Title page

Type of manuscript: Original article

Manuscript Title: A paired comparison for anthropometric measures and dental caries exposure among siblings with and without intellectual disability

Running title: Anthropometry & dental caries among intellectually disabled

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ABSTRACT

Background and objectives

Intellectually disabled (ID) children are at a high risk for developing malnutrition which results in poor oral health. The aim of the present study is to assess and compare the anthropometric measures and oral health status of intellectually disabled and normal children.

Methods

A case-control study was conducted from March to May 2015, among 2-5 year old ID children in Sriganganagar, Rajasthan, India. The study sample comprised of 150 cases and controls each. The data was recorded during a face to face interview by two examiners (k= 0.81). A proforma gathered information regarding the type of disability, socio-demographic factors, sweet score and oral hygiene habits. The socio-economic status (SES) was assessed according to the revised Kuppuswamy's SES scale. The clinical examination included anthropometric measures and the dmft index.

Results

In the study group 71 (47.33%), 45 (30%) and 34 (22.6%) children had mild, moderate and severe disability, respectively. Around 95 (63.3%) of the parents were graduates or had higher education qualification. Around 88 (58.70%) subjects were living in a nuclear family. A significant difference was reported among cases and controls in relation to Body Mass Index and sugar scores ($p<0.05$). The dmft was found to be greater among cases compared to controls with respect to underweight and normal weight categories ($p<0.05$).

Conclusions

The present paired study uncovered the poor nutritional and oral health status of the ID children as compared to their siblings which was influenced by the disability and Intelligence Quotient levels. Due to limitations in intellectual functioning and adaptive behavior of ID children there is an urgent need of strategies to be implemented by the public health dentist towards making a balance between oral and nutritional health status of this group, including health education for their parents or guardians.

***Key words*: Intellectually disabled- siblings- nutritional status- anthropometry**

RÉSUMÉ

Contexte et objectifs: Les enfants atteints d'une déficience intellectuelle (ID) courent un risque élevé de développer une malnutrition qui entraîne une mauvaise santé bucco-dentaire. Le but de la présente étude est d'évaluer et de comparer les mesures anthropométriques et l'état de santé buccodentaire des enfants atteints d'insuffisance intellectuelle et des enfants normaux.

Méthode: Une étude cas-témoins a été menée de mars à mai 2015, chez des enfants de 2-5 ans à Sriganganagar, Rajasthan, Inde. L'échantillon de l'étude comprenait 150 cas et contrôles chacun. Les données ont été enregistrées lors d'une entrevue face à face par deux examinateurs ($k = 0.81$). Un proforma a recueilli des informations sur le type d'incapacité, les facteurs sociodémographiques, le score doux et les habitudes d'hygiène bucco-dentaire. Le statut socio-économique (SSE) a été évalué selon l'échelle SES de Kuppuswamy révisée. L'examen clinique comprenait des mesures anthropométriques et l'indice dmft.

Résultats: Dans le groupe d'étude 71 (47.33%), 45 (30%) et 34 (22.6%) enfants avaient une incapacité légère, modérée et sévère, respectivement. Environ 95 (63.3%) des parents étaient diplômés ou titulaires d'un diplôme d'études supérieures. Environ 88 (58.70%) des sujets vivaient dans une famille nucléaire. Une différence significative a été rapportée entre les cas et les témoins par rapport à l'indice de masse corporelle et les scores de sucre ($p < 0.05$). La dmft a été jugée plus importante parmi les cas comparativement aux témoins en ce qui concerne les catégories de poids insuffisant et de poids normal ($p < 0.05$).

Conclusions: La présente étude couplée a révélé la mauvaise santé nutritionnelle et orale des enfants ID par rapport à leurs frères et sœurs qui a été influencée par le degré d'incapacité et le quotient intellectuel. En raison des limitations du fonctionnement intellectuel et du comportement adaptatif des enfants ID, il existe un besoin urgent de stratégies à mettre en œuvre par le dentiste de la santé publique pour établir un équilibre entre la santé orale et nutritionnelle de ce groupe, y compris l'éducation sanitaire de leurs parents ou tuteurs.

