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Structural Changes During Pregnancy and Lactation Among First Parity Women

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ABSTRACT A total of five hundred and fifty apparently healthy educated young Punjabi women belonging to elite class in the age range of 20 to 30 years participated in the present study. Only first pregnancies were considered. A set of eighteen measurements were recorded on each subject. Body weight showed an increasing trend immediately after delivery. With advanced pregnancy, the increase in chest and hip circumference was prominent, which explains the difference between pregnant and lactating women. Abdomen circumference also showed an increasing trend. All the skinfold thicknesses showed a significant increase during pregnancy and a significant decrease after delivery.

The union of an ovum and a sperm cell forms a zygote, which becomes an embryo and later a fetus within the uterine environment and finally emerges as an independent neonate, all within a relatively short span of time, involving a wide range of physiological processes in both mother and her developing fetus.

Preparation of the uterus for potential pregnancy occurs during the menstrual cycle under normal oestrogens and progestrone control, with increase in blood supply as the major change. Once the ovum has been fertilized and implanted in the uterus, progressive alterations in physiology affects many systems of maternal body as it adapts to the need of the growing embryo. Maternal blood volume begins to increase shortly after conception to supply the added nutrients, oxygen, hormones and enzymes needed by the conceptus. In normal pregnancy, the haemoglobin concentration, red cell count, serum, iron and packed cell volume decrease during first 7 to 8 months, then rise again.

Fasting levels of blood glucose decrease during pregnancy, in contrast, pregnancy shows elevated levels of total lipids, triglycerides, phospholipids and cholesterol. Plasma amino acid also tends to be lower in pregnancy. (Committee on Nutrition of the mother and Preschool child, Food and Nutrition Board, 1978).

The combined metabolic requirements of the mother with her increase in body tissues, the placenta and the fetus result in an increase in the basal or resting metabolic rate and in the function of lungs. (Committee on Maternal Nutrition and the course of pregnancy, 1970).

In majority of cases blood pressure slightly lowers during advancing pregnancy. It also remains unaltered while in some cases who do not even have any history, it becomes very high or low. Besides these physiological changes, a number of changes in maternal body composition reflecting alteration in energy balance take place during pregnancy and lactation. The most important is the maternal weight gain.

Increase in maternal body weight during pregnancy is due to a large number of components, many of which can only be estimated and some of which have not been identified.

Height, preconceptional weight and nutritional status, age, parity, race and physiological status are some of the factors that must be considered in evaluating the weight and nutritional status of an individual woman. Several population groups have been studied for weight gain in pregnancy both in developing and developed countries, (Beal, 1971; Prentice et al., 1981; Adair et al., 1983; Galtier et al., 1995).

Changes in other anthropometric indicators

of energy balance during pregnancy and lactation also take place. These include change in amount of fats and patterning of fat.

Major changes in maternal body composition reflecting alterations in energy balance take place during pregnancy and lactation. The exact nature and timing of these changes is poorly documented, but fat is apparently accumulated during the first two trimesters of pregnancy in preparation for the high energy cost of the last trimester reaching a minimum just after birth (Prentice et al., 1981; Adair et al., 1983) and again after birth it increases for sometime and then declines throughout lactation (Adair et al., 1983). Weight excess before pregnancy and its complications and cost has been documented by Galtier et al. (1995).

The distribution of subcutaneous fat is another important aspect as it is not uniform in human body. The measures of subcutaneous fat at the extremities and the trunk respond differently in response to variation in nutritional status or energy balance (Bogin and Macvean, 1981). Work has been done on patterns of fat distribution as affected by age and sex (Edwards, 1951; Reynold, 1951; Skerlz et al., 1951; Damon et al., 1972; Borkan and Norris, 1977; Katch et al., 1980; Gillum, 1987; Johnston et al., 1991; Jones and White, 1994; Mueller and Kaplowitz, 1994; Goran et al., 1995), socio economic status (Georges et al., 1993; Indech et al., 1991), with increasing adiposity (Edwards, 1950; Garn, 1955 a, b; Satwanti et al., 1990), on effects of levels of exercise and increased physical activity on fat distribution pattern (Brown and Jones, 1977; Bhalla et al., 1983). Studies confirm that fatness and fat distribution are enough good indicators of risk of several diseases (Esposito del Puento et al., 1993).

