CIRCUMFERENCES AND SKINFOLDS OF ELDERLY JAT SIKH FEMALES IN NUCLEAR AND EXTENDED FAMILIES OF PATIALA DISTRICT PUNJAB

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ABSTRACT

The present investigation has been conducted on a cross-sectional sample comprising of 500 elderly Jat Sikh females (198 from nuclear and 302 from extended families) ranging in age from 60 to 80+ years. The data have been collected from Patiala, Nabha and Rajpura cities of Patiala district. Various anthropometric measurements i.e., circumferences (upper arm, waist, hip and calf) and skinfolds (biceps, triceps, subscapular, suprailiac and calf) have been taken on each subject. Standard techniques given by Tanner et al. (1969) have been followed for taking these measurements. From the anthropometric measurements, Waist to Hip Ratio (WHR) has been calculated by applying formulae (WHO 2008). The females from both nuclear and extended families have been categorized according to waist circumference cut-off values. The women have been classified into three categories, with waist circumference <80 cm, between 80-88 cm and >88 cm, WHO (2008). The data collected have been arranged into five yearly age groups i.e. 60-64, 65-69, 70-74, 75-79 and 80+ years and have been subjected to statistical tests i.e. mean, standard deviation, standard error of mean, coefficient of correlation and test of significance ('t' test). The circumference i.e. upper arm, calf and waist have shown a trend of decrease after age group 60-64 years in nuclear families and 65-69 years in extended families. The decrease has been found to be more in females of nuclear families than in females of extended families. At age group 60-64, the females of nuclear families have more upper arm and calf circumferences, but in the subsequent age groups, the females of extended families have more circumferences, but the difference are not statistically significant. Waist circumference is more females of extended families at all age levels with significant differences at age group 65-69 years only. Hip circumference has shown a trend of increase upto 65-69 years in both nuclear and extended families followed by a trend of decline in subsequent age groups. The total decrease in hip circumference is more in females from nuclear families (9.53 cm) than extended families (8.09 cm), however the differences in the two groups are statistically non-significant. In both the groups of females, biceps, triceps and calf skinfolds have increased upto the age group 60-64. In most of the age groups, the skinfold values have been found to be larger in females of extended families, but the calf skinfold is greater in females from nuclear families in all the age groups. For all the skinfolds except suprailiac, the total loss is more in females from nuclear families. 25.75% females of nuclear and 36.75% females of extended families have waist circumference >88cm and are at substantially increased risk of metabolic complications. Females of extended families have high WHR at all age groups, with significant difference at age groups 65-69 and 80+ years age group. As per WHO classification, 40.72% females from extended families and 25.75% females of nuclear families have more than 0.85 Waist Hip Ratio which indicates higher prevalence of obesity in females of extended families. Circumferences and skinfolds of Elderly Jat Sikh females in Nuclear and Extended Families of Patiala District (Punjab).

KEYWORDS : Skinfolds, Jat Sikh Females, Nuclear and Extended Families, Patiala.

The World Health Organization (1999) defined health as: "a state of complete physical mental and social well being of an individual and not merely the absence of disease or infirmity". Thus, the policies and programmes that promote mental health, social connections and improve physical health status of the elderly are important. Healthy ageing involves the interaction between heredity, environment and the life style particularly diet and physical activity. Active life during old age is the process of optimizing opportunities for health, which allows people to realize their potential for physical, social and mental well being throughout the life course and to participate in society according to their needs, desire and capacities.

Living a healthy productive life is a goal for most people. But achieving good health is a continuous challenge as a number of factors like food habits, lifestyle and environmental constraints have an impact on the same. As one ages, there is a natural degeneration of cells and depletion with lower absorption of important nutrients in the body which expose individual to associated health challenges. Declining health status is a major symptom of an individual's ageing process. Such deterioration broadly depends on heredity, nature of lifestyle and the nutritional quality of food consumed.

