PREVALENCE OF NEONATAL SKIN AND MUCOUS MEMBRANE FINDINGS AND ITS ASSOCIATION WITH MATERNAL-NEONATAL FACTORS

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ABSTRACT

Background & Objectives: *Neonatal skin findings are frequently seen ranging from physiological to pathological and they can be influenced by certain conditions. The purpose of this study was twofold: our first aim was to detect the prevalence of different neonatal skin findings in the neonatal period. The second aim was to record the effect of different maternal-neonatal factors on their prevalence.*

Patients and Methods: *A cross section study conducted from June 2016 to February 2017 in Ain Shams University Hospitals, Cairo, Egypt, on 380 hemodynamically stable preterm and full term and post term neonates, examined by one neonatologist and dermatologist from birth till 28 days of life with recording their maternal and neonatal clinical data as gestational age, birth weight, maternal diseases during pregnancy and mode of delivery.*

Results: *Prevalence of Neonatal Skin Findings was (85.8%).Physiological findings were the most common category (52.4%).The most common skin finding was milia (16.6%).Oral moniliasis were more prevalent in preterms. Erythema toxicum neonatorum and neonatal acne were more prevalent in full terms. Salmon patches were more frequent in females. Mongolian spots were more frequent in black race. There was significant association between maternal age and diseases and certain skin findings as diabetes mellitus, hypertension and cardiac diseases.*

Conclusion: *Neonatal Skin Findings are frequent & commonly physiological. They are influenced by different maternal-neonatal factors. Their Precise identification is crucial to avoid unneeded interventions & therapy e.g NICU admission, systemic and local antibiotics or other medications.*

Keywords: *Skin findings, neonates, physiological, milia, Erythema toxicum neonatorum, neonatal acne, Mongolian spot.*

INTRODUCTION

During the neonatal period, various cutaneous findings are commonly seen. In most instances, the commonly observed findings during the neonatal period are regarded as physiologic, benign and transient **(Khoshnevisasl et al., 2015)**. Some of them may have prognostic implications like congenital melanocytic nevi and some as epidermolysis bullosa needs a family planning and genetic consultation to have more healthcare measures for the child **(Moosavi and Hosseni, 2006)**. There are wide geographic and ethnic variations in the neonatal skin. Some skin lesions are common in darker skin races and vice versa **(Haveri and Inamadar, 2014)**.

The dermatologists rarely examine these skin conditions. However, it is very important to discover and identify them correctly to avoid worrying of parents, pediatricians and gynecologists as well as unnecessary or incorrect diagnostic or therapeutic procedures **(Solak et al., 2014)**.

Although many studies have recorded the incidence of the neonatal cutaneous lesions, the knowledge concerning their influencing factors are still quite little **(Abraham et al., 2017)**. Nevertheless, many factors as fetal, maternal and environmental can have an influence on the onset, type and development of the neonatal cutaneous conditions **(Firouzi et al., 2020)**.

To our knowledge, no earlier studies among Egyptian neonates have gone precisely through the variant maternal-neonatal factors affecting the prevalence of neonatal skin findings.

AIM OF THE STUDY

The purpose of the study was twofold: our first aim was to detect the prevalence of different neonatal skin findings in the neonatal period. The second aim was to record the effect of different maternal-neonatal factors on their prevalence.

Ethical consideration:

1. Written consent was obtained from the parents/care-givers before enrollment in the study.
2. This study was approved by the ethics committee of Faculty of Medicine of Ain Shams University (FWA000017585).
3. The patient caregiver has the right to quit the study.
4. Study results were confidential.
5. Authors declared no conflict of interest nor fund was granted for this study.

6. No financial support regarding the study or publications.

Sample size calculation:

A prevalence rate of cutaneous manifestations of 45% need a maximum sample size of 380 reaching up to 400 at 5% margin of error and 95% confidence interval.

PATIENTS AND METHODS

This study was a cross sectional randomized study conducted on a total of 380 neonates from June 2016 to February 2017 in Ain Shams University Hospitals, Cairo, Egypt.

