Physical Growth of Deaf Mute Boys of Punjab

Singh, Sukhdeep and Singh, S. P.

Department of Human Biology, Punjabi University, Patiala-147002, PUNJAB

Abstract

The present study has been designed to provide information about any possible differentiation between the growth of deaf-mutes and the normal boys. A cross-sectional sample of 267 deaf-mute boys from 5 to 18 years was collected from various educational institutes of Punjab specially meant to teach hearing impaired children who were otherwise normal. Various anthropometric measurements were taken on each subject with the help of techniques given by Lohman et al. (1988) which included weight and height, humerus and femur bicondylar diameter, upper arm and calf circumferences, skinfolds at triceps and subscapular. In a nutshell, it has been found that the deaf-mute boys of the present study lag behind the normal in early years of life in height, have significantly smaller elbow widths and are more fatty at triceps skinfold. The ecological factors and mental attitude of the populace have not changed from those of the past in case of deafmutes while there is a tremendous improvement in the otherwise living standards of the general population. While the normal children seem to experience secular drifts in height, perhaps the deaf children remained mute spectators to the onward march of their normal peers in growth and development.

Key Words: Deaf-Mute, Punjab, Height, Weight, Skinfolds

Introduction

Deafness is one of the most ridiculed handicapping impairments of the child which causes lots of problems to them from birth. It is one of the less talked about disabilities and also one of the least studied one. The deaf people lose their ability of verbal communication and the only way left to communicate is by way of writing and by the use of sign language. Children with hearing loss greater than 90 decibels are designated as deaf. According to *Hunt (1964)*, "The deaf have been described as those whose hearing is of no practical importance for the purpose of communication with others." The condition of hearing impairment may be from the time of birth or it may be acquired later on. The deafness at birth is known as congenital deafness, while deafness that occurs after birth is called adventitious deafness. The most common cause of hearing impairment is otitis media followed by the impacted wax *(Smith and Hatcher, 1992).*

In order to find out the effect of deafness on physical growth of children *Abolfotouh (2000)* studied 75 blind and 155 deaf subjects and concluded that both blind and deaf mutes attain normal sexual maturity later in life than controls. The deaf mutes and visually challenged have lower height and weight values than controls which reflects a delaying effect of hearing and visual impairment on the physical growth of these children. In another study, *Abolfotouh and Telmesani (1993)* found that the visual handicap affects the growth of children in such a way that 76 percent blinds were below the 50^{th} centile for body weight which meant a considerable growth lag in them.

A mixed longitudinal study was conducted by Malina and *Gorzycki (1973)* on height and weight growth patterns of deaf children of age 6 to 17 years. It was found that the height of deaf boys and

girls, on average, was considerably below the standards from age 6 to 10 years. Between 11 and 17 years, deaf children belonging to White and Negro races were very close to the standards indicating parity in growth of children with general population. But the deaf-mutes of Mexican-American origin were below the height standards. In body weight, deaf boys were slightly below the weight standards from 6 to 11 years of age but were above the standards from 12 to 17 years of age. It may be concluded that a growth lag occurs only during the early years of life in American Whites and Negroes. *Umlawska and Staniszewska (2006)* studied children between the years 1995 and 2000 with hearing and visual disabilities and found that they have much lower body measurements than those of normals.

Falkner (1962) longitudinally investigated the height velocity curves for deaf children and found a close incremental parity with the standards. The height velocity curve, however, appeared to peak, on an average, about one year earlier in deaf children indicating their faster tempo of growth. *Thommessen et al. (1989)* studied the deaf and blind children from their nutrition and growth perspective and found that these children had energy intake below or in the lower range of reference values (Recommended Dietary Allowances - RDA). These subjects also suffered from serious feeding problems during weaning. All pupils were found to be strikingly thin while growing up despite being low on physical activities. The physical characteristics of deaf-mute boys were studied by *Yamaguchi (1956)* which indicated a body form that is characterized by extremely slender limbs and thick subcutaneous tissues resembling that of person with low metabolic rate and thus approaching feminine type. The study indicates weakness of muscles and bones in deaf-mute boys. Also they had a slightly shorter limbs and stature, narrower shoulders and slender hip breadth. The motor functions were also found to be generally lower than the normal children.

