ปัจจัยที่เกี่ยวข้องกับเหงือกอักเสบในเด็กสมองพิการชาวไทยช่วงก่อนวัยเรียน

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บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาความชุกและปัจจัยที่เกี่ยวข้องกับเหงือกอักเสบของเด็กสมองพิการชาวไทยช่วงก่อนวัยเรียน ที่เข้ารับบริการที่ศูนย์ฝึกกายภาพบำบัด เขตกรุงเทพมหานคร ประเทศไทย

วัสดุอุปกรณ์และวิธีการ: ประชากรที่ศึกษามาจากศูนย์ฝึกกายภาพบำบัดของมูลนิธิเพื่อเด็กพิการจำนวน 7 แห่งในกรุงเทพมหานคร กลุ่มตัวอย่างคือเด็กสมองพิการอายุ 3-6 ปีที่เข้ารับบริการ จำนวน 60 คน การเก็บข้อมูลประกอบด้วยการตรวจทางคลินิกและการสัมภาษณ์ผู้ดูแลหลัก การตรวจสุขภาพเหงือกจากดัชนีเหงือกอักเสบ (Gingival index; GI) โดย Löe และ Silness โดยแบ่งเป็น 2 ระดับ คือ เหงือกปกติหรือมีเหงือกอักเสบเล็กน้อย (GI < 2) และเหงือกอักเสบปานกลางถึงรุนแรง (GI ≥ 2) และเก็บข้อมูลที่เกี่ยวข้องได้แก่ เพศ ชนิดของภาวะสมองพิการ การใช้ยากันชัก ระดับการศึกษาของผู้ดูแลหลัก ความถี่ในการแปรงฟัน และการสะสมคราบจุลินทรีย์ด้วยดัชนีอนามัยช่องปากอย่างง่าย (OHI-S) ปัจจัยที่มีนัยสำคัญทางสถิติที่ระดับนัยสำคัญ 0.05 ในการวิเคราะห์สองตัวแปร จะถูกนำไปวิเคราะห์ในสมการถดถอยโลจิสติก

ผลการศึกษา: เด็กสมองพิการมีความชุกของเหงือกอักเสบร้อยละ 81.67 (49 คน) เด็กสมองพิการที่มีการสะสมของคราบจุลินทรีย์ที่เห็นได้ด้วยตาเปล่า (OHI-S ≥ 2) มีโอกาสพบเหงือกอักเสบชนิดปานกลางถึงรุนแรงได้มากกว่า 25.84 เท่าของเด็กที่ไม่พบคราบจุลินทรีย์ที่เห็นได้ด้วยตาเปล่า (95%CI 3.89-171.44) เด็กสมองพิการที่ผู้ปกครองมีระดับการศึกษาต่ำกว่ามัธยมศึกษาปีที่ 3 จะมีโอกาสพบเหงือกอักเสบชนิดปานกลางถึงรุนแรงมากกว่า 6.69 เท่าของเด็กที่ผู้ปกครองมีระดับการศึกษาสูงกว่ามัธยมศึกษาปีที่ 3 (95% CI 1.50-29.84) และเด็กสมองพิการที่ได้รับยากันชักจะมีโอกาสพบเหงือกอักเสบชนิดปานกลางถึงรุนแรงได้มากกว่าถึง 5.90 เท่าของเด็กที่ไม่ได้รับยากันชัก (95% CI 1.29-26.84)

สรุป: เหงือกอักเสบเป็นปัญหาสุขภาพช่องปากที่มีความชุกสูงในเด็กสมองพิการชาวไทยช่วงก่อนวัยเรียน ปัจจัยการมีคราบจุลินทรีย์ที่เห็นได้ด้วยตาเปล่า ระดับการศึกษาของผู้ปกครอง และการใช้ยากันชัก มีความเกี่ยวข้องกับเหงือกอักเสบระดับปานกลางและสูงในเด็กสมองพิการชาวไทยช่วงก่อนวัยเรียน

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Factors Associated with Gingivitis in Thai Preschool Children with Cerebral Palsy

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Abstract

Objective: The aim of this study was to investigate prevalence and factors associated with gingivitis among Thai preschool children with cerebral palsy (CP) attending rehabilitation centers in Bangkok, Thailand.

