GROWTH AND SEXUAL MATURATION OF BLIND AND DEAF MALE STUDENTS IN ABHA CITY, SAUDI ARABIA

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Children with disability are particularly susceptible to physical, social and emotional problems associated directly or indirectly with their experience of disease, disorders and disability. Some of the problems are directly related to limitations preventing the child from enjoying normal contacts with other children and other physical, social and educational activities typical for his or her age.[1]

A child's handicap cannot be considered in isolation. In order to alleviate his difficulties, it is essential to take into account how well he can function in his physical environment, and the effect, not only of his handicap, but also of the cultural environment to which he is exposed.[2]

Guidelines for dietary allowances in school lunch diets for handicapped students in Saudi Arabia, like in many other countries, have been based on those for normal students. However, because of specific nutritional requirements, the need for new guidelines for handicapped students has been expressed. Thus, it was decided to survey the growth and maturation of blind and deaf students in order to gather information about their nutritional and physical status to improve their health and fitness.

Materials and Methods

All male students in the Institute for the Blind (n=75) and the Institute for the Deaf (n=155) in Abha, the capital city of Asir Region, constituted the target population for the present study.

Anthropometry

All students were measured using a fixed wall ruler with a sliding headpiece and a beam balance to obtain height and weight. For heights, traction was applied to the mastoid process and measurement recorded to the nearest 0.25 cm. Weight measurements were recorded with light clothes to the nearest 0.1 kg. Comparison with the National Center for Health Statistics Standards[3] (NCHS) was made possible by deriving values corrected for age in the form of centile bands. A computer program placed each value in one of four centile bands: <10th, 10-49th, 50-89th and ≥90th, using data from the NCHS for height and weight. The results were compared by chi-square analyses. Body mass index (BMI) was calculated for each student according to the formula wt(kg)/ht^2(m).[4] The 85th and 95th percentiles for BMI were used to define obesity and superobesity, respectively,[5,6] using the data gathered in the National Health and Nutrition Examination Survey I (NHNES I).[7]

Measurement of Maturation

Each student who was aged 10 to 20 years was assessed in a private room for his secondary sex characteristics (genital and pubic hair) by comparing his body to drawings of the Tanner stages.[8] The drawings depict five successive stages of genital development and pubic hair growth. The first stage is pre-adolescence and the fifth stage is the mature adult. The mean scores for genital and pubic hair staging were estimated for the blind and the deaf between 10 and 18 years, as well as their average scores for combined genital and pubic hair staging (the sum of genital and pubic hair stages divided by two),[9] and their results were compared by Mann-Whitney test.

Pubertal stages (genital and pubic hair) for each student were corrected for age in the form of centile bands. Each stage was placed in one of the four centile bands: <10th, 10-49th, 50-89th and ≥90th, using the centile distribution of ages for pubertal stages.[10] Comparison of the students' results with such distribution was done by chi-square analyses.

Results

Table 1 shows the distribution of blind and deaf students according to the following characteristics:

- Age: Blind students showed significantly higher mean age (13.66±3.91 years) than deaf students (12.69±3.35 years) with P=0.04.
- Onset of the Handicap: The study showed that 89% and 76.5% of blind and deaf students, respectively, were born with their handicap (χ^2, df-1=14.98, P=0.03). On

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the other hand, 11% of blind and 23.5% of deaf handicaps were acquired after birth, by infection (1.4% and 20%), accident (8.2% and 3.2%) and surgical operation (1.4% and 0.0%).

- Residence: About 85% of blind students were resident at the Institute for the Blind, as compared to only 45.8% of deaf students living at the Institute for the Deaf (χ^2, df-1=31.23, P<0.01).

Physical Growth

Table 2 shows that both blind and deaf students were significantly lighter than NCHS children. Only 24% of the blind and 12.4% of the deaf fell above the 50th centile, with 58.7% and 69%, respectively, below the 10th centile (P<0.0001). Blind and deaf students were also shorter, with only 10.8% and 9.1%, respectively, above the 50th centile, and 62.2% and 69.0%, respectively, below the 10th centile (P<0.0001).

Table 3 shows a significantly higher prevalence of obesity and superobesity among blind (20.3%) than among deaf (6.5%) students (P=0.002).

Sexual Maturation

Table 2 shows the distribution of blind and deaf students aged 10 to 20 years according to Tanner's genital and pubic hair percentiles. Delayed sexual maturation was detected among the blind and deaf, with significantly high proportions of students below the 10th centiles for genital (40.5% and 38.1%) and pubic hair staging (38.1% and 39.2%), P<0.0001. However, the difference between blind and deaf students in sexual maturation was not significant, either in genital (P=0.27) or pubic hair staging (P=0.34). Blind students showed higher, though not significant, average scores in genital (P=0.60), pubic hair (P=0.12) and combined genital and pubic hair (P=0.32) stagings (Table 3).

All students aged 20 years or more had attained Tanner's stage 4 or 5, however, by the age of 16 years, only 79% of the blind and 70% of the deaf had attained such stages. Deaf students made up a higher proportion of students with delayed sexual maturation in all ages until the ages of twenty, when the proportion of both groups equalized.