Inclusion Criteria:

1. Full term, post term and preterm neonates.
2. Examined from birth till 28 days of life.
3. Hemodynamically stable to withstand thorough examination.

Exclusion Criteria:

1. Neonates with birth injuries
2. Neonatal jaundice and central cyanosis.

All included neonates were subjected to detailed perinatal and family history. The baby was fully undressed and examined in good white light – or day light if possible – to observe the entire skin surface, including palms, soles, nails, genitalia, scalp and oral cavity. Then accurate description of any skin finding morphology, site, size, color, or any other characteristic was recorded together with diagnosis of the finding based on the clinical impression; no skin biopsy was done.

Skin findings were examined by one neonatologist and diagnosis was confirmed by one dermatologist to avoid interpersonal variation in diagnosis. The diagnosis of skin findings was assigned to six categories: physiological, transient non-infective, infections, birth marks, developmental defects and other findings.

Statistical Analysis:

Data were analyzed using Statistical Program for Social Science (SPSS) version 20.0. Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage. The following tests were done:

Chi-square ($\chi 2$) test of significance was used in order to compare proportions between two qualitative parameters and Probability (P-value).

RESULTS

In our study we included 380 neonates from birth till age of 28 days with the neonatal & maternal socio-demographic data **(Table 1)**.

Table (1): Neonatal and maternal socio-demographic characteristics (n= 380)

Neonatal Data	n	(%)
Gestational age (weeks)		
Preterm	133	(35.0%)
Full term	242	(63.7%)
Post term	5	(1.3%)
Sex		
Female	168	(44.2%)
Male	212	(55.8%)
Weight (kg)		
ELBW	5	(1.3%)
VLBW	21	(5.5%)
LBW	55	(14.5%)
Normal birth weight	285	(75.0%)
LGA	14	(3.7%)
Mode of delivery		
NVD	104	(27.4%)
LSCS	276	(72.6%)
Race		
Black	9	(2.4%)
White	371	(97.6%)
General condition		
Good	313	(82.4%)
Ill	67	(17.6%)
Maternal age (years)		
<20 years	8	(2.1%)
20-24 years	198	(52.1 %)
25-29 years	93	(24.9%)
≥30 years	٨١	(21.3%)
Maternal diseases during pregnancy		
Negative	288	(75.8%)
Positive	92	(24.2%)
Maternal medications during pregnancy		
Negative	306	(80.5%)
Positive	74	(19.5%)

ELBW: extreme low birth weight, VLBW: very low birth weight; LBW: low birth weight, NVD: normal vaginal delivery, LSCS: lower segment caesarean section, LGA: large for gestation age..

Table (2): Prevalence of different skin and mucous membrane findings in the studied neonates (n= 380)

Skin Findings	N	%
Positive	326	85.8 %
Negative	54	14.2 %
Physiological Skin Findings	199	52.4 %
Milia	63	16.6%
Desquamation	39	10.3 %
Hypertrichosis	21	5.5 %
Sebaceous gland hyperplasia	21	5.5 %
Pigmentary Changes Due To Melanin		
Mongolian spot	45	16.8%
Hyperpigmentation	10	2.6 %
Transient Non-infective Findings	64	16.8 %
Neonatal acne	28	7.4%
Erythema toxicum neonatorum	20	5.3 %
Miliaria	9	2.4 %
Transient neonatal pustular melanosis	7	1.8 %
Infections	11	2.9 %
Fungal napkin dermatitis	7	1.8 %
Oral moniliasis	4	1.1 %
Birth Marks	61	16.1 %
Vascular birth marks		
Salmon patch	50	13.2%
Haemangioma	7	1.8 %
Port wine stain	1	0.3 %
Pigmentary birth marks		
Congenital melanocytic nevus	3	0.8 %
Developmental Defects	115	30.3%
Meningeomyelocele (Arnold Chiari malformation)	24	6.3 %
Omphalocele	15	3.9%
Cutis aplesia congenital	6	1.6%
Gastroschisis	4	1.1 %
Other developmental defects	4	1.1%
Cleft lip and palate	3	0.8%
Skin Dimple		
Sacral dimple	58	15.3 %
Cheek dimple	1	0.3 %
Others	47	12.4 %
Amniotic fluid band	6	1.6 %
Collodion ichthyosis	3	0.8 %
Harlequin ichthyosis	6	1.6 %
Ichthyosis vulgaris	3	0.8 %
Epidermolysis bullosa	3	0.8 %
Extravasation	3	0.8 %
Medical adhesive related skin injury (MARSI)	3	0.8 %
Petechiae	6	1.6 %
Purpura fulminans	3	0.8 %
Suckling blister	4	1.1 %
Rare conditions	7	1.8%