Materials and Methods: The studied population was recruited from the 7 rehabilitation centers of Foundation of Children with Disability (FCD) in Bangkok. Sixty children with CP, aged 3-6 years old, received an oral examination and primary caregivers completed a questionnaire. Gingival health of individuals was assessed by a gingival index assessed from Löe and Silness and was categorized as normal to mild gingivitis (GI < 2) and moderate to severe gingivitis (GI ≥ 2). The following variables were collected: gender, type of CP, use of anticonvulsants medication, caregiver's educational level, brushing frequency and dental plaque deposition based on Simplified Oral Hygiene Index (OHI-S). Variables with a $p<0.05$ in the bivariate analysis were incorporated into the logistic regression models.

Results: Prevalence rate of gingivitis in study group was 81.67% (n = 49). Children with visible plaque (OHI-S ≥ 2), children whose caregiver had an educational level less than 9^{th} grade and children who took anticonvulsants had a 25.84-fold (95% CI 3.89 to 171.44), a 6.69-fold (95% CI 1.50 to 29.84), and a 5.90-fold (95% CI 1.29 to 26.84), greater chance of exhibiting moderate to severe gingivitis, respectively.

Conclusions: Gingivitis is the oral health problem with high prevalence in Thai preschool children with CP. Dental plaque, low educational level of caregivers and using anticonvulsants drugs are factors associated with moderate to severe forms of gingivitis.

Keywords: Cerebral palsy, Gingivitis, Preschool children

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Introduction

Gingivitis, the most common form of periodontal disease in children, is an important oral health problem for children with developmental disabilities (1-3). Cerebral palsy (CP) is the most common newborn neurological disorder, resulting in motor dysfunction to control movement, posture and masticatory function, found in a range of 2-2.5 of every 1000 live-born children (4,5). Children with CP are unable to brush adequately to maintain good oral health. According to the study in Brazil in 2004, gingival disease was found to be prevalent in the primary dentition of children with CP, aged 2-6 years old (3). However, no data has been published in Thailand.

Gingival inflammation is caused by oral microorganisms in dental plaque attached to the tooth or near the gingival sulcus; however, few studies have investigated factors associated with gingivitis in children with CP (6,7). CP condition, oral hygiene status and individual's sociodemographic data were reported to be the factors associated with gingival health in CP children. Gingivitis in these groups of disabilities is mainly resulting from inadequate plaque removal (7-9). Previous studies showed that the oral hygiene of individuals with CP was inferior to those without a disability (1,2,10). A spastic condition of CP may relate to difficulties to perform a satisfactory level of oral hygiene (9). In addition, CP patients who experience gingival overgrowth due to anticonvulsant drug therapy combine with poor oral cleaning, prone to have gingival inflammation (1,11,12).

Since the oral hygiene in young children with CP is mainly maintained by caregivers, the caregiver's personal background and socioeconomic status affect the caring pattern for these children (13). Caregiver's educational level may influence his/her attitude toward oral health care in children, which relates to gingival health alteration (6). In addition, oral health behavior, including frequency of tooth brushing and dental visits, probably influences gingival diseases among these children (14). The contribution of factors associated with gingivitis in children with CP may vary in racially different populations.

Up to present, the prevalence of gingivitis and factors associated with gingivitis among Thai preschool children with CP are not available. The objective of this study was to investigate the prevalence of gingivitis and the factors associated with gingivitis of preschool children with CP attending physical therapy programs in rehabilitation centers of the Foundation of Children with Disability (FCD) in Bangkok, Thailand.

Materials and Methods

The study was conducted in a complete list of preschool children with CP who attended in 7 private rehabilitation centers of Foundation of Children with Disability (FCD) in Bangkok, Thailand. Preschool children with any type of CP, aged 3-6 years old, with completed primary dentition, and engaged with caregivers were included in the study. The children who were fed by gastrostomy tube insertion were excluded from the study.

The sample size was calculated by proposing minimum ratios of sample size to the number of variables. The sampling at least 10 individuals for each variable might be acceptable in an investigatory study (15). The investigating variables consisted of 6 factors. Thus, the suitable sample size should not less than 60.

According to the recent data of FCD, The number of CP children aged 3-6 years who were registered with the rehabilitation centers was 71. Sixty children were eligible to participate in the study while 11 cases were excluded because 5 children had tube-fed insertion, 4 were unable to schedule an appointment, and 2 were declined to participate by primary caregivers.

Examiner Calibration

Oral examination including assessment of gingival health and dental plaque of the sample were collected. Interviewing with structured questionnaire with the primary caregivers was performed. One calibrated dentist was designated as an oral examiner and interviewer. The intra-examiner reproducibility test used Cohen's kappa statistics for the assessment of gingival health and dental plaque, which showed good to excellent kappa values at 0.80 (dental plaque index) and 0.88 (gingival index).

