



Review Article

Birth Weights of the Babies in Diabetic Pregnancies

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Abstract

As the problem of diabetes is gradually increasing day by day, large babies of diabetic mothers are also becoming an alarming health problem. The shadow of diabetes falls on the pregnant women as long as fifteen or twenty years before the disease declares itself by glycosuria and hyperglycaemia. The latent interval between the birth of a large baby and the development of clinical diabetes may range up to 40 years, and the average as 24 years. During this period of prediabetes the mother may give birth to a series of large babies in her pregnancies. Pregnancy constitutes one of the few physiologic events that unmask the diabetic propensities. Excess fetal weight over 4 kg is regarded as fetal macrosomia and is due to fetal hyperglycemia; fetal pancreatic beta cell hyperplasia - foetal hyperinsulinism, deposition of fat and glycogen in foetus. Adequate control of diabetes with the preconception and prenatal care is the sheet anchor to prevent fetal macrosomia which occurs in 20-60% cases of gestational and clinical diabetes.

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Introduction

The world health situation is no longer clear as it has seemed in the past decades. If industrialized countries have triumphed over major communicable diseases of the past, they are now facing the threat of chronic ailments with regards to developing countries. They are now encountering the so called new health problems, which are growing at a rapid pace, at the same time, they are struggling to fight the old health problem such as diabetes¹. It is world wide distribution and the incidence of the problem is rising throughout the world². To conceive and deliver a healthy baby is the dream of every woman and is a demand from a healthy society. Diabetic woman are particularly handicapped in this respect³. The shadow of diabetes falls on the

pregnant women as long as fifteen or twenty years before the disease declares itself by glycosuria and hyperglycaemia. During this period of prediabetes the mother may give birth to a series of large babes with birth-weight of 9.5 to 10 pounds (4 or 4.5 kg) or more and in her pregnancies⁴.

Extent of the problem of diabetes

Global problem of diabetes is increasing day by day with the advancement of socio-economic & socio-cultural status of the people. Diabetes is an 'iceberg disease'. Currently the number of cases of diabetes worldwide is estimated to be 150 million. This number is predicted to double by 2025, with the greatest number of cases being expected in China and India^{5,6,7}.

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Macrosomic babies and diabetic pregnancies

Much interest has been focused upon the association of large babies and Mothers who subsequently develop diabetes mellitus. While it has long been known that diabetic women tended to have large babies, it is only more recently that the association has been noticed in cases exhibiting a latent interval, often amounting to many years, before developing the disease. The latent interval between the birth of a large baby and the development of clinical diabetes may range up to 40 years, and the average as 24 years. Kris's and Fitcher noted that 77 percent of 144 babies whose birth weights exceeded 4.7 kg, were born to women who subsequently develop diabetes and where a family history of diabetes existed, they noted too that the babies tended to be larger. They regard birth weights of over 4.7 kg as significant and it would appear that the average birth weight was greater in prediabetic cases than in those who had actually developed the disease⁸.

Babies weighing 4.5 kg and over are regarded as macrosomic babies^{9,10}. Though, there is uncertainty as to whether a birth-weight of 4000 or 4500 g. constitutes an appropriate definition of macrosomia¹⁰.

Mean birth weight of a mature Indian baby is about 500 g less than that of American infant. The criterion laid down by WHO where 2500 g is the dividing line between LBW infant and mature infant can not be applied for Indian infant. It was assessed by Indian scientists by maturity, respiratory distress and feeding problems that 2000 g or less should be taken as the criterion of LBW of Indian infants. When the criterion was applied, the incidence of LBW infants having a birth weight of 2000 g was found to be 5.5 percent as against 25-30 percent when the criterion was less than 2500 g. Mean birth weight of Indian baby at Calcutta are 2656 g for poor and 2851 g for rich⁵.

Aetiopathogenesis

According to Dawn C.S. excess fetal weight over 4 kg is regarded as fetal macrosomia and is due to fetal hyperglycemia; fetal pancreatic beta cell hyperplasia - foetal hyperinsulinism (maternal

insulin does not cross over to foetus), deposition of fat and glycogen in foetus. Adequate control of diabetes can prevent fetal macrosomia which occurs in 20-60% cases of gestational and clinical diabetes¹¹.

