



# Developmental and Behavioral Risks in Children Raised at Home, Compared with Children Who Attend Child Care Centers

Leelarapin Chongwatanasawat MD<sup>1</sup>

Chanyut Suphakunpinyo MD<sup>2\*</sup>

<sup>1</sup> Department of Pediatrics, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok, Thailand

<sup>2</sup> Department of Pediatrics, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

\* Corresponding author, e-mail address : chasup@kku.ac.th

Vajira Med J. 2021; 65(6) : 441-54

<http://dx.doi.org/10.14456/vmj.2021.42>

## Abstract

**Background:** Parenting and participation in interactive activities are both influence on child development. Thai children usually live as extended families, or attend in various standard of child care centers. So, the children who raised at home and those who attend child care centers are also learned the different practices, and we cannot imply where is better for the children.

**Objectives:** To compare the prevalence of developmental and behavioral risks in children raised at home and those who attend child care centers. Additionally, to find out the associated factors to these problems.

**Methods:** The caregivers of children aged 1 to 5 years old from Pediatric Outpatient Department Srinagarind Hospital Faculty of Medicine Khon Kaen University, the Demonstration Daycare Centers, and the child care centers under the Subdistrict Administration Organization participated. Data has included the parent questionnaires and evaluated with the Thai version of Parents' Evaluation of Developmental Status (PEDS). The data were analyzed to compare descriptive statistics and multivariable logistic regression was used to explore the associated factors on developmental and behavioral problems.

**Results:** The fifteen percent of all the participants reported positive of the developmental and behavioral concerns by the PEDS questionnaires, 55% of these were raised at home and 45% were child care center attendance ( $P = 0.254$ ). The child's gender was the only associated factors of child developmental and behavioral risks. However, child center attendance was not found as the significant factor to developmental and behavioral risks.

**Conclusion:** The prevalence of developmental and behavioral risks in the children raised at home and those who attended child care centers did not differ, neither both kind of child care centers. Thus, the developmental and behavioral risks were not mainly relied on the place children raised.

**Keywords:** developmental and behavioral risks, parenting, child care center



# การศึกษาเปรียบเทียบความเสี่ยงต่อปัญหาพัฒนาการและพฤติกรรมเด็กเล็ก (ก่อนวัยเรียน) ระหว่างเด็กที่ได้รับการเลี้ยงดูที่บ้านและเด็กที่เข้าศูนย์พัฒนาเด็กเล็ก

ลีลารพิน จงวัฒนสวัสดิ์ พ.บ., ว.ว. (กุมารเวชศาสตร์) ว.ว. (กุมารเวชศาสตร์พัฒนาการและพฤติกรรม)<sup>1</sup>  
 ชาญยุทธ์ ศุภคุณภิญโญ พ.บ., ว.ว.(กุมารเวชศาสตร์) อ.ว. (กุมารเวชศาสตร์พัฒนาการและพฤติกรรม)  
 อ.ว. (เวชศาสตร์ครอบครัว)<sup>2\*</sup>

<sup>1</sup> ภาควิชากุมารเวชศาสตร์ คณะแพทยศาสตร์วชิรพยาบาล มหาวิทยาลัยนวมินทราธิราช กรุงเทพมหานคร ประเทศไทย

<sup>2</sup> ภาควิชากุมารเวชศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น ขอนแก่น ประเทศไทย

\* ผู้ติดต่อ, อีเมล: chasup@kku.ac.th

Vajira Med J. 2021; 65(6) : 441-54

<http://dx.doi.org/10.14456/vmj.2021.42>

## บทคัดย่อ

**บทนำ:** รูปแบบการเลี้ยงดูและกิจกรรมส่งเสริมปฏิสัมพันธ์กับเด็กมีอิทธิพลต่อพัฒนาการเด็ก เด็กไทยส่วนมากอาศัยในครอบครัวขยายหรือเข้าศูนย์พัฒนาเด็กเล็กที่ยังมีความหลากหลายในมาตรฐาน ดังนั้นเด็กที่ได้รับการเลี้ยงดูที่บ้านและที่เข้าศูนย์พัฒนาเด็กเล็กอาจได้รับการฝึกฝนเรียนรู้แตกต่างกัน ซึ่งยังไม่สามารถสรุปได้ว่าเด็กที่ได้รับการเลี้ยงดูในสถานที่ไหนมีความเสี่ยงในการพบปัญหาพัฒนาการและพฤติกรรมมากกว่า

