Research Paper | *Asian Journal of Home Science* | December, 2011 | Volume 6 Issue 2 :223-230

Impact of nutritional education and counselling on change in dietary habits and behaviour of middle aged diabetics

BHARTI JAIN AND DIVYA KUVERA

See end of the paper for authors' affiliations

Correspondence to:

BHARTI JAIN
Department of Food Science and Nutrition
Maharshi Dayanand Saraswati University,
AJMER (RAJASTHAN) INDIA

ABSTRACT

Diabetes mellitus is a chronic disease that has affected human kind throughout the world. The impact of education and counseling was assessed in terms of acceptance of imparted knowledge, change in quality of life, change in personal habits and inclusion/exclusion of specific hypo/hyperglycemic foods in daily diet. The results of mean per cent scores of knowledge before and after counseling in males were noted as 21.20 and 69.70 per cent and in females 15.60 and 55.19 per cent, respectively. A significant difference ($P<0.005$) was noted in the per cent knowledge scores in both the sexes before and after counseling. Highly significant ($P<0.005$) difference in the quality of life prior and after the counseling was noted with the mean score values 3.39 and 19.01 in males and 2.03 and 15.23, in females respectively. Impact of changes in terms of change in personal habits like performing exercise daily, quitting smoking, alcohol, tobacco and chewing supari were also noted and results revealed significant increase in subjects performing exercise daily . Also more than 50 per cent of the subjects dropped the habit of smoking, drinking and eating tobacco and supari. Inclusion of hypoglycemic foods like fenugreek seeds and guar gum was also noted by majority of the subjects after 3 months of counseling. Also sugar, sweets and butter were excluded by 100 per cent subjects whereas preserved products and ghee was excluded by more than 95 per cent subjects. Thus, the over all results related to the impact of nutrition education and counseling revealed a significant change in dietary habits and behaviour of middle aged diabetics.

KEY WORDS: Diabetes mellitus, Non-insulin dependent diabetes mellitus (NIDDM) Chronic metabolic disorder, Hypoglycemic food.

How to cite this paper: Jain, Bharti and Kuvera, Divya (2011). Impact of nutritional education and counselling on change in dietary habits and behaviour of middle aged diabetics. *Asian J. Home Sci.,* **6** (2) : 223-230.

Article chronicle: Received: *08.07.2011*; **Revised:** *15.09.2011*; **Accepted:** *15.11.2011*

Though economic development has resulted in general improvements in nutrition, sanitation and hygiene. These changes have led to the decline of many infectious diseases, but because of easier availability of food and decreased levels of physical activity, they have also encouraged the emergence of non-communicable diseases, notably obesity and diabetes.

Diabetes mellitus (*Madhumeha*) is a metabolic disorder disease characterized by an abnormally elevated level of blood glucose and by excretion of glucose in urine, due to an absolute or relative lack of insulin or a decrease in insulin receptors on the membrane of the target cells. The prevalence of diabetes is increasing globally. It was estimated that in world there were 135 million diabetics in the year 1995, which increased up to 177 million in the year 2002. This rising figure in absence of proper measures, is estimated to rise up to 300 million, globally till the year 2025 (WHO, 2002).

Heredity plays the most important role in conferring susceptibility to diabetes. The closer the blood relationship of a person to a diabetic, the greater are his chances of developing the disease (Braunwald *et al.,* 2000). Other factors like life style changes especially declining physical activity because of mechanization, urbanization, adoption of high fats, energy dense westernized diet, psychosocial stress and obesity have been largely responsible for the rapid increase in diabetes especially type 2 (NIDDM). The greatest incidence occurs in middle aged adults. Raghuram (1996) reported that 90-95 per cent of all the patients with diabetes were 46 years old or above. Diabetes (type 2) has been labeled as life style disease, metabolic disease, vascular disease or simply cardiovascular disease. Studies indicated that 'diabetic lane' has gradually transformed into an 'Express highway' just because of changing life trends (Iyer, 2003).

Diabetes can be controlled effectively by the means

of diet management, drugs and exercise along with other life style changes. The success of treatment for diabetes depends upon proper nutrition education and individual counseling which help the patient to understand the disease and follow the therapy effectively and improve the quality of life. The present study was undertaken to assess and enhance the nutritional knowledge and awareness of the diabetics and to study the effects of nutritional education and counselling on the modification of dietary habits and life style changes of the diabetics.

