

Research Paper :

Prevalence and nutritional status of pre-gestational and gestational diabetes in Guntur

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Accepted : September, 2009

ABSTRACT

The subjects selected for the study were all Pre GDM and GDM patients between the age group of 18 to 47 years attending the five different gynaec and diabetic clinics. The study was conducted on a total number of 1935 pregnant women, of whom 20 were Pre GDM and 43 GDM patients. The prevalence of Pre GDM and GDM was 3.25%. A questionnaire was designed to collect the information regarding background of patients, family history and clinical history. Anthropometry included measurement of height, weight. Diet history was collected using 24 hr recall and food frequency. Data revealed that a majority of subjects were between 38-47 years of age. The onset of disease was noticed between 40-45 years. The symptom of frequent thirst and urination was more common. Many reported family history of diabetes from parent's side. Fasting blood sugar level of >120 mg/ dl was reported by majority of subjects. The incidence of anemia was more in Pre GDM. Among associated risk factors, eye and heart problems were predominant. Anthropometry of patients revealed that 15% (Pre GDM) and 28% (GDM) of patients were in normal range of BMI, 40% (Pre GDM) and 37.2 % (GDM) were over weight and 45 (Pre GDM) and 18.6% (GDM) were obese. Diet survey showed the intake of carotene, iron, vitamin C, niacin and riboflavin to be inadequate and that of calcium, fat and thiamine to be adequate.

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Key words : Hyperglycemia, gestational period, Anthropometry, Biochemical parameters, Dietary intake.

Diabetes mellitus is a clinical syndrome characterized by hyperglycemia and disturbances of carbohydrate, fat and protein metabolism that are associated with absolute or relative deficiencies in insulin action and/or insulin secretion. Although it is an endocrine disease in origin, its major manifestations are those of a metabolic disease (WHO, 1994). The metabolic derangement is frequently associated with permanent and irreversible functional and structural changes in the cells of the body, those of the vascular system being particularly susceptible. The changes lead in turn to the development of well-defined clinical entities, the complications of diabetes, which characteristically affect the eye, the kidney and the nervous system (Davidson, 1991).

Diabetes mellitus is on the increase world wide as many countries are achieving greater affluence and as their populations are growing grays. If 25% of the adults coming to health centers meet the WHO criteria for diabetes mellitus, there would be millions in the world who may suffer from eventual complications of the disease. The prevalence of diabetes in several parts of India has shown an increasing trend in the past 15 years. The increase in the prevalence is probably as a result of changing life styles. Prevalence of diabetes is high in the urban Indians and similar to the values reported in migrant

Indians in different countries (Ramachandran, 2000).

Many factors contribute to the onset of diabetes and these are termed as predisposing or risk factors. Environmental factors such as diet, obesity and sedentary life style increase the risk of diabetes (Zimmet *et al.*, 2001). Other important risk factors include high familial aggregation, insulin resistance, nutritional status, age, life style changes due to urbanization etc. (Ramachandran, 2000). Complications of diabetes are several. There is always the hazard of acute complication of ketoacidosis, which is dangerous but treatable medical emergency. Hypoglycemia and infections are other acute complications. Most investigators have suggested that the rise in Type 2 diabetes in urban population may have been triggered by mild obesity in mothers leading to glucose intolerance during pregnancy, macroscopic changes in the fetus, and insulin deficiency in adult (Dornhost and Rosi, 1998, Fall *et al.*, 1998, Yajnik *et al.*, 1995, Yajnik, 2003). Yajnik (2003) had reported that high prevalence of Type 2 diabetes and IGT in Indians may be linked to poor fetal growth. There is a possibility that Type 2 diabetes may be programmed in fetal life due to changes in intrauterine milieu interior. This may be due to nutritional deprivation or one of nutritional plenty. It leads to changes in pancreatic development and peripheral response to insulin

which may cause gestational diabetes mellitus (GDM) and adult onset Type 2 diabetes. GDM increases the lifetime risk of developing diabetes, at over 3 times compared to controls at 16 years after index pregnancy (Henary and Beischer, 1991). By 17 years of age one-third of children born of gestational diabetic mothers have had evidence of IGT or Type 2 diabetes (Bernard *et al.*, 1998). In an Indian study, one-third of the women who developed GDM had maternal history of diabetes (Seshiah *et al.*, 2004). The magnitude of diabetes as a problem is enormous and the implications for health services are staggering and it is life long condition with the diabetic who are always at the risk of associated complications. However, these can be avoided by meticulous management through medication and diet. The objectives of this study were to assess the prevalence and nutritional status of Pre Gestational Diabetes Mellitus (Pre GDM) and Gestational Diabetics Mellitus (GDM) using standardized techniques, to determine the food and nutrient intake of diabetics and to their bio chemical changes and their prevailing clinical symptoms.

