PRINT: ISSN 0972-0073 ONLINE: 2456-6802
Ethno-Med, 3(1): 11-18 (2009)
DOI: 10.31901/24566772.2009/03.01.03

Impact of Nutrition Counselling in the Management of Malnutrition among Juvenile Diabetics

Rachana Srivastava, Anita Kochhar and Rajbir Sachdeva

Department of Food and Nutrition, Punjab Agricultural University, Ludhiana 141 004, Punjab, India
E-mail: dranitakochhar@yahoo.com

KEYWORDS Juvenile Diabetics. Malnutrition. Nutrition Counselling

ABSTRACT Juvenile diabetes is the commonest endocrine metabolic disease of childhood. It develops as a result of synergistic effect of genetic, environmental and immunological factors that ultimately destroy the pancreatic beta-cells. To study the impact of nutrition counselling in the management of malnutrition among juvenile diabetics, thirty male juvenile diabetics were selected in the age group of 13-18 years from two hospitals of Ludhiana, and were divided on the basis of their age into two groups of 13-15 years and 16-18 years, with 15 subjects in each group. General, diabetic, dietary information and anthropometric measurements of the subjects were recorded by interview schedule before and after nutrition counselling. After one month of control period, both the groups were imparted nutrition counselling (NC) for 3 months at 15 days interval by individual and group contacts about diabetes, its types, causes, symptoms, complications and its management through insulin therapy, diet and physical activity. Pamphlets containing above information were also distributed after every session. Before NC the number of moderately malnourished subjects was 11(13-15 yrs) and 12(16-18yrs), which reduced to 8 (13-15 yrs) and 10 (16-18yrs) whereas number of marginally malnourished subjects increased from 3 to 5 (13-15 yrs) and 3 to 4 (16-18 yrs). However, the number of normal subjects increased from 1 to 2 (13-15 yrs) and 0 to 1 (16-18 yrs) after NC. The dietary adequacy of cereals, pulses, green leafy vegetables, other vegetables and fruits was lower which improved after nutrition counselling. Percent adequacy of intake of energy, carbohydrates, protein, iron and zinc by the subjects was lower before NC and increased significantly after NC, whereas the adequacies of thiamine, riboflavin, niacin, ascorbic acid, calcium, phosphorus, magnesium and folic acid were higher before NC and even increased after NC. Thus it can be inferred from the study that nutrition counselling can be an effective measure for bringing favorable and significant changes in the nutritional profile of juvenile diabetics, which may lead to an improvement in diabetic state, management of malnutrition and thus helps in retardation of secondary complications.

INTRODUCTION

Juvenile diabetes or Type1 diabetes is perceived as a chronic immune mediated disease with a subclinical prodrome characterized by selective loss of insulin producing beta- cells in the pancreatic islets in genetically susceptible persons. It results from autoimmune beta cell destruction that leads to insulin deficiency. It develops as a result of synergistic effect of genetic, environmental and immunological factors that ultimately destroy the pancreatic beta-cells. Individuals with genetic susceptibility have normal beta-cell mass at birth but began to lose beta-cells secondary to autoimmune destruction that occurs over months to years. This autoimmune process is thought to be triggered by an infection or environmental stimulus such as viruses like coxsackie and rubella, bovine milk protein and nitrosourea compounds and sustained by the beta cells (Power 2004).

Although type1 diabetes has much lower worldwide incidence than type2 diabetes, the loss of quality years of those with type 1 diabetes is especially great due to the earlier onset and greater degree of glycemic exposure This devastating disease can affect nearly every organ system in the body. It can cause blindness, lead to end stage renal disease, lower extremity amputations and increases the risk for stroke, ischaemic heart disease, peripheral vascular disease and neuropathy. (Bjork 2001)

Diabetes is likely to remain a huge threat to public health in years to come. Significant morbidity and mortality due to the enormous burden associated with diabetic complications indicate the urgent need to prevent global epidemic of diabetes by improved nutrition, better education, more exercise, early diagnosis and prompt treatment. Raghuram et al. (1993) found that adequate basic information on diabetes enable the diabetics to comprehend and improve their psychological acceptance of disease. They also observed that exercise enhances the action of insulin and thus help to reduce the dose of antidiabetic drugs /insulin. Therefore nutrition coun-

selling which aims at lowering blood glucose level, promoting reasonable body weight and encouraging healthy eating habits can play an important role in managing juvenile diabetes. Keeping this in view the present study was undertaken with the specific objective of studying the impact of nutrition counselling in management of malnutrition among juvenile diabetics.