Mots clés: déficience intellectuelle, fratrie, état nutritionnel, anthropométrie

INTRODUCTION

According to American Association on Intellectual and Developmental Disabilities (AAIDD), Intellectual disability (ID) is characterized by significant limitations both in intellectual functioning and in adaptive behaviour as expressed in conceptual, social, and practical adaptive skills. This disability originates before the age of eighteen (Schalock *et al.* 2007). The American Health Association defines a child with disability as a child, who for various reasons, cannot fully make use of all his or her physical, mental and social abilities – in other words, a child who cannot play, learn, or do things that other children of his or her age can. In general, disabilities in children may be present individually or as a set of numerous physical, developmental, cognitive and/or affective disabilities (Tesini *et al.* 1994). According to World Health Organization estimates, individuals with disabilities encompass 10% of the population in developed countries and 12% in developing countries (Baykan 2003).

Growth and development are an important part of childhood, similarly weight gain and increasing body size are normal components of this process. The consequences of malnutrition among school age children includes diminutive growth, underweight, anaemia, iodine deficiency and other health related problems such as malaria, diarrhoea, worm and respiratory infection. It is also known that severely mentally disabled children are at a high jeopardy for developing malnutrition which may partly explain the growth retardation generally encountered in such children and associated complications in later life. Malnutrition as revealed by anthropometric variables is highly prevalent among children with mental retardation; and the prevalence of malnutrition increases with age, deterioration of mental functioning and cerebral palsy (Mathur *et al.* 2007).

At present, although malnutrition and disability are rarely linked in policy or programming, there is increasing awareness of the interrelationships between them (Groce *et al.* 2014). Disability may also lead to malnutrition (Sheetal *et al.* 2013). Nutritional deficiency leads to chronic malnutrition which not only may affect tooth exfoliation but also appear to render the primary teeth susceptible to caries later in life. It may also lead to enamel hypoplasia which may be a predisposing factor in initiating and progression of dental caries (Alvarez *et al.* 1988). It has been recognized by various studies that children with disabilities may have a poorer nutritional status than their non-disabled sibling (Yousafzai *et al.* 2003) irrespective of the fact that they have similar socio-demographic data.

Hence, there is a felt need to understand the effect of intellectual disability on anthropometric measures and oral health status with similar socio-demographic conditions. Hence, there is a felt need to understand the effect of intellectual disability on anthropometric

measures and oral health status among children with similar socio-demographic conditions. The best way to avoid any confounding bias was to select disable students with siblings, so as to ensure the similar socio-demographic exposure.

This is for the first time when anthropometric and oral health variables are being tested together so as to evaluate the difference of nutritional status and Dental decay among similar socioeconomic strata.

METHOD

A case-control study was conducted from March to May 2015 among two to five years old, intellectually disabled children in the North West part of the country, Rajasthan, India. The ethical clearance was granted by ethical committee of the Surendera Dental College & Research Institute and permission to conduct the clinical examination of subjects was obtained from the respective authorities. World Medical Association Declaration of Helsinki principles for Medical Research involving human subjects were followed to maintain the ethics.

A total of 232 children in the 2-5 years age group enrolled in special school, were invited to participate in the present study. Out of the total enrolled children, 226 were ready to participate in the present study; amongst which 7 were uncooperative and 69 did not have siblings with 2-6 years of age group, which lead to a total of 150 intellectually disabled (cases) children for the study. The control group included 150 non disabled siblings of the selected cases with nearest age group. Subjects who were medically compromised or who didn't have the siblings aged around 2-6 years were excluded from the study and those who had parental consent/proxy consent were included in the study. An invitation letter for participation including a brief explanation about the nature of the study and written consent was distributed to the parents. The parents were invited along with the sibling of the intellectual disabled child to be accompanied on the selected dates.

