PRINT: ISSN 0970-9274 ONLINE: 2456-6608
J. Hum. Ecol., 9(1) : 35-46 (1997)
DOI: 10.31901/24566608.1998/09.01.03

Normality of Ageing : A Cross-Cultural Perspective

Amrita Bagga

Department of Anthropology, University of Poona, Pune 411 007, Maharashtra, India

KEY WORDS Anthropometric Measurements. Migrants. Women. Age Changes. India.

ABSTRACT The present study was aimed at studying the pattern of age-changes in the migrant Punjabi and Sindhi women and compare them with the local Maharashtrian women having a different genetic make up and life style. The data comprised of 307 women of Pune belonging to Punjabi, Sindhi and Maharashtrian Brahmin Communities from middle class families. In all 24 anthropometric measurements were taken including the blood pressure, pulse and grip strength. The total loss in height in six decades in the local Maharashtrian women was about two and half times of that of the migrant women. Overweight status of the migrants in their corresponding control group and in the subsequent decades was maintained in all age sets. Inspite of the first increase and subsequent decrease pattern in both the groups studied, the decrease was much slower in the migrants. Same was true of the four girths and two skinfold thicknesses studied. Weight increase and general obesity among the Punjabi and Sindhi women appeared to be due to habitual excessive food intake, consumption of richer, fried and frequent non-vegetarian food, compounded by a sedentary life style. On the other hand, lesser consumption of calcium rich food such as milk and milk products by the local Maharashtrian Brahmin women may be responsible for a rapid reduction in bone mass indicated by a sharp decrease in linear measurements such as stature and sitting height.

Little attention has been paid so far to comparative studies especially of biological ageing between individuals and populations and through time. As Borkan et al. (1982) have stated it is possible that life style, including diet or genetic characters which may retard or accelerate ageing, would be revealed by such studies and thus have major public health implications. Physical anthropologists are well equipped for such kind of investigations because they are used to this kind of longitudinal and cross-sectional developmental research; and they also focus on the interaction between biological and cultural influences in development. There is a substantial need for such studies focussing upon cross-cultural variations in the ageing process. Such studies may provide evidence on how to delay deleterious changes.

After scanning through the available data it was also revealed that not much such kind of work has been published on Indian populations. What-so-ever is available is more of sociological nature. My earlier study on the aged Maharashtrian women living in the homes for the elderly was a pace setter for the present study. This time the focus was on the Sindhi and Pubjabi women who had migrated either from Pakistan at the time of partition in 1947 or much earlier to settle down here. It was felt that the ecological conditions being the same, all the differences which may be encountered could be assumed to be either due to genetic differences and / or a specific life style.

It does not need a lot of research to know that the life style, including the eating habits of these communities (Punjabis and Sindhis) are much different from the Maharashtrian Brahmin families. To the naked eye it is evident that the local Brahmin women are in general more delicately built than the migrant women. The migrant women, whether Sindhis or Punjabis look sturdier and show much more fat.

It was felt that such a study was warranted to have more insight into such bodily age changes and to have certain answers. Is it the genetics alone playing a role as the groups under study are genetically different? Or are there other reasons as well, such as life style, eating habits etc.? Life style is an important factor in such kind of studies because it can influence the patterns of morbidity and mortality, and consequently longevity.

MATERIAL AND METHODS

Field work for the present study was conducted for over 12 months from July, 1993 to June, 1994. The data comprised of a total of 307

women of Pune belonging to Punjabi, Sindhi and Maharashtrian Brahmin communities. They all came from middle class households and were above the age of 40 years, the oldest subject being 90+ years old. None of them had any major health problems. The data on the migrant group (Sindhi and Punjabi) were collected from various ladies clubs, Punjabi and Sindhi Associations including Braham Kumari's Ashram.

Data on the local women were collected simultaneously from the residential areas where the local Brahmin population is concentrated.

Since the aim was to study the 'normal' ageing process, women with any major illnesses such as cancer, tuberculosis, severe arthritis, asthma or cardio-vascular diseases, etc. were not included in the study. Care was taken not to measure women immediately after they had taken a meal. Subjects of the other castes (Marawari, Jain, Maratha, etc.) were excluded.

The anthropometric measurements taken were Weight, Height, Sitting Height, Biacromial Breadth, Tibial Length, Total Arm Span, Bicondylar Humerus and Bicondylar Femur. A few girths such as Upper Mid-Arm, Chest, Abdomen, Hip, Waist and Max. Calf were also included in the study. Four skinfolds such as Bicep, Tricep, Sub-Scapular and Dorsum of Hand were also taken. Standard anthropometric techniques as recommended by Weiner and Lourie (1969) were used to take all these measurements falling in the catagories of linear, transverse and girth measurements. The physiological parameters included were Blood pressure, Pulse rate and Muscle strength. Information regarding the general health status of the elderly women above the age of 60 years was also collected besides some socio-cultural details such as their marital and educational status etc.

The sample was grouped into six age sets, each set comprising of a decade, to isolate the changes taking place in a decade. The first age set (20-29 years) comprised of our control for all the communities, that is, the Migrant Punjabis, Sindhis and the Maharashtrian Brahmins because this is the age when complete growth has been attained and a comparative stability is maintained, before the decline starts. Remaining age sets were 40 to 49 years (Set II), 50-59 years (Set III), 60-69 years (Set IV), 70-79 years (Set V) and 80 years and above (Set VI). Efforts were made to collect atleast 30 subjects in each age set. While it was possible to do so in the Maharashtrian group, the same could not be achieved for the Punjabis and Sindhis, the data for which had to be merged after some contemplation and discussions with senior collegues in the field who felt that since these two groups had migrated from the same place (Pakistan) and had a similar life style (including food habits) as compared to Maharashtrian Brahmins, merging them should not much influence the results. The control on 50 Maharashtrian women in the age range 20-29 years was available with the researcher from an earlier study (Bagga, 1992) which was made use of. Control for migrant group was collected simultaneously.

RESULTS

As mentioned earlier, for studying the effect of age on each variable, the data was grouped into different age sets (I-VI) comprising of a decade each and recorded separately for Maharashtrian (Table 1) and Migrant Women (Table 2). Distance curves were plotted for some of the variables using mean values against their respective age-sets. Changes per decade for each paramter were studied and statistical tests applied where ever applicable. The linear regression with age for all the variables was listed in table 5 for the local as well as the migrant women.