METHODOLOGY

The subjects selected for the study were all Pre GDM and GDM patients between the age group of 18 to 47 years attending the five different Gynaec and diabetic clinics. The study was conducted on a total number of 1935 pregnant women, of whom 20 were Pre GDM and 43 GDM patients. A questionnaire was developed for the collection of data from the subjects on various aspects like, background information, clinical history and diet history. Background information collected included age, sex, religion, education, occupation, income and family type. In clinical history, the age of onset of diabetes and family history were recorded by interviewing. Under biochemical analysis, data on Fasting Blood Glucose (FBS), haemoglobin Blood glucose was estimated by glucose oxidase method (Raghuramulu *et al.*, 2003) and haemoglobin by cyanmethemoglobin method (De Maeyer *et al.*, 1989). Blood Urea Nitrogen (BUN) by Diacetyl monoxime method (Natelson, 1957), Serum Creatinine (CRE) by Jaffe method (Bowers *et al.*, 1980), and Urine sugar by multiple reagent method (Wachtel *et al.*, 1995) collected with the help of laboratory technician were included. Presence of associated diseases of diabetes as diagnosed by the physician was recorded for all subjects. For information regarding the diet history of subjects, a food frequency table was formulated to study the frequency of consumption of various foodstuffs and the nutrient intake of subjects was determined making use of data from 24-hour recall method. Pre-standardized cups

and ladles were used to elicit information regarding the food intake and food composition tables were used to arrive at the nutrient intake of individual subjects (Gopalan *et al.*, 1996). The food frequency data was consolidated to represent number of families consuming a particular food item in a day using one month consumption pattern of foods. Standardized techniques were used for measuring the nutritional status of the individuals. The measurements included height and weight. Height and weight of the subjects were measured using a vertical height scale and a spring balance, respectively. From this information BMI was calculated (WHO, 2000). The data collected was classified age, Pre GDM and GDM and the average values were reported.

FINDINGS AND DISCUSSION

The results of the study are summarized in Tables 1, 2, 3, 4 and 5. The prevalence of Pre GDM and GDM was 3.25%. The background information of patients presented in Table 1 revealed that the number of subjects increased with increase in age. The prevalence increased

Table 1: Background information of patients (per cent of subjects)

Particulars	Pre GDM n=20	GDM n=43
Age in years		
18-27	20.0	21.0
28-37	35.0	30.2
38-47	45.0	48.8
Religion wise distribution		
Hindu	85.0	41.9
Muslim	10.0	44.2
Christian	05.0	13.9
Literacy level of subjects		
Illiterate	30.0	53.5
School education	15.0	32.5
Under graduate	35.0	09.3
Post graduate	20.0	04.7
Occupational status		
House wives	65.0	72.1
Business	10.0	2.3
Official	05.0	4.6
Other	20.0	21.0
Income level in Rs./-		
≤3000	15.0	32.5
3001-5000	20.0	46.5
≥ 7001	30.0	07.0
Family type		
Nuclear	55.0	76.7
Extended	30.0	04.7
Joint	15.0	18.6

markedly above the age of 35 years and the maximum incidence was seen between the ages of 28-37 in the study. Highest numbers were seen between 38-47 years in Pre GDM and GDM patients. 85% of the total (Pre GDM) subjects were Hindus followed by Muslims (10%) and Christians (5%). 41.9% of the total (GDM) subjects were Hindus followed by Muslims (44.2%) and Christians (13.9%). 30% and 53.5% were illiterate in both Pre GDM and GDM, respectively. 15% and 32.5% had school education, 35% and 9.3% were Undergraduates and 20% and 4.7% were Post graduates. Education is an important aspect in the management of diabetes. The overall management of diabetes includes management through drugs, diet and physical exercise and educated subjects perceive the diabetes education in a better way. Implementation of knowledge regarding the management helps the subjects to live a better quality of life.