The data was recorded during a face to face interview by two examiners. The proforma consisted of two sections– First section comprised of the information regarding type of disability, socio-demographic factors, sweet score and oral hygiene habits. Socioeconomic status (SES) was accessed according to revised Kuppuswamy's Socioeconomic Status Scale 2013 (Vijaya *et al.* 2013) which is calculated by summation of individual scores of education, occupation and income of any of the parent. Various categories according to scores are- Upper class, upper middle, Middle/Lower middle, Upper Lower, Lower class. Data regarding sweet score (Darby *et al.* 2003) was recorded using 24-hour recall diet frequency chart and the

subjects were grouped into excellent, good, and watch out zone based upon sugar sweet score which was calculated by multiplying, the liquid form of sugar by 5, solid sugar by 10 and slowly dissolving sugar by 15. The sum of these values can be interpreted as, 5 or less to be excellent, 10 to be good and 15 or more to be in watch out zone.

The second section includes clinical examination i.e. anthropometric measures (body weight and height) (Cole *et al.* 2000) and dmft index. Body weight was measured with a scale sensitive to ± 0.1 kg with thin clothing and no shoes, whereas height was measured with the feet adjacent and the head on a Frankfort plane. Body mass index (BMI) was calculated through the Weight (kg)/height^2 (m^2) formula. Caries examination was tooth-specific and all the teeth were examined. Mouth mirrors and CPI probes were used according to the World Health Organisation (WHO) criteria (Purohit *et al.* 2010).

Prior to the study, a team made up of two examiners participated in a training program which included intra-examiner and inter examiner calibration exercises where minimum and maximum kappa values were agreed (0.81 and 0.86 respectively) between the examiners for the parameters studied (caries status and anthropometric measures), showing a good degree of consistency in the observation. Reliability data were obtained from a pilot study of 10 cases, 10 controls and their parents/guardians to determine the applicability of the measure.

Data was recorded in an Excel table using identification numbers. The chi square test was used to compare between categorical variables. Mean and standard deviations were calculated for clinical parameters. Logistic regression analysis was executed to test the risk factors associated with dental caries. SPSS (statistical package for social sciences) software version 20 was used for statistical analysis.

RESULTS

The total sample consists of 150 intellectually disabled subjects, out of which 71 (47.33%), 45 (30%) and 34 (22.6%) were mild, moderate and severe disabled respectively.

Table 1 illustrates the socio-demographic variables of the cases and controls, since siblings were taken as the controls; data was same for both the groups. 95 (63.3%) of parents were graduates or had higher education qualification. 88 (58.70%) of the subjects were living in nuclear family.

Table 2 shows the distribution of oral health behaviour variables, BMI and sweet score among cases and controls. A significant difference was reported among case and controls in relation to BMI score and sugar score ($p<0.05$). 97 (64.67%) of cases were underweight in comparison to only 26 (17.34%) among controls. The chi square analysis revealed that dental

visit pattern was significantly different among case and control group ($p<0.05$). 91 (60.7%) of cases had reported to visit dentist for therapeutic reasons whereas, 79 (52.7%) of controls had visited dentist for preventive reasons. High severity dental caries was reported more among cases (41.34%) as compare to controls (12%) and it was statistically significant ($p<0.05$).

Table 3 shows that the mean dmft was found greater among cases as compared to controls in relation to underweight as well as normal weight categories ($p<0.05$). When mean dmft was analyzed among cases and controls in relation to sugar score categories (excellent, good, watch out zone), it was found more among cases in comparison to controls ($p<0.05$).

In table 4, multivariate analysis was employed to determine the relation of dental caries prevalence in case and control group with risk factors. The results showed that all risk factors were significantly related to dental caries prevalence in cases as compared to the controls. The cases that were underweight had more prevalence of dental caries as compared to the control (OR= 5.08; $p<0.05$). The cases with no brushing habit (OR= 4.21) were more likely to have dental caries as compared to the controls. The cases with sugar score (watch out zone) had 6.84 times more chances of having dental caries prevalence than their siblings and the cases who never visited to dentist had more prevalence of caries as compared to control group with an odds ratio of 5.94.

DISCUSSION

Oral health and quality oral health care contributes to holistic health, which should be a right rather than an opportunity. Oral hygiene practices are voluntary physical activities that have at least two requirements: motivation and manual dexterity. Thus, poor oral hygiene is perhaps more prevalent among intellectually disabled children compared to other individuals. People with disability may also suffer from abnormal swallowing and eating functions leading to nutritional problems which may further affect oral health. Therefore, the current study was conducted to assess the effect of anthropometric measure on oral health status of intellectually disabled children in comparison to normal siblings.