Table (2) revealed that the most prevalent skin findings physiological skin findings were followed by developmental

defects and transient non-infective findings, also salmon patches were the most frequent birth marks.

Table (3): Association between neonate's gestational age and skin and mucous membrane findings

	Preterm) (n=133)	**Term (n= 242)**	**Post term (n=5)**	**Chi-square test**	
	N(%)	**N(%)**	**N(%)**	**χ^2**	**p-value**
Negative	28 (21.1%)	25 (10.3%)	1 (20.0%)	8.233	0.016
Physiological Skin Findings					
Hypertrichosis	14 (10.5%)	6 (2.5%)	1 (20.0%)	12.678	0.002
Pigmentary Changes Due To Melanin					
Hyperpigmentation	0(0.0%)	8(3.3%)	2(40.0%)	31.273	<0.001
Transient Non-infective Findings					
Erythema toxicum neonatorum	2(1.5%)	18(7.4%)	0(0.0%)	6.343	0.042
Neonatal acne	0(0.0%)	28(11.6%)	0(0.0%)	17.237	<0.001
Infections					
Oral moniliasis	4(3.0%)	0(0.0%)	0(0.0%)	7.508	0.023
Birth Marks					
Vascular birth marks					
Salmon patch	13(9.8%)	37(15.3%)	0(0.0%)	3.052	0.217
Developmental Defects					
Gastroschisis	1(0.8%)	3(1.2%)	0(0.0%)	0.250	0.883
Omphalocele	5(3.8%)	10(4.1%)	0(0.0%)	0.240	0.887
Skin Dimple					
Cheek dimple	0(0.0%)	0(0.0%)	1(20.0%)	75.198	<0.001
Others					
Harlequin ichthyosis	5(3.8%)	4(1.7%)	0(0.0%)	6.265	0.044

(Table 3) recorded statistically significant correlation between gestational age and negative skin findings, oral moniliasis and harlequin ichthyosis, erythema toxicum neonatorum, neonatal acne , hypertrichosis, hyperpigmentation and cheek dimple.

Table (4): Association between neonate's birth weight and skin and mucous membrane Findings

	ELBW N=5	**VLBW N= 21**	**LBW N =55**	**Normal birth weight N = 285**	**LGA N = 14**	**Chi-square test**	
	N(%)	**N(%)**	**N(%)**	**N(%)**	**N(%)**	**χ^2**	**p-value**
Negative	1 (20.0%)	7 (33.3%)	10 (18.2%)	32 (11.2%)	4 (28.6%)	11.596	0.021
Physiological Skin Findings							
Desquamation	3 (60.0%)	2 (9.5%)	6 (10.9%)	24 (8.4%)	4 (28.6%)	19.613	<0.001
Hypertrichosis	1 (20.0%)	9 (42.9%)	6 (10.9%)	5 (1.8%)	0 (0.0%)	69.698	<0.001
Pigmentary Changes Due To Melanin							
Hyperpigmentation	0 (0.0%)	0(0.0%)	0(0.0%)	10(3.5%)	0(0.0%)	3.423	0.490
Mongolian spot	0 (0.0%)	3 (14.3%)	10 (18.2%)	31 (10.9%)	1 (7.1%)	3.460	0.484
Transient Non-infective Findings							
Neonatal acne	0 (0.0%)	0 (0.0%)	0 (0.0%)	28 (9.8%)	0 (0.0%)	10.076	0.039
Pigmentary birth mark							
Congenital melanocytic nevus	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (1.1%)	0 (0.0%)	1.008	0.909
Developmental Defects							
Skin Dimple							
Cheek dimple	0 (0.0%)	0 (0.0%)	0 (0.0%)	190.4%0	0 (0.0%)	0.334	0.987
Other							
Congenital vitiligo	1 (20.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	75.198	<0.001

