International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Nutritional Status of Diabetic Women in Bangalore City, India

Deepti Giri[1], Usha Ravindra[2], V. L. Madhu Prasad[3]

[1]Assistant Professor, Department of Home Science, Siddharth University, Siddharthnagar
[2]Professors of Department of Food Science and Nutrition
[3]Professor of Department of Agricultural Extension
University of Agricultural Sciences, GKVK, Bangalore-65, Karnataka, India
Corresponding author: drdeeptigiri15[at]gmail.com

Abstract: ***Bangalore being a large, fast growing metropolis and a major economic centre in India has a population of around 8 million of which 47.5 per cent are women. India, including Bangalore is designated as the world diabetic capital with highest number of diabetics with concurrent complications. But the risk becomes four-fold in case of women because of stress (at work, house-hold and marital), a highly competitive life style, eating out often, smoking, alcohol especially in the age group of 20 to 50 years. With this background, present study was taken up to assess the health and nutritional statuses of diabetic women.30 diabetic women were selected from Bangalore city. Anthropometric measurement (height, weight, BMI, waist circumference, hip circumference, and skinfold thickness) were obtained according to standard techniques. The results revealed that, the mean age of respondents was 53 year, height-154.85cm. Weight-61.67kg, BMI-26.02 kg/m^2, waist-102 cm, hip-105.9 cm, waist to hip ratio-0.98 and skin fold thickness-1.84. Majority of the respondents belong to the overweight category (BMI-23.0-27.0 kg/m^2). Among the subjects 73 per cent were having family history of diabetes. Nearly 90 per cent of subjects experienced the symptoms of fatigue, 73.33 per cent polyurea and followed by weight loss. With respect to dietary pattern, majority of the respondents were non vegetarian and eat food three times a day and having a snacking habit. From the above observation it could be concluded that higher BMI, family history and food habits were one of the contributing factor for nutritional status and occurrence of diabetes mellitus.***

Keywords: nutritional status, anthropometric, diet history, diabetes

1.Introduction

Diabetes Mellitus (DM) is a systemic disease with several major complications affecting both quality and the length of life (Lacopino, 2001). Diabetes is certain to be one of the most challenging health problems in the 21st century. It is now one of the most common non-communicable diseases globally and the fourth leading cause of death in most developed, developing and newly industrialized countries (Pradeepa and Mohan, 2002).

India leads the world with largest number of diabetics in any given country. Today, our country has about 50 million patients with diabetes and this number is projected to increase to 79.4 million by the year 2030 (Mohan et al., 2005). The World Health Organization (WHO) estimated that, there were 135 million diabetic individuals in the year 1995 and it has been projected that this number will increase to 300 million by 2025 (Iyer, 2003). WHO reported that, the maximum increase in the number of diabetics would occur in India. Considering the large population and increasing prevalence of diabetes mellitus of nearly 33 million diabetic subjects, the burden of diabetes in India could be enormous (Ramachandran et al., 2001). With a high genetic predisposition and high susceptibility to environmental insults, the Indian population faces a higher risk of diabetes and its associated complications (Ramachandran, 2005). Because of the above reason WHO has issued a warning stating that India will be the "Diabetes Capital of the World" with type 1 and type 2 DM (Bacic et al., 1988).

In India, limited studies have focused on diabetes care and provide an insight into the current profile of patients and their management especially women. In Diab-Care Asia, a multi-country study in Asia, the mean age of diagnosis among Indian respondents was 43.6 years.50 per cent had poor control as measured by HbA1c, and 54 per cent had late severe complications (Raheja et al., 2001).

The American Diabetes Association Guide to Diabetes Medical Nutrition Therapy and Education listed the major risk factors for type 2 diabetes mellitus as: age ≥45 years, ethnicity, family history, habitual physical inactivity, overweight (BMI ≥25 kg/m2), hypertension (≥I40/90 mm Hg in adults), previously diagnosed impaired fasting glucose or impaired glucose tolerance, HDL cholesterol <35mg/dL) and/or triglyceride level (> 250 mg/dL), polycystic ovary syndrome and history of vascular disease (Ross et al., 2005).

