

Anthropometric and nutritional profile of hospitalized diabetic eye disease patients

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Abstract

Objective: To assess anthropometric status and compare the nutritional intake of hospitalized diabetic eye disease (DED) patients with their recommended daily dietary requirements.

Design: A Cross sectional study.

Setting: The study was conducted, in the Ophthalmic sciences Centre of All India Institute of Medical Sciences (AIIMS), New Delhi.

Subjects: 62 adult patients hospitalized with type 1 or 2 diabetes > 20 years of age, on diabetes medication and/or basic insulin regimens were enrolled in the study.

Interventions: Anthropometric measurements were done by standardized methods. Nutritional needs were determined by applying Mifflin St Joer predictive equations, multiplying by a combined stress and activity factor of 1.3.

Results: DED patients were found to be obese. Analysis of dietary data indicate a significant difference ($p < 0.0005$) between average daily caloric and carbohydrate intake and needs.

Conclusions: Findings of the present study will be useful in planning nutritional care process (NCP) and ultimately providing safe and quality medical nutrition therapy (MNT) for improving clinical outcome of hospitalized DED patients.

Keywords: Diabetic eye disease, Anthropometry, Nutritional intake.

Introduction

Diabetes is rapidly acquiring the position of a prospective epidemic in India with more than 62 million diabetic individuals diagnosed with the disease.^{1,2} The WHO estimates diabetes in India is likely to increase to 79.4 million in 2030.³ This epidemic of diabetes is unfortunately paralleled by a corresponding increase in the prevalence of its complications, both microvascular and macrovascular, which account for much of the premature morbidity and mortality due to diabetes in India.⁴⁻⁶ Diabetic eye disease (DED), is a complication associated with diabetes. It refers to a group of eye problems including, diabetic retinopathy, cataracts, and glaucoma that can result from type 1 and type 2 diabetes causing most feared severe vision loss or even blindness as a long-term consequence of uncontrolled diabetes.⁷ Increased visceral adipose tissue is also a known confounder of risk factors for age-related ocular disease.^{8,9} Hospitalized DED patients on insulin and/or insulin secretagogues, report incidents of hyperglycemia and hypoglycaemia due to sudden changes in food intake, medication and treatment schedules.¹⁰ Blood glucose (BG) levels are often elevated during illness because of stress. Many patients with diabetes come to the hospital with high BG levels, or their BG levels become elevated during hospitalization. Certain medications and decreased physical activity during hospital stay contribute to elevated BG levels. Diabetic retinopathy is a highly specific vascular complication of both type 1 and type 2 diabetes, with prevalence strongly related to the duration of diabetes. Diabetic retinopathy is the most frequent cause of new cases of blindness among adults aged 20–74 years. Glaucoma, cataracts, and other disorders of the eye occur earlier and more frequently in people with diabetes. In addition to duration of diabetes, other factors that increase the risk of,

or are associated with, retinopathy include chronic hyperglycemia. Hyperglycemia has also been linked to immunosuppression, increased coagulopathies, increased infection rates, and prolonged lengths of hospitalizations.¹¹ It is recently suggested that hospitals consider implementing a meal planning system, based on most appropriate dietetic practice for better blood glucose management. As medical nutrition therapy (MNT) is an integral component of clinical care for people and includes an assessment of nutritional status and the provision of specialized nutrition therapy.¹² After patients are identified and referred to nutrition care, the nutrition care process (NCP) includes systematic problem solving method that dietetics professionals use to critically think and make decisions. Although, implementing MNT can be a challenge for healthy people with diabetes, but it poses greater challenge for people who are hospitalized. As per available knowledge, no study has been conducted till date to address safe and effective, nutrition care process (NCP) in hospitalized diabetic patients in India. Thus, the present study was undertaken with the following

Objectives

1. To assess anthropometric status of hospitalized DED patients.
2. To compare the nutritional intake of hospitalized DED patients with their recommended daily dietary requirements.