In North India, one of the earliest growth studies on head and face measurements in congenital deaf-mute children was done by *Singh and Dhir (1976).* According to this study the deafness affected only the upper portion of head and face in which the hearing impaired children had smaller measurements. A study by *Chitkara (1990)* on deaf mute children of Punjab indicated that the deaf mute boys and girls have smaller values than their normal counterparts for various parameters of height, weight and facial measurements. These differences were more prominent in children with congenital deafness. However, they experienced adolescent spurt a year earlier than the controls. However, keeping in mind the sample size and the cross-sectional nature of the study, it is difficult to comment on the timing of adolescent spurt and hence this conclusion must be taken with a lot of caution.

The information on physical characteristics of deaf-mute children and their growth is scanty in north Indian population. Keeping in mind this paucity of data on deaf-mutes, the present study has been designed which aims at providing information about any possible difference between deaf-mutes and the normal boys in order to make a comment on the growth process.

Materials and Methods

A cross-sectional sample of 267 deaf-mute boys was collected from various educational institutes of Punjab specially meant to teach hearing impaired children. These children were otherwise normal except for this defect. The subjects ranged in age from 5 to 18 years. Various anthropometric measurements were taken on each subject with the help of techniques given by *Lohman et al. (1988)* which included weight and height, humerus and femur bicondylar diameter, upper arm and calf circumferences, skinfolds at triceps and subscapular. For the sake of comparisons, two studies were taken with a similar socioeconomic background and from the same areas. The study by *Singh et al (2001)* is based on 6653 children while that of *Abha Mandira (1992)* includes 985 children.

Results

Table 1. Comparison of Height (cm) in deaf-mute and control males.

Age (yrs)	Control[a]				Deaf-mutes			t-value
	Mean	S.D.	S.E.M	N	Mean	S.D.	S.E.M	
5	107.8	7.10	0.70	7	110.4	8.24	3.11	0.81
6	112.3	7.74	0.72	13	116.0	10.09	2.80	1.29
7	119.1	8.06	0.58	13	117.6	4.51	1.25	1.15
8	124.8	7.68	0.48	13	118.4	5.93	1.65	3.75*
9	130.1	9.14	0.61	25	126.7	9.83	1.97	1.63
10	134.5	7.51	0.40	21	130.9	8.95	1.95	1.82
11	140.1	8.77	0.41	25	139.8	10.05	2.01	0.14
12	144.2	8.78	0.45	23	141.7	6.77	1.41	1.67
13	152.1	9.60	0.48	23	148.2	7.04	1.46	2.51*
14	156.1	11.20	0.55	12	152.0	10.82	3.12	1.29
15	161.0	10.50	0.58	22	159.8	8.59	1.83	0.64
16	164.8	8.90	0.58	12	161.9	6.8	1.96	1.41
17	162.3	12.7	1.18	29	165.4	7.37	1.36	1.72
18	168.8	7.03	0.79	29	167.1	6.61	1.23	1.15

* $p < 0.05$, Control[a] – Singh *et. al.,* (2001)

The height of deaf-mute boys is smaller than that of the controls at all ages but the deaf-mutes are significantly shorter than controls only at 8 and 13 years of age (Table 1 & Fig 1). Body weight of the deaf-mutes is significantly more than the controls at 5 and 6 years of age but the reverse is true at 9 years (Table 2 & Fig 2).

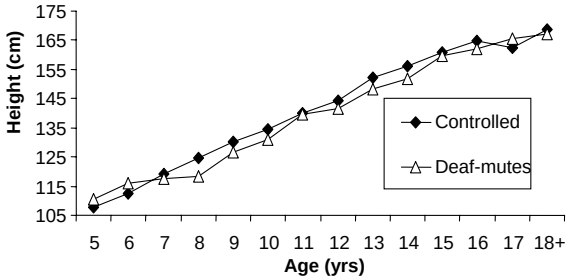

Figure 1. Comparison of Height (cm) of Deaf-Mute boys with Controls

Table 2. Comparison Weight (kg) in deaf-mute and control males.

