



ASSESSMENT OF DENTAL CARIES IN INDIVIDUALS WITH INTELLECTUAL DEVELOPMENTAL DISORDER IN KOZHIKODE DISTRICT- A CROSS-SECTIONAL STUDY

Dr Nimmy S Mukundan*

senior resident , Department of conservative dentistry and endodontics, Government dental college, Kozhikode, Kerala – *Corresponding Author

Dr Prasanth Balan

Associate Professor, Department of conservative dentistry and endodontics, Government dental college, Kozhikode.

Dr Jayasree S

Professor and Head of Department, Department of conservative dentistry and endodontics, Government dental college, Kozhikode.

ABSTRACT

Background: Individuals with intellectual developmental disorder (IDD) suffers from poor oral health due to impaired physical coordination and cognitive skills. However, their dental caries status is mostly underreported particularly in low-income countries. Therefore, this study aimed to assess the dental caries status of individuals with IDD as compared to age and gender matched healthy individuals in India.

Methodology: In this comparative cross-sectional study, dental caries status of 266 individuals with IDs aged 13-35 years and 266 age and gender-matched healthy individuals were assessed using the DMFT index. Statistical analysis was done using descriptive statistics, Wilcoxon signed ranks test, Kruskal Wallis Test and Mann Whitney test.

Results: Of the 266 individuals with IDD, IDD associated with autism (n=40, 15%) was the most common type of disability. 10.9% of the case and 30.5% of controls were caries-free. The mean number of decayed tooth and the DMFT score (DT= 4.16±4.17 vs 0.65±0.90; DMFT= 4.56±4.55 vs 1.41±1.42); P Value=0.00) were significantly higher among disabled compared to their healthy controls. Whereas the mean number of the filled tooth (0.18±0.81 vs 0.68±1.1; Pvalue=0.00) was significantly lower. DT and DMFT increased significantly with the severity of disability (P value<0.05).

Conclusion: Individuals with IDD had a higher caries experience and considerably lower filled tooth rate compared to healthy individuals. Uplifting the priority given to oral health by oral health education programs and implementing strategies to improve access to dental services will help to address many of the challenges faced by these less fortunate individuals.

KEYWORDS : Autism, Cerebral palsy, Dental caries, Down syndrome, DMFT Index, Intellectual disability.

INTRODUCTION

Intellectual disability (ID) is a developmental condition characterized by significant deficits in both intellectual functioning and adaptive behaviour including conceptual, social and practical skills.¹ Awareness among the public in India, concerning individual with intellectual disability has gained much attention recently after the passing of Rights of PWD (Person with disability) Act, 2016.² According to the Census 2011, there are about 2.68 crore people with disabilities in India who constitutes 2.21 percent of the total population of the Country.³

Individuals diagnosed with ID have limitations in both intellectual functioning and adaptive behaviour⁴, which limit their ability to independently complete sequential tasks such as daily tooth brushing. Consequently, the oral health status of individuals with ID needs particular attention. Dental caries is the most prevalent disease among mentally retarded children worldwide and dental treatment is the greatest unattended health need of the disabled.⁵ The population with disabilities has significantly higher rates of poor oral hygiene, gingivitis, and periodontitis than do members of the general population.⁶ Dental caries rates in people with ID are the same as or lower than the general population.⁷ According to a recent systematic review, individuals with an intellectual and developmental disability (IDD) has higher levels of dental plaque, worse gingival status, fewer decayed and filled permanent teeth.⁸ Moreover, because of the insufficient or sometimes complete dysfunction of their stomatognathic apparatus, often due to anatomical malformations of the orofacial cavity and children's uncooperative behaviour, accomplishment of good oral hygiene measurements usually implies the assistance of parents or caretakers.⁸

There is increasing worldwide interest in the oral health status of children with intellectual disabilities. Information concerning the oral health status and treatment needs of

adults with IDs is essential to create best practices for inclusion in dental treatment guidelines and to develop compensatory strategies to promote and protect the oral health of this vulnerable population.⁹ However, there is a serious dearth in the data available from India. Hence the aim of the current study was to assess the dental caries status of individuals with IDD as compared to age and gender-matched healthy individuals in India.

MATERIALS AND METHODS

A cross-sectional comparative study was done in randomly selected 266 individuals with IDD (with medical board certificate for IDD) from different special schools and 266 age and gender-matched healthy controls from general population residing in Kozhikode district, India. Sample size was calculated using the formula, $N = \{(Z_{\alpha} + Z_{\beta})^2 \times SD^2 \times 2\} / d^2$ where, $d=0.4$, $Z_{\alpha}=1.96$, $Z_{\beta}=0.842$, $SD=1.87$. Uncooperative individuals, individuals with profound IDD, individuals under long term sweet medications or with a severe systemic illness which contraindicated an oral examination and those who refused to sign the consent form were excluded from the study.

