

# ORAL HEALTH PROBLEMS AMONG CHILDREN IN SELECTED PRIMARY SCHOOLS IN BANGKOK, THAILAND

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## ABSTRACT:

**Background:** Dental caries and gingivitis are common health problems in schoolchildren worldwide. This study aimed to assess oral health problems and risk factors of children age 6-14 years in selected primary schools in Bangkok.

**Methods:** This retrospective analysis was done in 509 schoolchildren profiles based on primary data of Mahidol School Oral Health Program during academic year 2015. Validity for secondary data study, data entry was done from the original record forms. Data were analyzed using descriptive statistics, univariate analysis, and multiple logistic regression at a significance level of 0.05.

**Results:** The Caries Index (dmft) of grade 1 children demonstrated that caries in primary dentition were frequent. The prevalence of caries in primary teeth of grade 1 children was 82.6%, high level of caries in primary teeth was 55.0%. On the contrary, children in grade 2-6, high level of caries in permanent teeth was only 2.5%. Besides, gingivitis affected main group of children (76.8%). Logistic regression analysis found only poor oral hygiene significantly associated with dmft level (Adj OR=12.0, 95% of CI = 1.1-131.3). Gender, educational level and underlying diseases were significantly associated with DMFT level (Adj OR=2.3, 95% of CI =1.3-4.3, Adj OR=2.1, 95% of CI =1.0-4.1, and Adj OR= 4.1, 95% of CI =2.0-8.3, respectively). For gingivitis, school and oral hygiene were significantly associated factors (Adj OR= 3.5, 95% of CI =1.7-7.4, and Adj OR=19.1, 95% of CI =5.1-71.2).

**Conclusion:** An early detection and prevention program should be helpful in reducing dental caries in this group of children.

**Keywords:** Oral health problems, Dental caries, Gingivitis, Schoolchildren, Thailand

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## INTRODUCTION

Epidemiological data from several countries indicates that prevalence of dental caries are sharply increasing [1], particularly among school children. Although oral health of children has been improving in the present day, tooth caries still remains a public health problem, even though it is preventable [2]. A large number of children in many low income countries were affected by dental caries [3], and most were left untreated by reason of limited access to oral health services [4]. In Thailand, dental caries

in children have continuously increased during the past two decades. The seventh National Oral Health Survey in 2012 found that 78.5% of 5-6-year children and 52.3% of 12-year children were affected by dental caries [5, 6]. Moreover, the prevalence of gingivitis in children is very high, the majority of children being affected [7].

Untreated caries can lead to pain, irreversible damage, more serious general health problems, lost school time, low self-esteem and poor quality of life. The delay in treatment not only results in aggravation of disease, but also costs of care are considerably increased as a consequence. Many research studied on factors associated with oral

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health problems [8-25] such as oral hygiene status, nutritional status and underlying diseases. A study about dental caries and oral hygiene status among schoolchildren with age 6-8 years in Vietnam by Hein loc., found that schoolchildren with poor and fair oral hygiene had caries twice more than schoolchildren with good oral hygiene [8]. Consistent with Shabani, et al. [20], it found that there was a strong correlation between DMFT and OHI-S index in children 10-15 years old.

There are some studies mentioning about dental caries and growth in school-age children [24]. Heba studied about height and weight in 6-8-year Saudi children with high caries prevalence and found association between untreated caries and poorer growth. Children with higher level of caries had significantly lower height and weight outcome. Stunted children have high dmft score and most of scores come from decay not filling. On the other hand, Mostafa, et al. [23], found stunted growth children with lower caries in permanent teeth (DMFT). Furthermore, some studies did not find any association between height and dental caries, they found that only weight was related to caries [26]. Under nutritional status was also related with periodontal diseases. There are some evidences to suggest that periodontal diseases progress more rapidly in undernourished populations and the important role of nutrition in maintaining an adequate host immune response [21]. Additionally, a previous study found association between oral health problems and underlying diseases. Franco, et al. [13] found that children with severe congenital cardiac diseases have moderately high level Franco's study is of dental caries with a significantly greater amount of untreated diseases.

This research was done to assess oral health problems of school children from secondary data provided by Faculty of Dentistry, Mahidol University and factors associated with oral health problems in this target group.