The work on fat patterning during pregnancy and lactation is quite meagre in literature although a lot of work has been done on physiological changes during pregnancy and lactation. The present study was undertaken to establish the changes in subcutaneous fat distribution pattern with advancing pregnancy and early lactation in the first parity young Punjabi women.

MATERIALS AND METHODS

The sample for the present study consisted of five hundred and fifty apparently healthy young Punjabi women belonging to 20 to 30 years of age. Only first pregnancies were taken as the changes in measurements during first pregnancies are only highlighted in successive pregnancies.

The data were divided into four major groups (A, B, C and D) and the last groups *i.e.* C and D were further divided into six and three sub-groups respectively.

1. Group A-50 young unmarried girls.
2. Group B-50 married women who are married since more than a year but had no issue.
3. Group C-300 pregnant women, with further subdivisions into 6 subgroups of 50 each (C1 to C6) from 3rd month of pregnancy onwards with an interval of one month each.
4. Group D-150 lactating women. Group 'D' was further divided into 3 subgroups of 50 each (D1 to D3) with an interval of 1 month each. All these women breastfed their babies and had normal deliveries.

All the above subjects were studied for a set of eighteen body measurements and the measurements were taken according to Weiner and Lourie (1981).

RESULTS

Table 1 represents the means and standard deviations of the body weight, stature, sitting height and circumferences of the subjects from group A to group D_3.

Body weight showed slight but non-significant decline in non-pregnant women, followed by a continuous decline in normal women,

Table 1: Anthropometric measurements of the subjects

Variables	*Groups*										
	A	*B*	*C-1*	*C-2*	*C-3*	*C-4*	*C-5*	*C-6*	*D-1*	*D-2*	*D-3*
Weight (kg)	48.44	47.60	51.80	54.98	56.52	58.54	61.30	61.50	49.90	49.10	50.28
	±4.29	±3.46	±7.52	±6.94	±7.13	±6.21	±7.17	±6.38	±5.83	±6.89	±7.21
Standing height	155.27	155.26	155.77	154.98	154.99	156.41	156.54	156.54	156.58	156.34	156.23
(cm)	±4.99	±4.47	±5.38	±7.79	±4.09	±4.23	±4.57	±4.66	±3.73	±3.23	±3.32
Sitting height	81.83	81.75	81.62	81.97	81.74	82.08	81.71	81.36	81.66	80.95	81.98
(cm)	±2.82	±2.95	±3.85	±3.24	±2.48	±3.17	±4.07	±3.35	±2.57	±2.64	±2.67
Chest circumference	69.36	70.48	74.11	75.61	77.76	78.32	80.00	81.41	72.53	71.31	71.34
(cm)	±4.55	±5.65	±6.05	±5.79	±7.51	±4.47	±5.16	±6.04	±4.41	±5.27	±6.06
Hip circumference	89.21	88.60	94.97	95.89	99.17	100.15	98.57	100.79	92.76	89.78	91.37
(cm)	±5.62	±6.54	±7.39	±5.62	±8.66	±5.49	±4.04	±4.62	±5.06	±5.59	±6.06
Upper arm circumference	22.68	24.93	24.84	24.73	25.10	25.49	25.33	25.98	23.58	23.96	23.28
(cm)	±1.98	±1.92	±3.06	±2.50	±2.87	±2.18	±2.30	±2.43	±2.00	±2.06	±2.01
Calf circumference	29.20	31.22	30.47	32.15	31.44	32.98	32.16	32.64	30.15	30.24	30.46
(cm)	±2.27	±1.92	±2.85	±2.92	±3.46	±2.81	±2.39	±2.84	±2.67	±4.72	±2.99
Abdomen circumference	72.96	76.06	86.90	88.67	94.64	97.43	101.97	104.32	83.76	80.81	82.56
(cm)	±7.68	±8.31	±9.96	±10.99	±10.07	±11.75	±6.41	±8.20	±6.61	±7.50	±8.97

thereafter a continuous increase upto group C6 which is statistically significant in all the pregnant groups (Table 2).

