Evaluation of Preterm Infant (Risk factors and short-term complications) At Al-Bayda Medical Center AMC – Libya

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Abstract:

Infants are considered as premature or preterm when they are born before 37 weeks. The prematurity is one of the major health problems and the leading cause of neonatal mortality. This study aimed to determine the risk factors of prematurity and it is effect on mortality and morbidity. The research is a prospective study was conducted over one year period from July 2018 to July 2019, at neonatal care unit (NCU) in Al-Bayda medical center-Libya, the study included premature admitted patient (50 patients) who were randomly selected during this period. Results revealed that 64% of patients were males, while the rest were females (36%). The normal vaginal delivery mode represented 68 % of the cases while 32 % of infants were delivered by cesarean section. With 38 (76%) of single birth and 12 (24%) multiple births. Forty percent had body weight less than 1.5 kg. Multiple pregnancies were seen in 24% of patient, congenital anomalies were observed in 18% of cases. The most common complications were neonatal jaundice 92% followed by respiratory distress 90%, hypoglycemia in 54% and 40% of preterm infants had sepsis .The most common associated maternal risk were urinary tract infection (UTI), premature rupture of membrane (PROM), passive smoker, stressful life style, anemia, family history of preterm labour and preeclampsia (PET) (82%, 62%, 56%, 52%, 36%, 28% and 24%) respectively. Deaths constituted 42.8% of admitted premature infants with observed differences in the mortality with respect to risk factors were statistically significant to

the patients weight (p=0.017). The preterm infants remain vulnerable to many early complications including neonatal jaundice, respiratory distress, hypoglycemia and sepsis. It is important to raise public and professional awareness of the problems related to prematurity. An interdisciplinary team involving pediatrician and an obstetrician is important for counseling mothers who have a need for premature delivery. Delaying infant delivery until at least 38 weeks of gestation is recommended in order to reduce the risk of neonatal morbidity and mortality.

Keywords: Preterm infant, Risk factors, Short term complications, Libya, Al-Bayda.

تقييم الطفل الخديج (عوامل الخطر و المضاعفات المبكرة) بمركز البيضاء الطبي – ليبيا

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الملخص:

تهدف هذه الدراسة إلى تحديد عوامل الخطر للولادة المبكرة وتأثيرها على الوفيات، وقد أعدت هده الدراسة في قسم حديثي الولادة بمركز البيضاء الطبي (البيضاء – ليبيا). كانت الدراسة تحليلية وصفية عشوائية تتضمن الأطفال الخدج خلال فترة دخولهم في قسم حديثي الولادة في مركز البيضاء الطبي من عام 2018 –2019 اشتملت الدراسة على مرضي تم قبولهم قبل الأوان تم اختيارهم عشوائيا (عدد = 50) في هذه الفترة. وقد نتجت هده الدراسة عما يلي: كان عدد الذكور 32بنسبة (64%) و الإناث 18 بنسبة (36%) ،منهم 32% ولادة قيصرية، حمل متعدد 24% ، 40% وزن الجنين أقل من 1.5 كيلوجرام ،وقد كانت نسبة التشوهات في العينة 18%. الاستنتاجات: أكثر أسباب الدخول اليرقان الوليدي 92% وتليه الضائقة التنفسية 90% وهبوط السكر 54% وتعفن الدم 40%. وكانت أكثر

عوامل الخطر المصاحبة للولادة المبكرة هي التهاب المسالك للأم بنسبة 82% ، التدخين السلبي بنسبة 56% ، أنيميا الأم بنسبة 36% ، ضغط الدم بنسبة 24%. وقد كان معدل الوفيات بين الأطفال الخدج 42.8% وتوجد علاقة إحصائية دالة بين معدل الوفيات ووزن المريض 0.017. يظل الطفل الخديج عرضة للعديد من المضاعفات بما في ذلك اليرقان والضائقة التنفسية وهبوط السكر وتعفن الدم. حيث يمكن الوقاية من معظم هذه المسببات من خلال المتابعة المنتظمة والدقيقة أثناء وبعد الحمل من خلال فريق يضم كلا من طبيب التوليد وطبيب الأطفال وذلك لتقديم الاستشارات الطبية اللازمة، تأخير الولادة إلى ما بعد الأسبوع الثامن والثلاثون من الحمل وذلك لتقليل خطر الإصابة بمضاعفات الولادة المبكرة.