## METHODOLOGY

A retrospective analysis was done to assess oral health problems of children (grade 1 to 6) in 4 primary schools in Bangkok (Wat Devarajkunchorn School, Wat Sawaswaree Srimaram School, Wat Samananam Borihan School, and Pratumnak Suan Kularb School) and to identify factors associated with moderate and severe level of oral health problems. The study included total population of school children who were attending school in

academic year 2015. The secondary data analysis of 585 dental chart records of school children were revised and 76 were discarded for incomplete information. The remaining were analyzed and presented. Data profiles of primary school children were based on Mahidol school oral health program during academic year 2015

## Data collection

Secondary research was conducted from primary data of 509 children collected by school oral health program, Community Dentistry Department, Faculty of Dentistry, Mahidol University in academic year 2015. Each child was examined for dental cavity, history of treatment, gingivitis, food debris and calculus deposit by the fifth-year dental students and confirmed by their supervisors who are dentists. The oral examination were conducted in school using light from mobile dental unit. Each sextant of the mouth was examined and recorded for food debris and calculus deposit to calculate oral hygiene level using OHI-S index [27]. The decay, missing and filling teeth (dmft/DMFT index) were detected and recorded according to WHO oral health assessment in 1997[28]. Gingivitis was recorded when redness and swollen gum were observed following American Academy of Periodontology year 2000 [29]. Basic socio-demographic information including age, gender, weight, height and education level and underlying diseases were obtained from school records of each school. All collected data were recorded using dental chart profiles of Mahidol University, Faculty of Dentistry. Dental chart profile of each child was modified by using ID instead of child's name and matched with a checklist of preventive treatment record of each child.

## Validity of oral examination measurement tool

Validity for secondary data study, data entry was done from the original record forms. Most of the data were already validated from primary examination. Some studied variables were classified by using standard criteria for data analysis. Oral hygiene status and caries status were classified into categories using WHO criteria [28]. For nutritional status, using Thai national growth graph for 5 to 18 years of each gender provided from Thai Ministry of Public Health [30].

## Data analysis

Data were analyzed using Statistical Program for Social Science, (SPSS version 22, Chulalongkorn University).

**Table 1** Health status of the children

Health status	Number	Percent
<b>Nutritional status (n=509)</b>		
<b>Weight for height</b>	43	8.4
Severe wasting or wasting	377	74.1
Normal	89	17.5
Overweight or obesity		
<b>Weight for age</b>		
Severe underweight or underweight	38	7.5
Normal	380	74.7
Overweight or obesity	91	17.9
<b>Underlying diseases (n=509)</b>		
Not present	443	87.0
Present	66	13.0
<b>Oral hygiene (n=509)</b>		
Good	61	12.0
Fair	393	77.2
Poor	55	10.8
<b>Gingivitis (n=509)</b>		
Yes	391	76.8
No	118	23.2
<b>Caries status in primary teeth (n=149)</b>		
Low (dmft=0)	26	17.4
Moderate (dmft 1-4)	41	27.6
High (dmft >4)	82	55.0
<b>Caries status in permanent teeth (n=360)</b>		
Low (DMFT 0-2.6)	325	90.3
Moderate (DMFT 2.7-4.4)	26	7.2
High (DMFT >4.5)	9	2.5
<b>Caries prevalence at 6-7 years old (n=149)</b>		
Mean dmft = 6.23	123	82.6
<b>Caries prevalence at 11-12 years old (n=100)</b>		
Mean DMFT = 1.28	51	51.0
<b>Others (n=509)</b>		
Abscess	2	0.4

### *Descriptive statistics*

Categorical variables in personal characteristics (gender, educational level, school of enrollment, nutritional status and underlying diseases), Oral hygiene level (categorized by OHI-S score), caries status (categorized by dmft and DMFT scores) and gingivitis were presented in frequency and percentage of prevalence. The dmft and DMFT scores were presented as mean, used to measure the average number of tooth decay, missing due to caries, or filling tooth per child. Age was categorized by dental age into primary dentition (6-7 years old), mixed dentition (8-11 years old) and permanent dentition ( $\geq 12$  years old).