RESEARCH METHODS

Study was undertaken in one of the seven divisions of Rajasthan (India). Bikaner division was chosen as the area for study. Further, those subjects were chosen who were residing in urban area of the Bikaner city. Purposive sampling method was undertaken to select the patients. The study was conducted on 180 middle aged diabetics. All subjects belonging to the middle income group were taken for the study.

Further, extreme efforts were done to train the patients to understand the disease and to help themselves to cope up with everyday demands of diabetes and to regulate it. For the purpose, a booklet was also prepared in which complete information regarding diabetes and management of the disease was discussed in detail.

Next, the individual counselling method was opted to educate about the disease, for each of the patient. Education and counselling were imparted in a friendly environment, so as to avoid any hesitation to ask questions and also to remove the doubts, if any.

The education programme was rigorously evaluated to determine their outcomes, cost effectiveness and to optimize the method of counselling. The effect of nutrition education and counselling has proved very effective in the control of disease. Only a core of essential factual knowledge may be needed, but this must be taught that effectively so as to alter the patients' behaviour and improve the coping skills. No education programme can be said completed without evaluation of outcomes and desirable changes. So, to assess the impact of nutrition education and counselling on change in life pattern, various aspects were undertaken. The evaluation was done in terms of :

– Assessment of knowledge
– Quality of life
– Personal habits
– Inclusion / exclusion of specific food items

Assessment of knowledge :

The knowledge level related to the disease of the patients prior and after counseling was assessed in the terms of per cent scores with the help of a questionnaire. A questionnaire was prepared to assess the knowledge related to diabetes before and after imparting education and counselling and the assessment was done in per cent scores as given in Table a.

Table a: Grades for assessment of knowledge on the basis of per cent scores

Sr. No.	Per cent score range	Grades
1.	0 - 20	Very poor
2.	20 – 40	Poor
3.	40 – 60	Average
4.	60 – 80	Good
5.	80 – 100	Very good

Change in quality of life scores:

The diabetes related quality of life (DRQOL) scale was complied by slight modification of the renal failure diet related QOL scale (Suzukamo *et al*., 2000). The scale was designed to determine the quantitative and qualitative satisfaction with diet and the changes in physical activity before and after the counselling in terms of scores and grades (Table b).

Table b : Category range for assessment of quality of life

Sr. No.	Score range	Category
1.	0 – 5	Poor quality
2.	5 – 10	Average quality
3.	10 – 15	Good quality
4.	15 – 20	Very good quality

Change in personal habits :

Personal habits like smoking, drinking alcohol, chewing tobacco etc. were also noted prior and after counselling. Further, the habit of performing exercise was also recorded.

Inclusion/exclusion of specific food items :

Knowledge and habit about the products to be included or excluded in the diet that effects blood sugar level directly were assessed. Dietary changes before and after the counselling were noted in terms of inclusion of hypoglycemic foods and exclusion of essential food items *viz.,* sugar and its products, fats and oils and carbohydrates rich foods.

RESEARCH FINDINGS AND DISCUSSION

Education means learning and change in behaviour. The impact of education and counselling was assessed in terms of acceptance of imparted knowledge, change in

quality of life, change in personal habits and inclusion/ exclusion of specific hypo/hyperglycemic foods in daily diet.

Impact of education:

The mean per cent scores of knowledge calculated before and after the counselling (Table 1) were noted as 21.20 and 69.70 per cent in males and 15.60 and 55.19 per cent in females, respectively. A significant difference (P<0.005) was noted in per cent knowledge scores in both the sexes, before and after the counselling. The per cent scores of males were noted to be higher than females at both the levels i.e. prior and after the counselling.

Similarly, when the per cent scores were compared, a highly significant (P<0.005) increase in the knowledge was noted after counselling in both male and female subjects. A conclusion drawn by the study conducted on 50 NIDDM subjects by Ntion and Zea (2001) supports the present study and concluded that males showed more adherence and acceptance to new changes as compared to the females.

Distribution of the subjects on the basis of the previous knowledge about the disease revealed that majority of the patients (87.22 per cent) fell in the category of very poor (0-20%). Common 1.67 per cent subjects were noted for average, good and very good per cent scores (Table 2). Whereas comparing with after counselling data only, 5.0 and 6.12 per cent were noted for very poor and poor per cent scores and 25.00, 36.11 and 22.22 per cent subjects scored very good, good and average per cent scores, respectively (Table 3). Further, a significant (P<0.001) increase in per cent subjects in good to very good knowledge scores category was noted after the counselling as compared to prior counselling (Fig. 1).

