

# 15

## DIABETES MANAGEMENT IN SPECIAL SITUATIONS

Operations, pregnancy, infection and drug use due to concomitant diseases, and the problems arising from social life (traveling, driving and habits) can disrupt glycemic regulation in diabetic patients.

The treatment and follow-up protocols which should be performed in special situations are summarized below.

### 15.1 SURGERY AND DIABETES

#### 15.1.1 Preparation for Surgery in Patients with Diabetes

Patients with diabetes often require surgical procedures besides the general causes for peripheral vascular disease, diabetic foot, vitrectomy, cataract, and arteriovenous (AV) fistula for end-stage renal disease. Diabetes regulation is an important problem in patients undergoing surgical procedures. The patient undergoing to surgery may experience problems summarized in four main topics as follows beside the risks associated with surgery:

##### 1. Hyperglycemia and ketosis

Surgery invokes a stress response with release of counter-regulatory hormones. Counter-regulatory hormone secretion impairs insulin sensitivity and inhibits insulin secretion especially in patients with insulin deficiency. These changes will accelerate the catabolism and lead to rapid hyperglycemia and ketosis.

##### 2. Hypoglycemia

Perioperative fasting, a long-acting insulin or OAD given before the operation (e.g. chlorpropamide and glibenclamide) may cause hypoglycemia. Because the patient under anesthesia or sedation cannot feel warning signs of hypoglycemia or cannot seek help extremely serious consequences may occur. Therefore, it is necessary to avoid the risk of hypoglycemia in patients, especially in elderly patients, undergoing to surgery.

##### 3. Perioperative complications

Infection and myocardial infarction are common complications in diabetic patients undergoing to surgery.

##### 4. Suboptimal metabolic control

Negligence of protocols or only partially adherence to protocols during surgery, insufficient follow-up blood glucose levels and ignorance of obvious deviations of glycemia may lead to problems.

The goal is to maintain blood glucose levels within a target range (e.g., 100 to 125 mg/dL) during the perioperative period. Recommended target blood glucose levels for patients prone to develop diabetic complications including nephropathy and severe autonomic neuropathy are in the range of 120 to 180 mg/dL.

A simple and secure protocol should be developed to regulate diabetic patients during surgery, and this protocol should be adapted by all members of the team (Table 15.1). The protocols in patients treated with insulin and in those who are not using insulin to ensure glycemia regulation during surgery are different:

**Table 15.1 The preparation protocol for surgery in patients with type 1 and type 2 diabetes**

1. Glycemic control should be provided in the preoperative period
  - A short-acting agent should be used instead of a long-acting sulfonylurea a few days before minor surgery in patients with type 2 diabetes.
  - Patients undergoing to major surgical procedure are hospitalized 2-3 days before surgery, and a short-acting insulin is used in patients with type 2 diabetes.
2. A consultation with the anesthesiologist is arranged.
3. Operations should be planned in the morning if possible.
4. Patients should not have breakfast and should not take sulfonylurea or insulin in the operation morning.
5. Type 2 diabetic patients not using insulin, undergoing to a minor surgical procedure, is monitored by measuring blood glucose levels in every 2 hours in the operation day, and routine OAD treatment is started with the first meal after surgery.
6. All patients with type 1 diabetes as well as type 2 diabetic patients, undergoing to major surgical procedures, should receive glucose-insulin-potassium (GIK) infusion.
 

GIK solution<sup>†</sup> is prepared as a mixture of 500 mL 5% dextrose, 10 IU short-acting insulin and 10 mmol K (1 ampoule of 7.5% KCl).

  - The infusion is started at 08:00-09:00 am in the day of surgery.
  - The infusion rate is started at 100 mL/h.
  - The infusion is renewed in every 5 hours.
  - Blood glucose levels are measured in every 1 to 2 hours and the infusion rate is adjusted to keep the level between 100-125 mg/dL<sup>††</sup>.
7. GIK infusion is maintained until oral intake is adequate, then routine treatment is initiated. If the infusion is continued for longer than 24 hours Na<sup>+</sup> and K<sup>+</sup> must be controlled.

<sup>†</sup> GIK solution can be prepared as a mixture of 10% dextrose, 15 IU insulin and 10 mmol K<sup>+</sup>.

<sup>††</sup> Target BG levels should be between 120-180 mg/dL in patients at high risk of hypoglycemia.

### A. Non-insulin treated type 2 diabetic patients

- Short-acting agents should be used instead of long-acting sulfonylureas a few days before surgery to reduce the risk of hypoglycemia.
- Many patients with well-controlled diabetes are monitored closely for blood glucose levels during minor surgical procedures.
- The patients with uncontrolled diabetes or undergoing major surgical procedures should be monitored and treated as patients treated with insulin.

### B. Type 1 diabetic patients or insulin-treated type 2 diabetic patients

- Both insulin and glucose should be given in a continuous infusion during surgery. Glucose and insulin infusions during surgery reduce the metabolic disturbances and improve the success of surgery.
- Although glucose and insulin can be given through separate veins, they can also be given together as a glucose-insulin-potassium (GIK) infusion to avoid hypokalemia.

#### 15.1.2 GIK Infusion

Glucose and insulin is supplied in the same route in this widely used, practical and safe method. 10 IU short-acting insulin and 10 mmol KCl (1 ampoule of 7.5% KCl) are added to 500 mL 5% dextrose. The insulin infusion rate is determined by blood glucose levels according to the following protocol (Table 15.2).

**Table 15.2 GIK infusion protocol**

Blood glucose level (mg/dL)	Infusion rate (mL/h)
≥280	140
279-220	120
219-180	100
179-120	80
119-80	60
<80	Infusion is interrupted for 2 h
GIK: Glucose-insulin-potassium solution	

Alternatively a mixture of 500 mL 10% dextrose, 20 IU short-acting insulin and 10 mmol K may be prepared for patients at risk for fluid overload. The infusion rate is decreased by 50% of the original protocol, and adjusted according to blood glucose levels, thus fluid loading could be avoided.

### 15.1.3 Glucose and Insulin infusions Given by Separate Veins

Glucose is administered in 5% dextrose in water at the rate of 100 mL/h, and insulin is given to keep blood glucose levels in the range of 100-125 mg/dL (between 120-180 mg/dL in patients at high risk of hypoglycemia) at a rate of 2-4 IU/h. Insulin solution is prepared with 250 IU short-acting insulin within 500 mL saline solution. Insulin infusion should be given from the set of 5% dextrose rather than directly by intravenous route (Table 15.3). 10% rather than 5% dextrose solution can be chosen in patients at risk for fluid overload.