**วัตถุประสงค์:** เพื่อเปรียบเทียบความเสี่ยงต่อปัญหาพัฒนาการและพฤติกรรมเด็กระหว่างเด็กที่ได้รับการเลี้ยงดูที่บ้านกับเด็กที่เข้าศูนย์พัฒนาเด็กเล็ก และหาปัจจัยเกี่ยวกับผู้เลี้ยงดูเด็กและการเลี้ยงดูที่มีผลต่อปัญหาพัฒนาการและพฤติกรรมเด็ก

**วิธีการศึกษา:** เก็บแบบสอบถามเกี่ยวกับการเลี้ยงดูเด็กและแบบสอบถามประเมินความเสี่ยงต่อปัญหาพัฒนาการและพฤติกรรม Parents Evaluation Developmental Status (PEDS) จากผู้ปกครองของเด็กอายุ 1 ถึง 5 ปี ที่มารับบริการที่แผนกผู้ป่วยนอกกุมารเวชกรรม โรงพยาบาลศรีนครินทร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น ศูนย์พัฒนาเด็กเล็กคณะพยาบาลศาสตร์ มหาวิทยาลัยขอนแก่น และศูนย์พัฒนาเด็กเล็กในสังกัดเทศบาลหรือองค์การบริหารส่วนตำบล วิเคราะห์โดยใช้สถิติเชิงพรรณนาและการวิเคราะห์การถดถอยโลจิสติก (multivariable logistic regression) ในการหาปัจจัยที่เกี่ยวข้องกับปัญหาพัฒนาการและพฤติกรรม

**ผลการศึกษา:** ร้อยละ 15 ของอาสาสมัครพบความเสี่ยงต่อปัญหาพัฒนาการและพฤติกรรมจากแบบสอบถาม PEDS โดยอยู่กลุ่มที่ได้รับการเลี้ยงดูที่บ้านร้อยละ 55 และเป็นกลุ่มที่เข้าศูนย์พัฒนาเด็กเล็กร้อยละ 45 ( $P = 0.254$ ) จากการวิเคราะห์ข้อมูลทางสถิติ พบว่าปัจจัยที่มีผลต่อความเสี่ยงปัญหาพัฒนาการและพฤติกรรม คือ เพศของเด็ก โดยเพศหญิงมีผลลดความเสี่ยงของปัญหาพัฒนาการและพฤติกรรม ส่วนการเข้าศูนย์พัฒนาเด็กเล็กหรือไม่นั้นไม่พบว่าเป็นปัจจัยที่ส่งผลต่อความเสี่ยงของปัญหาพัฒนาการและพฤติกรรมเด็กอย่างมีนัยสำคัญทางสถิติ

**สรุป:** ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติระหว่างความชุกของความเสี่ยงต่อปัญหาพัฒนาการและพฤติกรรมในเด็กที่ได้รับการเลี้ยงดูที่บ้านและเด็กที่เข้าศูนย์พัฒนาเด็กเล็กทั้งสองประเภท แสดงว่าปัจจัยสำคัญที่มีผลต่อความเสี่ยงปัญหาพัฒนาการและพฤติกรรมในเด็กเล็กไม่ได้ขึ้นกับสถานที่เลี้ยงดูเด็กเป็นหลัก

**คำสำคัญ:** ปัญหาพัฒนาการและพฤติกรรม, การเลี้ยงดู, ศูนย์พัฒนาเด็กเล็ก

## Introduction

Child development is related to various factors, some of the factors can be promoted to thinking processes, such as play activities, problem-solving, positive discipline, and book reading<sup>1</sup>. On the other hand, social-emotional development can be improved through proper child-responsiveness, increase attachment and caregiver positive emotionality toward the child. Lack of these opportunities will affect their capacity for development<sup>2-3</sup>.

Prior literature has revealed that less frequency of parent-child interactive activities such as book reading, storytelling, singing, and outdoor activities predicted the risk of developmental delay<sup>4-6</sup>.

In most of Thailand's rural area, people live in extended families. Children are raised by caregivers who can differ in style; strict and spoil, which can confuse the children. Some parents have to leave their children with their elderly grandparents to work. Some are sent to childcare centers which vary in standards, based on adult-to-child ratios, and staff who have a good understanding of child development as suggested by the American Academy of Pediatrics and American Public Health Association<sup>7</sup>.