Growing old is a universal biological phenomenon which affects all the living organisms. Ageing is a continuous process that begins with conception and ends with death. It is a continuous process of change throughout the whole life span of an organism. All individuals follow the same patterns- growth, reproductive maturity, senescence and death. During growth the age changes are progressive while in old age the changes are regressive. However the latter are not a reversal to the previous conditions but an emergence of the new qualities. During

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growth, the building up (anabolic) processes exceed the degenerative (catabolic) changes, as a results the functional capabilities of the body tissues and organs continue to increase. After physiological maturity is reached, the process is reversed, slowly at first, until the degenerative changes occur at a faster rate than the growth changes, resulting in impaired functioning of most of the organs.

Ageing is a total life process with biologic, nutritional, social, economic, psychological and spiritual aspects. On a biological level, major organs like heart, lungs, eyes, ears and brain lose a portion of their functional ability as individuals grow older. In consequence, most biological functions show a progress age-related deterioration (Shepard, 1998). On a psychological level, changes in short term memory may decrease one's ability to recall. Ageing also effects the social environment. Upon retirement friendship patterns may change from those centered around a work life to those centered around religions, travel, clubs or organization or volunteer activities. Ageing not only affects one's bodies, minds and relationships, it also affects one's nutritional status. Food and nutrition continue to provide essential support during the adult ageing process. Life expectancy is increasing, thus health promotion and disease prevention are even more important to ensure quality of life throughout the extended years.

According to Rockstein et al. (1977) ageing is any time dependent change which occurs after maturity of size, form or function is reached and which is distinct from daily, seasonal and other biological rhythms. This includes all post maturational changes in an individual including senescence, while senescence is all those manifestations in structure and function which are of declining or deteriorating nature which take place during the period of life. Kohn (1975) describes ageing to be those changes, which are universally progressive, presently irreversible, functionally deleterious, etiologically intrinsic and possibly multiple in origin. Since their accumulation is initially subtle, they may exert insignificant effects in young organisms. However, in older individuals, the factor of ageing gains importance particularly in consideration of the response to trauma and repair. In fact ageing is the decreasing ability to survive stress (Tonna, 1977).

Ageing involves a steady decline of various organ functions and body systems thereby making individuals vulnerable to various diseases and illness. Gavrilou (2002) described ageing as a set of processes which contribute to health deterioration and ultimately to death with the passage of time. Ageing cannot be avoided but how fast people age varies from one person to another and depends on genetic makeup, environmental influence and lifestyle.

In most gerontological literatures, people above 60 years of age are considered as 'old' constituting the 'elderly' segment of the population also called senior citizen. As per WHO guidelines (1999), people aged 60 to 74 are called elderly population, between 75-84 old and 85+ old. In academic research, retirement age is often taken as an index of aged status. Chronological age of 60 is considered as the beginning of old age.

During the last few decades there is an unprecedented increase in the number and proportion of people entering into old age due to decline in mortality and increase in life expectancy. Therefore the country is at a risk of being overwhelmed by the health needs of seniors, since gradually the greater proportion of the health budget will be consumed for provision of services of the elderly only.

Women have a longer life expectancy than men, so as the population ages, there is a greater proportion of women. In U.S. population in the year 2000, among people 65 or over there were 70 men for every 100 women. Among people 85 or over there were 47 men for every 100 women (U.S. Bureau of the Census, 2000).

Mangal et al., (2010) reported high prevalence of obesity in older adults, while women generally gain more weight during the menopausal transition. According to World Health Organization, obesity is one of the 10 most preventable health risks. Obesity is a significant risk factor for coronary artery disease, hypertension, cholelithiasis, diabetes and osteoarthritis. More recently, regional redistribution of fat within the body has been the focus of attention. Excess abdominal fat or 'android' or 'central obesity' appears to be far more deleterious than 'gynoid' obesity or general obesity where fat is distributed peripherally around the body (Wason and Jain, 2009). The major cardio-vascular metabolic risk factors (high blood pressure, plasma lipids and insulin resistance) aggregate

independently with both Body Mass Index (BMI) and Waist Hip Ratio (WHR) and improve with weight loss. Waist circumference is also the indicator of changes in intra-abdominal fat during weight loss (Jayashree and Rama, 2011).