**Table 15.3 Perioperative insulin and glucose infusion protocol given by separate routes**

Blood glucose levels (mg/dL)	Insulin infusion		5% dextrose (mL/h)
	(mL/h)	(IU/h)	
≤70	1.0	0.5	150
71-100	2.0	1.0	125
101-150	3.0	1.5	100
151-200	4.0	2.0	75
201-250	6.0	3.0	50
251-300	8.0	4.0	0
>300	12.0	6.0	0

### 15.1.4 Regulation of Glycemia in Specific Surgical Procedures

Insulin requirement changes during surgery in patients with different clinical conditions (Table 15.4).

**Table 15.4 Perioperative insulin requirements in different clinical conditions**

Clinical condition	Insulin (IU /1 g glucose)
Normal weight	0.25-0.35
Obese	0.40
Liver disease	0.40-0.60
Steroid users	0.40-0.50
Sepsis	0.50-0.70
Cardiopulmonary problems	0.90-1.20

### Glycemic regulation during open heart surgery

- Glucose-rich solutions and inotropic agents given during cardiopulmonary bypass surgery, and hypothermia significantly increases insulin requirements.
- These patients may not be adequately controlled with GIK solution.
- Glucose and insulin should be given through separate veins and blood glucose levels should be checked more frequently (e.g. in every half an hour).
- Glucose infusion rate should be kept low during the operation, but immediately converted to the conventional doses after the operation.
- According to the literature, patients who received glucose, insulin and potassium during cardiac surgery had less need for inotropic agents, required a shorter duration of mechanical ventilation, had a shorter hospital stay and had a lower risk of atrial fibrillation compared to the patients who did not receive this treatment.

### Laparoscopic abdominal surgery

- Metabolic disorders and insulin resistance that may occur during these types of procedures (e.g. cholecystectomy) are similar to those seen in open surgeries.
- Therefore, surgery preparation guidelines should be strictly adhered and similar protocols should be used.

### Cesarean section

- Pregnant women with diabetes who require insulin are suggested to receive glucose and insulin in separate routes during delivery.
- GIK protocol is safe and reliable in women who undergo an elective section.
- GIK solution is prepared with 15-20 IU short-acting insulin within 500 mL 10% dextrose, and the infusion rate is determined by blood glucose levels.
- The  $\alpha$ -adrenergic agonists which are used to delay labor and dexamethasone, used to accelerate fetal lung maturation, may increase insulin requirements.
- Upon delivery of placenta the insulin requirement decreases. Therefore, GIK infusion is stopped and blood glucose monitoring is continued.
- After delivery the insulin dose is decreased by half or one-third of the original dose and GIK infusion is reinitiated.
- The pre-pregnancy s.c. insulin doses can be given again as oral intake is adequate.

## 15.2 PATIENTS UNDER TOTAL PARENTERAL NUTRITION THERAPY

Some diabetic patients may need TPN therapy in the postoperative period. TPN can cause serious metabolic problems if not properly monitored or adjusted.

- In this case, the therapy should be initiated with continuous insulin infusion and hourly blood glucose measurements.
- Since TPN solution contains a very high concentration of glucose, glucose infusion is not necessary.
- Initially, insulin infusion and TPN solution should be administered by different routes.
- Once the insulin dose becomes stable by hourly blood glucose measurements (usually after 12-24 hours), total insulin dose given in the last 24 hours can be added to the TPN solution.
- From this point blood glucose levels should be measured every 2-4 hours.
- The insulin dosage can be >100 IU/24 h according to the metabolic status and insulin resistance of the patient.

## 15.3 PREGNANCY AND DIABETES

The compliance with follow-up and treatment protocols in practice is necessary to minimize the risk of fetal and maternal complications in women with pregestational diabetes, or women with GDM. The principles of diagnosis and treatment in uncomplicated diabetic pregnancies are summarized in Table 15.5.

**Table 15.5 Principles of follow-up and treatment for pregnant women with diabetes without complication**

<b>Follow-up</b>	
<b>White Class B-C</b>	
<ul style="list-style-type: none"> <li>• SMBG is required 4 – 7 times a day at home.</li> <li>• The patient is examined every 2 weeks up to 34 weeks and every week after that.</li> <li>• The second level ultrasonography is performed at 20 weeks and then repeated every 4 – 6 weeks.</li> <li>• A1C is measured every month.</li> <li>• Fetal movements are evaluated.</li> <li>• A non-stress test is carried out at 32 and 34 weeks.</li> <li>• Fundus is examined every trimester.</li> <li>• Microalbuminuria is checked with a 24 hour urine sample every trimester.</li> </ul>	
<b>White Class D-FR</b>	
<ul style="list-style-type: none"> <li>• In addition to the above, ECG, and uric acid, transaminases, fibrinogen and fibrin degradation products levels are measured in each trimester.</li> </ul>	
<b>Insulin treatment</b>	
<ul style="list-style-type: none"> <li>• The basal-bolus insulin regimen is used in the therapy of both pregestational (type 1 and type 2) diabetic patients and GDM cases with FPG&gt;95 mg/dL, 1 h PG&gt;140 mg/dL and 2 h PG&gt;120 mg/dL.</li> <li>• A regular insulin is given 3 times a day before meals, and NPH insulin at night.</li> </ul> <p>NPH may be administered in two doses (morning and evening or noon and night) in patients who are inadequately controlled.</p>	
<b>Delivery time</b>	
<ul style="list-style-type: none"> <li>• In White A and B patients, if glycemia is well regulated delivery is planned in ≤42 weeks.</li> <li>• In White C-FR patients, delivery should be planned in term or when lung maturity has been completed.</li> </ul>	
<b>Delivery</b>	
<ul style="list-style-type: none"> <li>• GIK is infused based on blood glucose levels. An NaCl 0.9% is also infused if needed.</li> </ul>	

### 15.3.1 Gestational Period

#### Glycemic control targets

Targets for venous PG levels measured by glucose oxidase method and A1C goals are summarized below:

- Fasting (FPG) ≤95 mg/dL
- 1 h postprandial PG levels 100-140 mg/dL (preferably 100-120 mg/dL)
- 2 h PG 90-120 mg/dL
- A1C ≤6.5% (preferably <6.0%).

#### Treatment

##### A. The principles of medical nutrition therapy (MNT)

##### Daily caloric requirements

Calories are calculated according to ideal body weight.

