

Impact of Maternal Diabetes Mellitus on Early Morbidity and Mortality of Preterm Babies at Al Jala Maternity and Gynecology Hospital, Neonatal Intensive Care Unit (Tripoli, Libya)

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ABSTRACT

Studying burden of maternal diabetes mellitus on preterm babies is an important step to improve outcomes of these babies. The study was designed to compare morbidity and mortality in preterm babies (28-36 wks) born to mothers with and without diabetes mellitus (DM).

An analytical cross-sectional study was conducted at Al Jala Maternity Hospital, Neonatal Intensive Care Unit (NICU) department; all preterm babies with gestational age (GA) (28-36 wks) were enrolled in the study, from January 1st 2016 to December 31st 2016. The study sample was divided to two groups according to maternal health; preterm infant of diabetic mother (IDM) and preterm non-IDM. The information retrieved and analyzed were; sex, gestational age, birth weight, mode of delivery (MOD), Apgar score at 1st and 5th minute, hypoglycemia, respiratory illness, hyperbilirubinemia, sepsis, major congenital anomalies, length of stay (LOS), and neonatal death. Collected data coded and SPSS software was used for analysis.

A total of 378 preterm babies were enrolled in the study period divided into: preterm IDM group 79(20.9%) babies and preterm non-IDM group 299(79.1%) babies. The preterm IDM group had significant high frequency of large for gestational age (LGA) and unexpectedly significantly low frequency in respiratory diseases ($P=0.047$), perinatal asphyxia ($P=0.021$) and neonatal mortality ($P=0.007$); and no statistical significant difference in rate of hyperbilirubinemia ($P=0.145$), congenital anomalies ($P=0.187$) and sepsis ($P=0.468$).

Preterm babies born to diabetic mothers do not appear to be at an excess risk of mortality or early morbidity, except for birth weight for which diabetic mothers need more antenatal care.

Key words- Neonatal; Morbidity; Mortality; Prematurity; Diabetes.

INTRODUCTION

Preterm birth, defined as childbirth occurring at less than 37 completed weeks or 259 days of gestation, which is a major determinant of neonatal mortality and morbidity.¹ More than 80% of preterm births occur between 30-37 weeks of gestation, and most of these babies can survive with essential newborn care. These babies will have health problems and may need to stay in the hospital longer than term babies. The severity of complications associated with prematurity is proportional to the gestational age. Preterm birth rates have been reported to range from 5% to 11.6% of live births.² A number of maternal illnesses, conditions, and medical treatments are associated with indicated or spontaneous preterm birth.³ Maternal diabetes mellitus is one of the high risk pregnancies that causes prematurity. It is one of the commonest and important metabolic disorders that affect the health of pregnant women and infants.⁴ Diabetes mellitus (DM) can occur during pregnancy in 2 forms: pre-gestational and gestational diabetes. Pre-gestational diabetes is defined as Type I or Type II DM that existed before conception. Gestational diabetes (GDM) is defined as glucose intolerance

that is first detected during the pregnancy and is associated with a probable resolution after the end of the pregnancy.³

Approximately 2-3% of pregnancies are affected by diabetes, 90% of these cases represent GDM.⁵ Infants of diabetic mothers are prone to a number of immediate and short term neonatal complications when compared to the babies born to normal mothers. Many studies in different countries have emphasized the significant neonatal morbidities associated with diabetic pregnancies, hence this study aimed to compare morbidity and mortality in preterm babies (28-36 week gestational age (GA) born to women with and without diabetes mellitus (DM).

MATERIALS AND METHODS

An analytical cross-sectional study was carried out at Al jala maternity hospital NICU, conducted from January 1st 2016 to December 31st 2016. Al jala maternity hospital is a governmental specialized tertiary university hospital that provides maternity and NICU services in Tripoli, in addition to high percentage of referral of high risk pregnancies from other peripheral hospital and clinics. All born alive preterm



medical records with GA between 28-36 weeks were enrolled and reviewed in the study period (n=378). Best estimate of GA was based on last menstrual period, early prenatal ultrasound examination or the modified Ballard score. The study sample was divided to two groups for comparison according to maternal health; i.e. mothers with and without diabetes (either gestation or pre-gestational) preterm IDM and preterm non-IDM groups. The information retrieved and analyzed were sex, gestational age, birth weight, MOD, newborn complications: Apgar score at 1st and 5th minute, hypoglycemia, respiratory illness, hyperbilirubinemia, sepsis, major congenital anomalies, length of stay (LOS), and neonatal death. Hypoglycemia (defined as serum glucose levels <45mg/dl), large for gestational age (LGA), and small for gestational age (SGA) (birth weights above the 90th percentile and below the 10th percentile, respectively). Collected data was coded and SPSS software version 25 for analysis was used. Frequencies and percentages were obtained for all variables. Chi square test was used and a P value < 0.05 considered significance. Data collection tool was anonymous, and data confidentiality was maintained throughout the study.

