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Management of Diabetes Mellitus In Pregnancy

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Abstract
The study is on Management of diabetes mellitus in pregnancy.The aim of this study is management and outcome of good antenatal care in pregestational and gestational diabetes mellitus. 30 cases of diabetic pregnanant women were selected form Jinnah hospital Lahore, with restriction to concomitant disease accompanying diabetes.It is evident from result that diabetes during pregnancy can have favorable outcome provided that it is timely diagnosed. Good control of blood sugar by use of insulin and dietary modifications not only leads to less complications to mother but can also result in delivery of a healthy baby.

Key words: diabetes mellitus, pregnancy, antenatal care, insulin

INTRODUCTION

Diabetes mellitus is a chronic disorder of carbohydrate, fat and protein metabolism. A relative or absolute deficiency in insulin secretory response, which translates into impaired carbohydrate (glucose) use, is a characteristic feature of diabetes mellitus, as is the resulting hyperglycemia. Women with diabetes in pregnancy can be divided into two groups: women with diabetes diagnosed before pregnancy (pregestational diabetes) and women with glucose intolerance diagnosed during pregnancy (gestational diabetes mellitus). The majorities of women with pregestational diabetes have insulin-dependent diabetes mellitus (IDDM), but may also include early-onset non-insulin dependent diabetes mellitus (NIDDM). Gestational diabetes mellitus (GDM) can represent first recognition of IDDM or NIDDM. The expression of each of the forms of diabetes as a clinical disorder represents a complex interaction of genetic and environmental factors. Before the discovery of insulin in 1921, pregnancy in diabetic woman was uncommon and was accompanied by high maternal and fetal mortality rates. Through improved understanding of the pathophysiology of diabetes in pregnancy, as well as the implementation of the care programs emphasizing normalization of maternal glucose levels, fetal and neonatal mortality have been reduced.

PREGNANCY PHYSIOLOGY:

In pregnant state, mother must reorder her priorities so that not only her needs met but those of the growing fetus. Three important events occur when conceptus (fetus and placenta) is grafted in maternal organism i.e. conceptus becomes an additional site for metabolism of maternal hormones, conceptus becomes an additional site for hormones biosynthesis, by its own growth conceptus alters the maternal fuel economy (1).during pregnancy insulin secretion increases approximately two folds by third trimester. Despite this increase in insulin secretion it has a diminished effectiveness in peripheral tissues for mother. Human chronic somatotropin, estrogen and progesterone increases in proportion to placental size and are all synthesizes by placenta. They cause an increase in beta cell secretions and have an effect on target organ metabolism and diminish the insulin sensitivity. These hormones are affected either minimally or not at all by changes in plasma glucose so that the increase insulin secretion that occurs during feeding is able to offset the effect of higher level of these hormones during pregnancy. The conceptus removes glucose by facilitated diffusion and amino acids by active transport. It is necessary for mother to divert her fuel economy towards increasing utilization of fat to spare her glucose and amino acids to make them available for the needs of conceptus. This phenomenon is called as the ACCLERATED STARVATION and

occurs because of several reasons (2). First there is an increase in lipolysis because of human chronic somatotropin secretions. The increased availability of free fatty acids results in heightened ketogenesis by liver. There is also an increased gluconeogenic potential by the liver (3).however fasting glucose is lower than non pregnant state because of available substrate for glucogeonesis is limited since muscle catabolism provides insufficient amino acids for both maternal and fetal use. Thus accelerated starvation is driven by both i.e. presence of hormones and removal of substrate by conceptus.in normal woman the full expression of accelerated starvation includes hypoglycemia, hypoalanemia and hyperketonemia (4).

EFFECT OF PRENANCY ON DIABETES:

Physiological pregnancy alterations impair insulin action (5). The insulin antagonism is probably due to action of placental lactogen, which is secreted in enormous quantities, and to lesser degrees those actions of estrogen and progesterone. Also placental insulinase may contribute to pregnancy induced diabetogenecity by accelerating insulin degradation (6).

