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In exercise of the powers conferred by Rule 39B and 133A of the Aircraft Rules, 1937, the following requirements are hereby issued for information, guidance and compliance.



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DIRECTOR GENERAL OF CIVIL AVIATION

DIABETES MELLITUS

Introduction

1. Diabetes mellitus (DM) comprises a group of common metabolic disorders that share the phenotype of hyperglycemia. Several distinct types of DM exist and are caused by a complex interaction of genetics, environmental factors, and life-style choices. DM involves multiple organs is the leading cause of end-stage renal disease, non-traumatic lower extremity amputations, and adult blindness. With an increasing incidence worldwide, DM will likely continue to be a leading cause of morbidity and mortality for the foreseeable future

Classification

2. The two broad categories of **DM** are designated type 1 and type 2.

(a) **Type 1 Diabetes Mellitus.** Type 1A DM results from autoimmune beta cell destruction, which usually leads to insulin deficiency. Type 1B DM is also characterized by insulin deficiency as well as a tendency to develop ketosis. However, individuals with type 1B DM lack immunologic markers indicative of an autoimmune destructive process of the beta cells. The mechanisms leading to beta cell destruction in these patients are unknown

(b) **Type 2 Diabetes Mellitus.** Type 2 DM is a heterogeneous group of disorders usually characterized by variable degrees of insulin resistance, impaired insulin secretion, and increased glucose production. Distinct genetic and metabolic defects in insulin action

and/or secretion give rise to the common phenotype of hyperglycemia in type 2 DM the identification of distinct pathogenic processes in type 2 DM has important potential therapeutic implications, as pharmacological agents that target specific metabolic derangements become available

(c) **Other Specific types of DM**

- Genetic defects of beta cell function / Genetic defects in insulin action.
- Diseases of exocrine pancreas.
- Endocrinopathies
- Drug or chemical induced
- Infections
- Uncommon forms of immune mediated diabetes
- Other genetic Syndromes sometimes associated with diabetes.

(d) **Gestational DM (GDM)**

Glucose intolerance may develop and first become recognized during pregnancy. Insulin resistance related to the metabolic changes of late pregnancy increases insulin requirements and may lead to hyperglycemia or impaired glucose tolerance. Most women revert to normal glucose tolerance postpartum but have a substantial risk (30 to 60%) of developing DM later in life. For diagnosis of GDM, Standard OGTT is to be used. Pregnant women who meet the WHO criteria for DM or IGT are classified as having GDM. The significance of IFG in pregnancy remains to be established. Any woman with IFG, however, should undergo a 75g OGTT (Standard OGTT).

3 Diagnostic Criteria is given in the Table below

	Whole Blood Glucose		Plasma Glucose (mg/dl)	
	Venous	Capillary	Venous	Capillary
IFG (Impaired Fasting Glucose)				
Fasting	>100 (5.6 mmol / dl) <110 (6.1 mmol / dl)	>100 (5.6 mmol / dl) <110 (6.1 mmol/dl)	>100 (5.6 mmol / dl) <126 (7.0 mmol / dl)	>110 (6.1 mmol/dl) <126 (7.0 mmol / dl)
2 hrs Post Glucose	<120 (6.7 mmol / dl)	<140 (7.80 mmol/dl)	<140 (7.80 mmol/dl)	<160 (8.96 mmol/dl)
IGT (Impaired Glucose Tolerance)				
Fasting	<110 (6.1 mmol/dl)	<110 (6.1 mmol/dl)	<126 (7.0 mmol/dl)	<126(7.0 mmol/dl)
2 hrs Post Glucose	>120(6.72mmol / dl) <180 (10. mmol / dl)	>140 (7.8 mmol / dl) <200(11.1 mmol / dl)	>140(7.80 mmol/dl) <200(11.1 mmol / dl)	>160(8.9 mmol / dl) <200 (11 mmol / dl)
Diabetes Mellitus (DM)				
Fasting	>110 (6.1 mmol/dl)	>110(6.1 mmol/dl)	>126(7.0 mmol/dl)	>126(7.0 mmol/dl)
2 hrs Post Glucose	>180 (10. mmol / dl)	>200(11.1 mmol / dl)	>200(11.1 mmol / dl)	>200(11.1 mmol / dl)

4. **Initial Evaluation.** A detailed clinical and laboratory evaluation will be carried out to assess: -

- (a) Severity of carbohydrate intolerance.
- (b) Predisposing conditions like obesity, pancreatitis etc.

- (c) Associated diseases like hypertension, CAD, hyperlipidemia, etc.
- (d) Diabetic complications if any.
- (e) Functional capacity of the individual.

5. **Investigations to be carried out for assessment of Diabetes**

Initial Investigations

- Routine Blood haemogram and counts
- Urine routine and microscopy
- Urine for microalbuminuria
- Blood Sugar F and PP
- HbA1C or Glycosylated Hb
- Dilated Fundoscopy
- Biochemical profile including Urea, Creatinine, uric acid
- Lipid Profile
- TMT
- Insulin assay (if indicated)
- USG Abdomen (KUB region)
- Nerve Conduction velocities (if indicated)
- Tests for autonomic system (if indicated)

Follow up Investigations

- Sugar F / PP and Hb A-1C
- Urine for microalbuminuria (if indicated as part of follow up)
- Lipid profile annually
- Biochemical profile annually
- ECG annually
- TMT once in 2 years
- Dilated Fundoscopy annually
- Fundus photography (if indicated)

