



Physical Growth among Differently Able and Normal Children – A Cross Sectional Study

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ABSTRACT

Early identification of lag in physical growth would help in the planning of some interventions to address the nutritional needs of differently abled children. The present study carried out with the objectives: (1) To compare the physical growth of differently abled children with that of normal children. (2) To compare the physical growth of differently abled and normal children with WHO growth standard. A cross-sectional study comprised of 346 children from deaf-dumb, blind children school and selected school of Belagavi. Pretested questionnaires were used to collect necessary information like anthropometric measurement and socio-demographic variables. SPSS 20 and WHO Anthro version 3.2.2 was used for analysis. Informed consent from guardian and assent from children was obtained prior to collecting data. We observed that, the mean height of differently abled children was 141.2 ± 9.84 and that of normal children was 143.6 ± 6.52 , mean weight of differently abled children was 32.3 ± 5.12 and that of normal children was 38.8 ± 4.40 , mean BMI of differently abled children was 16.4 ± 1.72 and that of normal children was 18.7 ± 1.75 . A significant difference in all anthropometric variables between differently abled children and normal children was observed except in Hip circumference. WHO 'Z' score system showed more variation in differently abled children than normal children. The study revealed that there is more growth lag in differently abled children than normal children.

Keywords: Physical growth, differently able, children, Anthropometric measurements

INTRODUCTION

Measurement of height and weight of children (Anthropometric measurements) determine growth of a child (Ayatollahi & Pourahmad, 2006). In each child there is a special growth aptitude, which cannot be overtaken, but which can be stopped at any stage due to lack of proper nutrition (Nasirian & Tarvij, 2006). Deafness, blind and mute are the most ridiculed handicapping impairments of the child which causes lots of problems to them right from birth. These problems are very less talked and also very minimal studies have been done on their growth and development (Neyestani et al., 2010). According to WHO report (2007), worldwide an estimated 19 million children are visually impaired, of these, 12 million children are visually impaired due to refractive errors, a condition that could be easily diagnosed and corrected. Over 5% of the world's population (360 million people) has disabling hearing loss (328 million adults and 32 million children) (Maken & Varte, 2012). As per the study by Abolfotouh and Telmesani (1993), visual handicap affects the growth of children in such a way that 76%

blinds were below the 50th percentile for body weight, which meant a considerable growth lag in them (Abolfotouh & Temesani, 2010). Early identification of lag in physical growth would help in planning of some interventions as this growth period is the last chance for disabled children to make up for the lag in the physical growth. There are very few studies which have compared physical growth among differently abled and normal children. Hence the present study.

OBJECTIVES

1. To compare physical growth of differently abled children with that of normal children.
2. To compare physical growth of differently abled children and normal children with WHO standard.

MATERIALS AND METHODS

A cross sectional study was conducted during the year 2014 (January to November). All children in the age group of 7-16 years belonging to Maheshwari blind school Belagavi, Deaf-dumb school Azamnagar Belagavi and selected Govt. School Ramnagar Belagavi. The purposive sampling technique was used to collect samples. A total children from both blind and deaf-mute schools were 173 (105 blind children and 68 deaf-mute) and all were included in the study. The same number of boys and girls were selected from regular school i.e. government school Ramnagar Belagavi by using random sampling method after matching for age and sex. The ethical

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clearance was obtained from JNMC institution ethics committee for human subjects' research J N medical college Belagavi. The data was collected by interview method using the pre-designed and pre tested questionnaire. Informed consent from the principal of concerned school and assent from the children was taken prior to the data collection. The detailed information regarding age, sex, educational status, religion, past history of illness, present history of illness was collected during data collection, which was followed by anthropometric measurement (height, weight, head circumference, mid arm circumference, waist circumference, and hip circumference). Systemic examination was also done to assess any morbidity condition of the child. Data was analyzed using SPSS 20 and WHO Anthro Version 3.2.2 software. Weight percentiles were calculated and the same was compared with WHO percentiles for weight. 'Z' scores for 'Height for age', and 'BMI for age' was calculated using WHO anthropo software and the same was compared with WHO standard values for 'Height for age' and 'BMI for age'.