EFFECT OF DIABETES ON PREGNANCY:

During pregnancy in the insulin dependent diabetic women, periods of hyperglycemia results in fetal hyperglycemia. Persistently elevated levels of glucose will stimulate the fetal pancreas, resulting in beta cell hyperplasia and fetal hyperinsulinemia (7). Other potent insulin secretagogues, such as amino acids, may be elevated in sera of diabetic women and may be transferred in increased quantity to the fetus. The nutrient appears to play the major role in inducing excessive fetal growth. In a study it has been shown that birth weight can be correlated to fasting maternal plasma amino acid concentrations (8).glucose and other substrates stimulate fetal insulin release resulting in macrosomia and other morbidity. Fetal risks associated with diabetes during pregnancy are macrosomia, cleft palate, respiratory distress syndrome and birth canal injury (9).

MANAGEMENT OF DIABETES IN PREGNANCY:

Women whose pregnancies are complicated by diabetes can be separated into those who were known to have diabetes before pregnancy i.e. pregestatioal diabetes and those with gestational diabetes.

1. Pregestational Diabetes:

The establishment of a pre pregnancy counseling services in centre with a large diabetic clinic population is essential. The major objective is to ensure that good diabetic control prevails at the time of conception and embryogenesis. Studies indicate a lower glucose level in the first trimester and had fewer babies with congenital malformations compared to those women who didn't have counseling (10).pre conception care also gives the opportunity for a change to insulin for all diabetic women on oral hypoglycemic agents. The complications of diabetes in pregnancy also need discussing before pregnancy. In addition to improving diabetic control, the opportunity should be taken to give general advice regarding the importance of being healthy as possible at the start of pregnancy, stopping smoking, reducing alcohol intake and achieving ideal body weight (11). In addition to this contraceptive advise may be given if required and immunity status can be checked. Folic acid supplements are started (12). The major objective of medical management is to attain normoglycemia i.e. of 60 – 120 mg/dl (13).In most institutions most women are taught to monitor there glucose control using a glucose reflectance meter. Glucose determination is made in fasting state, before lunch, dinner, bedtime. Postprandial and nocturnal values are also helpful. (14). During pregnancy most insulin dependent women will require multiple insulin injections. A combination of intermediate and regular or quick acting insulin before breakfast and at dinner time in 70% of women (15). As a general rule the amount of intermediate acting insulin taken in morning will exceed that of

regular by a two or one ratio (16). Any alternate regimen is to administer separate injections of regular insulin at dinner time and intermediate insulin at bedtime to reduce the frequency of nocturnal hypoglycemia (17). Subcutaneous insulin infusion by a calibrated pump may be used during pregnancy. The pump has both advantages and disadvantages but any salutary pregnancy effects have yet to be determined (18). Oral hypoglycemic agents are not used during pregnancy because of there teratogenic effects (19). Diet therapy is critical to successful regulation of maternal diabetes. A program consisting of three meals and several snacks is employed. The goal of diet planning is to minimize hypoglycemia and hyperglycemia while prolonging adequate nutrition for mother and fetus during the entire day. Dietary composition should be 50-60% carbohydrates, 20% protein and 25-30%fat (20). Patients who fail to maintain adequate glucose control despite multiple insulin injections and dietary adjustment may be candidates for continuous subcutaneous insulin infusion (CSII) pump therapy. The initiation of this treatment almost always requires hospitalization. An infusion rate of one unit /hour is established. Multiple blood glucose determination is made to prevent periods of hypo and hyperglycemia (21). After initial visit to a clinic the pregnant women are followed up closely with frequent telephone contact to arrive at a stable insulin regimen. Following careful review of glucose level, adjustments in insulin dosage are made. Fetal growth is evaluated by serial ultrasonographic examinations at 4-6 weeks interval to detect growth abnormalities in diabetic pregnancies. Maternal monitoring of fetal activity is recommended for all women during third trimester. Heart rate monitoring is begun at approximately 32-34 weeks of gestation and should be performed twice (22).

The key to a successful outcome to labour is also good diabetic control. Insulin requirement in labour tends to be low. Fluctuations in blood glucose level are due to labour stress. Normoglycemia reduce the risks of neonatal hypoglycemia (23).

