

Assessment of Food Consumption Pattern, Anthropometric Parameters and Physical Activity Pattern of Non-Insulin Dependent Diabetics

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ABSTRACT Fifty non-insulin dependent diabetic subjects, 25 males and 25 females, free from serious complications were selected from posh areas of Ludhiana city. Diabetic and dietary information was collected using a questionnaire. Diabetic information of the subjects related to etiology of disease, family history and prevalence of symptoms was collected. Dietary information of the subjects was collected to know about their food habits and frequency of consumption of different food groups. Activity pattern of the subjects was recorded from their daily routine, and their involvement in other activities like time spent in recreational activities. Type of job, working hours, duration of sleep and any kind of physical exercise was recorded. Various anthropometric parameters viz. height, weight, Body Mass Index (BMI) and Waist Hip Ratio (WHR), were recorded. The most common reason for diabetes among the selected subjects was obesity which lead 22% subjects to be diabetic. Family history of diabetes was found in 38% subjects. The most common symptoms were polyuria (56%), polydypsia (48%), nocturia (44%), delayed healing (44%), polyphagia (40%) and loss of weight (38%). Twenty-eight percent of the males had normal weight and 56% and 16% males were in 1st and 2nd grades of obesity respectively. Sixty-eight percent and 24% of the female subjects were in 1st and 2nd grades of obesity respectively. As reported by the subjects, majority of them (78%) were not doing any kind of physical exercise. In all 76% of the subjects had disturbed sleep of 5-6 hours. It was found that the majority of the subjects 54% were ova/non-vegetarians. Ninety-four percent subjects liked sweet and salty foods. All the subjects took wheat flour thrice a day. Pulses were consumed by 90% subjects once a day. Forty-eight percent subjects used GLV's twice a week, 84% of the subjects consumed roots and tubers at least once a day. Fifty-two percent of the subjects consumed fruits once daily. All the subjects consumed milk. About 50% of the subjects consumed fried foods daily.

INTRODUCTION

Diabetes is fast becoming a leading cause of morbidity, mortality and disability across the world. Diabetes mellitus with its devastating consequences has assumed epidemic proportions as its prevalence is on a rise globally. According to International Diabetes Federation, Diabetes currently affects 246 million people worldwide and India has the largest number of people with diabetes i.e. 40.9 million (IDF 2007). India has been declared as the "Diabetic capital of the world". By 2030 there would be 366 million diabetics throughout the world and 79.44 million diabetics in India alone (WHO 2007). It is the fourth leading cause of death by disease and at every ten seconds a person dies from diabetes related causes in the world each year, over three million deaths worldwide are tied directly to diabetes.

Diabetes is a chronic disease marked by higher level of blood glucose from defects in insulin production, insulin action or both. It can

be defined as a state in which homeostasis of carbohydrate and lipid metabolism is improperly regulated by insulin in body (Aggarwal 2003).

Increasing incidence of diabetes mellitus is mainly due to modern life style and changed diets with balance tilted towards refined foods especially sugar and fat. In people with strong genetic factor, environmental factors such as excessive intake of food especially sugar, obesity and lack of exercise acts as precipitating agents.

The marked increase in the prevalence of overweight and obesity was responsible for the recent increase in the prevalence of NIDDM (Klein et al. 2004). Inactivity and alcohol consumption are other dominant risk factors for development of type 2 diabetes. Hu et al. (2003) examined the association between sedentary behaviors such as prolonged television watching, obesity and diabetes. Prolonged television watching was associated with a significantly increased risk of NIDDM. Men who watched television more than 40 hour per week had a nearly

three-fold increase in the risk of NIDDM as compared to those who spent less than 1 hour per week in watching television.

MATERIALS AND METHODS

A statistically adequate sample of fifty Non-Insulin Dependent Diabetes Mellitus (NIDDM) subjects, comprising of equal number of both sexes i.e. 25 males and 25 females, were selected from posh localities of Ludhiana city. They were aged between 35-65 years and belonged to upper middle socio-economic group. An interview schedule was drafted to elicit information pertaining to family history of the diabetes, dietary intake, physical activity, onset of diabetes, complications, anthropometric measurements etc. of the subjects so as to investigate their base line information and dietary habits.

Activity pattern of the subjects was recorded from their daily routine, and their involvement in other activities like time spent in recreational activities. The type of job, working hours, duration of sleep and any kind of physical exercise was recorded.

Information related to etiology, onset of disease, common symptoms experienced, family history of disease and medication followed was recorded. Various anthropometric parameters *viz.* height, weight, Body Mass Index (BMI) and Waist Hip Ratio (WHR), were recorded using standard method given by Jelliffe (1966).