Materials and Methods

Study Design

The proposed study was a cross sectional study of hospitalized DED patients. The study was conducted, in the General Wards of Dr. Rajendera Prasad centre for Ophthalmic sciences, All India Institute of Medical Sciences

(AIIMS). A convenience sample of 62 adult patients hospitalized with the diagnosis of type type 1 or 2 diabetes > 20 years of age, on diabetes medication and/or basic insulin regimens were enrolled in the study. Diabetic patients receiving steroid therapy, tube feedings, parenteral nutrition, pregnant or lactating women. immune-compromised and renal patients were excluded. Prior to filling of data, verbal consent was taken from the enrolled patients. Comprehensive eye examination for diagnosis of various DED was performed by an experienced and knowledgeable ophthalmologist.

On the first day of patient’s admission the dietician, on the basis of existing nutritional status determined caloric requirement of each DED patient to indent diabetic diet containing specified calories from centralized kitchen, AIIMS . A standard daily diet for a diabetic patient consisted 3 major meals ; breakfast, lunch and dinner along with early morning tea and evening tea based on fixed weekly cyclic menu. However, variations in the existing meal plan and timings and additional foods were provided if necessary.

Weight and Obesity Measures

Weight and obesity measures of enrolled patients were determined by the following criteria with Indian reference values.¹³

Body mass index (BMI) BMI was measured as a ratio of weight in kilograms divided by height in meters squared (kg/m²). Cut-off criteria was as follows : Normal 18.0 - 22.9 , Overweight 23.0 – 24.9 & Obese ≥ 25.

Body weight was measured and recorded to the nearest of 1 kg between 8 to 9 a.m. while the subject was minimally clothed and bare feet, standing motionless on a weighing scale.

Height was measured to the nearest of 1 cm while subject was standing in erect position barefooted on flat floor against a vertical scale and with heels touching the wall and head held straight.

Waist Circumference (WC) WC measurement was made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest. Measurements were taken with light clothes. by a non-stretchable tape, horizontally to the nearest 0.1 cm. WC cut-offs : Men = 88 cm, Women= 80 cm.

Hip Circumference (HC) HC was measured at the maximum circumference over the buttocks and the subject stood straight, keeping feet together, keeping hands by the sides facing palms inwards. Hip circumference was measured by a non-stretchable tape, horizontally to the nearest 0.1 cm.

Waist Hip Ratio (WHR) – WHR an index of both subcutaneous and intra abdominal adipose tissue was determined by dividing waist circumference with the hip circumference.

WHR cut-offs: Men = 0.90, Women= 0.80.

Body Adiposity Index

Body adiposity index (BAI), is a new surrogate measure of body fat its classifications for women and men are given in Table 1.BAI was evaluated by the following equation:¹⁴

BAI = (HC / (HM)^{1.5}) – 18			
BAI =	Body	Adiposity	Index
HM =	Height	In	Metres

HC = Hip Circumference in Centimetres

Table 1: Body Adiposity Index Classifications for Women and Men

Body Adiposity Index Classifications for Women:				
Age (years)	Underweight	Healthy	Overweight	Obese
20 - 39	Less than 21%	21% to 33%	Greater than 33%	Greater than 39%
40 - 59	Less than 23%	23% to 35%	Greater than 35%	Greater than 41%
60 - 79	Less than 25%	25% to 38%	Greater than 38%	Greater than 43%
Body Adiposity Index Classifications for Men:				
Age (years)	Underweight	Healthy	Overweight	Obese
20 - 39	Less than 8%	8% to 21%	Greater than 21%	Greater than 26%
40 - 59	Less than 11%	11% to 23%	Greater than 23%	Greater than 29%
60 - 79	Less than 13%	13% to 25%	Greater than 25%	Greater than 31%

Dietary Needs

Calorie needs for each patient were determined by applying Mifflin St Joer predictive equations¹⁵ and multiplying by a combined stress and activity factor of 1.3.

Mifflin-St Jeor equations

Males: RMR = 10×W + 6.25×H -5 × A + 5 Females: RMR =10×W + 6.25×H -5 × A -161

Where REE stands for Resting Energy Expenditure (kilocalorie per day), W for weight (kilogram), H for height (centimetre) and A for age in years(y).

Carbohydrate (CHO) Needs: CHO needs were calculated on the basis of dietary reference intakes (DRI) of 45-65% of

calories from CHO, 10-35% from proteins and 20-35% from fat sources,¹⁶ as given in Table 2.

Table 2: Determination of carbohydrate (CHO) needs for a day.

