

A STATISTICAL STUDY ON THE DENTAL DISEASE OF THE HANDICAPPED

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국문초록

심신장애인의 구강질환에 대한 통계학적 연구

최남기 · 양규호

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최근들어 국내에서 심신장애인수가 계속 증가하고 있지만 이들에 대한 구강건강상태의 전반적인 기초자료는 아직까지 부족한 실정이다. 본 연구는 장애인의 구강상태를 조사하고 정상인과의 차이점을 연구하여 건강한 구강상태를 유지 시키는 참고자료를 얻기위하여 시행하였으며, 267명의 장애인에 대해 치아우식증, 치주질환 상태, 교합상태를 조사하여 다음과 같은 결론을 얻었다.

1. 장애인의 우식유치경험율, 우식경험유치면지수, 우식경험영구치지수가 정상인보다 낮았다.
2. 장애인의 치은염유병자율이 나이에 따라 증가하는 양상을 보였으며, 정상인보다 높았다.
3. 장애인들은 정상인 보다 II급, III급 부정교합빈도가 더 높았다.

주요어 : 심신 장애인, 치아우식증, 치은염, 교합

I. Introduction

It is believed that the number of handicapped persons is increasing in proportion to the general growth of the world's population. A number of surveys and control studies have been conducted to determine the effect of cerebral palsy on the prevalence of oral disease¹⁻⁴⁾. The results of these studies have generally proved inconclusive. The reports concerning dental disease in handicapped children are contentious, and there are many differences of opinion as to what extent handicapped chil-

dren differ in oral health and disease from healthy children⁵⁾.

Regarding studies on the oral health of cerebral palsy children, Koster⁶⁾, Magnusson and Deval⁷⁾, Fishman et al.⁸⁾, Foster et al.⁹⁾ have reported and regarding on the mental retarded children, Cohen et al.¹⁰⁾, Pollack and Shapiro¹¹⁾, Gullickson¹²⁾, An and Kim¹³⁾, Chway and Kim¹⁴⁾ have studied. As to mongolism, Brown and Schodel¹⁵⁾, Cutress¹⁶⁾ have reported and as to autistic children Lowe and Lindemann¹⁷⁾, Chung et al.¹⁸⁾ and Ryu et al.¹⁹⁾ have showed the results of their studies. In addi-

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Table 1. Distribution of age, sex between the handicapped and the normal in examined persons

Age	Handicapped persons									Normal persons	
	Male	Female	CP	D & D	MR	Epilepsy	Hydrocephalus	Down's syndrome	Others	Male	Female
Below 5	5	8	10		1		1		1	1	
6	4	4	6		1		1			7	5
7	2	2	2	2					1	8	8
8	4	2	4	1						10	9
9	6	4	4	3	1		2			9	14
10	3	2	2		2		1			9	13
11	5	8	8	2	2				1	7	5
12	3	5	3	5							
13	8	13	6	4	2	4	2		1	2	
14	9	5	9	3	1		1				
15-19	45	20	26	16	13	2	2	4	4		
20-24	26	29	26	9	10	6	1	2	2		
25-29	18	18	17	4	11	1			1		
30-34	9	11	11	2	4	2			1		
Total	145	122	130	51	48	11	9	6	12	66	62

CP: Cerebral Palsy
 D & D: Deaf and Dumb
 MR: Mental Retardation

tion, as to general handicapped persons, Leeds²⁰⁾, Lee²¹⁾, KDA²²⁾, McDermott and Elbadrawy²³⁾, Costello²⁴⁾, and Kim and Yang²⁵⁾ have reported.

The present study was carried out to assess the oral health status of persons suffering from different handicapping conditions.

This was done by conducting a comprehensive study and evaluation of the oral health of a group of handicapped children. Caries rate, occlusion and the condition of the periodontium in different handicapped conditions was compared to a control group of non-handicapped children.