Data collection and clinical examination

Ethical approval was obtained from the Institutional Ethics Committee Government Dental College, Kozhikode (ECR/673/Inst/ KL/2014). Written informed consent was obtained from participants' parents, legal guardians or institution caretakers. Individuals with IDD were examined in the presence of their parents, teachers and or caretakers. Age and gender-matched healthy individuals in the control groups were recruited by conducting dental camps in schools, colleges. The baseline sociodemographic data along with relevant information such as medical history, brushing habits, residential status, and severity of mental retardation were recorded by interviewing parents, caretaker, teachers or from admission records and medical board certificates. Cases were then classified into four groups, intellectual

developmental disability associated with Autistic disorder (AD), Down syndrome (DS), and Cerebral palsy (CP) and individuals with intellectual developmental disability not associated with AD, CP and or DS (IDD), category were further classified into mild-moderate and severe intellectual disabilities (as per medical board certificate). Clinical examination for both cases and controls were carried out at the respective institutions using artificial light, plain mouth mirror and dental explorer. To record the dental health condition, Decayed-Missing-Filled Teeth Index (DMFT Index-by Henry T.Klien, Carrolle E. Palmer and Knutson J.W - 1938) was recorded.

STATISTICAL ANALYSIS

A descriptive analysis of the data was performed. The mean \pm standard deviations were used for describing DMFT and their components. Wilcoxon signed ranks test, Kruskal Wallis test and Mann Whitney test were used to compare the DMFT status and various components. A P -value < 0.5 is considered as statistically significant. IBM SPSS version 22 was used for statistical analysis.¹⁰

RESULTS

A total of 266 individuals with IDD and 266 age and gender-matched healthy controls between the age of 13 to 35 years were examined. The general profile of the study population is given in table:1. Majority of the study participants were males ($n=195(73.3)$) and aged 13 to 20 years ($n=155(58)$). IDD alone ($n=172(64.7)$) was the most common disability type and the majority ($n=134(50.4)$) had a moderate intellectual disability. Among the study participants, DMFT score=0 was found in 29 (10.9%) cases and 81 (30.5) controls. The mean number of decayed tooth and the DMFT score (DT= 4.16 ± 4.17 vs 0.65 ± 0.90 ; DMFT= 4.56 ± 4.55 vs 1.41 ± 1.42); P -value=0.00) was significantly higher among individuals with IDD compared to their healthy controls. Whereas the mean number of filled tooth (0.68 ± 1.1 vs 0.18 ± 0.81 ; P value=0.00) was significantly higher among controls compared to cases. (Table:2)

In both, the study groups DMFT score significantly increased (P Value=0.00) with age. Similarly, the mean number of decayed and missing teeth also showed a gradual increase across ages in both groups. However, this pattern was not seen in the case of filled teeth. Even though there was a gradual increase in the mean number of filled teeth till 30 years of age, it suddenly declined after 31 years in both the groups. When the DMFT status was compared based on gender, female showed slightly higher mean DMFT score, the mean number of decayed and filled teeth. However, this was not statistically significant (P value >0.05). There was a significant increase in the mean DMFT (P value=0.001) and DT score (p value=0.00) among IDD individuals with cerebral palsy compared to IDD alone or other types. The study showed a significant (P value=0.008) increase in the mean number of decayed teeth according to the severity of IDD. Similarly, the DMFT score also increased according to the severity. Nonetheless, the mean number of filled teeth decreased according to the severity of IDD even though non-significant (P value=0.359). (Table:3) Frequency of brushing revealed that, while the majority of the cases ($n=262(98.5)$) brushed once daily, the majority of the controls ($n= 142(53.4)$) brushed twice daily. (Figure:1)