For women having a planned induction of labour or a cesarean section and who are taking long acting insulin in evening, considerations should be given to reducing the evening dose the night before delivery. Normoglycemia is best achieved in both established diabetic and insulin requiring gestational diabetic women by the intra vascular administration of glucose and insulin and this current practice is in all hospitals of UK (24). When mother is admitted in spontaneous labour or prior to induction of labour an intravenous infusion of 10%dextrose solution should be commenced. The infusion rate should be adjusted to provide one liter of fluid every eight hour. Twenty units of soluble insulin should be mixed in 19.8 ml of normal saline in a 20 ml syringe which is then administered intravenously by infusion pump at a final concentration of one unit /ml.The plasma glucose concentration should be estimated prior to deciding whether to start an insulin infusion. Blood glucose concentrations are normally controlled by altering insulin infusion rate. Glucose concentration should initially be repeated at hourly interval and insulin infusion rate increased or decreased by one unit / hour until a stable blood glucose concentration of between 4.5 and 5.5 mmol/L has been achieved. After a rise in early labour the glucose concentration eventually falls as labour progresses so that it may be necessary to stop insulin administration and even to give extra glucose intravenously (25).

Immediately after delivery insulin and glucose infusion should be discontinued, if this is not done hypoglycemia is likely to occur because of increased insulin sensitivity following delivery. For insulin dependent women it is simplest to revert to insulin regimen she was taking before pregnancy and to wait until breast feeding is established before attempting more precise diabetic control. Women with diabetes are encouraged to breast fed. Dietary adjustments for breast feeding are made as they are in non diabetic patients. The insulin dose may be somewhat lower in lactating women because of increased caloric expenditure associated with nursing. If oral hypoglycemic agents are used breast feeding is not advised

because of their possible transfer to fetus in milk (26).

2. Gestational Diabetes:

Gestational diabetes is carbohydrate intolerance induced by pregnancy or carbohydrate intolerance of variable severity with onset or first recognition during the current pregnancy (27).risks factor associated with GDM are family history,obesity,age over 30,history of still birth ,macrosomia before or presently and polyhydramnious before or presently (28).Screening for GDM is controversial. O'Sullivan, whose name has been attached to the glucose tolerance test criteria for the diagnosis of diabetes, found that presence of a positive family history, prior macrosomia or maternal obesity, singly or in combination were of little helping predicting whether or not gestational diabetes would be present (29). Lavin studied over 2000 pregnant women, about half of whom had historic or clinical risk factors and half had none with about 1.5 % prevalence of diabetes in both the group concluding that absence or presence of risk factors had no utility (30). Due to difficulty in assigning relative risk factor to different categories of patients during pregnancy it was recommended that all pregnant women be screened for GDM (31).

The current recommendations are that a 50 g of glucose be given orally at any time of the day and plasma glucose level is determined one hour later. If this glucose is 140mg/dl or greater a glucose tolerance test should be done. The glucose tolerance test is done fasting after two or three days of adequate carbohydrate in take. A 100 g challenge is used, and the glucose level is measured at 0, 1, 2, 3 hr time. Two values have to be abnormal to be considered diagnostic (32).