RESULTS

Demographic Profiles

Socio demographic characteristics showed that maximum study subjects were from 16 year age group which constituted 17.34% of total study participants and minimum were from 7 year age group which constituted 5.20%. 41% of study participants were males and 59% were females. Majority of the study participants belonged to Hindu religion (90.8%) and less part was comprised of Jain religion (0.6%). Maximum study participants were from other backward class constituting 98.6% and minimum were from general category constituting only 0.6%. Out of total study participants 92.7% belonged to nuclear family and 7.3% belonged to joint family. As per as parent's occupation is concerned majority of parents (66.5%) were engaged in private job and only 2.6% were engaged in government job. Most of the study subjects belonged to class III (62.7%) followed by class II (25.4%), class IV (7.5%) and least being class I (4.3%).

Comparison of Anthropometric Measurements

Table 1: Age wise mean height of participants

Age	Blind	Deaf & Dumb	Normal	F value	P value
7	113.6 ± 7.76	127.1 ± 10.96	124.4 ± 11.03	1.675	0.220
8	119.5 ± 8.04	130.6 ± 7.63	134 ± 7.83	6.447	0.009
9	130.1 ± 6.87	137.5 ± 4.65	140.7 ± 6.99	9.189	0.001
10	129.6 ± 7.79	138.2 ± 7.62	138.4 ± 7.26	7.560	0.002
11	141.1 ± 7.62	141.2 ± 5.12	137.5 ± 7.44	4.607	0.021
12	141.2 ± 9.84	140.8 ± 5.23	143.6 ± 6.51	0.576	0.569
13	150.3 ± 7.37	150.3 ± 2.94	148.2 ± 7.92	3.424	0.045
14	157.2 ± 12.55	148.4 ± 5.6	151.4 ± 6.32	0.790	0.460
15	152.7 ± 11.21	151.7 ± 5.67	157.8 ± 8.71	0.585	0.564
16	152.7 ± 11.21	154.6 ± 10.54	155.4 ± 8.05	0.398	0.674

Significant difference was observed in height between differently abled children and normal children in the age group 8 year, 9 year, 10 year, 11 year, and 13 year with *p* values 0.009, 0.001, 0.002, 0.021, and 0.045 respectively.

Table 2: Age wise mean weight of study participants

Age	Blind	Deaf & dumb	Normal	F value	P value
7	20.6 ± 5.77	24 ± 8.14	24.9 ± 4.48	0.539	0.594
8	18.3 ± 2.80	28.3 ± 3.78	32.2 ± 5.37	17.718	< 0.001
9	25.1 ± 4.27	29.7 ± 2.87	37.4 ± 7.16	16.607	< 0.001
10	26 ± 8.24	30.7 ± 3.19	34.5 ± 5.89	7.938	< 0.001
11	24 ± 4.94	30 ± 5.88	32.4 ± 5.54	6.601	0.005
12	32.9 ± 4.91	32.3 ± 5.12	38.8 ± 4.40	6.556	0.005
13	35.7 ± 8.67	39 ± 4.89	42.2 ± 5.62	3.209	0.054
14	40.8 ± 7.16	40.6 ± 4.32	44.6 ± 4.65	3.217	0.049
15	43.7 ± 5.81	42.7 ± 5.90	46.7 ± 4.87	1.441	0.254
16	44.5 ± 5.98	46.8 ± 7.91	50.7 ± 6.34	4.604	0.014

Significant difference was observed in weight between differently abled children and normal children in almost all the age group except for the age group 7 years and 15 years. The mean weight of differently abled children was less than that of normal children with *p* < 0.05.

Table3: Age wise mean BMI of participants

Age	Blind	Deaf & dumb	Normal	F value	P value
7	16 ± 2.64	14.6 ± 1.96	16.2 ± 2.27	0.720	0.503
8	12 ± 1.32	16.6 ± 1.15	17.7 ± 1.33	26.203	< 0.001
9	14.8 ± 2.47	15.7 ± 0.95	18.8 ± 2.67	9.984	< 0.001
10	15.5 ± 3.91	16.1 ± 1.36	18 ± 2.60	3.734	0.032
11	14.1 ± 1.69	15 ± 1.82	17.1 ± 1.49	9.480	0.001
12	16.4 ± 2.35	16.1 ± 1.72	18.7 ± 1.75	5.755	0.008
13	17.5 ± 2.16	17.3 ± 1.86	19.1 ± 1.57	3.469	0.044
14	18.1 ± 3.01	18.4 ± 1.35	19.4 ± 1.71	1.996	0.148
15	17.9 ± 2.70	18.5 ± 1.73	18.8 ± 1.74	0.549	0.584
16	19.3 ± 3.35	19.7 ± 3.35	21 ± 2.54	2.075	0.135

Significant difference in BMI between differently abled children and normal children was observed in the age group 8yrs-13yrs with *p* values 0.001, 0.001, 0.032, 0.001, 0.008, and 0.044 respectively. No difference was observed in the age group 7yrs, 14yrs to 16yrs.