There was higher prevalence of disability in males (58%) as compared to females (51.33%) in the current study. The same was reported in L Wu *et al* study with 51.4% males and 48.6% females (Wu *et al.* 2010).

High severity dental caries was found to be prevalent more among ID children (41.34%) whereas low severity dental caries has emerged more among their control siblings (48.67%). Similar results were given by Bharthi M Purohit reporting that caries prevalence was higher in the children with special health care need than in the healthy controls, which could be due to

poor muscular synchronization and muscle weakness hindering routine daily oral hygiene (Purohit *et al.* 2010). Also frequent use of sugar- sweetened snacks, less frequent brushing may be important determinants of caries risk for children in both groups. Similar findings have been reported by other authors (Reddy *et al.* 2011, Shyama *et al.* 2001). Untreated dental caries has been reported more among ID cases till date (Storhaug *et al.* 1987, Mitsea *et al.* 2001, Jain *et al.* 2009), but the present study shows higher rate of treated dental caries, this may be due to more dental visits showing rise in awareness towards dental treatment. Authors feel that participant's higher socioeconomic status in the present study may attribute to these results

Those subjects who used toothbrush and toothpaste for oral hygiene were more in number in both cases (54.66%) and control (52%) groups. According to the National Survey report around 60% of the children were using toothpaste and toothbrush (Bail et al. 2004). B. M. Purohit *et al.* also showed that almost all the children used toothpaste and toothbrush. This could be attributed to better living conditions of the study groups in terms of their socioeconomic status and higher literacy level influencing oral health behaviour (Purohit *et al.* 2010).

Anthropometric assessment data of current study showed that the height and weight measures in cases were lower than controls which was in accordance with the study conducted by Yoshito Fujitake *et al.* (Fujitake *et al.* 2014). Present study also reported that in cases, underweight was more prevalent whereas the controls were having normal weight. Mathur M *et al.* reported that more mentally retarded subjects were underweight while more normal group subjects were overweight. The reason for this difference may be attributed to ability of independently procuring in-between meal snacking which is frequently high in calories and rich in sugars and fats by normal sibling group. (Mathur *et al.* 2007).

In current study cases were reported to have sugar score in watch out zone as compared to controls which was similar to the study by Purohit *et al.* (Purohit *et al.* 2010). The high sugar score may be the indicator of dental caries, the fact that frequent use of sugar-sweetened products increases caries risk is well reported, but there are also reports in which no association has been found between caries and sugar consumption frequency (Palin-Palokas *et al.* 1987, Richardson *et al.* 1911).

Receipt of timely dental services is of particular importance to children with special health-care needs because of the higher prevalence of structural irregularities, infections, and disease among these children compared with those in the general population. People with disabilities need to be treated as equals and in this direction.

Limitations of the study were that sophisticated measures of anthropometry, such as dual- energy x ray absorptiometry (DXA) scan could not be used. In case of recording sweet score there could be masking of data. There could be an association between degree of intellectual disability and performance of manual dexterity, children with intellectual disability may have significantly more borderline and definite motor problems effecting their brushing habits than the normative sample which may lead to poor oral hygiene but this is not examined in the current study as it was beyond the scope of this research. The study sample was diminutive, due to which the results can't be generalised. So, further studies are recommended in this direction in order to achieve more definite conclusions.

CONCLUSION

Further studies are recommended in this direction in order to achieve more definite conclusions. The alarming conclusion of the present paired study is poor nutritional status of ID children, considering that the household factors are adjusted in the present study as the compare group is siblings of cases. Special emphasis need to be made on the nutritional supplements for this special population. Also, the prevalence of caries in cases under watch out zone proves the ill effects of sugar rich diet on dental caries and awareness need to be spread regarding the misconception of high sugar diet as more nutritious among the parents.

