

Obesity and Dental Caries in Children Aged 2-6 Years in the United States: NHANES 1999-2002

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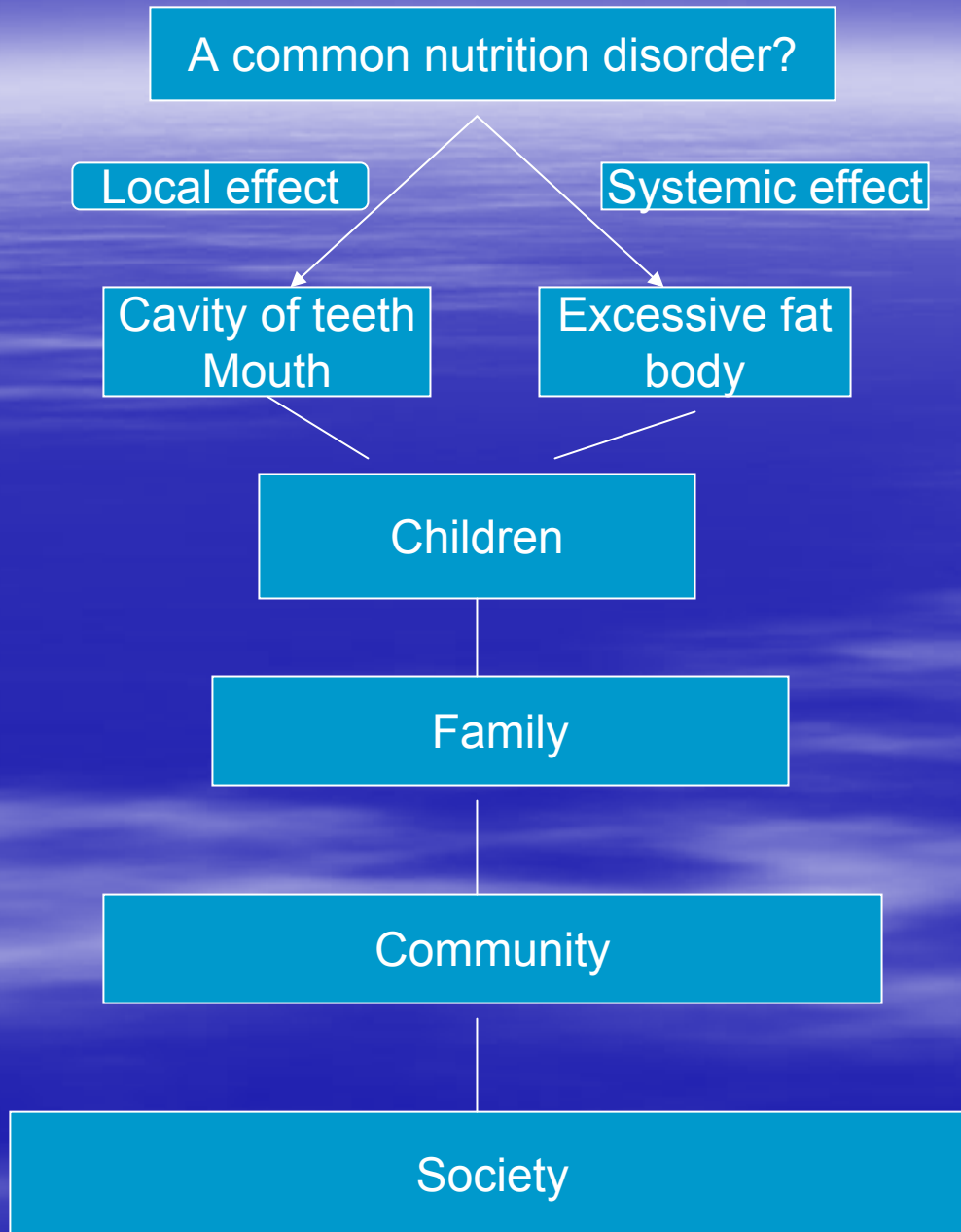
Early Childhood Caries

- The most common chronic childhood disease (five times more prevalent than asthma),
- 28% of U.S 2-5 year olds have caries (15% increase in last decade),
- Three-quarters of those children are untreated.