Industrialization, urbanization, education and exposure to western life style are brining changes in the values of life. Despite the strong family ties in India in general and Punjab in particular, the trend is changing from the traditional joint family system to a nuclear family system. Nuclear family is the reality of 21st century and this too may further break into micro nuclear family in coming years. There is evidence that in many developing countries, especially in the growing urban areas, the extended family and traditional coping systems for older people are beginning to show signs of strain. Wasson (1993) reported that women exhibit great immunity till menopause but afterwards they are susceptible to more diseases. However, the survival rate of women is better than that of men's. In epidemiological terms, women experience greater morbidity but lesser mortality. Therefore the increased longevity in women predisposes them to greater problems, disabilities and stresses. In order to cope with this situation, it is necessary that the caregivers be made aware of the health, physical conditions and problems of the elderly women, so as to meet their needs as far as possible in the home setting itself.

Keeping in view these factors, the present study has been undertaken to study the circumferences and skinfolds of elderly Jat Sikh females living in nuclear and extended families of Patiala district in Punjab.

MATERIALS AND METHODS

The present investigation has been undertaken to study the circumferences and skinfolds of elderly Jat Sikh females belonging to nuclear and extended families of Patiala (Punjab). This will provide and insight as to how two different family setups nuclear and extended affect the morphological profile in a given community i.e. Jat Sikh women of Punjab.

The results are based on a cross sectional data collected on 500 elderly Jat Sikh females ranging in age from 60 to 80+ years in nuclear and extended families (198 nuclear and 302 extended) from Patiala, Nabha and Rajpura cities of Patiala district of Punjab.

To study the morphological profile, the various anthropometric measurements taken on each subject include the circumferences i.e. upper arm, waist hip and calf and skinfolds i.e. biceps, triceps, sub scapular, suprailiac and calf. Standard techniques as given by tanner et al. (1969) have been followed for taking various measurements. The circumferences have been taken with a flexible steel tape. Lange's skinfold caliper has been used for measuring skinfold thickness. The bilateral measurements have been taken on left hand side of the subjects. From these anthropometric measurements, Waist Hip Ratio (WHR) has been calculated.

Waist Circumference

Waist circumference is an index of deep adipose tissue (Brokan et al. 1983). It is used as a measure of abdominal obesity with Asian Indian specific cut-offs. The females from both nuclear and extended families have been categorized according to waist circumference cut-off values. The women have been classified into three categories, with waist circumference <80cm, between 80-88 cm and >88 cm, WHO (2008).

Waist to Hip Ratio (WHR)

Waist to hip ratio is an additional measure of body fat distribution. It provides an index of both subcutaneous and intra-abdominal adipose tissue (Bjorntorp, 1987). The

Table 1 : Distribution of Elderly Females According to Their Age

Age Group	Nuclear Families(n=198)	Extended Families (n=302)
60-64	66	82
65-69	36	52
70-74	39	60
75-79	29	51
80+	28	57

females from both nuclear and extended families have been categorized according to waist to hip ratio cut-off values i.e.>0.85 for females, WHO (2008).

Waist Hip Ratio =

$$\frac{\text{Waist Circumference (cm)}}{\text{Hip Circumference (cm)}}$$

The data has been arranged in five age groups, each of 5 years duration for both nuclear and extended families. The statistical tests i.e. mean, standard deviation and standard error of mean have been applied for all measurement at all ages. 't' test has been applied to compare the two groups of families for the various anthropometric measurements.

The number of subjects studied in various age groups for both nuclear and extended group of families have been presented in Table 1.

1. Circumferences

RESULTS AND DISCUSSION

The results obtained are discussed under the following headings-

1. Circumferences
   a. Upper Arm
   b. Waist
   c. Hip
   d. Calf
2. Skinfolds
   a. Biceps
   b. Triceps
   c. Subscapular
   d. Suprailiac
   e. Calf
3. Prevalence of Obesity among Elderly Jat Sikh Females of Nuclear and Extended Families, according to Waist Circumference.
4. Waist Hip Ratio (WHR)
5. Prevalence of Obesity among Elderly Jat Sikh Females of Nuclear and Extended Families, according to Waist Hip Ratio.

