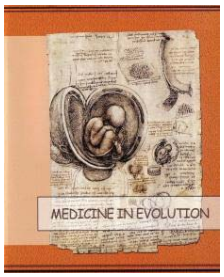
Oral health status of kindergarten children with special needs



Sava-Rosianu R.[1], Fratila A.[2], Hajdu I.A.[3], Schwarz C.[3], Podariu A.C.[1], Jumanca D.[1], Balean O.[1], Matichescu A.[1], Galuscan A.[1]

[1]*Faculty of Dentistry, University of Medicine and Pharmacy "Victor Babes", Timisoara, Romania*
[2]*Faculty of Dental Medicine, "Ludwig-Maximilian" University of Munich*
[3]*PhD, University of Medicine and Pharmacy "Victor Babes", Timisoara, Romania*

Correspondence to:
Name: Adrian Ioan Hajdu
Address: Faculty of Dental Medicine, "Victor Babes" University of Medicine and Pharmacy, 2nd Eftimie Murgu Sq., Timisoara, 300041, Romania
Phone: +40 740315848
E-mail address: hajdu.adrian@umft.ro

Abstract

The purpose of this retrospective study is to find out in what extent disabilities may have an effect on the oral health, in contrast to healthy children between three to six years of age from. Leverkusen, Germany. Three children enter the treatment room at the same time, this procedure being the most efficient. The evaluation of the patients made use of the dmft-index according to its definition. The specific dmft value that was found, is represented in percentage compared to all the others. Out of the total of disabled children, 16 showed the dmft value of 0, compared to the 82 children without disabilities found with a dmft of 0 However, comparing those two values in percentage, it is clear that the overall expectancy is rather different, since 44.44% of all disabled children in this study were caries free, compared to 63.57% in the healthy group of children. Furthermore, it is evident that extreme values are more frequent to be found in the group among disabled children. The results of this study show, that the average tooth of a child with special needs affected by the dmft index was always higher than compared to healthy children.

Keywords: DMFT, oral health, children, disabilities

INTRODUCTION

Today, around one billion, or around 15% of the world population in the year 2018 fall under the definition of some kind of disability. [1] They are often characterized by having poorer health condition than others, the ability to receive higher educational levels may be harder, or even unreachable to obtain, and higher rates of poverty itself and less interaction on social basis may be evident. [2]

The ICF [3] (International Classification of Functioning, Disability and Health) differentiates the word "Disability" in three subcategories. The "impairment" is a problem in body functioning or a modification of the body structure. The "limitation in activity" results in difficulties in the execution of activities. The "Restriction of participation" results in problems that involve any area of life on daily basis.

The disability results by the concurrence of one, two, or all three of these areas.

Nearly 200 million people in the world fall under category of severely impaired (physical or mental) and require special help in order to keep up with basic tasks of life.

There are two major ways on how a person can become disabled. One way is a congenital disability, which means it is either due to inheritance or chromosomal abnormality, or prenatal injury. The other way can be an acquired disability which is a result of perinatal damage, a disease, body injury, or by the aging process.

It is a fact that the ability to take care of themselves, young people with a physical or mental impairment, is either limited, or not given at all. The result very often is a less than optimal hygiene. Especially the combination of shortcoming in oral hygiene, proper nutrition, in combination with the lack of prevention and treatment options regarding children with special needs, results in an increased risk of dental problems in the oral cavity. [4]

However, there have been all kinds of studies with different results all over the world.

The studies of Tesini and Fenton [5], or the results of Nunn and Murray [6] showed no significant disparity in the prevalence of caries in children with, or without a disability.

On the contrary, in Germany there have been different studies that pointed out, that not only the occurrence of decays were more common in handicapped people, but also gingival or periodontal problems in combination with caries were very frequent. [7] [8] [9]

Storhaug and Holst [10] presented a higher than average caries incidence in disabled Norwegian children.

Strübig and Rosendahl [11] executed a study in which they compared disabled children with healthy children in the same group of age. Their result was that the caries prevalence was even double, compared to the healthy children.

Since children with special needs cannot take care of themselves, detection and prevention regarding the oral hygiene often is neglected. Due to physical or mental impairment, the food that is being eaten, or food residues stay longer in the mouth and may be cariogenic to the teeth. Also, anticonvulsive drugs may induce gingival hypertrophy, followed by gingival inflammation. Those two reasons are the most common causes why the only treatment option for a disabled person will be the removal of the affected teeth.