Standing height and sitting height were found to show a non significant change among all the groups.

Chest circumference showed significant increase from group A till group C_6. After delivery, chest circumference reduced but remained higher as compared to A and B.

Hip circumference also increased in all the pregnant groups while decreased in lactating groups. Upper arm circumference showed an increasing trend which was found to be inconsistent. During lactation period, however a significant decrease in upper arm circumference has been observed. Similar trend has been observed for the calf circumference.

All the skinfold thicknesses measured at ten sites over the entire body surface are presented in Table 3. Biceps skinfold thickness showed an increase in all the pregnant subjects while a decrease in all the lactating women. The decrease in biceps skinfold thickness after delivery was significant when compared with pregnant groups.

Triceps skinfold thickness showed the maximum increase between group B and C, followed by slight decline till C_6 stage and further decrease during lactation period.

The subscapular skinfold thickness was found to have higher mean values among married females as compared to unmarried females.

Immediately after delivery, the subscapular skinfold thickness reduced significantly as compared to pregnant women, though the decline was inconsistent.

Midaxillary skinfold thickness showed statistically significant increase in all the pregnant groups as compared to married and unmarried women (Table 4). The values of midaxillary skinfold thickness in lactating subjects are seen to be very close to pre-pregnancy subjects.

Chest skinfold thickness showed similar trend of increase during pregnancy and of decrease during lactation period. In the group D3 a slight increase is also observed as compared to group D_1 and D_2.

Suprailiac skinfold thickness showed an increasing trend from A to group C_4, a significant decrease in group C_5 and C_6 and also a marked decrease in groups D_1, D_2 and D_3. The lactating groups showed the suprailiac skinfold thickness values to be closer to pre-pregnancy groups of subjects.

Both the knee and calf skinfold thickness

Table 2 : The values of 't' with level of significance indicating the difference between two sample means