DISCUSSION

Oral disease is a major health problem for adults with disabilities and is the most unattended health need among the disabled.¹¹Dental caries, gingivitis and periodontal

disease are among the top ten secondary conditions among individuals with ID that cause limitations in their daily activities.¹² In the current study, dental caries status of 266 individuals with IDD were compared with 266 age and gender-matched controls. Overall, the prevalence rate of caries-free individuals was higher among individuals with IDD compared to their age and gender-matched healthy controls in the current study. The mean DMFT score was 4.56 ± 4.55 . This was comparable to other studies conducted among individuals with various intellectual disabilities in various parts of India.¹³ The mean number of decayed tooth and the DMFT score (p Value <0.05) was significantly higher among individuals with IDD compared to their healthy controls. This was in accordance with the findings of previous studies.^{15,16} However, data on dental caries prevalence among the disabled are not consistent. Few studies have reported similar or even lower decay rates in healthy individuals than individuals with intellectual disability of the same age.^{11,17,18} These conflicting results in various studies can be attributed to the institutional status of study subjects, the difference in age group or to the study population and settings and difference in the level of public welfare for the disabled among countries. In many institutional and group settings, residents receive a well-balanced diet, with a supervised intake of refined carbohydrates.⁷ The high DMFT score of the institutionalized disabled participants compared to the non-institutionalized disabled individuals in the current study confirms this finding. In our study, the majority of the participants were males. When comparing the caries rate between males and females, no significant difference was found, which is to previous literature.¹⁹In agreement with previous reports, the present study revealed that DMFT score is associated with age in both cases and controls.^{9, 11, 15, 20}This is due to the fact that dental caries is irreversible and accumulative.¹⁹

Poor oral health in the intellectually disabled has been attributed to several causes, including the individual's inability to achieve proper oral hygiene; the person's incapacity to express their pain and discomfort.¹¹ They have been reported to have more obstacles in daily tooth brushing than healthy children.⁴ This might be due to their difficulty in achieving the required manual dexterity for self-care and lack of awareness of the importance of oral hygiene practice.⁴ Consistent with this finding, ninety-eight percent of the cases brushed only once daily compared to the fifty-three percent of healthy controls who brushed twice daily. Also increased thirst, 'eating for consolation' or 'comfort' consumption of sweets and drinks, long-term consumption of medications in the form of sweetened syrups also increases the dental caries rate in these individuals.¹³ In order to remove the possible effect of long term sweetened cariogenic medication on the dental caries rate, and thereby the result of this study, individuals under such medication were excluded from our study.

The prevalence of the mean number of missing tooth was also higher among the cases compared to controls. However, the prevalence of filled tooth was significantly lower among disabled individuals compared to the normal participants. This observation has also been reported by previous studies^{11, 15} and reflects the limited accessibility to the dental care facilities for intellectually disabled than the general population. Several factors contributing to this large unmet treatment need among disabled individuals are lack of knowledge about good oral hygiene practices among parents, caretakers and concerned authorities, lack of motivation, low priority given to dental care in society, lack of facility for early and regular oral health check-up and prompt

treatment and finally cost of the treatment.¹⁹

The severity of ID has been identified as a predictor for oral care access by one previous study.²¹Inconsistent to this, we found that the caries rate and the DMFT score significantly(p value=0.008) increased with the severity of the intellectual disability. Also,the mean DMFT and DT score were significantly (p value<0.05) high among IDD individuals with cerebral palsy compared to IDD alone or other types. Cerebral palsy is often accompanied by disturbances in coordination, cognition, communication, and seizure disorders which in turn affects the oral self-care behaviour.²² IDD associated with down syndrome showed the lowest mean number of the decayed tooth which was in agreement with the previous studies.²³ Congenital oligodontia, delayed eruption, a different salivary composition (salivary IgA, salivary pH, buffering capacity, and flow rate) were the major reasons endorsed to lower caries prevalence in down syndrome patients.²⁴

Even though our study is one among the few studies which assessed the dental caries status of IDD individuals, there are several limitations for our study. Firstly, our study was confined to the dental caries status of the population which can be a limitation since individuals with intellectual disabilities suffer from other wide varieties of oral diseases also. However, this was beyond the scope of the current study. Also, various other factors like socioeconomic status, the extent of dental service being provided which might have an association with dental caries status were not assessed in the current study. Hence further studies are recommended.

CONCLUSION

It can be concluded from the study that individuals with IDD have higher dental caries experience compared to their healthy controls.With increasing age and life expectancy, this population is in need of good dental care on a regular basis to prevent disease and improve quality of life.²⁵ Necessary action has to be taken by stakeholders to formulate strategy and policy for promoting dental health services for theseless fortunate population.