Table 2: Men and some other statistical constants of Upper Arm, Waist Hip and Calf Circumference (cm) of the Elderly Females from Nuclear and Extended Families

Upper Arm Circumference (cm)

Age Group	Nuclear Families				Extended Families				t-values
	N	Mean	S.D.	SEM	N	Mean	SD	SEM	
60-64	66	32.08	7.68	0.95	82	30.19	5.30	0.58	1.53
65-69	36	30.09	3.81	0.64	52	30.71	4.29	0.59	0.83
70-74	39	29.03	4.29	0.69	60	29.05	4.80	0.62	0.02
75-79	29	28.44	4.36	0.81	51	28.54	3.80	0.53	0.10
80+	28	26.06	3.98	0.75	57	27.21	4.10	0.54	1.36

Waist Circumference (cm)

Age Group	Nuclear Families				Extended Families				t-values
	N	Mean	S.D.	SEM	N	Mean	SD	SEM	
60-64	66	83.62	11.02	1.36	82	84.21	13.9	1.54	0.30
65-69	36	82.54	9.29	1.55	52	87.71	10.52	1.46	2.43*
70-74	39	82.05	10.89	1.74	60	83.81	10.44	1.35	0.79
75-79	29	79.09	8.65	1.61	51	83.04	10.06	1.41	1.85
80+	28	77.80	9.77	1.85	57	81.45	9.17	1.21	1.65

Hip Circumference (cm)

Age Group	Nuclear Families				Extended Families				t-values
	N	Mean	S.D.	SEM	N	Mean	SD	SEM	
60-64	66	103.27	15.47	1.90	82	101.14	12.6	1.39	0.38
65-69	36	103.38	9.81	1.64	52	103.61	12.22	1.69	0.04
70-74	39	101.95	12.78	2.05	60	98.37	13.02	1.68	0.50
75-79	29	96.87	9.42	1.75	51	97.24	14.68	2.06	0.05
80+	28	93.85	7.03	1.33	57	95.52	10.19	1.35	0.46

Calf Circumference

Age Group	Nuclear Families				Extended Families				t-values
	N	Mean	S.D.	SEM	N	Mean	SD	SEM	
60-64	66	36.02	4.07	0.50	82	34.49	5.18	0.57	2.04*
65-69	36	35.36	4.21	0.70	52	34.95	5.28	0.73	0.40
70-74	39	33.34	4.93	0.79	60	33.75	7.68	0.99	0.25
75-79	29	32.04	3.98	0.74	51	31.68	5.74	0.80	0.30
80+	28	31.11	3.47	0.66	57	30.88	4.21	0.56	0.31

a) Upper Arm Circumference

Table 2 present the mean values of upper arm circumference from age group 60-64 to 80+ years in both the women from nuclear and extended families. In females from nuclear families, the mean value is 32.08 cm at age group 60-64 years, which starts decreasing and reaches a value of 26.06 cm at the age of 80+ years. A total decrease of 6.02 cm has taken place during this period.

In females from extended families, the mean value is 30.19 cm at age group 60-64 years, slightly increasing to 30.71 cm at age group 65-69 years. After this, a gradual decline sets in which continues upto 27.21 cm at the age group 80+ years. A total decrease of 3.50 cm has taken place during this period.

It is clear that the women from extended families have more upper arm circumference at all the age groups, except 60-64 years than the women of nuclear families. The 't' values indicate that the differences in the two groups are statistically non-significant. It is also evident that there is more (6.02 cm) decrease in upper arm circumference in women of nuclear families than (3.50 cm in women of extended families).

b) Waist Circumference

Table 2 represents the mean values of waist circumference from age group 60-64 to 80+ years in both the groups from nuclear and extended families. In females from nuclear families, the mean value is 83.62 cm at age group 60-64 years, which continuously decreases upto 77.80 cm at age group 80+ years. A total decrease of 5.82 cm has taken place during this period.

In females from extended families, the mean value is 84.21 cm at age group 60-64 years, it increases to 87.71 cm at age group 65-69 years followed by a continuous decline to 84.45 cm at age group 80+ years. A total decrease of 6.26 cm has taken place during this period.