Groups	*Variables*							
	Weight	*Standing height*	*Sitting height*	*Chest circum-ference*	*Hip circum-ference*	*Upper arm circum-ference*	*Calf circum-ference*	*Abdomen circum-ference*
A*vs*B	1.07	0.28	0.00	1.09	0.48	6.00[3]	4.89[3]	1.93
A*vs*C1	2.70[2]	0.47	0.28	4.44[3]	4.39[3]	4.31[3]	2.48[2]	7.84[3]
A*vs*C2	5.67[3]	0.20	0.14	6.01[3]	5.95[3]	4.70[3]	2.14[1]	8.29[3]
A*vs*C3	6.88[3]	0.28	0.00	6.76[3]	6.82[3]	5.04	3.80[3]	12.10[3]
A*vs*C4	9.46[3]	1.22	0.40	9.94[3]	9.86[3]	7.02[3]	2.92[2]	12.32[3]
A*vs*C5	10.87[3]	1.06	0.14	10.97[3]	4.40[3]	6.24[3]	6.45[3]	20.51[3]
A*vs*C6	12.02[3]	1.31	0.75	11.28[3]	5.23[3]	7.57[3]	6.75[3]	19.75[3]
A*vs*D1	1.43	1.48	0.24	3.52[3]	3.32[2]	2.32[1]	1.93	7.54[3]
A*vs*D2	0.56	1.27	1.60	1.97	0.50	3.29[2]	1.41	5.17[3]
A*vs*D3	1.54	1.13	0.24	1.85	1.75	1.54	2.37[1]	5.74[3]
B*vs*C1	3.54[3]	0.20	0.14	3.10[2]	4.56[3]	0.00	1.55	5.81[3]
B*vs*C2	6.74[3]	0.44	0.31	4.48[3]	5.99[3]	0.45	0.67	6.47[3]
B*vs*C3	4.97[3]	0.65	0.00	5.47[3]	6.89[3]	0.28	0.34	10.06[3]
B*vs*C4	10.88[3]	0.97	0.51	7.68[3]	9.55[3]	1.38	1.37	10.50[3]
B*vs*C5	12.15[3]	0.80	0.00	8.80[3]	4.45[3]	0.93	2.20[1]	17.46[3]
B*vs*C6	13.56[3]	1.07	0.61	9.33[3]	5.38[3]	2.40[1]	2.95[1]	17.13[3]
B*vs*D1	2.39[1]	1.24	0.00	2.02[1]	3.55[3]	3.48[3]	2.32[1]	5.13[3]
B*vs*D2	1.37	1.00	1.43	0.75	0.96	2.42[1]	1.35	3.00[2]
B*vs*D3	2.36[1]	0.83	0.40	0.72	2.12[1]	4.25[3]	1.50	3.75[2]
C1*vs*C2	2.17[1]	0.58	0.48	1.26	0.69	0.17	1.20	0.84
C1*vs*C3	3.18[2]	0.80	1.46	2.67[2]	2.60[1]	0.41	1.53	3.86[3]
C1*vs*C4	4.83[2]	0.65	0.64	3.95[3]	3.98[3]	1.22	1.90	4.83[3]
C1*vs*C5	6.40[3]	0.31	0.00	5.24[3]	1.61	0.89	3.24	9.00[3]
C1*vs*C6	6.89[3]	0.76	0.33	6.04[3]	2.51[2]	2.07	2.83[1]	9.54[3]
C1*vs*D1	1.39	0.87	0.00	1.48	1.74	2.46[1]	0.57	1.85
C1*vs*D2	1.85	0.64	1.00	2.47[1]	3.95[3]	1.68	0.28	3.45[3]
C1*vs*D3	1.01	0.50	0.51	2.29[1]	2.59[2]	3.05[2]	0.00	2.28[1]
C2*vs*C3	1.09	0.00	0.38	1.60	2.24[1]	0.66	0.48	2.83[2]
C2*vs*C4	2.70[2]	1.13	0.14	2.16[1]	3.83[3]	1.60	0.44	3.84[3]
C2*vs*C5	4.47[3]	1.01	0.33	4.00[3]	1.26	1.24	0.00	7.38[3]
C2*vs*C6	4.90[3]	1.21	0.92	4.90[3]	2.21[1]	2.54[1]	0.36	8.07[3]
C2*vs*D1	3.96[3]	1.30	0.50	2.99[2]	2.92[2]	2.56[1]	1.44	2.70[2]
C2*vs*D2	4.25[3]	1.13	1.72	3.89[3]	5.46[3]	1.67	1.27	4.17[3]
C2*vs*D3	3.22[3]	1.04	0.00	3.60[3]	3.24[2]	3.24[2]	1.20	3.04[2]
C3*vs*C4	1.48	1.70	0.58	0.44	0.67	0.75	1.14	1.27
C3*vs*C5	3.34[1]	1.50	0.00	1.73	0.24	0.41	1.20	4.34[3]
C3*vs*C6	3.68[3]	1.76	0.64	2.67[2]	0.67	1.65	1.89	5.27[3]
C3*vs*D1	5.09[3]	2.03	0.00	4.25[3]	4.51[3]	3.10[3]	2.08[1]	6.38[3]
C3*vs*D2	5.29[3]	1.83	1.54	4.17[3]	6.44[3]	2.27[1]	1.45	7.79[3]
C3*vs*D3	4.34[3]	1.66	0.43	4.70[3]	5.10[3]	3.71[3]	1.52	6.33[3]
C4*vs*C5	2.05[1]	0.10	0.48	1.74	0.74	0.31	0.62	2.39[1]
C4*vs*C6	2.35[1]	0.10	1.10	2.90[3]	0.28	1.06	0.24	3.39[3]
C4*vs*D1	7.17[3]	0.17	0.71	6.51[3]	7.01[3]	4.62[3]	2.16[1]	7.17[3]
C4*vs*D2	7.19[3]	0.00	1.93	7.19[3]	9.34[3]	3.60[3]	1.92	8.42[3]
C4*vs*D3	6.13[3]	0.22	0.14	6.56[3]	7.31[3]	5.35[3]	1.90	7.11[3]
C5*vs*C5	0.14	0.26	0.45	1.25	0.77	1.34	0.92	1.59
C5*vs*D1	8.71[3]	0.33	0.00	7.78[3]	2.77[2]	4.01[3]	4.02[3]	14.00[3]
C5*vs*D2	8.67[3]	0.00	1.00	8.36[3]	4.19[3]	3.05[2]	2.56[1]	15.19[3]
C5*vs*D3	7.65[3]	0.00	0.37	7.71[3]	3.31[2]	4.00[3]	3.15[3]	12.45[3]
C6*vs*D1	9.50[3]	0.00	0.50	8.39[3]	3.67[3]	5.50[3]	4.54[3]	13.83[3]
C6*vs*D2	9.34[3]	0.24	0.66	8.75[3]	4.97[3]	4.51[3]	3.09[2]	14.95[3]
C6*vs*D3	8.24[3]	0.36	1.02	8.33[3]	4.17[3]	6.19[3]	3.73[3]	12.66[3]
D1*vs*D2	0.62	0.31	1.36	1.25	2.78[2]	0.93	0.00	2.09
D1*vs*D3	0.28	0.48	0.60	1.11	1.19	0.74	0.52	0.76
D2*vs*D3	0.88	0.14	1.94	0.00	1.31	1.69	0.24	1.05