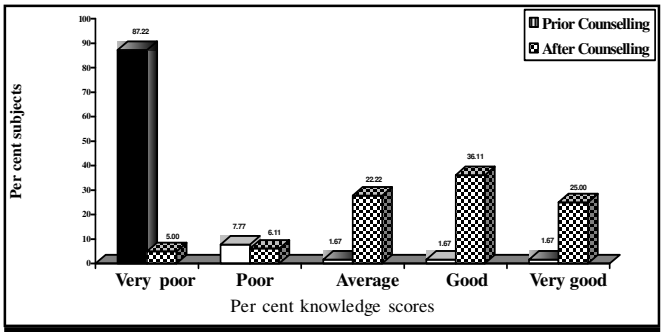

Fig. 1: Per cent distribution of the diabetics according to the knowledge scores

Table 1 : Mean per cent knowledge scores related to the disease

Knowledge per cent scores	Males	Females	t value
Prior counselling ± S.E.	21.20 ± 0.60	15.60 ± 1.36	3.78***
After counselling ± S.E.	69.70 ± 2.48	55.19 ± 2.60	4.04***
t value	19.01***	4.60***	

*** indicates significance of value at P=0.05

Table 2 : Per cent distribution of the diabetics according to the per cent knowledge scores related to the disease (prior counselling)

Per cent scores	Category	Total		Overall (180)
		Male (90)	Female (90)	
0-20	Very poor	83.34 (75)	91.12 (82)	87.22 (157)
20-40	Poor	11.11 (10)	4.44 (4)	7.77 (14)
40-60	Average	1.11 (1)	2.22 (2)	1.67 (3)
60-80	Good	2.22 (2)	1.11 (1)	1.67 (3)
80-100	Very pood	2.22(2)	1.11 (1)	1.67 (3)

Figures in parenthesis denote number of subjects

Table 3: Per cent distribution of the diabetics according to the per cent knowledge scores related to the disease (after counselling)

Per cent scores	Category	Total		Overall (180)
		Males (90)	Females (90)	
0-20	Very poor	5.56 (5)	4.44 (4)	5.00 (9)
20-40	Poor	5.56 (5)	6.67 (6)	6.12 (11)
40-60	Average	16.67 (15)	27.78 (25)	27.22 (40)
60-80	Good	38.88 (35)	33.33 (30)	36.11 (65)
80-100	Very good	33.33 (30)	27.78 (25)	25.00 (45)

Figures in parenthesis denote number of subjects

Counselling wise $\chi^2_4 = 252.77^{****}$ (P<0.001)

Assessment of the quality of life:

To assess the change in quality of life of the patients before and after giving education and counselling, in respect to the disease, the data were obtained with the help of DRQOL scale. Highly significant (P<0.005) difference in the quality of life prior and after the counselling was noted with the mean score values 3.39 and 19.01 in males and 2.03 and 15.23 in females, respectively (Table 4).

When the comparison was done in between the two sexes, significant difference at both the levels *i.e.* prior (P<0.005) and after (P<0.01) the counselling was noted. Males due to higher acceptance and adherence had better quality of life than females. In females due to traditional reasons they were not able to follow the modifications as accurately as males which in turn affected the quality of life.

The perusal of Table 5 clearly indicates that prior to counselling, 91.66 per cent subjects fell in the category of 'poor' quality life. Only 8.34 per cent subjects were noted to lead 'average' quality of life. None of the subjects, was found to be in the category of 'good' or 'very good' quality of life . But after impartation of education and adequate counselling only 11.12 per cent subjects were noted in the category of 'poor' quality of life. Whereas 31.67 and 38.88 per cent subjects were noted for 'good' and 'very good' quality of life, respectively (Table 6). Further, a significant (P<0.001) increase in the per cent subjects was noted in good to very good scores category observed after the counselling as compared to prior to counselling. The majority of the subjects were noted in the category of 'good' to 'very good' quality of life after the counselling (Fig. 2). Yan Hue (2003) also reported that after adequate counselling and education the quality of life improved significantly (P<0.001) in terms of social, dietary and physical health. Similar changes were reported in the quality of life in both the sexes.

