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Study Body Composition of Adolescent Girls

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Abstract

Nutritional status of individuals or populations and measurements of food and nutrient intake and evaluation of nutrition-related health indicators is aspect of study nutritional anthropometry. The use of nutritional assessment has increased importance in recent years because of our greater knowledge of the nutritional status and health. It refers not only to inadequate dietary intake or undernutrition but also to over- nutrition characterized by obesity and its associated co-morbidities such as diabetes mellitus, cardiovascular disease, hypertension and stroke, osteoporosis, and some form of cancer as well. Malnutrition is a "pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients".

Sample size: For this study 1009 adolescent's girls are chosen as subjects for this study. Weight is measured in weighing scale and height is measured by anthropometre rod, skinfolds are measured by Harpenden caliper.

Results: Fat Mass is 9.35 kg (2.01) mean Fat free Mass is 34.22 kg (4.35). Mean FMI and FFMI of Adolescent girls are 4.08 kg/m^2 and 14.98 kg/m^2 (1.61). Age wise changes of different variable which significantly vary with age. fat mass increase 4.03 kg from 10 to 19 years.

Keywords: Nutritional anthropometry; White adipose tissue; Brown adipose tissue

Introduction

Nutritional status of individuals or populations and measurements of food and nutrient intake and evaluation of nutrition-related health indicators is aspect of study nutritional anthropometry. The use of nutritional assessment has increased importance in recent years because of our greater knowledge of the nutritional status and health. It refers not only to inadequate dietary intake or undernutrition but also to over- nutrition characterized by obesity and its associated co-morbidities such as diabetes mellitus, cardiovascular disease, hypertension and stroke, osteoporosis, and some form of cancer as well [1].

According to [2], malnutrition is a "pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients" [2]. There are two types of adipose tissue (WAT) white adipose tissue and brown adipose tissue (BAT). Brown adipose tissue accounts for less than 1% of the adipose mass in human adults. White adipose tissue accounts for less than 1% of the adipose mass in human adults. White adipose tissue is composed of fat cells (adiposities) that generally contain a single, large droplet of lipid primarily in the form of triglycerides. The nucleus of adiposity and cell organelles of cytoplasm (i.e. mitochondria) are compressed to outer edge of cell between the lipid droplet and cell membrane.

Materials and Methods

Sample size: For this study 1009 adolescent's girls are chosen as subjects for this study.

Weight is measured in weighing scale and height is measured by anthropometre rod, skinfolds are measured by Harpenden caliper.

Percent body fat is increasing with age, it has weak but positive correlation with mean age at Menarche, FM has strong positive correlation with percent body fat, and BMI has strong positive correlation between Fat Mass and Fat Free Mass.

Fat Mass=(FM) (kg)=Body weight(kg)*(Percent body fat/100)

Fat free Mass (FFM) (kg)=weight-Fat Mass(kg)

Fat Mass index=(FMI) (kg/m^2)=Fat Mass(kg)/(height)m^2

Fat free Mass index =fat free Mass (kg)/height (m)^2

Results

Fat Mass is 9.35 kg (2.01) mean Fat free Mass is 34.22 kg (4.35). Mean FMI and FFMI of Adolescent girls are 4.08 kg/m^2 and 14.98 kg/m^2 (1.61). **Table 1** represents age wise changes

of different variable which significantly vary with age. Fat mass increase 4.03 kg from 10 to 19 years.

Table 1 Age wise change comparison of anthropometric derivation of study adolescence girls.

Variable	10 years	11 years	12 years	13 years	14 years	15 years	16 years	17 years	18 years	19 years	F
Fat Mass (kg)	7.10 (1.37)	8.48 (1.66)	8.53 (1.31)	8.7 (2.74)	9.4 (1.63)	9.52 (1.59)	9.94 (1.93)	9 (1.81)	10.04 (1.93)	11.13 (2.08)	48.056
Fat Free mass (kg)	31.85 (3.71)	33.27 (4.13)	33.25 (3.41)	33.62 (3.72)	35.01 (4.74)	35.03 (4.94)	34.46 (4.49)	34.61 (4.51)	35.72 (4.35)	35.08 (4.62)	77.77
Fat free Mass Index (kg/m^2)	14.83 (1.69)	14.76 (1.74)	14.72 (1.31)	14.67 (1.37)	15.27 (1.74)	15.23 (1.51)	14.96 (1.52)	14.9 (1.09)	15.33 (1.15)	15.04 (1.47)	2.67
Fat Mass Index (kg/m^2)	3.29 (0.51)	3.75 (0.6)	3.77 (0.53)	3.81 (0.52)	4.1 (0.662)	4.14 (0.62)	4.28 (0.731)	4.3 (0.66)	4.5 (0.72)	4.76 (0.74)	44.97

Longitudinal studies should be carried out to investigate the dynamics of changes in anthropometric, hormonal, and metabolic variables which occur during the attainment of menarche. In study on Netherlands by [3] have been reported that PBF. FM<FFM FMI. The pattern and intensity of adiposity is directly reproduced the composition of human body.

