



THE IMPACT OF BMI ON ORAL HEALTH OF VISUALLY IMPAIRED CHILDREN - MULTIINSTITUTIONAL STUDY OF HIMACHAL PRADESH

Dental Science

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ABSTRACT

Aim: To investigate the impact of lifestyle, BMI index to dental caries among residential visually impaired children in Himachal Pradesh. **Methodology:** 121 visually impaired children BMI index was assessed by weight, height of children. Lifestyle pattern was assessed by their socioeconomic status, dietary factor and oral hygiene practice. Dental caries was recorded by DMFT Index and compared to each other. **Result:** Majority of residential visually impaired children had adequate BMI-index as well as healthy life style pattern thus leading low caries. The dental caries was not significantly associated with the abnormal BMI-index. **Conclusion:** The findings highlight that association of physical impairment does not affect dental caries and obesity. Adequate BMI and low dental caries was found in visually impaired children as they live healthy life style in residential school. Dental caries can be associated with other contributing factors.

KEYWORDS

Dental caries, BMI Index, visually impaired

The growth and development of children and dental caries depend upon many factors. Blindness is defined as a condition where a person suffers from total absence of sight or visual acuity not exceeding 6/60 or 20/200 in the better eye even with correction lenses or limitation of the field of vision subtending an angle of 20° or worse¹. Dental caries is a widespread and chronic disease among children, which may lead to pain, feeding problems, sleep disturbances, malocclusion, discomfort and decreased quality of life. Moreover, rapidly changing and unhealthy lifestyles include excessive consumption of sugar and high fat diet leading to change in disease patterns. Studies have argued that dental caries is correlated with increasing weight, which may be attributed to high sugar consumption^{2,3}. Other studies argued that dental caries negatively impacts children's growth, practically in low income countries and communities^{7,9}. Dental caries also has an impact on the general health of children related to abnormal BMI due to growth disorders.

Although dental caries is multifactorial disease, related to genetic, environmental, social, and dietary factors like frequency of sugar consumption, dietary habits, salivary composition, flow, dental plaque, socioeconomic status and utilization of dental services. The aim of study was to determine impact of lifestyle pattern, socioeconomic status anthropometric measure BMI Index (weight, height) on dental caries in visually impaired residential children in Northern Indian state of Himachal Pradesh. Himachal is hilly state where most of the population lives in rural area of village which follows simple and healthy life style. BMI index is a simple tool for assessing lifestyle status, malnutrition related to deficiency, adequate or overweight related to obesity. Residential school provide healthy emotional, physical, internal, motivational environment to these children.

MATERIALS AND METHODS:

121 visually impaired children in 4 different residential school of Himachal Pradesh, dental caries was recorded by DMFT Index by Klein, Palmer & Knutson's DMFT index¹¹. Caries was detected by 'cavitations' level only (detectable softened floor, undermined enamel or softened wall). Criteria of "catching" or "retention" of the explorer was not used to detect caries. All the subjects were examined in premises of the respective residential schools, under adequate natural illumination (Type III) using plane mouth mirror and No. 23 explorer [American Dental Association, 1970]¹² to remove large debris. The height of children was measured with a portable stadiometer by standing upright without shoes.

Weight was assessed with a portable electronic digital scale to the nearest 0.5kg. Thus BMI Index was calculated. Children's personal detail name, age, gender, date of birth, location and education level of parents was noted. A close ended questionnaire adopted from *WHO oral health questionnaire for children, 2013*¹³ were asked for socioeconomic status, area of residence, oral health practices and utilization of dental services as baseline information. As we know that

BMI has become a standard in the medical world to define obesity.¹⁰ WHO classifies BMI index body weight: <18.5 underweight 18.5–25.0 normal, and ≥25.0 as overweight. BMI is based on the formula of body weight in kilograms (kg) divided by the height in meters squared. BMI is used widely throughout the world as it is easy, inexpensive, and practical to use.

$$\text{BMI} = \text{mass (kg)} / (\text{height [m]})^2$$

INCLUSION CRITERIA:-

- Visually impaired children only.
- Visually impaired children free from any other form of mental or physical handicapping conditions.
- All participants who gave written consent

EXCLUSION CRITERIA

- Mentally compromised children
- Uncooperative children
- Children using any chemical mode of plaque control.

