ORIGINAL ARTICLE

Association between exposure to adverse childhood experiences and adequate toothbrushing in children under 5 years in Peru: secondary analysis of a national survey in 2021

José Calmet-Rojas[1], Rodrigo Chumbiauca-Pomari[1], Dora Blitchtein-Winicki[1]

[1] Facultad de Ciencias de la Salud, Universidad Peruana de Ciencias Aplicadas, Lima, Perú

ABSTRACT

Specific childhood experiences, such as physical punishment and domestic violence, can impact children's dental health, potentially leading to the development of stomatological diseases and psychological stress. This study aimed to evaluate the association between physical punishment and exposure to domestic violence with adequate toothbrushing in Peruvian children under 5 years, using secondary data from the 2021 Demographic and Family Health survey. The association was assessed using generalized linear models of the family Poisson and link log function. The results were presented as prevalence ratios (PR). The prevalence of adequate toothbrushing was 22.8 %. Children of mothers who reported having been victims of domestic violence without their children witnessing it had a 20 % lower prevalence of adequate toothbrushing compared to those whose mothers did not report being victims of domestic violence (PR = 0.80; 95 % CI = 0.71 to 0.91; p < 0.001). Similarly, a 17 % higher prevalence of adequate toothbrushing was observed in children who received spanking as physical punishment from their parents compared to those who did not (PR = 1.17; 95 % CI = 1.05 to 1.31; p = 0.006). These findings suggest the need to consider domestic violence as a potential factor related to inadequate toothbrushing in children.

Keywords: Punishment; Intimate Partner Violence; Toothbrushing; Child (Source: MeSH)

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Corresponding author:
Dora Blitchtein-Winicki
Address: Calle los Nogales 765, San Isidro, Lima, Perú
Phone: +51 999090917
E-mail: juanfcoore@yahoo.com

ORCID iDs
José Calmet-Rojas
https://orcid.org/0000-0002-0479-2768
Rodrigo Chumbiauca-Pomari
https://orcid.org/0000-0003-1719-1774
Dora Blitchtein-Winicki
https://orcid.org/0000-0002-9986-7442

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Asociación entre la exposición a situaciones adversas en la niñez y cepillado dental adecuado en niños menores de 5 años en el Perú: análisis secundario de una encuesta nacional, en el año 2021

RESUMEN

Ciertas situaciones en la infancia, como el castigo físico y la violencia de pareja en el hogar, pueden afectar la salud dental de los niños, lo cual puede desencadenar en el desarrollo de enfermedades estomatológicas y estrés psicológico. El objetivo de este estudio fue evaluar la asociación entre el castigo físico y la exposición a violencia física de pareja con el cepillado dental adecuado en niños peruanos menores de 5 años, a través de un análisis de datos secundarios de la Encuesta Demográfica y de Salud Familiar 2021. La asociación se evaluó mediante modelos lineales generalizados de la familia Poisson y función de enlace logarítmica. Los resultados se presentaron en razones de prevalencia (RP). La prevalencia de cepillado dental adecuado fue del 22,8 %. La prevalencia de cepillado dental adecuado fue 20 % menor en niños de madres que reportaron haber sido víctimas de violencia por su pareja, sin que sus hijos lo hayan presenciado, en comparación con aquellos cuyas madres no reportaron ser víctimas de violencia (RP = 0,80; IC 95 % = 0,71 a 0,91; p < 0,001). Asimismo, se observó una prevalencia 17 % mayor de cepillado dental adecuado en aquellos niños que recibieron palmadas como castigo físico de su padre o madre en comparación con aquellos que no recibieron castigo físico (RP = 1,17; IC 95 % = 1,05 a 1,31; p = 0,006). Los hallazgos de este estudio sugieren la necesidad de incluir la violencia de pareja entre los factores potencialmente relacionados con el cepillado dental inadecuado.

Palabras clave: Castigo; Violencia de Pareja; Cepillado Dental; Niño (Fuente: DeCS)

INTRODUCTION

El Physical punishment of children remains a significant global issue, and most family environments are not safe (1). This practice involves using physical force to correct or control a child's behavior, causing pain but not injury (2). Nearly 300 million children aged 2 to 4 years worldwide are subjected to physical punishment by their caregivers (3). The prevalence of this problem is particularly high in Latin America, with Peru and Bolivia reporting the highest rates of physical punishment among children (4). Specifically, in 2018, the prevalence in Peru was 47%, occurring more frequently in households where the mother was younger, had a lower educational level, and belonged to a lower socioeconomic stratum (5).

