

## The Impact Of Maternal Diabetes On Newborns Admitted To Neonatal Care Unit Of Maternity And Children Teaching Hospital in Al-Diwaniya city .

Hulal Saleh Saheb\* , Muaid Hameed\*\* , Salam Jasim Al-Fatlawi \*\*\*

\* F.I.B.M.S. Pediatrics, College of Medicine- Al-Qadissiya University.; \*\*F.I.B.M.S. Pediatrics, Al-Diwaniya Teaching Hospital . Pediatrician, \*\*\*Assistant professor , F.I.B.M.S. community medicine. College of Medicine AL- Kufa University.

### الخلاصة

داء السكري كان ولا يزال احد الأسباب المؤدية لحدوث مضاعفات صحية و حالات وفاة لدى المولودين الجدد . هذه الدراسة شملت 184 كعدد كلي ، 99 منهم كانوا مولودين لأمهات مصابات بداء السكري وقد أدخلوا إلى وحدة العناية بالطفل الوليد في مستشفى الديوانية التعليمي للأطفال من الأول من أكتوبر/تشرين الأول 2013 حتى نهاية مارس/آذار 2014. خمس وثمانون مولود سُجِّلَ أيضاً في هذه الدراسة للمقارنة [ كسيطرة (رضيع الأمهات غير المرضيات بالسكري)] الهدف

لتحديد المضاعفات ونسبة الوفيات عند رضيع الأم المريضة بالسكري ولمقارنته مع رضيع الأمهات غير المصابات بالسكري .

### النتيجة

هناك نسبة أعلى من المضاعفات ونسبة الوفيات عند رضيع الأم المريضة بالسكري، ويعتبر هبوط نسبة السكر أهم المضاعفات المسجلة (31.3%) يليه اليرقان الولادي (13.3%) ثم عسر التنفس الولادي (12.1%) . وقد تم تسجيل فترة رقود أطول بين مولودين لأمهات مصابات بالسكري. الخاتمة

هناك نسبة أعلى من المضاعفات ونسبة الوفيات عند رضيع الأم المريضة بالسكري وان حدوث توازن في نسبة السكر وإعطاء رعاية صحية مثالية ذو قيمة عالية في تقليل هذه المضاعفات.

### Abstract

Diabetes has long been associated with increased perinatal morbidity and mortality It's one of the commonest and important metabolic disorder that affect the health of both mother and infant .

### Patient and methods

Total number of patient involved were one hundred eighty four , Ninety-nine of them were infants of diabetic mother , they were admitted to the NCU of AL-Diwaniya teaching hospital from the 1<sup>st</sup> of October 2013 to the end of march 2014. Eight-five neonates were also enrolled in this study as control (infants of non-diabetic mothers)

### Objective

To determine the morbidities and mortality among infants of diabetic mother and to compare it to that of control.

### Result

There is higher morbidity and mortality amongst IDM . Hypoglycemia was the commonest morbidity recorded (31.3%) followed by hyper bilirubinemia (13.3%) and respiratory distress (12.1%). More prolonged hospitalization had been seen amongst IDM.

### Conclusion

There is higher frequency of morbidity and mortality amongst IDM , hence ascertain a good glycemic control to diabetic mother and providing optimal neonatal care is valuable to decrease these complications.

### Key words

IDM , morbidity , mortality , Al-Diwaniya teaching hospital.

### Background

Diabetes has long been associated with increased perinatal morbidity and mortality<sup>1</sup>.

It's one of the commonest and important metabolic disorder that affect the health of both mother and infant<sup>2</sup> Its complicates about 4% of pregnancy<sup>3</sup>.

Women with diabetes in pregnancy (type 1, type 2, gestational) are all at increased risk for adverse pregnancy outcome. Adequate glycemic control before and during pregnancy is crucial to improve outcome.<sup>4</sup>

Fetus of diabetic mother may have growth disturbance at both ends of spectrum; IUGR and Macrosomia. IUGR is not infrequent finding in pregnancy of women with vascular complication, its often the result of uteroplacental insufficiency or congenital anomalies.<sup>5</sup>

Several tools are used to assess fetal well-being in diabetes and high risk pregnancies, obstetric ultrasonography to determine viability and anomalies, fetal echocardiography after 20 weeks gestation is important to evaluate fetal cardiac structure and 3<sup>rd</sup> trimester ultrasonography to assess growth and aid in the diagnosis of macrosomia, polyhydramnios and septal hypertrophy.<sup>6</sup>

In the immediate neonatal period. Infants of diabetic mothers are at high risks for a number of metabolic irregularities, hypoglycemia may occur from removal of the continued placental source of glucose and fetal islet cell hyperplasia.<sup>7</sup> they are also have a higher hematocrit<sup>8</sup>, higher serum bilirubin level, hypocalcaemia, congenital anomalies and hypomagnesaemia<sup>9</sup>.