Notably, due to revised and in this area untrained nursing staff, especially regarding home care, and the lack of flexibility of attentive care, will prevent effective early detection and therapy of oral diseases from the patient and caregiver side. [12] The result is, that the child will only be taken to the dentist when it is absolutely necessary, which usually means that it is too late. Also, inadequately equipped facilities and untrained doctors contribute to that problem. [13]

Dentists that are confronted with a child that presents special symptoms or an anatomical anomaly, usually feels overburdened because they neither have the required special training in this field, nor experience. The treatment options very often are limited,

since cooperation for an extended period of time, or even simple interventions will be very hard to obtain.

Children without disability often fear the visit to the dentist. They come to the office with an overall bad attitude, rejecting a treatment before it even started. This mind-set intensifies in disabled children. It is proven, that regular check-ups can help them to cope with their fear. Nicola Dreher [14] showed in her study, that this also applies to children that are handicapped. She based her study on prevention and treatment on a big group of disabled children and young adults and pointed out, that repeating patterns eases this group of people. If a patient was not able to cope with a treatment, they met up to three times and started the treatment after showing the instruments and explaining the approach of the procedure.

It is needless to say, that this approach is only feasible on patients with a minor or mild mental retardation. In patients that show severe signs of mental impairment, or serious physical disability, usually extraction therapy, or therapy under general anaesthesia is the only option left for them.

The condition may be congenital, developmental, or acquired through disease, trauma, or environmental cause and may impose limitations in performing daily self-maintenance activities or substantial limitations in a major life activity. [15]

The oral conditions of children with disabilities are reported to be worse, either due to the existing disability or due to medical, economic or social reasons. [16]

The oral health problems that might be encountered most often are: Tooth decay, periodontal disease, malocclusion, damaging oral habits, oral malformations, delayed tooth eruption, trauma and injury. [17]

Aim and objectives

The purpose of this retrospective observational study was to find out in what extent disabilities may have an effect on the oral health, in contrast to healthy children between three to six years of age.

For this reason, an investigation containing a total of 165 children was done and carried out between 2013 until 2018, within a free of charge agreement and non-profit cooperation between a kindergarten and dentistry.

MATERIALS AND METHODS

This study was performed as a retrospective analysis of the ongoing clinical investigation throughout the years between 2013, until 2018, in Leverkusen, Germany, on a group of 3-6 years old children. All children represented in this paper were provided by a non-profit contract between a particular dentist and a kindergarten which includes the informed consent and al the ethical approvals. This kindergarten has a specific focus on children with special needs. Compared to other day-care centres, it is known for a high concentration of people with all different kinds of disabilities and specifically trained staff, regarding that matter. The kindergarten has six different groups, containing approximately ten children each. All groups come one after another to the office and wait in the waiting room until it is their turn. The waiting room contains all different kinds of toys for young kids, so they can distract themselves, which decreases anxiety.

Three children enter the treatment room at the same time. After doing this procedure for already a couple of years, it was decided that this method was the most efficient one. One child takes place at the dental chair, while two others of the same group (preferably) sit next to him/her on small stools, so they can observe, what the dentist does to the one, sitting on the dental unit. Also, this measure was found to be effective in decreasing anxiety and stress of especially young children, who have never been to the dentist before. If there were more people in the room, it would have been too crowded and negative behaviour like screaming,

actively denying check-up, or others, would easily influence the other children. This would severely harm the procedure of dental charting and evaluation of the oral cavity. Afterwards, the child from the dental unit goes back to the waiting room, so he/she can explain that nothing bad happened, while the next child moves up from the stool to the dental unit, or from the waiting room to the treatment room, respectively. While the last children of a group are being checked, the following group enters the office. This approach appeared as the most efficient regarding effort and time that had to be spent with around 50 children in a dental office. Also, the staff of the dental office, as well as from the kindergarten agreed to this method because it is the least stressing, while still being efficient in the use of time.

The evaluation of the patients made use of the dmft-index according to the definition of the dmft-index.

The following criteria had to be fulfilled:

- The child had to be present
- The child had to present a signed consent that agrees to being part of the check-up program between the kindergarten and dental office.
- The child´s age had to be between 3 and 6 years of age. Otherwise it was excluded from the specific evaluation of this study.
- The child had to be cooperative in order to be able to determine the dmft value. Otherwise it was excluded from the specific evaluation of this study.
- All children being affected by some kind of disability had to be pointed out by staff of the kindergarten, in order to be able to place the dmft result under the category "disabled". Furthermore, this step is necessary, since very mild degrees of a disability might not be detected at first glance (e.g.: autism)

RESULTS

The main purpose of this clinical observational study, was to determine whether a disabled child is more prone to have an increased dmft, or if they have the exact same value compared to a child without disability.