Table:1 General profile of the study population

Parameters	Cases n (%)	Controls n (%)
Age (In Years)		
13 to 20	155(58)	155(58)
21 to 30	93(35)	93(35)
31 to 35	18(7)	18(7)
Total	266(100)	266(100)
Gender		
Male	195(733.3)	195(733.3)
Female	71(26.7)	71(26.7)
Total	266(100)	266(100)
IDD type		
IDD associated with DS	26(9.8)	-
IDD associated with AD	40(15)	-
IDD associated with CP	28(10.5)	-
IDD	172(64.7)	-
Total	266(100)	-
IDD severity		
Mild	72(27.1)	-
Moderate	134(50.4)	-
Severe	60(22.6)	-
Total	266(100)	-
Institutional status		
Institutionalized	147 (55.3)	-
Non- Institutionalized	119 (44.7)	-
Total	266(100)	-

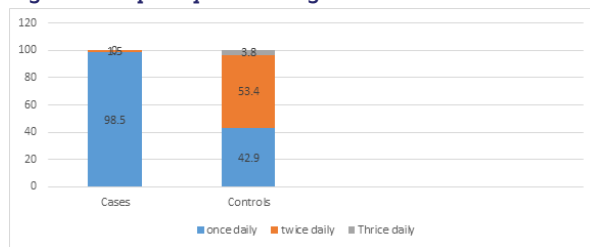
Table:2 Comparison of DMFT status among cases and controls

Variable	Cases	Controls	P value
DT	4.16±4.17	0.65±0.90	0.00 [*]
MT	0.21±0.94	0.09±0.46	0.059
FT	0.18±0.81	0.68±1.11	0.00 [*]
DMFT	4.56±4.55	1.41±1.42	0.00 [*]

Table 3: Comparison of various variables with DMFT status among cases and controls

Variable	DT (Mean±SD)		MT (Mean±SD)		FT (Mean±SD)		DMFT (Mean±SD)	
	Cases	Controls	Cases	Controls	Cases	Controls	Cases	Controls
Institutionalization								
Institutionalized	4.06±3.64	-	0.15±0.96	-	0.10±0.60	-	4.32±3.95	-
Non-Institutionalized	4.28±4.75	-	0.03±0.92	-	0.27±0.99	-	4.86±5.19	-
P Value [†]	0.528		0.002 [*]		0.053		0.999	
Age								
13-20	3.74±4.33	0.62±0.83	0.08±0.30	0.01±0.13	0.18±0.81	0.46±0.91	4.01±4.56	1.11±1.16
21-30	4.26±2.91	0.66±0.93	0.37±1.42	0.17±0.68	0.21±0.88	1.01±1.28	4.86±3.49	1.81±1.70
31-35	7.22±6.55	0.77±1.26	0.55±1.33	0.33±0.46	0	0.88±1.27	7.77±7.36	2.0±1.28
p-Value [‡]	0.002 [*]	0.988	0.110	0.001 [*]	0.493	0.001 [*]	0.001 [*]	0.000 [*]
Gender								
Male	4.13±4.09	0.64±0.93	0.22±0.99	0.06±0.39	0.10±0.51	0.64±1.06	4.46±4.42	1.33±1.42
Female	4.22±4.40	0.67±0.80	0.19±0.80	0.16±0.60	0.40±1.29	0.80±1.23	4.83±4.89	1.64±1.40
P Value [†]	0.910	0.341	0.983	0.070	0.065	0.506	0.559	0.065
IDD type								
IDD	4.61±4.40	-	0.26±0.88	-	0.25±0.97	-	5.12±4.88	-
IDD associated with DS	1.73±1.80	-	0.42±1.96	-	0.07±0.39	-	2.23±2.77	-
IDD associated with AD	4.27±4.60	-	0.05±0.22	-	0.05±0.22	-	4.37±4.58	-
IDD associated with CP	3.50±2.61	-	0	-	0.07±0.37	-	3.57±2.60	-
P value [‡]	0.00 [*]	-	0.11	-	0.65	-	0.001 [*]	-
IDD severity								
Mild	3.26±2.94	-	0.31±1.39	-	0.23±0.79	-	3.81±3.38	-
Moderate	4.0±4.05	-	0.19±0.78	-	0.19±0.90	-	4.38±4.62	-
Severe	5.60±5.23	-	0.15±0.54	-	0.10±0.57	-	5.58±5.35	-
P value	0.008 [*]	-	0.872	-	0.359	-	0.041	-

* P value<0.05, † Mann-Whitney U test, ‡Kruskal Wallis test.

Figure 1: Frequency of brushing in cases and controls.

