

Analysis of Cases of GTT Abnormality amongst Defence Aircrew

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This paper presents the analysis of cases of GTT (Glucose Tolerance Test) Abnormality amongst defence aircrew with aim to know the profile of Glucose Intolerance and its problem among them with special emphasis on its aeromedical significance.

During last five years (1984 to 1989), there have been 70 aircrew in whom GTT abnormality was detected. Of these, 40 (57.14%) cases were diagnosed as DM (Diabetes Mellitus) and 30 (42.26%) cases as IGT (Impaired Glucose Tolerance). Out of total 70 cases, 50 (71.43%) were asymptomatic and 20 (28.57%) symptomatic. Out of 70 cases, 40 (57.14%) were managed solely on dietary restriction, regular exercise and reduction of weight and 30 (42.26%) required oral hypoglycaemic drugs. There were 40 (57.14%) cases who were returned back to flying status and 30 (42.26%) cases were declared permanently unfit.

Keywords : GTT abnormality, Carbohydrate intolerance

Introduction

Diabetes Mellitus is known to be more prevalent amongst the affluent group of society including defence aircrew. It is one of the important disabilities leading to temporary or permanent grounding of aircrew decreasing overall productivity. GTT abnormality is a metabolic disorder of variable severity ranging from just mild IGT to frank DM with or without its complications and it can be brought back to normal partially or completely, if detected early and necessary measures taken in time. Flying involves man-machine complex and it requires an aircrew to be in his complete health to avoid any compromise with flight safety. Keeping in view the above facts, this study was undertaken.

Material and Methods

Aircrew with GTT abnormality reporting to IAM (Institute of Aerospace Medicine) for their medical evaluation were followed up for period of five years (1984 to 1989). All such cases were thoroughly evaluated including history, clinical

examination and investigations like GTT, S.cholesterol, urea and uric acid etc. Effects of dietary restriction, exercise, weight reduction and hypoglycaemic agents were noticed. The period of non-effective and restricted flying was noticed before final disposal.

Observations & Discussion

Table-I Age distribution of cases of GTT abnormality

Age in years	No	%
25 - 30	8	11.43
31 - 40	46	65.72
41 - 50	12	17.14
51 - 55	4	5.71
Total	70	100.00

Mean age of GTT abnormality was 40 years (25 - 55). Majority of (77.14%) cases were diagnosed before age of 40 years (Table-I). It has been observed in earlier studies that with advancing age tissues become insensitive to insulin which is more marked between 20-45 years of age and levels off thereafter¹⁻³. Various diseases which led to detection of GTT abnormality in asymptomatic cases during routine medical check up and medical reviews are given in Table II.

Table-II Reasons for diagnosis of GTT abn in asymptomatic cases

Disability	No	%
Obesity	3	6
Hypertension	3	6
ECG	12	24
IHD	3	6
Glycosuria	15	30
Eye changes	2	4
Family H/o DM	2	4
Other diseases	10	20
Total	50	100

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Table-III Family History of Diabetes Mellitus (N=70)

One parent	4	
Both parent	3	
One parent + One close relative	2	
Both parent + one close relative	1	
Total	10	(14.29%)

An aircrew with positive family history must be subjected to GTT to rule out GTT abnormality⁴ (Table-III).

There were 10 (14.29%) cases who showed raised level of Serum cholesterol (more than 250 mg%). In various studies, it has been shown that increased level of FFA, acts as nonhormonal antagonist of insulin and impair peripheral utilisation of glucose¹⁻³.

Fasting and two hours post prandial glucose blood level prior to drug therapy was analysed. The cases with fasting blood sugar level more than 100 mg% but less than 120 mg% and post prandial more than 120 mg% but less than 180 mg% were considered as IGT⁴. Those cases with fasting blood sugar level more than 120 mg% and post prandial more than 120 mg% with one additional abnormal blood sugar value like peak or fasting or 2 hours post prandial were considered as diabetes mellitus⁴. In this study 40 (57.14%) cases were diagnosed as diabetes mellitus and 30 (42.26%) as IGT, based on above criteria.