Once the diagnosis is established, the patients are examined and counseled. It is emphasized that the whole purpose of therapy is to ensure a safe delivery and a healthy newborn. Both at the time of first visit and postpartum, the mother needs to have her risk for persistence of or for the later development of diabetes explained. It should also be emphasized that the risk of childhood diabetes in offspring is quite low. Also helpful for many patients is assurance that insulin be required for fetal well being, it is unlikely to be needed postpartum. Women with GDM generally do not require to be hospitalized for dietary instruction and management. Patients are begun on a program of 2000-2500 calories daily (33). Obese women with GDM may be managed on as little as 1200-1800 kcal/day with less weight gain and no apparent reduction in fetal size (34, 35).the single most important therapeutic intervention in pregnancy complicated with GDM is the careful monitoring of maternal glucose levels throughout the third trimester. Fasting 2-h postprandial glucose levels are monitored at least weekly (36). It has been proposed that a repetitive fasting blood glucose 95mg/dl or greater justifies insulin therapy to reduce the frequency of macrosomia (37). Prophylactic insulin given to patients who would normally be treated with diet alone may also reduce the frequency of macrosomia, cesarean section and birth trauma. It has been suggested that insulin may reduce subtle degree of postprandial hyperglycemia which can promote excessive fetal growth (38). Another prospective randomized investigation of prophylactic insulin indicates similar rates of macrosomia in offspring of diet versus diet and insulin treated GDM women (39). Patients with GDM who are well controlled are at low risk for intrauterine death. Antepartum fetal heart rate testing prior to term has been recommended in three groups of patients with GDM i.e. those who require insulin, those with hypertension and those who have a history of a previous still birth. Maternal activity of fetal assessment is begun at 28 weeks (40).The management of labor of GDM women is not that difficult. If the patient did not require insulin before delivery, nothing needs to be done. If they were taking insulin before delivery and spontaneous labor occurs frequent glucose monitoring should be used and likelihood of need of insulin is low. If spontaneous labor occurs during the day after the usual full dose has been given, no more insulin is needed and careful glucose monitoring is done to prevent hypoglycemia. If

insulin is needed it may be administered as an intravenous drip at sufficient rate to maintain normal glucose. When a planned cesarean section is to be performed, it should be scheduled for early morning. This simplifies peripartum glucose control and allows the neonatal team too prepare for the care of the new born. The patient should not eat or drink after midnight, her usual morning insulin dose is withheld. Epidural anesthesia is preferred because it allows the anesthesiologist to detect early signs of hypoglycemia (41).Glucose values are determined in hospital during the immediate postpartum period to be sure that diabetes is not still present. If mild to moderate hyperglycemia is found than it is managed through lifestyle modifications. Patients are instructed to do home glucose level check during the first four to six weeks of postpartum and record the results for the next visit to hospital (42).

Diabetes is the second most common medical complication duringpregnancy with disastrous effects on the baby and mother if not properly controlled. The aims of the study are how diabetes is controlled during pregnancy and to compare the outcomes of good antenatal care on pregnancy.

MATERIAL AND METHOD

The study was conducted in Gynae department of Jinnah Hospital, Lahore. Women with gestational and pregestational diabetes were included. Women with any concomitant disease were excluded. 30 cases were studied. These women were followed till delivery. Data was collected on data collection form and results tabulated and analyzed.

RESULT

In this study 25% of the pregnant women had pregestational diabetes and 75% had gestational diabetes mellitus. Of all of these cases 90 % had a family history of diabetes mellitus and only 10 % had no family history of diabetes.

Out of these 55% had there diabetes well managed on insulin and 45 % were managed on life style modification such as healthy eating styles, walk and light exercise. 70% had normal delivery, 5% had outlet forceps delivery because of good baby size and 25 % had cesarean section due to fetal distress (baby heart rate more than 180/min) and previous cesarean sections. 90 % had alive and well baby and 10 % of those managed on diet alone and had cesarean section had immediate neonatal death.

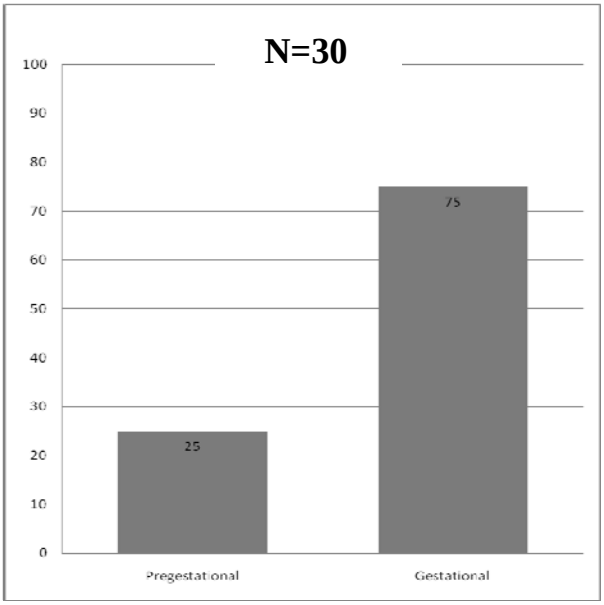

Figure 1 Graph showing ratio of pregestational and gestational diabetes during pregnancy.