Stature : It was seen that the total height loss in six decades in the local Maharashtrian women in the age Set-I (20-29 years) and the 80+ (age Set-VI) was about 14 cms., whereas in the migrants it was comparatively lesser (Table 1) *i.e.* 5.5 cms. in five decades.

To start with, the migrants on an average, were taller by about 1.5 cms. The decline in both the population groups was, however, gradual when studied decade wise (Fig. 1). But, rate of change (Table 6) was much more (more than double per decade) among the Maharashtrian women as compared to the Migrants. While the differences were not statistically significant in both the communities when the younger age

sets I and II were compared (Table 3 and 4), as the age increased the differences became significant and even highly significant in local women when age set I and V, and II and VI were compared (Table 4).

Some loss in stature with increasing age is expected and is attributed to the degenerative changes in the vertebral column such as compression of vertebral discs, collapse of vertebrae and kyphosis (Borkan et al., 1982). As was observed in the present study too the amount of loss in stature generally does not increase uniformly in passing from one age division to the next. A true regression of stature with increasing age was, however, indicated for both the population groups and the total loss in height in Maharashtrian Women was 9% which was two and half times of the loss in migrant women (Table 6).

Sitting Height : The Sindhi and Punjabi women in the present study, almost as a rule, were slightly taller than the local Maharashtrian Brahmin women. In both the communities a noticeable decline in sitting height began post fifties (Tables 1 and 2; Fig. 2) while there was a loss of about 6 cms among migrants between forties and seventies, no further loss in sitting height was recorded post-seventies. But in the Maharashtrian women the decline continued and it reached its peak in the last age set (80+). There the difference recorded was of about 5 cms. Rate of change per decade in sitting height

Table 1 : Anthropometric changes among Maharashtrian Brahmin women (Mean and S.D. Age Set wise)

Set	*I*		*II*		*III*		*IV*		*V*		*VI*	
Age	*(20-25)*		*(40-49)*		*(50-59)*		*(60-69)*		*(70-79)*		*(80+)*	
N	*50*		*30*		*30*		*35*		*30*		*32*	
Measurements	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Height (cms)	154.47 ± 5.38		152.36 ± 5.36		150.54 ± 4.70		149.81 ± 6.26		146.34 ± 4.93		140.49 ± 6.44	
Weight (kg)	47.62 ± 5.97		56.83 ± 9.86		58.26 ± 10.38		51.38 ± 9.49		48.17 ± 10.43		42.36 ± 10.64	
Body Mass Index (BMI)	-	-	24.39 ±3.80		25.67 ± 4.23		23.15 ± 4.27		22.44 ± 4.51		21.29 ± 4.58	
Sitting Height	81.13 ± 2.53		81.12 ± 3.18		79.52 ± 3.06		78.85 ± 4.95		76.30 ± 5.19		71.39 ± 4.24	
Biacromial Breadth	33.85 ± 1.97		34.16 ± 1.86		33.82 ± 1.40		33.34 ± 1.24		33.66 ± 1.01		31.68 ± 1.82	
Bi-iliac Breadth	24.96 ± 1.35		28.64 ± 1.91		29.14 ± 1.87		28.48 ± 1.66		28.44 ± 2.91		28.77 ± 1.91	
Girths												
Chest	75.19 ± 4.40		90.3 ± 8.00		91.87 ± 7.21		87.76 ± 9.37		86.43 ± 9.17		85.29 ± 8.25	
Abdomen	61.51 ± 6.19		80.53 ± 7.86		82.98 ± 9.38		79.83 ± 9.79		78.97 ± 10.00		80.73 ± 10.68	
Waist	-	-	80.65 ± 7.56		81.44 ± 6.95		76.9 ± 9.03		78.27 ± 10.62		80.13 ± 7.29	
Hip	-	-	99.1 ± 7.05		101.92 ± 9.16		96.49 ± 8.91		93.78 ± 9.90		91.69 ± 10.83	
Upper arm circumferences	22.09 ± 2.17		26.93 ± 3.15		27.48 ± 2.74		27.21 ± 4.99		25.35 ± 3.69		23.39 ± 3.65	
Maximum calf circumferences	29.13 ± 2.48		33.87 ± 4.61		33.47 ± 3.11		32.11 ± 3.71		30.03 ± 4.46		28.09 ± 3.76	
Bicondylar humerus	5.99 ± 0.40		6.33 ± 0.61		6.51 ± 0.62		6.34 ± 0.89		6.28 ± 0.46		6.21 ± 2.45	
Bicondylar femur	8.14 ± 3.72		8.65 ± 0.56		8.84 ± 0.77		8.69 ± 1.83		8.72 ± 0.74		8.66 ± 0.76	
Skinfold Measurements												
Bicep	8.69 ± 3.72		10.42 ± 4.05		9.31 ± 2.71		8.00 ± 3.73		6.87 ± 3.90		5.63 ± 2.44	
Tricept	16.33 ± 4.91		19.96 ± 5.56		17.98 ± 5.64		16.41 ± 5.90		15.3 ± 6.34		10.94 ± 5.23	
Subscapular	-	-	23.8 ± 5.95		25.56 ± 6.75		22.63 ± 6.92		21.27 ± 8.14		15.89 ± 7.35	
Physiological Parameters												
Systolic B.P.	108.12 ± 13.37		126.27 ± 13.39		124.6 ± 11.96		140.11 ± 16.37		134.13 ± 21.55		135.81 ± 15.93	
Diastolic B.P.	64.49 ± 7.97		81.2 ± 9.74		80.6 ± 6.76		85.43 ± 12.14		83.4 ± 15.96		83.38 ± 9.32	
Pulse Rate	79.31 ± 10.37		81.8 ± 10.25		75.8 ± 10.78		79.94 ± 11.17		76.47 ± 11.83		80.00 ± 11.18	
Muscle Strength												
Right Hand	-	-	18.33 ± 4.62		17.43 ± 4.57		16.14 ± 4.45		13.13 ± 3.58		8.81 ± 4.28	
Left Hand	-	-	17.63 ± 4.35		16.23 ± 4.81		14.97 ± 4.31		13.17 ± 3.24		8.47 ± 3.72	
Average	-	-	17.98 ± 4.49		16.83 ± 4.69		15.56 ± 4.38		13.15 ± 3.41		8.64 ± 3.99	