When analysing table 1., it can be seen, that the distribution of patients throughout the five years of study is not equal. Generally speaking, there were much more healthy children in that study, than disabled ones. Overall, this study over the five years of observation contains 129 healthy and 35 disabled children. The distribution of children between age, sex and the physical or mental state is uneven.

Table 1. Exact numbers of children, either healthy or disabled, that took part of the observation

	2018	2017	2015	2014	2013
Healthy Girls	11	18	4	10	14
Healthy Boys	18	14	9	21	11
Healthy Chil.	29	32	13	31	25
Disabled Girls	0	1	3	3	4
Disabled Boys	9	9	4	0	3
Disabled Chil.	9	10	9	3	7
All together	37	41	20	34	32

The year 2013 was the first year, in which the dental office was part of the program in which the kindergarten and the dentist worked together. Out of 32 participants, 14 (43.75%) or were girls without disabilities, 11 (34.38%) or were boys without disability, 4 (12.50%) were disabled girls and 3 (9.38%) were disabled boys. The total dmft score was 44, 29 (65.91%) of healthy children and 15 (34.09%) of disabled children having dmft scores higher than 0, resulting in an almost even distribution of throughout all children from that year.

2014 consisted of 34 participants, with only 3 8.82% being disabled girls, while the healthy children were represented by 10 (29.41%) of girls, and 21 (71.76%) boys. 2014 is the

only year in which the mean dmft value of healthy children is higher than compared to the value of disabled children, being 1.33 of disabled girls compared to 1.6 to healthy children. However, combining healthy girls and boys and comparing them to all disabled children of that year, the mean dmft per capita results in 1.33 to 0.97, meaning that the disabled ones are still worse in comparison.

The year 2015 gave rather different results, compared to the others. Just 20 children were part of the program, but only 65% or 13 of them were healthy. 9 or 35% were disabled, being split up into 3 girls and 4 boys. Due to the highly uneven distribution of dmft counts, the mean average dmft of disabled girls is 5.33, resulting in the highest value observed in this study. The mean value of healthy boys was 0.22 and the one of disabled boys was 1.

The year 2017 showed similar results like the following year. There were 41 participants, 32 healthy and 10 disabled children. 18 boys and 14 girls that were healthy, 9 boys and one girl that were disabled. When analyzing the mean dmft of 2017 regarding the boys, the healthy ones present a mean dmft of 0.86, whereas the disabled ones have a mean dmft of 4.22. This is a huge increase of caries prevalence and general status of the oral situation. Both genders together however, result in a mean dmft of 3.8 to 1.51 meaning it is twice as high and not so extreme anymore.

The year 2018 had 37 participants visiting the dental office. 29 of them were healthy and only 9 had some kind of disability. Only disabled boys were participants in that year because no girl with special needs were present. Considering all the dmft values from this year, 55 teeth in total were counted that fall under this category. Even though the distribution of healthy and disabled children were so uneven, meaning there were more healthy children in contrast to disabled ones, the percentage distribution of all dmft´s was 50.91% (29 children) to 49.09% (9 children). Considering the mean dmft split up to healthy and disabled regardless the gender of the observed children, it can be seen, that the prevalence is 1 (healthy): 3 (disabled), meaning disabled children had a three times higher caries incidence than the others.

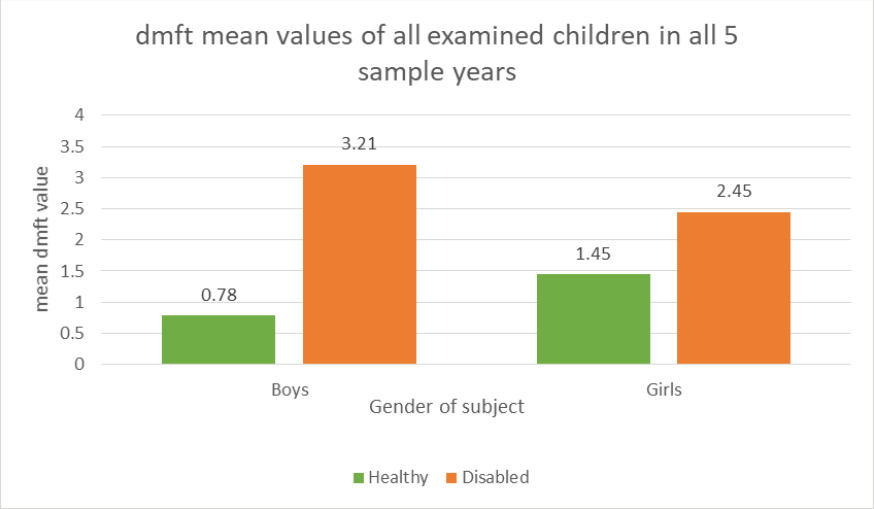


Figure 1. Conclusive chart from all the 5 years in which observation took place, in order to get an average of all the values, presented in the previous charts