ELBW: extremely low birth weight, LGA: Large for gestation, VLBW: very low birth weight.

Table (4) revealed statistically significant associations between birth weight and negative skin findings, desquamation, congenital vitiligo, hypertrichosis and neonatal acne.

Table (5): Association between maternal diseases and different skin findings in the studied neonates

	Negative maternal diseases (n= 288)	**Positive maternal diseases e.g DM, HTN, cardiac (n= 92)**	**Chi-square test**	
	N (%)	N (%)	χ^2	**p-value**
Negative	30 (10.4%)	24 (26.1%)	14.045	0.070
Physiological Skin Findings				
Desquamation	29 (10.1%)	10 (10.9%)	0.048	0.826
Hypertrichosis	15 (5.2%)	٦ (6.5%)	0.230	0.631
Milia	44 (15.3%)	19 (20.7%)	1.456	0.228
Sebaceous gland hyperplasia	11 (3.8%)	10 (10.9%)	6.638	0.010
Pigmentary Changes Due To Melanin				
Hyperpigmentation	10 (3.5%)	0 (0.0%)	3.281	0.070
Mongolian spot	24 (8.3%)	21 (22.8%)	14.028	<0.001
Transient Non-infective Conditions				
Erythema toxicum neonatorum	17 (5.9%)	3 (3.3%)	0.976	0.323
Miliaria	3 (1.0%)	6 (6.5%)	9.056	0.003
Neonatal acne	24 (8.3%)	4 (4.3%)	1.623	0.203
Transient neonatal pustular melanosis	7 (2.4%)	0 (0.0%)	2.278	0.131
Developmental Defects				
Gastroschisis	4 (1.4%)	0 (0.0%)	1.291	0.256
Omphalocele	15 (5.2%)	0 (0.0%)	4.989	0.026
Others				
Harlequin ichthyosis	6 (2.1%)	0 (0.0%)	1.947	0.163
Suckling blister	1 (0.3%)	3 (3.3%)	5.683	0.017

DM: diabetes mellitus, HTN :hypertension

Table (5) revealed statistically significant associations between the presence of maternal diseases and sebaceous gland hyperplasia Mongolian spot, miliaria and sucking blister.

DISCUSSION

Skin findings are commonly seen during the neonatal period ranging from transient physiological to grossly pathological findings (Reginatto etal., 2016).Several studies have been carried out to estimate the frequency of skin findings in newborns in several countries all over the world **(Abraham et al., 2017**, **Firouzi et al., 2020**, **Reginatto et al., 2016**, **Haveri and Inamadar, 2014**, **Budair et al., 2017)**.On the other hand, there were limited reports about prevalence of skin findings among Egyptian neonates including studies performed in Sohag & El-Sharkia Governorates **(El Moneim and El Dawela, 2012**, **Shehab et al., 2015)**.

The results of our study revealed that the prevalence of neonatal skin findings was 85.8% while earlier studies from other regions in Egypt showed lower prevalence of (74.6% & 40%) respectively **(El Moneim and El Dawela, 2012**, **Shehab et al., 2015)**. However, other studies from all over the world had conflicting results; where skin findings reported in German, Jordanian, Hungarian & Iranian neonates had lower prevalence than us (59.7%, 78%, 74.35% & 79.8) respectively, while prevalence in Indian and Australian neonates was higher (94.8% & 99.3%) respectively **(Lorenz et al., 2000**, **Al-Dahiyat, 2006**, **Abraham et al., 2017**, **Firouzi et al., 2020)**. This high prevalence variability among different regions in the world might be attributed to inherent individual differences or factors related to neonatal health, maternal health during pregnancy or seasonality **(Shehab et al., 2015)**.