MATERIALS AND METHODS

A sample of 30 male juvenile diabetic subjects free from serious complications were selected on the basis of their fasting blood glucose levels from the OPD (Out patient department) of Dayanand Medical College & Hospital and Christian Medical College & Hospital, Ludhiana and were equally divided into two groups (13-15years and 16-18 years). All the selected 30 subjects were treated as self-control for a period of one month. A dietary survey was conducted to asses the existing dietary pattern of the subjects for 3 consecutive days by '24 hour recall cum weighment method' and food frequency questionnaire. The daily nutrient intake from the food consumed by each subject was calculated by "MSU Nutriguide" software developed by Song et al. (1992). And the percent values of food and nutrient intake were calculated with respect to recommended allowances given by ICMR 2004. The height, weight, mid upper arm circumference (MUAC), triceps skinfold thickness (TSFT), were measured before and after experimental period according to method given by Jelliffe (1966). Percent weight for height of the subjects was calculated by using standard height and weight given for age by (NCHS 1987) and distribution of the subjects was done on the basis of classification given by Water low. Frequency of blood glucose testing was also measured. Nutrition counselling was imparted to the subjects for a period of 3 months at 15 days interval regarding types, causes, symptoms, risk factors, blood glucose monitoring, complications and their preventive measures, insulin types and precautions to be taken while injecting insulin, exercise and dietary management of diabetes using appropriate charts, posters, demonstrations and slides by individual and group contacts. Leaflets containing all the above-mentioned information along with food exchange lists, sample menu for a week of recommended calories and modified recipes were distributed among all the subjects. A special emphasis was given to make them aware regarding distribution of meals, intake of balanced diet, more consumption of fibrous foods like fruits with peel, salads, whole cereals & pulses and increased physical activity.

RESULTS AND DISCUSSION

The general information of the subjects in the present study revealed that majority of the subjects (57%) were Hindu and 43 percent were Sikh. Out of all the subjects 93% were literate and 7% illiterate. All the subjects (100%) had a sedentary lifestyle. Seventy three percent of the subjects belong to nuclear family and 27% belong to joint family system (Table1).

Table 1: General information of the subjects (n=30)

General information	*Subjects*	
	Number	*Percentage*
Age (year)		
13-15	15	50.00
16-18	15	50.00
Sex		
Male	30	100.00
Religion		
Hindu	17	56.67
Sikh	13	43.33
Education		
Illiterate	2	6.67
Primary to middle	19	63.33
High school	9	30.00
Occupation		
Student	19	63.33
Working	6	20.00
Non-working	5	16.67
Family Type		
Nuclear	22	73.33
Joint	8	26.67
Family Size		
Small (upto 4)	4	13.33
Medium (4-8)	21	70.00
Large (>8)	5	16.67

Diabetic Information of the Subjects

The diabetic information of the subjects is given in Table 2. It was observed that out of all the subjects 40% had a positive family history of diabetes with 20% having family history of type 1 diabetes. Likewise Vishwanathan (1996) reported that the prevalence of diabetes among offspring with one diabetic parent was 36%, which increased to 54% with a positive family history of diabetes. It was observed that the prevalence

Table 2: Diabetic information of the subjects (n=30)