Previous studies have confirmed a positive association between physical punishment and adverse outcomes in children (6,7). It has been shown that parenting styles influence children's oral hygiene and sugar intake, both of which affect oral health (8). Moreover, these disciplinary practices are associated with an increased risk of depressive disorders and aggressive behavior in children (9,10,11).

In addition to physical punishment, children may be exposed to other forms of domestic violence, such as witnessing physical intimate partner violence, defined as acts of physical aggression perpetrated by a partner (12). This exposure similarly affects children's health and development, being associated with the aforementioned outcomes as well as low self-esteem and poor academic performance (13,14,15). A systematic review found that children exposed to domestic violence exhibited accelerated telomere shortening, a marker of cellular aging that is linked to morbidity and mortality in childhood (16).

In this context, early detection of such adverse experiences is essential to prevent negative consequences on children's overall health. Good oral hygiene is part of overall health and is critical to prevent the development of oral diseases (17). Poor oral hygiene also affects a child's well-being, causing psychological stress and social rejection by peers (18). In recent years, oral hygiene has gained importance due to its implications for societal productivity and economic outcomes (19,20,21).

However, in Peru, there is still a lack of awareness and knowledge regarding children's oral hygiene. In 2018, it was reported that less than 24% of children under 12 years of age had access to dental services. Moreover, the prevalence of adequate oral hygiene practices was 19% higher among children living in urban areas compared to those in rural areas (22).

Factors associated with oral hygiene practices in Peru include socioeconomic status, geographic region, parental education level, maternal employment, and the number of children in the household (21). An association has also been suggested between physical punishment and inadequate toothbrushing. In the United Kingdom, adults who had been subjected to physical punishment and other violent experiences during childhood had a greater risk of tooth loss and required more dental restorations at any age (23). Similarly, in the Netherlands, a strong association was found between severe dental caries and a history of child abuse (24).

Both physical punishment and witnessing intimate partner violence have been linked to inadequate healthcare practices in children, such as not seeking medical attention for respiratory or gastrointestinal symptoms and nonadherence to prescribed treatment regimens (25). However, no studies have explored the association between these adverse experiences and adequate toothbrushing in Peru. Therefore, the objective of this study was to assess the association between physical punishment and/or exposure to intimate partner violence with adequate toothbrushing among Peruvian children under the age of 5.

METHODS

Study design

We conducted an analytical cross-sectional study based on secondary data from the Encuesta Demográfica y de Salud Familiar (ENDES) 2020 and 2021, a nationally representative survey that collects data on a wide range of health and demographic indicators. The survey employed a probabilistic sampling method with a two-stage cluster design. The analyzed sample was balanced, stratified, and independent. Data were collected across departments and both urban and rural areas. The primary sampling units were private households selected from clusters in urban areas and from rural enumeration areas in rural regions (26).

Population and eligibility criteria

The study population consisted of children residing in Peru in 2021. We analyzed data from children aged 12 to 60 months whose mothers were selected for the domestic violence module and who had complete responses to the oral hygiene questions. Only one child per mother was included. Children were excluded if their mothers lacked privacy during the domestic violence interview, did not respond to the discipline questions, or if the child had a permanent disability (e.g., mobility, vision, hearing, speech, communication, comprehension, or learning impairments).

Power calculation

We estimated statistical power at a 95% confidence level based on prior evidence indicating that 61.5% of children exposed to physical or sexual violence and 57.6% of those not exposed had dental health problems (caries) (27). Power was calculated using the OpenEpi software v3.0.1.

In the 2021 ENDES dataset, we identified 2,641 children exposed to physical punishment (violence) and 8,893 unexposed, yielding a power greater than 80%. Similarly, 3,870 children were exposed to physical or sexual violence toward their mothers by the most recent partner, while 7,764 were unexposed, also yielding a power greater than 80%.

Study variables

The independent variables were physical punishment by the father or mother and the occurrence of partner violence toward the mother in the presence of the child. Physical punishment was defined based on the mother's responses about how the child was disciplined. Punishment was categorized as spanking only (1), hitting with or without spanking (2), or none of these (0) by the father and/or mother.