1200 Kcal		1400 Kcal		1600 Kcal	
CHO	165g =11 CHO Exchanges	CHO	188g =12.5 CHO Exchanges	CHO	210g =14 CHO Exchanges
Protein	60g	Protein	68g	Protein	80g
Fat	30g	Fat	42g	Fat	49g
1800 Kcal		2000 Kcal		2200 Kcal	
CHO	240g =16 CHO Exchanges	CHO	270g =18 CHO Exchanges	CHO	300g =20 CHO Exchanges
Protein	86g	Protein	95g	Protein	99g
Fat	45g	Fat	60g	Fat	67g

Actual Meal Consumption

Actual meal consumption was estimated on the second day of admission. Dietician during the ward rounds noted the amount of food consumed by each patient for breakfast, lunch and dinner. Left-over food and the hospital diet shared with the patient's attendant from the food served out of the standard labeled calorie based meals was not documented. Estimated weighed food record method was used to quantify each patient's actual food consumption by using household measures such as cups or spoons.¹⁷

Diet analysis

This study focused on evaluating calories, protein, and carbohydrate only. A diet scale maintained by the hospital's dietetics department provided information about food quantity and the calorie, protein, and carbohydrate content for each serving of food. The pre-packaged foods have fixed and regular portions sizes without significant ingredient variation. In consumption observations or analyses any foods served or consumed in addition to the food on the main three daily meal trays was not recorded. Amount of calories, carbohydrates and protein consumed in a day's diet of each patient was calculated from the standard values given in Indian Food Composition Tables, National Institute of Nutrition, Hyderabad, India.¹⁸

Blood Glucose levels

On the second day of patient's admission, fasting and two hours after the start of meal blood glucose levels were recorded from the treatment book. The targets proposed by American Diabetic Association (ADA, Standards of Medical care in diabetes-2013) for fasting plasma glucose (FPG) (≥ 126 mg/dl/dL) and 2 hour plasma glucose (≥ 200 mg/dL) were considered. Modification of the regimen was

done when blood glucose values were <70 mg/dL (3.9 mmol/L), unless the event is easily explained by other factors (such as a missed meal).¹⁹

Statistical Analysis

SPSS 15.0 was used for statistical analysis. Minimum, maximum, means and SDs were calculated for the continuous data and frequencies distribution and percentages were determined for categorical data. Co-relation was determined for BMI, WC, WHR and BAI%. Paired t tests was used to determine whether differences existed between actual intake and required intake of calories and carbohydrates by sex. To identify factors that affect nutritional intake, frequencies and percentage was determined.

Results

In the present study 23 patients out of the 62 enrolled patients were diagnosed with diabetic retinopathy and remaining with cataract, macular edema, retinal diseases, glaucoma, refractive errors and other eye disorders.

The mean age of sixty two patients included in this study, ranged from 40 to 77 years (y), out of which 34 were men and 28 women. The age range of women was between 40 to 75 y and of men between 43 to 77 y. The mean age of men and women were almost same that is 59.2 and 61.2y, respectively. The mean weight of women was 66.46 ± 11.01 kg and of men was slightly lower that is 64.58 ± 10.22 kg. The weight for women and men ranged between 45-88 kg and 46-85. The height of women ranged between 1.48m to 1.63m however for men it was higher that is between 1.55m to 1.78m. The mean height of men was higher than women and was observed as 1.65 ± 0.05 m and 1.53 ± 0.03 m (Table 3).

Table 3: Age and Anthropometric profile

Total no. of patients - n=63	Female n=28	Male n=34
Mean Age (y)	59.28y	61.20y
Age range (y)	40-75y	43-77y
Mean weight (kg)SD	66.46 kg ±11.01	64.58 kg ±10.22
Weight Range (kg)	45 to 88 kg	46 to 85kg
Mean height (m) SD	1.53m ± .030	1.65m ±.050
Mean height range (m)	1.48 to 1.63m	1.55 to 1.78 m

On the basis of BMI, almost all the women 78.6% were obese, and equal number of (10.7%) overweight and (10.7%) normal. However, more men were normal (44%) or obese (38%) and a few (17.6%) were overweight.

WC cut-offs of almost all the women that is 92.9% were on the higher side, but the WC of men above cut-offs was for 58.5%. However, the Waist to Hip Ratio (WHR), cut-off values distribution for women and men were strikingly different. More men (76.5%) than women (71.4%) were in the risk category.