Table 4: Age wise mean Head circumference of participants

Age	Blind	Deaf & dumb	Normal	F value	P value
7	48 ± 1	50.6 ± 2.94	51.8 ± 1.56	3.724	0.049
8	50 ± 2	50.6 ± 1.15	52.4 ± 2.06	3.060	0.075
9	51.1 ± 1.65	50 ± 1.63	54.4 ± 2.71	11.012	< 0.001
10	49.9 ± 2.40	50 ± 1.73	52.4 ± 2.34	6.653	0.003
11	51.2 ± 2.11	52.5 ± 4.35	54.1 ± 2.25	3.290	0.055
12	51 ± 2.39	50.3 ± 1.63	53 ± 2.29	4.063	0.29
13	51.3 ± 2	50.6 ± 2.33	53.3 ± 2.14	4.824	0.015
14	53 ± 2.74	51.7 ± 1.56	53.8 ± 2.42	2.924	0.064
15	52.7 ± 1.79	49.7 ± 1.89	52.4 ± 1.88	4.099	0.028
16	52.4 ± 2.55	51.5 ± 4.13	52.9 ± 2.76	0.931	0.400

As far as head circumference is concerned, significant difference was observed between differently abled children and normal children in almost all age group except for the age group 12yrs and 16yrs. The mean head circumference in differently abled children was less compared to normal children with *p* < 0.05.

Table 5: Age wise mean mid arm circumference of participants

Age	Blind	Deaf & dumb	Normal	F value	P value
7	17 ± 1	16.8 ± 2.48	17.5 ± 0.88	0.395	0.68
8	16.8 ± 2.48	18.3 ± 0.58	18.4 ± 2.06	1.132	0.347
9	19.7 ± 2.35	18.5 ± 0.58	20.4 ± 2.18	1.450	0.250
10	18.5 ± 2.65	18.5 ± 1.51	20.5 ± 1.83	5.396	0.008
11	17.7 ± 1.71	19.2 ± 1.25	20.4 ± 1.66	7.167	0.004
12	19.4 ± 2.50	18.6 ± 2.42	21.4 ± 1.99	4.066	0.029
13	20.6 ± 1.50	19.8 ± 1.60	21.1 ± 1.74	1.528	0.233
14	23.6 ± 3.22	21 ± 2.71	21.9 ± 1.45	4.094	0.023
15	22.1 ± 1.92	21.5 ± 2.64	22.7 ± 1.33	0.949	0.400
16	23.1 ± 2.43	21.2 ± 1.72	21.6 ± 1.20	5.136	0.009

Table 5 Shows there is significant difference in mid arm circumference between differently able children and normal children among the age group 10yr, 11yr, 12yr, 14yr and 16yr with *p* values 0.008, 0.004, 0.029 and 0.009. No difference was observed in other age groups.

Table 6: Age wise mean chest circumference of participants

Age	Blind	Deaf & dumb	Normal	F value	P value
7	55.3 ± 4.72	57.1 ± 8.06	50.9 ± 1.26	2.876	0.088
8	55.6 ± 2.87	59.3 ± 2.88	51.6 ± 1.57	15.866	<0.001
9	60.4 ± 3.40	61.5 ± 3	57.1 ± 4.14	3.980	0.029
10	61.1 ± 4.01	63.6 ± 4	61.8 ± 3.37	1.328	0.276
11	61.4 ± 3	63 ± 5.16	62.4 ± 3.47	0.332	0.721
12	64.8 ± 4.22	64.3 ± 4.63	62.9 ± 4.04	0.666	0.522
13	68.5 ± 6.41	70.1 ± 5.98	68 ± 5.16	0.301	0.742
14	73.1 ± 6.46	72 ± 3.59	70.9 ± 4.01	0.989	0.380
15	72.8 ± 4.42	73.7 ± 4.92	71.9 ± 4.72	0.283	0.756
16	75.3 ± 6.51	74.2 ± 5.68	73 ± 5.51	0.822	0.445

Table 6 interprets that Chest circumference shows significant difference between differently able children and normal children in the age group 7yrs, 8yrs, 9yrs, where chest circumference of differently able children was more than normal children with *p* values 0.008, 0.001 and 0.029 respectively. No difference was observed in other age groups.