A child was considered a witness of partner violence against the mother if the mother responded affirmatively to whether the child had ever been present when her most recent partner pushed her, slapped her, hit her, kicked her, attempted to strangle her, attacked her with a knife, threatened her with a gun, or forced her to have non-consensual sex, based on the CTS2 scale (28), which has high reliability (Cronbach's alpha = 0.88) (28). Children were categorized as unexposed to partner violence ("0") if all responses to these items were negative; as exposed but not witnesses ("1") if at least one item was affirmative but the child was not present; and as witnesses ("2") if both the act occurred and the child witnessed it.

The dependent variable was adequate toothbrushing, based on the report by the mother or father. Brushing was considered adequate if the child brushed at least twice a day every day, replaced the toothbrush at least every three months, used a personal toothbrush, and used toothpaste containing at least 1000 ppm of fluoride. If any of these criteria were not met, toothbrushing was considered inadequate. Other variables included in the final analysis were the child's age, sex, mother's ethnicity, area of residence, socioeconomic level, child's primary caregiver, number of children, mother's educational level, and presence of moderate or severe maternal depressive symptoms.

ENDES data collection procedures for the main variables

Questions from the "Domestic violence" module were asked face-to-face by a trained interviewer. Prior to the interview, informed consent was obtained. Privacy was ensured, and the interviewer verified that no other person was present. If someone was listening in, the interview was discontinued (26). Oral health questions were asked by the same interviewer. The child's mother was interviewed, and responses were collected without suggesting answer options. In addition to questions about toothbrushing, mothers were asked to show the child's toothbrush to confirm its presence and the toothpaste to verify fluoride concentration (26).

Statistical analysis

Statistical analysis was conducted using Stata SE v17.0 (Stata Corporation, College Station, Texas). A 95% confidence level was applied. Survey design, clusters, strata, and individual sampling weights were specified using the svyset commands. Categorical variables were described using weighted frequencies, percentages, and 95% confidence intervals. For the bivariate analysis, the association between sociodemographic variables and adequate toothbrushing was evaluated using the Rao-Scott corrected Pearson Chi-squared test.

To evaluate the association between adverse experiences (physical punishment and witnessing partner violence) and adequate toothbrushing, generalized linear models of the Poisson family with a log link function were used. Results are presented as prevalence ratios (PR), both crude (cPR) and adjusted (aPR). Variable selection for the adjusted models was guided by an epidemiological approach using a directed acyclic graph.

Multicollinearity in the adjusted model was assessed using the variance inflation factor (VIF), with a cutoff value of 10; higher values were found for maternal education level. Correlations between model variables were also assessed using a cutoff of 0.5. A strong correlation was found between the number of children and the child's age in months, so only the latter was retained. Similarly, a correlation was found between poverty level and area of residence ($r > 0.5$), and only the former was included. Both the physical punishment and partner violence models were adjusted for poverty level, child's sex, mother's age, and mother's marital status.

Ethical considerations

This study protocol was approved by the Ethics Committee of the Universidad Peruana de Ciencias Aplicadas (FCS-SCEI/780-11-22). As this was a secondary analysis of publicly available survey data with no personal identifiers, additional measures to ensure anonymity and confidentiality were not required.

RESULTS

A total of 11,534 children aged 12 to 59 months met the inclusion criteria for the study (Figure 1). As shown in Table 1, the majority were male (50.6%), aged between 24 and 59 months (71.7%), and lived in urban areas (77.0%). Additionally, 22.0% belonged to the poorest wealth quintile, and 20.9% did not have access to a public water supply in their homes. Regarding maternal characteristics, half of the mothers (49.9%) were between 25 and 34 years old, 45.8% had completed secondary education, and 86.4% were married or cohabiting. Most mothers (57.3%) reported working in the past week. About 35.1% had two children. Furthermore, 31.9% of mothers reported experiencing physical or sexual violence by their partners, and 7.4% reported that their children had witnessed this violence. Overall, 77.2% of children did not meet the criteria for adequate toothbrushing.