الكلمات المفتاحية: الخدج، عوامل الخطورة، المضاعفات المبكرة، البيضاء، ليبيا.

Introduction

Infants who are born before complete 37 weeks of gestation are called preterm (PT) according to the world health organization WHO; every year many preterm babies are born, recent studies estimated that the worldwide annual rate was reduced at 0.14%, and the evidence showed that an estimated 13.4 million preterm neonates were born globally in 2020 [1,2]. A precise mechanism to preterm birth is not clear in most cases [3]; multiple risk factors have been associated with prematurity including environmental factors as life style, demographic risk factors, antenatal risk factors, maternal illness, - previous history of preterm birth, age below 18 or over 40, malnourishment, low socioeconomic status, short inter-pregnancy gap, African American ethnicity, psychological stress, and tobacco smoke in vitro fertilization, uterine malformation, abnormal placentation, antepartum hemorrhage, premature rupture of membrane, systemic and intrauterine infection in addition to maternal disorders as hypertension, thyroid, and diabetes which are also important risks [3,4].

Prematurity is a major leading cause for under five years' morbidity and mortality, PT babies are at greater risk for a variety of health and developmental problems including acute respiratory, central nervous system, gastrointestinal, hematologic, immunologic

problems, as well as long term cognitive, motor, visual, hearing, behavioral and growth complications, with substantial psychological, medical, social and economic impacts [5, 6].

In this study, the UTI, PROM, passive smoker, stressful life style, anemia, family history of preterm labour and preeclampsia were identified as determinants of preterm birth; whereas the neonatal jaundice, respiratory distress, hypoglycemia and sepsis were the main early complications. It is important to raise awareness regarding the problems related to prematurity. Delaying infant delivery until at least 38 weeks of gestation is recommended in order to reduce the risk of neonatal morbidity.

Methods and patients:

This - prospective study was conducted at neonatal care unit in Al-Bayda medical center, included 50 preterm neonates delivered at AMC in the period from July 2018 to July 2019. NCU is a part of pediatric department at AMC, which contains 18 incubator connected to central oxygen supply and 15 baby cot , 3 mechanical ventilators, 5 CPAP machines, 6 phototherapy machines, 6 monitor machines for monitoring of vital sign, one cylindrical phototherapy, 2 radiant wormer. The neonatal care unit is stuffed by one resident doctor on duty and two nurses; it is attached to obstetric and labor rooms and received the admission from these wards and from outpatient clinic. The collected data were statistically analyzed using the statistical package for the social science software (SPSS). Independent sample t test, chi square test was used to compare between two groups. Qualitative data was presented as number and percentage, statistical significance was considered at $p < 0.05$.

Results:

A total of 50 premature infants were admitted to NCU; among of them, 32 (64%) were males, and 18 (36%) were female; as regard the mode of delivery 34 (68%) were delivered by normal vaginal delivery and 16 (32%) delivered by cesarean section. Of total 38 (76%) were single birth, and 12 (24%) were multiple birth.

Data distribution according to gestational age (GA) were 18 (36%) of the babies between 34-36 weeks gestation, 18 (36%) of the babies were between 32-34 weeks gestation and 14 (28%) less than 32 weeks gestation as shown in Figure 1.

The results of early preterm complications in the studied cases were neonatal jaundice complicate 46 (92%) of cases, followed by respiratory distress 45 (90%), neonatal hypoglycemia 27 (54%), and sepsis in 20 (40%) preterm infants .

