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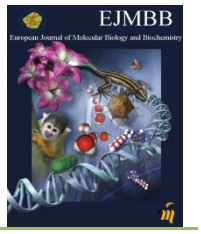

COMPARISON OF ANTHROPOMETRIC INDICES WITH BIOCHEMICAL PARAMETERS IN YOUNG FEMALES OF DAKSHINA KANNADA DISTRICT: A CROSS SECTIONAL STUDY

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ABSTRACT
Objectives: To study co-relation between anthropometric indices (BMI, waist circumference, waist-hip ratio and waist- height ratio) with Fasting Blood Glucose, Glucose Tolerance, Lipid profile and Plasma insulin levels in young females of Dakshina Kannada district. Materials and Methods: A cross sectional study was carried out involving 70 female students aged between 18 to 21 years. Height, weight, waist circumference, hip circumference were measured and Body Mass Index (BMI), Waist to hip ratio (WHR), Waist to height ratio (WHtR) were calculated. Biochemical parameters like Fasting Blood Glucose, Glucose Tolerance, Lipid profile and Plasma insulin levels were estimated. Regression analysis and Receiver Operating Characteristic (ROC) analysis was done to compare correlation between anthropometric indices with biochemical parameters. Results: The present study shows that WC (>80cm) has statistically significant correlation with LDL-C, HDL-C, TC/ HDL-C, LDL-C/HDL-C and non HDL-C /HDL-C ratio with p value < 0.05. Similarly, WHR (> 0.84) has statistically significant correlations with HDL-C. Waist–height ratio (WHtR>0.5) has shown statistically significant ($p<0.05$) correlation with LDL-C, Triglycerides and LDL-C/HDL-C ratio. It was also noted that there exists statistically significant ($p<0.05$) correlation between Body Mass Index (BMI>25) with LDL-C. Conclusion: In this study we found that all the anthropometric indices have good correlations with the biochemical parameters and hence these non invasive anthropometric indices can be considered for predicting or controlling cardiovascular diseases.

INTRODUCTION

Obesity is an increasingly important health problem worldwide and is recognized by international health organization as a global epidemic [1]. Globally, overweight and obesity are the fifth leading risk for deaths. Over 25% of population is obese in US and 15% in Europe. In India the prevalence of morbid obesity is about 5% as per World Health Organization (WHO) 2011 estimation.

In India, obesity is emerging as an important health problem particularly in urban areas, paradoxically co-existing with under nutrition. Almost 30-65% of adult urban Indian are either overweight or obese or have abdominal obesity [2]. In all parts of the world, women are more likely to be obese than men, and thus at greater risk of diabetes and cardiovascular disease and studies have

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shown that prevalence of obesity is higher in females than males [3].

Obesity has adverse effects on health and longevity. Obesity is known to cause metabolic syndrome which comprises dyslipidemia, hypertension and increased insulin resistance in addition to other components. And these in turn are known to cause cardiovascular disease and type 2 diabetes mellitus [4].

The rising prevalence of overweight and obesity in India has a direct correlation with the increasing prevalence of obesity related co-morbidities; hypertension, type 2 diabetes mellitus (T2DM), and cardiovascular disease (CVD) [5-6].

Anthropometric indices are used to measure adiposity or the fat cell mass. They include body mass index (BMI), waist circumference (WC), waist-hip ratio (WHR) and waist-height ratio (WHtR). WC, WHR, WHtR and BMI have been used to assess body fat distribution and abdominal obesity. Their measurement is simple and non invasive, give a fair measurement of fat cell mass, safe, cost effective and are the best predictors of medical complications of obesity [7].

Therefore the purpose of the present study was to correlate various anthropometric indices with biochemical parameters in young females of Dakshina Kannada district of Karnataka.

Objective

To study co-relation between anthropometric indices (BMI, waist circumference, waist-hip ratio and waist- height ratio) with Fasting Blood Glucose, Glucose Tolerance, Lipid profile and Plasma insulin levels in young females of Dakshina Kannada District.

MATERIALS AND METHODS

The present descriptive cross sectional study was conducted from May 2012 to April 2013 in Yenepoya Medical College Hospital, Yenepoya (Deemed to be University), Mangalore. Institutional Ethics Committee approval was obtained before starting the study.

Study participants: A total number of 70 female nulliparous students (n=70) of 18-21 years of age with no history of diabetes, hypertension or endocrinal disorders or menstrual irregularities (to exclude polycystic ovarian disease (PCOD) were included in this study.

Study sample: The participants were divided into 2 groups of 35 each and again into subgroups based on Body Mass Index (< 25 and > 25), Waist Circumference (< 80 cm and > 80cm), Waist to Hip Ratio (< 0.84 and > 0.84) and Waist to Height Ratio (< 0.5 and >0.5).