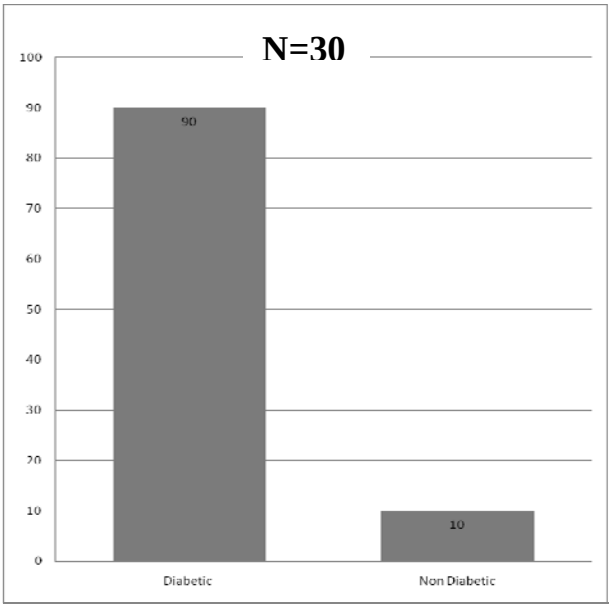

Figure 2 Graph showing familial history of diabetes in pregnant women**.**

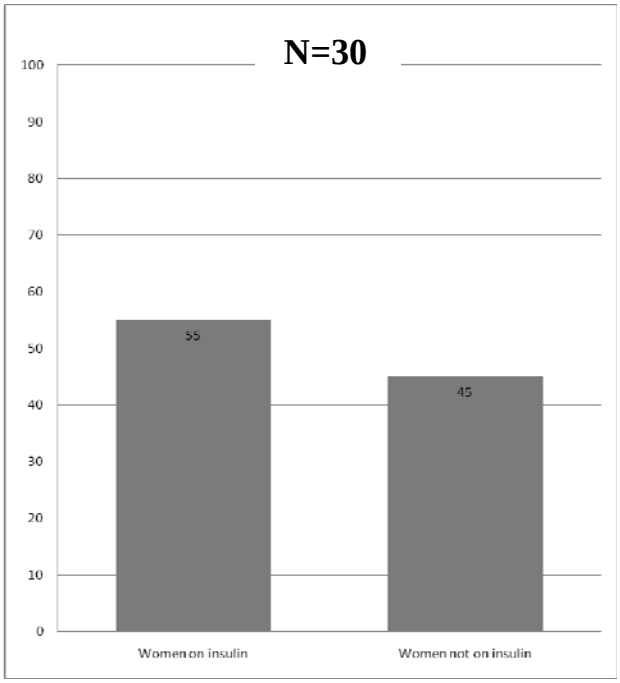

Figure 3 Graph showing number of women on insulin.