The total number of cases with congenital anomalies were 9 (18%), six (66.7%) of them with birth weight less than 2.5 kg and three cases were (33.3%) less than 1.5 kg, were as five of cases delivered with gestational age between 34-36 weeks and three cases (33.3%) between 32-34 weeks and one case (11.1%) less than 32 weeks.
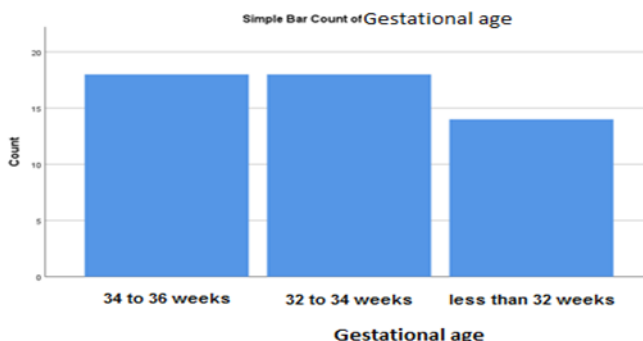

Figure 1. Data distribution according to the gestational age.

The results showed that the commonest maternal risk factor for preterm birth was urinary tract infection (UTI) 41 (82%), followed by PROM in 31 (62%) of cases, passive smoking 28 (56%), stressful life style 26 (52%), anemia 18 (36%), family history of preterm labour 14 (28%), preeclampsia 12 (24%), pregnancy induced hypertension PIH 9 (18%), polyhydramnios 9 (18%), essential hypertension 4 (8%) and lastly diabetes 2 (4%) as showed in Table 1.

Table 1. Percentage and number of different maternal risk factors in the studied group (N=50)

Maternal risk factor	Number	Percentage
Maternal urinary tract infection	41	82%
PROM	31	62%
Passive smoking	28	56%
Stressful life style	26	52%
Maternal anemia	18	36%
Family history of preterm labor	14	28%
Preeclampsia	12	24%
PIH	9	18%
Polyhydraminous	9	18%
Essential hypertension	4	8%
Maternal diabetes	2	4%

PROM: premature rupture of membrane, PIH: pregnancy induced hypertension.

Figure 2 shows the distribution according to the weight of preterm infants at birth, 28 (56%) were less than 2.5 kg, 20 (40%) of them were less than 1.5 kg and 2 (4%) were less than 1 kg.
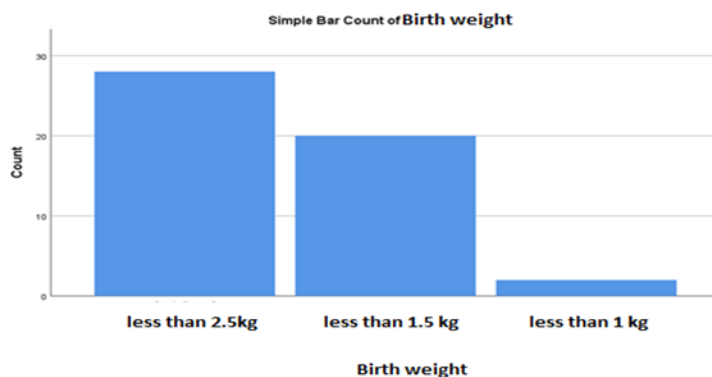

Figure 2. Data distribution according to birth weight.

As regard to the relation between passive smoking mothers, birth weight and GA, the number of passive smoking mothers in the studied cases was 28, 17 (60.7 %) of them, had preterm infants body weight of less than 2.5 kg, while 10 cases (35.7%) exhibited a body

weight of less than 1.5 kg in addition to one baby of less than 1 kg. 11 (39.9%) of preterm infants with passive smoker mothers were with gestational age between 34-36 weeks, 6 (21.4%) with gestational age between 32 and 34 weeks and 11 (39.9%) with gestational age of less than 32 weeks of gestation with significant p value 0.033 as showed in Table 2.

Table 2. The relation between passive smoker mothers, gestational age and birth weight:

Passive smoking mothers	Yes No=28		No No=22		X2	P
	NO	%	NO	%		
Birth weight <2.5 kg <1.5 kg <1 kg	 17 10 1	 60.7 35.7 3.6	 11 10 1	 50 45.5 4.5	0.846	0.784
G.A 34_36 week 32- 34 week <32 week	 11 6 11	 39.3 21.4 39.3	 7 12 3	 31.8 54.5 13.6	6.839*	0.033*

X2: chi square test

*Statistically significant at $p \leq 0.05$.