Age (yrs)	Control[a]			Deaf-mutes			t-value
	Mean	S.D.	S.E.M	Mean	S.D.	S.E.M	
5	15.62	1.17	0.11	16.85	1.11	0.42	2.88*
6	17.09	1.23	0.12	19.38	3.64	1.01	2.27*
7	19.55	1.23	0.09	21.03	2.73	0.76	1.93
8	22.34	1.20	0.08	22.26	7.57	2.10	0.03
9	24.39	1.24	0.08	24.44	5.25	1.05	0.04
10	26.72	1.22	0.06	26.04	5.00	1.09	0.62
11	30.26	1.24	0.06	28.08	4.30	0.86	2.53*
12	33.02	1.25	0.06	32.00	5.68	1.18	0.86
13	37.91	1.25	0.06	35.73	6.53	1.36	1.59
14	40.18	1.27	0.06	41.08	8.78	2.53	0.35
15	44.70	1.25	0.07	44.79	8.17	1.74	0.05
16	47.24	1.25	0.08	47.54	5.37	1.55	0.19
17	50.08	1.23	0.11	50.09	6.89	1.28	0.05
18	54.82	1.23	0.14	55.89	10.11	1.88	0.56

- $p < 0.05$, Control[a] – Singh *et. al.,* (2001)

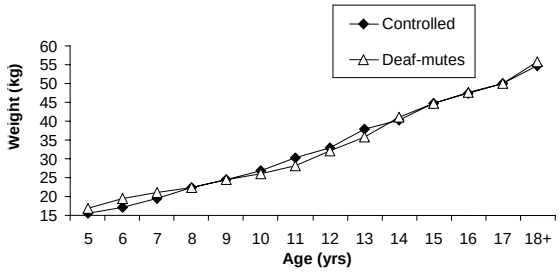

Figure 2. Comparison of Weight (kg) of Deaf-Mute boys with Controls.

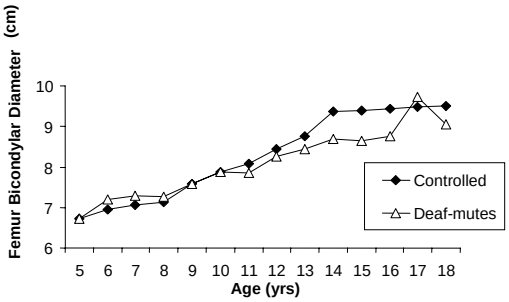

Figure 4. Comparison of Femur Bicondylar Diameter (cm) of Deaf- Mute boys with Controls

Table 3. Comparison of Humerus Bicondylar Diameter (cm) in deaf-mute and control males.

Age (yrs)	Control[a]			Deaf-mutes			t-value
	Mean	S.D.	S.E.M	Mean	S.D.	S.E.M	
5	5.09	0.28	0.04	4.52	0.17	0.06	7.90*
6	5.20	0.50	0.09	4.79	0.35	0.09	3.22*
7	5.32	0.39	0.06	4.74	0.32	0.08	5.80*
8	5.46	0.41	0.07	4.86	0.45	0.12	4.32*
9	5.61	0.50	0.08	5.30	0.55	0.11	2.28*
10	5.92	0.54	0.08	5.31	0.44	0.09	5.07*
11	6.25	0.49	0.07	5.43	0.34	0.06	8.89*
12	6.52	0.45	0.07	5.77	0.41	0.08	7.06*
13	6.74	0.36	0.06	5.89	0.36	0.07	9.22*
14	7.21	0.57	0.09	6.10	0.55	0.16	6.05*
15	7.30	0.55	0.09	6.52	0.49	0.10	5.80*
16	7.38	0.53	0.08	6.50	0.34	0.09	7.31*
17	7.35	0.33	0.03	6.54	0.50	0.09	8.54*
18	7.39	0.45	0.04	6.63	0.38	0.07	9.43*

* $p < 0.05$, Control[a] – Abha Mandira (1992)

Table 4. Comparison of Femur Bicondylar Diameter (cm) in deaf-mute and control males.