## Objectives

To compare the prevalence of developmental and behavioral risks between children raised at home and who attended child care centers, and also to determine the associated factors to child developmental and behavioral risks.

## Methods

### Subjects

We enrolled the caregivers of children 1 to 5 years of age, who raised at home, or those who attended any of childcare centers under the Subdistrict Administrative Organization, at the Pediatric Outpatient Department and Well Child Clinic, Srinagarind Hospital, Faculty of Medicine Khon Kaen University. Additionally, the caregivers of

children 1 to 5 years of age at the faculty affiliated childcare center at Khon Kaen University were also enrolled to the childcare group. Children with chronic illness such as neurodevelopmental disorders, epilepsy, congenital cyanotic heart diseases, endocrinopathies and malignancies were excluded. However, children with allergic rhinitis, asthma and obesity were still in this project. The parents or caregivers were informed consent by the hospital's health care providers and child care centers' staffs during May through September 2016 about this project and the caregivers who have completely answered our questionnaires were enrolled to this project. Ethical approval was obtained from the Khon Kaen University's Human Research Committee (HE591143).

Despite varying standards between the childcare centers, data was collected equally in number in both categories of childcare centers. First, the faculty affiliated childcare center at Khon Kaen University, in which 5-15 children per 1 staff person. Second, the childcare centers under Subdistrict Administrative Organization which adult-to-child ratios is 20 children to 1 staff person.

## Measurements

A questionnaire about the child and caregiver's information, parent-child interaction/activities, which was developed by our team. The interactions consist of reading, responsive reaction to child's attention, and playing. The frequency of each interaction was score in 3 categories; 0- less than once per week; 1- one to three days per week; 2 – four more days per week. Then all interactions were altogether scored.

The Parents Evaluation Developmental Status (PEDS)<sup>8</sup>, a questionnaire which evaluates child developmental and behavioral concerns, consists of 10 questions. The PEDS questionnaire is easy to use and can be completed within few minutes<sup>9-11</sup>, it has 74% to 79% sensitivity to a range of developmental problems and 70% to 80% specificity in correctly detecting normal development<sup>12</sup>. A study in Thailand revealed that the PEDS questionnaire had a 57.14%

sensitivity and 97.6% specificity<sup>13</sup>. Results are categorized into 5 groups; A- high risk, with the presence of 2 or more significant concerns; B- moderate risk, with the presence of 1 significant concern; C- low risk, presence only of non-significant concerns; D- respondent was unable to communicate; E- absence of all concerns. In this study, we use the Thai version of PEDS questionnaire, and we determined categories A and B as positive for developmental and behavioral problems.

