

# **RURAL vs URBAN DIFFERENCES IN DIET AMONG DIABETICS AT DIAGNOSIS (BEFORE INTERVENTION)- AN EXERCISE IN NUTRITIONAL EPIDEMIOLOGY\***

**P. S. Chattopadhyay, Subir Dasgupta, Kazi Layla Khaled, Subha Mukherjee, P. K. Kundu, Bharati Chatterjea**

## **Introduction**

Some dietary errors have been associated with increased risk of diabetes. These can operate by reducing insulin sensitivity or its secretion.

## **Dietary errors reducing insulin sensitivity:**

Following are the prevailing concepts:

- 1) Excess intake of energy (increase in body weight).
- 2) Excess (>30% of energy) total fat intake (irrespective of type).
- 3) Excess (>10 % of energy) intake of SFA and trans fatty acids found in hydrogenated fats.
- 4) Deficit of polyunsaturated fatty acids particularly of n-3 PUFA and a high n-6/n-3 ratio (>10).
- 5) Deficit of fibres particularly soluble or viscous fibres abounding vegetables, fruits, oats, barley, pulses and legumes but not in other cereals.

These dietary errors coupled with a sedentary life style are common in obese/centrally obese individuals who are genetically predisposed to Type 2 diabetes and considerably enhance the risk of IGT and overt diabetes in them.

## **Dietary errors that may cause severe undernutrition reducing insulin secretion which may persist:**

Several studies have shown that severe Protein Energy Malnutrition (PEM) caused by marked deficits in dietary energy and protein and coexistent deficits of micronutrients like chromium, selenium and zinc can impair insulin secretion leading to glucose intolerance which can persist in some cases. This persistent glucose intolerance expresses clinically as insulin requiring, ketosis-resistant diabetes with long standing under-nutrition with growth / sexual retardation. This clinical expression is different from the usual clinical expressions of Type 1 and Type 2 diabetes. Some patients with this unusual clinical expression have pancreatic calcification and are known as Fibrocalcific Pancreatic Diabetes (FCPD); others without

pancreatic calcification have been called Protein Deficient Diabetes Mellitus (PDDM) but the name Malnutrition Modulated Diabetes Mellitus (MMDM) recently mooted in an international Conference appears more appropriate and has been used in our study.

## **Aims and Objectives**

The aims and objectives of the study were to detect and assess the prevalence of the following dietary errors at diagnosis (before intervention) among diabetics attending the Diabetics Clinic of the School of Tropical Medicine since 1987.

- a) Excess of deficit of energy
- b) Deficit of protein
- c) Excess of total fat
- d) Excess of SFA
- e) Deficit of fibres particularly soluble or viscous fibres.

## **Subjects and Methods**

The study started from 1987 with diabetics attending the Diabetics Clinic of the School of Tropical Medicine. All subtypes i.e; Type 1, Type 2, FCPD and MMDM (PDDM) were included provided the duration of diabetes was 2 years or less so as to enhance the accuracy of dietary recall. Detailed dietary interviews were conducted by trained nutritional counsellors as well as the medical faculty. The energy, carbohydrate, fat and fibre intakes were computed on the basis of data obtained from 'Nutritive Value of Indian Foods' and 'Diet and Diabetes' published by ICMR. The energy requirements of study subjects were calculated on the basis of ideal body weight for height and level of physical activity as per guidelines in the previously mentioned publications.

## **Results**

The patients were more or less socio-economically homogeneous. There were 198 Type 2, 46 Type 1, 41 FCPD and 45 MMDM (PDDM) patients. Our observations are presented in the following tabulations:

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\* From Department of Nutrition and Metabolic Diseases & Diabetes Research Unit, School of Tropical Medicine, Calcutta-700 073.

**Table 1**  
**Pre-intervention dietary intakes of Type 2 diabetics (approx)**

	Urban		Rural	
	Males (n=66) Mean (SD)	Females (n=60) Mean (SD)	Males (n=40) Mean (SD)	Females (n=28) Mean (SD)
Energy intake (%Recommended)	126.2 (17.2)	128.2 (15.3)	116.4 (13.0)	115.0 (12.1)
Total carbohydrates (% Energy)	65.2 (6.4)	64.3 (5.3)	70.2 (7.0)	72.2 (8.2)
Complex Carbohydrates (% carbohydrates)	90.2 (10.2)	88.7 (7.7)	95.5 (6.9)	95.6 (9.0)
Total Fat (% energy)	30.2 (3.8)	30.5 (2.7)	23.5 (3.0)	22.9 (4.0)
Visible Fat (% Fat)	67.7 (7.4)	66.2 (6.6)	60.1 (7.0)	59.0 (6.1)
Protein (% Energy)	13.4 (4.2)	12.8 (3.5)	13.3 (3.7)	12.4 (3.0)
Fibre (G/Day)	18.5 (2.5)	17.8 (2.4)	18.4 (3.0)	19.4 (2.7)