According to figure 1 it is clearly evident that the total number of dmft value, being split up equally per observed children (not factoring in the gender or age), is generally higher for disabled children, than compared to the ones that are healthy. This statement is underlined when considering table nr. 12. It shows a conclusive chart which presents the results of all 5 observational years by comparing the mean dmft distributed to all healthy and disabled children, not factoring in the age or gender. Considering all children of this study

and distributing all the dmft values per individual, divided into healthy and disabled, the result of this study shows that the average healthy child between the age of three to six years, has around one tooth affected by caries, a missing, or filled tooth, according to the afore mentioned definition of dmf in 2.2.4., and a disabled child between three to six years, has 2.65 affected teeth, that are considered by the dmft score.

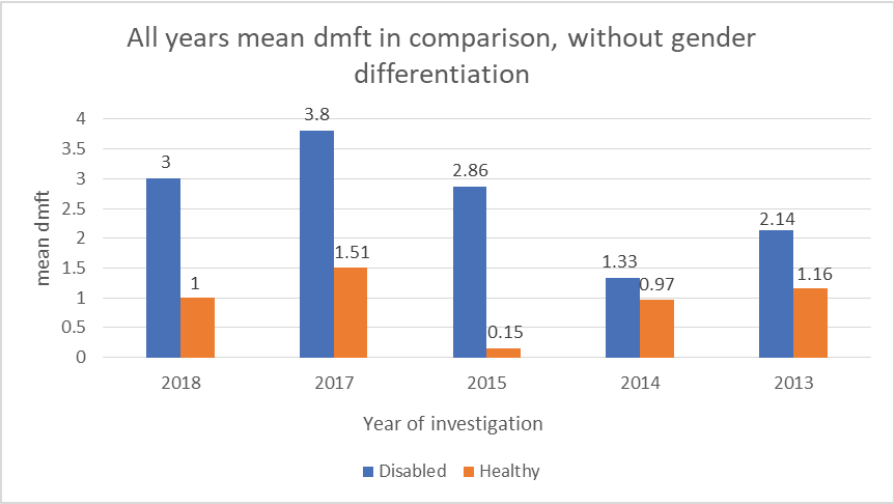


Figure 2. Conclusive chart presenting the results of the 5 years in which observation took place, without gender and age differentiation. A clear differentiation between the mean dmft of healthy and disabled children can be seen

Figure 3 focuses on the age of the individual and the dmft without considering the gender, differentiating only in healthy and disabled of the observed children. As well as in the other afore mentioned tables, it is evident in how the observed disabled children had a significant increase in their mean dmft value throughout the age of three to six years. Whereas the mean value of healthy children with the age of three years was relatively low with 0.22, disabled children had a mean value of 2.14. An increasing tendency can be observed when considering disabled children with the age of 4. They have a mean value of 3.2, compared to 0.72 of healthy children. The observed healthy children with the age of 5 had an increase to 1.55, while disabled children had a slight decrease to 3.08. Children observed with the age of 6 further decreased the mean value to 1.39 for healthy ones and 2.83 in disabled children respectively.