### *Inferential statistics*

The association between studied independent variables (personal characteristics) and dependent variables (caries status) were tested by using binary logistic regression (univariate analysis), each

independent variable was assessed separately in relation to each type of prevalence. After univariate analysis, the multiple logistic regression was used for controlling each independent variable and identifying significantly independent risk factors of dental health problem. All significant variables and non-significant variables with  $p < 0.1$  were put in the multivariate model analysis. Additionally, non-significant variables that were significant from the review literature (oral hygiene) were also put them into the model analysis.

### **Ethical consideration**

Ethical approval was sought and obtained from the Chulalongkorn University Ethics Review Committee for Research Involving Human Subjects, Health Science Group, COA No.093/2016 Date of Approval 11 May 2016. All data were obtained along with anonymous measures to ensure that their

**Table 2** Factors related to dmft of grade1 children (n= 149)

Characteristics	dmft		OR (95%CI)	Adjusted OR (95%CI)	p-value
	Low-Mod.	High			
<b>Personal characteristics</b>					
<i>Gender</i>					
Female	30	48	1.8(0.9,3.5)	1.8(0.9,3.7)	0.088
Male	37	34			
<i>School of enrolment</i>					
Wat Devarajkunchorn	13	11	0.9(0.4,2.1)	0.7(0.2,1.8)	0.397
Wat Sawaswaree Srimaram	6	12	1.6(0.6,4.5)	2.3 (0.7,7.3)	0.169
Wat Samananam Borihan	4	16	4.1(1.3,13.2)	2.7 (0.8,9.3)	0.110
Pratumnak Suan Kularb	44	43			0.125
<b>Nutritional status</b>					
<i>Weight for height</i>					
Not normal	9	8	1.2(0.33,4.36)	ND	ND
Normal	58	74			
<i>Weight for age</i>					
Not normal	15	13	0.7(0.16,3.05)	ND	ND
Normal	52	69			
<b>Underlying diseases</b>					
Yes	10	7	0.6(0.20,1.53)	ND	ND
No	57	75			
<b>Oral hygiene</b>					
Poor	1	7	7.6(0.81,72.41)	12.0(1.1,131.3)	0.041*
Fair	54	64	1.25(0.51,3.06)	1.8 (0.7,5.2)	0.254
Good	12	11			0.117

\*Significance at  $\alpha = 0.05$

Remarks: ND = Not done with multiple logistic analysis

data were safeguarded and not utilized for any purpose outside the purpose of this study.

## RESULTS

### Socio-demographic characteristics, nutritional and oral health situation

This study included 509 children from 4 primary schools, which comprised of 238(46.8%) boys and 271(53.2%) girls. Age of children ranged from 6 to 14 years old, classified by dental ages that 6-7 years old was primary dentition (36.0%), 8-11 years old was mixed dentition (54.6%) and over 12 years old was permanent dentition (9.4%). The majority 248(54.6%) were in the mixed dentition group. The education level ranged from grade 1 to 6, Educational level were separated into 2 groups, early primary school (Grade 1-4) (77.6%) and late primary school (Grade 5-6) (22.4%).

The nutritional status of the children was classified using growth chart of Thai children according to the Thai Ministry of Public Health (MoPH) [30]. Results showed that most children were normal nutritional status. According to weight for height and weight for age graphs, almost 75% were normal, and 18% were overweight or obese.

The recorded health conditions of the children are shown in Table 1, most of them had no underlying diseases. Only 13.0% presented underlying diseases such as asthma, allergy, impaired hearing and heart disease.

Although only 10.8% of children had poor oral hygiene, gingivitis had affected main group of children (76.8%). The dmft index for grade 1 children indicated that caries in primary dentition was very high. More than half of children were high caries status. The prevalence of caries in primary teeth of grade 1 children was 82.6%, only 17.4% of children were caries free. On the contrary, children in grade 2-6, high level of caries in permanent teeth was only 2.5% (Table 1).

### Factors associated with oral health problems

To find factors associated with dmft, we used binary logistic regression. The dmft index was used in primary tooth which was only relevant for grade 1 children, age 6-7 years old. Factors related to dmft are shown in Table 2. School of enrollment related with dmft level (95% CI of OR > 1). Height for age could not calculated due to cell zero number.