Age (yrs)	Control[a]			Deaf-mutes			t-value
	Mean	S.D.	S.E.M	Mean	S.D.	S.E.M	
5	6.73	0.34	0.05	6.72	0.45	0.17	0.06
6	6.95	0.47	0.08	7.20	0.73	0.20	1.16
7	7.06	0.39	0.06	7.28	0.33	0.09	2.03*
8	7.12	0.51	0.08	7.26	0.50	0.13	0.91
9	7.58	0.49	0.08	7.58	0.43	0.08	0.00
10	7.87	0.60	0.01	7.87	0.58	0.12	0.00
11	8.09	0.61	0.09	7.85	0.52	0.10	1.78
12	8.44	0.54	0.09	8.27	0.41	0.08	1.41
13	8.76	0.93	0.16	8.43	0.57	0.12	1.65
14	9.36	0.74	0.12	8.68	0.66	0.19	3.03*
15	9.39	1.45	0.22	8.64	0.67	0.14	2.88*
16	9.44	0.74	0.11	8.75	0.49	0.14	3.88*
17	9.49	0.58	0.11	9.72	0.53	0.09	5.45*
18	9.50	0.58	0.11	9.04	0.44	0.08	3.38*

* $p < 0.05$, Control[a] – Abha Mandira (1992)

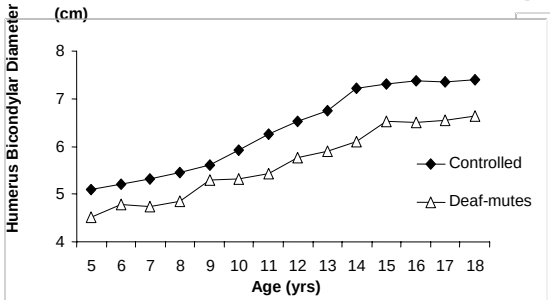

Figure 3. Comparison of Humerus Bicondylar Diameter (cm) of Deaf- Mute boys with Controls.

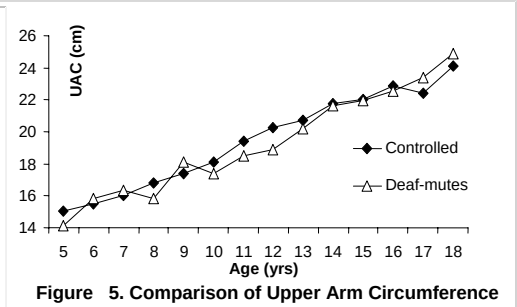

Figure 5. Comparison of Upper Arm Circumference (cm) of Deaf-Mute boys with Controls.

Table 5. Comparison of Upper arm circumference (cm) in deaf-mute and control males.

Age (yrs)	Control[a]			Deaf-mutes			t-value
	Mean	S.D.	S.E.M	Mean	S.D.	S.E.M	
5	15.06	1.29	0.13	14.11	1.01	0.38	2.37*
6	15.50	1.31	0.12	15.81	1.43	0.40	0.75
7	16.00	1.64	0.19	16.35	1.64	0.46	0.74
8	16.80	1.93	0.12	15.80	1.77	0.49	1.98*
9	17.40	2.22	0.15	18.08	3.70	0.74	0.90
10	18.10	2.34	0.12	17.37	3.35	0.73	0.98
11	19.40	3.86	0.18	18.48	2.91	0.59	1.51
12	20.28	2.78	0.14	18.89	2.98	0.62	2.18*
13	20.70	3.06	0.15	20.22	2.18	0.45	1.00
14	21.79	3.40	0.17	21.65	2.82	0.81	0.16
15	22.03	3.30	0.18	21.94	2.14	0.46	0.18
16	22.90	3.20	0.21	22.55	1.95	0.54	0.60
17	22.40	3.01	0.28	23.42	2.40	0.44	1.94
18	24.10	3.01	0.34	24.90	2.58	0.48	1.36

* $p < 0.05$, Control[a] – Singh *et. al.,* (2001)

Table 6. Comparison of Calf circumference (cm) in deaf-mute and control males.

Age (yrs)	Control[a]			Deaf-mutes			t-value
	Mean	S.D.	S.E.M	Mean	S.D.	S.E.M	
5	20.4	2.0	0.4	19.40	1.02	0.38	1.81
6	21.0	1.8	0.3	20.87	1.85	0.51	0.22
7	21.6	2.4	0.4	21.53	2.24	0.62	0.09
8	22.0	1.3	0.2	20.45	2.07	0.57	2.57*
9	22.2	2.0	0.3	22.53	2.02	0.40	0.66
10	23.4	2.3	0.4	22.99	2.95	0.64	0.54
11	24.3	1.9	0.3	24.04	2.51	0.50	0.45
12	25.9	2.3	0.3	25.60	2.10	0.43	0.57
13	28.7	2.1	0.4	25.57	1.68	0.35	1.56
14	28.7	2.6	0.4	28.64	2.09	0.60	0.08
15	29.0	2.8	0.5	28.81	2.74	0.58	0.25
16	29.8	4.1	0.8	29.31	1.59	0.45	0.53
17	30.1	2.3	0.5	29.75	2.37	0.43	0.53
18	29.9	0.8	0.2	29.73	3.34	0.61	0.26