According to Lebovitz (2004), overweight and obesity are the risk factor for developing type 2 diabetes. The best measure of overweight and obesity is the Body Mass Index (BMI). Overweight status, a BMI of equal to or greater than 25 kg/m^2, and obesity, a BMI greater than or equal to 30 kg/m^2 causes an increased risk of developing many types of chronic diseases, including type 2 diabetes mellitus. Thus, keeping in view of the above in mind the present study was undertaken to assess the nutritional status, family history and dietary pattern of diabetic women in Bangalore city.

2.Material and Methods

Selection of subjects: Thirty diabetic women willing to participate in study were selected through random sampling method from the Bangalore city.

Exclusion criteria: Subjects on insulin, with hormonal problem, inherited diseases / disorders, elderly above 70 years, mental disorders, physical and mental inaptitude, serious health conditions was excluded from the study in consultation with the doctor.

Inclusion criteria: subjects who were on single dose of oral drug (metformin) or on diet and exercise only were selected.

Data collection: The data were collected by using structured pretested interview schedule on various aspects related to demographic profile, nutritional status, family history and dietary pattern of type 2 diabetes mellitus.

Assessment of nutritional status: It includes both anthropometric status and dietary pattern. Anthropometric measurements viz. age, height, weight, Body Mass Index (BMI), skin fold thickness, waist and hip circumference were obtained by standard techniques. Dietary pattern, family history and symptoms experienced by diabetic subjects were assessed by using schedule through open end questions. Analysed the data by using appropriate statistical tools.

Height (cm): Height was measured accurately to the nearest 0.1 cm using vertical rod.

Weight (kg): Body weight of subjects was taken to the nearest 0.1 kg on a portable weighing balance. Scale calibration was checked regularly before taking each measurement.

Skinfold Thickness (mm): Skinfold thickness measurements are said to provide an estimate of the size of the subcutaneous fat depot, which in turn provides an estimate of the total body fat (Durnin and Rahaman, 1967). The site selected for measuring mid-arm circumference was used that is mid-way down the length of left arm with the arm hanging relaxed at the side. Skin fold parallel to the long away from the underlying muscle and the skin fold calipers measurements was done twice to ensure accuracy.

Body Mass Index (BMI)

Height and weight of the subjects were used to calculate the Body Mass Index. The subjects classified based on standard BMI.

$$\text{Body Mass Index (BMI)} = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

Waist and hip circumference (cm): Subjects were made to stand with weight evenly balanced on both legs which are placed about 25-30cm apart. The measurement was done midway between the lower rib margin and the iliac crest using the following procedure: marking the level of the lower rib margin, palpate the iliac crest in the mid axillary line and marked this level on the skin, applied the measuring tape horizontally midway between the lowest rib margin and iliac crest and measured the circumference over the tape. But for the measurement of the hip was placed at the point yielding the maximum circumference over the buttocks.

Waist-to-Hip Ratio (WHR)

Waist and hip circumference were used to calculate the waist to hip ratio. The subjects were classified based on standard WHR (Lean et al., 1995).

$$\text{Waist-to-hip ratio} = \frac{\text{Waist (cm)}}{\text{Hip (cm)}}$$

WHR classification for obesity

	At risk	No risk
Female	> 0.85	< 0.85

(Lean et al., 1995).

3.Results and Discussion

The data presented in table 1 revealed that, majority of the respondents (66.67%) belonged to the age group of ≥51 years and 33.33 per cent of them belonged to31-50 years age group. The prevalence of diabetes increases significantly with age. This may be due to prolonged exposure to physical inactivity, stress, obesity, genetic factors with advancement of age. (Basavanagowadappa et al., 2005, Rao et al., 2010, Deo et al., 2010, Majgi et al., 2012 and Madaan et al., 2014).