These infant have a higher mortality<sup>10,11</sup>, if they are delivered prematurely, they are at greater risk of developing RDS, birth asphyxia, birth trauma and death.<sup>12</sup>

If an optimal care is provided to those infants, the perinatal mortality (excluding congenital anomalies) is nearly equivalent to that observed in normal pregnancy<sup>13</sup>.

#### Patients and Methods

In this prospective case-control study, total number of patient involved were one hundred eighty four. Ninety-nine of them were infants of diabetic mother, while eight-five neonates were also enrolled in this study as control (infants of non-diabetic mothers).

They were admitted to NCU of AL-Diwaniya teaching hospital from the 1<sup>st</sup> of October 2013 to end of march 2014

All IDM who were admitted over that period were involved in our study, while the control group (the healthy neonates of non-diabetic healthy mothers) were selected randomly. They are fully studied information were taken from family members and from mothers hospital cards, a verbal permissions were allowed.

Complete history and physical examination was performed to all of them. We inquired about mode of delivery, history of maternal diabetes, history of previously affected babies, they had been also assessed for B. WT. and G.A.

Assessment for any obvious congenital anomalies, for signs of hypoglycemia (lethargy, jitteriness, irritability and poor feeding), hypocalcaemia (irritability, jitteriness and convulsion), polycythemia (respiratory distress and cyanosis) was done.

All of them were investigated for S. glucose, while other investigation such as S. calcium,

TSB, central PCV were done selectively. (CBP, ESR, C-reactive protein) were performed to patient with suspected to have sepsis clinically, Chest radiography were done to all newborns with respiratory distress and echocardiography were performed and followed to only one patient with a systolic murmur.

Skeletal imaging of the upper limbs was performed for two patients with asymmetrical Moro reflex, and imaging of the lower limb and pelvic imaging was done to another two patient with gross anomaly of lower extremities and digits.

Statistical analysis was done by using SPSS (Statistical Package For Social Science) version 20 in which we use chi square test for comparison between categorical data. We set P-value  $\leq 0.05$  as significant.

#### Results.

Over the six months period of this study, all infants of diabetic mother admitted to the nursery care unit were involved (as patient group) while the control group were selected randomly (neonates delivered to mothers with other chronic medical problem were excluded from this study). According to the information recorded to IDM group, the characteristics of them were as shown in (table 1);

**Table 1** The Parameters of IDM group.

Parameter	IDM	No.	%
Sex	Male	61	61.6%
	Female	38	38.3%
Gestational age	Preterm	56	56.5%
	Term	43	43.4%
History of neonatal or infant death	Positive	38	38.3%
	Negative	61	61.6%
Mode of delivery	C/S delivery	39	39.3%
	NVD	60	60.6%
Birth weight/ gram	<2.500	25	25.2%
	2.500- 4.500	52	52.5%
	>4.500	22	22.2%

Comparative data was obtained between patients and control group in their birth weight , GA , mode of delivery and period of hospitalization .

**TABLE 2** A Comparison in their birth weight .

		Groups		P value
		infant of DM mother	Control	
BW/gram	<2500	25	23	0.258
		52.1%	47.9%	
	2500-4500	52	51	
		50.5%	49.5%	
	>4500	22	11	
		66.7%	33.3%	
Total		99	85	
		53.8%	46.2%	

There is a higher rate of macrosomia (>4500 g) among IDM as there is 66.7% to only 33.3% , but p-value was of no statistical significance .