RESULTS

A total of 10464 alive baby was born in the study period at Al jala hospital, 2692 newborn were admitted to the NICU of whom 378 (3.6%) were preterm babies with gestational age between 28-36 weeks. This study sample was divided into two groups: preterm babies born to diabetic mothers 79 (20.9%) preterm babies born to non-diabetic mothers 299 (79.1%).

The study revealed non-significant difference between both groups regarding gender of neonate, but there were a significant difference between both groups in GA (P=0.001), birth weight (P=0.001) and MOD (P=0.001). GA distribution in the study sample showed that most preterm in the IDM group were late preterm 65(82.3%) compared to 65(55.2%) in the preterm non IDM (Table1).

Table 1: Demographic characteristics of preterm neonate in NICU at Al Jala Hospital

Characteristics	Preterm (IDM) N=79	Preterm (Non IDM) N= 992	P value
Sex			
Male	44(55.7%)	176(58.9%)	0.612
Female	35(44.3%)	123(41.1 %)	
GA			
28-<32	7(8.9%)	73 (24.4%)	0.001
32-<34	7(8.9%)	61 (20.4%)	
34-<37	165(82.2%)	165(55.2%)	
Birth weight			
>4 kg	13(16.5%)	3(1%)	0.001
2.5 - < 4 kg	46(58.2%)	110(36.8%)	
1.5 - <2.5kg	17(21.5%)	138(46.2%)	
1 - 1.5kg	2(2.5%)	35(11.7%)	
<1kg	1(1.3%)	13(4.3 %%)	
MOD			0.001
Vaginal	16(20.3%)	136(45.5%)	
Em C/S*	52(62.8%)	51(50.5%)	
El C/S**	11(13.9%)	12(4.%)	

*Em C/S: Emergency cesarean section, **El C/S: Elective cesarean section

Present study showed that severe perinatal asphyxia was seen more frequently in the non DM group than in preterm DM group 15% and 3.8% respectively (P<0.02). LGA was seen significantly more in the preterm IDM group while SGA was similar in both groups. Major congenital anomaly frequency was found more in the preterm non IDM but was not significantly different (P=0.19) (Table 2).

Table 2: Neonatal morbidity and outcome at NICU in Al Jala Hospital.

Character	Preterm IDM	Preterm Non-DM	P value
Apgar 1			
>7	59(74.7%)	78(59.5%)	0.001
4-7	11(13.9%)	50(16.7%)	
<3	6 (7.6%)	38(12.7%)	
Not attended*	3 (3.8%)	33(11%)	
Apgar 5			
>7	71(89.9%)	222(74.3%)	0.021
4-7	5 (6.3%)	33 (11%)	
<3	0 (0%)	11 (3.7%)	
Not attended*	3 (3.8%)	33 (11%)	
Hypoglycaemia	12(15.2%)	30(10%)	0.195
Hyperbilirubineamia	19(24.1%)	77(25.8%)	0.145
RD	29(36.7%)	155(51.8%)	0.047
Birth weight			
LGA	30(38%)	23(7.7)	0.001
SGA	12(15.2%)	49(16.4%)	
AGA	37(46.8%)	227(75.9%)	
Sepsis	8(10.1%)	34(11.4%)	0.468
Major congenital anomalies	4(5.1 %)	27(9%)	0.187
Length of stay:			
1day	27(34.2%)	85(28.4%)	0.606
2-7days	38(48.1%)	139(46.5%)	
8-28 days >28 day	12(15.2%)	63(21.1%)	
>28 day	2(2.5%)	12 (4%)	
Neonatal Death	5(6.3%)	57(19.1%)	0.007

*Delivery was not attended by pediatrician

Respiratory illness is a well-known morbidity of prematurity as well as with IDM. Studying the respiratory morbidity in the two groups showed significant difference. Unexpectedly the preterm IDM group were less affected 36.7% than the preterm non-IDM group 51.9% (P =0.047). Analyzing the respiratory disease according to GA revealed that only 5(7.5%) of the very preterm IDM had RD, while the majority of the RD in very preterm babies 62(92.5%) were among preterm non-IDM group (P=0.015) (Table 3).