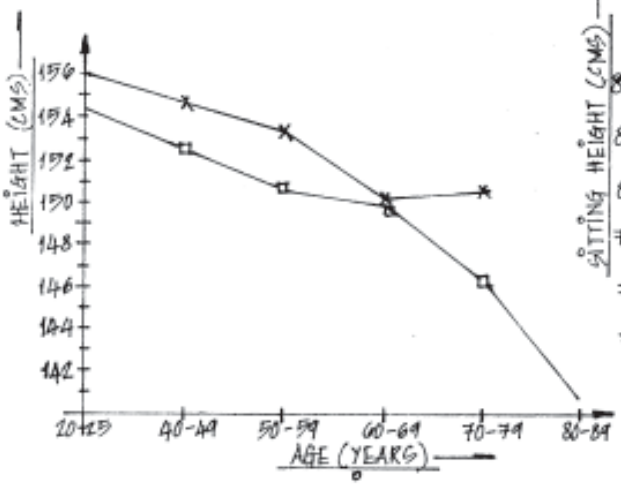

Fig. 1. Height

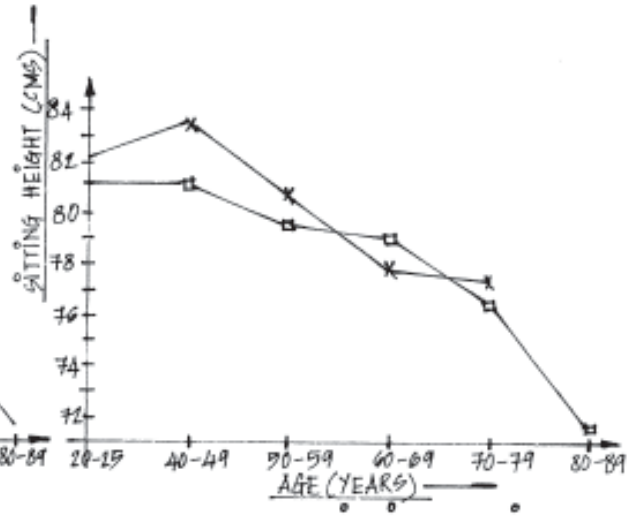

Fig. 2. Sitting height

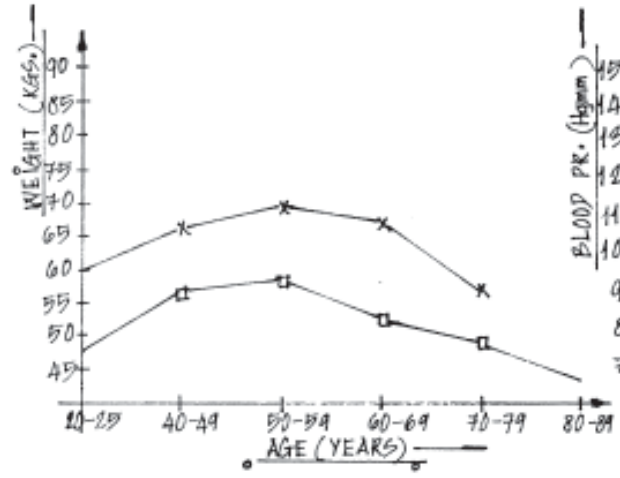

Fig. 3. Weight

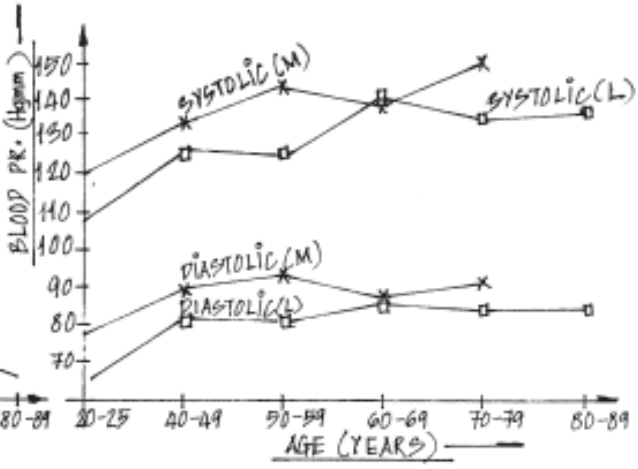

Fig. 4. Blood pressure

Distance curves for some variables in Local Maharashtrian Brahmin (L) and Migrant (M) Women

Legend = □ - Local women x - Migrant women

of the local women was one and a half times of that of the migrants and the total loss was 12% for local as compared to only 6% of the migrants (Table 6).

This loss in sitting height was statistically significant in the initial three decades in both the communities (Tables 3,4). It becomes statistically highly significant among the local women when Ist and IInd age sets were compared with the oldest age set VI (Table 3). Thus the negative co-relation of sitting height with age was clearly marked.

Body Weight : Comparison of the body weights of the migrant Punjabi and Sindhi women with those of the local women, showed that the former were heavier in built in all the age groups (Tables 1 and 2). The difference, which was 12 kg in the youngest group, was maintained more or less till seventh decade. The weight in both the communities decreased with age to a certain extent as reported in many other populations (Boutlier and Parot, 1962;

Table 2 : Anthropometric changes among Migrants (Punjabi + Sindhi) women (Mean and S.D. Age Set wise)