Inclusion criteria

Female students of age between 18-21 years who are willing to give written informed consent.

Exclusion criteria

Individuals not willing to participate or to give consent. Individuals suffering from cardiovascular disease, diabetes, hepatic or renal diseases and chronic alcoholics Patients who are taking corticosteroids or oral contraceptive pills. Patients suffering from thyroid disorder.

Methodology

A total of 70 female students were selected depending upon inclusion and exclusion criteria. Informed consent was obtained from the participants before starting the study. Initially anthropometric indices like Waist Circumference (WC), Waist to hip ratio (WHR), Waist to height ratio (WHtR) and Body Mass Index (BMI) were measured followed by biochemical parameters.

Anthropometry

Body weight, height, waist circumference and hip circumference were recorded by the same observer. Subjects were weighed on a weighing scale barefooted. Height was measured barefooted with head in horizontal plane to the nearest 0.5cm.

Using a tape, waist circumference (midway between the lower rib margin and the iliac crest at the end of normal expiration) and hip circumference (widest diameter over the greater trochanter) were measured to the nearest 0.1cm in standing position.

Body masss index (BMI) was calculated as weight (kg) divided by height squared(m2). Waist to hip ratio (WHR) was also calculated as WC divided by hip circumference. Waist to height ratio (WHtR) calculated as WC divided by height.

Biochemical parameters

The subjects were advised to come after 10 hrs of overnight fasting and Five ml of blood samples were obtained from each subject. The blood was collected in vacutainers with no added anticoagulant and serum separated within 1 hour. One more sample of blood was drawn 2 hours after 75 grams of oral glucose and analysed for plasma glucose (subjects were advised to have a carbohydrate rich diet for the previous 3 days).

Fasting plasma glucose, plasma glucose after 2 hours of glucose load, serum total cholesterol, LDL-cholesterol, triglycerides, and HDL-cholesterol were estimated by Liquid Gold, Span diagnostic kits. Non-HDL-C was calculated by subtracting HDL-C from total cholesterol. The atherogenic indices such as LDL-C/HDL-C and non HDL-C/HDL-C was also calculated. Insulin was estimated by DRG ELISA kit.

Statistical Analysis

Regression analysis and receiving operating curve (ROC) were statistical methods used to compare anthropometric indices to biochemical parameters.

RESULTS

Table 1. Correlation between waist circumference and biochemical parameters

Waist Circumference (WC)		Waist circumference<80 cm		Waist circumference>80 cm	
		r value	p	r value	P
	FPG	0.036	0.842	0.085	0.615
	PPG	0.120	0.505	0.078	0.677
	Insulin	-0.145	0.422	0.032	0.851
	LDL-C	0.244	0.171	0.511**	0.001#
	HDL-C	-0.204	0.256	-0.402*	0.014
	Total cholesterol	0.102	0.573	0.175	0.300
	TG	0.300	0.090	0.333	0.044
	TC / HDL-C	0.209	0.244	0.441*	0.006#
	LDL-C /HDL-C	0.311	0.078	0.492*	0.002#
	Non HDL-C/ HDL-C	0.209	0.243	0.444*	0.006#

r value < ± 0.4 moderate correlation; 0.4 to 0.8 - good correlations; > ± 0.8 strong correlation # p<0.05

Table 2. Correlation between waist-hip ratio and biochemical parameters

		WHR <0.84		WHR > 0.84	
		r value	P	r value	P
Waist-hip ratio (WHR)	FPG	0.104	0.587	0.201	0.195
	PPG	0.012	0.954	-0.107	0.493
	Insulin	-0.330	0.093	-0.142	0.365
	LDL-C	-0.067	0.738	0.267	0.083
	HDL-C	-0.204	0.256	-0.402*	0.014#
	Total cholesterol	0.102	0.573	0.175	0.300
	TG	-0.066	0.744	0.107	0.496
	TC / HDL-C	-0.083	0.680	0.154	0.324
	LDL-C / HDL-C	-0.038	0.849	0.327	0.032
	Non HDL-C /HDL-C	-0.086	0.669	0.141	0.366

r value < ± 0.4 moderate correlation; 0.4 to 0.8 - good correlations; > ± 0.8 strong correlation# p<0.05