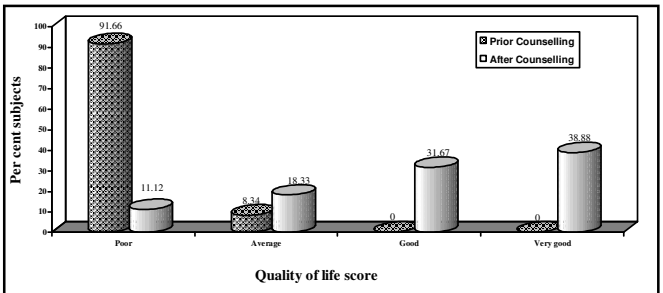

Fig. 2: Per cent distribution of the dibetics according to the quality of life score

Table 4 : Mean scores of quality of life related to the disease

Quality of life scores	Total subjects		t value
	Males (90)	Females (90)	
Prior counselling ± S.E.	3.39 ± 1.02	2.03 ± 2.01	5.60***
After counselling ± S.E.	19.01 ± 1.01	15.23 ± 1.25	2.36**
t value	10.92***	5.59***	

Maximum score 20

*** and ** indicate significance of values at P= 0.05 and P=0.01, respectively

Table 5 : Per cent distribution of the diabetics according to the scores of quality of life, related to the disease (prior counselling)

Quality of life scores	Category	Total		Overall (180)
		Males (90)	Females (90)	
0-5	Poor quality	88.89 (80)	94.44 (85)	91.66 (165)
5-10	Average quality	11.11 (10)	5.56 (5)	8.34 (15)
10-15	Good quality	--	--	--
15-20	Very good quality	--	--	--

Figures in parenthesis denote number of subjects

Table 6: Per cent distribution of the diabetics according to the scores of quality of life, related to the disease (after counselling)

Quality of life scores	Category	Total		Overall (180)
		Males (90)	Females (90)	
0-5	Poor quality	11.11 (10)	11.11 (10)	11.12 (20)
5-10	Average quality	16.67(15)	20.00(18)	18.33 (33)
10-15	Good quality	30.00(27)	33.33(30)	31.67 (57)
15-20	Very good quality	42.22 (38)	35.56(32)	38.88 (70)

Figures in parenthesis denote number of subjects

Counselling wise $\chi^2_3 = 120.56^{****}$ (P<0.001)

Change in personal habits:

Exercise :

8.34 per cent subjects were performing exercise prior to study in form of walking, jogging and Yoga for only 10-15 minutes. Whereas after the counselling significant (P<0.001) increase in per cent subjects, performing exercise was noted. After the counselling nearly 82.77 per cent subjects were exercising daily, mainly in form of walking and Yoga for at least 25-30 minutes (Fig.3). Remaining of the subjects (17.23 per cent) were not exercising in daily routine. Further, the habit of performing exercise was noted to be significantly (P<0.05) more among the males than in females at prior counselling level.

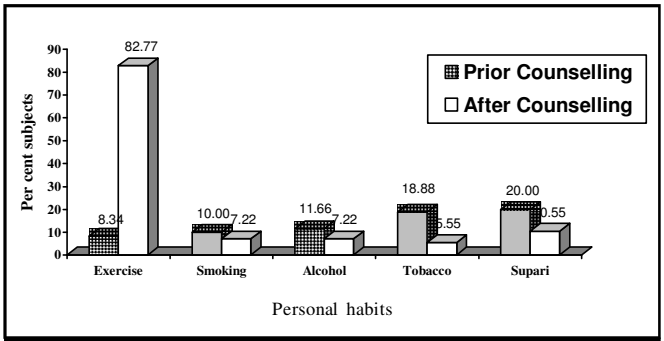

Fig. 3: Per cent distribution of the diabetics according to the personal habits, prior and after counselling

Smoking habit :

Prior to counselling, 10 per cent subjects were noted for smoking habit and remaining 90 per cent were not habitual. But after the counselling, a non-significant decrease in the habit was noted. Only 7.22 per cent subjects were recorded as smokers as usual with 92.73 per cent subjects as non-smokers (Fig. 3). The smoking habit was noted significantly (P<0.001) more in male subjects at both prior and after counselling level .