Most of the respondents belonged to the middle school group (36.67%) followed by illiterates (20%), graduates (16%), pre-university education (13%) and post graduate (6%). Low education status may be due to limited awareness and hence, less opportunities for prevention/control of diabetes. On the other hand, the higher education status may have negative influence through the changed lifestyle factor. Hence, education may not have a direct relation with development of diabetes (Majgi et al., 2012).

Occupation of the respondents showed that majority of them were belonged house wife (46.67%) followed by labour work (23.33%), service (20%), agriculture (6.67%) and business (3.33%). The association of diabetes with occupation due to combined effect of physical inactivity in employees, house wives and work related stress among respondents work in agriculture field (Agardh et al., 2011) was reported.

Majority of the respondents belonged to the monthly income range Rs.5001-15, 000/-(46.47%), followed Rs. ≥ 15, 000/-(40.00%) and Rs. ≥5000/-(13.33%) per month. Maximum per cent of the respondents belonged to Hindus (96.67%) and 3.33 per cent belongs to Muslim. More than 76.67 per cent of respondents belonged to the nuclear family and remaining 23.33 per cent belonged to joint family.

The data presented in Table 2 revealed that mean weight of diabetic subjects 61.67 kg, BMI-26.02 kg/m2, waist-103cm, waist hip ratio-0.98, skin fold thickness-18.4mm.

In present study mean of BMI and WHR was 26.02 and 1.02 respectively which is slightly higher than studies carried out by Ahmad et al. (2011) with BMI 22.84 and 0.86 WHR. Both cross sectional and longitudinal studied have identified a number of risk factors. The risk factors include abdominal obesity, excessive alcohol consumption, poor dietary habits and physical inactivity. The non-modifiable risk factors include ageing and genetic predisposition (Masemiano, 2010).

The anthropometric measurement of the diabetic women/respondents is depicted in Table 3. It was observed that 60 per cent of subjects belonged to overweight followed by obesity (26.7%), normal (10%) and undernourished (3%) as per BMI classification. The findings were on par with the results reported by Majgi et al. (2012). BMI is a significant independent predictor of diabetes. Adipose tissue in obese individuals releases increased amounts of non-esterified fatty acids, glycerol, hormones, pro-inflammatory cytokines that are involved in the development of insulin resistance (Khan et al., 2006).31 per cent of the subjects had more than 24-29 per cent body fat. This may be due to the presence of physical inactivity and family stress among female than male subjects. The stress has been proven to be associated with high BMI and obesity. Furthermore, south Asians had more total fat both overall and in the abdominal regions compared with Europeans and Pacific Islanders (Gujral et al., 2013). With respect to waist to hip ratio, 93 per cent of the subjects had obesity. In the present study, subjects have higher body mass index and waist to hip ratio. The increased risk posed by central obesity on diabetes and other metabolic disorders could be related to high fat cell number in adipose tissue,

Table 1: Personal and socio-economic profile of diabetic subjects (n=30)

Characteristics		
Age (yrs)	**Number**	**Per cent**
31-50	10	33.33
≥51	20	66.67
Education		
Illiterate	6	20.00
Primary School	1	3.33
Middle school	11	36.67
High School	1	3.33
Pre-University	4	13.33
Graduate	5	16.67
Post-graduate	2	6.67
Occupation		
Labour	7	23.33
Service	6	20.00
Business	1	3.33
Agriculture	2	6.67
Housewife	14	46.67
Monthly Income (Rs.)		
<5000	4	13.33
5001-15, 000	14	46.67
>15, 000	12	40.00
Religion		
Hindu	29	96.67
Muslim	1	3.33
Family type		
Nuclear	23	76.67
Joint	7	23.33

High blood flow and increased receptor level for cortical and testosterone. WHR as an index of central obesity is associated with increase in prevalence of diabetes mellitus, because high waist to hip ratio is a predictor of diabetes mellitus.