II. Materials and Methods

An oral examination of 267 persons with handicaps between three and thirty-four years was made at two facilities for handicapped persons in Gwangju(Table 1). A control group of 128 normal children between six and thirteen years also took part in the study.

In addition, the data from the Korean Dental Association were used as the normal persons after 13 years of age.

First, a mirror and explorer were used to evaluate the presence of decay in each tooth, and the number of missing and filled teeth was recorded. A caries rate was expressed as the number of decayed, missing, and filled

teeth.

In order to determine the degree of dental carries, df, DMF rate and dft index, DMFT index were used. In addition, gingival conditions and types of molar occlusion were noted. When there was a severe redness, swelling or bleeding tendency to pressure around the gingiva surrounding a tooth, it was concluded that gingivitis existed. Occlusal classification was then recorded as the Angle Classification and, in cases of primary dentition, as a terminal plane.

A statistical analysis of data was later performed utilizing a Chi square test and a pared T-test of significance. All data was conducted on SPSS.

A unpaired T-test was used to compare the caries prevalence and gingivitis between the handicapped and the normal, and a Chi-Square test also to do the class of occlusion.

III. Results

Dental Caries

The dft, dfs and DMFT indices of all handicapped persons examined according to age were significantly lower than those of report of normal persons($p < 0.05$)(Table 2, 4).

Besides this, there was no significant differences between the two groups.

Table 2. df rate, dft and dfs indexes of handicapped persons

Age	df rate		dft index	dfs index
	No. of exam	% of affected		
Below 5	13	38(5)	0.92	1.23
6	8	63(5)	3.5	5.88
7	4	75(3)	1.75	3
8	6	67(4)	1.5	1.5
9	10	70(7)	2.2	4.4
10	5	40(2)	0.8	1
11	13	38(5)	0.85	1.38
12	8	0	0	0
13	10	20(2)	0.2	0.6
14	14	14(2)	0.21	0.5
15-19	65	9(6)	0.17	0.2

() : No. of teeth

Table 3. DMF rate, DMFT and DMFS indexes of handicapped persons

Age	DMF rate		DMFT index	DMFS index
	No. of exam	% of affected		
6	8	13(1)	0.13	0.13
7	4	0	0	0
8	6	50(3)	1.33	1.5
9	10	30(3)	0.4	0.4
10	5	100(5)	1.8	2.6
11	13	54(7)	1.31	1.69
12	8	63(5)	1.13	2
13	10	60(6)	2.1	4.2
14	14	64(9)	2.36	2.79
15-19	65	85(55)	2.74	4.8
20-24	55	73(40)	3.33	5.96
25-29	36	89(32)	4.36	7.5
30-34	20	85(17)	4.15	9.7

() : No. of teeth

Table 4. df rate, dft and dfs indexes of normal persons

Age	df rate		dft index	dfs index
	No. of exam	% of affected		
Below 5	1	100(1)	6	15
6	12	100(12)	6.75	19.8
7	16	100(16)	6.93	15.2
8	19	100(19)	5.79	11.5
9	23	87(20)	4.17	10.2
10	22	36(8)	0.68	1.18
11	12	8(1)	0.75	1.25
12	21	14(3)	0.29	0.48

() : No. of teeth

The DMF rate, DMFT and DMFS index increased with age in both normal and handicapped persons(Table 3, 5).

From Table 6 to Table 14, the results of dental caries

studies according to the different handicapped types examined are presented.