Ethical clearance and informed consent

Ethical approval for the study was obtained from the Institutional Ethical Committee of Himachal Dental College & Hospital Sundernagar. Informed Consent was obtained before conducting the clinical examination and education from Principal /authority of Institute and H.P. State Council for Child Welfare-3 Craig Garden, Shimla.. Data Analysis was assessed variables used in the analysis for children with dmft index and BMI of children by Anova test, and Pearson correlation DMFT was compared with BMI index.

Description of study population results

Table:1 BMI Index in study population

BMI-CATEGORY	Frequency	Percentage
Underweight %	4	3.3%
Adequate%	108	89.3%
Overweight%	9	7.4%

Table 2: Comparison of study population BMI index status with gender

Sex	Number	%	% with Abnormal BMI	% > 5 dmft
Girls	36	29.7	4.1	1.3
Boys	83	70.3	5.9	1.2

Table 3: Comparison of oral hygiene practice with abnormal BMI Index children

Tooth Cleaning	%age	% abnormal BMI	% with caries
Once	91.7%	3	2
Twice	3.3%	1	0
Never/Sometime	5%	6	8

Table 4: Utilization of service by abnormal BMI index children

Visited Dentist	N	%	% abnormal BMI	% with caries
Never	92	76	5	10
Once /more	29	24	5	90

Table 5: Comparison and distribution of dental caries with BMI Index

Age group	N-%	Decayed teeth present	Mean dmft	% of underweight children	% of overweight Children	% of normal children
6-12	49/40.5%	Yes	2	2	4	94
12-18	72/59.5%	Yes	1.2	1	3	96

Table 6: Cariogenic dietary food frequency factor with DMFT

Cariogenic food frequency	% of <5 dmft	% of >5 dmft
Everyday	24.5	30
Not everyday	74.5	70

Table 7: Cariogenic dietary drink frequency factor with DMFT

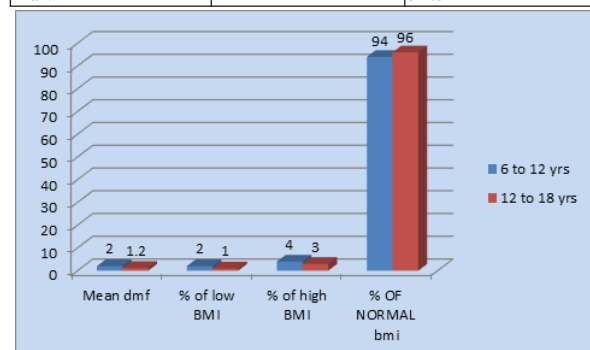
Cariogenic drink Frequency	<5 DMFT	>5 DMFT
Everyday	5%	20
Not everyday	95%	80

Table 8: Socioeconomic status of study population

Status	Number	%age	Number
Low	90	74.4	3
Middle	30	24.8	4
High	1	.8	3

Table 9: Study population geographic area location

Area	Number	%age
Urban	3	2.5
Periurban	6	5
Rural	112	92.5

**Graph 1: Distribution of BMI index and dental caries in children.**

DISCUSSION

In visually impaired children, healthy teeth were positively and significantly associated with adequate BMI index. Most of the children had normal BMI-Index and low caries index. Obesity and malnutrition was not found significantly in visually impaired children. The association of dental caries and abnormal BMI was not statistically significant found in study. Inadequate BMI may contribute to an adverse impact on quality of life, including pain, lack of sleep, concentration, hunger and absenteeism from school in children¹⁴. Our study show similar results as Alkarimi et al (2014) stated that dental caries did not impact height and weight gain instead immune, endocrine or metabolic activity and eating habit does affect.¹⁵ Utter et al stated that intake of increased unhealthy food (e.g. soft drinks, snacking) in a diet, low consumption of healthy dietary food (fruits, salad etc) and skipping breakfast meal lead to more caries.