Data Collection

Clinical oral health examination

Oral health assessment was conducted by using an examination kit containing a mouth mirror, CPI probe with a 0.5-mm ball tip, cotton rolls, gauze and a mouth gag. The examination was performed under a LED light torch. The examination procedures were recorded for 6 index teeth: upper right second molar; upper right central incisor; upper left first molar; lower left second molar; lower left central incisor and lower right first molar.

Gingival health status was determined using the gingival index (GI) modified from Löe and Silness (16). The bleeding of gingiva was assessed by probing gently along four dental surfaces (buccal, lingual, mesial and distal) of each tooth. Each site received a score from 0 to 3, resulting in the GI of the tooth. The mean GI of each tooth was calculated and the mean GI of all six teeth per participant was assessed. For the purpose of the study, gingivitis was considered as normal to mild inflammation (GI score < 2) or moderate to severe inflammation (GI score ≥ 2). Dental plaque deposition was recorded using Greene and Vermillion's Simplified Oral Hygiene Index (OHI-S) (17). The dental plaque score was graded 0-3 of each tooth index and the mean OHI-S of each participant was calculated. The presence of dental plaque was detected as visible (OHI-S score ≥ 2) and non-visible (OHI -S score < 2).

Interviewing with structured questionnaire

A structured questionnaire was developed for interviewing primary caregivers according to factors possibly associated with the occurrence of gingivitis in children with CP. The data were addressed as the children's demographic data, socioeconomic status and oral hygiene habits.

Demographic and socioeconomic characteristics included age, gender, primary caregiver's educational level (low; grade 9 or under/ high; above grade 9), the dental visit experience within 12 months. Oral hygiene habits were indicated by tooth brushing frequency (brushing less than 2 times a day/ brushing 2 times or more a day), brushing assistance (assisted/ unassisted by caregivers) and type of oral cleaning device.

Cerebral palsy status assessment

CP status was carried out using information collected from health charts that were obtained from the FCD. Classification of CP was assessed according to predominant motor disorder as spastic type and non-spastic type. Presence of using any anticonvulsant medications was obtained from primary caregivers.

Statistical Analysis

The outcome of the analysis was subject to level of the gingival inflammation (normal to mild inflammation; GI score < 2 and moderate to severe inflammation; GI score ≥ 2). The differences between factors and level of gingival inflammation were determined by the Chi-square test. Any independent variables which were significantly ($p < 0.05$) related to gingivitis were considered in the final multiple logistic regression model. The selected variables were entered to the model in a forward stepwise process to evaluate the final factors which are the risk factors of gingivitis in the sample. The data were calculated with SPSS software version 19 (SPSS Inc., Chicago, IL, USA).

Ethical Aspects

This study was approved by the Ethics Committee of Faculty of Dentistry, Chulalongkorn University (IRB No.: HREC-DCU 2017-017). Written consent was obtained from primary caregivers of the children with CP before their study enrollment.

Results

From a total of 60 participants (mean age of 5 years 1 month, range between 3–6 years), 63.34% were females and 36.66% were males. The gingivitis was verified in 49 participants (81.67%) and the moderate to severe gingivitis was found in 25 participants (41.67%). The characteristics of participants evaluated in this study are shown in Table 1.

From bivariate analysis, a statistically higher number of patients with moderate to severe gingivitis was found with frequency of toothbrushing (< 2 times/day), anticonvulsant users, children of caregivers having lower than 9th grade education, and children with visible plaque accumulation (OHI-S score ≥ 2). Unadjusted and 95% confidence interval are shown in Table 2.

The final logistic regression model demonstrated that children with visible plaque accumulation with OHI-S score ≥ 2 were 25.84 times more likely to have moderate to severe gingivitis than children who do not present visible plaque. Individuals whose caregiver had an educational level less than grade 9th had 6.69 times greater chance of exhibiting moderate to severe gingivitis. Finally, individuals who take anticonvulsant medications had a 5.90-fold greater chance of showing moderate to severe gingivitis.

Table 1. Clinical characteristics and sociodemographic of participants.