Table 5. DMF rate, DMFT and DMFS indexes of normal persons

Age	DMF rate		DMFT index	DMFS index
	No. of exam	% of affected		
6	12	17(2)	0.17	0.25
7	16	56(9)	1.75	2
8	19	84(16)	2.53	3.95
9	23	65(15)	2.09	3.4
10	22	18(4)	0.36	0.55
11	12	42(5)	0.42	1.67
12	21	76(16)	2.1	3.33
13	2	50(1)	2	3

() : No. of teeth

Table 6. df rate, dft and dfs indexes of Cerebral Palsy

Age	df rate		dft index	dfs index
	No. of exam	% of affected		
Below 5	10	40(4)	1.1	1.5
6	6	50(3)	2.5	3.67
7	2	50(1)	0.5	1
8	4	75(3)	1.5	1.5
9	4	75(3)	3.25	7
10	2	0	0	0
11	8	38(3)	0.75	1
12	3	0	0	0
13	2	0	0	0
14	9	22(2)	0.33	0.78
15-19	26	4(1)	0.04	0.04

() : No. of teeth

Table 7. DMF rate, DMFT and DMFS indexes of Cerebral Palsy

Age	DMF rate		DMFT index	DMFS index
	No. of exam	% of affected		
6	6	17(1)	0.17	0.17
7	2	0	0	0
8	4	50(2)	1.75	2
9	4	50(2)	0.75	0.75
10	2	100(2)	3	4
11	8	50(4)	1.13	1.5
12	3	0	0	0
13	2	0	0	0
14	9	56(5)	0.78	0.89
15-19	26	85(22)	2.69	4.27
20-24	26	69(18)	3.04	5.62
25-29	17	88(15)	3	5.59
30-34	11	100(11)	5	11.7

() : No. of teeth

Gingivitis

Comparison of the status of persons with different handicaps is difficult to make.

Prevalence of gingivitis in handicapped persons was

82% in epilepsy, 63% in mental retardation, 59% in others, 57% in cerebral palsy, and 49% in deaf and dumb.

Prevalence of gingivitis of handicapped persons increased with age and was significantly higher than that of

Table 8. df rate, dft and dfs indexes of Others

Age	df rate		dft index	dfs index
	No. of exam	% of affected		
Below 5	2	50(1)	0.5	1
6	1	100(1)	9	19
7	1	100(1)	1	1
8				
9	2	50(1)	0.5	0.5
10	1	0		
11	1	0		
12				
13	1			
14	1			
15-19	10	10(1)	0.1	0.2

() : No. of teeth

Others : involving Hydrocephalus and Down's syndrome etc.

Table 9. DMF rate, DMFT and DMFS indexes of Others

Age	DMF rate		DMFT index	DMFS index
	No. of exam	% of affected		
6				
7				
8				
9				
10	1	100(1)	1	1
11	1	100(1)	1	1
12				
13	1	100(1)	1	1
14	1	100(1)	16	20
15-19	10	90(9)	3.9	5.9
20-24	4	75(3)	3.5	6.75
25-29	1	100(1)	6	12
30-34	1	100(1)	1	2

Others : involving Hydrocephalus and Down's syndrome etc.

Table 10. DMF rate, DMFT and DMFS indexes of Epilepsy

Age	DMF rate		DMFT index	DMFS index
	No. of exam	% of affected		
6				
7				
8				
9				
10				
11				
12				
13				
14				
15-19	2	100(2)	1	1
20-24	6	100(6)	4	6
25-29	1	100(1)	16	4.5
30-34	2	100(2)	6	14

() : No. of teeth

Table 11. df rate, dft and dfs indexes of Deaf and Dumb

Age	df rate		dft index	dfs index
	No. of exam	% of affected		
Below 5				
6				
7	2	50(1)	2.5	4.5
8	1	100(1)	3	3
9	3	67(2)	1.67	3
10				
11	2	50(1)	2.5	5
12	5			
13	4			
14	3			
15-19	16	19(3)	0.5	0.56

() : No. of teeth

Table 12. DMF rate, DMFT and DMFS indexes of Deaf and Dumb

Age	DMF rate		DMFT index	DMFS index
	No. of exam	% of affected		
6				
7				
8	1	100(1)	1	1
9	3	33(1)	0.33	0.33
10				
11	2	50(1)	2	2
12	5	100(5)	1.8	3.2
13	4	100(4)	3.2	7.75
14	3	67(2)	1.67	1.67
15-19	16	81(13)	2.69	6.44
20-24	9	67(6)	3.33	9
25-29	4	100(4)	4.75	7.75
30-34	2			