REFERENCES

- American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-V. 5th ed. Washington (DC): American Psychiatric Association; 2013. p. 31.
- Narayan CL, John T. The Rights of Persons with Disabilities Act, 2016: Does it address the needs of the persons with mental illness and their families. *Indian J Psychiatry*. 2017;59(1):17-20.
- Department of Empowerment of Persons with Disabilities (Divyangjan)-Ministry of Social Justice and Empowerment, Government of India. 2019 [Available from: <http://disabilityaffairs.gov.in/content/>].
- Zhou N, Wong HM, Wen YF, McGrath C. Oral health status of children and adolescents with intellectual disabilities: a systematic review and meta-analysis. *Dev Med Child Neurol*. 2017;59(10):1019-26.
- Hennequin M, Faulks D, Roux D. Accuracy of estimation of dental treatment need in special care patients. *J Dent*. 2000;28(2):131-6.
- Kadam NS, Patil R, Gurav AN, Patil Y, Shete A, Naik Tari R, et al. Oral Hygiene Status, Periodontal Status, and Periodontal Treatment Needs among Institutionalized Intellectually Disabled Subjects in Kolhapur District, Maharashtra, India. *Journal of Oral Diseases*. 2014;2014:1-11.
- Anders PL, Davis EL. Oral health of patients with intellectual disabilities: a systematic review. *Spec Care Dentist*. 2010;30(3):110-7.
- Ivancic Jokic N, Majstorovic M, Bakaric D, Katalinic A, Szirovicza L. Dental caries in disabled children. *Coll Antropol*. 2007;31(1):321-4.
- Morgan JP, Minihan PM, Stark PC, Finkelman MD, Yantsides KE, Park A, et al. The oral health status of 4,732 adults with intellectual and developmental disabilities. *J Am Dent Assoc*. 2012;143(8):838-46.
- Machines IB. IBM SPSS Statistics for Windows, IBM Corp Armonk, NY; Version 22.0.
- Diab HA, Salameh Z, Hamadeh GN, Younes G, Ayoub F. Oral Health Status of Institutionalized Individuals with Intellectual Disabilities in Lebanon. *J Oral Maxillofac Res*. 2017;8(1):e4.
- Petrovic BB, Peric TO, Markovic DLJ, Bajkin BB, Petrovic D, Blagojevic DB, et al. Unmet oral health needs among persons with intellectual disability. *Res Dev Disabil*. 2016;59:370-7.
- Ahlborg B. Practical prevention. In: Nunn JH, editor. *Disability and Oral Care*. FDI World Dental Press; 2000. pp. 29-39.
- Chandrasekaran S, Dhanraj M. Oral hygiene status of mentally challenged adolescents in Chennai: A cross-sectional study. *International Journal of Orofacial Biology*. 2017;1(1):39-41.
- Lee JY, Lim KC, Kim SY, Paik HR, Kim YJ, Jin BH. Oral health status of the disabled compared with that of the non-disabled in Korea: A propensity score matching analysis. *PLoS One*. 2019;14(1):e0208246.
- Seirawan H, Schneiderman J, Greene V, Mulligan R. Interdisciplinary approach to oral health for persons with developmental disabilities. *Spec Care Dentist*. 2008;28(2):43-52.
- Turner S, Sweeney M, Kennedy C, Macpherson L. The oral health of people with intellectual disability participating in the UK Special Olympics. *J Intellect Disabil Res*. 2008;52(Pt 1):29-36.
- Gabre P, Martinsson T, Gahnberg L. Longitudinal study of dental caries, tooth mortality and interproximal bone loss in adults with intellectual disability. *Eur J Oral Sci*. 2001;109(1):20-6.
- Al-Maweri S, Al-Sufyani G. Dental caries and treatment needs of Yemeni children with down syndrome. *Dent Res J (Isfahan)*. 2014;11(6):631-5.
- Altun C, Guven G, Akgun OM, Akkurt MD, Basak F, Akbulut E. Oral health status of disabled individuals attending special schools. *Eur J Dent*. 2010;4(4):361-6.
- Kancherla V, Van Naarden Braun K, Yeargin-Allsopp M. Dental care among young adults with intellectual disability. *Res Dev Disabil*. 2013;34(5):1630-41.
- Jan BM, Jan MM. Dental health of children with cerebral palsy. *Neurosciences (Riyadh)*. 2016;21(4):314-8.
- Cheng RH, Leung WK, Corbet EF, King NM. Oral health status of adults with Down syndrome in Hong Kong. *Spec Care Dentist*. 2007;27(4):134-8.
- Porovic S, Zukanovic A, Juric H, Dinarevic SM. Oral Health of Down Syndrome Adults in Bosnia and Herzegovina. *Mater Sociomed*. 2016;28(6):437-9.
- Feldberg I, Merrick J. Intellectual disability and dental services: experience from Israel. *Front Public Health*. 2014;2:133.