1 = P<0.05, 2 = P<0.01, 3 = P<0.001

Table 3 : Adiposity measurements of the subjects

Variables	*Groups*										
Skinfold thickness at	*A*	*B*	*C-1*	*C-2*	*C-3*	*C-4*	*C-5*	*C-6*	*D-1*	*D-2*	*D-3*
Biceps	6.9	7.0	8.8	8.4	9.4	9.8	9.2	9.5	7.5	6.7	6.7
	±1.7	±1.8	±3.6	±3.4	±3.9	±3.5	±3.5	±4.3	±3.0	±2.5	±3.2
Triceps	11.8	12.3	15.7	14.3	15.0	15.1	14.9	14.9	14.4	12.3	13.6
	±3.0	±3.7	±5.3	±3.8	±5.1	±3.8	±4.8	±4.3	±4.5	±3.8	±4.9
Subscapular	12.6	19.2	14.1	16.9	18.0	17.4	22.4	24.5	18.6	16.4	17.1
	±3.4	±4.3	±5.1	±5.4	±5.6	±5.0	±6.7	±6.3	±6.1	±5.8	±6.0
Mid-axillary	10.2	9.9	12.2	12.6	12.9	12.9	13.6	13.5	11.0	10.2	10.9
	±2.2	±2.8	±4.5	±3.5	±4.0	±3.7	±4.2	±4.9	±2.7	±2.9	±3.7
Chest	8.1	8.0	9.3	9.6	9.5	9.9	10.0	10.3	8.4	7.9	8.2
	±2.0	±2.2	±3.2	±2.6	±2.9	±2.3	±2.3	±3.1	±1.8	±2.1	±2.4
Suprailiac	16.0	17.1	21.3	23.5	24.5	24.9	21.4	20.2	16.2	16.2	16.8
	±4.7	±5.1	±6.5	±6.2	±5.9	±5.6	±5.8	±6.0	±5.0	±5.3	±6.7
Knee	6.8	6.7	6.6	7.0	7.6	7.3	7.3	7.4	7.0	6.7	6.7
	±1.4	±1.6	±2.0	±1.7	±1.9	±1.6	±1.9	±1.7	±2.0	±1.8	±1.7
Calf	18.3	21.2	20.1	21.8	22.5	23.0	23.7	23.7	22.5	19.9	20.7
	±5.5	±5.0	±6.8	±6.2	±6.3	±5.3	±7.1	±6.1	±6.1	±6.2	±6.4
Thigh	29.1	30.4	31.3	33.1	32.5	36.3	35.0	34.9	30.5	29.5	29.2
	±8.3	±6.5	±9.9	±9.3	±8.4	±7.5	±9.4	±9.6	±8.6	±7.6	±7.8
Chin	6.5	6.4	6.9	7.1	6.8	7.2	7.6	8.3	7.3	6.7	7.0
	±1.3	±1.5	±1.7	±1.7	±1.4	±1.4	±1.6	±1.9	±1.4	±1.6	±1.7

showed an increasing trend during pregnancy and decreasing trend in lactating groups. The trend was found to be statistically non significant, showing thereby, that the knee and calf skinfold thickness is least affected by pregnancy among these subjects.