* $p < 0.05$, Control[a] – Singh *et. al.,* (2001)

Humerus bicondylar diameter in deaf-mutes is significantly smaller at all ages than the controls (Table3 & Fig 3). The deaf mutes possessed larger values of femur bicondylar diameter than controls at 7 and 17 years whereas the controls had larger values at 14, 15, 16 and 18 years (Table 4 & Fig 4).

The upper arm circumference in deaf-mutes is smaller at 5, 8 and 12 years than the controls (Table 5 and Fig 5). The deaf-mutes are similar to controls in calf circumference at all ages except at 8 years (Table 6 & Fig 6).

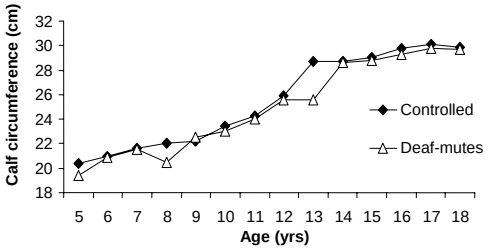

Figure 6. Comparison of Calf Circumference (cm) of Deaf-Mute boys with Controls.

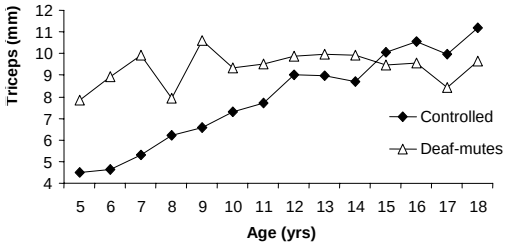

Figure 7. Comparison of Triceps (mm) of Deaf-Mute boys with Controls.

Table 7. Comparison of Triceps (mm) in deaf-mute and control males.

Age (yrs)	Control[a]			Deaf-mutes			t-value
	Mean	S.D.	S.E.M	Mean	S.D.	S.E.M	
5	4.50	1.900	0.19	7.86	2.54	0.96	3.42*
6	4.64	1.335	0.13	8.92	2.43	0.67	6.28*
7	5.29	2.225	0.12	9.92	3.52	0.98	4.67*
8	6.21	2.795	0.12	7.92	1.93	0.54	3.02*
9	6.56	3.395	0.15	10.6	3.08	0.62	6.15*
10	7.31	3.365	0.12	9.33	2.16	0.57	3.35*
11	7.69	3.365	0.18	9.52	2.53	0.51	3.43*
12	9.00	4.140	0.14	9.86	3.63	0.76	1.09
13	8.95	4.610	0.15	9.96	3.14	0.65	1.45
14	8.70	4.555	0.17	9.91	4.62	1.33	0.89
15	10.07	5.405	0.18	9.45	2.40	0.51	1.04
16	10.56	6.000	0.20	9.58	2.81	0.81	1.08
17	9.95	5.380	0.28	8.42	2.54	0.47	2.13*
18+	11.2	4.620	0.33	9.66	2.84	0.53	2.09*

* $p < 0.05$, Control[a] – *Singh et. al., (2001)*

Table 8. Comparison of Subscapular skinfold (mm) in deaf-mute and control males.

Age (yrs)	Control[a]			Deaf-mutes			t-value
	Mean	S.D.	S.E.M	Mean	S.D.	S.E.M	
5	4.8	0.8	0.2	8.42	2.14	0.81	4.31*
6	5.1	1.3	0.2	5.46	1.19	0.33	0.78
7	6.2	2.6	0.4	6.38	2.32	0.64	0.13
8	5.0	1.3	0.2	5.53	1.26	0.35	1.24
9	5.1	0.9	0.1	6.92	2.53	0.50	3.53*
10	5.4	1.4	0.2	6.04	1.39	0.30	1.66
11	5.3	1.1	0.2	6.48	1.75	0.35	2.93*
12	6.6	3.0	0.4	7.21	1.95	0.40	1.06
13	6.4	2.2	0.4	7.08	1.64	0.34	1.14
14	6.9	3.2	0.5	10.66	6.67	1.92	1.86
15	7.0	1.6	0.3	8.31	2.49	0.53	2.13*
16	8.7	3.0	0.6	9.25	2.05	0.59	0.60
17	8.0	1.8	0.4	9.31	2.68	0.49	2.06*
18	7.3	0.7	0.1	9.72	2.83	0.41	5.69*