Set	*I*	*Ia*	*II*	*III*	*IV*	*V*	*VI*
Age	*(20-25)*	*(30-39)*	*(40-49)*	*(50-59)*	*(60-69)*	*(70-79)*	*(80+)*
N	*50*	*30*	*30*	*35*	*30*	*32*	
Measurements	*Mean S.D.*	*Mean S.D.*	*Mean S.D.*	*Mean S.D.*	*Mean S.D.*	*Mean S.D.*	*Mean*
Height	156.00 ± 6.99	155.55 ± 6.51	154.70 ± 4.68	153.3 ± 7.23	150.12 ± 4.79	150.52 ± 7.49	144.7
Weight	59. 68 ± 11.17	66.90 ± 13.03	66.04 ± 10.53	69.23 ± 14.08	66.86 ± 9.82	55.43 ± 9.38	42.00
BMI	24.38 ± 59.62	27.36 ± 44.28	27.60 ± 22.99	29.51 ± 54.00	25.83 ± 42.05	26.15 ± 53.66	20.05
Sitting Ht.	82.16 ± 3.67	82.51 ± 3.09	83.50 ± 6.43	80.6 ± 5.22	77.74 ± 1.88	77.13 ± 5.30	73.50
Iliac Ht.	92.84 ± 4.70	90.84 ± 3.07	89.34 ± 4.63	88.64 ± 4.174	88.72 ± 7.65	87.92 ± 6.32	89.90
Tibial length	42.34 ± 3.76	44.72 ± 2.58	41.3 ± 5.07	43 ± 2.82	43.15 ± 2.09	43.22 ± 3.13	38.90
Foot Ht.	7.01 ± 1.09	7.10 ± 0.54	7.1 ± 1.10	7.04 ± 1.05	06.74 ± 0.79	06.95 ± 0.64	7.10
Act. Tib. Lt.	35.03 ± 3.16	37.21 ± 3.03	34.29 ± 4.74	35.87 ± 2.69	36.19 ± 1.77	36.28 ± 3.06	31.30
Arm Span	156.92 ± 7.38	157.29 ± 7.68	156.04 ± 6.14	155.75 ± 7.53	153.65 ± 6.19	156.91 ± 8.74	142.50
Biacro. Breadth	35.65 ± 1.73	35.97 ± 1.63	35.58 ± 1.85	35.51 ± 1.57	34.20 ± 2.21	34.45 ± 1.44	30.50
Act. Arm. Lt.	61.30 ± 3.04	60.64 ± 3.59	60.22 ± 3.01	60.28 ± 3.26	59.02 ± 2.5	61.22 ± 4.41	56.00
Bi-iliac Bt.	30.72 ± 3.04	30.60 ± 2.68	30.69 ± 2.17	30.73 ± 3.85	30.04 ± 3.01	29.42 ± 2.67	25.60
Bicondyl Hum.	6.50 ± 0.58	6.79 ± 0.49	7.07 ± 0.60	7.1 ± 0.68	06.59 ± 0.58	06.56 ± 0.42	25.30
Bicondyl Fem.	8.81 ± 0.85	9.24 ± 0.81	9.17 ± 1.09	9.47 ± 1.33	09.17 ± 0.608	09.73 ± 1.02	08.60
Girths							
Chest	89.36 ± 6.74	95.30 ± 8.33	95.21 ± 6.61	97.59 ± 9.11	92.84 ± 6.75	94.3 ± 8.51	88.00
Abdomen	87.82 ± 10.09	93.90 ± 10.17	94.73 ± 8.71	92.41 ± 13.25	94.52 ± 10.22	98.75 ± 10.08	-
Waist	74.91 ± 8.41	79.80 ± 8.95	83.56 ± 12.02	86.88 ± 10.98	81.58 ± 8.58	87.03 ± 9.62	81.00
Hip	96.37 ± 10.67	103.80 ± 13.00	101.43 ± 12.13	107.91 ± 11.25	96.26 ± 15.07	103.71 ± 9.67	-
Upper arm	23.64 ± 4.66	27.70 ± 2.06	28.04 ± 3.03	29.12 ± 4.35	26.39 ± 2.33	26.66 ± 2.53	21.00
Forearm	15.73 ± 4.55	15.00 ± 0.94	15.04 ± 0.75	15.90 ± 1.39	14.81 ± 0.77	14.63 ± 0.77	14.00
Max Calf	30.64 ± 5.26	34.75 ± 2.94	34.37 ± 5.07	33.67 ± 4.15	31.42 ± 4.18	33.53 ± 3.84	27.00
Ankle	20.40 ± 1.59	20.3 ± 1.36	20.5 ± 1.65	20.761 ± 0.66	21.07 ± 4.831	19.93 ± 2.09	19.00
Skinfolds							
Dorsum of hand	2.70 ± 0.48	2.42 ± 1.07	2.4 ± 0.517	2.36 ± 0.77	2.06 ± 0.58	02.09 ± 0.47	1.800
Bicep (mm)	20.64 ± 9.99	18.60 ± 7.37	17.74 ± 7.12	22.61 ± 9.97	20.05 ± 9.15	19.00 ± 7.83	6.00
Tricep (mm)	16.00 ± 7.28	23.70 ± 6.60	22.05 ± 5.50	21.70 ± 7.93	17.00 ± 6.83	20.23 ± 7.69	11.000
Subscapular	24.20 ± 14.06	27.90 ± 6.10	30.25 ± 6.82	28.911 ± 8.19	23.88 ± 6.46	26.28 ± 8.75	25.00
Physiological							
Pulse	71.73 ± 3.73	74.60 ± 6.66	72.74 ± 7.95	70.93 ± 5.85	73.47 ± 10.4	70.4 ± 7.06	90.00
B.P. Diastolic	77.09 ± 10.82	81.00 ± 11.00	88.91 ± 11.29	92.94 ± 10.47	86.88 ± 11.08	90.66 ± 12.79	80.00
B.P. Systolic	120.20 ± 8.31	120.00 ± 11.54	133.70 ± 19.06	143.17 ± 18.87	138.15 ± 19.23	149.33 ± 18.31	140.00
Muscle Strength							
Rt. Hand	21.14 ± 5.24	- -	18.00 ± 3.39	18.33 ± 1.15	12.57 ± 1.90	11.54 ± 3.93	-
Lt Hand	19.28 ± 4.43	- -	15.80 ± 3.19	15.00 ± 5.00	10.71 ± 4.46	09.81 ± 4.76	-
Average	20.29 ± 5.00	- -	16.90 ± 3.29	16.66 ± 3.01	11.64 ± 2.53	10.68 ± 4.07	-

Wyndham et al., 1970) but the rate was slower among the migrants (Fig. 3).

While the decline in weight in the Maharashtrian women was about 1 kg per decade, it was more haphazard in case of the migrants, the range being anywhere from 3 kgs to 9 kgs. The minimum loss of 3 kgs was observed between the age sets 50-59 and 60-69 years. In fact the maximum loss of weight of 7 kg in the Maharashtrian group was in the same age sets. The loss of weight continued till the nineties when it was about 6 kg among the Maharashtrian women. Similar trend was seen among the migrant women but the values remain higher in their case as compared to the Maharashtrian group.

Statistical tests revealed significant and highly significant 't' values (Tables 3 and 4) when younger age sets were compared with older age sets. This was true for local as well as migrants. Migrant women showed highly significant values (Tables 3 and 4).

Girths : In all the six body girths studied, there was a general trend of a sharp increase in the girths upto the age of 50 years. It was followed by a gradual decrease in all of them in the subsequent decades. In a span of two decades, the increase in chest girth of local women was about 15 cm whereas in the migrant women it was less than half *i.e.* 6 cm. But the migrant women at the outright (in the youngest age set) showed a 14 cm difference from the local women. The decrease was about 4 to 5 cm between the sixth and seventh decade when it declined to about one and a half centimeter per decade in both the groups (Tables 1 and 2).