In the current study, physiological skin findings were the most common category of neonatal skin findings. Milia were the most common among all skin findings. It was seen in 16.6% of all cases followed by mongolian spot (11.8%). Our results agreed with **Budair et al.** and **Firouzi et al.** where milia was the most common neonatal skin finding (45.2%) **(Budair et al., 2017**, **Firouzi et al., 2020)**, yet differing from **Shehab et al.** who reported that milia was observed only in (5.3%) of the studied neonates **(Shehab et al., 2015)**. On the other hand, mongolian spots were the most frequent skin findings in Iranian and Taiwanese neonates with a frequency of (71.3% & 61.6%) respectively **(Moosavi and Hosseini 2006**, **Shih 2007)**, and commonly present in Chinese neonates with frequency of (86.3%) **(Solak et al., 2015)**.

The second frequent category in our study was the developmental defects. The most detected developmental defects were sacral dimple, meningeomyelocele and omphalocele with prevalence of (15.3%, 6.3% & 3.9%) respectively, which were considered relatively high percentages in comparison to the majority of literatures, where in Turkey, **Ferahbas et al.** reported only one case of myelomeningocele (0.12%) in 816 newborns **(Ferahbas et al., 2009)**. In addition, we attributed this to maternal noncompliance for folic acid fortification and supplementation.

Moreover, the transient non-infective findings were the third frequent category of recorded skin findings. Neonatal acne was the most common finding in this category and was seen in (7.4%) of all cases followed by erythema toxicum neonatorum (5.3%) and transient pustular melanosis was the least common. On the contrary, **Shehab et al.** reported that transient non-infective findings were the most common category and were seen in 41% of all cases, papulopustular dermatoses was the most common transient findings and was detected in 30.3% of cases, with the following dermatoses mentioned in descending manner; miliaria and neonatal acne **(Al-Dahiyat 2006)**. However, **Firouzi et al.** recorded erythema toxicum as the second most common neonatal skin condition (37.3%) in Iranian neonates **(Firouzi et al., 2020)**. We attributed this difference to be related to different environmental, racial, neonatal or maternal factors.

The birth marks were the fourth frequent category in our research and salmon patches were the most frequent birth marks (13.2%) followed by haemangiomas and port wine stains. Agreeing with our study, in China, salmon patches were the most common birth marks, while port wine stains were the least **(Solak etal., 2015)**. Nonetheless many studies were conflicting across this issue, where **Firouzi et al.** recorded salmon patches as the third frequent neonatal cutaneous finding (37.3%) **(Firouzi et al., 2020)**. Others recorded higher incidence of birth marks in neonates **(Moosavi and Hosseini, 2006**, **Gokdemir et al., 2009**, **Sachdeva et al., 2002)**. On the other hand, vascular birth marks such as haemangiomas and port wine stains were the most common birth marks in German neonates with prevalence of (37.2%) **(Lorenz et al., 2000)**.

In the current study, infections were infrequent and were limited to oral moniliasis (1.1%) and fungal napkin dermatitis (1.8%). Comparably, **Ferahbas et al.,** reported incidence close to ours (2%) **(Ferahbas et al., 2009)**.

However, **Sachdeva et al., O'Connor et al.** and **Shehab et al.,** reported higher cases of oral candidiasis (3%,7% & 2% respectively) **(Sachdeva et al., 2006**, **O Connor et al., 2008**, **Shehab et al., 2015)**. Additionally, **Shehab et al.** considered napkin dermatitis and its related disorders as the third common category of Egyptian neonatal skin diseases (15.2%) **(Shehab et al., 2015)**. They attributed their results to financial reasons because mothers of studied newborns did not change nappies as frequently as required leading to prolong stool contact resulting in napkin rash. They also recorded that napkin dermatitis gave a significant relation with prematurity and seasons (more in summer and spring) **(Shehab et al., 2015)**.