Table 2 presents the association between sociodemographic characteristics and adequate toothbrushing. The findings show a higher prevalence of adequate toothbrushing among children living in urban areas compared to rural areas (24.0% vs. 18.3%, respectively; $p < 0.001$). There was also a significant association between higher socioeconomic status and increased prevalence of adequate toothbrushing. No significant differences were found between boys and girls in terms of adequate toothbrushing (22.2% vs. 23.4%, respectively; $p = 0.24$). A significant and directly proportional association was observed between increasing child age and a higher prevalence of adequate toothbrushing. Children of mothers with secondary or higher education had a greater

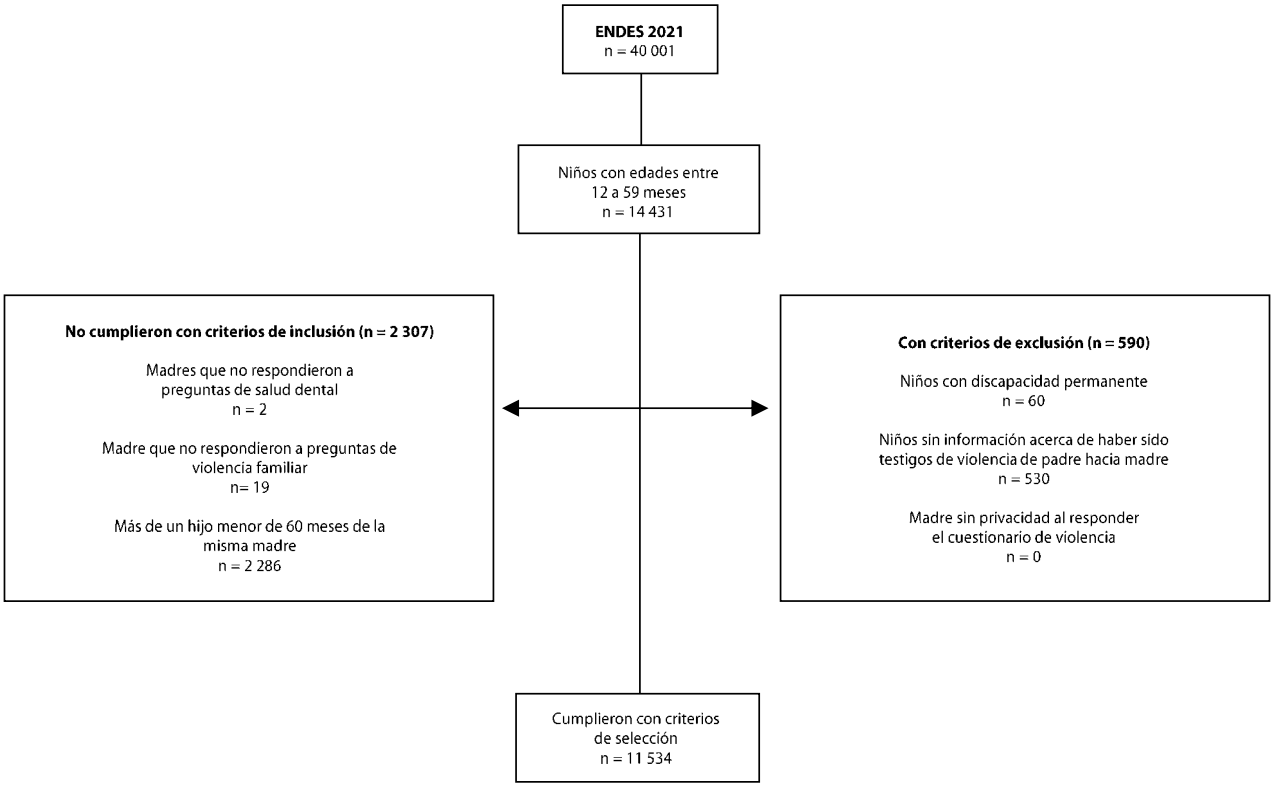

Figure 1. Flowchart of study population selection

prevalence of adequate toothbrushing compared to those whose mothers had only early childhood or primary education (22.1% and 25.7% vs. 10.3% and 18.5%, respectively; p < 0.001).

In the crude model (Table 3), children who received spanking as a form of physical punishment by their mother or father had a 17% higher prevalence of adequate toothbrushing compared to those who did not experience physical punishment (cPR = 1.17; 95% CI: 1.05 to 1.31; p = 0.006). No differences were observed in the prevalence of adequate toothbrushing between children who received hitting (with or without spanking) and those who did not receive physical punishment (cPR = 1.03; 95% CI: 0.73 to 1.46; p = 0.857). After adjusting for the child's sex, maternal marital status, household poverty level, and maternal age, no statistically significant association was found between hitting (with or without spanking) and adequate toothbrushing (aPR = 1.15; 95% CI: 0.82 to 1.64; p = 0.407).