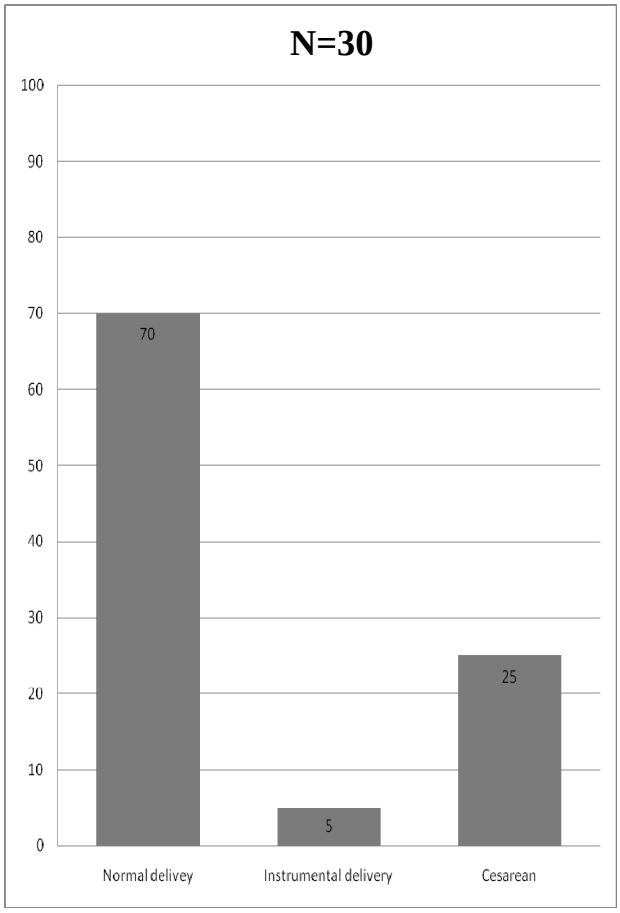

Figure 4 Graph showing mode of delivery .

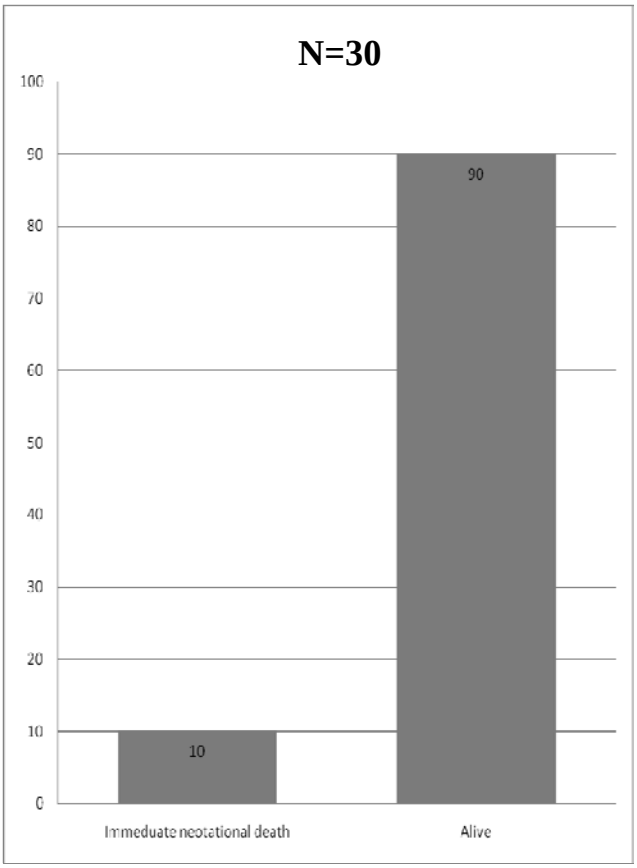

Figure 5 Graph showing outcome of delivery.

DISCUSSION

Women with diabetes mellitus were advised for more frequent antenatal checkups than normal pregnant women. Women with pregestational diabetes on oral hypoglycemic agents were switched to insulin. For this purpose they are admitted in hospital where the dose of insulin is adjusted and patient is taught how to give insulin shots to themselves. They are advised for regular monitoring of blood sugar level by using glucometer, taking balanced diet and exercise.

Serial ultrasound scans is done to monitor fetal growth. During labour insulin infusion along with dextrose is given whose rate is adjusted. Those having GDM, insulin is tapered off after delivery and in case of those women having pregestational diabetes on oral hypoglycemic agents they are switched back to these oral hypoglycemic agents. They were all advised for checkup at 6 week post partum. Those found to have gestational diabetes are advised for occasional checking of blood glucose level

as they can develop diabetes later in life specially those with positive diabetic family history.

CONCLUSION

Diabetes mellitus is a chronic metabolic disease that requires a combination of pharmacological and non-pharmacological measures for better control. Patient adherence to medication and lifestyle modifications plays an important role in diabetes management. It was concluded that timely diagnosis of diabetes and proper antenatal care has positive outcomes on pregnancy.

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