- 24 kcal/kg for obese diabetic patients
- A diet of 30 kcal/kg ideal body weight in the first trimester, with an increase to 35 kcal/kg ideal body weight in the second trimester in non-obese patients

##### Food components

The food components in total daily caloric requirements should be calculated as follows:

- Carbohydrates: 45-50% (≥200 g/day)
- Proteins: 18-20% (1-1.5 g/kg/day)
- Fats: 30-35% (40-60 g/day)

In addition, pregnant women need sufficient vitamin and mineral intakes:

- Iron: 18 mg/day
- Folic acid: 400-800 mg/day
- Calcium: 1200 mg/day

**Number of meals**

Pregnant women should have a meal planning in 7 parts in a distribution of 3 main meals and 4 snacks. Daily calorie intake should be distributed as follows:

- Main meals: 3/18 in the morning, 4/18 at noon, and 4/18 in the evening
- 2/18 in each snack
- 1/18 at bedtime snack

**The rate of weight gain**

- 1-2 kg in the first trimester
- 250-500 g per week in the second and third trimesters
- Total weight gain during pregnancy should not exceed 10-12 kg.

**B. Principles of medical treatment****Gestational diabetes**

1. Insulin should be initiated if FPG >105 mg/dL and/or 1 h PG levels >140 mg/dL despite two weeks of dietary treatment (insulin therapy may be initiated in patients with FPG >95 mg/dL and trained against the risk of hypoglycemia).
2. If FPG is 105-120 mg/dL, and 1 h PG levels are 120-160 mg/dL, 0.3-0.4 IU/kg/day intermediate acting NPH insulin can be given as a single dose at night.
3. If FPG >120 mg/dL, and 1 h PG levels >200 mg/dL, 0.7 IU/kg/day mixed insulin (short acting + NPH) can be given in two doses.
4. Basal-bolus insulin therapy should be implemented as early as possible in patients with symptoms of hyperglycemia or who cannot be controlled with the therapy mentioned above.
5. Dosage adjustment is done according to the results of SMBG at least 3 days per week for 4-7 times a day.

**SEMT RECOMMENDATIONS FOR MANAGEMENT OF GESTATIONAL DIABETES**

1. *Women with GDM should achieve the following glycemic targets:*
  - o *Fasting and preprandial PG ≤95 mg/dL*
  - o *1 h postprandial PG (PPG) 100-140 mg/dL*
  - o *2 h PPG 90-120 mg/dL*
  - o *A1C ≤6.5% (preferably <6.0%)*
- *SMBG should be undertaken at least 3 times per day, 4-7 times a day (both pre- and postprandial and at night) to achieve glycemic targets and improve pregnancy outcomes [Class C, Level 3 evidence (1)].*
  - *1-h PPG levels should be preferred in postprandial monitoring [Class D, evidence based consensus].*
  - *Nutrition counseling should be received from a dietitian who is a part of the diabetes health care team during pregnancy and postpartum period [in pregnancy: Class C, Level 3 evidence (2); postpartum period: Class D, evidence based consensus].*
  - *Recommendations for weight gain during pregnancy should be based on pregravid BMI [Class D, evidence based consensus].*
  - *Ketosis should be avoided during pregnancy [Class C, Level 3 evidence (3)].*
2. *Insulin treatment should be initiated in women with GDM who cannot achieve adequate glycemic control despite two-week dietary treatment [Class D, evidence based consensus].*
  - *Insulin regimen should be individualized to achieve glycemic targets, with consideration given to intensive insulin therapy [Grade A, Level 1A evidence (4)].*
3. *As women who have had GDM are defined at high risk of developing subsequent type 2 diabetes, a standard OGTT (with 75-g glucose) should be performed between 6 weeks and 6 months postpartum [Class D, evidence based consensus].*
4. *Women with previous GDM should follow the screening and prevention guidelines for other high-risk groups for type 2 diabetes [Class D, evidence based consensus].*
  - *They should be rescreened for type 2 diabetes when planning another pregnancy [Class D, evidence based consensus].*

## REFERENCES

1. Nachum Z, Ben-Shlomo I, Weiner E, et al. Twice daily versus four times daily insulin dose regimens for diabetes in pregnancy: randomized controlled trial. *BMJ* 1999;319:1223-7.
2. Langer O, Conway DL, Berkus MD, et al. A comparison of glyburide and insulin in women with gestational diabetes mellitus. *N Engl J Med* 2000;343:1134-8.
3. Bertini AM, Silva JC, Taborda W, et al. Perinatal outcomes and the use of oral hypoglycemic agents. *J Perinat Med* 2005; 33:519-23.
4. Jacobson GF, Ramos GA, Ching JY, et al. Comparison of glyburide and insulin for the management of gestational diabetes in a large managed care organization. *Am J Obstet Gynecol* 2005;193:118-24.

## Pregestational diabetes

- In patients with insulin requirement of  $\geq 0.8$  IU/kg/day, insulin is applied 3-5 times a day according to basal-bolus insulin regimen.
- There is no consensus about the use of rapid-acting insulin analogues (lispro, aspart) in pregnancy. However, an increasing number of clinical studies reported successful results because these insulins provide physiological insulinemia, and they were taken to category B in pregnancy.
- Similarly the use of insulin pump provides a more physiological insulinemia in trained and motivated patients.