Table 4 shows the results of the crude and adjusted models assessing the association between witnessing intimate partner violence and adequate toothbrushing. Children whose mothers reported experiencing physical or sexual violence by their partner without the child having witnessed it had a 19% lower prevalence of adequate toothbrushing compared to those whose mothers did not report experiencing violence (cPR = 0.81; 95% CI: 0.71 to 0.91; p = 0.001). No significant difference in adequate toothbrushing was found between children who had and had not witnessed intimate partner violence (cPR = 0.89; 95% CI: 0.74 to 1.06; p = 0.186).

After adjusting for household poverty level, child's sex, maternal age, and marital status, children of mothers who experienced partner violence (without the child witnessing it) had a 20% lower prevalence of adequate toothbrushing compared to those whose mothers did not report any violence (aPR = 0.80; 95% CI: 0.71 to 0.91; p < 0.001). No significant difference was observed in the prevalence of adequate toothbrushing between children who witnessed and those who did not witness acts of intimate partner violence (aPR = 0.90; 95% CI: 0.75 to 1.08; p = 0.244). Exploratory analyses also indicated that lower poverty levels and higher maternal age were associated with a higher prevalence of adequate toothbrushing (Tables 3 and 4).

DISCUSSION

This study found an association between physical punishment by the father and/or mother through spanking and adequate toothbrushing. Additionally, it identified a relationship between children's exposure to violence against their mothers by their most recent partners (without the mother reporting that the child witnessed it) and a lower prevalence of adequate toothbrushing. The overall prevalence of adequate toothbrushing in the study population was 22.8%.

Table 1. Sociodemographic characteristics of the study population

Characteristic		n	(%) [b]	95% CI [b]	
				LL	UL
Area of residence					
	Urban	7,896	(76.99)	76.18	77.77
	Rural	3,638	(23.01)	22.23	23.82
Poverty level					
	Lowest quintile	3,375	(22.04)	21.14	22.95
	Second quintile	3,129	(23.02)	21.97	24.10
	Third quintile	2,266	(20.94)	19.92	22.00
	Fourth quintile	1,667	(18.37)	17.38	19.40
	Highest quintile	1,097	(15.63)	14.55	16.77
Access to public drinking water network					
	Yes	8,679	(79.07)	77.89	80.20
	No	2,855	(20.93)	19.80	22.11
Child's sex					
	Male	5,834	(50.58)	49.40	51.76
	Female	5,700	(49.42)	48.24	50.60
Child's age (months)					
	12-18	1,940	(16.91)	16.04	17.83
	19-23	1,286	(11.42)	10.65	12.23
	24-36	3,236	(27.57)	26.53	28.63
	37-59	5,072	(44.11)	42.89	45.33
Primary caregiver					
	Mother	3,518	(26.59)	25.51	27.69
	Partner	2,028	(18.22)	17.24	19.24
	Other relatives	5,674	(51.77)	50.44	53.09
	Non-relatives	294	(3.19)	2.70	3.78
Mother's age (years)					
	15-24	1,993	(16.31)	15.46	17.19
	25-34	5,832	(49.99)	48.77	51.21
	35-49	3,709	(33.71)	32.52	34.92
Mother's educational level					
	Preschool/none	190	(1.09)	0.88	1.37
	Primary	2,601	(15.27)	14.47	16.10
	Secondary	6,822	(45.78)	44.54	47.01
	Higher	4,816	(37.86)	36.62	39.12
Mother's marital status					
	Married or cohabiting (in union)	10,058	(86.36)	85.51	87.18
	Widowed/divorced/separated (not in union)	1,476	(13.64)	12.82	14.49
Currently employed					
	No	4,832	(42.74)	41.44	44.05
	Yes	6,702	(57.26)	55.95	58.56
Number of children					
	One	3,186	(29.17)	28.06	30.31
	Two	4,018	(35.12)	33.96	36.31
	Three	2,353	(20.26)	19.29	21.27
	Four or more	1,977	(15.44)	14.63	16.29
Child witnessing intimate partner violence (father toward mother)					
	No report of physical violence from father toward mother	7,664	(68.09)	66.86	69.29
	Intimate partner violence, but child was not a witness	2,972	(24.5)	23.43	25.61
	Child witnessed intimate partner violence	898	(7.41)	6.79	8.09
Physical punishment by the father or mother					
	No physical punishment	8,893	(77.89)	76.84	78.90
	Slapping only	2,450	(20.76)	19.77	21.78
	Hitting with or without slapping	191	(1.36)	1.13	1.63
Adequate toothbrushing					
	No	9,088	(77.24)	76.14	78.31
	Yes	2,446	(22.76)	21.69	23.86

