

Original Research Paper

Anthropometry and Newly Detected Type 2 Diabetics

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ABSTRACT	Metabolic disease we know today as diabetes mellitus is ever growing and general observation that NIDDM is genetic transferred among family members is not the only factors several factors such as diet, obesity, ethnic background, ageing a stress have shown to influence diabetes development. People who eat too much food and lead sedentary life become overwei and obese. The present investigation was designed to study the relationship of anthropometric indices with diabetes. Subje- were 214 newly detected female type 2 diabetics, who visited the Diabetes centres in Coimbatore. Data collection carried through structured questionnaire regarding age, sex, marital status, family history, symptoms, known medical illm anthropometry and clinical parameters. Dietary intake was assessed by 24 hour-recall method. Among the selected subjects 4, females were overweight, whereas only 45% stood with normal BMI. Grade-lobesity were 4%, grade-II obesity 3%. correlation between anthropometric indices and blood sugar levels were analysed. Fasting and Postprandial blood sugar le were positively and significantly correlated with total body weight, BMI and WHR. Conclusion:Higher intake of carbohydrates fat contribute to increased energy intake.Elevated anthropometric indices and faulty diet are strongly associated with risk developing diabetes.	
KE	YWORDS	anthropometric measurements, diabetes, obesity,

Introduction

Diabetes mellitus is a metabolic disease which is caused by absolute or relative insulin deficiency that can affect merely every organ system in the body. It has been estimated that 380 million individuals would be affected with diabetes worldwide by the year 2025. Physical inactivity poor nutrition practices and obesity contributes significantly to development of type 2 diabetes mellitus. (Krishna et al, 2011).

In India, obesity is emerging as an important health almost 30-65% of adult urban Indians is either overweight or obese or abdominal obesity. The rising prevalence overweight and obesity in India has direct correlation with increasing prevalence of obesity-related co-morbidities; hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetesand cardiovascular disease (Gupta and Misra, 2007).

Kumari and Chauhan (2013) in their study of 200 subjects with respect to anthropometric indices, most of the diabetics were under overweight and obese category. Regarding central obesity 40% of male diabetics and 30% of female diabetics were severe category. There were significant differences in the genderadjusted Body Mass Index (BMI) and Waist Hip Ratio (WHR) between diabetic subjects and controls and concluded that elevated anthropometric indices and faulty diet are strongly associated with risk of developing diabetes.

Abdominal fat is secreting a group of hormones called adipokines that may possibly impair glucose tolerance. But adiponectin found in lower concentration in obese and diabetic individuals has shown to be beneficial and protective in Type 2 diabetes mellitus. (Ghoshal and Kakali, 2015).

Present investigation was designed to study the relationship of anthropometric indices and diabetes with following objectives to

- Find the anthropometric status
- Know the prevalence of overweight and obesity among the subjects.
- Provide guidelines for lifestyle modification.

Methodology

Study was conducted in Coimbatore city, by purposive sampling, the investigator enlisted around 214 newly detected female type 2 diabetics, who visited the Diabetescentresfrom June 2012 - May 2013in Coimbatore, the inclusion criteria- newly detected type 2 diabetes FBS: >100 mg/dl, HbA1c >5.6 %, Oral Glucose Tolerance Test- FBS: >126mg/dl, 2hr :> 200mg/dl and exclusion criteria-Osteoporosis, Complicated cases of diabetes mellitus, known cases of type 2 diabetes on treatment. Data collection carried out through structured guestionnaire regarding their age, sex, marital status, family history, symptoms onset, known medical illness, anthropometric measurements, clinical parameters and nutritional status was assessed by 24hr diet recall and food frequency questionnaire (FFQ). Under anthropometric measurement, body weight, height, waist and hip circumferences were measured. Body weight determined using a digital scale to nearest 0.1 kg. Height measured with portable SecaStadiometer 2080 to nearest 0.1 cm. BMI was computed as the ratio of weight (kg) per height squared (m2). Waist circumferences (WC) measured at the minimum circumference between umbilicus and iliac crest; hip circumference (HC) measured at widest circumference around buttocks; waist -to -hip ratio calculated.The biochemical investigations carried out were fasting and post-prandialblood Glucose and HbA1c. All the parameters were run using Roche, Germany - Cobas b 101 POC systems and diagnostic kit.Diet guidelines were given to all selected subjects to be aware on risk of overweight, obesity and diabetes. Individual counseling was given to allselected newly diagnosed female diabetics to prevent complications.