Of the total Pre GDM and GDM subjects, 65% and 72.1% were house wives. They formed the largest group in the occupational status. 10% and 2.3% were of business class, 5% and 4.6% were officials and 20% and 21% came under the group of others and including agriculturists, coolies, hotel workers and beedi workers. Diabetes is seen mostly among people who lead a sedentary lifestyle, as such a life style leads to obesity and obesity in turn is one of the major predisposing factors for the onset of diabetes. Most of the housewives who visited the clinic were overweight. This may be due to sedentary life style or lack of physical activity. In the business community and officials, stress may be one of the factors for the onset of diabetes. Most of the subjects had monthly income ranging from Rs/- 1000 -7001. Small percentages were in the higher income category. As the income of the subject increases, his food purchasing power also increases. High income also facilitates better management of the diabetes because the subject can

afford medical facilities and medicines better. Nuclear family type formed the major group for total number of subjects. More than half *i.e.*, 55-76.7% of subjects lived as nuclear families, 4.7-30% was in extended families and 15-18.6% of subjects lived in joint families. These figures show the shift from traditional living style to urbanization. The number of vegetarians was more than the number of non-vegetarians.

Under clinical history (Table 2) the age of onset of diabetes, symptoms noticed when diabetes was diagnosed, family history; values of biochemical analysis and presence of associated diseases of diabetes were included. Of the total number 9.5% became diabetics between the age group 18-22 years and the incidence of onset of diabetes between 43-47 years was between 27%. The various symptoms reported were frequent thirst (63.5%), excess weakness (58.7%) frequent urination (81%), frequent perspiration (49.2%) frequent hunger (60.3%) and loss of weight (28.5%). Family history of diabetes indicated a highest incidence in mothers (20.6%) followed by father, sisters and brother. Smaller per cent also reported presence of diabetes in uncles, aunts and grandparents. A familial tendency to diabetes undoubtedly exists. It is generally seen that NIDDM runs into families. Many studies have shown that heredity is one of the major predisposing factors for the onset of diabetes. Women are more at risk of developing GDM because of having a family history of GDM from mother, grand mother (or) aunt (Seshiah *et al.*, 2004). Of the subjects, 34.5% had associated complications of diabetes like eye problems (4.7%), neurological problems like peripheral neuropathy (6.3%), dental problems (12.6%), and skin problems (7.9%). Chronic uncontrolled diabetes gives rise to many complications which can be life threatening.

The blood sugar levels and haemoglobin status of the subjects were analyzed and classified as per WHO

Table 2 : Clinical history of diabetics (Per cent of subjects)

Age of onset		Symptoms reported at the time of diagnosis		Family history		Subjects associated risk factor	
Years	%	Symptoms	%	Relation	%	Associated risk factors	%
18-22	9.5	Frequent thirst	63.5	Father	14.3	Eye problems	4.7
23-27	11.1	Frequent hunger	60.3	Mother	20.6	Neurological problems	6.3
28-32	14.3	Frequent urination	81.0	Brother	4.7	Dental problems	12.6
33-37	17.5	Frequent		Sister	08.0	Skin problems	7.9
38-42	20.6	Perspiration	49.2	Parental		Foot problems	3.1
43-47	27.0	Excess weakness	58.7	Grand parents	1.5	Heart problems	-
				Maternal uncle	12.6	Kidney problem	-
		Loss of weight	28.5	Parental uncle	06.3		
				Maternal aunt	01.5		
				Parental uncle	09.5		

standards (Table 3). 20% of Pre GDM had their FBS levels between 79-99 mg/dl and another 35% had levels between 100-119mg/dl. 45% of Pre GDM, the largest group, had FBS levels above 120. This indicates that in such cases diabetes was poorly controlled. 25.5% of the GDM had their FBS levels between 79-99mg/dl and 35% had levels between 100-119mg/dl. In this group, diabetes was under control as the normal range is 80-120mg/dl. 39.5% of the GDM subjects had FBS levels of more than

120 which indicate that diabetes was poorly controlled. It could be due to improper diet, negligence about medication etc. 10% of Pre GDM had normal haemoglobin status while only 65% were classified as mildly anemic. Among women, 35% of GDM subjects enjoyed normal haemoglobin status and 44.2% were mildly anemic.

Of the 20 subjects (Pre GDM), 90% had normal BUN levels, 10% had more than the normal's. Of the 43 subjects (GDM), it was seen that 90.7% had normal BUN levels, 9.3% had more than the normal's. It was observed that lower number of GDM subjects were more BUN levels compared to Pre GDM subjects. Of the 20 Pre GDM, 16 subjects (80%) had their serum creatinine levels between 0.6-1.4 mg/dl and another 20% had more than normal. 93% of the GDM subjects had their serum creatinine levels between 0.6-1.4 mg/dl.