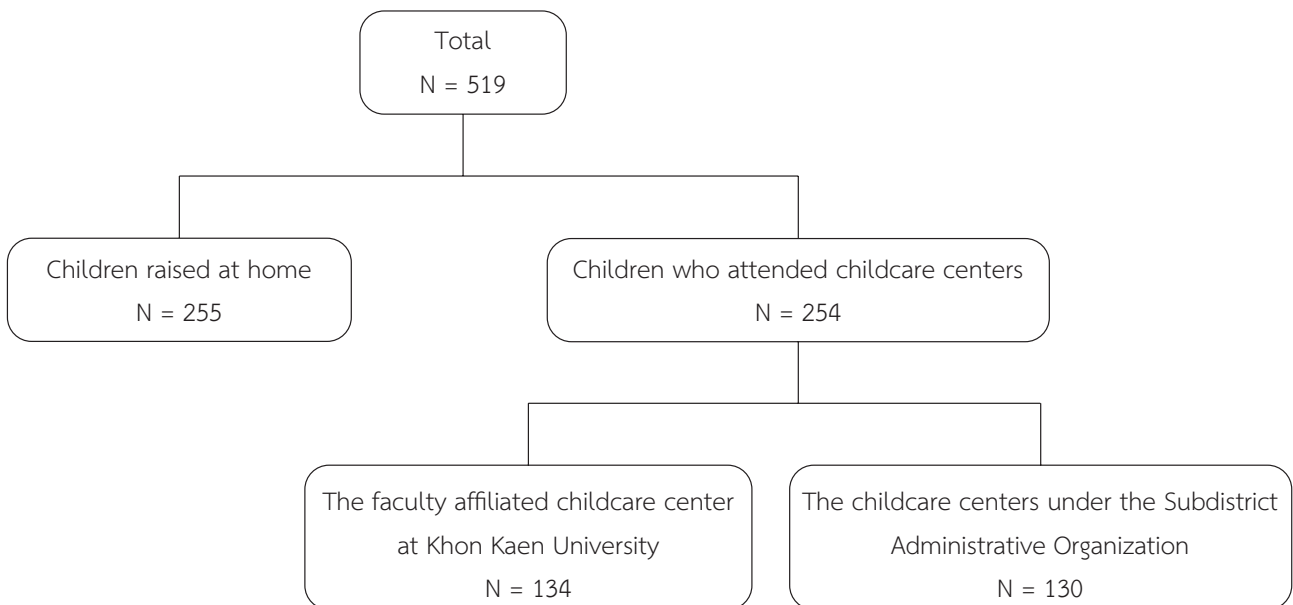
**Statistical Analysis**

The collected data were analyzed by Stata version 12.0 statistical program, and is presented as the prevalence of developmental and behavioral problems among children raised at home and of those who attended childcare centers, and also between the subgroups of different child care centers. To compare differences between groups, Chi-square tests was used for categorical variables. Due to the non-normal distribution of the caregiver and parents’ age, quantile regression using the 50th percentile (median) were used to investigate associations between demographic variables.

Nominal logistic regressions were used to determine associated factors to the problems.

**Results**

There were 519 participating children, 255 participants were raised at home and the others were attending childcare centers, among these 134 attended the faculty affiliated childcare center, and 130 attended childcare centers under the Subdistrict Administration Organization as shown in Figure1. There was an equal proportion of boys and girls (boy, n = 263, 50.6%) but the age groups were different between the home-raised and childcare center attendees; 72.16% of children raised at home were 1-2 years of age, and 46.97% of children who attended childcare centers were 3-4 years of age. The majority of the primary caregivers were parents (n = 336, 64.74%) and grandparents (n = 165, 31.79%), there were fewer prevalence of grandparents in the childcare group. Of these, less than half earned a college degree (n = 232, 45.22%); about one-third of the caregivers of children who were raised at home and about one-half in of those who attend childcare centers (Table 1).



**Figure 1:** The participations enrolled in this study

Table 1:

Demographic data of children raised at home and children who attended childcare centers

Characteristics	Children who were raised at home		Children who attended childcare centers		p-value*
	N	Percent	N	Percent	
Child's Age (months)					<0.001
12-24	184	72.16	13	4.92	
25-36	57	21.35	102	38.64	
37-48	13	5.10	124	46.97	
49-60	1	0.39	25	9.47	
Gender					0.025
Boys	142	55.69	121	45.83	
Girls	113	44.31	143	54.17	
Caregivers					0.012
Parents	149	58.43	187	70.83	
Grandparents	94	36.86	71	26.89	
Relatives	8	3.14	2	0.76	
Babysitters	4	1.57	4	1.52	
Caregiver age (years; median)	37		36		0.57
Caregiver education					0.010
Elementary school	79	31.35	61	23.37	
High school	76	30.16	65	24.9	
College degree	97	38.49	135	51.72	
Maternal age (years; median)	31		33		<0.001
Maternal education					0.140
Elementary school	18	7.09	12	4.6	
High school	89	35.04	77	29.5	
College degree	147	57.87	172	65.9	
Paternal age (years; median)	33		36		<0.001
Paternal education					0.058
Elementary school	25	10.33	15	6.05	
High school	108	44.63	98	39.52	
College degree	109	45.04	135	54.44	

**Table 1:**

Demographic data of children raised at home and children who attended childcare centers (Continued)

Characteristics	Children who were raised at home		Children who attended childcare centers		p-value*
	N	Percent	N	Percent	
Family income (Baht/month)					<0.001
< 10000	21	8.47	29	11.2	
10000-20000	86	34.68	45	17.37	
20001-30000	55	22.18	44	16.99	
30001-40000	31	12.5	34	13.13	
40001-50000	25	10.08	37	14.29	
> 50000	30	12.1	70	27.03	
Child temperament					0.087
Easy	165	66.27	145	55.34	
Slow-warm up	22	8.84	30	11.45	
Difficult	10	4.02	12	4.58	
Mix	52	20.88	75	28.63	
Television watching (hrs/day)					0.057
< 2	200	80.32	191	73.18	
≥ 2	49	19.68	70	26.82	
Other electronic media use (hrs/day)					0.004
< 2	209	85.66	197	75.48	
≥ 2	35	14.34	64	24.52	
Reading					<0.001
Sometimes (< 4 days/week)	210	85.37	167	63.98	
Often (4-7 days/week)	36	14.63	94	36.02	
Caregiver-child interaction score (0-12)					<0.001
Never (score 0)	25	10.29	10	3.81	
Rarely (score 1-4)	53	21.81	51	19.54	
Sometimes (score 5-8)	135	55.56	126	48.28	
Often (score 9-12)	30	12.35	74	28.35	