Diabetic information	*Subjects*	
	Number	*Percentage*
History	12	40.00
Type II		
Grand parents	6	20.00
Type I		
Single Parent (Father)	2	6.67
Sibling	2	6.67
Parents + sibling	2	6.67
Symptoms		
Polyuria	25	83.33
Polydypsia	22	73.33
Fatigue	19	63.33
Polyphagia	12	40.00
Excessive sweating	11	36.67
Headache	10	33.33
Burning sensation under feet	8	26.67
Nocturia	7	23.33
Delayed healing	4	13.33
Duration		
Less than 5 years	13	43.33
5-10 years	15	50.00
More than 10 years	2	6.67
Type of Insulin (peak hours)		
Human Mixtard (2-8hrs)	28	93.33
Monotard +Actrapid (4-12hrs+1-3hr)	2	6.67
Devices		
Injection	25	83.34
Pen	4	13.33
Pump1		3.33
Sites		
Stomach	13	43.33
Arms	3	10.00
Thighs	5	16.67
Stomach + Thighs	7	23.33
Arms + Thighs	2	6.67

of diabetes increases with increasing family history of diabetes. Out of all half of the subjects (50%) were suffering from diabetes since last 5-10 years, 43 percent from less than 5 years and 6.7 percent from more than 10 years. The most common signs and symptoms of diabetes observed in decreasing order of frequency were polyuria (83%), polydypsia (73%), fatigue (63%), polyphagia (40%), excessive sweating (37%), headache (33%), burning sensation under feet (27%), nocturia (23%) and delayed healing (13%). The most commonly used insulin was Human Mixtard (93%) which is a semi-lente kind of insulin (peak hour 2-4 hours) other one was combination of Monotard + Actrapid (peak hours 4-12 +1-3 hrs), the devices used were injection (84%), pen (13%) and pump (3%). The common sites were stomach (43%) stomach and thighs (23%), thighs (17%), arms (10%), thighs and arms (7%).

Food Intake by the Subjects

The food intake of the subjects before and after nutrition counselling is given in Table 3. The percent adequacy of cereals before and after NC was 67.47 and 72.6 per cent in (13-15 years) and 76.35 and 79.8 percent (16-18 years) of suggested intakes. The majority of the subjects included, broken wheat and whole-wheat flour to their diets. This could be as a result of nutrition counselling as subjects were taught about the importance of whole cereals that these are rich in fiber, which helps in management of blood sugar levels. The percent adequacy of the pulses before and after N.C was 46.22 and 58.67 (13-15 years) and 65.66 and 82.81 (16-18 years), of the suggested intakes, indicating that pulse intake was lower among the subjects. The adequacy of GLV'S by the subjects before NC was 36.30 (13-15 years) and 37.5 (16-18 years) and after NC it decreased to 31.47 and 33.86 percent of suggest-

Table 3: Percent adequacy of food intake by the subjects before and after nutrition counselling

Food groups	*13-15year*		*16-18 year*		*Suggested intake*
	Before N.C. (%)	*After N.C. (%)*	*Before N.C. (%)*	*After N.C. (%)*	
Cereals	67.47	72.60	76.35	79.80	375
Pulses	46.22	58.67	65.66	82.43	60
Green leafy vegetables	36.30	31.47	37.50	33.86	200
Other vegetables	42.20	56.84	51.00ss	71.67	200
Roots tubers	-	-	-	-	NA
Fruits	34.50	48.90	38.70	54.83	200
Milk & milk	105.67	106.67	114.37	116.55	300
Fats	77.60	82.92	88.28	93.08	25
Sugar	-	-	-	-	NA