It is clear that the females from extended families possess more waist circumference at all age groups as compared to the females from nuclear families with values reaching a level of significance only at age group 65-69 years.

c) Hip Circumference

Table 2 illustrate the age changes in hip circumference from age group 60-64 to 80+ years in females from nuclear and extended families. In females from nuclear families, the average value is 103.27 cm at the age group 60-64 years. After this age group a trend of decline sets in which continues upto 80+ years attaining an average value of 93.852 cm. A total loss of 9.53 cm has taken place during this period.

In females from extended families, the maximum mean value is 103.61 cm at age group 65-69 years, but falls steadily upto 80+ years attaining an average value of 95.52 cm. The total loss of 8.09 cm has taken place during this period.

Maximum hip circumference is observed in the age group of 65-69 years in females from both nuclear and extended families. The total decrease in hip circumference is more (9.53 cm) in females from nuclear families than extended families (8.09 cm), however the differences are statistically non-significant at all age levels.

d) Calf Circumference

Table 2 present the mean values of calf circumference of females from nuclear and extended families from age group 60-64 to 80+ years. In females from nuclear families, the mean value of calf circumference is 36.02 cm at age group 60-64 years and it decreases constantly till the age group 80+ years. A total decrease of 4.91 cm has taken place during this period.

In females from extended families, the calf circumference is maximum (34.95 cm) at the age group 65-69 years, but gradually decreases to 30.88 cm at age group 80+ years. A total decrease of 4.07 cm has taken place during this period.

The mean values of calf circumference are greater in females from nuclear families except age group 70-74 years and also the total decrease in circumference is more in females of nuclear families than extended families. The differences are statistically significant only at age group 60-64 years.

2. Skinfolds

The skinfolds include Biceps, Triceps, Calf, Subscapular and Suprailiac Skinfolds.

a) Biceps Skinfold

The mean values of biceps skinfold are presented in table 3 for female from nuclear and extended families. In females from nuclear families, the mean value is 19.81 mm at age group 60-64 years, but increases to 21.14 mm at age group 65-69 years and thereafter continuously decreases upto 80+ years. A total loss of 9.6 mm is seen during this period.

Similarly, in females from extended families, the man value is 19.01 mm at age group 60-64 years, but increases to 20.60 mm at age group 65-69 years and thereafter steeply decreases upto 80+ years. A total loss of 7.89 mm is seen during this period.

The mean values for biceps skinfold are larger, in females of extended families than females of nuclear families except in age groups 60-64 and 65-69. The total loss in biceps skinfold is more in females from nuclear families (9.6 mm) than the extended families (7.89 mm). The 't' values indicate insignificant differences at all age levels.

b) Triceps Skinfold

Table 3 present the mean values of triceps skinfold of both the groups of families. In females from nuclear families, the mean value of triceps skinfold is 35.17 mm at age group 60-64 years, followed by a decline till 80+ years. A total decrement of 13.79 mm has occurred during this period.

In females from extended families, the mean value is 33.61 mm at age group 60-64 years. It slightly increases to 33.71 mm at age group 65-69 years, but thereafter, a trend of decrease sets in to 80+ years. A total decrease of 10.8 mm has occurred during this period.

Table 3: Mean and Some Other Statistical Constants of Biceps, Triceps, Calf, Subscapular and Suprailiac Skinfold (mm) of the Elderly Females from Nuclear and Extended Families.

Biceps Skinfold (mm)

Age Group	Nuclear Families				Extended Families				t-value
	N	Mean	SD	SEM	N	Mean	SD	SEM	
60-64	66	19.81	9.09	1.12	82	19.01	9.18	1.01	0.35
65-69	36	21.14	8.41	1.40	52	20.60	9.06	1.26	0.15
70-74	39	17.51	8.26	1.32	60	18.16	7.62	0.98	0.24
75-79	29	15.34	7.43	1.38	51	15.59	7.99	1.12	0.07
80+	28	11.54	7.33	1.39	57	12.76	6.38	0.84	0.84

Triceps Skinfold (mm)

Age Group	Nuclear Families				Extended Families				t-value
	N	Mean	SD	SEM	N	Mean	SD	SEM	
60-64	66	35.17	11.64	1.43	82	33.61	11.47	1.26	0.43
65-69	36	33.11	8.71	1.45	52	33.71	10.16	1.41	0.14
70-74	39	29.49	9.11	1.46	60	30.25	10.06	1.30	0.13
75-79	29	28.10	9.31	1.73	51	27.80	9.30	1.30	0.06
80+	28	21.38	8.69	1.64	57	22.91	8.97	1.19	0.37