\* Chi-square test

It was found that both television watching time and other electronic media use were 2 hours or less per day in half of all the children, but, most of the children who watched television and used electronic media were 1 to 2 years of age (37% equally). Almost one-third of caregivers read to their children less than once a week. Caregivers of children who attended the faculty affiliated childcare center reported more participation in reading together (43.94%,  $p = 0.007$ )

and less frequent TV viewing (80.3%) than who attended childcare centers under the Subdistrict Administration Organization, but the use of electronic media between the two groups were not different as shown in Table 2. In addition, the interaction scores, which include reading, responsive reaction to children, and playing, were lower in the children who stayed at home when compared to the children who go to childcare centers.

**Table 2:**

Demographic data of children who attended childcare centers under the Subdistrict Administration Organization and the faculty affiliated childcare center

Characteristics	Children who attended the childcare centers under the Subdistrict Administration Organization		Children who attended the faculty affiliated childcare center		p-value*
	N	Percent	N	Percent	
Child's Age (months)					< 0.001
12-24	4	3.08	9	6.72	
25-36	55	42.31	47	35.07	
37-48	48	36.92	76	56.72	
49-60	23	17.69	2	1.49	
Gender					0.067
Boys	67	51.54	54	40.3	
Girls	63	48.46	80	59.7	
Caregivers					< 0.001
Parents	80	61.54	123	91.79	
Grandparents	47	36.15	8	5.97	
Relatives	2	1.54	0	0	
Babysitters	1	0.77	3	2.24	
Caregiver education					< 0.001
Elementary school	48	37.5	13	9.77	
High school	53	41.41	12	9.02	
College degree	27	21.09	108	81.2	

**Table 2:**

Demographic data of children who attended childcare centers under the Subdistrict Administration Organization and the faculty affiliated childcare center (Continued)

Characteristics	Children who attended the childcare centers under the Subdistrict Administration Organization		Children who attended the faculty affiliated childcare center		p-value*
	N	Percent	N	Percent	
Maternal education					< 0.001
Elementary school	11	8.66	1	0.75	
High school	71	55.91	6	4.48	
College degree	45	35.43	127	94.78	
Paternal education					< 0.001
Elementary school	12	9.92	3	2.36	
High school	77	63.64	21	16.54	
College degree	32	26.45	103	81.1	
Family income (Baht/month)					<0.001
< 10000	29	22.83	0	0	
10000-20000	36	28.35	9	6.82	
20001-30000	29	22.83	15	11.36	
30001-40000	19	14.96	15	11.36	
40001-50000	12	9.45	25	18.94	
> 50000	2	1.57	68	51.52	
Television watching (hrs/day)					0.009
< 2	85	65.89	106	80.3	
≥ 2	44	34.11	26	19.7	
Other electronic media use (hrs/day)					0.916
< 2	97	75.19	100	75.76	
≥ 2	32	24.81	32	24.24	
Reading					0.007
Sometimes	93	72.09	74	56.06	
Often	36	27.91	58	43.94	

\* Chi-square test



The Parents' Evaluation Developmental Status (PEDS) were interpreted positive for developmental and behavioral concerns in about 15.4% of all participants, 55% of these were raised at home ( $P = 0.254$ ).

The Parents' Evaluation Developmental Status (PEDS) reported greater concerns about developmental and behavioral problems among boys than girls (62.5% vs 37.5%,  $p = 0.021$ ), and greater in the children raised at home than those who attended child care centers (55% vs 45%,  $p = 0.254$ ), most of these concerns were reported from the faculty affiliated childcare center (61.11% vs 38.89%,  $p = 0.211$ ). Most of the concerns were about behavioral problems (10.6%) such as waywardness, intemperance, bottle use and mobile phone use. The second most common problem was about developmental delay (9.06%), most were related to language skills. And, the third common concern was about the physical health of children (7.32%), such as poor weight gain, limited appetite and accident.