In order to study the fat distribution pattern the skinfold thicknesses, in the present study, were arranged in ascending order of their mean thickness in group A to D_3. The pattern of subcutaneous fat distribution in the subjects of group A *i.e.* unmarried girls was kept as the base line and the pattern of fat distribution in the other groups was compared with it.

Group A - The ascending order is Chin, Knee, Biceps, Chest, Midaxillary, Triceps, Subscapular, Suprailiac, Calf and Thigh.

Although the overall fatness increased slightly in group B, the pattern of fat distribution remained the same as that of group A, thereafter changing slightly in pregnant women.

In C_1 (4 months pregnant women) the pattern of fatness remained identical upto site subscapular, inspite of an overall increase in fatness, but changed at suprailiac and calf sites. This pattern of greater fatness at suprailiac site in comparison to calf site remained the same in Groups C_2, C_3 and C_4.

The pattern of subcutaneous fat distribution again changed in last two months in C_5 and C_6 groups, showing thereby a relative decrease in fatness at suprailiac site as compared to subscapular and calf sites.

The C_5 group showed the pattern as Suprailiac, Subscapular and Calf skinfold thickness. The C_6 group showed the pattern as Suprailiac, Calf and Subscapular skinfold thickness.

DISCUSSION

In the present study the body weight was found to increase among the pregnant women as compared to normal women. A significant decline in body weight was observed immediately after delivery. This decline in body weight is in contrast to the findings by Adair et al. (1983) which showed a gain in weight by the mothers during first months of lactation followed by a decline.

In the present study, the increase in chest and hip circumference was prominent with ad-

Table 4 : The values of 't' with level of significance indicating the difference between two samples means