## SEMT RECOMMENDATIONS FOR MANAGEMENT OF PREGESTATIONAL DIABETES

1. Women with type 1 or type 2 diabetes of reproductive age should:
  - Use a reliable birth control method if sexually active and not desire pregnancy [Class D, evidence based consensus].
  - Be counseled about the necessity of pregnancy planning, including the importance of good glycemic control and the need to stop potentially embryopathic drugs prior to pregnancy [Class D, evidence based consensus].
2. Before attempting to become pregnant, women with type 1 or type 2 diabetes should:
  - Receive preconception counseling regarding optimal diabetes management and nutrition, preferably in consultation with an interdisciplinary pregnancy team, to optimize maternal and neonatal outcomes [Class C, Level 3 evidence (1-3)].
  - Strive to attain a preconception glycemic control (optimal A1C should be  $\leq 6.5\%$ , if the patient is not at high risk of hypoglycemia A1C target can be  $6.0\%$ ) to minimize the risk of:
    - o Spontaneous abortions [For type 1 diabetes: Class C, Level 3 evidence (4); for type 2 diabetes: Class D, evidence based consensus]
    - o Congenital malformations [Class C, Level 3 evidence (1-6)]
    - o Pre-eclampsia [Class C, Level 3 evidence (7,8)]
    - o Progression of retinopathy in pregnancy [For type 1 diabetes: Class A, Level 1A evidence (9); for type 2 diabetes: Class D, evidence based consensus].
  - The women attempting to become pregnant should be supplemented with 5 mg/day folic acid at least 3 months preconception and continuing until at least 12 weeks postconception. From 12 weeks postconception and throughout the pregnancy, the first 6 weeks postpartum and as long as breastfeeding continues, supplementation should consist of 0.4 to 1.0 mg/day folic acid [Class D, evidence based consensus].
  - The medications considered to be potentially embryopathic, including any from the following classes should be discontinued:
    - o ACE-Is and ARBs [Class C, Level 3 evidence (10)]. In the presence of HT, these may be replaced with antihypertensive agents that are known to be safe in pregnancy such as calcium channel blockers, beta-blockers, labetalol, hydralazine and methyl dopa [Class D, evidence based consensus].
    - o Statins [Class D, Level 4 evidence (11)].
  - Women planning pregnancy should undergo an ophthalmologic evaluation by a specialist. Repeat assessments should be performed during the first trimester, as needed during the rest of the pregnancy and within the first year postpartum [For type 1 diabetes: Class A, Level 1 evidence (9-12); for type 2 diabetes: Class D, evidence based consensus].
  - Women attempting to become pregnant should be screened for nephropathy [Class D, evidence based consensus]. If microalbuminuria or overt nephropathy is found, glycemic and BP control should be optimized to minimize maternal and fetal complications and to delay progression of nephropathy [Class C, Level 3 evidence (13,14)].
3. Women with type 2 diabetes who are planning pregnancy or become pregnant should:
  - Switch from OADs to insulin [Class D, evidence based consensus].
  - In the setting of PCOS metformin can be safely used for ovulation induction [Class D, evidence based consensus].

- *The safety of metformin beyond ovulation induction in women with type 2 diabetes remains unknown [Class D, evidence based consensus].*
  - *Receive an individualized insulin regimen to achieve glycemic targets, with consideration given to intensive insulin therapy [Class A, Level 1 evidence (15)].*
4. *Pregnant women with type 1 or type 2 diabetes should:*
- *Strive to achieve target glucose values:*
    - o *Fasting/preprandial PG  $\leq$ 95 mg/dL*
    - o *1 h PPG 100-140 mg/dL*
    - o *2 h PPG 90-120 mg/dL*
    - o *A1C  $\leq$ 6.5% (preferably 6.0%)*
  - *Perform SMBG at least 3 days and 4-7 times a day (pre- and postprandial and at night) to achieve glycemic targets and improve pregnancy outcomes [Class C, Level 3 evidence (1)].*
  - *1 h PPG should be preferred in postprandial monitoring [Class D, evidence based consensus].*
  - *Receive nutrition counseling from a dietitian who is a part of the diabetes health care team during pregnancy and postpartum period [in pregnancy: Class C, Level 3 evidence (3); postpartum period: Class D, evidence based consensus].*
  - *Weight gain during pregnancy should be based on pregravid BMI [Class D, evidence based consensus].*
  - *Ketosis should be avoided during pregnancy [Class C, Level 3 evidence (16)].*
  - *Pregnant women with type 1 diabetes should receive intensive insulin therapy with multiple daily injections or an insulin pump [Class A, Level 1A evidence (15,17)].*
  - *Pregnant women with type 1 diabetes should be screened for postpartum thyroiditis with TSH levels at 6 weeks postpartum [Class D, evidence based consensus].*

## REFERENCES

1. Ray JG, O'Brien TE, Chan WS. Preconception care and the risk of congenital anomalies in the offspring of women with diabetes mellitus: a meta-analysis. QJM 2001;94:435-44.
2. Kitzmiller JL, Gavin LA, Gin GD, et al. Preconception care of diabetes. Glycemic control prevents congenital anomalies. JAMA 1991;265:731-6.
3. McElvy SS, Miodovnik M, Rosenn B, et al. A focused preconceptional and early pregnancy program in women with type 1 diabetes reduces perinatal mortality and malformation rates to general population levels. J Matern Fetal Med 2000;9:14-20.
4. Jovanovic L, Knopp RH, Kim H, et al. Elevated pregnancy losses at high and low extremes of maternal glucose in early normal and diabetic pregnancy: evidence for a protective adaptation in diabetes. Diabetes Care 2005;28:1113-7.
5. Suhonen L, Hiilesmaa V, Teramo K. Glycaemic control during early pregnancy and fetal malformations in women with type I diabetes mellitus. Diabetologia 2000;43:79-82.
6. Guerin A, Nisenbaum R, Ray JG. Use of maternal GHb concentration to estimate the risk of congenital anomalies in the offspring of women with pre-pregnancy diabetes. Diabetes Care 2007;30:1920-5.
7. Hiilesmaa V, Suhonen L, Teramo K. Glycaemic control is associated with pre-eclampsia but not with pregnancy-induced hypertension in women with type I diabetes mellitus. Diabetologia 2000;43:1534-9.
8. Hsu CD, Tan HY, Hong SF, et al. Strategies for reducing the frequency of preeclampsia in pregnancies with insulin-dependent diabetes mellitus. Am J Perinatol 1996;13:265-8.
9. The Diabetes Control and Complications Trial Research Group. Effect of pregnancy on microvascular complications in the Diabetes Control and Complications Trial. Diabetes Care 2000;23:1084-91.
10. Cooper WO, Hernandez-Diaz S, Arbogast PG, et al. Major congenital malformations after first-trimester exposure to ACE inhibitors. N Engl J Med 2006;354:2443-51.
11. Edison RJ, Muenke M. Central nervous system and limb anomalies in case reports of first-trimester statin exposure. N Engl J Med 2004;350:1579-82.
12. The Diabetes Control and Complications Trial Research Group. Early worsening of diabetic retinopathy in the Diabetes Control and Complications Trial. Arch Ophthalmol 1998;116:874-86.
13. Ekblom P, Damm P, Feldt-Rasmussen B, et al. Pregnancy outcome in type 1 diabetic women with microalbuminuria. Diabetes Care 2001;24:1739-44.
14. Reece EA, Leguizamón G, Homko C. Stringent controls in diabetic 180 mg/dl nephropathy associated with optimization of pregnancy outcomes. J Matern Fetal Med 1998;7:213-6.
15. Nachum Z, Ben-Shlomo I, Weiner E, et al. Twice daily versus four times daily insulin dose regimens for diabetes in pregnancy: randomized controlled trial. BMJ 1999;319:1223-7.
16. Rizzo T, Metzger BE, Burns WJ, et al. Correlations between antepartum maternal metabolism and child intelligence. N Engl J Med 1991;325:911-16.
17. The Diabetes Control and Complications Trial Research Group. Pregnancy outcomes in the Diabetes Control and Complications Trial. Am J Obstet Gynecol 1996;174:1343-53.