Table 3 also gives the nutritional anthropometry of subjects. Of the total 20 Pre GDM subjects, 15% had normal BMI, 40% had grade I obesity and 45% had grade II obesity. In this group, obesity may have functioned as a predisposing factor for NIDDM. Of the total 43 GDM, it was seen that 16.2% had normal BMI, 28% had grade I obesity and 37.2% had grade II obesity. It was observed that higher number of GDM subjects were obese compared to Pre GDM. The risk of NIDDM increases continuously with BMI and decreases with weight loss (WHO, 1994).

Using pre-standardized cups and ladles, food intake of the patients was determined and the nutrient intake was computed using food composition tables. Data formulated thus were classified age, Pre GDM and GDM (Table 4). In the age group of 18-27 years, fat intake was very high compared to RDA (ICMR, 1990). The intake of protein, calcium, thiamine and niacin was adequate.

Table 3 : Biochemical parameters and nutritional anthropometry of subjects (Per cent of subjects)

Subjects	Parameters			
Fasting blood sugar levels (mg/dl)				
	<79	79-99	100-119	>120
Pre GDM	----	20(4)	35(7)	45(9)
GDM	----	25.5(11)	35(15)	39.5(17)
Haemoglobin status (g/dl)				
	>12	10-12	7-10	>120
Pre GDM	10(2)	65(13)	20(4)	5(1)
GDM	35(15)	44.2(19)	16.2(7)	4.6(2)
Blood urea nitrogen levels (mg/dl)				
	<6	6-20	>20	
Pre GDM	---	90(18)	10(2)	
GDM	---	90.7(39)	9.3(4)	
Serum creatinine levels (mg/dl)				
	<0.6	0.6-1.4	>1.4	
Pre GDM	----	80(16)	20(4)	
GDM	----	93(40)	7(3)	
Body Mass Index (BMI) grades				
	15.0-18.4	18.5-24.9	25-30	>30
Pre GDM	----	15 (3)	40(8)	45(9)
GDM	16.2(7)	28.0(12)	37.2(16)	18.6(8)

Table 4 : Average nutrient consumption of subjects

Nutrients	Age in years					
	Pre GDM			GDM		
	18-27	28-37	38-47	18-27	28-37	38-47
Protein (gm)	65.3	54.4	46.2	46.6	45.1	75.1
Fat (gm)	50.0	42.7	30.0	42.2	47.2	38.5
Carbohydrate (gm)	33.0	32.5	29.5	26.6	25.0	21.8
Energy (Kcal)	2096	1968	1727	1640	1496	1310
Calcium (mg)	1090	988	562	1104	1710	1079
Iron (mg)	16.3	27.4	24.9	17.2	16.0	19.9
Carotene (µg)	1008	1104	746	3584	2389	680
Thiamine (mg)	1.75	1.65	1.07	0.96	1.51	0.83
Riboflavin (mg)	0.97	1.48	0.79	0.79	2.15	0.86
Niacin (mg)	16.4	18.7	10.2	8.9	10.7	8.6
Vitamin C (mg)	29.3	87.1	55.2	92.0	83.6	46.5
Dietary fibre (gm)	26.7	30.4	19.0	21.7	23.7	16.4

The adequacy of carotene and iron was only 42 and 42.8%, respectively. In the age group of 28-37 years, protein, energy, iron and carotene were inadequate. In the age group of 38-47 years, in addition to these, B-Complex was inadequate. Among GDM subjects, in the age group of 18-27 years, consumption of fat, calcium, carotene and vitamin C was found to be higher than the recommendations. Only 45.2% of iron was consumed compared to the RDA. Adequacy of B-vitamins, riboflavin and niacin was 71.8% and 63.5% compared to the RDA.

In the next age group, *i.e.*, 28-37 years of age, intake of fat, calcium, thiamine, riboflavin and vitamin C were found to be much higher than the RDA. Iron in the diet was only half of the recommendations *i.e.*, 53%. In the next age group of 38-47 years, intakes of protein, fat, calcium and vitamin C were adequate. Adequacy of iron was 52.3% while that of carotene was only 63%. This could be due to low consumption of green leafy vegetables, milk and its products and other rich sources. It can be summarized from the results that among the associated risk factors of diabetes, heart disease and eye problems were the most prominent. Different grades of obesity were observed in study population although weight management is very important for diabetics. The diets were inadequate mainly in carotene and iron in all age groups hence qualitative improvement of diets is very important.

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