Variables	Mean ± (SD)	N (%)
Gingival index (GI)	1.73 ± 0.74	
Normal (GI score = 0)		11 (18.33%)
Mild inflammation (0 < GI score < 2)		24 (40.00%)
Moderate to severely inflammation (GI score ≥ 2)		25 (41.67%)
Plaque index (OHI-S)	1.51 ± 0.69	
Visible plaque (OHI-S score ≥ 2)		17 (28.33%)
Non visible plaque (OHI-S score < 2)		43 (71.67%)
Sociodemographic data		
Primary caregiver's educational level		
Low		35 (58.33%)
High		25 (41.67%)
Dental visit experience within 12 months		
Yes		14 (23.33%)
No		46 (76.67%)
Cerebral palsy status		
Type of cerebral palsy		
Spastic type		35 (58.33%)
Non-spastic type		25 (41.67%)
Anticonvulsant use		
Use		31 (51.67%)
Non-use		29 (48.33%)
Oral health behaviors		
Brushing frequency		
Once a day		30 (50.00%)
At least twice a day		30 (50.00%)
Brushing assistant		
Assistant		56 (93.33%)
No Assistant		4 (6.67%)
Type of toothbrush		
Manual toothbrush		60 (100.00%)

Table 2. Crude and adjusted odds ratios and 95% confidence intervals of the risk of moderate to severe gingivitis.

Variables	Crude odds ratio (95% CI)	p-value	Adjusted odds ratio (95% CI)	p-value
Gender				
Males	1.28 (0.44 to 3.69)	0.651		
Females	1			
Parents educational level				
Low	5.32 (1.63 to 17.47)*	0.004*	6.69 (1.50 to 29.84)	0.013**
High	1		1	
Type of cerebral palsy				
Spastic CP	1.49 (0.52 to 4.29)	0.341		
Non spastic CP	1			
Anticonvulsant use				
Use	3.18 (1.08 to 9.37)	0.032*	5.90 (1.29 to 26.50)	0.022**
Non-use	1		1	
Brushing frequency				
< 2 /day	4.92 (1.61 to 15.07)	0.012*		
≥ 2 /day	1			
Plaque index				
Visible plaque (OHI-S score ≥ 2)	13.57 (3.27 to 56.31)	< 0.000*	25.84 (3.89 to 171.44)	0.001**
Non visible plaque (OHI-S score < 2)	1		1	

* $p < 0.05$ statistically significant (Chi square)

** Odds ratios and 95% CI are obtained from logistic regression analysis using GI < 2 as the reference group

Discussion

Untreated gingivitis can progress to attachment loss which finally causes tooth loss and poor masticatory function. In our study, gingivitis was found in 81.67% of preschool children with CP, and 41.67% presented with moderate to severe gingivitis. The prevalence of gingivitis is considered high in preschool children with physical and mental disabilities including CP, Autism, Down syndrome and mental retardation (3,18,19). The study of Makboon et al. (2019) also found gingivitis in 66.70% of Thai preschool children with Down syndrome and autistic disorder (19). However, there is no data available for gingival health status of healthy Thai preschoolers. The 8th Thailand National Oral Health survey evaluated the gingival health status of children starting at age 12. From the survey, the prevalence of gingivitis in children aged 12 and 15-year-old were 66.30% and 69.90%, respectively (20).

Regarding the dental plaque, CP children with visible plaque accumulation (OHI-S score ≥ 2) were 25.84-fold more likely to have moderate to severe gingivitis than children who had no visible plaque (OHI-S score < 2). Gingival inflammation is associated with the presence of oral microorganisms in dental plaque attached to the tooth or near the gingival sulcus. The study of Naka et al. (2009) indicated that periodontopathic bacterial species were presented in higher incidence in one-fourth of children with developmental disabilities including CP (21).

Moreover, children with CP who take anticonvulsant medications had a 5.90-fold greater chance of showing moderate to severe gingivitis. Anticonvulsants mostly used in the study group were Phenobarbital and Sodium valproate. The occurrence of gingival overgrowth related to these two drugs is less than that of Phenytoin (22). However, there have been some reported cases of gingival overgrowth following Phenobarbital and Sodium valproate treatments (23-26). Gurbuz and Tan (2010) described that gingival enlargement was found in 42% of epileptic children on Valproate monotherapy and 16% of those on Phenobarbital (27). This gingival overgrowth not only traps both plaque and food debris, but also effect the adequate cleaning that consequently enhances secondary inflammation (12). Hassell et al. (1984) reported the positive correlations between gingival overgrowth severity and gingival inflammation, probing depths, calculus accumulation and plaque score (11). Despite the fact that anticonvulsant medication enhances gingivitis, the use of medication is indispensable. To prevent gingivitis among these children, meticulous plaque control should be emphasized.