Dutta DC¹² states that fatal macrosomia (30%-40%) probably results from : (a) maternal hyperglycaemia → hypertrophy and hyperplasia of the fetal islets of Langerhans → increased secretion of fetal insulin → stimulates carbohydrate utilization and accumulation of fat. Insulin like growth factors (IGF-I and II) are also involved in fetal growth and adiposity. With good diabetic control, incidence of macrosomia is markedly reduced. (b) Elevation of maternal free fatty acid (FFA) in diabetes leads to its increase transfer to the fetus → acceleration of triglyceride synthesis → adiposity.

Traditionally, birth weight is regarded as one simple measure of outcome of pregnancy. It is a reliable indicator of fetal well-being and maturity. Birth weight depends upon numerous factors-genetic factors, maternal nutrition, height and age of mother, parity, duration of gestation, birth spacing, sex of the child, weight of placenta, smoking in pregnancy, obstetrical history etc. Most of these factors interact and it is difficult to single out any one main factor⁵.

Malins JM, in a study shows, women who have large babies are likely to become obese and to develop diabetes in later life. Very large infants weighing more than 4.5 kg at birth show signs of hyperinsulinism and this is possibly associated with an elevation, albeit very slight, of mother's blood glucose¹³.

Gestational diabetes mellitus (GDM) is associated with higher incidence of macrosomia, although the metabolic abnormality of GDM is mild. Pedersen postulated that diabetes-related macrosomia was a consequence of fetal hyperinsulinaemia caused by maternal hyperglycemia. However, it is well known that women who give birth to large babies have not always had glucose intolerance antenatally¹⁴.

Birth weights of babies of diabetic and non-diabetic mothers

Miranda J.A., et al. in a study in Granada (Spain) presents the outcome of 62 pregestational IDDM patients under strict glycaemic control, show a mean birth weight in IDMs was 3220 ± 791.1 g and was not significantly different from that of controls. Birth weights in excess of 4000 g were recorded for 17.7% of IDMs compared with 7.3% of the controls ($p < 0.001$)¹⁵.

In a retrospective analysis of complications of 322 infants of diabetic mothers (IDM) in white, classes B-R was undertaken, the mean birth weights were $3,563 \pm 97$ g. for class B, $3,520 \pm 455$ g for class C and $2,985 \pm 790$ g. for classes through R, 22 percent weighed over 4,000 g and 7 percent weighed less than 25 g¹⁶.

Schwartz R, et al. in their study of Hyperinsulinaemia and macrosomia in the fetus of diabetic mothers, defined macrosomia as > 2 standard deviation unity (97.75%), was found in 10-27% of the diabetic group¹⁷.

A prospective analysis has been made on 145 consecutive deliveries resulting in babies weighing and above delivered at the University of Nigeria Teaching Hospital (U.N.T.A), Enugu, over a 1-year period (1985), the incidence of macrosomic babies (babies weighing more than 4.5 Kg and above) was 11 per thousand deliveries or 1 in 90⁹.

In a study of 75,979 women who were delivered vaginally in the period 1970 to 1985, the overall incidence of macrosomia (≥ 4000 g) was 7.6% (5674/74390) in the non-diabetic group and 20.6% (328/1589) in the diabetic group¹⁸.

Karim E, et al in a study in Bangladesh, found a mean birth weight 3.58 kg of the babies of established diabetic mothers and 2.89 Kg for the babies of gestational diabetic mothers¹⁹.

Jovanovic L, et al. described a range 16 to 40 percent macrosomia that occurred in diabetic mothers²⁰.

Conclusion

Coming events cast their shadows before. The woman destined to develop diabetes divulges her

future fate by producing infants which are dead or large, during pregnancy²¹. In the maximum cases diabetes was detected during pregnancy. On the whole, longer the duration of diabetes, the worse the outlook. Women with established diabetes mellitus (EDM) or gestational diabetes mellitus (GDM) or in the period of prediabetes are at increased risk of giving births of large babies. Outcome in pregnancies of diabetic mothers is directly related to quality of health care. These health problems may be prevented in women with diabetes through improved glycaemic control and through preconception and prenatal care.

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