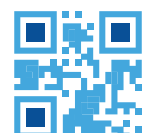


Table 3: Distribution of respiratory morbidity according to gestational age among both groups.

Gestational age	Preterm IDM	Preterm Non IDM	P value
Very preterm	5(7.5%)	62(92.5%)	0.015
Moderate preterm	4 (11.4%)	31(88.6%)	
Late preterm	20 (24.1%)	62 (57.9%)	

DISCUSSION

As far as the knowledge of the author, this is the first study in Libya conducted to compare the significant morbidity and mortality in preterm babies born to diabetic and non-diabetic mothers. The frequency of cesarean section in the study sample was 203(53.7%), this is lower than that in Salima *et al*, study conducted in Misurata where the rate was very high 78.9%.⁶ The study reported that the frequency of spontaneous vaginal birth was lower in the preterm IDM group compared to non-IDM 20.3% to 45.5% respectively. EM C/S was seen in 62.8% of the preterm IDM and this finding was similar to Mannan *et al* and Qadir *et al* studies with C/S rate 58%.^{7,8} while Woon *et al* study reported a lower caesarean section rate 41.8%.⁹

As expected the preterm IDM group had higher rate of LGA 30 (38%) than in preterm non-IDM group 23(7.7%) with a significance difference ($P=0.001$). This was higher than what was in the study conducted by Carlos Grandi *et al*¹⁰, but similar to Thomas *et al* study where the overall LGA rate was (35.0%).¹¹ Overall low Apgar score at 5 minutes was seen in 13% of the babies in the study sample but severe birth asphyxia with low Apgar score (<3) was seen only in preterm non-IDM babies, as preterm IDM group had no severe perinatal asphyxia ($P<0.021$). Only 5(6.3%) had low Apgar in the current study; which is lower than Salima *et al* study of 13.3% and many other studies where the rate exceeded 15%.^{6,12,13} The frequency of hypoglycemia in the study sample was 42(11.1%). There was no statistical significant difference between the 2 groups ($P>0.195$). However, contradicted finding was demonstrated in Deorari *et al*, Ranade *et al* studies.^{14,15}

A retrospective study by Yamamoto *et al* indicated that in women with type 1 diabetes mellitus, LGA newborns have a 2.5-fold increased risk for hypoglycemia.¹⁶ The current study demonstrated that 75% of the LGA preterm in the IDM group were hypoglycemic compared to 10% in the non IDM group and this was statistically significant ($P=0.006$). Studying the respiratory morbidity in the two groups showed significant difference. Unexpectedly the preterm of IDM group were less affected 36.7% than the preterm of non -IDM group 51.9% ($P=0.047$). This was different from Saudian study that was conducted by Lasheen *et al*, where the respiratory morbidity was significantly more in IDM group 70.1%.¹⁷ Becerra *et al* and Abdelmoneim *et al* studies found frequency of congenital malformation among the IDM 7.9% and 6% respectively^{18,19}, this is similar to the current study results which was less in preterm IDM group 4(5.1%) group than

in preterm non-IDM. The result was markedly different than Salima *et al*, where the rate was 26.7%.⁸ Prematurity complications expose the babies to prolonged hospital stay. Unexpectedly, the result showed that maternal DM did not affect the length of stay of the preterm babies and there was no statistical difference in the two groups ($P=0.606$). Most of the babies in the 2 groups stayed between 2-7 days. It was observed that more preterm babies in the IDM group 34.18% left hospital early in the 1st day and very prolonged hospital stay was seen more in preterm non-IDM babies for up to 60 day hospitalization. Although IDM babies have high risk for neonatal mortality, the current study demonstrated that the risk of mortality was not increased in preterm infants born to diabetic mothers 5(6.3%) compared to non IDM 57(19.1%) ($P=0.007$). This result is similar to Carlos Grandia *et al* study that showed statistical significant less mortality rate in the preterm IDM group.¹⁰

CONCLUSION

The study revealed that preterm IDM babies have less frequency of perinatal asphyxia, respiratory illness and death, but higher frequency of babies with hypoglycemia and LGA babies. This decrease in the overall morbidity in preterm IDM group highlights the importance of close monitor of the pregnant diabetic mother in the antenatal clinic. Better facilities and good qualified midwives should be encouraged for NICU work for better neonatal outcome.

