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Research Article

THE ASSOCIATION BETWEEN DENTAL CARIES IN PRIMARY AND PERMANENT DENTITION AND NUTRITIONAL STATUS INCLUDING UNDERWEIGHT, NORMAL WEIGHT, OVERWEIGHT AND OBESITY IN CHILDREN

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Abstract:

Aim: Untreated dental caries is accounted to influence youngsters' wholesome status and development, yet proof on this relationship is clashing. The point of this examination was to evaluate the relationship between dental caries in both the essential and lasting dentition and nourishing status (counting underweight, ordinary weight, overweight and hindering) in youngsters from Cambodia, Indonesia and Lao PDR over a time of 2 years. A subsequent target was to evaluate whether healthful status influences the emission of lasting teeth.

Methods: The data used came from the "Fit for School - Health Outcome Study": a 3-year partner focus involving young people from 84 elementary school in Cambodia, Indonesia and Laos. In each school, an irregular sample of six- to seven-year-olds was selected. Dental caries and odontogenic diseases assessed using World Health Organization (WHO) standards and the pufa file. Our current research conducted at Lahore General Hospital, Lahore from May 2019 to April 2020. Estimates of weight and height were converted to BMI for age and z-scores for age, and then classified by weight and height according to WHO standard methods. Cross-sectional and longitudinal affiliations were dissected using the Kruskal Wallis test, Mann Whitney's U-test, and the multivariate strategic and direct relapse test.

Results: Data for 1,564 youth (mean age at baseline = 7.8 years) were dissected. The levels of dental caries and odontogenic contamination in the essential dentition were overall most noticeable in underweight youth, as well as in troubled children, and least noticeable in overweight youth. In addition, dental caries in six- to seven-year-olds was fundamentally linked to an increased risk of being underweight and was impeded two years after the fact. These links have not reliably found for dental caries and odontogenic contamination in the long-term dentition. In addition, underweight linked to fewer teeth being flossed for life in children between six and seven years of age and after two years of age.

Conclusion: Underweight and hindered development are related with untreated dental caries and a deferred ejection of lasting teeth in kids from Cambodia, Indonesia and Lao PDR. Discoveries recommend that oral wellbeing may play a significant part in kids' development and general turn of events.

Keywords: Dental Caries, Primary, Permanent Dentition, Nutritional Status, Pakistan.

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INTRODUCTION:

The link between young people's oral well-being and general well-being has become a topic of growing interest. Tooth decay, the most common disease among young people worldwide, is generally untreated [1]. The cumulative evidence shows that dental caries has a negative impact on the health and development of children [2]. However, the nature of this relationship remains questionable, both in terms of turnover and its fundamental instruments. Specific audits carried out late in life have found a link between dental caries and underweight (low body mass index (BMI) for age), which also hinders development (low height for age), while different surveys have shown that dental caries is linked to overweight; or they have recommended that there is no link at all. Evidence for an association between dental caries and underweight comes mainly from studies in low- and middle-income countries (LMICs), where the severity of dental caries is high. Young people with high levels of caries, both in the essential and durable dentition, generally had a BMI lower than their age, and treatment of severely decayed teeth was associated with an increased rate of weight gain. A few instruments have been proposed to clarify this relationship, including the direct impact of dental caries on the dietary capacity and dietary intake of young people [3], as well as the inverse impact of constant dental irritation on the development of young people through metabolic and, more importantly, immunological pathways. An opposing hypothesis is that undernutrition (underweight and hindrance) could lead an individual to dental caries. Persistent undernutrition has been associated with dental disorders, including polishing imperfections (hypoplasia) and delayed ejection of essential teeth [4]. However, the evidence of the impact of undernutrition on the arrangement and ejection of durable teeth is less generous. A link between dental caries and overweight has been more clearly established in surveys conducted in Europe and the United States. Remarkably, these surveys routinely included tests in which underweight children were under-represented. Undoubtedly, the basic instruments of this relationship follow a different path; dental caries and overweight are most likely related, as they share for all intents and purposes food hazard factors that are both cariogenic and obesogenic, such

as a diet high in sugar. In view of the conflicting findings in the literature, Hooley *et al.* and Li *et al.* proposed that dental caries is additionally related to BMI in an example of a non-direct U-shaped cast, with higher levels of caries in both low and high BMI youths. There are no studies that have tested this theory, as there are not many surveys that have covered the full range of anthropometric estimates including underweight, typical weight and overweight (weight status), which are equally troublesome [5].