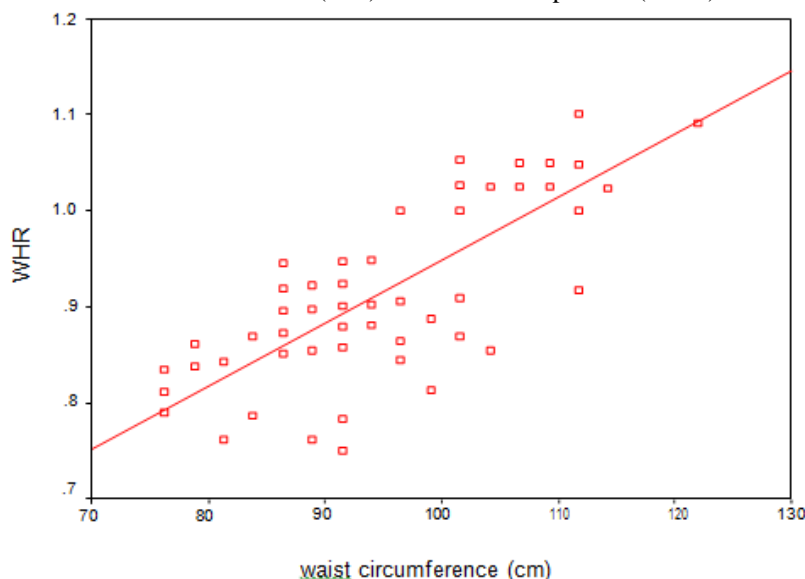
The BAI% categorized showed that both men and women had higher fat percentages. However women were more in obese (39.3%) compared to men (26.5%), but overweight patients were more men that is (64.7%) than women (42.9%),(Table 4).

Table 4: Waist circumference (WC), Waist Hip Ratio (WHR), Body Mass Index (BMI), Body Adiposity Index (BAI)

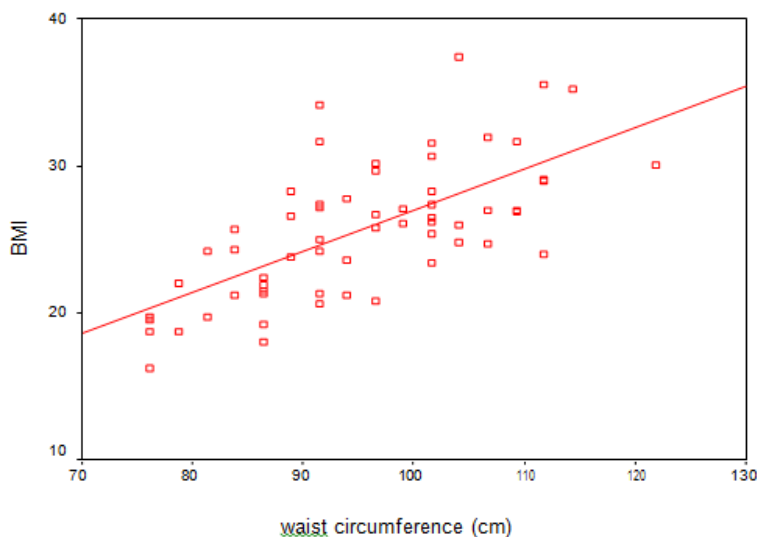
Total no. of patients - n=62	Female n=28	Male n=34
Body Mass Index (BMI) – Mean	28.14	23.64
Normal =18.0-22.9	n= 3 (10.7 %)	n=15 (44%)
Overweight=23.0 – 24.9	n=3 (10.7%)	n=6 (17.6%)
Obese ≥ 25	n=22 (78.6%)	n=13 (38%)
Waist Circumference(WC)- Above cut-off	≥ 80cm = n=26	≥ 88cm = n=20
WC- % above cut-off	92.9%	58.5%
Waist Hip Ratio (WHR)- Above cut-off	≥ 0.80 = n=20	≥ 0.90 = n=26
WHR- % above cut-off	71.4%	76.5%
Body Adiposity Index (BAI)- Mean	39.98	28.59
Normal ≥Female: 21- 38%, Male: 8-25 %	n= 5 (17.9%)	n=3 (8.8%)
Overweight Female: 33- 38% Male : ≥ 25%	n=12 (43%)	n=22 (64.7%)
Obese Females 39-43 % Males 26-31 %	n=11 (39%)	n=9 (26%)