A binary logistic regression was done to measure the relationship between the level of dmft

**Table 3** Factors related to DMFT of grade 2 to 6 children (n= 360); multiple logistic regression

Characteristics	DMFT		OR (95%CI)	Adjusted OR (95%CI)	p-value
	Low	Mod.-High			
<b>Age (years)</b>					
12-14	30	18	4.8(1.5,15.8)	1.9(0.5,7.5)	0.388
8-11	232	44	1.5(0.5,4.5)	1.1(0.3,3.4)	0.918
6-7	32	4			0.408
<b>Gender</b>					
Female	148	45	2.1(1.2,3.7)	2.3(1.3,4.3)	0.008*
Male	146	21			
<b>Educational level</b>					
Grade 5-6	80	34	2.8(1.7,4.9)	2.1(1.1,4.1)	0.039*
Grade 1-4	214	32			
<b>School of enrolment</b>					
Wat Devarajkunchorn	44	9	1.2(0.5,2.9)	-	-
Wat Sawaswaree Srimaram	77	13	0.9(0.4,2.2)		
Wat Samananam Borihan	100	31	1.7(0.9,3.6)		
Pratumnak Suan Kularb	73	13			
<b>Nutritional status</b>					
<i>Weight for height</i>					
Wasting or quite wasting	24	9	1.8(0.8,4.2)	-	-
Normal or overweight or obesity	270	57			
<i>Weight for age</i>					
Underweight or quite underweight	25	5	0.9(0.3,2.4)	-	-
Normal or overweight or obesity	269	61			
<i>Height for age</i>					
Stunted or quite stunted	18	4	1.0(0.3,3.0)	-	-
Normal or quite tall or tall	276	62			
<b>Underlying disease</b>					
Yes	30	19	3.6(1.9,6.8)	4.1(2.0,8.3)	<0.001*
No	264	47			
<b>Oral hygiene</b>					
Poor	32	15	1.6(0.7,4.7)	2.2(0.7,6.4)	0.164
Fair	232	43	0.7(0.3,1.6)	0.9(0.4,2.1)	0.729
Good	30	8			0.058

\*Significance at  $\alpha = 0.05$

and studied factors. The results showed that only school of enrollment related with dmft level. After multiple logistic regression, results revealed that only poor oral hygiene affected on dmft level with adjusted OR = 12.0 (95% CI = 1.1, 131.3). Children with poor oral hygiene have chance to get high dmft 12.0 times higher than children with good oral hygiene, Table 2.

For studied factors related to dental caries in permanent dentition by univariate analysis, results showed that age, gender and educational level and underlying diseases were significantly associated with DMFT (95% CI of OR > 1.0), Table 3.

After that, we put significant factors from bivariate analysis and significant factors from literature reviews into multiple logistic regression model. Results showed that age and oral hygiene

lost significant association. Gender, educational level and underlying diseases were still significantly associated with DMFT level with adjusted OR = 2.3 (95% CI of OR = 1.2,4.3), adjusted OR = 2.1 (95% CI of OR = 1.1,4.1), and adjusted OR = 4.1 (95% CI of OR = 2.0,8.3), respectively. Details are presented in Table 3.

For gingivitis, factors significantly associated with gingivitis in univariate analysis included age, education level, school of enrolment and oral hygiene with 95% CI of OR > 1.0, Table 4. After multiple logistic regression analysis, results revealed that only school of enrolment and oral hygiene were significantly related to gingivitis, adjusted OR = 2.9 and 3.6 (95% CI of OR = 1.3, 6.7 and 1.7,7.4), adjusted OR = 4.4 and 19.1 (95% CI of OR = 2.4,8.1 and 5.1,71.2), respectively. Details are shown in Table 4.