Multivariable analysis revealed that gender was the only factor associated with developmental and behavioral risks in this study; boys were at greater risk about two times. Age of children, caregiver' factor and parents' factors; age, education, were not associated with the children's developmental and behavioral risks. Also, television and other electronic media use were not significant differed between both children with or without developmental and behavioral risks. However, childcare center attendance was not shown as a significant factor in this study (Table 3).

## Discussion

Our results revealed that the prevalence of developmental and behavioral risks did not differ between children who were raised at home and those who attended child care centers, which is inconsistent with previous studies from The National Institute of Child Health and Human Development

(NICHD)<sup>14</sup> and Loeb et al<sup>15</sup> that children with longer childcare center attendance were related to better cognitive, language, mathematical skills, and also more externalized behavioral problems. This may be explained by the significant difference between children's age group between both groups, most of the children raised at home were 1 to 2 years of age, in which their caregivers might not detect or even be concerned about the child's development, especially when there were no other children to compare with.

There were also differences of developmental and behavioral risks between the groups of childcare centers, which were not statistically significant. Thus, the important factor that affected to developmental and behavioral risks was not related to where the child was raised. This might be explained by the fact that even though the children attended childcare centers, they still lived and spent most of their time with their parents or caregivers. From our study the caregiver-child interaction was found to be a more important factor to the child development than where the child has been raised. As suggested in prior literature, the more quality of interactions between mother and child, the better cognitive, language and social outcomes. Family and parent characteristics were more important predictors of child development than childcare quality<sup>14,16-17</sup>. However, the age of children in our population samples were not equally distributed among both categories, the difference of nationality, and evaluation of developmental and behavioral concerns in this study were by parental/caregiver reports which represent the risk of those problems without evaluation of the children. In addition, we found that book reading among lowest-income families was lesser than the highest groups (6.98% vs 39.53%). Reading encourages positive parent-child interaction, so a lack of reading also increases the risk of developmental delay<sup>5</sup>.

**Table 3:**

Univariable and multivariable analysis of developmental and behavioral risks

Characteristics	Negative PEDS		Positive PEDS		p-value*	Odds ratio	95% Confidence interval
	N	Percent	N	Percent			
Childcare attendance					0.254		
No	211	48.06	44	55		1.0	
Yes	228	51.94	36	45		0.52	0.22-1.24
Age (months)					0.028		
12-24	162	36.9	35	43.75		1.0	
25-36	145	33.03	14	17.5		0.86	0.36-2.04
37-48	109	24.83	28	35.0		4.24	1.53-11.77
49-60	23	5.24	3	3.75		2.37	0.46-12.14
Gender					0.021		
Boys	213	48.52	50	62.5		1.0	
Girls	226	51.48	30	37.5		0.45	0.25-0.81
Caregivers					0.821		
Parents	283	64.46	53	66.25		1.0	
Grandparents	141	32.12	24	30.0		2.23	0.73-6.83
Relatives	9	2.05	1	1.25		0.49	0.04-6.08
Babysitters	6	1.37	2	2.5		4.05	0.47-35.1
Caregiver age (years; Median)	36		35			-	-
Caregiver education					0.747		
Elementary school	118	27.19	22	27.85		1.0	
High school	122	28.11	19	24.05		1.16	0.41-3.31
College degree	194	44.7	38	48.1		0.56	0.15-2.08

**Table 3:**

Univariable and multivariable analysis of developmental and behavioral risks (Continued)

Characteristics	Negative PEDS		Positive PEDS		p-value*	Odds ratio	95% Confidence interval
	N	Percent	N	Percent			
Maternal age (years; median)	32		32			-	-
Maternal education					0.291		
Elementary school	24	5.52	6	7.5		1.0	
High school	146	33.56	20	25.0		0.96	0.18-5.08
College degree	265	60.92	54	67.5		2.96	0.46-19.23
Paternal age (years; median)	35		35			-	-
Paternal education					0.439		
Elementary school	32	7.17	8	10.67		1.0	
High school	179	43.13	27	36.00		0.67	0.19-2.35
College degree	204	49.16	40	53.33		0.99	0.26-3.87
Family income (Baht/month)					0.734		
< 10000	43	10.02	7	8.97		-	-
10000-20000	114	26.57	17	21.79			
20001-30000	81	18.88	18	23.08			
30001-40000	52	12.12	13	16.67			
40001-50000	52	12.12	10	12.82			
> 50000	87	20.28	13	16.67			

**Table 3:**

Univariable and multivariable analysis of developmental and behavioral risks (Continued)