### 15.3.2 Delivery

- Preferably delivery by the vaginal route at 38 weeks is recommended.
- The delivery must take place in pregestational diabetics classified as C-FR in White classification when fetal pulmonary maturation has completed.
- Glycemic levels during labor are followed in accordance with GIK infusion protocol. (GIK infusion has been described under the heading of 'Diabetes and surgery' previously. See Chapter 15.1).
- GIK protocol is continued until normal oral intake can be resumed.
- Women can switch to preconception insulin therapy when oral intake is adequate.

### 15.3.3 Postnatal Period

- After delivery the need for insulin is reduced.
- The treatment is rearranged by taking into consideration therapeutic doses before pregnancy.
- Lactation should be started as soon as possible and CH should be increased 50g/day in daily energy requirements.
- If glycemic targets are not achieved using lifestyle modifications in pregestational type 2 diabetic patients and postpartum GDM cases insulin therapy should be continued during lactation period.

## 15.4 TREATMENT OF HYPERGLYCEMIA IN INTENSIVE CARE UNIT

Hyperglycemia in patients with previously known diabetes or newly onset diabetes who are monitored in medical and surgical intensive care units is one of the key factors determining morbidity and mortality. Although previous studies have been reported good results with intensive insulin therapy in patients monitored in the coronary care unit due to acute myocardial infarction, subsequent studies revealed contradictory results. But as a result of new meta-analyses including the NICE-SUGAR study published in 2009, and similar studies, tight glycemic goals have been adopted to avoid hypoglycemia that may increase the risk of mortality. The revised SEMT approach is summarized below in light of recently published ADA/EASD consensus on this issue.

### SEMT RECOMMENDATIONS FOR MANAGEMENT OF HYPERGLYCEMIA IN INTENSIVE CARE UNIT PATIENTS

1. *Provided that their medical conditions, dietary intake and glycemic control are acceptable, patients with diabetes should be maintained on their prehospitalization regimens [Class D, evidence based consensus].*
2. *In critically ill patients:*
  - *Insulin therapy should be initiated for treatment of persistent hyperglycemia, starting at a threshold of 180 mg/dL [Class D, evidence based consensus].*
  - *Intravenous insulin infusion is the preferred method for achieving and maintaining glycemic control in critically ill patients [Class D, evidence based consensus].*
  - *Glycemic levels should be maintained between 140-180 mg/dL in critically ill patients using insulin [Class A, Level 1A evidence (1)].*
  - *Validated insulin infusion protocols with demonstrated safety and efficacy, and with low risk of hypoglycemia are recommended [Class D, evidence based consensus].*
  - *In patients on i.v. insulin therapy, frequent glucose monitoring is essential to minimize the risk of hypoglycemia and to achieve optimal glucose control [Class D, evidence based consensus].*
  - *To maintain intraoperative glycemic levels between 100 and 180 mg/dL for patients with diabetes undergoing coronary artery bypass surgery, a continuous i.v. insulin infusion alone [Class C, Level 3 evidence (2-5)] or with the addition of glucose and potassium [Class B, Level 2 evidence (6)].*
3. *Non-critically ill patients [Class D, evidence based consensus]:*
  - *For the majority of noncritical ill patients, premeal PG target should generally be <140 mg/dL in conjunction with random PG levels <180 mg/dL, provided these targets can be safely achieved.*
  - *In patients already in tight glucose control, lower glycemia levels can be achieved.*
  - *Less stringent targets may be appropriate in terminally ill patients or in patients with severe comorbidities.*

- A proactive approach that may include s.c. basal-bolus insulin along with correction-doses is preferred over the "sliding scale" reactive approach using only a short- or a rapid-acting insulin after hyperglycemia has occurred [Class D, evidence based consensus].
  - Non-insulin antihyperglycemic agents are not appropriate in most hospitalized patients who require therapy for hyperglycemia.
  - Clinical judgment and ongoing assessment of clinical status must be incorporated into day-to-day decisions regarding treatment of hyperglycemia.
4. Safety [Class B, Level 2 evidence (7,8)].
- Overtreatment and undertreatment of hyperglycemia represent major safety concerns.
  - In hospitalized patients the therapy should be conducted with an appropriate protocol and trained staff to ensure the safe and effective implementation of this therapy and to minimize the likelihood of hypoglycemia.
  - Caution is required in interpreting results of point of care glucose meters in patients with anemia, polycythemia, hypoperfusion, or use of some medications.
5. Cost [Class A, Level 1A evidence (9,10)].
- Appropriate inpatient management of hyperglycemia is cost-effective.
6. Discharge planning
- Preparation for discharge should begin at the time of hospital admission.
  - Discharge planning, patient education, and clear communication with outpatient providers are critical for ensuring a safe and successful transition to outpatient glycemic management.
7. Other issues [Class B, Level 2 evidence (8)].
- Hyperglycemia is a common complication of corticosteroid therapy. A reasonable approach is to institute glucose monitoring for at least 48 h in all patients receiving high-dose glucocorticoid therapy and to initiate insulin therapy as appropriate.
  - In patients who are receiving continuous enteral or parenteral nutrition, glucose monitoring is optimally performed every 4-6 h. More frequent BG testing, ranging from every 30 min to every 2 h, is required for patients receiving i.v. insulin infusions.