() : No. of teeth

Table 13. df rate, dft and dfs indexes of Mental Retardation

Age	df rate		dft index	dfs index
	No. of exam	% of affected		
Below 5				
6	1	100(1)	4	6
7				
8				
9	1	100(1)	3	6
10	2	50(1)	2	2.5
11				
12				
13	2	100(2)	1	3
14	1			
15-19	13	8(1)	0.08	0.08

() : No. of teeth

Table 14. DMF rate, DMFT and DMFS indexes of Mental Retardation

Age	DMF rate		DMFT index	DMFS index
	No. of exam	% of affected		
6				
7				
8				
9				
10	2	100(2)	1	2
11	2	50(1)	1.5	2
12				
13	2	50(1)	2	5
14	1	100(1)	5	6
15-19	13	69(9)	1.85	2.85
20-24	10	70(7)	3.6	6.5
25-29	11	100(11)	5.91	9.55
30-34	4	75(3)	3.75	8.75

() : No. of teeth

Table 15. The distribution of gingivitis in examined persons

Age	Handicapped Persons					Total (%)	Normal Persons
	CP	D&D	MR	Epilepsy	Others		
Below 5	1				1	2(8%)	
6	1		1			2(25%)	2(17%)
7	1					1(25%)	
8	2					2(33%)	1(5%)
9	3	2	1		1	7(70%)	3(13%)
10	2		2			4(80%)	3(14%)
11	4	2	1			7(54%)	2(17%)
12	1	2				3(38%)	6(29%)
13	1	1	2		1	5(40%)	
14	4	1			1	6(36%)	
15-19	19	9	8	2	7	45(69%)	
20-24	16	4	5	6	3	34(62%)	
25-29	13	3	7		1	24(67%)	
30-34	6	1	3	1	1	12(60%)	
Total	74(57%)	25(49%)	30(63%)	9(82%)	16(59%)		

CP: Cerebral Palsy

D & D: Deaf and Dumb

MR: Mental Retardation

Others : involving Hydrocephalus and Down's syndrome etc.

Table 16. Type of molar occlusion in examined persons

	Normal		Handicapped		Total	
	Number	%	Number	%	Number	%
Class I	96	75.0%	138	51.9%	234	59.4%
Class II	15	11.7%	64	24.1%	79	20.1%
Class III	17	13.3%	64	24.1%	81	20.6%
Total	128	100%	266	100%	394	100%

$\chi^2 = 19.226$ $df=2$ p -value : 0.0001

report of normal persons ($p < 0.001$) (Table 15).

Malocclusion

Table 16 shows that the distribution of the class of occlusion in the handicapped group was statistically different from that of the control group and had a significant difference in the distribution of the class of occlusion, with a higher percentage of Class II and Class III occlusion from that observed in the control group when handicapped persons were joined together ($p < 0.001$).

On the contrary, a number of normal persons had Class I occlusion.

IV. Discussion

It is more meaningful to compare the *df*, DMF rate, gingivitis, and classification of occlusion simultaneously than to do them separately. As expected, those children with orthopedic handicaps of a more debilitating nature exhibited a higher prevalence of oral disease. A number of surveys and control studies have been conducted to determine the effects of handicaps on the prevalence of oral disease. The results of these studies, however, have proved generally inconclusive. As Swallow suggests, "there are conflicting accounts of the prevalence of dental disease in handicapped children." He found that a group of physically handicapped children in England showed no appreciable difference in their cumulative caries indices when compared to a normal control group²⁶. Lyons, in his studies of orthopedically handicapped children, found the prevalence of periodontal disease, dental caries, and malocclusion to be noticeably high, and he attributed this, in part, to a loss of oral function²⁷. In his study on the oral health status of cerebral palsied children and their siblings, Lyons also found that the DMF rate and the status of oral hygiene in cerebral palsied children was not statistically higher than in their non-handicapped siblings, whereas the incidence of periodontal disease and oral habits was greater in the cerebral palsied children²⁸.