Drinking habit :

Habit of drinking alcohol was only noted for male subjects and none of the females reported for the same. Nearly 11.66 per cent subjects reported for drinking habit prior to counselling. Whereas after the counselling, a non-significant decrease in the habit was noted. 7.22 per cent subjects were noted to be habitual for drinking alcohol after the counselling. Further, a significant (P<0.001) difference was noted in between the two sexes at both the levels of counselling (Fig. 3).

Tobacco consumption :

Nearly 18.88 per cent subjects were habitual of chewing tobacco prior to counselling. Whereas after the counselling the per cent subjects fell to 5.55 per cent (Table 7 and Fig. 3). The decrease in the habit was noted to be

Table 7 : Per cent distribution of the diabetics according to the personal habits, prior and after counselling

Personal habits	Males		Females		Overall	
	Prior	After	Prior	After	Prior	After
1. Exercise						
Performing	13.33 (12)	87.77 (79)	3.33 (3)	77.77 (70)	8.34 (15)	82.77 (149)
Not performing	86.67 (78)	12.23 (11)	96.67 (87)	22.23 (20)	91.66 (165)	17.23 (31)
2. Cigarette						
Smoking	20.00 (18)	14.44 (13)	--	--	10.00 (18)	7.23 (13)
Not smoking	80.00 (72)	85.56 (77)	100.00 (90)	100.00 (90)	90.00 (162)	92.77 (167)
3. Alcohol						
Drinking	23.33 (21)	14.44 (13)	--	--	11.66 (21)	7.23 (13)
Not drinking	76.67 (69)	85.56 (77)	100.00 (90)	100.00 (90)	88.34 (159)	92.77 (167)
4. Tobacco						
Chewing	31.11 (28)	11.11 (10)	6.66 (6)	--	18.88 (34)	5.55 (10)
Not chewing	68.89 (62)	88.89 (80)	93.34 (84)	100.00 (90)	81.12 (146)	94.45 (170)
5. Supari						
Chewing	7.77 (7)	4.44 (4)	32.23 (29)	16.66 (15)	20.00 (36)	10.55 (19)
Not chewing	92.23 (83)	95.56 (86)	67.77 (61)	83.34 (75)	80.00 (144)	89.45 (161)

Figures in parenthesis denote number of subjects

1. $\chi^2 = 201.08^{****}$ (P<0.001)
2. $\chi^2 = 0.88^{NS}$
3. $\chi^2 = 2.07^{NS}$
4. $\chi^2 = 14.90^{****}$ (P<0.001)
5. $\chi^2 = 6.18^{*}$ (P<0.05)

Table 8: Per cent distribution of the diabetics by the inclusion of specific food items in their daily diet, prior and after counselling

Included products	Males				Females				Overall	
	Completely		Partially		Completely		Partially		Completely	
	Prior	After	Prior	After	Prior	After	Prior	After	Prior	After
Fenugreek seeds	16.66(15)	27.78(25)	1.11(1)	5.55(5)	15.55(14)	33.33(30)	2.22(2)	3.33(3)	16.12(29)	30.56(55)
Powder	8.88(8)	5.56(5)	--	2.22(2)	7.77(7)	11.11(10)	1.11(1)	1.11(1)	8.34(15)	8.34(15)
Soaked	6.66(6)	16.67(15)	1.11(1)	2.22(2)	7.78(7)	22.22(20)	--	1.11(1)	7.23(13)	19.45(35)
Vegetable	1.12(1)	5.55(5)	--	1.11(1)	--	--	1.11(1)	1.11(1)	0.56(1)	2.78(5)
Bitter gourd	6.66(6)	11.11(10)	5.55(5)	2.22(3)	4.44(4)	8.88(8)	6.66(6)	2.22(2)	5.56(10)	10.00(18)
Juice	5.55(5)	7.78(7)	--	1.11(1)	4.44(4)	7.77(7)	5.55(5)	1.11(1)	5.00(9)	10.56(14)
Powder	1.11(1)	1.11(1)	--	1.11(1)	--	1.11(1)	--	1.11(1)	0.56(1)	1.12(2)
Vegetables	--	2.22(2)	5.55(5)	1.11(1)	--	--	1.11(1)	--	--	1.12(2)
Jamun	2.22(2)	8.88(8)	2.22(2)	5.55(5)	1.11(1)	2.22(2)	1.11(1)	--	1.67(3)	5.56(10)
Fresh	1.11(1)	2.22(2)	1.11(1)	3.33(3)	1.11(1)	1.11(1)	1.11(1)	--	1.12(2)	1.67(3)
Powder	1.11(1)	6.66(6)	1.11(1)	2.22(2)	--	1.11(1)	--	--	0.56(1)	3.89(7)
Other	5.55(5)	18.88(17)	2.22(2)	14.44(13)	--	20.00(18)	1.11(1)	3.33(3)	2.78(5)	19.45(35)
Neem leaves	4.44(4)	2.22(2)	1.11(1)	--	--	--	1.11(1)	1.11(1)	2.23(4)	1.12(2)
Tulsi	1.11(1)	5.55(5)	1.11(1)	8.88(8)	--	6.66(6)	--	1.11(1)	0.56(1)	6.12(11)
Guar gum	--	11.11(10)	--	5.55(5)	--	13.34(12)	--	--	--	12.23(22)