Characteristics	Negative PEDS		Positive PEDS		p-value*	Odds ratio	95% Confidence interval
	N	Percent	N	Percent			
Child temperament					0.017		
Easy	256	59.26	54	68.35		1.0	
Slow-warm up	40	9.26	12	15.19		1.33	0.61-2.9
Difficult	18	4.17	4	5.06		0.59	0.15-2.39
Mix	118	27.31	9	11.39		0.36	0.16-0.8
Television watching (hrs/day)					0.458		
< 2	333	77.26	58	73.42		1.0	
≥ 2	98	22.74	21	26.58		1.13	0.58-2.23
Other electronic media use (hrs/day)					0.307		
< 2	340	79.63	66	84.62		1.0	
≥ 2	87	20.37	12	15.38		0.49	0.21-1.12
Caregiver-child interaction score (0-12)					0.039		
Never (score 0)	29	6.81	6	7.69		1.0	
Rarely (score 1-4)	79	18.54	25	32.05		1.12	0.35-3.65
Sometimes (score 5-8)	225	52.82	36	46.15		0.57	0.18-1.76
Often (score 9-12)	93	21.83	11	14.1		0.48	0.13-1.71

\*Multiple logistic regression analysis

The statistical analysis revealed an overall of 15.4% positive concerns of developmental and behavioral problems, which is slightly lower than the nationwide Thai child developmental screening (20%)<sup>18</sup>. Boys were reported nearly twice than girls as a predictor of developmental and behavioral risks (62.5% vs 37.5%), furthermore, this study was also found that caregiver-child interaction a predicting factor of developmental and behavioral risks. According to the study by Coghlan et al., child development was significantly lower than average if parenting behaviors were less of positive, and the significant concerns from the PEDS questionnaires were also reported twice in boys than girls (12.15 vs 6.5%)<sup>19</sup>.

The most common concerns reported from the PEDS questionnaires were about behavioral problems (10.6%) and expressive language (9.06%), which were lower than the study by Pornsamrit et al. which studied children 9 months of age in well child visits (37.78% and 22.2% respectively)<sup>6</sup>. The third common concern was about physical health similarly to Cox et al.<sup>20</sup>.

Interestingly, there were an amount of concerns that were inappropriate to the child's developmental level also some concerns were not related to the questions in the PEDS questionnaires. For example, they reported the concerns as about playing with electrical outlets and accidents instead of the concerns regarding the use of hand doing things. Additionally, the concerns of receptive language were reported as uncontrollable, consistent with the prior literature<sup>20-21</sup>. This represents that the caregivers did not have the proper knowledge and/ or understanding about age-appropriate child development, or else, they may have over-anxious characters about child-rearing. The literature discovered that maternal Middle-Eastern or Asian nationality and household disadvantage (low income, low maternal education, and paternal unemployment) were the associated factors with moderate or high developmental risk of PEDS<sup>22</sup>. However, we interpreted significant concerns if the reports were consistent and not the age-appropriate development.

### Limitations

In this study we found two main characters of Thai families, the first is over-concern caregivers

who seem to compare their child to others; the second is under-concern. These may confound the collected data from PEDS questionnaires.

We suggest that PEDS questionnaires may not suitable in the context of Thailand due to the over-concern character as above; it may need to be modified better suit our context.

### Conclusions

Growth and development of children are important and all parents should give their child proper attention. Some parents try to search for the best school to promote their child's abilities. However, we must not forget that the most important factor is parent-child interaction regardless of where they are raised. We suggest that the quality of a child's development is created by spending appropriate quality time with them.

### Acknowledgment

The authors thank Asst. Prof. Rosawan Areemitr for her recommendations and comments on early drafts of this manuscript, Ms. Pawittra Khumpiyapon, Clinical Psychologist, and Nurses of Pediatric Outpatient Department, Srinagarind Hospital, Khon Kaen University Faculty of Medicine, Mrs. Kaewjai Thepsuthammarat, Staffs of the child care centers, and caregivers of the participating children who facilitated in this project. This study was granted by Faculty of Medicine, Khon Kaen University, Thailand (Grant Number IN59320).