**TABLE 3** Show A Comparison of their gestational age

		Groups		P value
		infant of DM mother	control	
Gestational age/weeks	<37	56	50	0.932
		52.8%	47.2%	
	37-41	41	33	
		55.4%	44.6%	
	>41	2	2	
		50.0%	50.0%	
Total		99	85	
		53.8%	46.2%	

**TABLE 4 show** A Comparison in their mode of delivery

		Groups		P value
		infant of DM mother	control	
Mode of delivery	El. c/s	23	21	0.966
		52.3%	47.7%	
	Em. c/s	16	14	
		53.3%	46.7%	
	NVD	60	50	
		54.5%	45.5%	
Total		99	85	
		53.8%	46.2%	

There is no significant difference between the two group on evaluation of gestational age and mode of delivery .

**TABLE 5** show a comparison between the two groups their periods of hospitalization .

		Groups		P value
		infant of DM mother	control	
Hospitalization days	<3	28	46	0.001
		37.8%	62.2%	
	3-7	43	21	
		67.2%	32.8%	
	>7	28	18	
		60.9%	39.1%	
Total		99	85	
		53.8%	46.2%	

67.2% of IDM group had hospitalization from 3-7 days while only (32.8%) of the control group had that , and another 60.9% of IDM group had hospitalization for > 7 days compared to ( 39. 1%) of the control group . P-value was of statistical significance . A detailed history and biochemical data was reported for both groups

Table.6 show the comparative data between patients and control :

Parameters	Groups		P value
	infant of DM mother	Control	
Asymptomatic	11	43	<0.001
	11.1%	50.6%	
Asphyxia	9	5	0.413
	9.1%	5.9%	
Birth injury	3	1	0.390
	3.0%	1.2%	
Congenital malformations	3	3	0.849
	3.0%	3.5%	
Hypocalcaemia	6	2	0.219
	6.1%	2.4%	
Hypoglycemia	31	9	0.001
	31.3%	10.6%	
Jaundice	13	7	0.287
	13.1%	8.2%	
Neonatal sepsis	6	4	0.686
	6.1%	4.7%	
Polycythemia	5	2	0.340
	5.1%	2.4%	
Respiratory distress	12	9	0.744
	12.1%	10.6%	
Mortality rate	7	3	0.291
	7%	3.5%	

From these results, only 11.1% of IDM were asymptomatic at birth . There is higher rates of morbidities reported among patient group, the commonest of them was hypoglycemia as its seen in ( 31.3%), secondly hyperbilirubinemia (13.1%) followed then by respiratory distress (12.1%) .

Twelve patients had a respiratory distress, 5 of them were complaining from RDS , 3 diagnosed with MAS , 2 with congenital pneumonia , 1 with TTN , and one patient presented with persistent tachycardia and pathological murmur , he was diagnosed as a case of hypertrophic CMP by echocardiography from the 1<sup>st</sup> week of his life , treated with propranolol in the 1<sup>st</sup> few

months and the condition resolve spontaneously after 6 months of life, as he had a normal echocardiography with no more need of medical therapy .

Six patients had a clinical presentation suggestive of neonatal sepsis (in addition to leukocytosis , high acute phase reactant ) , the diagnosis was not confirmed because of the unavailability of blood culture in our hospital .

Gross congenital anomalies were reported in 3 patients, one of them presented with hydrocephaly , while the other two had skeletal anomalies [ hypoplastic femur , polydactyly and vertebral anomalies ] .

Birth Asphyxia was noted in nine patients , 3 of them had stage I HIE, 2 had stage II while 4 with stage III HIE , 5 were a product of NVD , 2 by EM.C/S and 2 by EL.C/S Birth trauma was found in three patient , one had cephalhematoma , other with erbs palsy and the 3<sup>rd</sup> with fracture humerus and pneumothorax.

The mortality rate was higher in IDM 7% : 3 % only in the control , three of them had a birth asphyxia , one with severe RDS , another with neural tube defect and one with birth trauma{ obstructed labor with secondary pneumothorax and fractured humerus } , the last one with neonatal sepsis.

## Discussion

Our study showed that the M : F ratios amongst IDM was 1.6 : 1 , fifty six of them (56.6%) was preterm , which is considered higher than reported by others , as kualalumpur <sup>14</sup> , and (17.5%) by a study in india <sup>15</sup> by a study in (16.7%) its and (14.9%) in Nigeria <sup>16</sup> , there is a higher rate of polyhydramnios , preeclampsia and preterm delivery among diabetic mothers. <sup>17</sup> The rate of prematurity show a comparable result to that of control. {p-value was of no statistical significance} .