BMI was categorized according to the classification given by James et al. (1988). Where BMI, > 25 is an indicator of obesity.

BMI class	Presumptive diagnosis	
< 16.0	CED-Grade III	Severe undernutrition
16.0-17.0	CED-Grade III	Moderate undernutrition
17.0-18.5	CED-Grade III	Mild undernutrition
18.5-20.0	Low weight – normal	
20.0-25.0	Normal	
25.0-30.0	Obese grade I	
>30	Obese grade II	

*CED :- Chronic Energy Deficiency

Information pertaining to food preference, food avoidances was recorded. Dietary intake of the subjects was recorded for three consecutive days by “24 hours recall cum weightment method”.

RESULTS AND DISCUSSION

Obesity was observed in 58% subjects (56% males and 60% females) (Table 1). Obesity among the subjects was due to faulty eating habits, sedentary life style and lack of physical exercise. It was observed that 38% of the subjects (36% males and 40% females) had diabetes in their families. Only 8% of the males consumed excessive alcohol. Similarly, Pimentha et al. (1995) also reported that genetic and environmental factors play an important role in the pathogenesis of this condition.

According to table 2, 14% subjects (16% males and 12% females) had diabetic mother. Sixteen percent subjects (12% males and 20% females) inherited diabetes from father. Both parents of 6% subjects (4% males and 8% females) had diabetes. Siblings of 2% of the subjects had

Table 1: Etiology of disease of the subjects

S. No.	Factors	Males (n=25)		Females (n=25)		Total (N=50)	
		No.	%	No.	%	No.	%
1.	Heredity	9	36	10	40	19	38
2.	Obesity	14	56	15	60	29	58
3.	Alcohol consumption	2	8	-	-	2	4

Table 2: Family history of disease of the subjects

S. No.	Relation	Males (n=25)		Females (n=25)		Total (N=50)	
		No.	%	No.	%	No.	%
1.	Diabetic mother	4	16	3	12	7	14
2.	Diabetic father	3	12	5	20	8	16
3.	Both Parents	1	4	2	8	3	6
4.	Siblings	1	4	-	-	1	2

diabetes. Kapoor (2001) reported that 22 subjects had a positive family history with either a single parent, both parents (12%) or in siblings (8%).

The symptoms that were reported by the diabetic subjects are presented in the table 3. The most common symptoms observed were loss of weight, polyuria, polydypsia, nocturia, delayed healing of wounds, polyphagia, tiredness and hypertension. Some of the other symptoms were excessive sweating and itching. The symptoms arranged in decreasing order of frequency were polyuria (56%), polydypsia (48%), nocturia (44%), delayed healing (44%), polyphagia (40%), loss of weight (38%), tiredness (26%), hypertension (24%), itching (20%) and excessive sweating (16%). These results indicate that patients had multiple symptoms at the time of study. Dhindsa (2008) reported, 46.7% subjects had polydypsia, 43.3% subjects had loss in weight, polyphagia was present in 46.7% male NIDDM subjects.

As reported by the subjects, majority of them (78%) were not doing any kind of physical exercise and the rest of them i.e. 22% were doing some kind of physical exercise (Table 4). Walking as physical exercise was followed by 14% of the subjects (12% males and 16% females). They were doing walk for less than 1 hour. The second preferred form of exercise was yoga which was being done by 8% (8% males and 8% females). A regular walking program that represents the simplest form of exercise improved the fitness and lipid profile in subjects at a risk for type 2 diabetes (Walker et al. 1999).

In all 76% of the subjects (72% males and 80% females) had disturbed sleep of 5-6 hours. Twenty-one percent of the subjects (28% males and 20% females) had sound sleep of 7-8 hours a day. Dhindsa (2008) also reported that only 33.3% diabetic subjects had sound sleep of 7-8 hours.

The average anthropometric parameters of the

Table 3: Prevalence of symptoms of diabetes among subjects

S. No.	Symptoms	Males (n=25)		Females (n=25)		Total (N=50)	
		No.	%	No.	%	No.	%
1.	Polyuria	16	64	12	48	28	56
2.	Polydypsia	14	56	10	40	24	48
3.	Delayed healing	14	56	8	32	22	44
4.	Nocturia	13	52	9	36	22	44
5.	Polyphagia	11	44	9	36	20	40
6.	Loss of weight	15	30	14	56	19	38
7.	Tiredness	5	20	8	32	13	26
8.	Hypertension	9	36	3	12	12	24
9.	Itching	1	4	9	36	10	20
10.	Excessive sweating	4	16	2	8	8	16