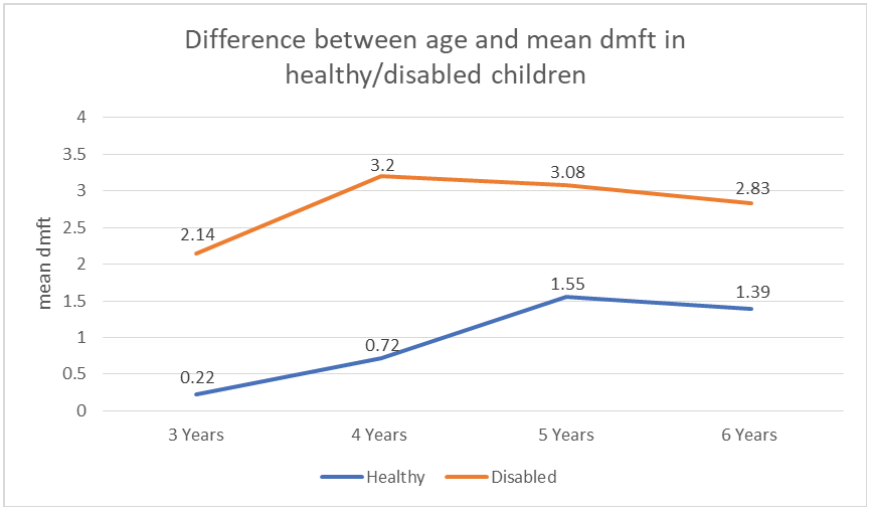


Figure 3. Conclusive chart presenting the results of the 5 years in which observation took place, pointing out the mean dmft in relation to the age of the patients

To get a better understanding and to mitigate the problem of the uneven distribution of healthy to disabled children, the specific dmft value that was found, is also represented in percentage compared to all the others. The number of disabled children was uneven, 16 children showed the dmft value of 0, which compared to the 82 children found without a problem, seems rather small. However, comparing those two values in percentage, it is clear that the overall expectancy is rather different, since 44.44% of all disabled children in this study were found caries free, compared to 63.57% caries free in the healthy group of children. Having a look onto all children with one tooth affected by caries, 3 disabled children compared 11 healthy ones, it is very interesting to see that percentagewise they are almost even, being 8.33% to 8.55%. However, the trend from that point onwards is decreasing since the majority of the disabled children had either zero or only one affected tooth. Children with more extreme scores are observed more frequently now. As an example, in the healthy children group, the dmft value of 4 was only observed one time, meaning 2.33%. In contrast, this value was found 7 times in disabled children, meaning 19.44% were found with a dmft value of 4. This trend continues when considering the following values regarding disabled children. Furthermore, it is evident that extreme values are more frequent to be found in the group among disabled children. Regarding table nr.14 it can be seen, that (except for three children) the worst dmft value obtained from healthy children was 5 and this is considering all 129 children. Compared to the disabled children, worse dmft values (6, 7, 8, 10 and 16) can be found rather often. Concluding, from 36 children, 8 (22.22%) children alone make up of 65,38 % of all teeth affected by the dmft value which is extreme.

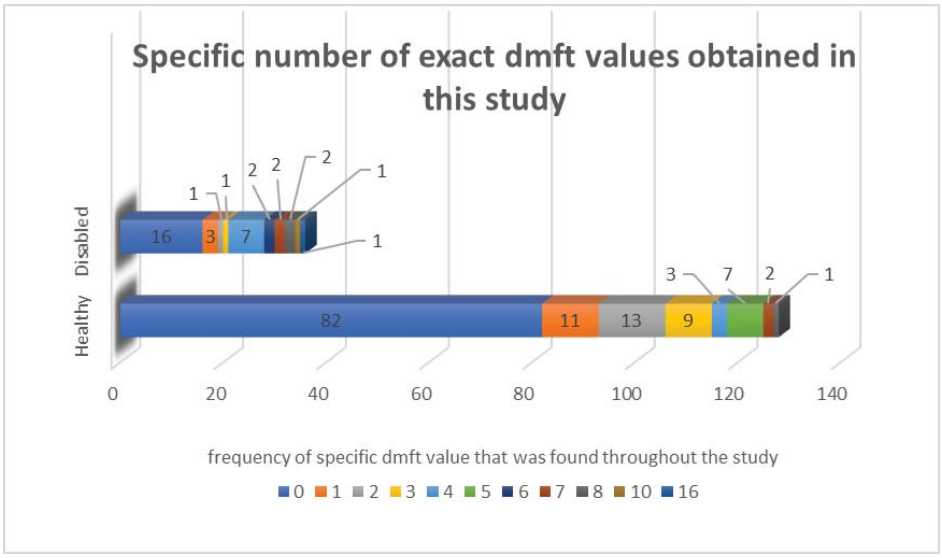


Figure 4. Bar diagram showing the specific number of dmft values obtained by the observation of 129 healthy and 36 disabled children

DISCUSSIONS

This retrospective observational study assesses the prevalence of oral health in disabled children compared to healthy ones from the year 2013 until 2018. The results from the yearly check-up of every individual child were accumulated until the last year of observation in order to be able to make a comparison.