## REFERENCES

1. The NICE-SUGAR Study Investigators, Finfer S, Chittock DR, Su SY, et al. Intensive versus conventional glucose control in critically ill patients. *N Engl J Med* 2009;360:1283-97.
2. Furnary AP, Zerr KJ, Grunkemeier GL, et al. Continuous intravenous insulin infusion reduces the incidence of deep sternal wound infection in diabetic patients after cardiac surgical procedures. *Ann Thorac Surg* 1999;67:352-60.
3. Furnary AP, Gao G, Grunkemeier GL, et al. Continuous insulin infusion reduces mortality in patients with diabetes undergoing coronary artery bypass grafting. *J Thorac Cardiovasc Surg* 2003;125:1007-21.
4. Furnary AP, Wu Y, Bookin SO. Effect of hyperglycemia and continuous intravenous insulin infusions on outcomes of cardiac surgical procedures: the Portland Diabetic Project. *Endocr Pract* 2004;10(Suppl. 2):21-33.
5. Van den Berghe G, Wouters P, Weekers F, et al. Intensive insulin therapy in the critically ill patients. *N Engl J Med* 2001;345:1359-67.
6. Lazar HL, Chipkin SR, Fitzgerald CA, et al. Tight glycaemic control in diabetic coronary artery bypass graft patients improves perioperative outcomes and decreases recurrent ischemic events. *Circulation* 2004;109:1497-502.
7. Wiener RS, Wiener DC, Larson RJ. Benefits and risks of tight glucose control in critically ill adults: a meta-analysis. *JAMA* 2008;300:933-44.
8. Moghissi ES, Korytkowski MT, DiNardo M, et al. American Association of Clinical Endocrinologists and American Diabetes Association Consensus Statement on Inpatient Glycemic Control. *Diabetes Care* 2009;32:1119-31, and *Endocrine Practice* 2009;15:1-15.
9. Krinsley JS, Jones RL. Cost analysis of intensive glycemic control in critically ill adult patients. *Chest* 2006;129:644-50.
10. Van den Berghe G, Wouters PJ, Kesteloot K, et al. Analysis of healthcare resource utilization with intensive insulin therapy in critically ill patients. *Crit Care Med* 2006;34:612-6.

## 15.5 TREATMENT OF CORTICOSTEROID RELATED HYPERGLYCEMIA

Certain drugs, commonly used today may cause hyperglycemia in people without diabetes or may impair glycemic control in patients with previously known diabetes (Table 15.6). Glucocorticoids are the most well-known of these drugs.

**Table 15.6 Drugs that cause hyperglycemia**

<b>Strong effect</b>	Glucocorticoids Oral contraceptives High-dose estrogen preparations Levonorgestrel (combined) Drugs containing high dose (>5 mg/day) thiazide diuretics $\beta$ 2-adrenoceptor antagonists B2-adrenoceptor agonists Salbutamol Ritodrine Atypical antipsychotics Clozapine Olanzapine HIV protease inhibitors Indinavir Nelfinavir Other hyperglycemic agents Pentamidine Streptozotocin Diazoxide Cyclosporin Tacrolimus
<b>Light effect</b>	Oral contraceptives Drugs containing low dose ( $\leq$ 2.5 mg/day) thiazide diuretics Loop diuretics ACE-I Calcium channel blockers $\alpha$ 1-antagonists Growth hormone Somatostatin analogues SSRI

ACE-I: Angiotensin converting enzyme inhibitors, SSRI: Selective serotonin re-uptake inhibitors

- Glucocorticoids reduce the peripheral and partly hepatic insulin sensitivity by affecting post-receptor mechanisms.
- High-dose prednisolone ( $\geq$ 30 mg/day) impairs glycemic regulation in known diabetics, and increases short-acting insulin requirement. Insulin resistance and hyperglycemia, occurred in patients using prednisolone over the physiological doses (>7.5 mg/day) may return to normal after discontinuation of medication.
- Almost 14-28% of people without diabetes develop IGT or diabetes with glucocorticoid use. Insulin response to glucose decreases in OGTT.
- In diabetes induced by glucocorticoids, an OAD or more favorably insulin should be used.
- Patients receiving high dose glucocorticoid therapy should initiate insulin.
- The insulin dose should be increased (by ~50%) in diabetic patients under insulin treatment.

#### **SEMT RECOMMENDATIONS FOR GLUCOCORTICOID INDUCED HYPERGLYCEMIA**

1. *FPG is relatively normal in diabetics using glucocorticoid, whereas postprandial glycemia is high in the afternoon and in the evening (Class D, evidence based consensus).*
2. *A short/rapid-acting insulin should be preferred in hyperglycemia related to the use of high dose glucocorticoids. Basal insulin may be required in patients using single-dose steroid (Class D, evidence based consensus).*
3. *The insulin dose can be increased by 50% in patients under insulin treatment (Class D, evidence based consensus).*

## 15.6 DIABETES IN THE ELDERLY

Older population with diabetes is growing with prolonged life expectancy in our country and diabetes care and treatment of this group constitutes problem. The relevant approach and recommendations by SEMT are summarized below.

### SEMT RECOMMENDATIONS FOR MANAGEMENT OF DIABETES IN THE ELDERLY

1. *Similar to other risk groups, in elderly individuals with IGT, a structured program of lifestyle modification that includes moderate weight loss and regular physical activity should be considered to reduce the risk of type 2 diabetes [Class A, Level 1A evidence (1)].*
2. *Otherwise healthy elderly people with diabetes should be treated to achieve the same glycemic, BP and lipid targets as younger people with diabetes [Class D, evidence based consensus].*
  - *In people with multiple comorbidities, restricted functional capacity or limited life expectancy, the goals should be less stringent [Class D, evidence based consensus].*
3. *Elderly people with diabetes living in the nursing house should be referred for interdisciplinary interventions [Class D, evidence based consensus].*
4. *Mild aerobic (and if necessary endurance exercise may benefit elderly people with type 2 diabetes and should be recommended for those individuals in whom it is not contraindicated [Class B, Level 2 evidence (2,3-5)].*
  - *In elderly people with type 2 diabetes, sulfonylureas should be used with caution because the risk of hypoglycemia increases exponentially with age [Class D, Level 4 evidence (6)].*
  - *In general, initial doses of sulfonylureas in the elderly should be half those used for younger people, and doses should be increased more slowly or switched to glinides [Class D, evidence based consensus].*
  - *Gliclazide [Class B, Level 2 evidence (7,8)] and glimepiride [Class C, Level 3 evidence (9)] are the preferred sulfonylureas, as they are associated with a reduced frequency of hypoglycemic events.*
  - *Glinides (repaglinide and nateglinide) should be considered in patients with irregular eating habits [Class D, evidence based consensus].*
5. *In elderly people, the use of premixed insulins and prefilled insulin pens should be considered to reduce dose errors, and to potentially improve glycemic control [Class B, Level 2 evidence (10-12)].*