N.C. – Nutrition counseling NA – Data not available # - Raghuram et al. (1993)

ed intakes respectively. There was an insignificant reduction in intake of green leafy vegetables because of seasonal unavailability. The percent adequacy of other vegetables before and after NC was 42.2 and 56.84 (13-15 years) and 51 and 71.67 (16-18 years) of suggested intakes. The most commonly consumed vegetables by the subjects were cauliflower, peas and bottle gourd. Juvenile diabetic subjects were explained that these vegetables are low in calories and have low glycemic index as compared to roots and tubers. In accordance with the present study inadequate intake of green leafy vegetables by the diabetic patients was also reported by Vasanthamani and Savita (2001).Significant improvement in the vegetable intake after nutrition counseling was also reported by Bernstein (2002). The percent adequacy of fruits before and after NC was 34.5 and 48.9 (13-15 years) and 38.70 and 54.83 (16-18 years). Lower intake of fruits among the subjects might be due to the fact that they were not aware of the importance of whole fruits, were having fads that diabetics can not eat fruits as they are sweet and also their purchasing power was low. Intake of fruits was improved after nutrition counselling as subjects were taught about glycemic index of various fruits and importance of whole fruits. Milk was consumed as such in the form of tea, curd or lassi. The percent adequacy of milk and milk products before and after NC was 105.67and 106.67 (13-15 years) and 114.37 and 116.55 (16-18 years). The percent adequacy of fats and oils before and after NC was 77.6 and 82.92 in (13-15 years) and 88.28 and 93.08 (16-18 years) indicating that the consumption of fats and oils was lower than the suggested intake. Similarly lower dietary intake by IDDM subjects than the recommendations given by American Diabetic association was also reported by Mayer et al. (2006).

Nutrient Intake by the Subjects

The percent adequacy of intakes of macronutrients are given in Table 4.The adequacy of energy by the subjects before and after NC was 71.65 to 76.63 percent (13-15 years) and 82.02 to 88.02 percent (16-18 years) of the suggested intakes, indicating that there was lower intake of energy by all the subjects. Similarly low energy intake by diabetics was reported by Lee *et al* (1998).The adequacy of carbohydrates by the subjects before and after NC was 71.7 and 76.26 percent (13-15 years) and 82.74 and 87.55 percent (16-18 years) of the suggested intakes. The percent adequacy of protein intake before and after nutrition counselling was 65.26 and 70.62 percent (13-15 years) and 76.39 and 81.96 percent (16-18 years) when compared with RDA. The protein intakes by the subjects were lower than RDA (75g) given by Raghuram et al. (1993) in both the groups before and after NC, possibly due to vegetarian dietary habits of subjects. The adequacy of fat before and after NC was 75.21 and 81.16 percent (13-15 years) and 83.4 and 88.26 percent (16-18 years) of the suggested intakes, indicating that there was lower consumption of fat by the subjects. Similar results were also reported by Vasanthmani and Savita (2001).

The percent adequacy of fiber intake by the subjects before and after NC was 84.33 and 90.55 percent (13-15 years) and 98.43 and 106.38 percent (16-18 years) of suggested intake of 40 g/ day by Raghuram et al (1993), indicating that after NC fiber consumption was increased. The increase in fiber intake could be due to the counselling about beneficial affects of fiber, having low glycemic index, in the management of blood sugar levels and lipid profile. The subjects were told about the fiber rich foods which are easily available, easy to cook and give more satiety

Table 4: Percent adequacy of macronutrient intake by the subjects before and after nutrition counselling

Nutrients	*13-15year*		*16-18 year*		*RDA#*
	Before N.C. (%)	*After N.C. (%)*	*Before N.C. (%)*	*After N.C. (%)*	
Energy, Kcal	71.65	76.63	82.02	88.02	2265
Carbohydrates, g	71.7	76.26	82.74	87.55	356
Protein, g	65.26	70.62	76.39	81.96	75
Fat, g	75.21	81.16	83.42	88.26	60
Fiber, g	84.33	90.55	98.43	106.38	40

- Raghuram et al. (1993) N.C. – Nutrition counseling

value like whole wheat flour, whole pulses, whole cereals, fruits with peel etc. Similarly increased fiber intake after nutrition counselling by diabetics of Coimbatore was also reported by Suganthi and Saradha (1991).