6. **Assessment of Diabetic Control**

(a) **Grades of control.**

Grade of control	Plasma Glucose (mg/dl)		Hb A1c
	Fasting	2 hrs	
Grade I (Good)	< 110 (6.1 mmol / dl)	<140 (7.80 mmol / dl)	< 6
Grade II (Acceptable)	<126(7.0 mmol / dl)	< 180(10.08 mmol / dl)	< 7
Grade III (Fair)	< 140(7.80 mmol / dl)	< 200(11.1 mmol / dl)	< 8
Grade IV (Poor)	> 140(7.80 mmol / dl)	> 200(11.1 mmol / dl)	> 8

- (b) Serum cholesterol or Lipid Profile should be normal for Grade I (good control).
- (c) Presence of associated diseases like hypertension, IHD, Cerebrovascular insufficiency, which require medication for stabilization, will indicate lower grade of control in respect of diabetes mellitus.
- (d) Presence or absence of diabetic complications which effect functions of the target organs, will also determine the grade of control e.g. Grade I diabetic control means good blood glucose values with normal HbA1C / Gly Hb and serum cholesterol / Lipid profile. Any significant abnormality in Gly Hb / HbA1C and serum cholesterol/Lipid profile will make the diabetic control as Grade II.
- (c) In diabetics stabilized with drugs / insulin the control is to be assessed by blood glucose fasting and 2 hrs after breakfast instead of 75 g oral glucose load.

Disposal of Diabetes

7. The **P1 status** pertains to pilots fully fit for all flying duties, including instructional duties. **P2 status** pertains to fit for all flying duties except instructional duties and trainer captain in flight.

8. **Renal Glycosuria.** All cases of Renal glycosuria will be considered fit for flying duties

9. **IFG / IGT.** All cases of IFG / IGT will be considered fit for all flying duties and they will be granted a P1 status. All subsequent renewals / reviews will held be at IAM / AFCME only every 6 months.

10. **Diabetes Mellitus.** All aircrew detected to have DM will be initially made unfit for flying for 03 months, disposal thereafter will be as per the grade and type of control with only dietary restrictions or permitted OHA, as given below

(a) **Grade I Control with non-pharmacological means.** Grade I control achieved with dietary restrictions, exercise and suitable weight reduction will be cleared to fly as P1, with all subsequent reviews at IAM / AFCME every six months. Under the above clause the following criteria will have to be met: -

- (i) There are no symptoms.
- (ii) Control is without drugs on a balanced diet and calorie intake is optimum for aircrew duties without causing any functional impairment.
- (iii) Certificate from the individual stating that he is not on any oral hypoglycemic medication or any form of medication for control of his diabetic status.
- (iv) Fitness Certificate from the treating Physician / Endocrinologist including the fact that the individual is not on any oral hypoglycemic medication or any form of medication for control of his diabetic status.
- (v) There have no been previous diabetic complications or existing complications, if any, have fully regressed.
- (vi) Blood glucose profile (Fasting and 2 hours after 75 g glucose) demonstrates Grade I (Good) response of blood (plasma) glucose values at least on two occasions with an interval not less than 12 weeks.
- (vii) HbA1C, urine microalbumin levels and lipid profile are within normal limits

and there is no evidence of any target organ damage.

(viii) Associated diseases like IHD, Hypertension or dyslipidemia are being controlled by drugs, which are generally permissible with flying.

(b) **Grade II Control with non-pharmacological means.** After 03 months of unfit status if he is found to have Grade II control, they will be awarded a P2 status and followed up at IAM / AFCME, every six months. If on review he is found to have Grade I control his disposal will be as in para 10 (a)

(d) **Grade I Controlled with Pharmacological means (Single Drug)**

(i) During the initial observation of 03 months when the aircrew is unfit for flying duties, if he needs to be put on medication, the same will be instituted. However, only **Plain Metformin** (maximum 2 gm / day) is to be considered compatible with flying. Extended / delayed release preparations of Metformin are not acceptable for flying duties. The period of unfitness for aircrew on Tab Metformin shall be from the date the aircrew is stable on medicine with stable blood sugar values and not the date that he is made unfit for NIDDM.

(ii) After a total period of non-flying status of 03 + 03 months or more, (depending on stabilization of drug dosage and blood sugar values) if the glycemic control achieved is Grade I he will be declared fit as P1, with all subsequent reviews at IAM / AFCME. A certificate from the individual as well as treating physician / endocrinologist with regards to medication being taken will be attached as mentioned in para 10 (a).

(iii) He will not be permitted to fly if has other associated disease like IHD, Hypertension or dyslipidemia. However, the boarding center on the merits of individual case may consider P1 / P2 status in some cases if the coexisting disabilities are well stabilized with medication compatible with flying.

(iv) During each review every six months, the individual will be re-evaluated in detail with regard to grade of control and assessment of target organ involvement.

(d) **Grade II Control with Single Drug.** After instituting Metformin, if the Glycemic control is found to be Grade II, the individual will be awarded a permanent P2 status. However, during subsequent reviews if the individual is able to demonstrate a Grade I control with life style modifications alone or with a single permissible drug he will be disposed of as mentioned in sub para (b) and (c) ante respectively.

(e) **Grade II Control with Multiple Drugs or Insulin or Grade III and IV Control.** Uncontrolled diabetes and those requiring oral hypoglycemics other than biguanides, a combination of two drugs or insulin in any form will be declared permanently unfit for flying.

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