In the youngest age set (20-29) a difference of about 26 cms between the abdominal girths of local and the migrant women was recorded. The gain in abdominal girth by the time the migrant women reached their fifth decade was about 7 cm, while the local group in general showed lesser abdominal girth in the younger group but the increase was sharp. In this case it was of 19 cm. Overall, their (local group) total gain was lesser when compared with the migrant women. In both cases the gradual reduction of about 2.4 cm was recorded in the next decade. Increase in the circumference of abdomen was explained partly by enhanced deposition of fat, but it was also suggested by Parizkova and Eiselt (1966) that it could be due to increased relaxation of abdominal muscles, especially in the seventh decade when there was a decrease in body fat.

Similar trend of first increase and then decrease in the waist and hip girths was seen in both the communities with the migrant women showing increase for both these measurements

Table 3: 't' values for various parameters (Maharashtrian Women)

Parameters	*Age Sets*	*'t' Value*	*Remarks*
Height	I-III	-3.4228	Significant
	I-IV	-3.5757	Significant
	I-V	-6.9010	Highly Significant
	I-VI	-10.2166	Highly Significant
	II-VI	-7.9106	Highly Significant
Weight	I-II	4.6317	Significant
	I-III	5.1307	Highly Significant
	I-VI	-2.5510	Significant
	I-VI	-5.5571	Highly Significant
Sitting height	I-III	-2.4330	Significant
vertex	I-IV	-2.5018	Significant
	I-V	-4.7714	Significant
	I-VI	-11.7248	Highly Significant
	II-VI	-10.2589	Highly Significant
Chest	I-II	9.5145	Highly Significant
	I-III	11.4622	Highly Significant
	I-IV	7.3837	Highly Significant
	I-V	6.2924	Highly Significant
	I-VI	6.3020	Highly Significant
	II-VI	2.4758	Significant
Waist	I-II	11.3194	Highly Significant
	I-III	11.1642	Highly Significant
	I-IV	9.7851	Highly Significant
	I-V	8.6193	Highly Significant
	I-VI	9.2394	Highly Significant
Hip	II-VI	3.2126	Significant
Tricep	I-II	2.9497	Significant
	I-VI	-4.6625	Highly Significant
	II-VI	-6.5695	Highly Significant
Blood pressure	I-II	5.8728	Significant
Systole	I-III	5.7063	Significant
	I-IV	9.5453	Highly Significant
	I-V	5.9586	Significant
	I-VI	8.1635	Highly Significant
	II-VI	2.452	Significant
Diastole	I-II	8.2232	Highly Significant
	I-III	9.6915	Highly Significant
	I-IV	6.6012	Highly Significant
	I-V	6.052	Highly Significant
	I-VI	9.4464	Highly Significant

in the eighth decade (70-79 years) just like for the abdominal girth.

Mid-arm circumference showed a difference of about 1.5 cm between the two groups whle it was 7.5 cm for maximum calf girths. Increase was more in the local women and by the time these women reached in their fifties, there was a partial levelling-off of differences. The gradual reduction was visible in the next decade for both groups but an increase was noticed in both variables, among the migrant group at the age of 70-79 years. Same trend was observed for the other girths among the migrants also.

This general reduction in girths after middle years may be attributed to a loss of subcutaneous fat, muscle and partially due to a decrease in the cortical diameter of bones, the last one being in the case of upper arm circumference and calf girth. A positive co-relation of all these body girths with increasing age were clearly indicated in both population groups (Tables 3 and 4).

Table 4: Significant 't' values for some anthropometric and physiological parameters in the migrant (Sindhi + Punjabi) women

Parameters	*Age Sets*	*'t' Value*	*Remarks*
Height	I & IV	2.3647	Significant
Weight	II & V	3.2766	Significant
Sitting height	I & IV	3.7131	Significant
	I & V	2.2855	Significant
	II & V	2.3054	Significant
Bicondylar Humerus	I & II	2.7392	Significant
	I & III	2.5701	Significant
Bidondylar Femur	I & V	2.5506	Significant
Chest girth	I & II	2.3995	Significant
	I & III	2.7425	Significant
Abdomen girth	I & V	2.6873	Significant
Waist girth	I & II	2.4511	Significant
	I & III	3.2545	Significant
	I & V	3.4141	Significant
Hip girth	I & III	2.7336	Significant
Diastolic B.P.	I & II	2.7119	Significant
	I & II	3.8353	Significant
	I & IV	2.3654	Significant
	I & V	2.9254	Significant
Systolic B.P.	I & II	2.9161	Significant
	I & III	4.4173	Highly Significant
	I & IV	3.5471	Significant
	I & V	5.4401	Highly Significant
	II & V	2.5587	Significant
Grip strength Right hand	I & VI	5.2337	Highly Significant
	I & V	5.1193	Highly Significant
	II & V	7.9018	Highly Significant
Grip strength Left hand	I & IV	4.1130	Highly Significant
	I & V	5.2274	Highly Significant
	II & V	2.8752	Significant

Skinfolds : The skinfold thicknesses at four sites *e.g.* at biceps, at triceps, in the subscapular region and at the dorsum of the hand showed first increase and then a gradual and a continuous decrease in the values from the fifth decade (age set II) onwards for all the skin folds in the migrant and the local population (Tables 1 and 2). The difference between the local and migrant women in the youngest age set was about 12 cm for biceps but almost negligible for triceps. The bicep values remained very high (more than double) among the migrants for all age sets while tricep values were only slightly higher. Migrant women showed higher values for subscapular fold also and the differences became statistically highly significant when the younger age set was compared with the oldest (Tables 3 and 4).

Biacromial and Bi-iliac Breadths: There was no difference in biacromial breadths of the local and migrant women but for bi-iliac breadths, the migrant Sindhi and Punjabi women showed, on an average, a higher value for all age set. In other words it can be said that though the local women were as broad as the migrants for shoulder breadth, the migrant women have more broad pelvic region. None of these measurements showed any significant change with increase in age.

Bicondylar Humerus and Bicondylar Femur: There was only a negligible change in the absolute values of these two measurements in the local as well as the migrant groups (Tables 1 and 2). The differences were statistically non-significant. However, a 3.6% increase in the bicondylar humerus in the Maharashtrian (as compared to 0.92% in the migrant women) and a 10.4% increase in the bicondylar femur in the migrant women (as compared to 6.4% in local) in their total life span was recorded (Table 6).