Figures in parenthesis denote number of subjects

Counselling wise $\chi^2 = 7.81^*$ (P<0.05)

significant at 0.1% level. Further, it was noted that males were significantly more habitual than females at both prior (P<0.001) and after (P<0.005) the counselling .

Chewing supari :

Habit of chewing supari was noted to be very common in both the sexes. Prior to counselling, 20 per cent subjects had regular habit of chewing 8-10 suparis' daily. But as an impact of counselling, the per cent subjects reduced to 10.55. The reduction was noted to be significant at 0.1% level. Further, the habit of chewing supari was significantly more in female subjects at both prior (P<0.001) and after (P<0.1) the counselling (Table 8). In a study to find out the feasibility and success of counselling Hamalainen (2003) undertook 47 diabetics. As a result, positive changes were noted in the subjects after the counselling. Nearly 63 per cent patients reached the target of the study. Further changes in lifestyle *i.e.* exercise, dropping of alcohol and smoking and increase in the quality of life (p<0.001) were also noted. Thus, the results of present depicts conformity with the above study.

Inclusion/exclusion of specific food items

Inclusion of specific food items :

Inclusion of hypoglycemic foods helps in significant reduction of blood glucose level. Therefore, main emphasis was laid in counselling regarding the inclusion of specific hypoglycemic agents. The per cent subjects consuming fenugreek seeds, bittergourd and jamun in different forms were noted as 16.12, 5.56 and 1.67 per cent respectively prior to counselling (Table 8). Whereas other hypoglycemic agents like neem leaves and tulsi leaves were consumed by 2.78 per cent subjects. None of the subjects was consuming guar-gum completely or partially in their daily diet prior to counselling .

But after the counselling a significant (P<0.05) rise in per cent subjects was recorded regarding the inclusion of specific hypoglycemic foods. The per cent subjects noted for fenugreek seeds, bittergourd and jamun were 30.56, 10.0 and 5.56 per cent, respectively. Nearly 19.45 subjects were consuming other hypoglycemic foods like neem leaves, tulsi and guar-gum of which guar-gum was noted to be more common (Table 8).

Exclusion of specific food items :

Sugar and preserved products were excluded completely by 83.33 and 86.66 per cent subjects, prior to counselling, whereas 77.22 per cent subjects avoided sweets completely from their daily diet.

But after the counselling cent per cent subjects were noted to avoid sugar and preserved products and 95.55 per cent subjects avoided sweets daily from their diet (Table 9).

Further, prior to counselling only 33.3 per cent subjects shunned butter and ghee from routine diet whereas after the counselling the per cent subjects noted was 100.0 and 95.0 per cent for the same. Oil was consumed regularly in daily diet by all subjects but as an

Table 9: Per cent distribution of the diabetics according to the exclusion of specific foods in their daily diet, prior and after counselling