Table 2: Mean anthropometric measurements of diabetic women (n=30)

Anthropometric measurements	**Mean±Sd**
Weight (kg)	61.6±8.56
Body Mass Index (kg/m2)	26.02±3.33
Skin fold thickness (mm)	18.4±7.3
Body Fat (%)	39.68±4.5
Body Fat (Kg)	25.15±5.64
Waist circumference (cm)	103.0±6.80
Hip circumference (cm)	105.0±9.20
Waist to hip ratio	0.98±0.19

Table 3: Distribution of respondents based on anthropometric indices (n=30)

Anthropometric Indices	**Number**	**Per cent**
Body mass index		
Undernourished (<18.5)	1	3.30
Normal (18.5-23.0)	3	10.0
Overweight (23.0-27.0)	18	60.0
Obesity (>27)	8	26.7
Body fat (%)		
<19 (Group 1)	7	12.1
19-23 (Group 2)	18	31.0
24-29 (Group 3)	18	31.0
>30 (Group 4)	15	25.9
Waist to Hip Ratio		
Normal (<0.86)	2	6.70
Obese (>0.86)	28	93.3

The results depicted in Table 4 indicated that, more than one third of the respondents (76.67%) were having family history of the diabetes and 60 per cent of them had one diabetic parent. While 13 per cent had both the parent diabetics. Subjects with family history had 2-3 times higher risk of developing diabetes. It has been shown that subjects with family history of diabetes develop diabetes earlier compared to subjects without family history (Ahmad et al., in 2011). Those with family history of diabetes were 3.6 times odds of developing diabetes compared to those without (Majgi et al., 2012). It is observed that, maternal history of diabetes to be stronger risk compared to paternal history of diabetes. When both parents are diabetic, the risk increases synergistically. Family history of type 2 diabetes mellitus acts through environmental factors such as diet, stress, physical activity, socio-economic status as well as a genetic mechanism through gene expression. Hence, family history of diabetes could be an important public health tool in predicting development of diabetes (Khatib et al., 2008).

It was observed from the Table 5 that majority of subjects (63.33%) were non vegetarians, 20 per cent were ova-vegetarians and only 16 per cent were vegetarians. Foods high in meat and fat appear to confer a higher diabetes risk (Schulze et al., 2005).

Table 4: Distribution of respondents based on their family history (n=30)

Family history of Diabetes	Number	Per cent
Present	23	76.67
Absent	7	23.33
Mother	9	30.00
Father	9	30.00
Both parents	4	13.33
Blood related members	1	3.33

Note: Multiple responses, total will not add up to 100%

Table 5: Distribution of respondents based on their dietary pattern (n=30)

Dietary pattern	Number	Per cent
1. Types of meal		
Vegetarian	5	16.66
Non vegetarian	19	63.33
Ova-vegetarian	6	20.00
2. Meals per day		
Twice a day	0	0.00
Thrice a day	16	53.33
Four times a day	10	33.33
Five times a day	4	13.33
3. Meal skipping		
Never	22	73.33
Once/week	6	20.00
>1/week	2	6.66
4. Snacking pattern		
Daily	7	23.33
Weekly	23	76.66