Table 4: Physical activity pattern of the subjects

S. No.	Symptoms	Males (n=25)		Females (n=25)		Total (N=50)	
		No.	%	No.	%	No.	%
<i>Physical Exercise</i>							
	Yes	5	20	6	24	11	22
	No	20	80	19	76	39	78
<i>Type of Exercise</i>							
	Walking	3	12	4	16	7	14
	Yoga	2	8	2	8	4	8
<i>Sleeping Pattern</i>							
	Disturbed sleep (5-6 hrs)	18	72	20	80	38	76
	Sound sleep (7-8 hrs)	7	28	5	20	12	24

Table 5: Major anthropometric parameters of the subjects

Variable	Males(n=25)	Ref. std. for males	Females(n=25)	Ref. std. for females
Height (cm)	175.87 ± 2.64	NA	159.04 ± 1.4	NA
Weight(kg)	82.56 ± 1.27	60 ¹	72.3 ± 1.16	50 ¹
Body Mass Index (kg/m ²)	27.09 ± 0.87	20-25 ²	26.82 ± 0.42	20-25 ²
Waist to hip ratio	0.98 ± 0.013	0.95 ³	0.86 ± 0.008	0.8 ³

NA = Data not available, ¹ = ICMR(1992), ² = James et al. (1988), ³ = WHO (1995), Values are given mean ± S.E.

subjects are presented in table 5. This includes height, weight, body mass index (BMI) and waist hip ratio of the subjects at the time of survey.

The mean height of the male subjects was 175.87 ± 2.64 cm ranging from 147.32 to 198.12 cm. The mean height of females ranged from 137.16 to 167.64 cm with mean value of 159.04 ± 1.4 cm.

The weight of the male subjects ranged from 70 to 95 kg with mean value of 82.56 ± 1.27 kg. The weight of the female subjects varied from 58 to 78 kg with mean value of 72.3 ± 1.16 kg. The fact that weight gain leads to insulin insensitivity and resistance may be a causative factor for overweight subjects without hereditary influence (Kalsi 1989).

A derived index of fatness from weight and height was used to classify the subjects into grades of obesity (Table 6) according to classification proposed by James et al. (1988). The mean BMI for the male subjects was 27.09 ± 0.87 kg/m² which was higher than the reference standard of 20-25 kg/m². Twenty-eight percent of the males had normal weight and 56% and 16% males were in 1st and 2nd grades of obesity respectively. In case of females, 8% had normal weight. Sixty-eight percent and 24% of the female subjects were in 1st and 2nd grades of obesity respectively. The mean BMI among females was 26.82 ± 0.42 kg/m². Higher BMI among NIDDM females was reported by Monro (2002) and Satman et al. (2002).

The mean value of WHR for males was 0.98 ± 0.013 , which was higher than the standard value i.e. 0.95. In females also, WHR value was on a higher side when compared with the recommendations. It was 0.86 ± 0.008 . Hodge et al. (1993) have reported that diabetes is more related to WHR than BMI in both men and women.

The type of medication used by the selected diabetics is presented in table 7. Seventy six percent of the subjects (80% males and 72% females) used allopathic drugs like Dianil, Diabinese etc. Only 14% of the subjects (8% males and 20% females) followed diet control alongwith allopathic medicines. Only 10% of the subjects took ayurvedic medicines

The food habits of the subjects are shown in the table 8. It was found that majority of the subjects 54% were ova/ non-vegetarians (72% males and 36% females). Forty-six percent subjects (28% males and 64% females) were vegetarian.

Data reveals that 94% subjects (92% males and 96% females) liked sweet foods and 94% (96% males and 92% females) liked salty foods. It was found that the majority of the subjects had a craving for sweet and salty foods.

The frequency of food consumption of different food groups is presented in the table 9.

Unrefined wheat flour was their staple diet with an intake of three times a day in 100% subjects. Refined cereal products like noodles, pasta etc. were also consumed sometimes by the subjects in place of wheat flour chapattis. Bhatia (2004) also reported that wheat flour was the staple diet of the diabetics.

The most commonly used pulses were green gram dhal, lentil, Bengal gram dhal, black gram dhal etc. Pulses were consumed by 90% subjects once a day while 10% consumed it twice a day. Sharma (2005) also reported that 83.3% diabetic subjects consumed pulses once daily.