Grip Strength : As expected, past adulthood, the grip strength showed a steady decline with increasing age. The grip strength recorded for

Table 5 : The regression coefficient with age, of the migrant (Sindhi + Punjabi) and the local Maharashtrian Brahmin Women for some anthropometric and physiological variables

Measurement	*Regression co-efficient with std. Dev.*	
	Migrant	*Local*
Stature	-0.1272 ± 0.03	-0.2075 ± 0.04
Weight	-0.1287 ± 0.35	-0.1035 ± 0.12
BMI	+0.0312 ± 0.05	+0.0091
Sitting height	-0.1212 ± 0.04	-0.1453 ± 0.04
Biacromial breadth	-0.0293 ± 0.01	-0.0284 ± 0.01
Bi-iliac breadth	-0.0245 ± 0.01	+0.0514 ± 0.02
Bicondylar humerus	-0.0002 ± 0.009	+0.0030 ± 0.003
Bicondylar femur	+0.0159 ± 0.005	+0.0077 ± 0.003
Girths		
Chest	+0.0866 ± 0.07	+0.1230 ±0.92
Abdominal	+0.1846 ± 0.05	+0.2514 ± 0.12
Waist	+0.2114 ± 0.09	-0.0417
Hip	+0.1054 ± 0.14	-0.2247 ± 0.07
Upper Arm	+0.0543 ± 0.55	+0.0194 ± 0.05
Max. calf	+0.0349 ± 0.04	+0.0570 ± 0.08
Skinfolds		
Biceps	-0.0083 ± 0.05	-0.0585 ± 0.02
Triceps	+0.0494 ± 0.08	-0.0882 ± 0.05
Subscapular	+0.0046 ± 0.08	-0.1977 ± 0.07
Systolic B.P.	+0.5518 ± 0.11	+0.4590 ± 0.12
Diastolic B.P.	+0.2487 ± 0.12	+0.2894 ± 0.09
Pulse Rate	-0.0133 ± 0.04	-0.0208 ± 0.05
Rt. hand strength	-0.1998 ± 0.05	-0.2129 ± 0.05
Lt. hand strength	-0.1984 ± 0.03	-0.2222 ± 0.04

both the groups was more for the right hands in the youngest age group and difference minimized by the time the women reached their middle age *i.e.* 40-49 years (Tables 1 and 2). The decline in strength was sharp between 6th and 7th decades among the migrants for right as well as left hand. It was more gradual for the local women. All the differences for the left hand grip strength were statistically significant, and for right hand they were highly significant when the younger women (20-29 years) were compared with the older women in subsequent decades (Tables 3 and 4). It was uniformly true for Maharashtrian as well as the migrant women. The total loss in grip strength in Maharashtrian women was more than 50% for both the hands and for migrants it was 45% for right hand and 49% for the left hand (Table 6).

The muscle strength is thus negatively co-related with age with the regression analysis being also highly significant (Table 5). This reflects the well known phenomenon of failing health and muscular strength with increasing age. Among the local women, having lesser body weight and less body girths the regression is more as compared to Punjabi and Sindhi women having better attributes in terms of weight, girths etc.

Table 6: Rate of change and per cent change in some anthropometric measurements in elderly women

Measurement	*Maharashtrian women (40-80 yrs)*		*Migrant women (30-70 yrs)*	
	Rate of change per decade	*% change*	*Rate of change per decade*	*% change*
Height	-2.34cm	-9.06%	-1.1cm	-3.51%
Sitting height	-1.62cm	-12.00%	-1.00 cm	-6.12%
Bicondyl hum.	+0.36mm	+3.6%	+0.12mm	+0.92%
Bicondyl fem.	+0.86mm	+6.39%	1.84mm	+10.44%
Grip strength (Rt. hand)	-2.30	-51.96%	-1.92	-45.41%
Grip strength (Lt. hand)	-2.33	-52.83%	-1.90	-48.80%
B.P. systolic	+4.61	+25.62%	+5.83	+24.23%
B.P. diastolic	+3.15	+29.29%	+2.71	+17.60%

Blood Pressure : There was, in general, a higher value (12-13 points) for the systolic as well as diastolic blood pressure among the migrant control (20-29 years) as compared to that of the Maharashtrian women of the same age set. The values remained higher than that of the local for all the subsequent age sets. However, the readings were within the normal range whch was 120 to 150 (Tables 1 and 2) for migrants, and 100 to 135 for locals for systolic B.P. For diastolic B.P. the range was 77 to 90.6 for migrants and 64.5 to 83 for locals. The highest reading for systolic B.P. among the migrants was in the 70-79 years age set and for locals it was recorded a decade earlier *i.e.* in 60-69 age set (Fig. 4). All the values for systolic as well as diastolic B.P. of older age sets were statisticaly significant, when compared with the younger sets of the locals as well as the migrants. In fact systolic blood pressure showed highly significant values when age set 20-29 was compared with age sets 40-49 and 60-69 of migrants (Tables 3 and 4). Among locals all the comparisions showed highly significant values for systolic B.P. Thus the present study corroborates the earlier such studies that there is a gen-

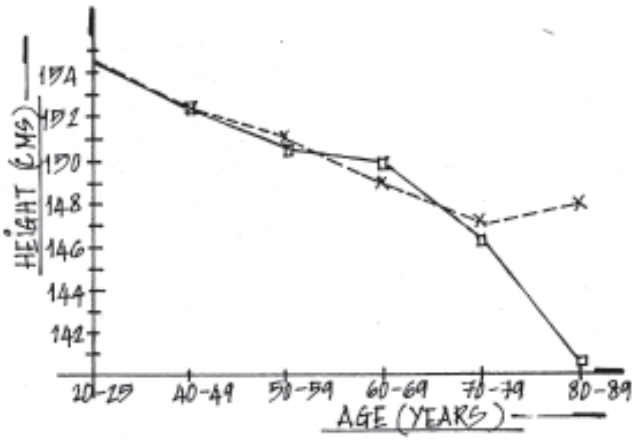

Fig. 5. Heights of Maharashtrian women in two studies

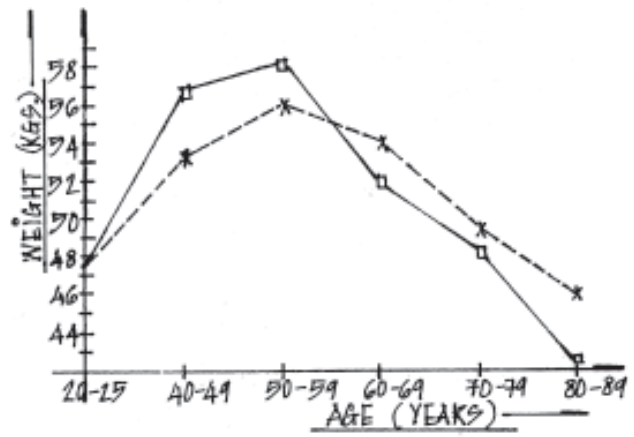

Fig. 6. Weights of Maharashtrian women in two studies

Legend **= —□— Present study, -- x --- Previous study**

eral increase in the systolic blood pressure with increasing age (Gordon, 1964; Robert and Maurer, 1977; Bagga, 1994).