### REFERENCES

1. Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002;346:393-403.
2. Tessier D, Ménard J, Fülöp T, et al. Effects of aerobic physical exercise in the elderly with type 2 diabetes mellitus. *Arch Gerontol Geriatr* 2000;31:121-32.
3. Ligtnerberg PC, Hoekstra JBL, Bol E, et al. Effects of physical training on metabolic control in elderly type 2 diabetes mellitus patients. *Clin Sci (Lond)* 1997;93:127-35.
4. Dunstan DW, Daly RM, Owen N, et al. High-intensity resistance training improves glycemic control in older patients with type 2 diabetes. *Diabetes Care* 2002;25:1729-36.
5. Castaneda C, Layne JE, Munoz-Orians L, et al. A randomized controlled trial of resistance exercise training to improve glycemic control in older adults with type 2 diabetes. *Diabetes Care* 2002;25:2335-41.
6. Asplund K, Wiholm BE, Lithner F. Glibenclamide-associated hypoglycaemia: a report on 57 cases. *Diabetologia* 1983;24: 412-7.
7. Tessier D, Dawson K, Tétrault JP, et al. Glibenclamide vs gliclazide in type 2 diabetes of the elderly. *Diabet Med*. 1994;11:974-80.
8. Schernthaner G, Grimaldi A, Di Mario U, et al. GUIDE study: double-blind comparison of once-daily gliclazide MR and glimepiride in type 2 diabetic patients. *Eur J Clin Invest* 2004;34:535-42.
9. Holstein A, Plaschke A, Egberts EH. Lower incidence of severe hypoglycaemia in patients with type 2 diabetes treated with glimepiride versus glibenclamide. *Diabetes Metab Res Rev* 2001;17:467-73.
10. Coscelli C, Calabrese G, Fedele D, et al. Use of premixed insulin among the elderly. Reduction of errors in patient preparation of mixtures. *Diabetes Care* 1992;15:1628-30.
11. Corsi A, Torre E, Coronel GA, et al. Pre-filled insulin pen in newly insulin-treated diabetic patients over 60 years old. *Diab Nutr Metab* 1997;10:78-81.
12. Coscelli C, Lostia S, Lunetta M, et al. Safety, efficacy, acceptability of a pre-filled insulin pen in diabetic patients over 60 years old. *Diabetes Res Clin Pract* 1995;28:173-7.

## 15.7 DIABETES AND TRAVELING

Diabetes is not an obstacle to travel. But the changes in eating habits and physical activity increase, or going beyond the routine application in medical treatment may affect the glycemic levels.

- Diabetic patient using insulin should have an identity card stating he/she has diabetes.
- Insulin vials or cartridges, insulin pen or syringes and pen needles as well as insulin cooler, glucometer, sufficient quantities of lancets and glucose measurement strips, and additional battery should be packed in travel bag.
- The patient should have adequate amount of sugarless liquid and water. Also fruit juice, sugar cubes or glucose tablets and biscuits should be kept in the bag to use in case of hypoglycemia.
- Diabetes handbag should not be put in the check-in luggage as there is a risk of the luggage being lost.
- Prior to travel, particularly by air, the physician should be informed about the travel planning (departure time, travel length, meal time, offered food and arrival time) and necessary treatment changes should be learned.
- Flight crew should be informed, extra CHs should be kept, and patient should be vigilant against the delay.
- Insulin doses should be adjusted during long distance flights.
- Glucose levels should be measured every 3-4 hours throughout the journey, especially in time zone changes, and the treatment should be continued to keep the level of glycemia between 120-180 mg/dL.

### 15.7.1 Travel of Patients with Type 1 Diabetes and Patients with Type 2 Diabetes Using Insulin

1. When patient travels from north to south (or vice versa) there will not be time zone difference and there will not be a big change in times of meals and insulin injections.
2. As in going west the days are longer
  - Before flight: Normal insulin dose is taken.
  - During flight: Additional insulin is applied if the flight is longer than 8 hours.
  - On arrival: The next dose is applied at the scheduled time according to a new local time.
3. As in going east the days are shorter
  - Before flight: Normal insulin dose is decreased
  - During flight: Additional insulin is applied if necessary due to measured glucose levels.
  - On arrival: The next dose is applied at the scheduled time according to a new local time.

### 15.7.2 Travel of Non-Insulin Dependent Type 2 Diabetic Patients

These patients should be advised to use short-acting agents (glinides) in long journeys.

## 15.8 IMMUNIZATION IN PATIENTS WITH DIABETES

International authorities such as ADA, WHO and The Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices (<http://www.cdc.gov/vaccines/recs/>) recommend influenza and pneumococcal vaccination for all patients with diabetes. The relevant SEMT recommendations are summarized below.

### SEMT RECOMMENDATIONS FOR VACCINATION IN PATIENTS WITH DIABETES

1. *Childhood routine immunization program should be continued in children with type 1 diabetes (Class D, evidence based consensus)*
2. *Individuals with diabetes are at high risk for complications and mortality related to influenza and pneumococcal infection [Class C, Level 3 evidence (1,2)].*
3. *People with diabetes should receive an annual influenza vaccine to reduce the risk of complications associated with influenza epidemics [Class B, Level 2 evidence (3)].*
4. *Influenza vaccine in early September each year is highly protective for people with diabetes.*
5. *As people with diabetes are at least as susceptible to pneumococcal infection as other people with chronic diseases, the use of the pneumococcal vaccine once in lifetime should be encouraged [Class D, Level 4 evidence (4)].*
6. *Pneumococcal revaccination is recommended for individuals ≥65 years of age if the original vaccine was administered when they were <65 years of age and >5 years earlier (Class D, evidence based consensus).*
7. *Pneumococcal vaccine should be repeated in patients with immunosuppression, nephrotic syndrome, chronic renal failure and transplantation (Class D, evidence based consensus).*
8. *People with diabetes should take place within all social protection and eradication programs (Class D, evidence based consensus).*
9. *Patients with diabetes who will travel to endemic areas are recommended to receive required vaccination according to the destination.*

## REFERENCES

1. Colquhoun AJ, Nicholson KG, Botha JL, et al. Effectiveness of influenza vaccine in reducing hospital admissions in people with diabetes. *Epidemiol Infect* 1997;119:335–41.
2. American Diabetes Association: Influenza and pneumococcal immunization in diabetes (Position Statement). *Diabetes Care* 2004;27(Suppl.1):S111–S113.
3. Heymann AD, Shapiro Y, Chodick G, et al. Reduced hospitalizations and death associated with influenza vaccination among patients with and without diabetes. *Diabetes Care* 2004;27:2581–4.
4. Bolan G, Broome CV, Facklam RR, et al. Pneumococcal vaccine efficacy in selected populations in the United States. *Ann Intern Med* 1986;104:1–6.

## 15.9 MANAGEMENT OF DIABETES DURING NATURAL DISASTERS

The SEMT approach on this issue is summarized below (Class D, evidence based consensus).