[b] *Percentages and confidence intervals are weighted*
[c] *Twenty missing values*
CI: 95% confidence interval; LL: lower limit; UL: upper limit

Table 2. Association between sociodemographic characteristics and adequate toothbrushing in children

Sociodemographic characteristic	Adequate toothbrushing in children						
	No			Yes			
	n = 9,088	77.24 %		n = 2,446	27.76 %		
		95 % CI			95 % CI		p*
	n (%[a])	LL	UL	n (%[a])	LL	UL	
Area of residence							<0.001
Urban	6,080 (75.91)	75.56	77.21	1,816 (24.09)	22.79	25.44	
Rural	3,008 (81.70)	80.12	83.18	6,30 (18.30)	16.82	19.88	
Poverty level							<0.001
Lowest quintile	2,832 (82.89)	81.29	84.38	543 (17.11)	15.62	18.71	
Second quintile	2,454 (78.57)	76.66	80.38	675 (21.43)	19.62	23.34	
Third quintile	1,753 (77.13)	74.84	79.28	513 (22.87)	20.72	25.16	
Fourth quintile	1,247 (74.47)	71.72	77.04	420 (25.53)	22.96	28.28	
Highest quintile	802 (70.72)	66.86	74.3	295 (29.28)	25.7	33.14	
Sex							0.240
Male	4,638 (77.84)	76.4	79.21	1,196 (22.16)	20.79	23.6	
Female	4,450 (76.63)	75.06	78.14	1,250 (23.37)	21.86	24.94	
Child's age (months)							<0.001
12-18	1,851 (94.2)	92.41	95.58	89 (5.80)	4.42	7.59	
19-23	1,150 (88.75)	86.02	91	136 (11.25)	9.01	13.98	
24-36	2,584 (78.58)	76.58	80.44	652 (21.42)	19.56	23.42	
37-59	3,503 (66.93)	65.16	68.66	1,569 (33.07)	31.34	34.84	
Primary caregiver							0.114
Mother	2,851 (79.37)	77.39	81.22	667 (20.63)	18.78	22.61	
Partner	1,588 (77.79)	75.25	80.14	440 (22.21)	19.86	24.75	
Other relatives	4,417 (76.16)	74.6	77.66	1,257 (23.84)	22.34	25.4	
Non-relatives	220 (75.07)	66.82	81.83	74 (24.93)	18.17	33.18	
Child witnessing intimate partner violence (father toward mother)							<0.001
No report of physical violence from father toward mother	5,928 (75.89)	74.54	77.19	1,736 (24.11)	22.81	25.46	
Intimate partner violence, but child was not a witness	2,433 (80.56)	78.28	82.66	539 (19.44)	17.34	21.72	
Child witnessed intimate partner violence	727 (78.65)	74.74	82.1	171 (21.35)	17.9	25.26	
Mother's age (years)							0.003
15-24 años	1,638 (81.27)	78. 88	83.45	355 (18.73)	16.55	21.12	
25-34 años	4,563 (76.64)	75.16	78.06	1,269 (23.36)	21.94	24.84	
35-49 años	2,887 (76.19)	74.18	78.09	822 (23.81)	21.91	25.82	
Mother's educational level							<0.001
Preschool/none	125 (89.73)	83.07	93.96	16 (10.27)	6.04	16.93	
Primary	1,649 (81.52)	79.29	83.57	350 (18.48)	16.43	20.71	
Secondary	4,349 (77.92)	76.35	79.42	1,112 (22.08)	20.58	23.65	
Higher	2,965 (74.33)	72.35	76.21	968 (25.67)	23.79	27.65	
Mother's marital status							0.158
Married or cohabiting (in union)	7,930 (77.57)	76.39	78.71	2,128 (22.43)	21.29	23.61	
Widowed/divorced/separated (not in union)	1,158 (75.18)	71.86	78.22	318 (24.82)	21.78	28.14	
Currently employed							0.906
No	3,803 (77.32)	75.53	79.02	1,029 (22.68)	20.98	24.47	
Yes	5,285 (77.18)	75.76	78.55	1,417 (22.82)	21.45	24.24	
Number of children							0.063
One	2,463 (75.82)	73.74	77.78	723 (24.18)	22.22	26.26	
Two	3,140 (7.55)	74.62	78.38	878 (23.45)	21.62	25.38	
Three	1,875 (78.84)	76.58	80.93	478 (21.16)	19.07	23.42	
Four or more	1,610 (79.42)	76.90	81.73	367 (20.58)	18.27	23.10	
Physical punishment by the father or mother							0.013
No physical punishment	7,097 (78.02)	76.76	79.24	1,796 (21.98)	20.76	23.24	
Slapping only	1,839 (74.30)	71.81	76.65	611 (25.70)	23.35	28.19	
Hitting with or without slapping	152 (77.24)	68.68	84.12	39 (22.69)	15.88	31.32	