Comparison of Percent Contribution of Carbohydrates, Proteins and Fats to the Total Energy Intake

The percent contribution of carbohydrates, proteins and fats to the total energy is shown in Table 5.The dietary carbohydrates contributed 62.55 percent (13-15 years) and 63.77 percent (16-18 years) of energy after NC. A similar percentage of energy(60 – 65%) from dietary carbohydrate have been reported by Raghuram et al. (1993). The average contribution of dietary protein to the total energy after NC was 12.20 percent (13-15 years) and 12.33 percent (16-18 years), respectively while an average intake of 10-20 percent has been recommended by Sharma (2004). Total fat contribution after NC was 25.25 percent (13-15 years) and 23.91percent (16-18 years) whereas contribution of saturated and unsaturated fat before and after NC was 13.11 and 12.14 percent (13-15 years) and 12.69 and 11.08 percent (16-18 years) respectively.

The percent adequacy of micronutrients is presented with recommended dietary allowance as suggested by ICMR (2004) in Table 6 and 7.

The adequacy of thiamine intake of the subjects before and after NC was 115.83 and 124.16 percent (13-15 years) and 123.07 and 133 percent (16-18 years) of RDA, respectively. The thiamine intakes were higher possibly due to the higher intake of cereals. The increase in thiamine intake could be due to increase in intake of cereals and its products when compared to ICMR (2004) recommendations (1.2 mg and 1.3 mg). The data revealed that the diets of the subjects in both the groups provided more than adequate amount of thiamine, even after less energy intake. The percent adequacy of riboflavin before NC was 125.33 (13-15 years) and 129.38 (16-18 years) while it increased to 135.33 and 142.5 percent respectively after NC. The percent adequacy of niacin before and after NC was 58.8 and 64.0 percent (13-15 years) and 63.47 and 69.94 percent (16-18 years) of the RDA given by ICMR (2004), indicating that there was in adequate consumption of niacin by the subjects. Adequate consump-

Table 5: Comparison of percent energy contribution from carbohydrates, protein and fat of the subjects, with various recommendations for diabetics

Nutrients	*13-15 yrs*	*16-18 yrs*	*Raghuram et al. (1993)*	*Ghafoorunissa (2000)*	*Sharma (AIIMS) (2004)*
Energy	1735.80	1993.76	-	-	-
Carbohydrates	62.55	63.77	60-65	55-60	60
Protein	12.20	12.33	15-20	15-20	10-20
Total fat	25.25	23.91	15-25	20-25	30
a)saturated fat	13.11	12.69	-	8-10	<10
b)unsaturated	12.14	11.08	5-8	5-8	10

Table 6: Percent adequacy of micronutrient intake of the subjects (13-15yrs) before and after nutrition counselling

Nutrients	*Before N.C. (%)*	*After N.C. (%)*	*RDA#*
Thiamine, mg	115.83	124.16	1.2
Riboflavin,mg	125.33	135.33	1.5
Niacin, mg	58.8	64	16
Ascorbic acid,mg	317.92	362.17	40
Vitamin B_{12}, µg	44	45	1
Folic acid, µg	241	259.87	100
Iron,mg	90.2	111.70	41
Calcium, mg	175.8	188.33	600
Phosphorus, mg	224.8	238.67	600
Magnesium, mg	142.25	154	350
Zinc, mg	53.8	58	15.5

N.C.-Nutrition counseling, NA-Data not available, #ICMR (2004)

Table 7: Percent adequacy of micronutrient intake of the subjects (16-18yrs) before and after nutrition counselling

Nutrients	*Before N.C. (%)*	*After N.C. (%)*	*RDA#*
Thiamine, mg	123.07	133.00	1.3
Riboflavin, mg	129.38	142.50	1.6
Niacin, mg	63.47	69.94	17
Ascorbic acid, mg	331.85	379.70	40
Vitamin $B_{12,}$ µg	48.00	49.00	1
Folic acid, µg	262.20	326.00	100
Iron, mg	65.86	80.60	50
Calcium,mg	192.30	219.50	600
Phosphorus, mg	244.83	273.14	600
Magnesium, mg	166.14	184.00	350
Zinc, mg	66.86	72.00	15.5