Further, this investigation showed that there were few differences in caries prevalence when comparing handicapped children with children attending normal school. Although no single group consistently rated highest or lowest, the nature of the handicap seemed to have a definite effect upon the prevalence of oral disease in the orthopedically handicapped children included in the study.

Down's syndrome subjects, age for age, do have less caries, but this is probably due to local factors rather than inherent resistance. In addition, the institutionalized handicapped groups have a lower caries incidence than those living at home, probably as a result of dietary control.

Swallow demonstrated a trend of lower caries incidence in the primary teeth of children with a wide range of physical and medical handicaps^{26,30}, while Miller and Taylor showed a somewhat greater caries incidence in the permanent teeth of orthopedically handicapped children²⁹. In short it was found that the dental caries rate was generally higher in handicapped children than normal children. Its prevalence was highest in the mentally retarded children, followed by the cerebral palsied, the blind, the epileptic, the physically handicapped children with Down's syndrome, and the deaf and dumb.

In Korean research, Lee reported on the oral status of the handicapped, and Kim and Yang showed that the *dmf* rate and *dft* index in handicapped persons were lower than those of normal persons^{21,22,25}. In addition, Rue et al also found that autistic persons had lower *dft* rates than normal persons¹⁹.

In our study, the *dft*, *dfs* and DMFT indices of handicapped persons were significantly lower, than those reported for normal persons ($p < 0.05$). Beyond this, there were no significant differences between the two groups.

The DMF rate, and the DMFT and DMFS indices increased with age in both normal and handicapped persons (Table 17).

In general, oral hygiene is poorer in the handicapped than in normal patients, and this is paralleled by a greater incidence of gingivitis and periodontal disease. The severity of a handicap seems to be an important factor in determining hygiene status. While Magnusson and Deval found greater incidence of gingivitis in noninstitutionalized cerebral palsied children, Swallow did not^{7,30}. In Down's syndrome, an inherent susceptibility to periodontal disease exists, but this relation has not been fully explained. The institutionalized handicapped appear to have higher incidence of periodontal disease. This is likely to be related to less adequate oral hygiene for handicapped persons in institutions¹⁵.

Johnson, Seymour, and Greeley et al reported that the type of handicapped condition had a significant effect on the periodontal problems observed; children with mental retardation having the poorest levels of oral hygiene and the greatest periodontal treatment requirements³¹⁻³³.

Table 17. Comparison of oral health status between the handicapped and normal persons

	Handicapped Person		Normal Person		t-value	p-value
	Mean	SD	Mean	SD		
Gingivitis	0.47	0.21	0.17	0.13	6.087	0.0001**
df rate	0.49	0.25	0.68	0.41	-1.967	0.090
dft index	1.44	1.07	3.92	2.9	-3.067	0.018*
dfts index	2.30	1.98	9.33	7.48	-3.194	0.015*
DMF rate	0.59	0.3	0.64	0.26	-0.603	0.558
DMFT index	1.93	1.43	2.71	2.05	-2.46	0.030*
DMFS index	1.57	1.42	2.27	1.37	-1.11	0.303

* : p<0.05 ** : p<0.01

Various investigators have founded poor oral hygiene in handicapped children. Prolonged retention of food particles in the oral cavity might result in a higher incidence of dental caries and gingival inflammation. First of all, the most obvious reason for poor oral hygiene in an orthopedically handicapped child is a physical inability to clean the oral cavity adequately. Another reason is a lack of self-discipline because of over-protective parents²⁶⁾. In our study prevalence of gingivitis in handicapped persons was 82 % in epileptics, 63% in the mental retarded, 59% in others, 56% in cerebral palsied and 51% in deaf and dumb. As Kim²⁵⁾ has mentioned, these figures are significantly higher than that of normal persons(p<0.001)(Table 17).