Since there was no even distribution of children in regard to gender, age and especially to numbers of healthy und disabled children throughout the study, there is no possibility in making a definitive conclusion. However, the results presented in this study shows clear evidence that children with special needs, who were observed in this study, actually do have an increased dmft index value.

Other studies came to the same conclusion, like the one done by Donay, who pointed out that people with special needs are limited in their maintenance of oral hygiene due to restriction in movement, malnutrition throughout prolonged timespans and improper prevention. [32] Storhaug and Holst [10] conducted a study in Norway which also came to the same conclusion. Strübig and Rosendahal [11] had a survey and found a caries prevalence in disabled children which was even twice as high, compared to healthy children in the same age. However, this study was done only in children with moderate to severe disabilities. Furthermore in 1980, the general oral health situation was worse than it is nowadays, almost 40 years later. A well-respected German journal reported back in 2014, that an average twelve years old child had a dmft of 0.7, compared to 7, 30 years ago. [33] Anyways, there are also studies that claim that there is no significant difference in caries prevalence in children with special needs compared to healthy ones. [5] [6]

The author thinks that children with special needs definitely are more susceptible of being affected with bad oral health than others, due to the aforementioned reasons. However, depending on the severity of the disability, a child of the age of 6 can be in perfect condition with the dmft of zero. This can also be seen in this study, where 44% of the disabled children observed had exactly this score, when not considering the age. On the other hand, extreme cases can be found on both sides. Factors of nutrition and habits, like sweetened drinks in a bottle over nigh can play an important role and may lead to ECC (Early Childhood Caries, etc.)

Although the DMF index has been a well-established index in the evaluation of the dental epidemiology for more than 80 years, it may present limitations. It is said, that there can be a significant amount inter-observer bias and variability. [31] The resulting value does neither provide true indication for treatment needs, nor does it point out what specific tooth has to receive immediate action. Furthermore, the indices give equal amount of equal needs to untreated decay, missing, or well-restored teeth. [31] Also, teeth lost due to reasons other than decay are no accounted for.

The average dmft value is higher in disabled children because oral hygiene might be harder to perform, especially for severe handicapped individuals, leading to extreme results regarding specific dmft values,. The following decrease of mean dmft values in healthy and disabled children might be due to the reason, why parents realize that there might be a problem with the oral hygiene and they start to look for help of a dentist to prevent future worsening of the situation.

During this study we realized that, even though there were many disabled children present, most of them were able to cope with the investigation of the dentist. Furthermore, the majority of the children with special needs were only mild or moderately affected by their disability. This includes the disabilities like autism, attention deficit hyperactivity disorder (ADHD), cerebral palsy for mild disabilities and Down syndrome, epilepsy, spine bifida or intellectual disabilities for moderate levels of disability. The lower severity of those disabilities eases the contact between child and dentist which is very important because very often, children and especially children with special needs are in fear and have high levels of anxiety. As mentioned in the methodology, we grouped children together with their friends so the by standing friends can observe that nothing bad is happening to them. During the (normally) three year's period of stay of each individual child in the kindergarten, each child had the possibility to be part of our program at least three times. The result was that children that were taking part, got a better understanding of the procedure of investigation and improved their attitude towards the "unusual" situation of being in a dental chair and getting investigated by the dentist. A decrease of their anxiety and fear was very noticeable and improved cooperation with the dentist was achieved. Throughout the years and generally speaking, we found about 60% of the disabled children´s behaviour good enough to cope

with and receive the treatment. 20% of the children with moderate and severe disability however failed in cooperating and following instructions of the dentist. The last 20% were severely disabled and completely failed to follow instructions of the dentist. Those include disabled children with severe retardation and malformations leading to uncontrollable or involuntary movements of the patient. The only option of treatment in severe cases leads to the necessity of general or full anaesthesia. Those findings are on par with other investigations of other authors, who were also conducted on children with special needs. Cichon [9] for example showed that around 40% of his patients with disabilities were able to receive normal dental treatment without any special interventions like general anaesthesia or medical relaxants. Dreher [13] observed 50% of her patients with good cooperation towards the dentist, leading to a positive outcome. 60–100% even resulted in the best possible outcome of the treatment. However, her test subjects were mainly mild to moderate disabled children and teenager under controlled supervision in a special care centre. Regarding the fear and anxiety, Martin et al [36] stated that in his study it was evident, that 40% of the patients with mental retardation showed a higher-than-average prevalence and concluded that this fear and anxiety can be reduced by having the patient coming to the same dental office more often, so he or she can get used to the new environment.