The correlation was observed between WC and WHR (r = 0.762) and WC & BMI (r=.668). The WC and BMI were found to be more correlated (r=0.762) than BMI and WHR (r=0.184) . (Graph 1,2,3)

Graph 1: Relationship between Waist Circumference (WC) and Waist to Hip Ratio (WHR)



Graph 2: Relationship between Waist Circumference (WC) and Body Mass Index (BMI)



Graph 3: Relationship between Waist Circumference (WC) and Body Adiposity Index (BAI)

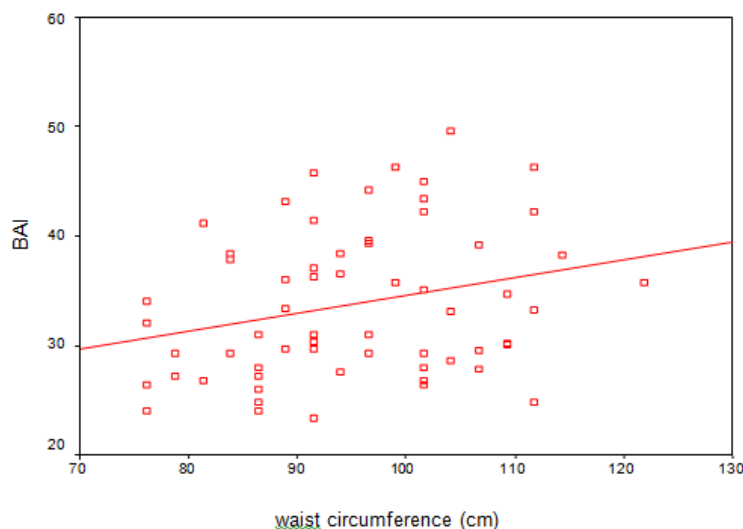


Table 5: Distribution of Calories (k/cal) in each meal for a day for all the patients

n = 62	Minimum	Maximum	Mean	Std. Deviation
Breakfast calories	40	540	257.25	126.98
Lunch calories	60	540	394.25	94.85
Dinner calories	129	437	263.87	75

On a day’s basis, the mean calories (kcal) consumed by all the enrolled patients for breakfast were 257.2 ± 126.9 , for lunch 394.25 ± 94.85 and dinner were 263.87 ± 75.09 , (Table 5).

Table 6: Distribution of Carbohydrates (g/unit) in each meal for all the patients on a day

n = 62	Minimum	Maximum	Mean	Std. Deviation
Breakfast CHO g/U	7/0.46	51/3.4	35/ 2.3	5.56/0.37
Lunch CHO g/U	11/ 0.7	77/5.1	66/4.4	4.19/0.27
Dinner CHO g/U	24/1.6	52/3.4	36/2.4	2.75/0.12

The mean actual CHO g/units(U) consumed by the enrolled patients in a day for breakfast was $35g/2.3U$ for lunch $66/4.4$ and for dinner $36/2.4$. (Table 6).

Table 6: Actual Caloric intake and Estimated Caloric needs of a day by sex:

Sex	N	Caloric intake		Caloric needs		t	df	Sig. (2- tailed)
		Mean	SD	Mean	SD			
Women	28	775.57	120.2	1517.72	150.1	-19.5	27	p < 0.0005
Men	34	921.11	164.93	1791.08	70.26	-19.3	33	p < 0.0005

* Calories reported as kilocalories. df, degrees of freedom

As the predictive equation are different for both the sexes, t-test was applied for actual caloric intake and estimated caloric needs of a day by sex. CHO intake in a day for women was estimated as 154.8±19.5g against the recommended intake of 195.25±16.84g. Men also consumed 174.8±23.2 g of CHO against the needs of 230.1±27.2g in a day. (Table 7)

Table 7: Carbohydrate (CHO) * intake and Carbohydrate needs of a day by sex.

Sex	N	CHO intake		CHO needs				Sig 2- tailed
		Me	DSD	Me	DSD	t	Df	
Women	28	154.89	.19.58	195.25	.16.84	-10.39	27	p < 0.0005
Men	34	174.82	.23.29	230.11	.27.29	1-10.4	33	p < 0.0005

* CHO reported as g.