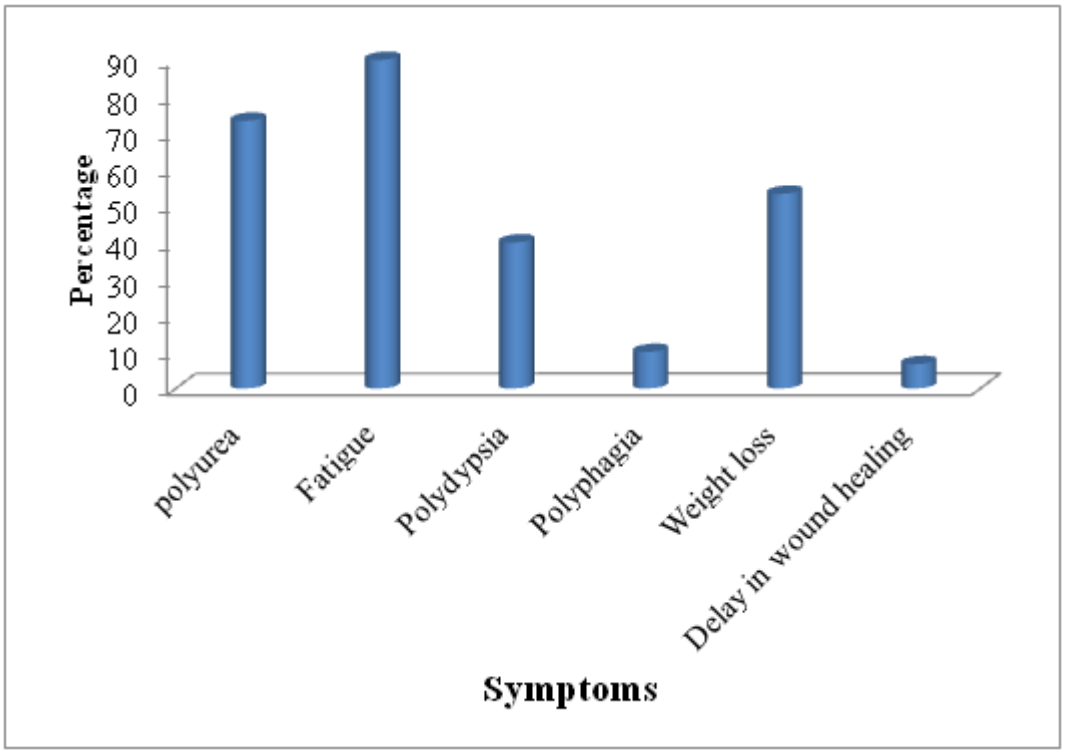

Figure 1: Symptoms experienced by diabetic subjects

Note: Multiple responses, total will not add up to 100%

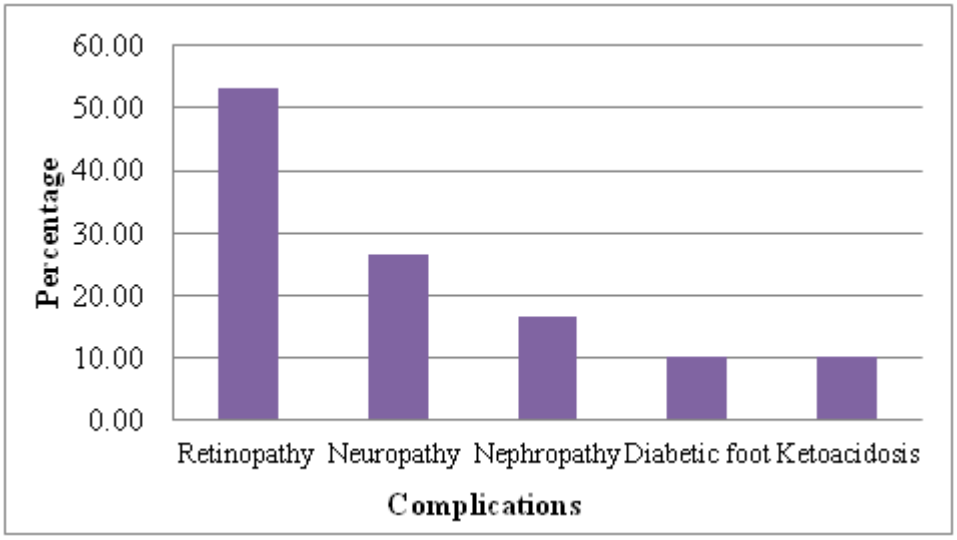

Figure 2: Complication observed by diabetic subjects (n=30)
Note: Multiple responses, total will not add up to 100%