**Table 4** Factors related to gingivitis problem of the children (n= 509)

Characteristics	Gingivitis		OR (95%CI)	Adjusted OR (95%CI)	p-value
	Yes	No			
<b>Personal characteristics</b>					
<i>Age (years)</i>					
12-14	5	43	3.1(1.1,8.2)	1.2(0.3,4.7)	0.761
8-11	65	213	1.2(0.8,1.8)	0.9(0.5,1.5)	0.666
6-7	48	135			0.800
<i>Gender</i>					
Female	206	65	0.9(0.6,1.4)	-	-
Male	185	53			
<i>Educational level</i>					
Grade 1-4	102	12	3.1(1.7,5.9)	2.2(0.9,5.1)	0.068
Grade 5-6	289	106			
<i>School of enrolment</i>					
Wat Devarajkunchorn	69	8	4.1(1.9,9.2)	3.6(1.7,7.4)	0.013*
Wat Sawaswaree Srimaram	94	14	3.2(1.7,6.1)	1.2(0.7,2.1)	0.001*
Wat Samananam Borihan	111	40	1.3(0.8,2.2)	2.9(1.3,6.7)	0.596
Pratumnak Suan Kularb	117	56			0.001*
<b>Nutritional status</b>					
<i>Weight for height</i>					
Wasting or quite wasting	25	5	2.4(0.9,6.3)	-	-
Normal or overweight or obesity	366	113			
<i>Weight for age</i>					
Underweight or quite underweight	33	5	2.1(0.8,5.5)	-	-
Normal or overweight or obesity	358	113			
<b>Underlying disease</b>					
Yes	57	9	2.1(0.9,4.3)	2.1(0.9,4.5)	0.069
No	334	109			
<b>Oral hygiene</b>					
Poor	52	3	16.8(4.7,59.6)	19.1(5.1,71.2)	<0.001*
Fair	308	85	3.5(2.0,6.1)	4.4(2.4,8.1)	<0.001*
Good	31	30			<0.001*

\*Significance at  $\alpha = 0.05$

## DISCUSSION

The oral health status of study children 6-7 years old and 11-12 years old were 17.4% and 49.0% caries free, with mean dmft 6.23 and mean DMFT 1.28, respectively consistent with 7<sup>th</sup> National Oral Health Survey in 2012 [5] found that only 21.5% of 5-6 years old children and 47.7% of 12 years old children were caries free.[5, 6], with mean dmft 4.4 and mean DMFT 1.3 respectively.[5] The prevalence of gingivitis in this study is 76.8% whereas National Oral Health Survey in 2012 found 50.3% in 12 year old children have gingivitis [31].

This study found factors related to dmft is poor oral hygiene. While, gender, educational level and underlying disease are significantly associated with DMFT. It is obviously that poor oral hygiene can lead to tooth decay [32, 33]. Oral hygiene are significantly associated with dmft can be explain with etiology of caries poor oral hygiene have more dental plaque and bacteria that cause caries [34]. In

this study we use OHI-S index to represent of dental plaque which contain cariogenic bacteria, etiology of dental caries. The Luljeta Ferizi Shabani et al., [20] found that there is a strong correlation between DMFT and OHI-S index in children 10-15 years old. However, we did not find relationship between oral hygiene and caries in mixed dentition (DMFT level).

The nutritional status of the study children were corresponding with studies of obesity prevalence in children aged 6–12 years from a National Health Examination Survey using weight-for-height criteria which revealed that overweight and obese children increased nationally from 5.8% in 1997 to 6.7% in 2001 and then became substantially higher at 8.7% in 2010, with the highest regional prevalence (14.8%) in Bangkok[35]. Furthermore, underweight and stunting still be problems in this group of children, lower in urban than rural, with 11.0% and 4.3% respectively [36].

For nutritional status aspect, our study did not

find any association between nutritional status and dental caries in both primary and mixed dentition. However, there are some studies mention about dental caries and growth in school age children. Alkarimi [24] studied about height and weight in 6 to 8 years old Saudi children with high caries prevalence, found association between untreated caries and poorer growth, children with higher level of caries had significantly lower height and weight outcome. Stunted children have high dmft score and most of score come from decay not filling. On the other hand, Abolfotouh in 2000 [23] study found stunted growth children with lower caries in permanent teeth (DMFT) they gave hypothesis that chronic malnutrition effect on delay tooth eruption, the teeth that emerged at a later time are less exposed to oral cavity environment. Furthermore, some studies did not find any association between height and dental caries they found only weight have related to caries [25, 26].

Gender has influence with dental caries in permanent teeth, some studies found the same association [10]. According to ur Rehman in 2008 [19], the prevalence of caries is significantly higher in female students as compared to their male counterparts. Same with Babu in 2011 [37], found that Dental caries prevalence was higher in female children even with good oral hygiene. The study in dental caries rates among the Guanches (Tenerife, Canary Islands) found higher caries prevalence among females than male. It can explained by earlier eruption of teeth in girls, hence longer exposure of girls' teeth to the cariogenic oral environment and behavior of girls frequent take snack and sugary diet [22].