Elfenbaum stated that patients with a history of poliomyelitis often retain vestiges of atropic masticatory musculature which can result in malocclusion. He also indicated that patients afflicted with arthritic conditions are often subject to disturbances of the temporomandibular joint, with a subsequent lack of oral functions³⁴⁾. Swallow, however, did not show significant differences from the norm for malocclusion in a group of physically and medically handicapped children³⁰⁾. Lyons did not find altered incidence of malocclusion in teenagers affected with poliomyelitis, while Miller and Taylor's figures for the orthopedically handicapped do not differ widely from the norm²⁷⁻²⁹⁾.

Previous reports have indicated that children with cerebral palsy and poliomyelitis have an increased incidence of malocclusion, which has been attributed to lack of muscular coordination. A significantly higher percentage of cerebral palsy children exhibited oral habits such as bruxism, tongue-thrusting, and mouth breathing. It has been suggested that the dyskinetic movement of the muscles and joints associated with cerebral palsy might be an influencing factor in causing occlusal disharmony⁸⁾.

In a comparison of the class distribution of occlusion among the orthopedic handicapped groups, Brown and Schodel have reported that the handicapped group had a significant difference in the distribution, with a higher percentage of Class II and Class III occlusion from that observed in the control group¹⁵⁾. In Down's syndrome patients there is an alteration in cranial base relationships, which predisposes them to Class III malocclusion.

While malocclusion has been reported to be higher in the mental retarded and in cerebral palsied patients, a basis for this has only been established in the case of mental retardates with Down's syndrome, and in the more severe cases of cerebral palsy¹⁵⁾.

In Korean research, Lee has investigated the distribution of malocclusion in the handicapped and reported that mongoloids had a significantly higher incidence of malocclusion than the other handicapped groups²¹⁾.

In our study, it was found that the handicapped group had a significant difference in the class distribution of occlusion, with a higher combined percentage of Class II and Class III occlusion from that observed in the control group(p<0.001)(Table 16).

Of the handicapped groups, on average 44~57% of the patients had Class I occlusion.

In contrast, 75% of normal persons had Class I occlusion.

V. Conclusion

In order to investigate the degree of dental caries, the gingival condition and the type of occlusion, an oral examination of 267 persons with handicaps between three and thirty-four years of age was made at two facilities for them in Gwangju.

We also examined 128 normal children between six and thirteen years of age as a control group.

The results were as follows:

1. The dft, the dfs and DMFT indices of handicapped persons according to age were significantly lower than those of normal persons($p < 0.05$). Besides this, there were no significant differences between two groups.
2. The prevalence of gingivitis in handicapped persons increased with age and was significantly higher than those reported for normal persons($p < 0.001$).
3. It was found that the handicapped group had a significant difference in the class distribution of occlusion, with a higher percentage of Class II and Class III occlusion from that observed in the control group($p < 0.05$).

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Abstract

A STATISTICAL STUDY ON THE DENTAL DISEASE OF THE HANDICAPPED

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The reports concerning dental disease in handicapped children are contentious, and there are many differences of opinion as to what extent handicapped children differ in oral health and disease from healthy children.

The present study was done by conducting a comprehensive study and evaluation of the oral health between the 267 handicapped and the 128 normal persons with regard to caries rate, occlusion and the condition of the periodontium

The result showed that the dft, the dfs and DMFT indices of handicapped persons according to age were significantly lower than those of normal persons($p < 0.05$).

The prevalence of gingivitis in handicapped persons increased with age and was significantly higher than those reported for normal persons($p < 0.001$).

It was found that the handicapped group had a significant difference in the class distribution of occlusion, with a higher percentage of Class II and Class III occlusion from that observed in the control group($p < 0.05$).

Key words : Handicapped persons, Dental caries, Gingivitis, Occlusion