other dermatopathies that behave like skin lesions, such as brown spots with milk, melanocytic nevus, large haemangiomas, etc., which have or may have some local or systemic repercussions in the future and alter the homeostasis of the skin and the growth and development of the child; therefore, early diagnosis would help to educate parents and relatives about the good, uncertain or bad behaviour and prognosis of these lesions.

Finally, we consider the need to apply an algorithm to identify and aid in the diagnosis of dermatopathies in the newborn, hoping in the future it will be applied in the neonatology services of our region; in this way, the present investigation will be the beginning of other similar algorithms according to the reality of each regional hospital centre.

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COMPETING INTERESTS

The authors declare they have no conflict of interest

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