There was not much difference in the waist circumference between differently able children and normal children among different age groups except for the children in the age group 9yrs, and 14yrs with *p* values 0.001 and 0.009 respectively.

Hip circumference did not show any difference between differently able children and normal children.

Table 7: Weight percentiles for normal children

Age	Percentiles for normal children			WHO percentiles for 'weight for age'		
	P 25	P 50	P 75	P 25	P 50	P 75
7-9	-0.20	0.59	1.50	-0.21	0.61	1.55
9-11	-0.01	0.75	1.69	-0.01	0.80	1.78
11-13	1.13	1.82	2.62	1.14	1.99	2.74
13-16	2.24	2.83	3.49	2.29	2.89	3.55

Table 8. Weight percentiles for differently able children

Age	weight percentiles for differently able children			WHO percentiles for weight		
	P 25	P 50	P 75	P 25	P 50	P 75
7-9	-0.18	0.54	1.48	-0.21	0.61	1.55
9-11	-0.01	0.69	1.62	-0.01	0.80	1.78
11-13	1.10	1.78	2.56	1.14	1.99	2.74
13-16	2.18	2.73	3.42	2.29	2.89	3.55

Table 7 & 8 shows, percentiles for weight of differently able and normal children at P25, P50, and P75. 50th percentile for both differently able children and normal children was less when compared to WHO value for 50th percentile. But the more variation was observed in differently able children.

Table 9 mean Z scores of both differently able and normal children were less compared to WHO Z scores for -2SD. The variation towards lower side was more in differently able children from 7-10 years age group. 11-16 year age group showed increased variation in Z scores among normal children when compared to 7-10 year age group but differently able children continue to show more variation towards lower side than normal children.

Table 9. Mean Z scores for 'Height for Age' (BOYS)

Age	Boys (Differently able / normal)	Mean Z score (differently able)	Mean Z score (Normal children)	WHO 'Z' scores (-2SD)
7	2	-1.86	0.25	1.11
8	5	-1.13	1.25	1.16
9	11	-0.38	0.99	1.20
10	8	-2.13	0.42	1.25
11	4	-1.74	-1.34	1.29
12	5	-1.62	-1.25	1.34
13	6	-2.50	-0.59	1.41
14	9	-2.01	-0.69	1.47
15	8	-0.85	-0.69	1.53
16	11	-1.16	-1.14	1.57

Table 10. Mean Z score for 'BMI for Age' (BOYS)

Age	Boys (Differently able / Normal)	Mean Z score (Differently able)	Mean Z score (Normal children)	WHO 'Z' scores (-2SD)
7	2	-0.87	-0.52	1.32
8	5	-2.98	0.70	1.33
9	11	-1.70	0.19	1.35
10	8	-1.44	1.11	1.38
11	4	-2.49	0.42	1.41
12	5	0.95	0.85	1.45
13	6	-1.33	0.16	1.49
14	9	-0.40	0.93	1.55
15	8	-1.46	-1.03	1.60
16	11	-2.21	0.005	1.65

Table 10 mean Z scores are less in differently able children compared to normal children. Variation is observed in the age group 7 and 15 years compared to other age groups. 12 year age group showed almost same variation both in normal as well as differently able children.

The more variation towards lower side is observed in differently able children than normal children when compared with WHO 'Z' scores for -2 SD.

Table 11: Mean Z score for 'Height for Age' of (GIRLS)

Age	Boys (Differently able / Normal)	Mean Z score (Differently able)	Mean Z score (Normal children)	WHO 'Z' scores (-2SD)
7	7	-0.95	0.25	1.09
8	4	-0.64	1.25	1.15
9	6	0.66	0.99	1.20
10	15	-0.34	0.42	1.25
11	8	-2.21	-1.34	1.31
12	10	-1.79	-1.25	1.37
13	11	-1.007	-0.59	1.42
14	15	-1.16	-0.69	1.45
15	7	-1.64	-0.69	1.47
16	19	-1.72	-1.14	1.48

The Z scores for both differently able children and normal children were less but the more deviation towards lower side was found among differently able than normal children when compared to WHO Z scores for -2 SD. The variation was least in 9 year age group.