The numbers of anemic mothers in the studied cases were 28, 5 (27.8%) of them her preterm infants were with gestational age between 34-36 weeks, 4(22.3%) with gestational age between 32-34 weeks and 9(50.0) with gestational age below 32 weeks, with significant p value < 0.03. Nine (50%) of the delivered neonates to anemic mothers in which the birth weight were less than 2,5 kg, 8 (44.4 %) with body weight less than 1.5 kg and one(5.6%) preterm infant with body weight less than 1 kg as in showed in Table 3.

Table 3. The relation between maternal anemia, gestational age and birth weight.

Maternal anemia	Yes NO=28		No NO=22		X2	P
	NO	%	NO	%		
Gestational age 34-36 week 32-34 week <32 week	5 4 9	27.8 22.2 50.0	13 14 5	40.6 43.8 15.6	6.873	0.032*
Birth weight <2.5 kg <1.5 kg <1 kg	9 8 1	50.0 44.4 5.6	19 12 1	59.4 37.5 3.1	0.830	0.889

*Statistically significant at p ≤ 0.05.

The number of maternal UTI in the studied cases were 41 (82%), 19 (46.3 %) of them had infants with birth weight of less than 2.5 kg, 20 (48.8 %) preterm infants with body weight less than 1 kg and two infants (4.9%) with body weight less than 1 kg, with significant p value 0.012. Ten (55.6%) of delivered infants were with gestational age between 34 and 36 weeks, while 17 (94.4%) were with gestational age between 32 and 34 weeks and 14 infants were with gestational age of less than 32 weeks with significant p value 0.012.

The results reveals that the number of mothers with preeclampsia were 12, 25% of them delivered preterm infants with birth weight of less than 2.5 kg, 8 (66.7%) of them with birth weight of less than 1.5 kg and one baby with birth weight less than 1 kg with significant p value 0.038. Five (41.7%) of mothers with preeclampsia delivered infants with gestational age between 32 and 34 weeks, 7 (58.3%) with gestational age of less than 32 weeks with significant p value 0.001. However, the number of mothers with essential hypertension were 4 (8% of total studied mothers), 3 (75%) of them delivered babies with birth weight of less than 1.5 kg and one case (25%) with a birth weight of less than 1 kg and significant p value 0.0016; the gestational age of the 4 cases were less than 32 weeks with significant p value <0.005.

The study shows that the number of the delivered infants with gestational age between 34 and 36 week were 18 (36%), five (27.8%) of - mothers aged between 15 and 30 year, and 13 (72.2 %) of mothers aged between 30 and 45 years. - The number of the delivered infants with GA between 32 and 34 weeks were 18 (36%), 13 (72.2%) of them were mothers aged between 15 and 30 years and five (35.7%) mothers aged between 30 and 45 years. Infants with GA less than 32 weeks were 14 (28%), 9 (64.3%) of their mothers aged between 15 and 30 years and five (35.7%) mothers aged between 30 and 45 years with significant p value of 0.018.

As regard to birth weight of preterm infants in relation to mothers exposed to stressful life in the studied sample which were - 26 cases, 16 (61.5%) of the delivered infants were with birth weight of less than 2.5 kg, 9 (34.6 %) were with birth weight of less than 1.5 kg and in one case (3.8%) the birth weight was less than 1 kg. In 11 (42.3%) out of the cases exposed to stressful life, the gestational age was between 34 and 36 weeks, 9 (34.6%) with gestational age between 32 and 34 weeks and 6 (23.1%) were with - gestational age below 30 weeks.

The number of the alive preterm infants in the studied cases were 35 (70%), 23 (65.7%) of them with birth weight below 2.5 kg and 12 (34.3%) cases with birth weight below 1.5 kg with significant p value of 0.024. In 15 (42.9%) of alive cases, the gestational age was between 34 and 36 weeks, 13 (37.1%) cases with gestational age between 32 and 34 weeks and seven cases (20.0%) with gestational age below 30 weeks as shown in table 4.

Table 4. The relation between neonatal outcome, gestational age and birth weight.