The difference in average daily caloric and carbohydrate intake of men and women against caloric and carbohydrate needs was determined by paired t test. Analysis of data showed a significant difference (p < 0.0005) between average daily caloric and carbohydrate intake and actual daily caloric and carbohydrate needs in men and women. Additionally, patients had a mean actual protein consumption of 52.14 g, against the daily need of 64.16g.

As per medical records 7 incidents of hypoglycaemia and 29 incidents of hyperglycemia were recorded. Mean fasting and two hours after the meals plasma glucose levels for the enrolled patients was 150.71±72.200 mg/dL and 219.76±97.365 mg/dL, respectively and 9 incidents of hypoglycaemia were documented.

Discussion

In the present study one third of the enrolled patients were diagnosed with diabetic retinopathy and remaining with cataract, macular edema, retinal diseases, glaucoma, refractive errors and other eye disorders. As indicated in Standards of Medical Care in Diabetes-2013, for preventing onset and progression of diabetic retinopathy and occurrence of glaucoma, cataracts, and other disorders of the eye at an early age optimizing glycemic control is very important.¹⁹

Similar to findings of the present study, review of literature of earlier Indian studies also depicts appreciable prevalence of obesity, dyslipidaemia, diabetes mellitus, higher body fat, generalised and regional obesity particularly in women. Indians have been known to exhibit distinctive characteristics of obesity: excess body fat, abdominal adiposity, increased subcutaneous and intra-abdominal fat, and deposition of fat in ectopic sites (such as liver, muscle, and others), predisposing them to risk of morbidity and mortality.²⁰

In the present study, different levels of correlation was observed between WC & WHR, WC & BMI and WC & BAI. But, the level of association between WC and BMI was more, suggesting validity of joint analyses of BMI in

combination with WC (measures of general and abdominal obesity) in hospitalized DED patients to determine their clinical risk prediction. Several recent studies also confirm that the level of association of BMI varies with waist circumference and waist-hip ratio, suggesting that interpretation of all the measures to be done independently.²¹⁻²⁴ The importance of WC in predicting cardiometabolic risk factors (eg, elevated blood pressure, dyslipidemia, and hyperglycemia) and adverse outcomes (eg, diabetes, CHD, and death rate) has been examined in many large epidemiologic studies. The relation between WC and clinical outcome is consistently strong for diabetes risk, and WC is a stronger predictor of diabetes than is BMI. Data from many large population studies have found WC to be a strong correlate of clinical outcome, particularly diabetes, and to be independent of BMI. The joint analyses, of BMI in combination with WC and WHR were also measured in a prospective population-based cohort study based on 3055 men and 2957 women aged 35–74 years who participated in the second (1989– 1990) or third (1994– 1995) MONICA (Monitoring Trends and Determinants on Cardiovascular Diseases) Augsburg survey in which the subjects were initially free of diabetes at baseline, but during a mean follow-up of 9.2 y, 243 cases of incident type 2 diabetes occurred in men and 158 occurred in women. The study concluded that there was an additive effect of overall and abdominal obesity on risk prediction.²⁵

Hospitalized diabetic eye disease patients were able to attain 51% of estimated calorie needs and 77% of the recommended carbohydrate intakes. A similar study on non-acutely ill diabetic patients conducted recently in a hospital setting indicates that in-patients consumed only 37–39% of their estimated caloric needs and 43–46% of the recommended carbohydrate intake and it was concluded that meal plans in the hospital may not require caloric or carbohydrate restrictions.²⁶ Comparison of the findings of the above two studies by two sample t-test with equal variances indicated that difference in carbohydrate intake in the present study was statistically significant than the

western study ($p < 0.0005$) but not for energy intake.

Levels, which may affect or interfere with the treatment goals (12.59%) and self restricted eating due to anticipated fear of further progression of medical complications and fear of postponement of treatment procedures.