Symptoms experienced by diabetic subjects were depicted in Fig.1. Majority of the subjects experienced symptoms of fatigue (90 %), weight loss (53.33%) and polyurea (73.33%) followed by polydipsia (40%), polyphagia (10%) and delay in wound healing (6.66%). These are the common symptoms experienced and used as primary early diagnostic parameters by the physicians using diabetes risk score. The complications observed by the diabetic respondents depicted in Fig.2. Majority of the respondents opined that, they have complications related to retinopathy (53.33%) followed by neuropathy (26.67%), nephropathy (16.67%) and diabetic foot (10%) as well as ketoacidosis (10%). It is estimated that, up to 50 per cent patients with diabetes will develop renal failure (Harkonen and Kjellstrand, 1977). The relationship between arterial blood pressure and diabetic nephropathy seems a complex one, nephropathy increasing blood pressure and blood pressure increasing nephropathy. Insulin resistance thought to be a pathogenic factor. Diabetic nephropathy and retinopathy increase with increase in duration of diabetes resulting from long standing progressive microangiopathy (Rehman et al., 2005). The per cent of complications were found to be high reflecting the poor glycemic control. It has been shown that good glycemic control helps to prevent diabetic complications (Anon, 1997).

4.Conclusion

In the last two decades, there has been a marked increase in the prevalence of diabetes among Indians. Several modifiable and non-modifiable risk factors play an important role in the pathogenesis of diabetes among women. There is positive relationship with age, BMI, WHR in the development of diabetes mellitus in the present study. Along with this family history of diabetes are at higher risk. Risk factors like age, obesity, stress, food rich in fat and meat are most important for diabetes mellitus. Dietary modification, nutrition education, regular physical activity and weight reduction have been proven to be beneficial in preventing diabetes mellitus.

References

[1] Agardh, E., Allebeck, P., Hallqvist, J., Moradi, T., Sidorchuk, A., 2011, Type 2 diabetes incidence and socio-economic position: a systematic review and meta-analysis. Int. J. Epidem., 40: 804-818.
[2] Ahmad J, Masoodi MA, Ashraf M, Rashida R, Ahmad A, and Dawood S, 2011, Prevalence of diabetes mellitus and its associated risk factors in age group of 20 years and above in kashmir, India. Al Ame en J Med Sci.4: 38-4 4.
[3] Anonymous, 1997, Hypoglycemia in the Diabetes Control and Complications Trial. The Diabetes Control and Complications Trial Research Group, Pub. Med., 46 (2): 271-286.
[4] Bacic M, Plancak D, Granic M.1988, CPITN Assessment of periodontal disease in diabetic patients. J Periodontol.59: 816–822.
[5] BASAVANGOWDAPPA, H., PRABHAKAR, A. K., PRASANNARAJ, P., GURUDEV, K. C., VIRUPAKSHA AND SUMA, 2005, Study of prevalence of diabetes mellitus and impaired fasting glucose in a Rural population. Int. J. Diab. Dev. Ctries., 25: 98-101.
[6] DEO, S. S., ZANTYE, A., MOKAL, R., MITHBAWKAR, S., RANE, S. AND THAKUR, K., 2006, To identify the risk factors for high prevalence of diabetes and impaired glucose tolerance in Indian population. Int. J. Diab. Dev. Ctries., 26: 19-23.
[7] DURNIN, J. V. G. A. AND RAHAMAN, M. M., 1967, The assessment of amount of fat in the human body from measurements of skinfold thickness. Br. J. Nutr., 21: 681-689.
[8] Gujral, U. P., Pradeepa, R., Weber, M. B., Venkat Narayan, K. M., Mohan, V., 2013, Type 2 diabetes in South Asians: similarities and differences with white Caucasian and other populations. Ann. N. Y. Acad. Sci., 1281: 51-63.