Discussion

The growth of normal Saudi schoolboys in the Asir Region was less than that of the reference population.[11] The results of the present study, which were derived from growth data of blind and deaf students of the same region, showed the same trend as that of normal students, where blind and deaf students were lighter and shorter than children of the NCHS population. This may reflect both nutritional and ethnic variations between Saudi children (both normal and handicapped) and NCHS data representing Caucasian American children. However, data of the present study showed a significantly higher prevalence of obesity and superobesity among the blind than among the deaf. This finding could be activity related, and explained by the findings of Abolfotouh and Telmesani,[12] who reported the difficulty in mobility as the main problem among the blind, while playing football was

TABLE 1. *Distribution of blind and deaf students according to various characteristics.*

	Blind (N=73)		Deaf (N=153)		
Characteristics	N	(%)	N	(%)	*P*-value
Age (years)					
6-11	20	27.4	49	32.0	
12-17	37	50.7	91	59.5	
18+	16	21.9	13	8.5	
Total	73	100.0	153	100.0	
X±SD	13.66±3.91		12.3±3.35		0.04*
Onset of handicap					
Born with	65	89.0	117	76.5	
After birth	8	11.0	36	23.5	
Post fever	1	1.1	31	20.3	
Post accident	6	8.2	5	3.2	
Post operation	1	1.4	0	–	
Total	73	100.0	153	100.0	0.03**
Residence					
Institute	62	84.9	70	45.8	
Home	11	15.1	85	54.2	
Total	73	100.0	153	100.0	<0.01**

*Mann-Whitney test was applied; **Pearson chi-squared test (df=1) was applied.

TABLE 2. *Centile band distribution of weights, heights, genital and pubic hair maturation for blind and deaf students in Abha in comparison to the reference population.*

	Centile band				
	<10th %	10-49th %	50-89th %	≥90th %	*P*-value
Weight					
Blind (n=75)	58.7	17.3	13.3	10.7	<0.0001*
Deaf (n=155)	69.0	18.7	9.7	2.7	<0.0001*
Height					
Blind (n=74)	62.2	27.0	10.8	–	<0.0001*
Deaf (n=155)	69.0	21.9	2.5	6.6	<0.0001*
Genital maturation					
Blind (n=42)	40.5	40.5	19.0	–	<0.0001**
Deaf (n=97)	37.1	30.9	27.8	4.2	<0.0001**
Pubic hair maturation					
Blind (n=42)	38.1	35.7	14.3	11.9	<0.0001**
Deaf (n=97)	39.2	24.7	27.8	8.3	<0.0001**

*Values compared with US NCHS students using χ^2 analyses; **values compared with the staging system of Tanner and Whitehouse using χ^2 analyses. Genital and pubic hair maturations were assessed only for students aged 10-20 years.

TABLE 3. *Prevalence (%) of obesity and average score (x±SD) of different Tanner stagings for sexual maturation among blind and deaf students in Abha.*

	Blind		Deaf		*P*-value
Obesity (n, %)					
Normal	59	(79.7)	145	(93.5)	
Obese	8	(10.8)	10	(6.5)	
Superobese	7	(9.5)	–	–	
Total	74	(100.0)	155	(100.0)	0.002*
Tanner's staging (score x± SD)					
Genital staging+	2.73	2.43	2.59	1.43	0.60**
Pubic hair staging+	2.65	1.52	2.27	1.51	0.12**
Combined genital and pubic hair staging++	2.69	1.49	2.43	1.45	0.32**

*χ^2 test was applied; **Mann-Whitney test was applied; [+]Tanner stage evaluation range is 1-5; [++]the sum of genital and pubic hair stages divided by two.

the most common hobby for the deaf. It could also be attributed to the difference between the blind and the deaf in terms of dietary intake, especially since blind students are normally resident at their institute, being provided with four meals per day, while deaf students spend only half the day at their institute, being fed only one or two meals and then going home. Muecke et al.[13] reported the possible synergistic effect of low physical activity and high-fat foods in the development of childhood obesity, when both factors are present in the same child.

Great variability exists in the timing and onset of puberty and growth. In the present study, delayed sexual maturation in terms of genital and pubic hair staging was demonstrated for both blind and deaf students when compared with the expected maturation for their ages. By the age of 16, when all students should have attained adult maturation, 21% and 30% of the blind and the deaf, respectively, had not attained Tanner's stage 4 or 5. Blind students had higher, though not significant, average scores for sexual maturation. However, the comparison of young and older students demonstrate that a normal sexual maturation is attained later in life by both blind and deaf students.

Conclusion and Recommendations

Although the growth and maturation of blind and deaf students are less than that of the reference population, the role of the handicap in such delayed growth and maturation cannot be analyzed with the methodology of the present study. In spite of the delayed sexual maturation of the blind and the deaf, normal sexual maturation is attained later in life.

Blind students are significantly more obese than deaf students, most probably due to the synergistic effect of their low physical activity and high food intake. Thus, a simple activity program aiming at weight reduction and maintenance for obese blind students is recommended. Also, guidelines for dietary allowances need to be modified at the Institute for the Blind.

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