The fasting and two hours after the meals, blood glucose levels of the enrolled patients, in the present study were observed to be high and 9 incidents of hypoglycaemia were documented. It may be due to mismatch between administered carbohydrate intake and nutritional insulin therapy.¹² Moreover, patient's mindset regarding self induced avoidance of carbohydrates especially in the hospital and observed inconsistency in amounts of carbohydrates consumed in the three major meals of the day, that is breakfast, lunch and dinner predisposes to blood glucose level irregularities. Setting carbohydrates goals and maintaining its consistency by eating the same amounts of carbohydrate food, at regular times each day has been proven to help attain blood glucose goals.¹³

The fact that observed mean fasting and two hours after the meals plasma glucose levels determined as routine hospital protocol for the enrolled patients were 150.71 ± 72.200 mg/dL and ± 97.365 mg/dL, respectively, confirms that patients may be asymptomatic and require a strong support for a screening program to detect diabetic retinopathy. As retinopathy is estimated to take at least 5 years to develop after the onset of hyperglycemia, patients with type 1 diabetes should have an initial dilated and comprehensive eye examination within 5 years after the onset of diabetes. Patients with type 2 diabetes, who generally have had years of undiagnosed diabetes and who have a significant risk of prevalent diabetic retinopathy at time of diabetes diagnosis, should have an initial dilated and comprehensive eye examination soon after diagnosis.²⁸

Conclusions

The current standard of care in an Indian hospital setting relies on nutrition screening by a dietician to identify patients who are at nutritional risk on admission for appropriate dietary intervention, and ongoing monitoring and evaluation.¹¹ Therefore, to address safe and effective, nutrition care process (NCP) in hospitalized diabetic patients in India implementing "consistent carbohydrate counting" a meal planning system, based on most appropriate dietetic practice for better blood glucose management can be recommended as a component of medical nutrition therapy (MNT) in hospitalized diabetic patients in India. To determine anthropometric status, WC provided a unique indicator of body fat distribution, that can identify patients who are at increased risk of obesity-related poor DED clinical outcomes during hospitalization as it is above and beyond the measurement of BMI. Additional research is needed to agree on WC cut points that can measure DED risk that is not sufficiently captured by BMI and routine clinical assessments. Selection of the most appropriate WC values will be complex, because they are likely influenced by sex, race-ethnicity, age, BMI, and other factors. Nevertheless, it should be feasible to determine

more useful WC cut points than are currently recommended, by carefully reviewing findings of the present study.

Further, research is needed to take note of all the dietary intake rather than that which occurs only at scheduled mealtimes. This study used a convenience sample from a single facility. Patients may have obtained food from other sources and consumed more calories, carbohydrate, and protein than meal consumption analysis indicated. Though, to keep blood glucose levels in the healthy range and better understanding of dietary aspects of diabetes management a team approach of nurses, physicians and other health care providers is required besides the expertise of dietetics professional to make a nutritional care plan work with the medical treatment plan, not against it.²⁶

To conclude, findings of the present study will be useful in planning nutritional care process (NCP) for reducing the risk or slow the progression of retinopathy, by optimizing glycemic control^{27,28} and ultimately by providing safe and quality medical nutrition therapy (MNT) to improve clinical outcome of hospitalized DED patients.

Summary

Medical Nutrition Therapy (MNT) is an integral component for maintaining glycemic control in hospitalized patients with diabetes. Hyperglycemia in hospitalized Diabetic Eye Disease (DED) patients has been linked to immune-suppression, increased coagulopathies and infections. Therefore, the goal of the present study was to determine nutritional factors related to underlying glycemic control. DED patients with type 1 or 2 diabetes > 20 years, were enrolled in the study. Actual food intake was determined by weighed food record method and analysed for macronutrient intake. Mifflin St Joer predictive equation, multiplied by a combined stress and activity factor of 1.3 to estimate caloric needs. A questionnaire was administered for reasons of inadequate dietary intake. Results, indicated overall general and abdominal obesity. Analysis of data showed a significant difference ($p < 0.0005$) between average daily caloric and carbohydrate intake and actual daily caloric and carbohydrate needs in men and women. To keep blood glucose levels in the healthy range and to enable better understanding of dietary aspects of diabetes management a team approach of nurses, physicians and other health care providers is required besides the expertise of dietetics professional to make a nutritional care plan work with the medical treatment plan, not against it. In conclusion, findings of the present study will be useful in planning nutritional care process (NCP) and ultimately providing safe and quality medical nutrition therapy (MNT) for improving clinical outcome of hospitalized DED patients.

Conflict of Interest: None.

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