

HORMONAL ADAPTATIONS IN MALNUTRITION RELATED DIABETES MELLITUS (MRDM)

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Interesting relation between nutritional status and hormone dynamics in humans is well known. Further intimate relationship exist between hormonal aberrations and pathogenesis of diabetes. Hormonal abnormalities in adult with chronic undernutrition and malnutrition was documented in this country^{1,2} where work had started since 1964.

Glucose intolerance is very common (63%) amongst patients of clinical malnutrition. Insulin insensitivity has been documented in 62% of cases. Mean plasma insulin during G.T.T. was reported to be significantly ($P < 0.01$) lower compared to healthy controls. Estimation of human growth hormone revealed high basal (15-19 ug/ml) and very high rise in response to insulin. Further suppression of GH in response to intravenous glucose load was low thereby suggesting nature's adjustment in terms of abnormal growth hormone rise to compensate the catabolism of chronic malnutrition. In addition Cortisol levels are significantly higher in patients of clinical malnutrition. On feeding, cases of clinical malnutrition with appropriate diet, the hormonal profile improves but many remained abnormal in some of the patients upto two months or after.

With this background knowledge we have studied 10 patients of Protein Deficient Pancreatic Diabetes (PDPD) and 10 patients of Fibro Calcific Pancreatic Diabetes

(FCPD) with a mean age of 21 and 18 years respectively. The sex incidence of patients was on 3 : 2 and 4 : 1 in favour of males, mean BMI was 15.1 and 15.3 in patients of PDDM and FCPD respectively. Familial occurrence was absent in FCPD and was present in 1 case of PDDM. History of childhood undernutrition was available in all cases of PDDM and 80% cases of FCPD. The mean duration of diabetes in both groups was around 2.4 years.

Serum protein, T_3 , T_4 , TSH, TSH response to TRH, $r-T_3$ and prolactin were estimated in all patients (Table-I) Mean serum immunoreactive insulin in controls and patients with malnutrition, FCPD, PDDM & NIDDM as shown in Table-2, Serum C-peptides estimated in patients of FCPD in response to a mixed meal and glucose load is given in Table-3. Estimation of Human growth hormone shows mean basal value of 19.94 ± 3.09 ng/ml in patients of malnutrition 6.89 ± 2.44 in patients of FCPD and 8.88 ± 3.19 in patients of PDDM. In response of GTT, the peak value was 17.78 ± 7.30 , 10.42 ± 3.68 and 10.20 ± 2.74 respectively in three groups of patients showing paradoxical rise of GH in all of them.

24 hours urine ketosteroids (mg/24 hrs) was 11.0 ± 1.2 , $6.5 \pm 5.9 \pm 2.3$ in patients of clinical malnutrition, FCPD, PDDM respectively.

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Table 1
Hormonal Assessment

Test	Normal	Adult malnutrition	FCPD	PDDM
Serum Protein (gmdl)	7.5±0.28	3.8 ±1.2	3.7 ±0.8	3.23 ±1.2
Tri-iodothyronine (T _s) (ng/ml)	0.8±0.2	0.79 ±0.10	0.6 ±0.3	0.42 ±0.23
Thyroxine (T ₄) (ug/dl)	7-6±2.6	4.12 ±2.24	7.30±2.50	4.2 ±2.1
TSH (Basal) mlv/ml	3.5±1.2	3.5 ±1.25	3.10±1.4	3.6 ±1.48
TSH (peak) 200 ug (mlv/ml)	42.5±7.5	12.2 ±2.0	15.2±2.3	14.8 ±2.3
r-T _s (ng/ml)	0.1±0.18	0.14 ±0.04	0.18±0.05	0.20 ±0.05
Prolactin (ulv/ml)	76 to 375	620.0 ±20.1	694.33±22.2	672.0 ±18.36
LH (mlv/ml)	5 to 18	6.82 ±2.82	10.14 ± 4.43	10.1 ±0.9

Table 2
Mean Serum IRI (ulu/ml) In Controls and Patients with Malnutrition

	Control	Malnutrition	FCPD	PDDM	NIDDM OBESE	LEAN
Basal	12.2 ± 4.6	5.0 ±1.6	4.49±1.1	8.4 ± 4.1	11.82 ± 6.95	39.6±14.2
Post Mixed	36.5 ± 8.45	13.2±2.7	12.88 ± 1.52	23.6±4.6	21.30 ± 9.82	57.2 ±12.1
Meal (2 hrs)						
Post Oral	48.16±11.9	26.1 ±3.6	15.11±2.17	28.4 ± 6.2	23.97 ± 4.34	62.2 ± 2.6
Glucose (2 hrs)						

Table 3
Mean Serum C-Peptide (ng/ml) in Controls and Patients with FCPD.

	Control	FCPD
Basal	0.8 ± 0.2	0.6±0.2
Post Mixed	1.3 ± 0.6	0.9±0.16
Meal (2 hrs.)		
Post Oral	2.1 ± 0.6	1.3±0.3
Glucose (2 hrs)		

after 1 mg dexamethasone load to a value of 10.2 ± 1.06 mg/dl Further 0.25 mg of corticotropin raise the basal cortisol level significantly (P< 0.001) to a level of 30.3 ± 4.08 ug/dl inducing adrenal pituitary axis.

Analysis of the above data shows low serum Insulin, high nonsuppressible human growth hormone, low LH, normal cortisol, Low T₃, low T₄, high r-T₃, normal basal TSH rise to TRH, high serum prolactin level in patients of malnutrition

Mean plasma cortisol in both the groups of malnutrition related diabetes was 15.0 ± 2.3 mg/dl which was suppressible 9 hours

related diabetes mellitus. The hormonal profile worked over in the these patients is almost similar with the hormonal profile of patients of clinical malnutrition. The cause of high rise of serum prolactin in patients of MRDM is probably as adjustment similar to that growth hormone.

It is concluded that the hormonal profile during periods of gross nutritional deficiency of food deprivation (protein) is obviously much needed metabolic adaption. It is also possible that the process of malnutriton if prolonged promotes a diabetogenic state in a

proportion of subjects and the hormonal profile in these patients of MRDM is similar in pattern to that of patients of malnutrition.

References

1. Tripathy, B.B. In Nutrition and Diabetes : Advances in Medicine. Ed. M.K. Chhetri. (1982). 106-33
2. Chhetri M.K. In Adult Malnutrition-Evidences and hypothesis : Advances in Medicine Ed. M.K. Chetri (1982) 1-10.