N.C.-Nutrition counseling, NA-Data not available, #ICMR (2004)

tion of niacin by diabetics was also reported by Vasanthamani and Savita (2001). The percent adequacy of vitamin C when compared with RDA before and after NC was 317.92 and 362.17 percent (13-15 years) and 331.85 and 379.7 percent (16-18 years) respectively indicating that ascorbic acid intake by the subjects was higher. Similar results were also reported by Banga (2005). When compared with RDA, the mean intake of vitamin B_{12} by the subjects before and after NC was 44 and 45 percent (13-15 years) and 48 and 49 percent (16-18 years) respectively indicating lower intake of vitamin B_{12} by the subjects which may be due to the vegetarian habits of the subjects. The percent adequacy of folic acid before and after NC was 241 and 259.87percent (13-15 years) and 262.2 and 326 percent (16-18 years) of the suggested intakes. Thus, higher amount of folic acid was consumed by all the subjects before and after NC. When compared with RDA, the mean intake of iron by the subjects before and after NC was 90.2 and 111.7 percent (13-15 years) and 65.86 and 80.60 percent (16-18 years) respectively. The iron intake by the subjects was inadequate possibly due to lower intake of green leafy vegetables. The percent adequacy of calcium by the subjects before and after NC was 175.8 and 188.33 percent (13-15 years) and 192.3 and 219.50 percent (16-18 years) of the recommended allowances. The calcium intake was higher due to more consumption of milk and milk products. The adequacy of phosphorus by the subjects before and after NC was 224.8 and 238.67 percent (13-15 years) and 244.83 and 273.14 percent (16-18 years) of suggested intake. There was high intake of phosphorus before and after NC, which can be due to higher intake of cereals and vegetables. Higher intake of phosphorus among diabetics of Brazil was also reported by Gross *et al* (2002). The percent adequacy of magnesium before and after NC was 142.25 and 154 percent (13-15 years) and 166.14 and 184 percent (16-18 years) of the suggested intake, indicating that intake of magnesium by the subjects was adequate. The adequacy of zinc before and after NC was 53.8 and 58 percent (13-15 years) and 66.68 and 72 percent (16-18 years) of suggested intakes, indicating inadequate intake of zinc by the subjects.

Anthropometric Profile of the Subjects

The anthropometric parameters i.e. height, weight, mid upper arm circumference (MUAC) and triceps skin fold thickness (TSFT) are presented in Table 8 and 9. The mean height of the subjects before and after NC ranged from 126 to 144 cm (13-15 years) and 139 to 165.5 cm (16-18 years). The corresponding values before and after NC were 133.36 cm ± 1.06 and 133.73 cm ± 1.01 (13-15 years) and 152.47 cm ± 1.51 and 152.8 cm± 1.56 (16-18 years). The increase in height was statistically insignificant.The average weight of the subjects before and after NC range from 26.5 to 43 kg (13-15years) and 38 to 57.5 kg (16-18 years). The corresponding mean values before and after NC were 32.03 ± 0.95 and 33.13 ± 1.05 (13-15 years) and 43.13 ± 5.5 and 44.6 ± 5.65 (16-

Table 8: Major anthropometric measurements of the subjects (13-15yrs) before and after nutrition counselling.

Variables	*Before N.C.*	*After N.C.*	*t-value*	*Reference standard**
Height (cm)	133.36 ± 1.06	133.73 ± 1.01	0.25^{NS}	159.67
Weight (kg)	32.03 ± 0.95	33.13 ± 1.05	0.74^{NS}	46.83
Midupper arm circumference (cm)	17.42 ± 0.62	17.77 ± 0.61	0.39^{NS}	21.65
Triceps skin fold thickness (mm)	7.32 ± 0.34	7.44 ± 0.38	0.22^{NS}	9.28

* -NCHS standards (1987), NS-Non significant, N.C.-Nutrition counselling

Table 9: Major anthropometric measurements of the subjects (16-18yrs) before and after nutrition counselling.