Thus a strong positive co-relation of systolic blood pressure (0.820) with age and a less strong co-relation of diastolic blood pressure (0.239) was seen in the migrant women. Both, systolic as well as diastolic B.P. showed high positive co-relation (Syst. 0.885; and Diast. 0.832).

The liner regression co-efficients were also significant (Table 5) especially for systolic blood pressure which was as high as 0.5518 for migrants as compared to 0.4590 for locals. For diastolic the values for migrants and local were 0.2487 and 0.2489 respectively, it being higher for the Maharashtrian women.

Pulse : Pulse rate was minimum in the age set 20-29 and insignificant fluctuations were observed from one age set to the next (Tables 1 and 2). However, the pulse rate of the local control (20-29) was found to be higher by 8 points than the migrants and the higher reading was maintained in all age sets.

DISCUSSION

It was a general observation that the migrant Sindhi and Punjabi women were, in general taller and heftier having more height, sitting height, and weight. Their body girths were also more than those of the local Maharashtrian women except the biacromial girth which was almost equal.

Individual parameters indicated a much greater loss (two and a half times) of height among the local Maharashtrian women as compared to that of the migrants. While the difference, at the start, was of only 1.5 cm the loss was much greater which can't be accounted for by the initial differences in heights.

In an earlier such cross-sectional study conducted on Maharashtrian women (Bagga, 1992 press), the decline in stature was more gradual (Fig. 5). Both the samples were drawn from the same community and the same caste group, having similar life style including food habits. The earlier study was conducted in 1987 and the present data collection was done in 1994. For the 1st study data were collected by the researcher herself while for the later study, two trainee field assistants were employed who worked under the researcher's supervision. Similar guidelines and same proforma was used for data collection.

Almost exact rate of change was recorded for sitting height also for the Maharashtrian women in the present study (and the earlier sample mentioned above), which was statistically highly significant and more than that of the migrant women. Percent change per decade in sitting height in the Maharashtrian women in an earlier study mentioned above (Bagga, 1992) was almost three times that of their western counterparts.

The degenerative changes in the vertebral column play a crucial role in the reduction of height as well as sitting height. It is felt that life style is instrumental in the speed of such deteriorative changes.

The ageing effect on weight observed in the literature is difficult to interpret. In good environmental conditions, in western populations, for example, longitudinal data showed an increase in the beginning of adulthood, but a decrease after 60 years (Susanne, 1977; Parizkova and Eislet, 1971, 1980) In cross-sectional studies (Parot, 1959; Master et al., 1959; Bourliers 1963; Norris et al., 1963) the same trend was observed. However in bad nutritional conditions, a decrease of weight is inevitable. In the present study the migrant women were, in general, overweight in all age sets. The differences in weights between the two study groups at the same age also increased upto a maximum of 15 kg in 7th decade (Fig. 3).

The gain in weight in middle age and subsequent decline among Maharashtrian women was more gradual in an earlier such study conducted on the Maharashtrian Brahmin women living in the homes for the elderly (Bagga, 1992). Weight-values for fifth and sixth decade were lower than the present local women (Fig. 6). This may be attributed partly to their physical or / and economic inability to procure and consume sufficient food between the two sparse meals provided in such institutes. Women living with their families generally do not have any such limitations. Interestingly, the institutionalised women maintained better weight post-

sixties right into eighties.

As a consequence of increased weight of the migrant women in all the age groups, not surprising all the four transverse girths studied also showed increased values.

The same was true of the skinfold thicknesses. Just like body weight and girths, here too the migrant young women showed higher values and the difference was maximum (12 cm) for the bicep skinfold.

High values for all these fat related measurements (body weight, body girths and skinfolds) among the Punjabi and Sindhi women reflects their life styles.

Since height and weight are polygenic characters determined by genetic and environmental factors, both are assumed to be involved in the differences observed between the migrant and the local women. But weight is a variable known to be more influenced by environmental factors than any other variable such as height, biacromial breadth etc.

Obesity thus is largely of exogenous origin related to excess food intake, alone or coupled with a sedentary life style, and lower output in terms of energy utilization.

Eating habits and diet patterns have changed considerably over a rather short period of about half a century and so the physical activity pattern. Green and White revolutions have resulted in a larger consumption of refined sugars and dairy products carrying a higher incidence of obesity and diseases. The diet-diseases relationship specialy appears relevant to coronary artery disease, hypertension, Non-Insulin Dependent Diabetes Mellitus (Type II), and some forms of cancer (Wasir, 1995).

Sindhis are highly influenced by Western cultures and are knwon to be one of the fastest changing community whether it is the language, dress pattern, inter caste marriage or eating habits (Bagga, 1987). So are the Punjabis though to a lesser extent. As it is and is well known that Punjabis really are concerned about what they eat. They actually are known to love their food (Singh K., 1984). But not so the Maharashtrians who adhere to their culture (and food habits) much more strongly. Affluence has brought along the purchasing power for the spend-thrift (like Punjabis and Sindhis), to acquire all labour saving devices resulting in a more comfortable life-style. It has worked in two ways. Freedom from rigours of intense physical activity on one hand; and more rich, high calorie food on the other hand, which is unfortunatey compounded by a sedentary life-style.

Perhaps after going through the strains of starting from scratch due to displacement and disruption, struggle and starvation following partition, finally if affluence has come such behavioural changes are not surprising.