Table 3. Correlation between waist-height ratio and biochemical parameters

		WHtR<0.5		**WHtR> 0.5**	
		r value	**P**	**r value**	**P**
Waist-height ratio (WHtR)	FPG	0.060	0.723	0.242	0.175
	PPG	-0.104	0.541	-0.061	0.738
	Insulin	-0.305	0.066	0.065	0.728
	LDL-C	0.058	0.733	**0.506****	**0.003**#
	HDL-C	-0.053	0.757	-0.317	0.072
	Total cholesterol	0.041	0.808	-0.126	0.485
	TG	0.194	0.250	**0.497***	**0.003**#
	TC / HDL-C	0.111	0.512	0.259	0.145
	LDL-C / HDL-C	0.149	0.379	**0.471****	**0.006**#
	Non HDL-C / HDL-C	0.099	0.560	0.294	0.097

r value < ± 0.4 moderate correlation; 0.4 to 0.8 - good correlations; > ± 0.8 strong correlation

# p<0.05

Table 4. Correlation between BMI with biochemical parameters

	Body Mass Index			
	BMI<25		BMI >25	
	r value	P	r value	P
BMI	FPG	0.116	0.476	0.299	0.108
	PPG	0.131	0.420	-0.123	0.516
	Insulin	-0.310	0.084	0.037	0.858
	LDL-C	0.034	0.835	**0.522****	**0.003**#
	HDL-C	0.214	0.185	-0.191	0.311
	Total cholesterol	0.221	0.171	-0.288	0.123
	TG	0.261	0.104	0.256	0.172
	TC / HDL-C	0.106	0.520	-0.007	0.969
	LDL-C / HDL-C	-0.132	0.417	-0.272	0.146
	Non HDL-C / HDL-C	0.193	0.232	0.130	0.494

r value < ± 0.4 moderate correlation; 0.4 to 0.8 - good correlations; > ± 0.8 strong correlation # p<0.05

DISCUSSION

Persistency of obesity across ages and also the increasing incidence of obesity associated morbidity in children and young are a public health as well as social problem in industrialized countries. The need for early diagnosis of obesity and possibly of its complications has encouraged research to find simple but sensitive and accurate indexes of obesity in childhood and young. Different studies have given varying conclusions about which anthropometric measure has the best predictive capacity for dyslipidemia and diabetic risks. It has been shown that age modifies the discriminative ability of anthropometric indices to identify subjects with CVD risk factors. Also studies have shown that anthropometric measure performs differently for the prediction of disease risk in diverse ethnic and geographic populations [8].

Two studies in populations of Asian origin in both men and women have reported WHR to have superior predictive capacity than WC only, while similar studies in the USA have reported WC to be superior to WHR [9-11]. Certain studies in US showed WC as an independent predictor of increased CVD risk in women but not in men [12-14]. Studies by Mathew S et al, a prospective study on men and women of wide age range of over 30 to 69 yrs provided information regarding the possible optimal range of clinical utility for WC in predicting future CVD events [15]. The IOWA's women Health study reported that overweight and obese women with a high WC (>88 cms) face a greater risk of CVD related deaths when compared with overweight and obese women with a normal WC (<88 cm). Studies have shown that a given increment in BMI in the youngest subgroup of the study population has more negative implications for future disease risk than a similar increment among older individuals [16]. At the moment, BMI is the recommended index of adiposity for epidemiological studies as well as for clinical practice [17]. The validity of BMI as an index of adiposity in children was recently demonstrated by measurements taken with dual x-ray absorptiometry.

The results of our study indicate good correlations between waist Circumference >80cm and LDL-C (with r value of 0.511), HDL-C (with r value of -0.402), TC/ HDL-C ratio (with r value of 0.441), LDL-C / HDL-C ratio (with r value of 0.492) and non HDL-C /HDL-C ratio (with r value of 0.444) with p value < 0.05. There is no significant correlations between of all the biochemical parameters with waist circumference <80cm (Table 1). Table 2 shows there is negative correlation between waist-hip ratio > 0.84 and HDL-C (with r value of - 0.402) which is statistically significant (p<0.05). Table 3 tells us Waist–height ratio (WHtR>0.5) has statistically significant (p<0.05) correlation with LDL-C (with r value of 0.506), Triglycerides (with r value of 0.497) and LDL-C/HDL-C ratio (with r value of 0.471). And table 4 represents statistically significant (p<0.05) correlation between Body Mass Index (BMI>25) with LDL-C (with r value of 0.522).

CONCLUSION

In this study we found that all the anthropometric indices have good correlations with the biochemical parameters and hence these non invasive anthropometric indices can be considered for predicting or controlling cardiovascular diseases.

CLINICAL SIGNIFICANCE

The measurement of anthropometric indices are simplest, give a fair measurement of fat cell mass and are the best predictors of medical complications of obesity. These anthropometric indices have been extensively used over the invasive techniques of blood investigations and allow medical and public health practitioners to identify those at highest risk and reduce the burden of chronic disease at a later age, by allowing individuals to undergo dietary and lifestyle changes. This early screening could

provide benefit to the individuals to avoid CVD and type 2 diabetes mellitus at later ages.

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Nil.

CONFLICT OF INTEREST

None.

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