Since primary teeth of children start to erupt at the age of 6 months, proper oral hygiene has to be maintained by the caregiver. Often this goal can be hardly achieved because children are known for not being very cooperative when it comes to this topic. Furthermore, children with special needs can be extra challenging. They have extreme anxiety, they may not have the understanding of the necessity of dental hygiene and may exhibit resistant behaviour. [37, 38] Due to this reason the caretaker should pay special attention in providing the child with a non-cariogenic died. Meaning that tooth decay can be prevented my minimizing the frequency and the amount of sugary drinks and foods. After the intake of those, regular brushing with fluoride toothpaste is highly indicated. Once the children are capable and old enough, they should start with brushing their own teeth under the supervision of the parents. Also, from that point on, prevention with the help of the dentist should be taken into consideration. Regular check-up can reduce anxiety to a minimum. Furthermore, the dentist has the possibility to treat caries in an early stage after detection and prevent other caries from forming. With the use of sealants, prominent fissures and pits can be closed, which greatly reduces the risk of decay forming in exactly those areas. [37] The use of topical fluoride is also very advisable in children with tendency towards bad oral hygiene because the manifestation of caries is reduced.

All in all, it is evident that children with special needs are more susceptible to caries and worse oral hygiene compared to their healthy counter parts. However, if prevention is started from early on and good oral hygiene is being maintained by the caregiver with the help of a dentist, the diagnose does not have to be worse than the one healthy children might receive. Even though that a disability can be challenging, oral hygiene is an important factor that must not to be neglected and has to be taken special care of in order to decrease the difficulty and severity of treatment which might follow on a long term.

CONCLUSIONS

The results of this study show, that the average dmft index of a child with special needs was always higher than compared to healthy children. Especially when considering the individual´s age, it was evident that children with special needs throughout the study had worse outcomes than their healthy counterpart. It was evident that the severity of the disability, meaning how serious the child physically and mentally was affected, definitely had an impact on the outcome.

REFERENCES

1. "The World Bank," 2018. Available: https://www.worldbank.org/en/topic/disability.
2. "WHO," 2018. Available: http://www.who.int/topics/disabilities/en/.
3. "World Health Organisation - The International Classification of Functioning. Disability and Health," 2001. Available:http://www.who.int/topics/disabilities/en/.
4. P. Cichon, "Die zahnärztliche Betreuung von Patienten mit Behinderung – Eine retrospektive klinische Erfolgsbewertung und kontrollierte Interventionsstudie.," Witten/Herdecke, 1996.
5. D. A Tesini, S. J Fenton, in Oral health needs of persons with physical or mental disabilities, 1994, pp. 483 - 498.
6. J. H. Nunn, in The dental health of mentally and physically handicapped children: a review of the literature., Northumberland, 1987, pp. 157 - 168.
7. K. Pieper, P. Kessler, "Karies- und Gingivitisprophylaxe bei behinderten Kindern und Jugendlichen," Deutsche Zahnärztliche Zeitschrift, vol. 38, pp. 770 - 775, 1983.
8. K. Piepers, B. Dirks, P. Kessler, "Caries, oral hygiene and periodontal disease in handicapped adults," Community Dental Oral Epidemiology, vol. 14, pp. 28 - 30, 1986.
9. P. Cichon, Die Behinderten in der Zahnarztpraxis, 1987.
10. K. Storhaug, D. Holst, "Caries experience of disabled school-children," Community Dental Oral Epidemiology, 1978.
11. W. Strübig, H. Rosendahl, "Kariesstatistische Erhebungen an behinderten Kindern," Deutsche Zahnärztliche Zeitschrift, vol. 35, pp. 294 - 296, 1980.
12. P. Künzel-Mirel, J. Mönig, "Ergebnisse einer regelmäßigen zahnärztlichen Betreuung geistig und körperlich behinderter Patienten," Deutsche Stomatologie Zeitschrift, vol. 41, pp. 513 - 515, 1991.
13. N. Dreher, "Ein dezentrales Konzept zur zahnmedizinischen Betreuung behinderter Menschen," in TEAMWERK –ZAHNMEDIZIN FÜR MENSCHEN MIT BEHINDERUNGEN, München, 2008, p. 9.
14. N. Dreher, Ein dezentrales Konzept zur zahnmedizinischen Betreuung behinderter Menschen, München, 2008.
15. "Clinical guideline on management of persons with special health care needs," Clinical Affairs Committee, 2004. Available: http://www.aapd.org/assets/news/upload/2004/582.pdf.
16. Sajith Vellappally et al., "The prevalence of malocclusion and its association," Vellappally, 2014.
17. "National Institue of Dental and Craniofacial Research,". Available: https://www.nidcr.nih.gov/health-info/developmental-disabilities/more-info.
18. Khushbu Yadav, Satyam Prakash, "Dental Caries: A Review," Nepal, 2016.
19. C. Simon, in Evaluation of modern caries removal techniques & approaches- carisolv, 2018, p. 5.
20. R. Ferro, A. Besostri and A. Olivieri, "Caries prevalence and tooth surface distribution in a group of 5-year-old Italian children," Cittadella, 2009.
21. "American Academy of Periodontology," 2018. Available: https://www.perio.org/consumer/gum-disease-risk-factors.
22. Nazia Ameer, Rajababu Palaparthi, Madhukar Neerudu, Sunil Kumar Palakuru, Harinath Reddy Singam, and Satyanarayana Durvasula, "Oral hygiene and periodontal status of teenagers with special needs in the district of Nalgonda, India," Indian Society of Periodontology, vol. 16, pp. 421 - 425, 2012.
23. K. Pieper, B. Dirks, P. Kessler, "Caries, oral hygiene and periodontal disease in handicapped adults.," Community Cental Oral Epidemiology, vol. 14, pp. 28 - 30, 1986.
24. L. S. Franck, C. S. Greenberg, B. Stevens, "Pain assessment in infants and children," Pediatric Clinics of North America, vol. 47, pp. 487 - 512, 2000.
25. SumerM. Alaki and Niveen S. Bakry, "Dental Pain in Children with Intellectual Disabilities:," International Journal of Dentistry, vol. 2012, 2012.
26. Dr. Milt Noveck and Dr. John Nosti, "ADVANCED COSMETIC AND GENERAL DENTISTRY," Gilleard Marketing, 2014 - 2018. Available: https://cosmeticdentistryofsj.com/worn-teeth/.
27. RW Matthews; SR Porter; C. Sully, "Measurement of confidence levels of new UK dental graduates: an approach to academic audit.," Int Dent, vol. 43, pp. 606-608, 1993.
28. C. o. C. Affairs, "Guideline on Use of Nitrous Oxide for Pediatric," 2005.
29. M.M. Cohen; R.A. Winer; S. Achwartz; G. Shklar, "Oral aspects of Mongolism. Part I. Perioodontal disease in Mongolism.," in Oral Surgery, 1961, p. 92.