Neonatal Outcome	Alive NO=35		Died NO=15		X2	P
	NO	%	NO	%		
Gestational age 34-36 week 32-34 week <32 week	15 13 7	42.9% 37.1% 20.0%	3 5 7	20.0% 33.3% 46.7%	4.233	0.120

Birth weight					6.742 *	0.024*
<2.5 kg	23	65.7%	5	33.3 %		
<1.5 kg	12	34.3%	8	53.3%		
<1 kg	0	0.0 %	2	13.3%		

*statistically significant at p ≤ 0.05.

The study revealed that the number of mothers with polyhydramnios in the studied sample were nine, six of the preterm infants were with birth weight below 2.5 kg, and three of infants were the birth weight less than 1.5 kg, were as four infants (44.4%) delivered with gestational age between 34 and 36 weeks, two cases (22.2%) delivered with gestational age between 32 and 34 weeks, and three cases with gestational age below 32 weeks.

The number of diabetic mothers in the studied cases was 2 (4%), in both cases; the infants were born with birth weight of less than 2.5 kg and were with gestational age between 34 and 36 weeks .

Discussion

Prematurity is the major risk factor of perinatal mortality .Our study was done with the purpose of finding out the risk factors associated with preterm labor and assess the early complication. The current study show maternal anemia, urinary tract infection, PIH, passive smoker mothers, essential hypertension, abnormal amniotic fluid volumes are independent risk factors for preterm labour, the precise mechanism of preterm birth is not known in many cases, in the presence of the associated factors but not the causal pathway can be used to explain preterm birth.

Anemia is a common presentation during pregnancy, it is considered   as a worldwide health problem that affects almost half of all pregnant women, predominantly with a low socioeconomic level [7]; in addition to the negative effect of maternal anemia on mother health, it - also raises the risk of postpartum hemorrhage, preterm birth, low birth weight, still births and congenital anomalies, which in turn increases the risk of perinatal mortality and neonatal intensive care unit NICU admission [8].

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We have shown that the effect associated with anemia remain recognizable, were our results showed that 36% of mothers delivered preterm babies were anemic with significant p value 0.03, which suggest that there is an increased risk of a poor obstetric outcome due to maternal anemia which is supported by the observation made by Barut A and Mohamud DO. The association of maternal anaemia with adverse maternal and foetal outcomes in Somali women: a prospective study., in 2023 [9]. The rate of anemia in our study was high (56%), it was close to the study reported in Egypt in which the prevalence of maternal anemia were 66% [10]. In a systematic review and meta-analysis study, the investigators found a significantly lower mean birth weight in infants delivered by anemic women, where as in our study no significance effects of maternal anemia on birth weight [11].

In the present study the incidence of maternal were UTI 82% and there is significant association between the maternal UTI and prematurity with p value 0.01, which was high compared to studies that done by Garg S et al., and by chhabra and patil which was 34% and 14%, respectively [12,13]. Delzell j et al., stated that high incidence of UTI may due to hormonal effect during pregnancy which reduce the ureteral tone [14]; UTI when diagnosed early and treated adequately can prevent preterm delivery.

Hosny et al., stated that the association of PROM with infections especially vaginal and UTI considered as a causal factors for preterm births, this finding also supported by Mathew SM & Kumar which reported that 59% of patients with preterm births had PROM [15, 16]; these results were consistent with our result which was 62%; special attention and conservative management to women with risk factors of PROM especially lower genitourinary tract infections, like history of previous abortion and PROM can also beneficial.

Pregnancy induced hypertension was the commonest risk factor for preterm birth in the study in Karnataka, with more than 21% of the women with preterm delivery having PIH, were in our study PIH occurring only in 18% with preterm delivery which was in concordance with the previous studies [17]; whereas An, H., et al reported that the incidence of PIH and preeclampsia were 5.63% and

7.33%, respectively [18], which was lower than the findings reported in our study - in 12 (24%) of cases, this might be explained by that most premature births in mothers with preeclampsia are medically induced, thus large percentage of preterm birth among them are reported. The disparate results could be the result of variations in the measurement techniques, demographic heterogeneity, and study design. Early detection and adequate management of PIH is critical as those patients are more likely to have preterm delivery resulting in poor outcomes [19].

