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Body Mass Index, Fat Mass Index and Fat Free Mass Index as Predictor of Cardiometabolic Risk of Mid Age Men

Mr. Arup Gayen*, Prof.SagarikaBandyopadhyay**
**Research Scholar, Department of Physical Education, Visva-Bharati, Santiniketan - 731235, (WB), India.*
***Professor, Department of Physical Education, Visva-Bharati, Santiniketan - 731235, (WB), India.*

Abstract: *Body mass index (BMI), fat mass index (FMI) and fat free mass index (FFMI)areusually widely used to assess the prevalence of obesity.Abdominal obesity is associated with high plasma triglyceride and with low plasma high density lipoprotein cholesterol levels. Anatomical adipose tissue distribution patterns are reported to relate to plasma lipids and risk of cardio metabolic diseases. The present study examined the association of BMI, FMI,FFMI and metabolic markers as cardio-metabolic risk factors of mid age men in West Bengal, India. A total of 40 mid age men of sedentary habits aged 35-55 years participated in this study. Age, height, weight were measured as personal data. Body mass index (BMI), fat mass index (FMI) and fat-free mass index (FFMI) were calculated by standard equations.The metabolic parameters, namely fasting blood glucose (FBG), triglyceride (TGc), Cholesterol (Ch), high-density lipoprotein (HDL), low-density lipoprotein (LDL) and very low-density lipoprotein (VLDL) were measured in the clinic. The results indicated that all selected morphological parameters i.e. Body mass index, Fat mass index and Fat-free mass index had significant association with Blood triglyceride and Very low density lipoprotein ($p<0.05$).*

Key word: *Cardio-metabolic risk factor, metabolic parameter, morphologic parameter, mid age men.*

I. Background

Obesity is one of basic clinical conditions of metabolic syndrome which is a cluster of risk factors for cardiovascular disease. The clustering of factors includes hypertension, hyperinsulinemia, hyper-lipidemia, fasting hyper-glucose or type 2 diabetes mellitus, and obesity (particularly central obesity) which plays a central role(Reaven GM, 2008). The growing prevalence of overweight and obesity are established risk factors for the metabolic syndrome (Mokdad AH, et al, 2001).

Body mass index (BMI) is commonly used to determine overweight and obesity in clinical and fieldresearch settings. However, BMI does not distinguish between lean and fat bodymass (Stein and Colditz, 2004; Frankenfield et al., 2001; Snijder et al., 2006; Peltz et al.2007).The concept of fat-free mass index (FFMI) and fat massindex (FMI), in similarity to the BMI, merits a review and appears to be ofinterest in the classification of overweightas equal to overfat.

With this background the study was undertaken to reveal the inter-relationship of BMI, FMI, and FFMI with FBG, TGc, Ch, HDL, LDL and VLDL.

II. Materials and Methods

Forty mid age sedentary male subjects participated in this study. The age of the subjects ranged between 35 to 55 years and the study area was Birbhum district, West Bengal, India. The sampling technique was random and a static group design was adapted to the study. Criterion Measures: The parameters chosen for the study were body mass index (BMI), fat mass index (FMI), fat free mass index (FFMI) and fasting blood glucose (FBG), triglyceride (TGc), Cholesterol (Ch), high-density lipoprotein (HDL), low-density lipoprotein (LDL) and very low-density lipoprotein (VLDL).BMI, FMI and FFMI were measured in kg/m^2 usingstandard equations. Clinical tests and measurement procedures were used to test blood glucose (fasting), cholesterol, triglycerides, HDL, LDL and VLDL. Analytical Techniques: To assess the relationship among selected variables descriptive statistics and Pearson product moment method of correlation were computed using Microsoft excel and SPSS Software version 20. The level of significance was set at 0.05.

III. Findings and Results

The finding pertaining to personal data of the subjects has been presented in table 1.

Table 1: Personal Data of the Subjects

	Mean	Standard Error	Standard Deviation	Minimum Value	Maximum Value
Age (year)	38.70	1.09	6.91	22	59
Height (cm)	164.95	1.07	6.76	150	178
Weight (kg)	69.26	1.26	7.95	56	86

Table 1 showed that mean age, height and weight of the subjects were 38.70±6.91 years, 164.95±6.76 cm and 69.26±7.95 kg respectively.