Results and Discussion 1.Background information

Diabetes is an inherited disease. It can affect people of any age from young infants to the elderly. It is estimated that 90-95 percent of all patients with diabetes mellitus are of 40 years or older (Balachandran 2001). Information of all selected subjects their age, sex, marital status, family history, symptoms onset and known medical illness were shown in table-1and discussed under the following subheadings.

Background Information Age Split-up	Criteria	Number of Subjects (n=214)	
		No	%
	25-30 years	15	7
	30-35 years	143	67
	35-40 years	56	26
	Total	214	52
Marital Status	Married	158	74
	Unmarried	56	26
Family history	Both parents	21	10
of diabetes	Either parents	15	07
	Blood relations		60
No family history		49	23
Symptoms of	Tiredness	18	08
unusetes	Polyphagia	05	02
	Polydipsia	27	13
	Polyuria	16	07
	Weight loss	85	40
	Giddiness	06	3
	Urinary Infection	28	13
	General check up	29	14
Other medical	Hypertension	14	07
	Hypercholesterolemia	05	02
	Hypertriglyceridemia	07	03
	Hypothyroidism	04	02

Many factors contribute to the onset of diabetes and these are termed as predisposing or risk factors. Environmental factors such as diet, obesity and sedentary life style increase the risk of diabetes (Zimmet et al. 2001). Changes in socio-economic status and lifestyle and trends in nutrition related non-communicable diseases over the last two decades, particularly in developing countries with rising income levels, as well as the other extreme of poverty, chronic hunger and coping strategies and metabolic adaptations in foetal life that predispose to non-communicable disease risk in later life.

Age

Over the past30 years, the status of diabetes has changed from being considered as mild disorder of elderly to one of the major causes of morbidity and mortality affecting youth and middle aged people. It is important to note that the rise in prevalence is seen in all six inhabited continents of the globe. Diabetes also develops at a younger age in Indians(Mohan et al, 2007). Among the selected female diabeticsit was found that most of their age was between 30 years to 35 years. Nearly seven percent of the selected females belong to 25-30 years of age.

Marital status and Family history of diabetes

Maximum percentage 74 percent females were married and 26 percent females were unmarried and 91 per cent of the female subjects were employed in various sectors.

Family history of diabetes is not only a risk factor for the disease but is also positively associated with risk awareness and risk-reducing behaviours. It may provide a useful screening tool for detection and prevention of diabetes. Hariri et al (2006) in his study, a positive familial risk of diabetes identified 73% of all respondents with diabetes and correctly predicted prevalent diabetes in 21.5% of respondents.From the selected female subjects 10% of them had a positive family history as both parents are diabetics and 15% of their either parent was diabetic. Nearly 60% of female cases blood relatives had diabetes.

Symptoms at onset of diabetes

Symptoms of type 2 diabetes occur slowly. Increased thirst, frequent urination, excess sugar in blood, increased hunger, weight loss, fatigue, vision problem, slow healing or frequent infections and patches of dark skin which can be a sign that body is resistant to insulin. (Zeitz et al, 2003). Among the selected 214 female newly detected diabetics 85 subjects recorded the symptoms of weight loss, polydipsia (27%), tiredness (18%), giddiness (6%) and urinary tract infection (13%). Around 29 females were diagnosed as diabetes by undergoing general check-up.