Calf Skinfold (mm)

Age Group	Nuclear Families				Extended Families				t-value
	N	Mean	SD	SEM	N	Mean	SD	SEM	
60-64	66	37.64	15.47	1.90	82	37.57	14.89	1.64	0.02
65-69	36	43.38	14.56	2.43	52	38.24	15.22	2.11	1.62
70-74	39	34.90	14.43	2.31	60	33.81	10.15	1.31	0.41
75-79	29	33.67	15.05	2.79	51	32.05	16.03	2.25	0.45
80+	28	29.21	12.49	2.36	57	28.15	14.54	1.86	0.34

Subscapular Skinfold (mm)

Age Group	Nuclear Families				Extended Families				t-value
	N	Mean	SD	SEM	N	Mean	SD	SEM	
60-64	66	35.70	12.17	1.50	82	34.60	12.36	1.36	0.26
65-69	36	33.24	11.52	1.92	52	34.31	12.22	1.70	0.16
70-74	39	30.90	12.63	2.02	60	31.09	10.49	1.35	0.03
75-79	29	29.07	10.06	1.87	51	29.28	10.32	1.44	0.03
80+	28	23.07	9.16	1.73	57	26.51	13.91	1.84	0.54

Suprailiac Skinfold (mm)

Age Group	Nuclear Families				Extended Families				t-value
	N	Mean	SD	SEM	N	Mean	SD	SEM	
60-64	66	28.97	10.16	1.25	82	30.39	11.84	1.30	0.43
65-69	36	27.79	6.85	1.14	52	29.07	10.08	1.40	0.39
70-74	39	25.13	11.40	1.83	60	26.31	7.23	0.93	1.07
75-79	29	21.79	6.78	1.26	51	23.31	8.88	1.24	0.48
80+	28	18.32	7.84	1.48	57	19.56	10.53	1.39	0.30

The females from extended families possess slightly more triceps skinfold except in the age group 60-64 and 75-79 years than the females from nuclear families. It is also seen that the total loss in triceps skinfold is more in females from nuclear families (13.79 mm) than the extended families (10.8 mm), howe3ver the differences in the two groups are statistically non-significant at all ages.

c) Calf Skinfold

Table 3 summarize the mean values of calf skinfold of females from age group 60-64 to 80+ years of nuclear and extended families. In females of nuclear families, the mean value of calf skinfold at age group 60-64 is 37.64 mm, but it increases to 43.38 at age group 65-69 years and thereafter continuously decreases upto 80+ years. During this period, a total decreases in calf skinfold is 14.17 mm.

In females of extended families, the mean value of calf skinfold is 37.57 mm at age group 60-64 years, but

Table 4: Prevalence of Obesity Among Elderly Jat Sikh Females of Nuclear and Extended Families, According to Waist Circumference (cm)

Waist Circumference (cm) (Cut-offs)	Nuclear Families (n=198)		Extended Families (n=302)	
<80	90	45.45	96	31.78
80-88	57	28.78	95	31.45
>88	51	25.75	111	36.75

Waist Hip Ratio (WHR)

Table 5: Mean and some other statistical constants of Waist Hip Ratio (WHR) of Elderly Females of Nuclear and Extended Families.

Age Group	Nuclear Families				Extended Families				t-value
	N	Mean	S.D.	SEM	N	Mean	SD	SEM	
60-64	66	0.81	0.06	0.00	82	0.83	0.25	0.02	1.00
65-69	36	0.80	0.07	0.01	52	0.85	0.06	0.00	5.00*
70-74	39	0.80	0.04	0.00	60	0.85	0.04	0.00	0.00
75-79	29	0.82	0.05	0.00	51	0.85	0.30	0.04	0.75
80+	28	0.83	0.07	0.01	57	0.85	0.07	0.00	2.00*

increases to 38.24 mm at age group 65-69 years and thereafter continuously decreases upto 80+ years. A total decrease of 10.09 mm has taken place during this period.