Variables	*Before N.C.*	*After N.C.*	*t-value*	*Reference standard**
Height (cm)	152.47 ± 1.51	152.8 ± 1.56	0.14^{NS}	174.33
Weight (kg)	43.13 ± 5.5	44.6 ± 5.65	0.94^{NS}	61.9
Midupper arm circumference (cm)	20.64 ± 2.83	21.30 ± 2.74	0.16^{NS}	24.44
Triceps skin fold thickness (mm)	7.85 ± 0.31	8.1 ± 0.43	0.46^{NS}	9.27

* -NCHS standards (1987), NS-Non significant, N.C.-Nutrition counselling

18 years). The average weight after study increased insignificantly which can be due to nutrition counselling which emphasized on intake of balanced diet. However, even after NC mean weights of the subject were higher as compared to recommendations of NCHS.

The average MUAC of the subject before NC ranged from 15.2 to 21.8 cm (13-15years) and 17.5 to 25.4 cm (16-18 years) with mean values 17.42 cm ± 0.62 and 20.64 cm ± 2.83 values were lower when compared with that of NCHS standard nonsignificant increase in MUAC was observed after NC. The mean TSFT of the subjects ranged from 6.82 to 9.2 mm (13-15 years) and 7.4 to 10.5 mm (16-18 years). The corresponding mean values before and after NC were 7.32 ± 0.34 and 7.44 ± 0.38 (13-15 years) and 7.85 ±0.31 and 8.1 ± 0.43 (16-18 years) respectively. TSFT values were lower than recommendations. Increase in TSFT values after NC was statistically non-significant.

Distribution of Subjects According to Waterlow's* Classification

Percent weight for height of the subjects before and after nutrition counselling is given in Table10. Percent weight for height of all the subjects was calculated on the basis of NCHS standard and distribution of the subjects was done according to waterlow's lassification into various categories like severe, moderate and marginal malnutrition and normal.it was observed that majority of the subjects 73 % in (13-15 years) and 80 % in (16-18 years) were in the category of moderate malnutrition, 20% of (13-15 years) and (16-18 years) of children were in marginally malnourished category whereas 7% of (13-15 years) and none of the subject of (16-18 years) were in normal category. After 3 months of nutrition counselling of the subjects, 54 % of (13-15 years) and 67 % of (16-18 years) were in moderately malnourish category,33 % of (13-15 years) and 26 % (16-18 years) of in marginally malnourish whereas 13 % of (13-15 years) and 7 % of (16-18 years) the subjects were in normal category.

Frequency of Blood Glucose Testing by the Subjects Before and After Nutrition Counselling

The frequency of blood glucose testing by the subjects before and after nutrition counselling was studied (Table 11). It was observed that before nutrition counselling 6.67 percent of the subjects tested their blood glucose level daily,35 percent 2-3 times/week, 27% tested once a week, 20 percent 2-3 times/month whereas 13.33 % tested their blood glucose level monthly. After 3 months of nutrition counselling the frequency of blood glucose testing increased as the subjects were taught about the importance of regular blood glucose testing for their day to day

Table 10: Distribution of subjects according to Waterlow's* classification (percent weight for height) before and after nutrition counselling

Weight for height	*Presumptive diagnosis*	*13-15 Years*				*16-18 Years*			
		Before N.C.		*After N.C.*		*Before N.C.*		*After N.C.*	
		No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
< 75%	Severe malnutrition	-	-	-	-	-	-	-	-
75-84%	Moderate malnutrition	11	73.0	8	54.0	12	80.0	10	67.0
85-90%	Marginal malnutrition	3	20.0	5	33.0	3	20.0	4	26.0
>90%	Normal	1	7.0	2	13.0	-	-	1	7.0

*-Waterlow (1963)

Table 11: Frequency of blood glucose testing by the subjects before and after nutrition counselling. (n=30)