The frequency of CS delivery was (39. 3%) , 23.2% were delivered by EL. CS and 16.1% by EM.CS delivery. This result was comparable to the control but lower than reported in Nigeria <sup>16</sup> , Pakistan <sup>18</sup> , india <sup>15</sup>

and Malaysia <sup>14</sup> where it was 80.85% , 45.2% , 89.4% , and 40. 7% respectively . The lower rate of C/S delivery may be explained by the higher rate of prematurity in our study .

Twenty- two of the patient group were macrosomic , which is higher than the control group , but it was of no statistical significance . Macrosomia was reported in 11% by kitzmiller et al <sup>19</sup> and 12% by Lenovo et al <sup>20</sup> which is lower than our study result. While it was seen in 45% by Thomas Moore <sup>21</sup> , 46% by Hakam <sup>22</sup> and 40.4% by a study in Pakistan <sup>18</sup> .

With good prenatal diabetic control , the incidence of macrosomia and other perinatal complication has reduced. <sup>4</sup>

There is no confirmed data regarding maternal ANC and diabetic control in our study .

Thirty-eight of IDM ( 38.3%) had a history of neonatal and / or infant death , this was seen in ( 59.6%) in Nigeria <sup>16</sup> and ( 61.3% ) in india .<sup>15</sup> Although it is considered lower than other studies , but it still to be considered a significant cause of perinatal mortality in many societies.

IDM group had more prolong hospitalization than the control group and it was of statistical significance , this prolong hospitalization was belong to the higher rate of morbidities and mortality in the former one.

The commonest morbidity recorded was hypoglycemia (31.3%) during the first 24 hours , it was of statistical significance when compared with the control (only 10.6%) . This high proportion of hypoglycemia was also reported by Kitzmiller et al (28%)<sup>20</sup> , Leveno (49%)<sup>19</sup> and by Thomas Moore(52 %) <sup>21</sup> . This high rate of hypoglycemia is considered as a useful marker o f poor glycemic control of their mothers.

The second most common morbidity reported was hyperbilirubinemia which was reported in ( 13.1%) which was higher than the control (8.2%) , the result was of no statistical significance. It was similar to than reported by lasheen et al <sup>23</sup> (14.6%) , but less

than that reported in Nigeria<sup>16</sup>, by Thomas R. Moore<sup>21</sup> and by shabir<sup>15</sup>, as it was (57.4%), (25.5%) and (52.6%) respectively.

This is may be partially explained by the lower rate of polycythemia reported by our study (only 5.1%), where it was (10%), (20%) and (40%) by Thomas R. Moore<sup>21</sup>, Tylor PM<sup>23</sup> and Peeky KJ<sup>24</sup> respectively.

Respiratory distress was reported in (12.1%) of IDM, HMD and MAS were the commonest two causes, it was less than reported by a study in Nigeria (34%)<sup>16</sup> and by Thomas R. Moore (26%)<sup>21</sup>, this may be attributed to the lower rate of CS delivery and the lower rate of polycythemia in our study.

Only one patient was diagnosed as a case of hypertrophic CMP which is lower than that reported by Thomas R. Moore (4%)<sup>21</sup> and in Pakistan (4.7%)<sup>18</sup>.

The lower rate of CHD detected may be explained by the unavailability of routine echocardiography in our hospital and the inability to diagnose asymptomatic one.

Birth asphyxia was seen in nine patients (9.1%), three of them were macrosomic and were delivered by NVD. This was less than reported by Peace I opera in Nigeria<sup>16</sup>, in Pakistan<sup>18</sup> and by mimouni<sup>26</sup> were it was (14.9%), (19%) and (27%) respectively. The high rate of birth asphyxia amongst IDM is seen to be related to placental vascular disease and decrease placental blood flow.<sup>26</sup>

Traumatic delivery was seen in three cases (3%), they were macrosomic and were product of NVD. this result was comparable to that noted by Lasheen et al<sup>23</sup> (3.6%) and by Thomas Moore<sup>21</sup> (3.6%) and shabir et al in India (5.2%)<sup>15</sup>, but less than shown by N.Y.boo<sup>14</sup> (20.5%) and in Pakistan<sup>18</sup>.