Furthermore, in our neonates ichthyosis was presented in 3 forms collodion ichthyosis, harlequin ichthyosis and ichthyosis vulgaris and we e had higher prevalence of ichthyosis than other Egyptian reports **(El Moneim and El Dawela, 2012)**. Our higher percentage may be allocated to being tertiary hospital with multidisciplinary teams accepting complex cases referred from all over Egypt.

As regard racial relation with neonatal skin findings, there was significant association between the black race and desquamation, hypertrichosis, hyperpigmentation, mongolian spot, congenital melanocytic nevus, and cheek dimple with p= (<0.001, 0.027, <0.001, 0.002, <0.001, <0.001) respectively.

These results were coinciding with Brazilian study done by **Reginatto et al.** in which black newborns showed a higher prevalence of mongolian spot, skin desquamation in the extremities, genital hyperpigmentation and xerosis **(Reginatto et al., 2016)**. Additionally, earlier studies found that salmon patches and mongolian spots were the most common in non-white Asian and Arab neonates while congenital melanocytic nevus was common in white and European neonates **(Sachdeva et al., 2006**, **Moosavi and Hosseini, 2006)**.

Regarding the neonatal factors influencing skin findings, the majority of our skin findings were found in full term neonates and

this went hand in hand with **Asha et al. (Asha el., 2016)**. Negative skin findings, oral moniliasis and harlequin ichthyosis were more frequent in preterm neonates, while erythema toxicum neonatorum and neonatal acne were more frequent in full term neonates, and hypertrichosis, hyperpigmentation and cheek dimple were more frequent in post terms neonates. Similarly, in earlier studies erythema toxicum neonatorum were more prevalent in term gestation **(Firouzi et al., 2020)**.

Different theories explained the relation between gestational age and skin findings, one of them reported that the physical maturity of the skin was associated with appearance of certain skin findings which was partially agreeing with our results **(Cutrone and Perzutto, 2006)**.

Concerning the relation between baby gender and skin findings, salmon patch was more prevalent in female sex (16.7%) with (p = 0.042), while gastroschisis (1.9%) and omphalocele (5.7%) were more prevalent in male sex (p= 0.046 and 0.034) respectively. Nevertheless, **Firouzi et al.** recorded significant association of Mongolian spots with the male sex **(Firouzi etal., 2020)**, yet **Ferahbas et al.** and **Khoshnevisasl et al.** both found no association between Mongolian spots and baby gender, but they were linked to gestational age and hair color **(Ferahbas et al., 2009**, **Khoshnevisasl, et al., 2015)**. Moreover **Zagne and Fernandes** and **Behera et al.,** had significant association between male sex and milia **(Zagne and Fernandes, 2011**, **Behera et al., 2018)**. On the other hand, both **Gokdemir et al.** and **Jain et al.** recorded a significant association between female sex with milia **(Gokdemir et al., 2009**, **Jain et al., 2013)**. Additionally **Firouzi et al.,** and **Behera et al.,** found that erythema toxicum was more frequent in males **(Firouzi et al., 2020**, **Behera et al., 2018)**. On the contrary, **Budair et al.** didn't detect any association between skin findings and the baby gender **(Budair et al., 2017)**.

Furthermore, the present study revealed that desquamation and congenital vitiligo were more prevalent in extremely low birth weight, while hypertrichosis was more prevalent in very low birth weight. Additionally, neonatal acne was more prevalent in normal birth weight negative skin findings was more common in macrosomia. However, **Migoto et al.** reported that one of the risk factors associated with the incidence of skin findings was

birth weight ≤1500gm **(Migoto et al., 2013)**.