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Childhood Obesity

- Currently most prevalent nutritional disease of American children,
- 25% are at risk for overweight and 11% obese (Nicklas et al, 2003)
- The proportion of overweight children aged 6-11 has more than doubled and the rate for overweight adolescents has tripled (Surgeon General Report 2004)



Childhood Obesity and Caries May Share Some Common Risk

- Biological/genetic factors
- Social/cultural factors
- Dietary/feeding factors
- Environmental/lifestyle factors

Controversial Association between Childhood Obesity and Caries

- Positive association: higher caries experience, higher body mass index (BMI), (Reifsnider 2004, Larsson 1995, Willershausen 2006, Draper 2006)
- Negative association: higher caries experience, lower BMI (Ayhan 1996, Acs1999) ,
- No association (Tuomi 1989, Chen 1995, Whelton 2004, Kim 2006, McDougal 2006, Hayes 2006)

Study Aim

- To assess the associations between obesity and dental caries in children aged 2-6 years participating in NHANES 1999-2002

Study Subjects

NHANES 1999-2002 sample size	21,004
No. of participants with dental caries examinations	18,185
Age 2-6 years	1,904
At least have 10 primary teeth	1,507 (71% had 20 primary teeth)

Dental Examinations

- Teeth were dried with air and examined with a surface reflection mirror and a No.23 explorer,
- Coronal caries was assessed using a visual-tactile method with standardized equipment and supplies,
- The number of decayed and filled teeth (DFT) was calculated and categorized into three groups: 0 DFT, 1-10 DFT, and >10 DFT

Body Mass Index (BMI) Calculation

- Body mass index (BMI; kg/m²) was calculated using weight and height measures,
- Using age and gender specific criteria, subjects were categorized as underweight (<5%), normal (5%-<85%), at risk for overweight (85-<95 %), and overweight (≥95 %).

Other Variables

- Demographic variables: age, gender, race, poverty income ratio (PIR),
- Dietary variables: carbohydrate intake, sugar intake,
- Medical variables: asthma, diabetes,
- Dental variables: dental visit in past 12 months.

	Percentage or Mean (SD)
Gender	Male 49.2% Female 50.8%
Race	Non-Hispanic White 29.0%, Non-Hispanic Black 28.0% Hispanic 37.9%, Other 5.1%
Poverty Income Ratio (PIR)	<2.0 68%, ≥2.0 32%
Body mass index (BMI)	Underweight 4.6%, Normal 72.4%, At risk 12.4%, Overweight 10.6%
Daily total carbohydrate intake (gm) (N=1417)	Mean 257.5 SD 137.1
Daily total sugar intake (gm) (N=695)	Mean 134.7 SD 83.0
Asthma	15%
Diabetes	0.1%
Dental caries	Mean dft 1.89 (3.10) dft: 0 56.6%, 1-5 30.5%, >5 12.9%
Dental visit in last year (1278)	Yes 67.3% No 32.7%

Caries Experience and BMI According to Subjects' Characteristics

		Caries experience		BMI categories			
		Caries free	Caries present	Underweight BMI	Normal BMI	At risk BMI	Overweight BMI
		Percentage		Percentage			
Gender (1507)	Male	56	44	5	71	13	11
	Female	58	42	4	74	12	10
Poverty income ratio (1507)	<2	58	42	5	71	13	11
	≥2	55	45	4	76	11	9
Race (1507)	White	57	43	4	77	11	8
	Black	56	44	7	71	13	9
	Hispanic	57	43	3	69	14	14
	Others	64	36	5	77	9	9

Caries Experience and BMI According to Subjects' Characteristics

		Caries experience		BMI categories			
		Caries free	Caries present	Underweight BMI	Normal BMI	At-risk BMI	Overweigh BMI
		Percentage		Percentage			
Asthma (1504)	No	58	42	3	68	16	13
	Yes	57	43	5	73	12	10
Dental visit in last year (1501)	No	57	43	5	73	13	9
	Yes	57	43	5	72	12	11
		Mean		Mean			
Daily total carbohydrate intake (gm) (1417)		257	258	274	258	261	251
Daily total sugar intake (gm) (695)		134	137	138	137	147	134