Age and educational level are related with caries in permanent teeth due to the exposure time in oral environment. Underlying disease was significant association with DMFT but not dmft due to the characteristic of the sample. Most of grade 1 children' underlying disease is hearing impairment which is not a systemic disease and perhaps not related to caries. According to Vichayanrat, et al., 2014 [38]. Hearing impairment did not appear to affect the prevalence of dental caries compared to those with normal hearing

Factor associated with gingivitis are school of enrolment and oral hygiene. The relationship between Gingivitis and oral hygiene had been found in many study. A high sucrose intake is associated with increased plaque volume due to the production of extracellular glucans, and there is a strong

association between plaque volume and gingivitis [39]. Improving in oral hygiene can effectively reduce clinical signs of gingivitis and caries. It was also observed that while oral hygiene instruction and practice in proper tooth cleaning techniques reduced plaque and gingivitis in children [17]. Baelum [18] do the cross-sectional findings on dental plaque, calculus, gingivitis, loss of attachment, periodontal pockets and tooth loss in a population of adult Tanzanians

Though, the main overriding factor in the etiology of periodontal disease is the presence of plaque, and prevention measures focus on oral hygiene. There is some evidence to suggest that periodontal disease progresses more rapidly in undernourished populations and the important role of nutrition in maintaining an adequate host immune response may explain this observation [21]. Overgrowth of bacteria that cause periodontal disease and yeasts has been observed in malnourished African children [40]. Nevertheless, our study did not find any association between nutritional status and gingivitis.

Factors associated with gingivitis were school of enrolment and oral hygiene level. The public primary schools in this study belong to Bangkok metropolitan administration (BMA) and Thai Ministry of Education (MOE). All schools are located in urban areas. Wat Devarajkunchorn School, Wat Sawaswaree Srimaram School and Wat Samananam Borihan School belong to BMA but Pratumnak Suan Kularb School belongs to MOE. Therefore, there are some differences in school programs and socio-demographic characteristics of children. For school aspect, teachers of each school seemed to be an important factor that affected oral health of children. School with well motivating practice for oral health care could have better result in OHI level and less number of children who have gingivitis [15].

## CONCLUSION

The results of this study demonstrated oral health problems of 4 primary school children in Bangkok. High prevalence of gingivitis were reported of 76.8% and caries in primary teeth of grade 1 children were 82.6%. These still be the oral health problem in this target group. School and oral hygiene significantly related to gingivitis with OR= 3.55 (95% CI = 1.71, 7.37) and OR = 19.05 (95% CI = 5.12, 71.24). For caries in deciduous teeth, only poor oral hygiene effecting on dmft level with

OR=12.04; 95% CI =1.11, 131.28. While, gender, educational level and underlying diseases have significant association with DMFT level, OR=2.32 (95% CI=1.25, 4.32), OR= 2.05 (95% CI=1.04, 4.06) and OR= 4.09 (95% CI=2.01, 8.32), respectively.

### LIMITATION

The first limitation of this study is quality of secondary data which may be not accurate due to the reliability and validity of oral examination. Therefore, we cannot detect initial proximal caries. For data record of dental caries we record dentine caries which can be detected by simple oral examination. In general dentists identify caries by oral examination and take radiographic images only in high risk patients.

Secondly, we do not study some other known variables which might be associated with dental caries, such as salivary *Streptococcus mutans*, saliva pH or salivary flow, food and drink behaviors and social status. These cannot be studied because they are not available in the primary data base.

### RECOMMENDATION

The benefit extends for future researchers in identifying the factors associated with oral health problems among primary school children and proposes further investigation using prospective cohort studies.

This research did not study about socioeconomic status, oral health behavior and frequency of sugary diet consumption of the children which may associated with oral health problems. The use of caries index in this study are dmft for primary dentition and DMFT for mixed dentition which are caries experience may not show the exact number of decay teeth because this index include missing and filling teeth. Using WHO criteria to classify oral hygiene of children make the number of some group of children too less to analyze with statistic method. Next study can use percentile of study population to classify level of oral hygiene of children.

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