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Table 1: Socio-economic status of the study population

Variables	N (%)
Father's Education	
Illiterate	17 (11.34%)
School level	38 (25.34%)
Graduate, Postgraduate	95 (63.34%)
Income	
<10000	20 (13.34%)
10000-20000	51 (34.34%)
>20000	79 (52.33%)
Occupation	
Profession	73 (48.67%)
Clerical, shop-owner, farmer	58 (38.34%)
Unemployed	19 (13%)
Socioeconomic class	
Upper	67 (45%)
Middle	48 (31.67%)
Lower	35 (23.34%)
No. of siblings	
≤1	63 (42%)
≥2	87 (58%)
Family structure	
Nuclear	88 (58.67%)
Non-nuclear	62 (41.34%)

Table 2: Distribution of the study population according to the anthropometric and oral health behavioural characteristics

Characteristics	Case N (%)	Control N (%)	P Value
Gender			
Male	87 (58%)	77 (51.33%)	0.08
Female	63 (42%)	73 (48.67%)	
BMI			
Underweight (<18.50)	97(64.67%)	26 (17.34%)	<0.0001
Normal range (18.50-24.99)	53(35.34%)	103 (68.67%)	
Overweight (≥25) and obese	0	21 (14%)	
Sugar score			
Excellent	19 (12.67%)	15 (10%)	0.007
Good	50(33.34%)	77 (51.34%)	
Watch out zone	81 (54%)	58 (38.67%)	
Visit to dentist			
Never	26(17.34%)	56 (37.34%)	<0.0001
Once	75 (50%)	79 (52.67%)	
≥Twice	49 (32.67%)	15 (10%)	
Reason for dental visit			
Preventive	59 (39.34%)	79 (52.67%)	0.02
Therapeutic	91 (60.67%)	71 (47.34%)	
Dental Caries			
None	27(18%)	59 (39.34%)	<0.0001
Low Severity (≤3)	61 (40.67%)	73 (48.67%)	
High severity (≥3)	62 (41.34%)	18 (12%)	

Table 3: Association between dental caries as dependent variable with BMI and sugar score as independent variable among the study population

BMI	**Cases** (dmft>0) (Mean±SD)	**Controls** (dmft>0) (Mean±SD)	**p- value** (t- test)
Underweight (<18.50)	(1.77±1.42)	(0.48±0.41)	<0.0001
Normal range (18.50-24.99)	(0.96±1.09)	(0.61±0.84)	0.03
Overweight (≥25) and Obese (≥30)	-		
Sugar score			
Excellent	(0.11±0.09)	(0.05±0.03)	0.019
Good	(0.59±0.75)	(0.33±0.18)	0.004
Watch out zone	(2.03±1.62)	(0.79±0.81)	<0.0001

Table 4: Logistic regression analysis for study population with dental caries as dependent variable and nutritional status, brushing habits, sugar score, and visit to dentist as independent variables

Variables	Case Caries	Control Caries	OR (95% CI)		*P*
	N %	N%	Control	Case	
Nutritional status					
Underweight (<18.50)	83 (55.34%)	14 (9.34%)	1	5.08 (1.95-13.23)	0.0009
Normal range (18.50-24.99)	40 (26.67%)	69 (46%)		1.52 (0.72-3.20)	0.28
Overweight (≥25) and obese	0	8 (5.34%)			
Brushing habits					
Yes	82 (54.67%)	78 (52%)	1	2.40 (1.36-4.26)	0.002
No	41 (27.34%)	13 (8.67%)	1	4.21 (0.83-21.29)	0.08
Sugar score					
Excellent	12 (8%)	9 (6%)	1	1.14 (0.28-4.59)	0.85
Good	35 (23.34%)	42 (28%)	1	1.94 (0.92-4.13)	0.08
Watch out zone	76 (50.67%)	40 (26.67%)	1	6.84 (2.36-19.79)	0.0004
Visit to dentist					
Never	23 (15.34%)	29 (19.34%)	1	5.94 (1.83-19.32)	0.003
Once	65 (43.34%)	53 (35.34%)	1	3.19 (1.41-7.20)	0.005
≥Twice	35 (23.34%)	9 (6%)	1	1.67 (0.50-5.56)	0.41