In this study, all participants used manual toothbrush and half of them had brushing two or more times a day. Almost all of caregivers reported assisted brushing for their children However, in the multivariate analysis, the frequency of toothbrushing was not associated with gingival inflammation level. This could imply that the cleaning frequency did not represent the quality of plaque removal.

Caring for preschool children is the responsibility of caregivers. In this study, CP children with caregivers having an educational level of less than 9^{th} grade presented with 6.69-fold higher level of gingivitis. This result was conformed to the previous findings that education level of mother and father of children with CP

was significantly associated with periodontal status (6,28). Caregivers with a low educational level may have lesser health knowledge, inadequate oral health habits and lower levels of regular dental visits (13). Moreover, from the study in Thailand, individuals who had educational levels limited to secondary school were at risk for periodontitis (29). These caregivers probably have periodontal pathogens that could be transmitted to their children, as found in the study reporting the correlation of periodontal bacteria in pairs of mothers and children (30,31). However, this transmission model should be verified in Thai ethnic group.

Although children with spastic CP have difficulties in oral cleaning due to their biting reflex (32), our results confirmed that spastic type of CP was not associated with gingival health. This result was similar to the study of De Camargo and Antunes (2008), who found that non-spastic children with CP did not have a better dental conditions than the others with spastic CP and the children with spastic quadriplegia which represents a further level of physical limitation were not associated with worse oral health (33).

According to the American Academy of Pediatric Dentistry, children with special health care needs may be at increased risk for dental diseases and may need dental recall visits every 3 months or more often (34). The results from our study, 76.67% of the CP children had no dental visit in the past 12 months, whereas the data of 2017 National Health and Welfare Survey showed that 93% of Thai preschool children did not receive dental service within the previous year (35). Thai studies reported that delays and prolonged waiting time, school absence and financial problems were the barriers to accessing dental care of children (35,36). However, the barriers between disabled persons and normal persons may be different (37). The potential barriers in children with CP were also reported to be associated with high expense, child's complicated condition and difficulties to find a dentist willing to treat them (38). Moreover, limitation to dental service care for Thai people with intellectual disabilities was related to a lack of skilled dentists (39). Casamassimo (2004) also reported that reasons for being less likely to treat patients with disability were lack of experience and insufficient undergraduate education and clinical exposure (40). Therefore, the undergraduate curriculum should incorporate didactic courses and clinical experience in primary dental care (oral hygiene advice, dental prophylaxis and fluoride application) for CSHCN. The individuals with complicated dental treatment needs should be referred to specialist care. In addition, the dental school should take the social responsibility in providing dental education for caregivers of the CSHCN through modern accessible platforms.

To limit the progression of oral health problems at the beginning stage, early detection of the dental disease and instant referral to dentist are important. One study found that having a regular doctor or nurse was significantly protective against an unmet dental care need in CSHCN (41). Therefore, dental care should be incorporated into the comprehensive health care services. Doctors, nurses and health care workers could influence access to dental care for CSHCN, including CP, through oral health assessment and dental referral.

The study findings indicate that gingivitis can be found in Thai children with CP aged 3-6 years old. CP preschool children with visible plaque, children whose caregiver had a low educational level and children who take anticonvulsant medications were at risk to develop gingivitis. This study showed high prevalence of gingivitis in Thai preschool children with CP whereas 76% of them were reported unmet dental care and limitations to dental services. The results suggest policy implications for addressing these discrepancies among Thai preschool children with CP. Dental education for efficient routine oral care and better dental service access should be designated to the children with CP at early age.

The limitation of this study is that data considered were limited to generalized findings for the population of children with CP. In addition, this is a cross-sectional analysis in which only an association between gingival inflammation level and various risk factors can be accessed. A future longitudinal study is necessary to identify causal factors of gingivitis in children with CP. Our study initiated the groundwork for further studies to build a foundation for oral health surveillance and health policy development for children with CP in Thailand.

Conclusion

Our results showed that 81.67% of Thai children with CP experienced gingival disease at a very early age. More than three quarters of participants were reported no dental visit experience within the past 12 months. The presence of moderate to severe forms of gingivitis in the study group was associated with visible plaque accumulation, caregiver's educational level and use of anticonvulsant medications.

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Conflicts of interest

The authors declare no conflict of interest.

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