**Table 2**  
**Pre-intervention dietary intakes of Type 1 diabetics (approx)**

	Urban		Rural	
	Males (n=16) Mean (SD)	Females (n=14) Mean (SD)	Males (n=7) Mean (SD)	Females (n=9) Mean (SD)
Energy intake (% Recommended)	119.8 (9.0)	118.0 (9.2)	109.7 (7.0)	108.1 (8.0)
Total carbohydrates (% Energy)	68.2 (5.2)	65.8 (5.0)	72.2 (7.3)	73.4 (8.0)
Complex Carbohydrates (%carbohydrates)	91.7 (8.1)	92.2 (7.0)	95.8 (9.0)	96.1 (9.0)
Total Fat (% energy)	20.4 (6.1)	18.8 (4.8)	16.2 (5.0)	15.9 (4.1)
Visible Fat (% Fat)	66.1 (6.4)	65.1 (5.8)	58.1 (6.0)	57.1 (6.1)
Protein (% Energy)	14.2 (5.1)	13.8 (4.7)	12.4 (3.4)	12.0 (3.3)
Fibre (G/Day)	17.7 (2.7)	18.1 (3.2)	19.6 (3.0)	18.8 (3.3)

**Table 3**  
**Pre-intervention dietary intakes of FCPD subjects (approx)**

	Urban		Rural	
	Males (n=6) Mean (SD)	Females (n=9) Mean (SD)	Males (n=10) Mean (SD)	Females (n=16) Mean (SD)
Energy intake (% Recommended)	82.2 (7.8)	78.6 (7.2)	72.3 (6.0)	70.0 (6.1)
Total carbohydrates (% Energy)	77.9 (6.8)	79.1 (7.3)	83.3 (8.2)	85.1 (8.2)
Complex Carbohydrates (% carbohydrates)	94.2 (8.2)	95.2 (8.0)	96.5 (8.6)	97.4 (8.8)
Total Fat (% energy)	12.7 (5.7)	12.2 (4.8)	12.1 (5.0)	11.4 (4.4)
Visible Fat (% Fat)	64.6 (6.0)	64.1 (5.8)	59.1 (5.0)	58.4 (4.7)
Protein (% Energy)	10.3 (4.4)	9.1 (3.8)	8.6 (3.3)	8.4 (2.9)
Fibre (G/Day)	18.4 (2.7)	18.2 (2.8)	19.6 (3.1)	18.8 (3.3)

**Table 4**  
**Pre-intervention dietary intakes of MMDM (PDDM) subjects (approx)**

	Urban		Rural	
	Males (n=7) Mean (SD)	Females (n=6) Mean (SD)	Males (n=14) Mean (SD)	Females (n=18) Mean (SD)
Energy intake (% Recommended)	72.2 (7.1)	73.0 (6.5)	68.2 (7.2)	66.4 (6.0)
Total carbohydrates (% Energy)	77.7 (6.4)	78.2 (7.1)	82.8 (7.7)	84.7 (8.0)
Complex Carbohydrates (% carbohydrates)	95.1 (9.0)	94.4 (8.2)	96.6 (9.4)	97.1 (8.6)
Total Fat (% energy)	12.4 (4.4)	12.0 (3.7)	11.4 (3.6)	10.8 (3.1)
Visible Fat (% Fat)	63.7 (6.1)	64.8 (5.9)	56.9 (5.1)	56.1 (5.0)
Protein (% Energy)	10.2 (4.2)	9.3 (3.7)	8.9 (3.4)	8.2 (4.3)
Fibre (G/Day)	18.6 (2.5)	18.8 (3.1)	19.1 (3.1)	19.8 (4.1)

Sources of complex carbohydrates were usually cereals, potatoes and to a lesser extent other vegetables, pulses and fruits (usually bananas). Same applied to fibres except that some fibre contribution came from spices and condiments. Intake of visible fats exceeded the invisible fat intake and the only visible fat used regularly was mustard oil.

## **Discussion**

Dietary errors as seen among our subjects were as follows:

**Excess energy intakes** were common in NIDDM and less marked in IDDM – energy intakes, on the whole, were greater in urban subjects developing NIDDM and IDDM.

**Deficits of energy intakes** were consistently seen in FCPD and MMDM (PDDM) subjects. Deficits, on the whole, were greater in rural subjects developing FCPD & MMDM (PDDM).

**Low protein intakes** were also consistently seen in FCPD and MMDM (PDDM) subjects. Intakes, on

the whole, were lower in rural subjects developing FCPD & MMDM (PDDM).

**Excess intake of fat (total)** were unusual as intakes were usually optimum to low. The intakes were highest in urban NIDDM and lowest in rural FCPD and MMDM (PDDM) subjects.

**Excess SFA intakes** were unlikely as consumption of SFA rich fats were occasional in urban and rare in rural subjects.

**Deficit of n-3 PUFA** was unlikely as the usual cooking oil was mustard oil.

**Deficit of diet fibres** were likely as milled rice was the main cereal and peeled potatoes the main vegetable.

Except moderate energy excess and low fibre intake dietary errors were not that marked in subjects developing NIDDM for which sedentary life styles and genetic predisposition must have played important roles. Lower energy and protein intakes were expectedly seen in both FCPD and PDDM (MMDM).