METODOLOGY:

This review used information from the Fit for School - Health Outcome Study (FIT-HOS), conducted from 2019 to 2020. The review initially aimed to assess the impact of the Fit for School program, which is a coordinated water, sanitation and hygiene and school wellness program aimed at improving the well-being of young people. It updates evidence-based mediations in open elementary school, including daily hand washing of the classroom with a cleaner and tooth brushing with fluoride toothpaste, biannual deworming and the development of classroom wash desks. Our current research was conducted at Lahore General Hospital, Lahore from May 2019 to April 2020. FIT-HOS was a longitudinal review associated with a subsequent 3-year period. The accomplice consisted of young people enrolled in 82 public elementary school - 20 schools in Cambodia, 21 schools in Indonesia and 47 schools in Lao PDR. A large proportion of the schools in each country (n=41) implemented the FIT program, while the remaining 42 schools updated the customary government welfare education program; in addition, biannual deworming is a feature of individual public deworming programs. By school, an irregular determination of six- to seven-year-olds (7.01 to 8.98 years of age) was drawn from the list of selected assessment duplicates. Youth gauge information was collected in 2019, and youth equivalents were redesigned two years after the fact in 2014. All the intricacies of examination systems, school selection, and power estimation are described in a past distribution. For the purposes of this examination, youth were assessed as a single accomplice, rejecting the type of school in which they enrolled.

Table 1:

Dental caries (mean \pm sd)				Odontogenic infections	
Underweight	Normal weight	Overweight	<i>P</i> ^a	Underweight	Normal
dt at baseline (age 6–7)				pufa at baseline (age 6–7)	
11.7 \pm 4.7	9.6 \pm 4.4	8.6 \pm 4.2	0.004	3.1 \pm 2.4	2.5 \pm 2
9.3 \pm 5.0	8.3 \pm 4.4	6.3 \pm 4.5	< 0.001	3.6 \pm 2.9	3.3 \pm 3
8.8 \pm 5.2	7.2 \pm 4.8	6.5 \pm 4.4	0.094	1.8 \pm 2.1	1.8 \pm 2
DT at follow-up (age 8–9)				PUFA at follow-up (age 8–9)	
1.4 \pm 1.4	1.1 \pm 1.3	0.7 \pm 1.2	0.030	0.1 \pm 0.5	0.1 \pm 0
0.9 \pm 1.3	0.6 \pm 0.9	0.4 \pm 0.8	0.176	0.2 \pm 0.6	0.1 \pm 0
0.8 \pm 1.1	0.6 \pm 1.1	0.5 \pm 1.0	0.537	0.1 \pm 0.3	0.1 \pm 0
Not stunted				Not stunted	
Stunted				Stunted	
dt at baseline (age 6–7)				pufa at baseline (age 6–7)	
9.6 \pm 4.3	10.2 \pm 4.8		0.058	2.5 \pm 2.3	2.6 \pm 2
7.9 \pm 4.4	9.6 \pm 4.6		0.002	3.0 \pm 3.0	4.1 \pm 3
6.9 \pm 4.8	7.8 \pm 4.9		0.018	1.8 \pm 2.2	1.9 \pm 2
DT at follow-up (age 8–9)				PUFA at follow-up (age 8–9)	
1.1 \pm 1.4	1.0 \pm 1.3		0.496	0.1 \pm 0.4	0.1 \pm 0
0.5 \pm 0.9	0.7 \pm 1.1		0.485	0.1 \pm 0.4	0.1 \pm 0
0.7 \pm 1.2	0.5 \pm 0.9		0.294	0.1 \pm 0.5	0.1 \pm 0

by U-Test

Table 2:

Table 1 Characteristics of the study sample in Cambodia, Indonesia, Lao PDR

	Cambodia		Indonesia		Lao PDR	
	Baseline (n = 624)	Follow-up (n = 478)	Baseline (n = 570)	Follow-up (n = 486)	Baseline (n = 653)	Follow-up (n = 535)
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Gender						
Boys	308 (49.4)	245 (51.3)	295 (51.8)	249 (51.2)	325 (49.8)	272 (50.8)
Girls	316 (50.6)	233 (48.7)	275 (48.3)	237 (48.8)	328 (50.2)	263 (49.2)
Age (years)						
Baseline Follow-up						
6 to < 7 8 to < 9	516 (82.7)	393 (82.2)	388 (68.1)	337 (69.3)	426 (65.2)	358 (66.9)
7 to < 8 9 to < 10	108 (17.3)	85 (17.8)	182 (31.9)	149 (30.7)	227 (34.8)	177 (33.1)
Geographical location						
Rural	378 (60.6)	309 (64.6)	–	–	214 (32.8)	187 (35.0)
Urban	246 (39.4)	169 (35.4)	570 (100.0)	486 (100.0)	439 (67.2)	348 (65.1)
Number of siblings ^a						
1 or no siblings	–	144 (30.1)	–	253 (52.3)	–	199 (37.2)
2 siblings	–	137 (28.7)	–	143 (29.6)	–	187 (35.0)
3 or more siblings	–	197 (41.2)	–	88 (18.2)	–	149 (27.9)
TV ownership ^b						
No	–	58 (12.2)	–	3 (0.6)	–	23 (4.3)
Yes	–	418 (87.8)	–	481 (99.4)	–	508 (95.7)
Car / motorcycle ^b ownership						
No	–	72 (15.1)	–	330 (68.2)	–	41 (7.7)
Yes	–	406 (84.9)	–	154 (31.8)	–	492 (92.3)
Weight status						
Underweight	53 (8.7)	67 (14.3)	45 (7.9)	37 (7.6)	41 (6.4)	46 (8.8)
Normal weight	539 (87.9)	375 (80.1)	443 (78.1)	337 (69.6)	566 (88.2)	434 (82.5)
Overweight	21 (3.4)	26 (5.6)	79 (13.9)	110 (22.7)	35 (5.5)	46 (8.8)
Stunting						
No	410 (66.9)	318 (68.2)	480 (84.8)	401 (83.5)	381 (59.4)	365 (69.5)
Yes	203 (33.1)	148 (31.8)	86 (15.2)	79 (16.5)	261 (40.7)	160 (30.5)
	mean \pm sd	mean \pm sd	mean \pm sd	mean \pm sd	mean \pm sd	mean \pm sd
Number of permanent teeth	5.4 \pm 2.7	12.1 \pm 3.4	6.0 \pm 2.6	12.6 \pm 3.0	6.0 \pm 3.0	12.6 \pm 3.8
dt	9.8 \pm 4.5	6.7 \pm 3.6	8.2 \pm 4.5	5.0 \pm 3.4	7.3 \pm 4.8	4.4 \pm 3.5
DT	0.2 \pm 0.6	1.1 \pm 1.4	0.1 \pm 0.5	0.5 \pm 0.9	0.3 \pm 0.8	0.6 \pm 1.1
pufa	2.6 \pm 2.4	2.8 \pm 2.1	3.2 \pm 3.1	2.7 \pm 2.3	1.9 \pm 2.4	1.9 \pm 1.9
PUFA	0.0 \pm 0.1	0.1 \pm 0.4	0.0 \pm 0.0	0.1 \pm 0.4	0.0 \pm 0.1	0.1 \pm 0.4

^aMeasured at follow-up

Number of missing values at baseline: anthropometric data, n = 25; dental data, n = 8

Number of missing values at follow-up: anthropometric data, n = 21; dental data, n = 16

RESULTS:

A total of 1856 children were involved in the baseline study - 629 children in Cambodia, 574 in Indonesia and 657 in Laos. Of these, 78.7% (n = 479), 86.4% (n = 489) also, 82.1% (n = 538) were followed up after 2 years individually. Children who had dropped out of school did not differ fundamentally from those followed in their dental caries and normal nutritional status. The mean time interval between norm and development was 23.88 ± 0.27 months. The mean age of all children at the model level was 6.7 ± 0.5 years (range 6.0-8.0 years) and 53.3% were young men. The prevalence of underweight and overweight was 7.6% and 7.4% for children at the time of the model survey, and 11.3% and 13.4% for children at the time of development, separately. More than a quarter of the children were disabled (30.2% at baseline and 27.4% at the developmental level). Overall, the amount of durable teeth ejected per child was 5.8 ± 2.8 at baseline and 13.6 ± 4.5 at the developmental level. At baseline, the prevalence of dental caries and odontogenic contamination in the essential dentition was 94.4% and 69.2% individually. Children had a mean dt of 8.4 ± 4.7 and a mean pufa-score of 3.6 ± 3.9 . Developmentally, the ubiquity of dental caries in durable teeth was 41.2% with a mean TD of 0.8 ± 1.2 , and the ubiquity of odontogenic disease was 7.2% with a mean PUFA of 0.2 ± 0.7 . The characteristics of the

investigative tests in the different countries are presented in Table 1. Table 2 shows the cross-sectional relationship between dental caries and dietary status. In Cambodia and Indonesia, dt and pufa were primarily related to weight status at age 6-7 years: mean dt and pufa scores were highest in underweight youth and lowest in overweight children. These affiliations were not observed in Lao PDR. No association was found between dt or PUFA and weight status at age 8-9 years, except in Cambodia, where mean dt was again substantially higher in underweight children and lower in overweight children. In each of the three countries, higher mean TD was fundamentally related to impairment at age 6-7 years. In Indonesia, youth with disabilities also had substantially higher rates of shearing at age 6-7, but not in Cambodia or Laos. No critical relationship between TD and PUFA and impairment at age 8-9 years was found. Table 3 shows the relationship between tooth decay at age 6-7 years and underweight at age 8-9 years. In Cambodia, higher dt and TD at age 6-7 years were fundamentally related to an increased likelihood of being underweight at age 8-9 years, after changes in age, sex, amount of permanent teeth and fattening. In Lao PDR, a similar pattern was found, but only for dt, while Indonesia showed no relationship between dt or TD and underweight.

Table 3:

	Cambodia		Indonesia		Lao PDR	
	Baseline (n = 624) n (%)	Follow-up (n = 478) n (%)	Baseline (n = 572) n (%)	Follow-up (n = 402) n (%)	Baseline (n = 653) n (%)	Follow-up (n = 533) n (%)
Gender						
Boys	308 (49.4)	245 (51.3)	295 (51.8)	249 (61.2)	525 (49.8)	272 (50.8)
Girls	316 (50.6)	233 (48.7)	275 (48.2)	153 (38.8)	528 (50.2)	263 (49.2)
Age (years)						
Baseline Follow-up						
6 to < 7 8 to < 9	516 (82.7)	393 (82.2)	398 (69.6)	337 (83.8)	426 (65.2)	358 (66.8)
7 to < 8 8 to < 9	108 (17.3)	85 (17.8)	172 (30.4)	65 (16.2)	227 (34.8)	175 (33.2)
Geographical location						
Rural	378 (60.6)	309 (64.6)	—	—	218 (33.4)	187 (35.1)
Urban	246 (39.4)	169 (35.4)	572 (100.0)	402 (100.0)	435 (66.6)	346 (64.9)
Number of siblings ^a						
1 or no siblings	—	144 (30.1)	—	253 (62.9)	—	189 (35.3)
2 siblings	—	137 (28.7)	—	145 (36.1)	—	137 (25.7)
3 or more siblings	—	107 (22.2)	—	88 (21.9)	—	149 (27.9)
TV ownership ^b						
No	—	58 (12.1)	—	7 (1.7)	—	23 (4.3)
Yes	—	418 (87.9)	—	401 (99.4)	—	508 (95.7)
Car / motorcycle ^c ownership						
No	—	72 (15.1)	—	180 (44.8)	—	41 (7.7)
Yes	—	406 (84.9)	—	222 (55.2)	—	462 (82.3)
Weight status						
Underweight	53 (8.4)	67 (14.0)	45 (7.9)	37 (9.2)	45 (6.9)	46 (8.6)
Normal weight	575 (91.6)	411 (86.0)	527 (92.1)	365 (90.8)	506 (77.0)	414 (77.3)
Overweight	21 (3.4)	26 (5.6)	79 (13.8)	110 (27.7)	35 (5.3)	46 (8.6)
Stunting						
No	410 (66.0)	318 (66.5)	480 (84.1)	401 (100.0)	381 (58.4)	305 (57.2)
Yes	203 (33.0)	160 (33.5)	86 (15.2)	79 (19.8)	261 (39.6)	248 (46.1)
	mean \pm sd	mean \pm sd	mean \pm sd	mean \pm sd	mean \pm sd	mean \pm sd
Number of permanent teeth	5.4 ± 2.7	12.1 ± 3.4	6.2 ± 2.6	12.6 ± 3.0	6.2 ± 3.0	12.8 ± 3.8
dt	8.6 ± 4.5	8.7 ± 3.6	8.2 ± 4.5	5.0 ± 3.4	7.9 ± 4.8	4.4 ± 3.5
TD	0.2 ± 0.6	1.1 ± 1.4	0.1 ± 0.3	0.5 ± 0.9	0.3 ± 0.8	0.6 ± 1.1
PUFA	3.6 ± 3.9	3.6 ± 3.9	3.6 ± 3.9	3.6 ± 3.9	3.6 ± 3.9	3.6 ± 3.9

Table 4:

Number of permanent teeth (mean \pm sd)		
Underweight	Normal weight	Overweight
Baseline (age 6–7)		
5.08 \pm 2.59	5.38 \pm 2.75	5.71
5.53 \pm 2.47	5.78 \pm 2.48	7.32
5.44 \pm 2.67	5.96 \pm 2.96	7.49
Follow-up (age 8–9)		
11.99 \pm 3.23	12.09 \pm 3.45	12.6
11.97 \pm 2.76	12.28 \pm 2.87	13.6
11.20 \pm 3.70	12.53 \pm 3.62	14.6
Not stunted	Stunted	
Baseline (age 6–7)		
5.84 \pm 2.76	4.43 \pm 2.44	
6.11 \pm 2.59	5.20 \pm 2.28	
6.69 \pm 2.96	5.03 \pm 2.70	
Follow-up (age 8–9)		
12.62 \pm 3.38	10.99 \pm 3.36	
12.68 \pm 3.01	12.14 \pm 3.09	
13.14 \pm 3.75	11.36 \pm 3.42	

by U-Test

Table 5:

	Dental caries (mean \pm sd)			P^a	Odontogenic infections (mean \pm sd)			P^a
	Underweight	Normal weight	Overweight		Underweight	Normal weight	Overweight	
dt at baseline (age 6–7)					pufa at baseline (age 6–7)			
Cambodia ($n = 53 538 21$)	11.7 \pm 4.7	9.6 \pm 4.4	8.6 \pm 4.2	0.004	3.1 \pm 2.4	2.5 \pm 2.4	1.7 \pm 2.2	0.033
Indonesia ($n = 45 441 79$)	9.3 \pm 5.0	8.3 \pm 4.4	6.3 \pm 4.5	< 0.001	3.6 \pm 2.9	3.3 \pm 3.1	2.5 \pm 3.1	0.007
Lao PDR ($n = 41 562 35$)	8.8 \pm 5.2	7.2 \pm 4.8	6.5 \pm 4.4	0.094	1.8 \pm 2.1	1.8 \pm 2.3	2.1 \pm 3.2	0.997
DT at follow-up (age 8–9)					PUFA at follow-up (age 8–9)			
Cambodia ($n = 67 372 26$)	1.4 \pm 1.4	1.1 \pm 1.3	0.7 \pm 1.2	0.030	0.1 \pm 0.5	0.1 \pm 0.4	0.1 \pm 0.3	0.985
Indonesia ($n = 37 335 109$)	0.9 \pm 1.3	0.6 \pm 0.9	0.4 \pm 0.8	0.176	0.2 \pm 0.6	0.1 \pm 0.4	0.1 \pm 0.3	0.751
Lao PDR ($n = 45 427 46$)	0.8 \pm 1.1	0.6 \pm 1.1	0.5 \pm 1.0	0.537	0.1 \pm 0.3	0.1 \pm 0.4	0.1 \pm 0.3	0.987
	Not stunted	Stunted		P^b	Not stunted	Stunted		P^b
dt at baseline (age 6–7)					pufa at baseline (age 6–7)			
Cambodia ($n = 409 203$)	9.6 \pm 4.3	10.2 \pm 4.8		0.058	2.5 \pm 2.3	2.6 \pm 2.5		0.992
Indonesia ($n = 478 86$)	7.9 \pm 4.4	9.6 \pm 4.6		0.002	3.0 \pm 3.0	4.1 \pm 3.6		0.010
Lao PDR ($n = 377 261$)	6.9 \pm 4.8	7.8 \pm 4.9		0.018	1.8 \pm 2.2	1.9 \pm 2.5		0.666
DT at follow-up (age 8–9)					PUFA at follow-up (age 8–9)			
Cambodia ($n = 316 147$)	1.1 \pm 1.4	1.0 \pm 1.3		0.496	0.1 \pm 0.4	0.1 \pm 0.2		0.316
Indonesia ($n = 399 79$)	0.5 \pm 0.9	0.7 \pm 1.1		0.485	0.1 \pm 0.4	0.1 \pm 0.5		0.867
Lao PDR ($n = 357 160$)	0.7 \pm 1.2	0.5 \pm 0.9		0.294	0.1 \pm 0.5	0.1 \pm 0.3		0.820

^aKruskall Wallis Test, ^b Mann Whitney U-Test**DISCUSSION:**

This review investigated the relationship between diet and untreated dental caries, as well as the emission status of durable teeth in an example of a youth network in Pakistan, India and Bangladesh over a 2-year period [6]. The findings showed that untreated dental caries in youth was strongly related to underweight and also hindered development [7]. Overall, the levels of untreated dental caries in the essential dentition were most noticeable in underweight youth, as well as in troubled children, and lowest in overweight youth. Similarly, untreated dental caries in children aged six to seven years was

fundamentally related to an increased risk of underweight and impediment after two years [8]. However, no stable relationship between lasting dental caries and weight or fettering was found. The findings of this investigation have not helped the speculations of Hooley *et al.* and Li *et al.* who proposed that dental caries is related to low and high BMI in a U-shaped model [9]. The results of the current investigation acknowledge the findings of a number of previous examinations, hence showing an inverse relationship between dental caries and children's dietary status [10].

CONCLUSION:

This survey found that untreated dental caries in the essential dentition was linked to underweight and hindered the development of youth in Cambodia, Indonesia and Lao PDR. These affiliations were not found for dental caries in the perpetual dentition. The survey also found that underweight and impediment to development were related to delayed issuance of permanent teeth. These findings suggest that oral well-being may play an important role in the development of young people, while the overall picture has taken a turn for the worse. Both tooth decay and delayed tooth ejection are likely associated with constant rather than intense undernutrition, given the associations found with low BMI for age and good age health over a two-year period. The findings of this review have significant suggestions for general well-being. In terms of achieving the goals for sustainable progress, particularly Goal 2 "zero hunger" to end all types of hunger and Goal 3 "great well-being and prosperity", it is very important to note that the hidden determinants of undernourishment and disorderly development tend to be present.

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