[9] HARKONEN, S. AND KJELLSTRAND, C. M., 1977, Exacerbation of diabetes renal failure following intravenous pyeloghraphy. Am. J. Med., 63: 939-945.
[10] Iyer SR., 2003, Type 2 diabetes express highway, J Assoc Physicians India.51: 495–500.
[11] KHAN, S., HULL, R. AND UTZSCHNEIDER, K., 2006, Review article mechanism linking obesity to insulin resistance and type 2 diabetes. Nature, 444: 840-846.
[12] KHATIB, N. M., QUAZI, Z. S., GAIDHANE, A. M., WAGJARE, T. S. AND GOYAL, R. C., 2008, Risk factors of type 2 diabetes mellitus in rural Wardha: A community based study. Int. J. Diab. Dev. Ctries., 28: 79-82.
[13] Lacopino, A. M., 2001. Periodontitis and Diabetes Interrelationships: Role of Inflammation. Ann Periodontol. Pub. Med., 6: 125–137.
[14] LEAN, M. E., HAN, T. S. AND MORRISON, C. E., 1995, Waist circumference as a measurement for indicating need for weight management. Br. Med. J., 11: 638-642.
[15] Lebovitz HE, 2004, Therapyfor diabetes mellitus and related disorders. (Fourth ed.). Alexandria, VA: American Diabetes Association, Inc.
[16] Madaan H, Agrawal P, Garg R, Sachdeva A, Partra SK, and Nair R, 2014, Prevalence of diabetes mellitus in Rural population of District Sonepat, India. Int. J. Med. Sci. Public. Health, 3: 248-251.
[17] Majgi SM, Bala SM, Roy G. and Das AK, 2012, Risk factors of Diabetes Mellitus in Rural Puducherry. Online J. Health. and Allied Sci., 11: 1-7.
[18] Masemiano PC, 2010, Risk factors for type 2 diabetes mellitus among patients attending a rural Kenya hospital. Afr. J. Prim. Health Care and Family Med., 2: 1-5.
[19] Mohan D, Raj D, Shanthirani CS, Datta M, Unwin NC and Kapur A.2005, Awareness and knowledge of diabetes in Chennai-The Chennai Urban rural Epidemiology study. J Assoc Physicians India, 53: 283–287.
[20] Pradeepa R. and Mohan V., 2002, Changing scenario of the diabetes epidemic: Implications for India. Indian J Med Res., 116: 121–132.
[21] Raheja BS, Kapur A, Bhoraskar A, Sathe SR, Jorgensen LN and Moorthi SR, 2001, Diabcare Asia-India Study: Diabetes care in India – current status. J Assoc Phys India.2001; 49: 717–22.
[22] Ramachandran A, Snehalatha C, Kapur A, Vijay V, Mohan V and Das AK, 2001, High prevalence of diabetes and impaired glucose tolerance in India: National Urban Diabetes Survey. Diabetologia., 44: 1094–1101.
[23] Rao CR, Kamath VG, ShettY A and Kamath A, 2010, A study on the prevalence of type 2 diabetes in Coastal Karnataka. Int. J. Diab. Dev. Ctries., 30: 80-85.
[24] Rehman, G., Khan, S. A. and Hamayun, M., 2005, Studies on Diabetic Nephropathy and Secondary Diseases in Type 2 Diabetes. Int. J. Dev. Ctries., 25: 25-29.
[25] Ross TA, Boucher JL and O'Connell BS.2005, American Dietetic Association guide to diabetes medical nutrition therapy and education. United States of America: American Dietetic Association.
[26] Schulze MBS, Hoffmann K, Manson JE, Willett WC, Meigs JB, Weikert C, Heidemann C, Colditz GA and Hu FB, 2005, Dietary pattern, inflammation, and incidence of type 2 diabetes in women. Am J Clin Nutr., 82: 675–715