Since, the present study concerned the normal ageing process, no data on the morbidity and mortality was collected which, it is now felt, needs to be studied in depth. Not surprising that getting data on 70+ and 80+ Sindhi and Punjabi women was extremely slow in coming. Frankly speaking there were not many older women of these communities around, only one subject in 80+, who did not have any major illness could be measured. No such problem was encountered for collecting data on the older healthier Maharashtrian women where we could easily get more than the desired data even in the oldest age set.

Normally one does not come across an overweight Maharashtrian Brahmin male or a female. They seem to age gracefully. The expected changes with age and the health survey seem to indicate that in them the longevity should be better than in the people of North India.

They are the opposites of some affluent western societies where there is a mindless munching of crackers, consumption of chocolates and soft drinks. Limited amount of butter and butter milk and groundnut and coconut is used in cooking. Groundnuts take care of their protein requirements and coconut, of the calcium to a limited extent. Consumption of sprouts also is more or less regular. A few drops of pure ghee used raw (which is ideal, as per National Institute of Nutrition) is just sufficient to meet their daily requirement. This community does not believe in between - meal snacking. They have a more or less regular pattern of eating. Normally in a small city like Pune, a common Maharashtrian man prefers to have a meal around late morning and then early in the evening. In between stray small cup of tea and one or two biscuits are the routine. Nutritional-

ly speaking their diet is deficient in two aspects: fruit consumption and milk consumption. Consumption of milk products is quite low which should be a matter of concern.

Despite the above it is felt that in India, the Maharashtrian population is better suited for studying the normative age changes. Majority seem to consume just sufficient number of calories. No wonder we find more of them in older age brackets (Bagga, 1993). Sufficient evidence is now available linking lesser calorie intake and longevity (McCay and Crowell, 1934; Berg, 1960; Berg and Simms, 1960). Conversely, excess calorie intake and higher morbidity is also well documented (WHO, 1990: Wasir, 1995).

Physical changes during the ageing process in people of different genetic make up, different life style including food habits, exposed to similar environmental conditions provides an unusual opportunity to examine such changes. Such studies will be more meaningful if conducted after a few generations when the migrant populations have had sufficient time to adjust to the changed ecological and environmental conditions.

ACKNOWLEDGEMENT

The financial assistance from University Grant's Commission is gratefully acknowledged.

REFERENCES

Bagga, Amrita : Health status of women in old age homes. *Agening and Society*, **4**: 11-21 (1994).

Bagga, Amrita : Migrant communities of Pune : Sindhi, Punjabi and Sikhs. Anthropological Survey of India Report (Unpublished) (1989).

Bagga, Amrita : Women and ageing : An anthropometric study (In Press). Paper presented at the *24th Triennial Conference of International Federation of University of Women* held at Stanford University, California, U.S.A. August, 1992 (1992).

Bagga, Amrita : A study of women in old-age homes of Pune. Aging and society. *Ind. J. Gerontology*, **3**: 17-27 (1993).

Bagga, Amrita : Older women in India. In : *Women's Voice and Feminism*. R.K. Dhawan (Ed.). *In Press* (1995).

Berg, B.N. : Nutrition and longevity in the rat. I. Food intake relative to size, health, and fertility, *J. Nutr.*, **71**: 242-254 (1960).

Berg, B.N. and Simms, H.S. : Nutrition and longevity in rat. II. Longevity and onset of disease with different levels of food intake. *J. Nutr.*, **71**: 255-263 (1960).

Borkan, G.A., Hults, D.E. and Mayer, P.J. : Physical anthropological approaches to ageing. *Year book of Physical Anthropology*, **25**: 181-202 (1982).

Bourliere, F. and Parot S. : Le Vieillissement de deux populations blanches vivant dans les conditions ecologiques tres differentes, etud comparativ, *Rev. Fr. Etud. Clin. Biol.*, **7**: 629-635 (1962).

Bourliere, F. : The assessment of biological age in man. *Public Health Papers, No. 37*, WHO Geneva (1970).

Gordan, T. : Blood pressure of adults by age and sex, National Centre for Health Statistics, *PHS Publication 100 Series*, **11** (1964).

McCay, C.M. and Crowell, M.F. : Prolonging the life span. *Sci. Mon.*, **39**: 405-416 (1934).

Master, A.M., Lasser, R.P. and Bechmann, G. : Analysis of weight and height of apparently healthy population aged 64 to 94 years. *Proc. Soc. Biol. Med.*, 102-367 (1959).

Norris, A.H., Lundy, T. and Shock, N.W. : Trends in selected indices of body composition in men between the age of 30 and 80 years. *Ann. N.Y. Acad. Sci.*, **110**: 623-639 (1963).

Parizkova, J. : *Body Fat and Physical Fitness*. Martinus Nijhoff B.V., Medical Division, The Hague (1977).

Parizkova, J. and Eiselt, E. : Longitudinal study of changes in anthropometric indicators and body composition in old men of various physical activities. *Hum. Biol.*, **38**: 351-363 (1966).

Parizkova, J. and Eiselt, E. : A further study of changes in somatic characteristics and body composition of old men followed longitudinally for 8-10 year. *Hum. Biol.*, **43** : 318-326 (1971).

Parizkova, J. and Eiselt, E. : Longitudinal changes in body build and skinfolds in a group of old men over a 16 year period. *Hum. Biol.*, **52**: 803-809 (1980).

Parot, S. : Les Variation de points lices a l'age : etude transversale a taille constante. *Rev. Soc. biom. Humaine*, **1**: 78-91 (1959).

Robert, J. and Murer K. : Blood pressure levels of persons aged 6-74 years, United States 1971-1974, *Vital and Health Statistics Series 11, No. 203*. DHEW Publications No. (HRA) 78-1648 (1977).

Singh, Khuswant : *The Sikhs*. Lustre Press. Rupa and Co., Calcutta (1984).

Susane, C. : Individual age changes of the morphological characteristics. *J. Hum. Evol.*, **6**: 181-189 (1977).

Wasir, H.S. : Life-styles and longevity. Research and development *J. Helpage India*, **1**: 3 (1995).

Weiner J.S. and Lourie J.A. : *Human Biology - A Guide to Field Methods, IBP Hand Book No. 9*, Blackwell, Oxford (1969).

WHO : Diet Nutrition and prevention of chronic diseases. *WHO Technical Report Series 797* (1990).

Wyndham, C. H., Watson M. and Sluid-Cramer G.R. : The relationship between weight and height of South African males of European decent between the age of 20 and 60 years. *S. Afr. J.*, **44**: 406-409 (1970).