Hypocalcaemia was noted in 6 patients (6.1%) this result was comparable to that observed by Thomas R. Moore (6%)<sup>21</sup>, but less than in Pakistan (16.6%)<sup>18</sup>, India (14%)<sup>15</sup> and Nigeria (23%)<sup>16</sup>. Hypocalcaemia was seem to be related to birth asphyxia and delay in the synthesis of PTH as a result of maternal hyperparathyroidism<sup>27</sup>.

There is no confirmed data regarding maternal hyperparathyroidism in our study.

Gross congenital malformation had been seen in 3% of IDM, this is considered comparable to the result reported in Pakistan (6.7%)<sup>18</sup>, but less than reported by Thomas (16%)<sup>21</sup> and by Charlet F. pott (15%)<sup>28</sup>. Gross congenital malformations is closely related to IU hypoxia, hypo or hyperglycemia and poorly controlled diabetes by the mother

Neonatal sepsis was suspected in six patients (6.1%), which is lower than reported by Lasheen et al (11.6%)<sup>23</sup> and in Nigeria (31.9%)<sup>16</sup>, but it is higher than what seen by Infants of non-diabetic mother.

The mortality rate among IDM was 7% (3 with birth asphyxia, 1 with severe RDS, 1 with neural tube defect, 1 with obstructed labor and secondary pneumothorax and the last with neonatal sepsis), it was higher than the control and higher than a study made in Pakistan<sup>18</sup>, Saudia Arabia<sup>23</sup> and India<sup>15</sup>, as it was 4.7%, 2.1% and 5.2% in all of them respectively.

The high morbidity and mortality amongst IDM reflect the poor glycemic control of the mothers, which was very difficult to ascertain in our society as we depend only on blood glucose level performed during pregnancy and there is no routine HbA1c measurement.

### Conclusion

IDM had a higher rate of morbidity and mortality than infants of non-diabetic mothers. This high rates of morbidities is a message to accentuate the efforts to those who are involved with maternal care during pregnancy to ascertain good glycemic control and decrease both maternal and fetal complications.

All diabetic mothers should have a planned pregnancy with proper antenatal care. Delivery of IDM should be made in the hospital, and the availability of adequate medical services is essential because of the high rate of morbidities and mortality they are liable for.

### Abbreviations

B.WT : birth weight  
 ..... C/S :  
 caesarian section  
 CMP : Cardiomyopathy.....  
 EL.C/S : elective caesarian section EM.C/S  
 : emergency caesarian section  
 ..... 1<sup>ST</sup> : first  
 G.A. : gestational age ..... HIE  
 : Hypoxic ischemic encephalopathy  
 IDM : infant of diabetic mothers  
 ..... IUGR: intrauterine growth  
 retardation MAS : meconium aspiration  
 syndrome ..... M:F : male to  
 female ratio  
 NCU : neonatal care  
 unit..... NVD : normal  
 vaginal delivery  
 PCV : packed cell volume  
 ..... PTH : parathyroid  
 hormone RDS : Respiratory distress  
 syndrome ... ..TTN : transient tachypnea of  
 newborn  
 3<sup>rd</sup> :  
 third.....  
 .... TSB :total serum bilirubin.

## References

1. Butle NF et al : Carbohydrate and lipid metabolism in pregnancy: normal compared with gestational diabetes mellitus. American Journal of Clinical Nutrition 2000, 71(5):12565-12615.
2. Meur S, Mann NP et al . Infant outcomes following diabetic pregnancies. Pediatrics Child Health 2007;17:217-22
3. American College of Obstetricians and Gynecologists. Gestational diabetes. ACOG practice bulletin 30. Washington, DC: ACOG, 2001.
4. Barbara J stool , Nelson Textbook Of Pediatrics, 2007, eighteenth edition. Part XI Chapter 107 – the endocrine system , 107-1 infant of diabetic mothers by Saunders.
5. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. American Diabetes Association. Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 2001;4 :S5-S20.
6. American College of Obstetricians and Gynecologists. Fetal macrosomia. ACOG practice bulletin 22. Washington, DC: ACOG, 2000.
7. Landon MB, Gabbe SG. Fetal surveillance and timing of delivery in