[a] *Weighted percentages*
CI: 95% confidence interval; LL: lower limit; UL: upper limit
**Pearson's chi-square test with Rao-Scott correction*

Table 3. Association between physical punishment by the father and/or mother and adequate toothbrushing

Adequate toothbrushing	Crude model*			Adjusted model**		
	PRc	95% CI	p	PRa	95% CI	p
Physical punishment by mother or father						
No	Ref.			Ref.		
Slapping only	1.17	1.05-1.31	0.006	1.16	1.04-1.29	0.007
Hitting with or without slapping	1.03	0.73-1.46	0.857	1.15	0.82-1.64	0.407
Poverty level						
Lowest quintile	Ref.			Ref.		
Second quintile	1.25	1.11-1.42	<0.001	1.22	1.08-1.38	0.002
Third quintile	1.34	1.70-1.53	<0.001	1.28	1.11-1.47	<0.001
Fourth quintile	1.49	1.30-1.71	<0.001	1.42	1.23-1.64	<0.001
Highest quintile	1.71	1.46-2.00	<0.001	1. 60	1.36-1.87	<0.001
Child's sex						
Female	Ref.			Ref.		
Male	0.95	0.87-1.04	0.237	0.93	0.86-1.03	0.189
Mother's age (years)						
15-24	Ref.			Ref.		
25-34	1.25	1.09-1.43	0.001	1.25	1.08-1.44	0.003
35-49	1.27	1.10-1.47	0.001	1.29	1.09-1.53	0.004
Mother's marital status						
Married or cohabiting (in union)	Ref.			Ref.		
Widowed/divorced/separated (not in union)	1.11	0.96-1.27	0.153	1.09	0.95-1.26	1.27

PR: prevalence ratio (c = crude, a = adjusted); 95% CI: 95% confidence interval
** Crude generalized linear model (family: Poisson, link: log). Results are expressed as crude prevalence ratios (PRc).*
***Adjusted generalized linear model (family: Poisson, link: log). Results are expressed as adjusted prevalence ratios (PRa).*
All analyses accounted for the complex sampling design using survey (svy) commands.
The adjusted model was controlled for the child's sex, socioeconomic level, mother's marital status, and mother's age.

Table 4. Association between child witnessing intimate partner violence (father toward mother) and adequate toothbrushing

Adequate toothbrushing	Crude model*			Adjusted model**		
	PRc	95% CI	p	PRa	95% CI	p
Child witnessing intimate partner violence (father toward mother)						
No report of physical violence from father toward mother	Ref.			Ref.		
Intimate partner violence, but child was not a witness	0.81	0.71-0.91	0.001	0.80	0.71-0.91	<0.001
Child witnessed intimate partner violence	0.89	0.74-1.06	0.186	0.90	0.75-1.08	0.244
Poverty level						
Lowest quintile	Ref.			Ref.		
Second quintile	1.25	1.11-1.42	<0.001	1.23	1.09-1.39	<0.001
Third quintile	1.34	1.70-1.53	<0.001	1.29	1.24-1.48	<0.001
Fourth quintile	1.49	1.30-1.71	<0.001	1.42	1.23-1.64	<0.001
Highest quintile	1.71	1.46-2.00	<0.001	1.57	1.33-1.84	<0.001
Child's sex						
Female	Ref.			Ref.		
Male		0.87-1.04	0.237	0.95	0.87-1.03	0.215
Mother's age (years)						
15-24	Ref.			Ref.		
25-34	1.25	1.09-1.43	0.001	1.25	1.08-1.45	0.003
35-49	1.27	1.10-1.47	0.001	1. 30	1.09-1.54	0.003
Mother's marital status						
Married or cohabiting (in union)	Ref.			Ref.		
Widowed, divorced, or separated (not in union)	1.11	0.96-1.27	0.153	1.17	1.01-1.35	0.031

PR: prevalence ratio (c = crude, a = adjusted); 95% CI: 95% confidence interval
** Crude generalized linear model (family: Poisson, link: log). Results are presented as crude prevalence ratios (PRc).*
***Adjusted generalized linear model (family: Poisson, link: log). Results are presented as adjusted prevalence ratios (PRa).*
All analyses accounted for the complex survey design using the svy commands.