Table-IV Relationship of body weight and GTT Abnormality

Body weight	IGT		DM		Total	
	No	%	No	%	No	%
Up to 10%	25	41.66	35	52.34	60	25.71
10 to 20%	3	42.26	4	57.14	7	10.00
20%	2	66.66	1	33.34	3	4.29
Total	30	42.56	40	57.14	70	100.00

Out of 70 cases, 60 (25.71%) were nonobese, 7 (10%) over-weight between 10 to 20%, and 3 (4.29%) overweight more than 20% (Table IV). Thus majority of cases were nonobese. GTT abnormality, in majority of cases, was detected during routine check up or review for other disabilities.

Effect of weight reduction on blood sugar level in 4 obese individuals without oral

hypoglycaemic agent was analysed. In all the cases, blood sugar level came down (blood sugar levels fasting less than 110%, peak less than 180 mg% and post prandial less than 140 mg%) after desirable weight reduction showing significant improvement⁴. It is a well established fact that there is improvement in glucose utilisation by the cells with body weight reduction in obese individuals and is mainly due to increase in affinity of cell receptors for insulin rather than increase in their number¹⁻³.

GTT abnormality and its control with and without hypoglycaemic agent was analysed. Only cases of frank diabetes mellitus required continuous medication. Out of 40 cases of diabetes mellitus, 30 (75%) required continuous medication and 10 (25%) required medication only initially but subsequently normoglycaemic state was maintained only with dietary restriction, exercise and weight reduction. Those 30 cases requiring continuous medication were permanently grounded since flying is not permitted while a pilot is on hypoglycaemic drugs⁴. But in case they are managed with drugs in initial stage, an attempt is made to withdraw the drug so that they can be brought back to flying category and it was evident in 10 (25%) diabetic cases in this study.

Table-V Disposal of aircrew

Category	Initial (Temp)		Final (Permanent)	
	NO	%	No	%
1. Nonflying	70	100	30	42.86
2. Restricted flying	—	—	8	11.43
3. Unrestricted flying	—	—	32	45.71
Total	70	100	70	100.00

Thus 30 (42.86%) cases, all diabetics with medication, were permanently grounded after period of observation upto 2 years.

All the cases were initially temporarily grounded because of existing policy at that time. As per latest policy applicable for Indian defence aircrew, it is not necessary to ground a case of IGT whose blood sugar fasting is less than 110 mg% and 2 hours post glucose less than 140 mg%. Similarly, an aircrew with GTT abnormality, if already grounded, is upgraded to full flying category in case his blood sugar fasting becomes

less than 110 mg% and post prandial less than 140 mg% on two consecutive occasions at interval of twelve weeks without medication. This present policy supports the observation that 57.14% cases were subsequently upgraded to flying category after period of observation (Table-V).

The time based relationship of follow up and final disposal of aircrew having GTT abnormality was analysed. 30 (42.86%) cases were declared permanently unfit for flying duties within 2 years of observation and 40 (57.14%) cases were declared fit for flying. Out of 40 cases, 6 (15%) within 1 year, 25 (62.5%) within 1.5 years, 7 (17.5%) within 2 years and 2 (5%) were observed more than 2 years before being declared fit for aircrew duties.

Thus, a majority of cases reached finality within period of 2 years of observation. It is supported by the present policy for disposal of an aircrew, which states that an aircrew with GTT abnormality must be declared by medical board about his continuance as aircrew by end of two years i.e. final disposal be given within period of two years of observation.

Conclusion

Carbohydrate intolerance (GTT abnormality) is of significance in flying which involves man-machine complex and a lapse of split second on behalf of man may be disastrous. It is a well known fact that IGT/DM may affect the

performance of an aircrew by metabolic alterations or other complications. In view of the above, all aircrew with GTT abnormality must be thoroughly evaluated to rule out any anticipated incapacitation in flight before they are considered fit for flying and also to prevent further complications of diabetes mellitus.

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