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REFERENCES

1. March of Dimes, PMNCH, Save the Children, WHO (2012) Born Too Soon: The Global Action Report on Preterm Birth. Howson CP, Kinney MV, Lawn JE (eds). World Health Organization. Geneva .p.19
2. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH *et al* (2010) The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity, *Bull World Health Organ* **88**(1), 31-38.
3. Behrman RE, Butler AS, (eds) (2007) Preterm Birth: Causes, Consequences, and Prevention. Washington (DC): National Academies Press (US). p148.
4. Meur S, Mann NP (2007) Infant outcomes following diabetic pregnancies, *Paediatr Child Health* **17**, 217-222.
5. American College of Obstetricians and Gynecologists (1995) Diabetes and Pregnancy, *Int J Gynaecol Obstet.* **48**(3), 331-339.
6. Salima A, Moktar A, Hanan J and Bashir A (2018) Study on infants of diabetic mothers in neonatal intensive care unit of Misurata teaching hospital-Libya/2015, *Res Pediatr Neonatol.* **1**(5), RPN.000525.2018.
7. Mannan J, Bhatti MT and Kamal K (1996) Outcome of pregnancies in diabetic mothers: A descriptive study, *Pak J Obstet Gynaecol* **9**, 35-40.



8. Qadir SY, Yasmin T and Fatima I (2011) Maternal and foetal outcome in gestational diabetes, *J Ayub Med Coll Abbottabad* **24**(3-4), 17-20.
9. Woon KY, Lim LS, Tan KL, Ng C, Yeo PBP, *et al* (1985) The infants of a diabetic mother, *J Singapore Paed Soc* **27**(1-2), 74-81.
10. Grandi C, Tapia JL and Cardosa VC (2015) Impact of maternal diabetes mellitus on mortality and morbidity of very low birth weight infants: a multicenter Latin America study, *J Pediatr (Rio J)* **91**(3), 234-241.
11. Thomas N, Chinta AJ, Sridhar S, Kumar M, Kuruvilla KA and Jana AK (2013) Perinatal outcome of infants born to diabetic mothers in a developing country-comparison of insulin and oral hypoglycemic agents, *Indian Pediatr.* **50**, 289-293.
12. Mahmood CB and Kayes MI (2008) Problems and immediate outcome of infants of diabetic mothers, *Journal of Bangladesh College of Physicians and Surgeons* **26**(2), 67-72.
13. Ahmed S, Rashid I, Shahzad N and Jan M (2015) Morbidity and mortality amongst infants of diabetic mothers (IDM) admitted into neonatology unit of G. B. Pant Children Hospital Srinagar, *Journal of Dental and Medical Sciences* **14**(3), 9-13.
14. Deorari AK, Menon PSN and Gupta N (1985) Outcome of infants born to diabetic women, *Indian Pediatrics* **22**, 375-378.
15. Ranade AY, Merchant RH and Bajaj RT (1989) Infants of diabetic mothers-An analysis of 50 cases, *Indian Pediatrics* **26**, 366-370.
16. Yamamoto JM, Kallas-Koeman MM, Butalia S, Lodha AK and Donovan LE (2017) Large-for-gestational-age neonate predicts a 2.5-fold increased odds of neonatal hypoglycemia in women with type 1 diabetes, *Diabetes Metab Res Rev.* **33**(1), e2824.
17. Lasheen AE, Abdelbasit OB, CH, Seid Ahmed MZ and Hussein KA (2014) Infants of diabetic mothers, *Saudi Med J* **35** (6), 572-577.
18. Becerra JE, Koury MJ, Cordero JF, Erickson JD (1990) Diabetes mellitus during pregnancy and the risks for specific birth defects: a population based case control study, *Pediatrics* **85**(1), 1-9.
19. Kheir A, Berair R, Gulfan I, Karrar M and Mohammed Z (2012) Morbidity and mortality amongst infants of diabetic mothers admitted into Soba university hospital, Khartoum, Sudan, *Sudan J of Pediatrics* **12**(1), 49-55.