* $p < 0.05$, Control[a] – *Abha Mandira (1992)*

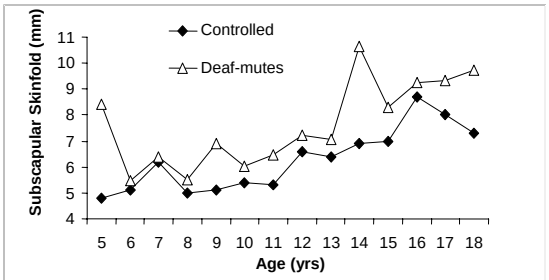

Figure 8. Comparison of Subscapular Skinfold (mm) of Deaf-Mute boys with Controls.

The skin and subcutaneous tissue folds over triceps have greater thickness in deaf-mutes from age 5 to 11 years. On the other hand, the controls have greater thickness of triceps skinfold during 17 an d 18 years (Table 7 & Fig 7). The deaf mutes have siginificantly larger values of subscapular skinfold than normals at 5, 9, 11, 15, 17 and 18 years (Table 8 & Fig 8).

Discussion

The deaf-mute boys of the present study are smaller than their control counterparts at all ages but the significant differences appear only at 8 and 13 years of age. The deaf mute boys studied during 1990 by *Chitkara (1990)* from Punjab were comparatively taller than the controls, for all ages from 7 to 12 years except at 10 years where the controls had overtaken the affected ones. *Kumar (1974)* observed that the height of deaf mute boys of Punjab studied during 1974 was more than controls in early years from 6 through 14 years. But the trend was just opposite in later years with controls being taller than deaf mutes from 15 through 17 years of age. It revealed that adolescent spurt in height of affected individuals appears one year later as compared to controls.

The studies by *Kumar (1974)* and *Chitkara (1990)* have concluded that the

deaf-mutes are taller in height than the controls especially during the younger ages whereas the subjects of the present study are shorter than the controls. The reason for this may be found in the differential status of living standards at present between the deaf-mutes and the controls. It seems reasonable to assume that the overall living standards have improved a lot for the general population during the last two to three decades. There is a possibility of the secular changes occurring in this region in height of the children. On the other hand, the care and general upkeep of the deaf-mutes has not undergone perceptible changes. Therefore for them the ecological factors have not changed from those of the past. So while the normal children experienced secular drifts in height perhaps the deaf-mutes remained mute spectators to the onward march of their normal peers in growth and development.

A study by *Abolfotouh (2000)* found from a sample of 155 deaf mutes of 6-12 years of age of Saudi Arabia that 90.9% deaf mutes have their height below 50th percentile out of which 69% fall below 10^{th} percentile. *Malina and Gorzycki (1973)* studied the deaf mutes of different races of America and observed that the height of White, Negro and Mexico-American boys was below the pediatric standards from 6 through 10 years of age. Between 11 and 17 years, deaf White and Negro boys approximated the standard, while the Mexican-American were found below the standards. The study revealed that the height velocity curves approach to peak on the average about one year earlier in deaf children. Findings from the present study especially during the preadolescent years conform to the above studies on Saudi and American children in a sense that the deaf mutes are laggards in growth.

Body weight of the deaf-mutes of the present study is significantly more than the controls at 5 and 6 years of age but the reverse is true at 9 years. The two groups do not differ from each other at all other ages. Deaf mute males of Punjab and Delhi are heavier in their early years of life (from 8 to 13 years) as compared to the controls *(Kumar 1974).* But after adolescence, they became lighter than the controls. He observed the adolescence spurt at age of 14 years in deaf mute males. *Chitkara (1990)* found that the deaf mute children had less weight in age group of 6 to 10 years. But they were heavier than controls at 11 to 14 years of age. The findings in body weight indicating an initial growth lag in deaf-mutes in the present study were similarly found by *Kumar (1974)* and *Chitkara (1990)* from the same settings.