The variation in body composition between individuals is large mainly because of variations in adiposity level. Adiposity and body composition between individuals is large, mainly because of variations in adiposity level. Adiposity and Body Composition measures are used to evaluate nutritional status growth development and specific disease state [4].

Table 2 Correlations bet(kg), percent body fat between mean age at menarche (years), fat mass(kg), fat free mass.

		Mean Age at Menarche (years)	Fat Mass (kg)	Fat Free Mass (kg)	Percent body fat
Mean Age at Menarche (years)	Pearson Correlation	1	0.239**	0.048	0.231**
	Sig. (2-tailed)		0	0.15	0
	N	896	896	896	896
Fat Mass (kg)	Pearson Correlation	0.239**	1	0.537**	0.807**
	Sig. (2-tailed)	0		0	0
	N	896	1009	1009	1009
Fat Free Mass (kg)	Pearson Correlation	0.048	0.537**	1	-0.051
	Sig. (2-tailed)	0.15	0		0.105
	N	896	1009	1009	1009
percent body fat	Pearson Correlation	0.231**	0.807**	-0.051	1
	Sig. (2-tailed)	0	0	0.105	
	N	896	1009	1009	1009

**. Correlation is significant at the 0.01 level (2-tailed).

Cellularity of adipose tissue (hyperplasia) practically doubles with onset of puberty and then plateaus in late adolescence and early adulthood. In adiposities hyperplasia and hypertrophy not only during growth but also on adulthood are significantly higher among post-menarcheal girls compared with premenarcheal girls. Although the terms FFM and lean body mass (LBM) are used interchangeably, there is a difference (**Tables 2-4**). Unlike FFM, which contains no lipid, the LBM contains a small amount of essential lipids [5].

In epidemiological and clinical studies, it is interesting to understand the relative proportion of FM and FFM and its change in relation to the total body mass because this has medical and nutritional significance. Skin folds (SKF) are indirect measure of the thickness of subcutaneous adipose

tissue. In the early 1900, the thickness of subcutaneous adipose tissue was measured by taking SKF measurements [6].

Table 3 Age-wise mean and SD of different anthropometric characteristics of adolescent Bengalee girls (Post menarcheal girls, premenarcheal girls, combined (post and premenarcheal).

Variables	10 years	11 years	12 years	13 years	14 years
Percent body fat (post menarcheal)	18.33(2.38)	20.70(2.23)	20.54(2.14)	20.67(2.19)	21.09(2.46)
premenarcheal	18.02(2.14)	19.06(2.52)	19.85(2.13)	20.35(2.67)	22.24(2.85)
Combined	18.17(2.26)	20.21(2.43)	20.54(2.14)	20.63(2.24)	21.18(2.50)
Fat Mass (kg) Post menarcheal	7.67(1.42)	9.05(1.40)	8.84(1.19)	8.91(1.28)	9.49(1.64)
Premenarcheal	6.53(1.050)	7.15(1.46)	7.28	7.54(1.1)	8.29(1.06)
combined	7.10(1.37)	8.48(1.66)	8.53(1.31)	8.74(1.34)	9.40(1.63)
Fat free mass (kg) Post menarcheal	34.03(1.42)	34.54(3.05)	34.21(2.85)	34.19(4.73)	35.53(4.73)
Premenarcheal	29.66(2.74)	30.32(4.72)	29.43(2.77)	29.46(3.11)	29.09(3.17)
combined	31.85(3.71)	33.27(4.10)	33.62(3.72)	33.62(3.72)	35.01(4.12)

Table 4 Represents relation of fat mas, fat free mass, fat free mass index, fat free mass index.

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
FM (kg)	147.326	1008	0	9.35	9.22	9.47661
FFM (kg)	249.739	1008	0	34.22	33.95427	34.49209
FMI (kg/sqm)	170.407	1008	0	4.082	4.03528	4.129299
FFMI (kg/sqm)	295.091	1008	0	14.98	14.885	15.08429

Conclusion

Percent body fat is increasing with age, it has weak but positive correlation with mean age at Menarche [7], FM has strong positive correlation with percent body fat, and BMI has strong positive correlation between fat mass and fat free mass.

The study represents typical differential rates of positive change in different body composition measures after the attainment of menarche [8].

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