Excluded products	Males				Females				Overall	
	Completely		Partially		Completely		Partially		Completely	
	Prior	After	Prior	After	Prior	After	Prior	After	Prior	After
Sugar and sugar products										
Sugar	77.77(70)	100.00(90)	16.66(15)	--	88.88(80)	100.00(90)	11.11(10)	--	83.33(150)	100.00(180)
Sweets	71.11(64)	94.44 (85)	10.00(9)	5.55(5)	83.33(75)	96.66(87)	2.22(2)	3.33 (3)	77.22(139)	95.55(172)
Preserved polls (Jam, squash, syrups)	77.77(70)	100.00(90)	11.11(10)	--	95.55(86)	100.00(90)	1.11(1)	--	86.66(156)	100.00(180)
Fat and oils										
Butter	36.66(33)	100.00(90)	3.33(3)	--	30.00(27)	100.00(90)	33.33(30)	--	33.33(60)	100.00(180)
Ghee	24.44(22)	94.44(85)	25.55(23)	5.55(5)	43.33(39)	95.55(86)	11.11(10)	4.44(4)	33.88(61)	95.00(171)
Oil	--	27.77(25)	11.11(10)	66.66(60)	--	22.22(20)	12.22(11)	72.22(65)	--	25.00(45)
Carbohydrates rich foods										
Potato and other vegetables	68.88(62)	55.56(50)	3.33(3)	44.44(40)	6.66(78)	88.88(80)	1.11(1)	5.55(5)	77.77(140)	72.22(130)
Rice	88.88(80)	88.89(60)	7.77(7)	2.22(2)	94.44(85)	82.22(74)	3.33(3)	3.33(3)	91.66(165)	74.44(134)
Fruits (mango, chiku, grapes etc.)	44.44(40)	94.44(85)	4.44(4)	5.55(5)	57.77(52)	90.00(81)	5.55(5)	6.66(6)	51.11(92)	92.22(166)

Figures in parenthesis denote number of subjects

impact of counselling, 25 per cent subjects were consuming fat free diet after the counselling.

Regarding the complete exclusion of carbohydrates rich fruits, vegetable and rice, the per cent subjects noted were 51.11, 77.77 and 91.66, respectively prior to counselling. But after providing the list of fruits and vegetables to be avoided and alternate process to consume boiled rice by discarding water, per cent subjects changed to 92.22, 72.22 and 74.44 for the same. Thus, the positive outcomes of individual counselling was noted regarding the exclusion of specific food items (Table 9).

Conclusion:

Thus, the overall results related to the impact of nutritional education and counselling revealed a significant change in dietary habits and behaviour of the study population. The mean knowledge per cent scores for males and females of the study group was found to be very low prior to counselling. But after the counselling significant increase in the per cent knowledge scores was noted for the subjects. Also males had significantly higher per cent knowledge scores than females.

A significant increase in quality of life score was noted in both the sexes after the counselling. Further, males due to higher acceptance and adherence had significantly better quality of life than females. Impact of counselling was noted with the significant increase in per cent subjects exercising daily. Further, a significant decrease in the per cent subjects was noted after the counselling for chewing tobacco and supari. But, a non significant reduction in the per cent subjects was noted for the habit of smoking and drinking alcohol. Inclusion of hypoglycemic substance specially fenugreek seeds was noted to be more common among the subjects. Imparting knowledge and personal counseling had a significant change in daily habits related to exercise and dietary regime. Education of the patient is an integral and important component in the management of diabetes.

Authors' affiliations:
DIVYA KUVERA, Department of Food Science and Nutrition, Maharshi Dayanand Saraswati University, AJMER (RAJASTHAN) INDIA

REFERENCES

Braunwald, E., Fauci, A.S., Kasper, D.L., Hauser, S.L., Longo, D.L. and Jameson, J.L. (2000). *Principles of internal medicine* : *Diabetes Mellitus.* 2nd ed, McGraw Hill Companies, **1**: 1151-1158.

Hamalainen, R. (2003). Prevention of type-2 (NIDDM) diabetes mellitus by diet and physical exercise : the 6 year feasibility study. *Diabetologia*, **34** : 891-898.

Iyer, S.R. (2003). Type-2 diabetes express highway, where is the 'U' turn. *J. Assoc. Physicians India*, **51**: 78-83.

Ntion, H. and Zea, R. (2001). Effect of counselling on decrease in the risk factors related to the diabetes. *Diabetes Car*e, **13** : 53-58.

Raghuram, T.C. (1996). Diabetes mellitus c.f. Balmji, M.S., Rao, N.S. and Reddy, V. *Text book of human nutrition*. 3rd ed., Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, pp. 333-343.

Suzukamo, V., Sato, E., Miyashita, M. and Kazuma, K. (2000). Study the impact of counselling on change in behaviour and habits of renal diabetic patients. *Diabetologia*, **4**(2) : 58-60.

WHO (2002). World health organization. *Tech. Rep. Ser* : 534.

Yan Hue (2003). Ten years follow-up of subjects with impaired glucose tolerance : Prevention of diabetes by diet regulation and exercise. *Diabetes*, **29**:41-49.

*** ********** ***