The present study showed that 54% of - women with preterm delivery aged between 25 and 30 years which is closed to the result reported by Ayele et al., in which - 58.5% of cases aged between 25 and 35 years and higher compared with the study done by Kusum et al., where 33% of - women with preterm delivery aged between 26 and 30 years [20, 21].

In our study, passive smoking was associated with adverse perinatal outcomes; women exposed to smoking were 2-3 times more likely to have preterm birth than those who are not exposed. In the present study 56% of the mothers deliver preterm infants were passive smokers, these results support previous studies reporting an increased risk of preterm birth in passive smoker women [22].It is still unknown how smoking affects pregnancy outcomes, nicotine provoked vasoconstriction, carbon monoxide can induce fetal hypoxia, calcium signaling were disrupted which induced by cadmium, leading to alteration in the production of steroid hormone, disruption of prostaglandin synthesis, and modified responses to oxytocin are some of the suggested mechanisms [23]. Amasha HA and Jaradeh MS., found that infants born to passive smoking mothers were small for gestational age compared to infants to non-exposed mothers [24].

In the current study, the hyperbilirubinemia was the most common complication that preterm infants had (92%), whereas Woodgate, P., & Jardine, L. A. reported that about 80% of premature infants develop jaundice; the main cause of hyperbilirubinemia was physiological jaundice which may augmented in preterm infants as their liver, gastrointestinal tract and red cells less matures, in

addition to dehydration secondary to poor feeding increasing enterohepatic circulation [25].

Respiratory problems which include RDS, meconium aspiration syndrome (MAS), pneumonia, apnea and transient tachypnea of newborn (TTN), were represented clinically by respiratory distress (RD) constituted 90% of preterm complications, our result is in concomitant with other studies done by Mishra KN et al., and Kumar, A. et al., in which 12.9% and 30% of premature infants had RD, respectively [26,27]. The higher result may be explained by that mothers are not receiving prophylaxis corticosteroid, due to sudden complications like PROM and preeclampsia leading to urgent medical intervention and premature delivery.

In the current study, we found also that hypoglycemia was significantly high in preterm infants in which 54% of the studied cases develop it, Marrocchella et al., found a significantly higher incidence of hypoglycemia that decreased with the increase in GA in all PT compared with FT neonates [28]. This finding could be explained on the basis that the limited glycogen stores, increased metabolic demands of the newborn transition period, in addition to cold stress, poor suck and swallow ability, and respiratory complications all of these factors will contribute to the development of hypoglycemia [29].

The incidence of sepsis in our study was 40% which is relatively higher than that reported by Armanian, A. M. et al., which was 20.60%; and that done by Sobaih B H. & Al-Mandeel H., which showed that the prevalence of early onset sepsis in infant weighting between 500 and 1500 g is 10.9% and the late onset sepsis 37.1% [30, 31]. This could be a result of various factors including inadequate personal hygiene, home deliveries which typically take place under incomplete aseptic conditions and lack of knowledge about the weakened immune systems of premature infants.

Eventually, the death rate in the current study was 42.8% which is close to the result reported by Fakher M. et al. of 48% and in another study done in Pakistan by Saleem S. et al., which was 58% and higher than the result reported in a study done by Abebaw, E. et al., which was 35%, the results of a study conducted by this

difference can be interpreted to because of limited resources, availability and/or quality of care [32, 33,34].

Conclusion

In conclusion the main predictive factors for the risk of preterm birth are maternal medical disease as anemia, poorly managed UTI and hypertensive disorder. Passive exposure to smoke during pregnancy is associated with - increased risk of premature deliveries and lower birth weight. However, most of these factors can be prevented by regular antenatal care and healthy practice. The preterm infants remain vulnerable to many early complications including neonatal jaundice, respiratory distress, hypoglycemia and sepsis. It is important to raise public and professional awareness of the problems related to prematurity. An interdisciplinary team involving pediatrician and an obstetrician is important for counseling mothers who have a need for premature delivery. Delaying infant delivery until at least 38 weeks of gestation is recommended in order to reduce the risk of neonatal morbidity.

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