- Pregnancy complicated by diabetes mellitus. Obstetrics and Gynecology Clinical journal North America 1996 ; 23:109-123.
8. Landon MB, Catalano PM, Gabbe SG. Diabetes Mellitus. Obstetrics—normal and problem pregnancies, 4th ed. Orlando, FL: Churchill Livingstone, 2002:1105-1106.
  9. Leipold H, Alexandra Kautzky- Willer A, Ozbal A, Bancher-Todesca D, Worda Fetal hyperinsulinism and maternal one-hour post load plasma glucose level. Obstetrics and Gynecology 22. 2004;104:1301-6.
  10. Stoll BJ. Infants of diabetic mothers. In: Behrman RE, Kliegman RM, Jenson HB . Nelson's text book of pediatrics. 18<sup>th</sup>. Ed. By Saunders; 2007. P. 783-6.
  11. Cowett RM. The infant of diabetic mothers Neoreviews 2002;3:173-89.
  12. Rudge MVC, Calderon MP, Ramos MD, Abbade MDJF, Souza Rugolo ALMS. Perinatal outcome of pregnancies complicated by diabetes and by maternal daily hyperglycaemia , not related to diabetes: a retrospective 10 ye a r s analysis . Gynecology and obstetrics Investigations 2000;50:108-12.
  13. Aucott S. W. , Williams, T. G : Rigorous management of Insulin dependent diabetes during Pregnancy , 1994 ; 31 (3) : 126 – 9.
  14. N. Y. Boo, MBBS, MRCP , Morbidity and mortality of infants of diabetic Mothers born at the Maternity Hospital, Kuala Lumpur , Medical Journals in Malaysia Vol.ume 47 No. 1 March 1992 .
  15. Shabir Ahmed, Ishrat Rashid , Naveed Shahzad et al , Morbidity and Mortality amongst Infants of Diabetic Mothers (IDM) Admitted Into Neonatology Unit of G. B. Pant Children Hospital Srinagar , IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 14, Issue 3 Ver. VI (March 2015), PP 09-13.
  16. Peace I Opara et al , Morbidity and mortality amongst infants of diabetic mothers admitted into a special care baby unit in Port Harcourt, Nigeria Italian Journal of Pediatrics 2010, 36:77
  17. Frank W. Ling Patrick : diabetes mellitus and other endocrine Disease. Obstetrics and Gynecology principles for Practice. Chapter 6 , 2001 ; 218-230.
  18. Mohammad Hussain, Mohammad Irshad, Afzal Khan Khattak et al , frequency of various neonatal complications in infants born to diabetic mothers - a hospital base study , journal of pediatric medicine 2011 volume 25 no.. 03 :: 227 – 232.
  19. Kitzmiller et al , centres for disease control. public health guidelines for enhancing diabetes control through maternal and child health care programmes 1996; 13: 201.
  20. Leveno , Martin FI, Health P, Mountain KR. Pregnancy in women with Diabetes Mellitus: fifteen year's experience 1970-1985. Medical journals 1987; 146: 187.

21. Thomas R. Moore , M. D. : diabetes mellitus and pregnancy . E. Medicine 2005 ; 2-27.
22. Frank W. Ling Patrick Deff.: diabetes mellitus and other endocrine Disease. Obstetrics and Gynecology principles for Practice. Chapter 6 , 2001 ; 218-230.
23. Abeer E. Lasheen, Omer B. Abdelbasit, CH, Mohammed Z. Seidahmed, , Infants of diabetic mothers A cohort study , Saudi Medical Journals 2014; Vol. 35.
24. Taylor PM, Wolfson J, Bright NH, et al. Hyperbilirubinemia in infants of diabetic mothers.1993; 5; 289 –298 .
25. Peevy KJ, Landaw SA, Gross SA. Hyperbilirubinemia in infants of diabetic mothers. Pediatrics. 2001.
26. Mimouni F, Moidovnik M, Siddiqi TA, Khoury , J, Isang RC. Perinatal asphyxia in infant of insulin-dependent diabetic mothers. Journals of Pediatrics 1998;113:345-53.
27. Tsang RC, Kleinman LI, Sutherland JM, Light IJ: Hypocalcaemia in infants of diabetic mothers: studies in calcium, phosphorus and magnesium metabolism and parathormone reponsiveness. Journal of Pediatrics 1992, 80:384-395.
28. Charles f Potter , M.D.: Infant of diabetic mother. E. Medicine 2006 ; 2-25