The finding pertaining to descriptive statistics of selected parameters for the subjects had been presented in table 2.

Table 2: Descriptive Statistics of Metabolic Variables & Gross Efficiency

	Min	Max	Mean	SEM	SD	Skewness	Kurtosis
BMI (kg/m^2)	20.72	32.37	25.44	0.37	2.31	0.42	0.92
FMI (kg/m^2)	2.98	8.99	5.49	0.23	1.47	0.58	-0.26
FFMI (kg/m^2)	17.69	23.38	19.95	0.23	1.44	0.51	0.01
FBG (mg/dl)	77.00	221.00	95.17	4.25	26.87	3.34	12.79
TGc (mg/dl)	90.00	415.00	139.25	9.01	57.00	3.28	13.75
Ch (mg/dl)	140.00	250.00	168.00	4.14	26.21	1.86	3.46
HDL (mg/dl)	41.00	58.00	47.70	0.68	4.33	0.84	0.09
LDL (mg/dl)	59.00	169.00	91.90	3.70	23.40	1.74	3.24
VLDL (mg/dl)	18.00	83.00	27.90	1.80	11.41	3.26	13.66

Abbreviations: Min = Minimum, Max = Maximum, SEM = Standard Error Mean, SD = Standard Deviation, BMI = Body Mass Index, FMI = Fat Mass Index, FFMI = Fat Free Mass Index, FBG = Fasting Blood Glucose, TGc = Triglyceride, Ch = Cholesterol, HDL = High Density Lipoprotein, LDL = Low Density Lipoprotein, VLDL = Very Low Density Lipoprotein, SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, GE = Gross Efficiency

Table 2 showed that mean BMI, FMI, FFMI of mid age men were 25.44±2.31 kg/m^2, 5.49±1.47 kg/m^2, 19.95±1.44 kg/m^2 respectively. Also the mean value of fasting blood glucose, triglyceride, cholesterol, HDL, LDL and VLDL were 95.17±26.87 mg/dl, 139.25±57.00 mg/dl 168.00±26.21 mg/dl, 47.70±4.33 mg/dl, 91.90±23.40 mg/dl and 27.90±11.41 mg/dl respectively.

Table 3: Normal range of Metabolic Markers for Men

Glucose (F) (mg/dl)	Triglyceride (mg/dl)	Cholesterol (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)
70-110	65-170	150-250	35-55	150-190	15-35

The relationship among the selected parameters of the subjects has been presented in table 4

Table 4: Correlation Matrix of All Selected Parameters

	BMI	FMI	FFMI	FBG	TGc	Ch	HDL	LDL	VLDL
BMI	1								
FMI	**0.799***	1							
FFMI	**0.790***	0.262	1						
FBG	0.036	0.150	-0.097	1					
TGc	**0.460***	**0.305***	**0.427***	-0.0002	1				
Ch	0.203	0.144	0.179	0.008	0.288	1			
HDL	0.227	0.199	0.161	0.017	**0.695***	**0.399***	1		
LDL	-0.035	-0.023	-0.033	0.008	-0.295	**0.818***	-0.061	1	
VLDL	**0.460***	**0.305***	**0.426***	-0.001	**0.675***	0.302	**0.692***	-0.283	1

*. Significant at 0.05 levels

Table 4 indicated that the morphological parameters i.e. BMI, FMI and FFMI were significantly inter-related. Further, all those three parameters had significant correlation with TGc and VLDL while insignificant relationship was established with FBG, Ch, HDL and LDLat 0.05 level.

BMI, FMI and FFMI of the subjects were inter-related to each other might be due to the fact that the subjects of the study were not obese in average (BMI= 25.44kg/m^2, FMI = 5.49kg/m^2, FFMI= 19.95 kg/m^2). This result is in support of the study of Gishti O, Jaddoe VW, et al. (2015), Christian AH, Mochari H, et al. (2009), Lam BC, Koh GC, et al. (2015).

IV. Conclusion

Body mass index, Fat mass index andFat free mass index are directly related to each other in sedentary non-obese mid-age men. Further, these morphological parameters are correlated to themetabolic markers like

triglyceride and very low-density lipoprotein of same subjects, however, insignificant to blood glucose, cholesterol, HDL and LDL. Thus the study suggests that to prevent cardio- metabolic diseases, a healthy body mass index and fat mass index are desired.

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