In our study there was no direct correlation of decayed teeth with abnormal BMI. Visually impaired children had low caries index with adequate BMI index. In fact, caries occur by frequent eating habits along with high sugar consumption and obesity. Peng¹⁶ concluded that underweight children likely to have more caries than normal weight children and obese children had a lower prevalence of dental caries than normal weight children. Liang¹⁷ Delgado-Angulo et al¹⁸ demonstrated that children with higher BMI person had lower caries, thus obese children were more likely to be caries free in primary dentition. Yang¹⁹ found an inverse relationship between BMI and dmft

index among Chinese children. Johansson et al. had suggested that the relationship between being underweight and dental caries is confounded by inadequate nutritional intake as poor nutrition can increase susceptibility to dental caries due to altered saliva composition and impaired secretion.²⁰ Dental caries is influenced by life style like dietary habits, overweight, obesity, malnutrition and oral hygiene practices with socioeconomic status^{21,22}

In 8.3% children who do not brushes their teeth daily, had high caries severity in comparison to daily tooth brushing habit children. Benzian et al revealed that untreated dental decay is a neglected determinant of low BMI.²³ Our study also revealed that in abnormal BMI children had higher caries risk than healthy ones. Physical impairment along with oral health problems co-relation was not significantly associated with Dental health parameters probably much supported by the personal behaviour related to children's oral hygiene practice, dietary and lifestyle pattern in maintaining the good oral health. Our study found no association of socioeconomic status, BMI and dental caries.

As these children are in residential hostel where balanced diet with disciplined schedule is followed resulting good health as well as healthy teeth. Physical impairment does not affect oral health if they follow healthy personal and dietary habits. The results of this study do not agree on a very strong association between obesity, malnutrition, and dental caries, a longitudinal research in future should include dietary aspects, oral hygiene compliance, SES, and other confounding factors. The limitation of the study was that underestimated caries experience as bitewing radiographs were not used to identify proximal caries. The sample size of population was small as residential visually impaired children are only few in Himachal Pradesh.

CONCLUSION

This study demonstrated that better oral health can be gained through better overall general development of children. This study examined the correlation between dental caries, height and weight among visually impaired children. The study demonstrated that majority of visually impaired children in Himachal Pradesh have healthy teeth with normal BMI as this state is healthy and prosperous. It will be unfair to say that underweight/overweight children only develop dental caries. Residential Schools in Himachal Pradesh are providing good care for special health care needs which is reflected by children over all development.

Financial support and sponsorship: Nil.

Conflicts of interest: There are no conflicts of interest.