Groups	*Variables*									
	Biceps	*Triceps*	*Sub-scapular*	*Mid-axillary*	*Chest*	*Suprailiac*	*Knee*	*Calf*	*Thigh*	*Chin*
A *vs* B	0.40	0.72	1.20	0.58	0.22	1.09	0.46	2.72[2]	0.89	0.00
A *vs* C 1	3.37[2]	4.51[3]	1.75	2.75[3]	2.33[1]	4.63[3]	0.07	1.48	1.20	1.24
A *vs* C 2	2.85[2]	3.66[3]	4.75	4.09[3]	3.25[2]	6.76[3]	0.46	2.98[2]	2.20[1]	2.20[1]
A *vs* C3	4.09[3]	3.89[3]	5.73[3]	4.11[3]	2.79[2]	7.83[3]	2.33[1]	3.55[3]	2.00[1]	1.25
A *vs* C4	5.32[3]	4.85[3]	5.63[3]	4.38[3]	4.05[3]	8.48[3]	1.56	2.25[2]	4.29[3]	2.77[2]
A *vs* C5	4.20[3]	3.84[3]	9.16[3]	5.01[3]	4.26[3]	5.08[3]	1.52	4.19[3]	3.09[2]	3.62[3]
A *vs* C6	4.02[3]	4.15[3]	11.75[3]	4.29[3]	4.26[3]	3.86[3]	1.73	4.60[3]	3.07[2]	2.05[1]
A *vs* D1	1.18	3.43[3]	6.03[3]	1.16	0.70	0.17	0.40	3.56[3]	0.83	3.20[3]
A *vs* D2	0.40	0.82	3.96[3]	0.00	0.33	0.17	0.14	1.36	0.28	0.74
A *vs* D3	0.17	2.28[1]	4.63[3]	1.13	0.31	0.67	0.31	2.03[1]	0.00	1.73
B *vs* C1	3.02[2]	3.70[3]	0.60	3.05[2]	2.47[1]	3.59[3]	0.26	0.84	0.50	1.41
B *vs* C2	2.49[1]	2.69[2]	3.40[3]	4.19[3]	3.35[2]	5.63[3]	0.94	0.52	1.57	2.21[1]
B *vs* C3	3.77[3]	3.09[2]	4.36[3]	4.26[3]	2.92[2]	6.63[3]	2.60[1]	1.17	1.32	1.33
B *vs* C4	4.93[3]	3.78[3]	4.12[3]	4.47[3]	4.22[3]	7.21[3]	1.97	1.70	3.82[3]	2.84[2]
B *vs* C5	3.83[3]	3.00[2]	7.78[3]	5.13[3]	4.31[3]	3.92[3]	1.90	2.00[1]	2.55[1]	3.66[2]
B *vs* C6	3.72[3]	3.20[2]	10.10[3]	4.43[3]	4.41[3]	2.79[1]	2.13[1]	2.25[1]	2.53[1]	2.11[1]
B *vs* D1	0.82	2.59[1]	4.73[3]	1.98	0.96	0.88	0.87	1.14	0.00	3.24[3]
B *vs* D2	0.79	0.00	2.75[2]	0.38	0.00	0.83	0.00	1.11	0.60	0.94
B *vs* D3	0.57	1.56	3.42[2]	1.48	0.55	0.24	0.00	0.36	0.84	1.84
Cl *vs* C2	0.50	1.46	2.63[2]	0.50	0.41	1.73	1.17	1.24	0.90	0.81
Cl *vs* C3	0.76	0.61	3.55[3]	0.84	0.14	2.51[1]	2.68[2]	1.77	0.64	0.00
Cl *vs* C4	1.41	0.60	3.24[2]	0.84	0.94	2.89[1]	2.01	2.24[1]	2.71[1]	1.15
Cl *vs* C5	0.58	0.81	6.88[3]	1.62	1.08	0.00	1.96	2.48	1.78	2.13[1]
Cl *vs* C6	0.90	0.84	9.05[3]	1.39	1.56	0.85	2.15[1]	2.70[2]	1.76	1.61
Cl *vs* D1	1.96	1.26	3.93[3]	1.54	1.86	4.39[3]	1.02	1.75	0.38	1.56
Cl *vs* D2	3.34[2]	3.60[3]	2.06[1]	2.66[2]	2.59[1]	4.28[3]	0.26	0.17	0.96	0.30
Cl *vs* D3	2.97[2]	1.97	2.69[2]	1.52	1.87	3.41[3]	0.26	0.43	1.17	0.30
C2 *vs* C3	1.29	0.78	0.95	0.38	0.17	0.74	1.68	0.58	0.30	1.00
C2 *vs* C4	1.98	1.04	0.48	0.36	0.52	1.09	0.90	1.00	1.75	0.00
C2 *vs* C5	1.14	0.61	4.48[3]	1.29	0.72	1.74	0.95	1.38	0.92	1.24
C2 *vs* C6	1.40	0.65	6.48[3]	1.04	1.28	2.68[2]	1.12	1.55	0.88	1.28
C2 *vs* D1	1.46	0.10	1.44	2.52[1]	2.72[2]	6.47[3]	0.00	1.54	1.33	0.54
C2 *vs* D2	2.86[2]	2.56[1]	0.44	3.77[3]	3.43[3]	6.30[3]	0.91	1.50	1.98	1.27
C2 *vs* D3	2.51[1]	0.74	0.11	2.31[1]	2.60[1]	5.19[3]	0.90	0.81	2.17[1]	0.40
C3 *vs* D4	0.47	0.00	0.51	0.00	0.75	0.31	0.83	0.34	2.20[1]	1.41
C3 vs D5	0.17	1.17	3.54[3]	0.84	0.92	2.58[1]	0.63	0.83	1.26	2.49[1]
C3 *vs* C6	0.10	0.17	5.45[3]	0.65	1.41	3.51[3]	0.61	0.95	1.23	1.66
C3 *vs* D1	2.69[2]	0.61	0.50	2.75[2]	2.29[1]	7.51[3]	1.59	0.00	1.09	1.90
C3 *vs* D2	4.03[3]	2.96[2]	1.36	3.90[3]	3.00[1]	7.30[3]	2.47[1]	2.07[1]	1.76	0.33
C3 *vs* D3	3.64[3]	1.38	0.71	2.55[1]	2.24[1]	6.05[3]	2.54[1]	1.37	1.97	0.57
C4 *vs* C5	0.81	0.30	4.18[3]	0.90	0.00	2.99[3]	0.00	0.55	0.70	1.15
C4 *vs* C6	0.33	0.31	6.25[3]	0.70	0.81	3.94[3]	0.00	0.65	0.74	1.22
C4 *vs* D1	3.58[3]	0.81	1.03	2.86[2]	3.36[3]	8.12[3]	0.83	0.41	3.26[2]	0.34
C4 *vs* D2	5.09[3]	3.64[3]	0.93	4.06[3]	4.31[3]	7.89[3]	1.77	2.60[1]	4.11[3]	1.66
C4 *vs* D3	4.49[3]	1.67	0.22	2.63[2]	3.35[2]	6.52[3]	1.83	1.83	4.28[2]	0.63
C5 *vs* C6	0.37	6.00[3]	1.63	0.13	0.63	0.99	0.00	0.00	0.00	0.82
C5 *vs* D1	2.63[1]	0.43	2.95[2]	3.62[3]	3.74[3]	4.79[3]	0.90	0.89	2.23[1]	0.74
C5 *vs* D2	4.08[3]	2.89[2]	4.73[3]	4.75[3]	4.51[3]	4.66[3]	1.81	2.79[2]	2.89[2]	2.68[2]
C5 *vs* D3	3.60[3]	1.23	4.11[3]	3.37[3]	3.54[3]	3.67[3]	1.33	2.12[1]	3.07[2]	1.70
C6 *vs* D1	2.73[2]	0.45	4.79[3]	3.11[3]	3.89[3]	3.63[3]	1.03	1.01	2.21[1]	1.10
C6 *vs* D2	3.98[3]	3.08[2]	6.68[3]	4.13[3]	4.49[3]	3.51[3]	2.01[1]	3.05[2]	2.38[2]	1.76
C6 *vs* D3	3.63[3]	1.30	6.01[3]	2.94[2]	3.68[3]	2.69[2]	2.06[1]	2.33[1]	3.05[2]	1.44
D1 *vs* D2	1.38	2.47[2]	1.82	1.59	1.05	0.00	0.80	2.06[1]	0.58	2.02
D1 *vs* D3	1.14	0.82	1.18	0.14	0.22	0.50	0.83	1.35	0.79	1.00
D2 *vs* D3	0.00	1.46	0.61	1.10	0.68	0.46	0.00	0.65	0.22	0.79