### References

1. Engle PL, Fernald LC, Alderman H, Behrman J, O'Gara C, Yousafzai A, et al. Strategies for reducing inequalities and improving developmental outcomes for young children in low-income and middle-income countries. *Lancet* 2011;378(9799):1339–53.
2. Walker SP, Wachs TD, Gardner JM, Lozoff B, Wasserman GA, Pollitt E, et al. Child development: risk factors for adverse outcomes in developing countries. *Lancet* 2007; 369(9556):145–57.
3. Walker SP, Wachs TD, Grantham-McGregor S, Black MM, Nelson CA, Huffman SL, et al. Inequality in early childhood: risk and protective factors for early child development. *Lancet* 2011; 378(9799):1325–38.

4. Barros AJ, Matijasevich A, Santos IS, Halpern R. Child development in a birth cohort: effect of child stimulation is stronger in less educated mothers. *Int J Epidemiol* 2010; 39:285–94.
5. Shah R, Sobotka SA, Chen YF, Msall ME. Positive parenting practices, health disparities, and developmental progress. *Pediatrics* 2015(2);136: 318–26.
6. Glascoe FP, Leew S. Parenting behaviors, perceptions, and psychosocial risk: impacts on young children’s development. *Pediatrics* 2010; 125(2):313–9.
7. NICHD Early Child Care Research Network. Familial factors associated with the characteristics of nonmaternal care for infants. *J Marriage Fam* 1997; 59(2):389–408.
8. Marks KP, LaRosa AC. Understanding developmental-behavioral screening measures. *Pediatr Rev* 2012; 33(10):448-57.
9. Johnson CP. Using developmental and behavioral screening tests. *Pediatr Rev* 2000; 21(8):255–6.
10. Waitchaporn C, Theeranate C. Using parents’ evaluation of developmental status (peds) to detect developmental and behavioral problems in well-baby clinic at Phramongkutklao Hospital. *Thai J Pediatr* 2011; 50:59–68.
11. Thompson LA, Tuli SY, Saliba H, DiPietro M, Nackashi JA. Improving developmental screening in pediatric resident education. *Clin Pediatr (Phila)* 2010; 49(8):737–42.
12. Schonwald A, Huntington N, Chan E, Risko W, Bridgemohan C. Routine developmental screening implemented in urban primary care settings: more evidence of feasibility and effectiveness. *Pediatrics* 2009; 123(2):660–8.
13. Theeranate K, Chuengchitraks S. Parent’s Evaluation of Developmental Status (PEDS) detects developmental problems compared to DenverII. *J Med Assoc Thai* 2005; 88Suppl 3: S188-92.
14. National Institute of Child Health and Human Development. The NICHD study of early child care and youth development. Findings for children up to age 4½ years. Bethesda (MD): NICHD; 2006.
15. Loeb S, Bridges M, Bassok D, Fuller B, Rumberger RW. How much is too much? The influence of preschool centers on children’s social and cognitive development. *Econ Educ Rev* 2007; 26:52–66.
16. Glascoe FP, Trimm F. Brief approaches to developmental-behavioral promotion in primary care: updates on methods and technology. *Pediatrics* 2014; 133(5):884–97.
17. Eshel N, Daelmans B, de Mello MC, Martines J. Responsive parenting: interventions and outcomes. *Bull World Health Organ* 2006; 84(12):991–8.
18. Decreasing rate to 20% of developmental delay among Thai children, but still high in some area ASTV Manager Online [Internet]. 2015 [cited 2015 Nov 25]. Available from: <http://bit.ly/2eFhfCL>
19. Coghlan D, Kiing JS, Wake M. Parents’ Evaluation of Developmental Status in the Australian day-care setting: developmental concerns of parents and carers. *J Paediatr Child Health* 2003; 39:49–54.
20. Pornsamrit S, Chunsuwan I, Hansakunachai T. Developmental screening by PEDS (Parents’ Evaluation Developmental Status) survey during 9 months of age at well child clinic, Thammasat University Hospital. *Thai J Pediatr* 2014(2); 53:136–43.
21. Cox JE, Huntington N, Saada A, Epee-Bounya A, Schonwald AD. Developmental screening and parents’ written comments: an added dimension to the parents’ evaluation of developmental status questionnaire. *Pediatrics* 2010 ;126Suppl 3:S170-6.
22. Woolfenden S, Eapen V, Jalaludin B, Hayen A, Kemp L, Dissanyake C, et al. Prevalence and factors associated with parental concerns about development detected by the Parents’ Evaluation of Developmental Status (PEDS) at 6-month, 12-month and 18-month well-child checks in a birth cohort. *BMJ Open*. 2016; 6(6):e012144. doi: 10.1136/bmjopen-2016-012144