Regarding Maternal factors; Negative skin findings, neonatal acne and transient neonatal pustular melanosis were more common in maternal age (<20 years) with p = (0.002, 0.039, 0.05) consequently. Interestingly, **Firouzi et al.** revealed no significant association between skin findings and maternal age, yet in another Iranian study maternal age seemed to be the only element significantly associated with salmon patch **(Firouzi et al., 2020)**.

Besides this **Abraham et al.** found significant association between the six neonatal & maternal factors they examined: baby gender, gestational age and neonatal birth weight; maternal age, the maternal previous pregnancies number, and mode of the delivery and neonatal skin findings **(Abraham et al., 2017)**.

Moreover, our results emphasized significant associations between sebaceous gland hyperplasia and maternal Diabetes mellitus (28.6%), hypertension (28.6%) and oligohydraminos with p = (0.002, 0.015, <0.001) consequently. Mongolian spot was significantly associated with maternal hypothyroidism (2.2%) B thalassemia major (2.2%), polyhydraminos (4.4%), hypotension (2.2%), cardiac diseases (6.7%) and rheumatoid arthritis (2.2%) with p = (0.006, 0.006, 0.018, 0.006, <0.001, 0.006) consequently. Miliaria was significantly associated with maternal diabetes mellitus (66.7%) p = (<0.001).Sucking blister was significantly associated with maternal diabetes mellitus and cardiac diseases (75%) p = (<0.001).

According to **Boccardi et al.** this might be attributed to medication use during pregnancy **(Boccardi et al., 2007)**. Additionally, suckling blister was more prevalent in diabetes mellitus and cardiac diseases. In agreement with our study, Al-Hakeem reported that neonates of poorly controlled diabetic mothers or having cardiac disease seemed to have multiple complications like skin diseases including suckling blisters and other serious complications **(AL-Hakeem, 2006)**.

Regarding mode of delivery, two hundred and seventy six neonates (72.63%) were delivered by lower segment cesarean section (LSCS) and 104 neonates (27.36%) were delivered by normal vaginal delivery (NVD). Negative Skin findings were

reported in 12.5% in NVD group and 14.9% in LSCS group (p = 0.558).We detected significant associations between NVD and hyperpigmentation (7.7%), neonatal acne (13.5%) & sacral dimple (21.2%) with p = (<0.001, 0.005 &0.050) consequently. Also significant associations between LSCS and hypertrichosis (7.2%) and sebaceous gland hyperplasia (7.2%) with p = (0.017 & 0.017).

Since majority of our neonates were delivered by LSCS, therefore this could be the reason behind reporting less frequent skin findings in NVD group.

Conversely, **Fairouzi et al.** had 80 % of their neonates delivered by NVD and 20% by LSCS and they reported higher frequency of cutaneous lesions among neonates delivered by NVD than those by LSCS. They assumed this could be due to higher gestational age and mechanical trauma during delivery **(Firouzi etal., 2020)**. On the contrary, **Budair et al.** and **Gokdemir et al.,** showed no association between skin findings and the mode of delivery **(Budair et al., 2017**, **Gokdemir et al., 2009)**.

CONCLUSION

In conclusion, we emphasized that neonatal skin findings were frequent and variant with Prevalence of 85.8%. The most frequent skin findings categories recorded in descending manner were; physiological (52.3%), developmental defects, transient non-infective and birth marks. The most common skin findings among all neonates were milia, sacral dimple and salmon patches. Maternal-neonatal factors seemed to influence the different neonatal skin conditions.

With this study we intended to increase the awareness of the various neonatal skin findings among the pediatricians to enable them to treat or reassure the parents and avoid any unneeded interventions and therapy. However, further studies were required to study larger sample size in different regions in Egypt with recording more influencing factors.

LIMITATION OF THE STUDY

No investigative parameters were applied whether dermatological investigations as skin scraping and microscopic examination of the findings or other blood laboratory tests as immunological and genetic studies.

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Authors Contributions:

All authors contributed equally in this article.

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