1 = P<0.05, 2 = P<0.01, 3 = P<0.001

vanced pregnancy, thus clearly highlighting the difference between pregnant and lactating mothers.

The increase in hip circumference could be due to general widening of pelvic girdle in the preparation of delivery and for abdomen circumference it could be due to increase in the size of the fetus.

The importance of deposition of trunk fat in pregnant women is highlighted by the increase in skinfold thickness among all the pregnant subjects. The trunk fat acts as a shock absorbing pad in protecting the growing fetus besides as the source of energy needed during this period.

It is also interesting to note that the overall gain in fatness is relatively less in last month of pregnancy as compared to other pregnant months supported by the fact that the total weight gain is marginal in the last month of pregnancy. The skinfold thickness have been found to decline during the lactation period and in most cases they have reached almost near the values of pre-pregnancy groups. It may be due to sudden loss of body fluid from body's cells and loss of fat after delivery during first and second months. The slight increase in fatness during third lactation month may be due to an extra rich diet which is given after delivery to the young mothers for their speedy recovery and also to aid in lactation. Similar findings have been reported by Thomson et al. (1966), Taggert et al. (1967) Harrison et al. (1975) Arroyo et al. (1978) and Adair et al. (1983).

Changes in fat distribution pattern seem mainly due to demands of the pregnancy stages. In the earlier stages of pregnancy the most important task is to protect the developing fetus against shocks, thus the suprailiac region showed more fat thus helping to make shock absorbing pads.

At the later stage of pregnancy, the most important task is to prepare the body for labour and lactation, so the priority site for greater fat deposition becomes upper trunk hence subscapular site showed greater fat deposition as compared to suprailiac site. Though, thigh remained the site of maximum fatness in all the groups, the deposition of extra fat on thigh was not marked in pregnant as compared to pre-pregnant groups.

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