The US deaf boys were at or slightly below the American standards from 6 to 11 years and slightly above the weight standard from 12 to 17 years *(Malina and Gorzycki 1973).* The weight velocity curve for deaf boys paralleled closely to the incremental standards of *Falkner (1962).* As many as 87.7% of the deaf mute children of age ranging from 6 to 12 years from Saudi Arabia were below the 50^{th} percentile of weight *(Abolfotouh 2000).*

The skin and subcutaneous tissue folds over triceps in deaf-mutes of the present study have greater thickness whereas the controls overtake the deaf-mutes in the thickness of triceps skinfold during 17 an d 18 years. *Suzuki et al. (1991)* found that obesity was more prevalent in deaf boys especially in later age of 15 to 19 as compared to other disabilities.. Study by *Yamaguchi (1956)*

reveals that deaf mute male of 15 to 17 years of age have higher values for triceps skinfold as compared to the control and have feminine type of subcutaneous fat deposition. The sedentary life style of deaf mute children has been pointed out as the main reason for them being fattier than the controls.

In a nutshell, it has been found that the deaf-mute boys of the present study lag behind the normal in early years of life in height, have significantly smaller elbow widths and are more fatty at triceps skinfold.

References

Abha Mandira 1992. *Physical growth and sexual maturation of Khatri boys and girls of semi-urban areas of Punjab aged 6 to 19 years*. Ph.D. Thesis (Unpublished). Punjabi University, Patiala.

Abolfotouh, M.A. 2000. Growth and sexual maturation of blind and deaf male students in Abha city, Saudi Arabia. *Annals of Saudi Medicine*, **20** : 374-379.

Abolfotouh, M. A. and Telmesani, A. 1993. A study of some psycho-social characteristics of blind and deaf male students in Abha City, Asir region, Saudi Arabia. *Public Health*. **107**: 261-269.

Chitkara, A. 1990. *Hearing impaired : their physical status and congnitive behaviour.* M.Sc. Dissertation (unpublished), Punjabi University, Patiala.

Falkner, F. 1962. The physical development of children – a guide to interpretation of growth, charts and development assessment and a commentary on contemporary and future problems. *Pediatrics*, 29 : 448.

Hunt, V.V. 1964. *Recreation for Handicapped*. Prentice Hall, Physical Education Series, USA.

Lohman, T.G., Roche, A.F. and Martorell, R. 1988. *Anthropometric Standardization Reference Manual.* Human Kinetics, Champaign.

Kumar, S. 1974. *An ecological study of deaf and dumb*. M.Sc. Dissertation (Unpublished), Punjabi University, Patiala.

Malina, R.M. and Gorzycki, P.A. 1973. Height and weight growth patterns of school age deaf children. *Am. J. Phys. Anthropol.,* **38** : 135-43.

Singh, L. and Dhir, S.K. 1976. Head and face measurements in congenital deaf-mute children. *Acta Medica Auxologica*, **8**: 2 45-251.

Singh. S.P., Singal, P., Bhatnagar, D.P. 2001. *Growth Standards 2001: Evaluation of Physical Growth of Punjabi Children*. Human Biology Department. Patiala.

Smith, A. and Hatcher, J. 1992. Preventing deafness in Africa's children. *African Health,* **15**: 33-35.

Suzuki, M., Saitoh, S., Tasaki, Y., Shimomura, R. and Hosoya, N. 1991. Nutritional status and daily physical activity of handicapped students in Tokyo metropolitan school for deaf, blind, mentally retarded and physically handicapped individuals. *Am. J. Clin. Nutr*., **54**: 110-111.

Thommessen, M., Trygg, K., Riis, G. and Kase, B.F. 1989. Nutrition and growth retardation in children with congenital deaf-blindness. *J. Am. Diet. Assoc*., **89**: 69-73.

Umlawska, W., Staniszewska, A., 2006, Influence des affections des organes des sens sur le développement physique des enfants et des jeunes. Antropo, **11**, 25-32. www.didac.ehu.es/antropo

Yamaguchi, B. 1956. Some physical peculiarities of deaf mute boys. *Hum. Biol*., **28** : 308-315.