Caries Experience by BMI category

			Normal BMI	At risk BMI	Overweight BMI	P value
Percent with caries	Age	24-36 month (417)	37	48	38	0.302
		36-48 month (276)	42	50	52	0.463
		48-60 month (295)	43	44	37	0.789
		60-72 month (276)	42	63	48	0.057
	Race	Non-Hispanic White (355)	42	50	58	0.152
		Non-Hispanic Black (351)	42	56	40	0.229
		Hispanic (445)	39	49	41	0.353
		Others (62)	28	50	17	0.417

Caries Experience by BMI category

			Normal BMI	At risk BMI	Overweight BMI	P value
dft (mean)	Age	24-36 month (417)	1.53	2.36	2.08	0.112
		36-48 month (276)	1.62	1.97	2.19	0.511
		48-60 month (295)	1.90	1.38	1.46	0.487
		60-72 month (276)	1.81	3.55	2.60	0.014
	Race	Non-Hispanic White (355)	1.77	1.95	2.72	0.259
		Non-Hispanic Black (351)	1.54	2.89	2.22	0.010
		Hispanic (445)	1.84	2.38	1.88	0.471
		Others (62)	0.94	1.00	0.83	0.988

BMI categories in caries-free and severe-early childhood caries (S_ECC) children

			Underweight BMI	Normal BMI	At risk BMI	Overweight BMI	P value
Age	24-36 month (416)	Caries Free	6	78	10	6	0.528
		S_ECC	6	79	12	3	
	36-48 month (175)	Caries Free	7	73	10	10	0.117
		S_ECC	0	60	15	25	
	48-60 month (178)	Caries Free	2	72	12	14	0.620
		S_ECC	5	79	5	11	
	60-72 month (147)	Caries Free	5	69	11	15	0.456
		S_ECC	0	90	10	0	

BMI categories in caries-free and severe-early childhood caries (S_ECC) children

			Underweight BMI	Normal BMI	At risk BMI	Overweight BMI	P value
Race	Non-His White (279)	Caries Free	6	79	9	6	0.672
		S_ECC	3	85	8	4	
	Non-His Black (253)	Caries Free	8	73	10	9	0.754
		S_ECC	7	75	13	5	
	Hispanic (330)	Caries Free	3	71	12	14	0.643
		S_ECC	5	73	14	8	

BMI categories in caries-free and severe-early childhood caries (S_ECC) children

			Underweight BMI	Normal BMI	At risk BMI	Overweight BMI	P value
Gender	Male (468)	Caries Free	6	72	11	11	0.137
		S_ECC	2	79	13	6	
	Female (448)	Caries Free	4	77	10	9	0.202
		S_ECC	9	76	10	5	

Logistic Model Predicting Children's Caries Experience

	Likelihood ratio test for full model: N=1170, p=0.022		
	Coefficient estimate	Odds ratios (95% CI)	P-value
Age (years)	0.09	1.10 (0.99-1.20)	0.059
Poverty income ratio	0.26	1.30 (1.01-1.68)	0.040
Obesity	0.15	1.17 (0.99-1.38)	0.066
Race	-0.02	0.98 (0.90-1.07)	0.706
Carbohydrate intake (gm)	0.06	1.07 (0.92-1.23)	0.378

Discussion

- The relationship between childhood obesity and dental caries is complex and varies depending on many factors, such as age, gender, race, and family income.

Discussion

- Generally those with at-risk BMI had highest caries experience, consistent with a study reported by Marshall et al 2005.
- This relationship was statistically significant for those aged 60-72 months and African American.

Discussion

- Regardless of age, gender, race, and family income, for both children with severe ECC and children without caries, few were underweight (about 5%), most were normal (70%), and many were at at-risk-of-overweight (15%) or overweight (10%).

Discussion

- In multiple logistic regression model, only family income is a statistically significant predictor for dental caries,
- However, a combination of family income and BMI provides a better prediction.

Future Direction

- Longitudinal studies are needed to further assess the complex associations among nutritional intake, obesity, and dental caries development.