Other medical illness among the selected subjects

Hypertension (blood pressure \geq 140/90 mmHg or on therapy for hypertension), High density lipoprotein cholesterol level < 35 mg/dl (0.90mmol/L) and/or a triglyceride level > 250 mg/dl (2.82mmol/l), cardiovascular disease and Women with polycystic ovarian syndrome are the risk factors associated with diabetes listed by ADA (2012). Among the selected samples14 females have informed that they already have hypertension and they were on drugs, 16 females with hypertriglyceridemia and 6 females were with hypothyroidism and on treatment.

2. Anthropometric status of selected subjects

There is a strong association between excess weight and risk of incident diabetes and showed that BMI, WC and WHR had a similar association with incident diabetes. Hadaegh et al (2009) state in a study that over a median follow up of 3.5 years (11 months-6.3 years), 114 individuals developed diabetes (4.1%). The risk for developing diabetes was significantly higher for the highest quartile of BMI, WC, WHR respectively, compared to the lowest quartile, and the risk decreased but remained statistically significant when abnormal glucose tolerance was included in the multivariate model.

According to WHO criteria (2000) the BMI (kg/m2) less than 18.5 is underweight, between 18.5 to 24.9 is normal, 25 to 29.9 is overweight, 30 to 34.9 is obese grade-I, 35 to 39.9 is obese grade-II and more than 40 is obese grade-III.

From the below table-2 it is clear that among the selected subjects 48% of the females were overweight, whereas only 45% of females stood with normal BMI, Grade-I obesity were 4%, grade-II obesity 3% females.

Table-2 Anthropometric st	tatus of all the selected
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S.No	Anthropometric measures	pometric Mean ± SD value sures measures		ue of
1	Mean age (yrs)	33.9 ± 3.08		
2	Height (cm)	156.6 ± 4.15		
3	Weight (kg)	64.21 ± 8.37		
4	BMI(kg/m2)	26.17 ± 3.14		
5	Waist(cm)	93.7 ± 4.18		
6	Hip (cm)	99.67 ± 4.61		
7	WHR(w/h)	0.94 ± 0.04		
	BMI status	Criteria	No	%
8	Underweight	< 18.5	-	-
9	Normal	18.5-24.9	96	45
10	Over weight	25-29.9	103	48

11	Obesity grade I	30-34.9	09	04
12	Obesity grade II	35-39.9	06	03
13	Obesity grade III	>40	-	-
14	Total		214	100

subjects

3. Correlation between anthropometric measures and blood sugars

Need et al (2005) observed in their study that fasting serum glucose was positively and significantly correlated with BMI. The findings support the evidence that BMI as well as central obesity (WHR ratio of > 0.8 for women and > 0.9 for men) pose a higher risk towards diabetes. Table-3 represents the correlation coefficient between anthropometric indices and blood sugar levels of the subjects were analysed. It was clear that fasting blood sugar levels was positively and significantly correlated with total body weight, BMI and WHR. Postprandial blood sugar level was also positively and significantly correlated with total body weight and BMI.

Table-3 Correlation between anthropometricmeasures and blood sugars

Particulars	Blood sugar levels			
	Fasting	Post prandial	HbA1c	
Weight	0.532**	0.391*	0.649**	
BMI	0.495**	0.363*	0.546**	
WHR	0.621**	0.126 NS	0.729**	