### SEMT RECOMMENDATIONS FOR MANAGEMENT OF DIABETES DURING NATURAL DISASTERS

- *People with diabetes should make a portable diabetes disaster kit to use in the event of a flood, earthquake or other natural disaster in case of hypoglycemic and hyperglycaemic emergencies (DKA and HHS), and the contents should be checked at least twice a year in terms of the amounts and expiration dates.*
- *Since our country lies on an earthquake zone, nurseries, schools, caring homes, and all institutions employing or caring people with diabetes should be required to keep such disaster kit.*
- *Disaster kits in these institutions should include adequate amount of insulin vials (short- and long-acting insulins), insulin syringes, glucagon vials, glucometer and blood glucose strips, urine ketone strips, i.v. solutions (10% dextrose, 0.9% NaCl) and some certain OADs (sulphonylureas, metformin).*
- *In the same way, people with diabetes and their relatives or responsible care-providers should prepare a small emergency kit with currently used drugs and insulins to use in hypo-and hyperglycemia emergencies and should store it in a place known by household.*

## 15.10 DIABETES AND RELIGIOUS TASKS

People with chronic diseases like diabetes may experience some negative issues in fulfilling their religious duties. The items below summarize the issues which should be considered during fasting and pilgrimage by patients belonging to the religion of Islam. Similarly patients belonging to Christianity and Judaism can fulfill their religious duties by consulting their physicians, and as their health status requires.

### 15.10.1 Hajj Mission

The general rules of travelling that diabetics have to follow are valid for pilgrimage. SEMT approach in this issue is summarized below (Class D, evidence based consensus).

### SEMT RECOMMENDATIONS FOR HAJJ MISSION

- *Elderly diabetic patients with complications should interview their health condition with their physicians before going to pilgrimage, and fulfill this task if their health status is appropriate.*
- *Diabetic patients going to Hajj should receive vaccinations recommended for diabetic patients.*
- *All diabetic patients should increase the frequency of SMBG during the pilgrimage duties.*
- *Especially in the summer, hot environments may cause unexpected hypoglycemia in diabetics using insulin. Therefore, patients are required to carry sugar and fruit juice with them.*
- *Fluid intake should be increased, and direct sunlight exposure should be avoided.*
- *Since physical activity is increased while performing his/her duties during pilgrimage, patient with diabetes should be alert against the risk of hypoglycemia, and insulin/OAD dose adjustments should be performed, if necessary.*
- *Diabetic patient should wear proper footwear during the collective worship in crowded environments (circumambulation of the Kaaba), and should avoid to walk barefoot or wearing slippers since it may increase the risk of injury and infection.*

### 15.10.2 Diabetes and Fasting

Although some small studies carried out in some Islamic countries have reported that fasting does not impair metabolic control in patients on diet or OAD therapy, but other studies do not support these findings.

SEMT approach in this issue is summarized below (Class D, evidence based consensus).

#### SEMT RECOMMENDATIONS FOR FASTING

- *Ramadan fasting may be hazardous in patients with type 1 and type 2 diabetes because it may lead to severe hypoglycemia, and hyperglycemia after the meals taken after sunset and before dawn, and also it might disrupt fluid and electrolyte balance.*
- *Fasting should be strictly prohibited in patients with type 1 and type 2 diabetes on basal-bolus insulin therapy.*
- *Training sessions should be arranged for patients for information before Ramadan, and if necessary, support from religious authority should be provided.*

## 15.11 DIABETES CARE FOR PEOPLE LIVING IN SPECIAL SETTINGS

### 15.11.1 Diabetic Patients Living in Orphanages, Nursing Homes or Prisons

SEMT recommendations regarding care and therapy of diabetic patients living in orphanages, nursing homes or prisons are summarized below (Class D, evidence based consensus).

#### SEMT RECOMMENDATIONS FOR PEOPLE WITH DIABETES LIVING IN SPECIAL SETTINGS

1. *Medical history of the people with diabetes who are admitted to institutions (prison, detention center, orphanage or nursing home) should be questioned by the doctors or nurses, and physical examination should be performed immediately.*
2. *When the patients on insulin therapy first arrived to institution glycemic levels should be measured in 1-2 hours.*
3. *Pharmacological treatment and MNT of patients should be continued without interruption without changing the insulin-meal timing, and physical activity opportunities as well as snack meals should be provided.*
4. *Institution staff should be informed about the symptoms and treatment of hypo-and hyperglycemia, and be taught to inject glucagon if needed.*
5. *When PG level is measured <50 mg/dL or >350 mg/dL on-duty personnel should inform the physician and refer the patient to hospital immediately.*
6. *Patient should be referred to a hospital containing a diabetes unit for periodic screening for diabetes complications.*
7. *Insulin and OAD should be provided, glycemic monitoring should be performed at an appropriate frequency, necessary material for SMBG should be provided, and the patient should be referred to hospital every 3-6 months for A1C measurement.*
8. *Discharge report should include the patient's history of diabetes and treatment in details.*
9. *Residents of prisons or nursing homes without known diabetes should be reviewed in terms of risk factors for diabetes and should undergo diabetes screening.*

### 15.11.2 Diabetes At Workplace

The number of individuals with diabetes at various business lines is increasing with the increase of people with diabetes and better care opportunities. To reduce the problems faced in workplace by individuals with diabetes, some issues have to be taken into consideration. SEMT recommendations in this issue are summarized below (Class D, evidence based consensus).



**SEMT RECOMMENDATIONS FOR MANAGEMENT OF DIABETES IN THE WORKPLACE**

1. *Health authorities and civil organizations working in the field of diabetes should inform the employers about breaking prejudice and negative discriminations directed against diabetic patients at stages of employment and workplace safety.*
2. *People with diabetes, when applying for a new job, must be considered on an individual basis with medical history, disease stage, drugs, and special circumstances of this new job.*
3. *If there are doubts raised from diabetes in terms of employment eligibility to work, the situation should be evaluated by a physician expert in diabetes treatment.*
4. *Whether the business environment and job pose a risk for people with diabetes should be evaluated in an objective manner, and protective measures and positive discrimination should be implemented, if necessary.*
5. *People with well-controlled diabetes without serious complications can do all kinds of works. But working in some jobs that require special attention (working at high altitude, use of firearms, use of heavy construction machinery, driving of heavy vehicles and public transport, and guarding) may be risky for the people experiencing recurrent severe hypoglycemia.*
6. *People with diabetes should be provided appropriate care opportunities for productive work (main meals and snacks consistent with MNT, physical activity arrangements, SMBG, treatment options).*
7. *Especially the patients on intensive insulin therapy should avoid working in different shifts.*
8. *The physician in the workplace should collaborate with the doctor treating the diabetic patient.*