REFERENCES

- Census of India. Data on Disability, Office of the Registrar General & Census Commissioner, New Delhi India 2011, <http://www.disabilityaffairs.gov.in/upload/uploadfile/file/disabilityin india 2011 data.pdf>.
- Basha S, Mohamed RN, Swamy HS, Ramamurthy PH, Sexena V. Caries Incidence Among Obese Adolescents: A 3-year Prospective Study. *Oral Health Prev Dent*. 2017; 15:65–71.
- Hooley M, Skouteris H, Millar L. The relationship between childhood weight, dental caries and eating practices in children aged 4–8 years in Australia, 2004–2008. *Pediatric obesity*. 2012; 7(6):461–70. <https://doi.org/10.1111/j.2047-6310.2012.00072.x> PMID: 22911896
- Gerdin EW, Angbratt M, Aronsson K, Eriksson E, Johansson I. Dental caries and body mass index by socio-economic status in Swedish children. *Community dentistry and oral epidemiology*. 2008; 36 (5):459–65. <https://doi.org/10.1111/j.1600-0528.2007.00421.x> PMID: 18284433
- Sa nechez-Pe rez L, Irigoyen M, Zepeda M. Dental caries, tooth eruption timing and obesity: a longitudinal study in a group of Mexican schoolchildren. *Acta Odontologica Scandinavica*. 2010; 68(1):57–64. <https://doi.org/10.3109/00016350903449367> PMID: 19958253
- Alm A, Isaksson H, Fahraeus C, Koch G, Andersson-Gare B, Nilsson M, et al. BMI status in Swedish children and young adults in relation to caries prevalence. *Swed Dent J*. 2011; 35(1):1–8. PMID: 21591594
- Mishu MP, Hobdell M, Khan MH, Hubbard RM, Sabbah W. Relationship between untreated dental caries and weight and height of 6-to 12-year-old primary school children in Bangladesh. *International journal of dentistry*. 2013; 2013.
- Gaur S, Nayak R. Underweight in low socioeconomic status preschool children with severe early childhood caries. *Journal of Indian Society of Pedodontics and Preventive Dentistry*. 2011; 29(4):305. <https://doi.org/10.4103/0970-4388.86375> PMID: 22016314
- van Gemert-Schriks MC, van Amerongen EW, Aartman IH, Wennink JM, Jacob M, de Soet JJ. The influence of dental caries on body growth in prepubertal children. *Clinical oral investigation*. 2011; 15 (2):141–9. <https://doi.org/10.1007/s00784-010-0380-3> PMID: 20111879
- Barkeling B, Linne Y, Lindroos AK, Birkhed D, Rooth P, Rossner S. Intake of sweet foods and counts of cariogenic microorganisms in relation to body mass index and psychometric variables in women. *Int J Obes Relat Metab Disord*. 2002; 26: 1239–44
- Klein H, Palmer CE, Knutson JW. Dental status and dental needs of elementary school children. *PublicHealthRep*. 1938; 53:751–65.
- American Dental Association. Classification of Types of Examination 1970.
- World Health Organization. World Health Surveys. Basic Methods. Fifth Edition. 2013
- Benzian H, Monse B, Heinrich-Weltzien R, Hobdell M, Mulder J, van Palenstein Helderman W. Untreated severe dental decay: a neglected determinant of low Body Mass Index in 12-year-old Filipino children. *BMC public health*. 2011; 11(1):558.

15. Alkarimi HA, Watt RG, Pikhart H, Sheiham A, Tsakos G. Dental caries and growth in school-age children. *Pediatrics*. 2014;peds.2013-0846
16. Peng R, Li S, Zhang H, Zeng H, Jiang B, Liu Y, et al. Weight status is associated with blood pressure, vital capacity, dental decay, and visual acuity among school-age children in chengdu, china. *Annals of Nutrition and Metabolism*. 2016; 69(3-4):237-45. <https://doi.org/10.1159/000454888> PMID: 28013297
17. Liang J-j Zhang Z-q, Chen Y-j Mai J-c, Ma J Yang W-h, et al. Dental caries is negatively correlated with body mass index among 7-9 years old children in Guangzhou, China. *BMC public health*. 2016; 16(1):638.
18. Delgado-Angulo EK, Hobdell MH, Bernabe E. Childhood stunting and caries increment in permanent teeth: a three and a half year longitudinal study in Peru. *Int J Paediatr Dent* 2013;23(2):101-9.
19. Yang F, Zhang Y, Yuan X, Yu J, Chen S, Chen Z, et al. Caries experience and its association with weight status among 8-year-old children in Qingdao, China. *Journal of International Society of Preventive & Community Dentistry*. 2015; 5(1):52
20. I. Johansson, M. Lenander-Lumikari, and A. K. Saellström, "Saliva composition in Indian children with chronic proteinenergy malnutrition," *Journal of Dental Research*, vol.73,no.1, pp.11-19,1994
21. A. Lamerz, J. Kuepper-Nybelen, C. Wehle et al., "Social class, parental education, and obesity prevalence in a study of six-year-old children in Germany," *International Journal of Obesity*, vol.29,no.4,pp.373-380,2005.
22. D.Locker, "Deprivation and oral health :are view," *Community Dentistry and Oral Epidemiology*, vol. 28, no. 3, pp. 161-169, 2000.
23. Benzan H, Monse B, Heinrich-Weltzien R, Hobdell M, Mulder J, van Palenstein Helderman W. Untreated severe dental decay: a neglected determinant of low body mass index in 12-year-old Filipino children. *BMC Public Health* 2011;11:558.