The mean values for calf skifold are greater in females from nuclear families in all the age groups and the total loss in calf skinfold is also more (14.17 mm) in females from nuclear families than the females from extended families (10.09 mm). The 't' values indicate insignificant difference at all age in the two groups of females.

d) Subscapular Skinfold

Table 3 represent the mean values of subscapular skinfold of females from nuclear and extended families categorized in 5 yearly age groups from 60-64 to 80+ years. In females from nuclear families, the mean value of subscapular skinfold is 35.70 mm at age group 60-64 years. After this, there is a decrease of 12.63 mm in subscapular skinfold upto 80+ years.

Similarly in females from extended families, the mean value is 34.60 mm at age group 60-64 years. After this, there occurs a decrement of 8.09 mm in subscapular skinfold upto 80+ years.

The subscapular skinfold is larger, except in age group 60-64 years in females from extended families than the females of nuclear families. The loss in subscapular skinfold is more in females of nuclear families (12.63 mm)

than the extended families (8.09 mm). The 't' values indicate insignificant difference in the two groups of females at all age levels.

e) Suprailiac Skinfold

Table 3 present the mean values of suprailiac skinfold of Jat Sikh females from age groups 60-64 to 80+. In females of nuclear families, the mean value of suprailiac skinfold is 28.97 mm at age group 60-64 years, but afterwards, there is a tremendous decrease of 10.65 mm upto 80+ years.

In females of extended families, the mean value is 30.39 mm at age group 60-64 years, followed by a decrease of 10.83 mm upto 80+ years.

The females from extended families have larger values of suprailiac skinfold than the females of nuclear families at all the age groups, although the differences are not statistically significant.

Table 4 represent the prevalence of obesity as per waist circumference 45.45% females of nuclear and 31.78% females of extended families have waist circumference <80 cm. 28.78% females from nuclear and 31.45% of females from extended families have their waist circumference in the range of 80-88 cm. 25.75% females from nuclear and 36.75% of females from extended families and having waist circumference >88 cm.

**Table 6 : Prevalence of Obesity among Elderly Jat Sikh Females of Nuclear and Extended Families,
According to Waist Hip Ratio (WHR)**

W/H Ratio	Nuclear Families (n=198)		Extended Families (n=302)	
	Frequency	Percentage	Frequency	Percentage
Non-obese (<0.85)	147	74.24	179	59.27
Obese (>0.85)	51	25.75	123	40.75

Table 5 indicate mean values of Waist to Hip Ratio of females from nuclear and extended families from 60-64 to 80+ years. In females of nuclear families in the age group of 60-64 years, the mean value of Waist Hip Ratio is 0.81. It slightly decreases to 0.80 at the age group 65-69 and 70-74 years, but from age 75 onwards, the mean value of Waist Hip Ratio gradually increases till age 80+ years, thus marking an increase of 0.03 during this period.

In the elderly females of extended families, the mean value of Waist Hip Ratio is 0.83 at the age group 60-64, followed by increase to 0.85 in all subsequent age groups.

The mean value of Waist Hip Ratio is high in the females of extended families at all age groups, with significant differences at 65-69 and 80+ years age group.

As per WHO (2008), the women having Waist Hip Ratio more than 0.85 are considered obese. The prevalence of obesity is high (40.72%) among females of extended families than in the females of nuclear families (25.75%).

The upper arm and calf circumferences have decreased after age group 60-64 years in nuclear families and after age group 65-69 years in extended families. The decrease has been found to be more in females of nuclear families than in females of extended families. At age group 60-64, the females of nuclear families have more upper arm and calf circumferences, but in the subsequent age groups, the females of extended families have more circumferences in some age groups, but the differences are not statistically significant.

Singal and Sidhu (1984), Campbell and Borrie (1988), Kaur (1994) and Kaur (2004) have also reported a similar trend of decrease in upper arm and calf circumferences although the age and the rate of decline varies depending upon various factors like nutrition, working conditions and socio-economic level etc.