Most commonly used GLVs were spinach, bathua leaves, cabbage, coriander leaves, fenugreek leaves, mint leaves etc. The intake of GLVs

Table 6: Distribution of subjects according to grades of obesity

BMI.	Interpretation of BMI category	Males (n=25)		Females (n=25)		Total (N=50)	
		No.	%	No.	%	No.	%
20-25	Normal	7	28	2	8	9	18
25-30	Obese Grade-I	14	56	17	68	31	62
>30	Obese Grade-II	4	16	6	24	10	20

Classification gives by James *et al* (1988)

Table 7: Type of medication of the subjects

BMI.	Medication	Males (n=25)		Females (n=25)		Total (N=50)	
		No.	%	No.	%	No.	%
1.	Allopathic	20	80	18	72	38	76
2.	Ayurvedic	3	12	2	8	5	10
3.	Allopathic + Diet control	2	8	5	20	7	14

Table 8: Food habits of the selected diabetics

S.No.	Food habit	Males (n=25)		Females (n=25)		Total (N=50)	
		No.	%	No.	%	No.	%
<i>1. Vegetarian / Non-vegetarian</i>							
	Vegetarian	7	28	16	64	23	46
	Ova /Non-vegetarian	18	72	9	36	27	54
<i>2. Food Likes and Dislikes</i>							
<i>Sweet Food</i>							
	Liked	23	92	24	96	47	94
	Disliked	2	8	1	4	3	6
<i>Salty Food</i>							
	Liked	24	96	23	92	47	94
	Disliked	1	4	2	8	3	6

Table 9: Frequency of consumption of different food groups by the diabetic subjects

Food items	No. of times a day				No. of times a week				Occ.	Never				
	4		3		2		1							
	No.	%	No.	%	No.	%	No.	%	No.	%				
Cereals	-	-	50	100	-	-	-	-	-	-				
Pulses	-	-	5	10	45	90	-	-	-	-				
Green leafy vegetables	-	-	-	-	18	36	-	24	48	8	16			
Roots and tubers	-	-	8	16	42	84	-	-	-	-				
Fruits	-	-	2	4	26	52	-	12	24	10	20			
Flesh foods	-	-	-	-	-	-	12	24	14	28	1	2	23	46
Milk and milk products	6	12	38	76	5	10	1	2	-	-	-	-		
Fried foods	-	-	-	-	25	50	-	7	14	8	16	10	20	

was mostly in winter. Thirty-six percent subjects used to consume GLV'S four times a week and 16% consumed it once a week.

The commonly used roots and tubers were onion, potato, carrot, radish, sweet potato etc. Table 9 shows that 84% of the subjects consumed them at least once a day and 16% used it twice a day.

Fifty-two percent of the subjects consumed fruits once daily. Twenty-four percent subjects consumed fruits thrice a week. Fruits were consumed twice a week by 20% subjects and twice a day by only 4% subjects.

Flesh foods were consumed by 54% subjects, out of which 28% consumed flesh foods once a week, 24% consumed it twice a week and only 2% had it occasionally. Sadakane et al. (2008) reported that in men, the meat pattern was associated with higher total, high-density lipoprotein (HDL), and low-density lipoprotein (LDL) cholesterol.

Milk consumed was mainly in the form of tea, coffee, curd and drinking milk. All the subjects consumed milk. Seventy-six percent subjects consumed them thrice a day, 12% used them four times a day. Ten percent used them twice daily while only 2% had it once a day. Sharma (2005)

also reported that all the diabetic subjects consumed milk and milk products and 90% subjects consumed milk and milk products twice daily.

About 50% of the subjects consumed fried foods daily in the form of samosa, kachori, manchurian, tikkis etc. Fried foods were consumed at least three times a week by 14% subjects, twice a week by 16% and once a week by 20% subjects. Gulati (2004) also reported that 90% subjects had unrefined cereals thrice a day, pulses were consumed daily by 33% subjects. Fifty-five percent subjects consumed roots and tubers once a day, 33% subjects consumed fruits daily, milk and milk products were consumed once daily and 33% subjects had fried foods daily.

CONCLUSION

The investigation of the present study revealed that thirty-eight percent of the subjects had family history of diabetes. Obesity was the main cause of diabetes in 59% subjects. The most common symptoms observed were loss of weight, polyuria, polydypsia, nocturia, delayed healing of wounds, polyphagia, tiredness and hypertension. Seventy-eight percent of the subjects

did not do exercise. The mean BMI for the male subjects was 27.09 ± 0.87 kg/m² which was higher than the reference standard of 20-25 kg/m². The mean BMI among females was 26.82 ± 0.42 kg/m². Seventy-six percent of the subjects (80% males and 72% females) used allopathic drugs. Ninety-four percent subjects (92% males and 96% females) liked sweet foods and 94% (96% males and 92% females) liked salty foods. It was found that the majority of the subjects had a craving for sweet and salty foods. About 50% of the subjects consumed fried foods daily in the form of samosa, kachori, manchurian, tikkis etc.

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