Table 12 when compared to WHO Z scores at -2 SD for 'BMI for age' of girls, the scores were less in both normal as well as differently able children except for 8 years age group. But the table clearly shows the more variation towards lower side in differently able children than in normal children when compared to WHO Z scores at -2 SD except for the 8 year age group.

Table 12: Mean Z score for 'BMI for Age' (GIRLS)

Age	No. of girls (Differently abled / Normal)	Mean Z score (Differently abled)	Mean Z score (Normal children)	WHO 'Z' scores (-2SD)
7	7	-0.64	1.05	1.29
8	8	1.31	1.23	1.32
9	9	-0.26	1.29	1.35
10	10	-1.25	0.05	1.37
11	11	-0.93	0.09	1.40
12	12	-1.30	0.43	1.43
13	13	-1.09	-0.30	1.48
14	14	0.60	-0.23	1.53
15	15	-1.86	-0.23	1.58
16	16	-0.17	-0.20	1.62

DISCUSSION

Comparison of Anthropometric variables

In the present study the mean height of the children with disability was 141.1 ± 7.79 and that of normal was 143.6 ± 6.51 cm. A study conducted in 2010 showed that mean height of children with disability was 133 ± 12 cm (Neyestani et al., 2010). In the present study the mean weight of children with disability was 29.5 ± 5.13 and that of normal children mean weight was 35.6 ± 5.21 kg. A study conducted by Neyestani et al showed that the mean weight of children with disability was 28.7 ± 8.1 kg (Neyestani et al., 2010) which is similar to our study. In the present study the mean BMI of children with disability was 16.4 ± 1.82 and the mean BMI of normal children was 18.7 ± 1.75 . A study conducted by Milanese et al. (2010) showed that the mean BMI of normal children was 16.0 ± 3.2 (Maken & Varte, 2012). In the present study the mean Head circumference of children with disability was 50.5 ± 2.4 and that of normal children mean head circumference was 53.3 ± 2.14 . A study conducted by Vashist et al. (2005) showed that the mean head circumference of normal children was 54.90 ± 2.87 (Vashisht, Krishan, & Devlal, 2005) which was similar to our study. In the present study the mean mid arm circumference of children with disability was 19.53 ± 2.6 and mean mid arm circumference of normal children was 21.4 ± 1.99 . A study conducted by Ayatollahi showed that the mean mid arm circumference was 19.99 ± 1.73 (Ayatollahi & Shayan, 2006). In the present study the mean chest circumference of children with disability was 64.5 ± 4.31 and that of normal children mean chest circumference was 62.9 ± 4.04 . A study conducted by Vashist et al showed that the mean chest circumference of normal children was 64.90 ± 7.15 (Vashisht et al., 2005), which is similar to our study. In this study the mean waist circumference of children with disability was 60.21 ± 5.40 and that of normal children mean waist circumference was 62.1 ± 4.44 . A study conducted by Milanese et al showed that the mean waist circumference of normal children was 59.2 ± 6.50 (Milanese, Bortolami, Bertuccio, & Verlato, 2010) which is slightly less compared to our study.

In the present study WHO 'Z' score for 'Height for age' and 'BMI for age' were less both in differently abled and normal children but the extent of variation was more in differently abled children. A similar study conducted by Maken and Varte in the year 2012 with a sample size of 507 used 'Z' score

system to see physical growth status. The study revealed that, the mean height and weight of girls was found to be higher than boys in all age groups. In all age groups more males were found to be underweight than females ($p < 0.01$) (Maken & Varte, 2012).

In the present study percentiles for 'weight for age' at P25, P50, and P75 were less in differently abled children when compared with normal children. The more variation was observed for 50th percentile. The calculated percentiles were compared with WHO percentiles for P25, P50, and P75. The more variation was observed in differently abled children than normal children. In the study conducted by Maken and Varte the variation for 'weight for age' at 50th percentile showed more in girls than boys (Maken & Varte, 2012).

Limitations

Three-fourth of differently abled students were residing in hostel; we could not get similar normal children, i.e. staying in the hostel in study area. In some age group, the representation was less. We could not collect information about diet due to lack of communication skills. We could not assess factors associated with growth faltering

CONCLUSION

The study revealed that there growth lag in differently abled children than normal children. It emphasize to focus more on some interventions to improve the nutritional status of differently abled children during their formative years.

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