Waist circumference has started decreasing after age group 60-64 years in nuclear and 65-69 years in extended families and a total decrease of 6.26 cm in extended and 5.82 cm in nuclear families has been observed. The females from extended families possess more waist circumference at all the age groups as compared to the females from nuclear families with values reaching a level of significance at age group 65-69. Hip circumference has shown a trend of increase upto 65-69 years in both nuclear and extended families followed by a trend of decline in subsequent age groups. The total decrease in hip circumference is more (9.53 cm) in females from nuclear families than extended families (8.09 cm).

Waist circumference has been used for the diagnosis of obesity, intra-abdominal fat and metabolic syndrome by Misra et al. (2009). It is used as a measure of abdominal obesity with Asian Indian specific cut-offs. Accordingly, the females have been divided into three categories with waist circumference < 80 cm, between 80-88 cm and >88 cm (WHO, 2008). 25.75% of females from nuclear and 36.75% of females from extended families are at substantially increased risk of metabolic complications, with waist circumference of > 88 cm. 28.78% of females from nuclear and 31.45 % of females from extended families have their waist circumference in the range of 80-88 cm. These females are at an increased risk of metabolic complications.

Obesity has been shown to relate to functional disability in the elderly. In women, waist circumference has been found to be a better predictor of functional disability than BMI (Chen and Guo, 2008).

Skinfold

Skinfold thicknesses are the measures of the fatty depots of the body. The changes in skinfolds at various locations of the body reflect the pattern of change of

subcutaneous fat with age. In the present study, biceps, triceps, calf, subscapular and suprailiac skinfold have been studied.

In both the groups of females, biceps, triceps and calf skinfolds have increased upto the age group of 65-69 years and thereafter have steeply declined upto 80+ years. The total loss is more in case of females from nuclear families as compared to the females of extended families. The subscapular and suprailiac skinfolds have increased upto the age group of 60-64 years and have declined thereafter upto 80+ years.

Biceps and triceps skinfolds are lager (except age group 60-64 and 65-69 for biceps and 75-79 years for triceps) in females of extended families but the calf skinfold is greater in females from nuclear families in all the age groups. However, the differences in all the skinfolds are statistically non significant. For all the skinfolds, the total loss is more in females from nuclear families than the females from extended families.

Subscapular and suprailiac skinfolds are larger (except age group 60-64 years for subscapular) in females from extended families than the females of nuclear families, however in the two group of females the loss for subscapular skinfold is more in nuclear and for suprailiac, it is more in extended families.

Increase in the skinfold thicknesses during the middle years followed by decreases in old age has been reported by many authors, however, the age at which the decline starts differs from population to population (Singal and Sidhu, 1983; Campbell and Borrie, 1988; Ross et al. 1988; Kaur 1994 and Kaur 2004).

Skinfolds are directly related to body weight and fat deposits, as females of extended families have more body weight so they have more biceps, triceps and subscapular and suprailiac skinfolds, but calf skinfold is greater in females of nuclear families.

Waist to Hip Ratio (WHR)

Waist-hip ratio is an additional measure of body fat distribution. The ratio can be measured more precisely than skinfolds and it provides an index of both subcutaneous and intra-abdominal adipose tissue (Bjorntorp, 1987). As per WHO (2008), a WHR of 0.90 or less of men and 0.85 for

women is considered safe. A higher WHR is considered undesirable for health consequences such as heart diseases and other ailments associated with being overweight.

In the present sample, there are intermittent fluctuations in the WHR of the females of both nuclear and extended families. In females of nuclear families it ranges from 0.81 to 0.83 whereas in females of extended families it ranges from 0.83 to 0.85. Females of extended families at all the age groups have high WHR with significant differences at age groups 65-69 and 80+ years.

As per WHO classification 40.75% females of extended families and 25.75% females of nuclear families have WHR more than 0.85. Mangal et al. (2010) reported 63.5% of urban females in Jaipur are obese. Wason and Jain (2009), also found that the fat accumulation at the abdomen increases with age in the females and reported that 68.3% of females of Jodhpur city had abdominal obesity.

Using Waist Circumference and WHR in combination assists in assessing the nutritional status of elderly females and help in implementing the necessary measures to control obesity. Overweight/obesity is not a specific disease but it is the mother of important degenerative diseases. Prevention and control of this problem must therefore claim priority attention in case of elderly females.

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