30. "dentalcare.com," Crest; Oral B, 2018. Available: https://www.dentalcare.com/en-us/professional-education/ce-courses/ce368/epidemiology-the-dmf-index.
31. E. Lesaffre, SM Mwalili, D. Declerck, "Analysis of caries experience taking inter-observer bias and variability into account.," J Dent Res., Leuven, Dec. 2004.
32. Silke Donay; Peter Cichon, "Die zahnärztliche Betreuung von Patienten mit Behinderung – Eine retrospektive klinische Erfolgsbewertung und kontrollierte Interventionsstudie.," IDZ, vol. 4, pp. 3 - 16, 2004.
33. P. Pleul, "stern.de," 3 7 2014. [Online]. Available: https://www.stern.de/gesundheit/zaehne/studie-zur-zahngesundheit-kinder-haben-heute-deutlich-weniger-karies-3949262.html.
34. Hery Mwakayoka; Joyce Rose Masalu; Emil Namakuka Kikwilu, "Dental Caries and Associated Factors in Children Aged 2-4 Years Old," J Dent Shiraz Univ Med Sci, Muhimbili, 2017.
35. P.M Leong; M.G Gussy; S.Y Barrow; A. de Silva-Sangiorski; E. Waters, "A systematic review of risk factors during first year of life for early childhood caries," International Journal of Paediatric Dentistry, vol. 23, pp. 235-250, 2012.
36. M. D Martin; J. Kinoshita-Byrne; T. Getz, "Dental fear in a special needs clinic population of persons with disabilities.," in Special Care Dentist, Seattle, 2002, pp. 99-102.
37. A. A. o. P. Dentistry, Guidlines on Management of Dental Patients with Special Health Care Needs, 2004.
38. "Advanced cosmetic and general dentistry," 2014 - 2018. Available: https://cosmeticdentistryofsj.com/worn-teeth/.
39. A. Galuscan, Aspecte de Sanatate Orala in Stomatologia Speciala, Ed. Eurobit, Tm 2016