Frequency	*Before N.C.*		*After N.C.*	
	Number	*Percentage*	*Number*	*Percentage*
Daily	2	6.67	2	6.67
2-3 times/week	10	35.33	11	36.67
Once/week	8	26.67	10	33.33
2-3 times/month	6	20.00	5	16.67
Monthly	4	13.33	2	6.67

N.C.-Nutrition counselling

normal life and delay of diabetes related acute and chronic complications by maintaining their blood glucose level near normal. After nutrition counseling 37% of the subjects started testing their blood glucose level 2-3 times per week, 33.33 % once in a week, 17% tested 2-3 times/month and 7% subjects tested their blood glucose level monthly.

CONCLUSIONS

The results of the present investigation suggest need to focus attention on nutrition counselling of juvenile diabetics so as to facilitate the intake of increase amount of foods like whole cereals, pulses, sprouted pulses, fruits, vegetables etc and controlled intake of fried foods and sweets in their daily dietaries to improve their nutritional status and for management of malnutrition among them. Thus it can be inferred from the study that nutrition counselling can be an effective measure for bringing favorable and significant changes in the nutritional profile of juvenile diabetics, which may lead to an improvement in diabetic state, management of malnutrition and thus helps in retardation of secondary complications.

REFERENCES

Banga K 2005. *Effect of Chromium Supplementation and Nutrition Counseling in Male Diabetic Subjects*. Ph. D Thesis (Unpublished). Ludhiana: Punjab Agricultural University,

Bernstein MA, Nelson ME, Tucker KH, Hayne H, Johnson E et al. 2002. A home based nutrition intervention to increase the consumption of fruits, vegetables and calcium rich foods in community dwelling elders. *J Am Dietet Assoc*, 102: 1421-1427.

Bjork S 2001. The cost of diabetes and diabetes care. *Diabetes Res Clin Pract*, 54: 513-516.

Gross JH, Zelmano T, Marlin CC, Mello VD, Azevedo MJ 2002. Effect of chicken based diet on renal function and lipid profile in patients with type 2 diabetes. *Diabetes Care*, 24: 645-657

ICMR 2004. *Nutrient Requirements and Recommended Dietary Allowances for Indians*, Hyderabad: NIN.

Jelliffe DB 1966. The assessment of status of nutrition of the community. *World Health Organization Monograph Series no. 53*, Geneva: WHO, pp. 50-84.

Lee CJ, Templeton SB, Marlette M, Watten RS, Fahm EC 1998. Diet quality and nutrient intakes of black southern rural elderly. *J Nutr for Elderly*, 17: 1-15.

Mayer D, Nicholas M, Liese AD, Bell RA, Dabeilia DM et al. 2006. Dietary intake among youth with diabetes, the search for diabetics in youth study. *J Am Dietet Assoc*, 106: 689-697

NCHS 1987. Anthropometric reference data and prevalence of overweight. US 1976-80. *Vital Health Statistics*, Series 11, No. 238.

Power R 2004. *Principle of Internal Medicine*. London: McGraw Hill.

Raghuram TC, Pasricha S, Sharma RD 1993. *Diet and Diabetes*, Hyderabad: NIN, ICMR.

Sharma R 2004. *Diet Management.* New Delhi: All India Institute of Medical Sciences, pp. 42-46.

Song WO, Moerr S, Bond J, Korkarale M, Mann SK et al. 1992. *Nutriguide, Asian Indian Foods, A Nutrient analysis Computer Programme*. Michigan: Michigan State University, pp. 7-38.

Suganthi V, Saradha V 1991. Prevalence of hypertension in diabetes mellitus and impact of diet counseling. *Ind J Nutr Dietet*, 28: 238-242.

Vasanthamani G, Savita D 2001. Hypoglycemic and hypocholesterolemic effect of selected herbal powders. *Ind J Nutr Dietet*, 38: 419-427

Waterlow JC 1963. The assessment of marginal protein malnutrition. *Pro Nutr Soc*, 22: 6.