The observed association between spanking and adequate toothbrushing may reflect a more controlling parenting style, consistent with the findings of Howenstein et al. (31), who reported a relationship between authoritarian parenting styles and better oral health practices and fewer caries. Similarly, Tadakamadla et al. (32) showed that parents who adopted more controlling parenting strategies were associated with higher toothbrushing frequency in their children. In contrast, other studies did not find a significant association between parenting style and the presence of caries or dental plaque (8,33).

Regarding the association between children's exposure to violence against their mothers by their partners and a lower prevalence of adequate toothbrushing, we propose two possible mechanisms to explain this finding. The first involves a direct phenomenon in which the mother develops inadequate practices regarding her child's toothbrushing. The second involves an indirect phenomenon, in which the partner does not directly influence toothbrushing, but the violence affects it nonetheless.

The first mechanism could be supported by the findings of Folayan et al. (34), who observed that women who were victims of violence were more likely to engage in inadequate child health practices, such as purchasing sugary foods or failing to take their children to dental appointments, both of which increase the risk of early caries. The second mechanism could be based on the findings of Weijs et al. (35), who reported a positive association between children's exposure to intimate partner violence and the presence of dental caries. They characterized intimate partner violence as a "lesser" form of child maltreatment, in line with the emerging understanding of such violence as an adverse childhood experience that impacts individuals throughout their lives.

Exploring the effects of intimate partner violence on children's toothbrushing is a novel objective and introduces new challenges in child health research. Our findings suggest that adequate toothbrushing is influenced by parent-child relationships from early life stages. Therefore, it is essential to consider parenting styles, parental discipline practices, and the domestic environment when developing public health measures aimed at protecting children's well-being.

This study included a nationally representative sample to examine a relatively unexplored but highly relevant topic in child health. Furthermore, the data were collected using standardized methodologies, with trained interviewers and strict supervision protocols. This included verifying the physical presence of toothbrushes and checking the fluoride concentration in the toothpaste.

However, several limitations should be considered when interpreting the findings. As a cross-sectional study using secondary data, it was only possible to estimate prevalence and assess associations between variables of interest; establishing temporal or causal relationships was not feasible. In addition, no data were available on parenting styles or parental knowledge of proper toothbrushing practices, both of which are important for understanding children's oral hygiene habits. Data on refined sugar consumption and access to dental services during early childhood were also unavailable, limiting the assessment of children's oral health. Moreover, the survey did not include questions regarding whether a parent or guardian supervised toothbrushing. The physical punishment variable was assessed in general terms without measuring frequency or intensity. Finally, the categorization of "adequate toothbrushing" was based on the survey items included in ENDES without applying a validated, specific instrument.

The results of this study suggest that children's exposure to violence against their mother by her most recent partner, without the child being reported as a witness, is associated with a lower prevalence of adequate toothbrushing. In contrast, spanking as a form of physical punishment by the parents was associated with a higher prevalence of adequate toothbrushing. These findings highlight the need to include intimate partner violence among the factors potentially influencing children's oral hygiene practices. We hope that this study encourages further research on parenting styles and parental knowledge, attitudes, and practices related to toothbrushing, ultimately supporting the development of public health strategies that protect children's health and well-being.

Author contributions

Conceptualization: JC, RC; data collection, management, and curation: JC, RC, DBW; data analysis: JC, RC, DBW; original draft writing: JC, RC, DBW; interpretation of results: JC, RC, DBW; review and editing of the final version: JC, RC, DBW.

Conflicts of interest

The authors declare no conflicts of interest related to the content of this manuscript.

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Ethical considerations

The study protocol was approved by the Ethics Committee of the Universidad Peruana de Ciencias Aplicadas (FCS-SCEI/780-11-22). As this was a secondary data analysis of a publicly available survey with no personally identifiable information from respondents, no additional measures were required to ensure participant anonymity and data confidentiality. Survey participants signed an informed consent form authorizing their inclusion in the study. No questions were directed at minors; all responses were provided solely by the child's mother or father.

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