**- Significant at one percent level, *- Significant at five percent level, NS-Not Significant

4. Nutritional Status

Bhati and Goyal (2013) in a study the data revealed that overweight/ obesity, hypertension and eye problems were the health disorders associated with the subjects. Body mass index of subjects revealed that a higher number of female subjects were obese compared to their male counterparts. Mean fasting blood sugar and postprandial glucose level was noted to be 175.2 mg/dl and 258.4 mg/dl respectively. Wide prevalence of associated health problems among the hyperglycemic subjects clearly emphasized need of their diet and lifestyle modifications. It was revealed that among the females subjects intake of energy, carbohydrate and fat consumption were excess than the daily requirements 147kcals, 21.2grams and 9.17grams respectively. Protein and fibre were deficit by 10.86 grams and 6.13 grams respectively. From FFQ it was found that intake of cereals and millets, vegetables, roots and tubers, sugars, fat, egg and meat was more than recommended intake whereas intake of pulses, fruits and milk was lesser than recommended intake which also a pathway to increase the glycemic parameters. It was concluded that higher intake of carbohydrates and fat contribute to increased energy intake. There is protein and fibre inadequacy. There is a strong positive correlation between FFQ and 24 hour diet recall for energy intake whereas other nutrients also have positive correlation technically.

Conclusion

Overweight and abdominal obesity is the major contributing factor for the incidence of diabetes. Obesity reduces the sensitivity of tissues to the action of insulin in the utilization of glucose. Lack of physical activity and obesity increases the risk for development of diabetes in the later stage of a person's life. In the present study with respect to anthropometric indices, most of the diabetics were fell under overweight and obese category. BMI, WC and waist-toheight ratio (WHtR) were the best predictors of incident diabetes. It might be concluded that elevated anthropometric indices (body weight, BMI and WHR) are strongly associated with increased risk of developing diabetes.

References:

1. Balachandran, V. (2001). Pathophysiology of Diabetic Complications in Type 2

- Diabetes. Bangalore: The Indian Scenario 2025. Micro Labs Ltd.
 Ghoshal K, Bhattacharyya M. Adiponectin: (2015) Probe of the molecular paradigm associating diabetes and obesity. World J Diabetes. 15;6(1):151-66.
- Goyal, K. B. M. (2013). Nutritional and Health Status of Diabetics. 15,6(1):151-66.
 Goyal, K. B. M. (2013). Nutritional and Health Status of Diabetic Patients. Study on Home science, 7(1), 45-48.
- Gupta R, Misra A.(2007). Review: Type 2 diabetes in India: regional disparities. The British Journal of Diabetes & Vascular Disease. 1;7(1):12-6.
- Hadaegh F, Zabetian A, Sarbakhsh P, Khalili D, James WP, Azizi F.(2009). Appropriate cutoff values of anthropometric variables to predict cardiovascular outcomes: 7.6 years follow-up in an Iranian population. International journal of obesity. 1;33(12):1437-45.
- Hariri Ś, Yoon PW, Qureshi N, Valdez R, Scheuner MT, Khoury MJ. (2006). Family history of type 2 diabetes: a population-based screening tool for prevention?. Genetics in Medicine. 1;8(2):102-8.
- Krishna,G.S., Bubblu,T., Amarabalan,R. Role of vitamin D in diabetes. Journal of Endocrinology and Metabolism, 2011 Feb. 1(2), 47-56.
- Kumari S, Chauhan S. (2013). Anthropometry and Diabetes. International Journal of Food And Nutritional Sciences. 2 (4):52-54.
- Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. (2007). Epidemiology of type 2 diabetes: Indian scenario. Indian journal of medical research. 1;125(3):217.
- Need AG, O'Loughlin PD, Horowitz M, Nordin BE.(2005). Relationship between fasting serum glucose, age, body mass index and serum 25 hydroxyvitamin D in postmenopausal women. Clinical endocrinology. 1;62(6):738-41.
 Zeitz U, Weber K, Soegiarto DW, Wolf E, Balling R, Erben RG. (2003). Impaired
- Zeitz U, Weber K, Soegiarto DW, Wolf E, Balling R, Erben RG. (2003). Impaired insulin secretory capacity in mice lacking a functional vitamin D receptor. The FASEB journal. 1;17(3):509-11.
- 12. Zimmet P, Alberti KG, Shaw J. (2001). Global and societal implications of the diabetes epidemic. Nature. 13;414(6865):782-7.