Pilot Study in Young Thai Children with Delayed Bottle-Weaning at Queen Sirikit National Institute of Child Health: Does It Affect Iron Status?

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Background: *Delayed bottle weaning or prolonged bottle-feeding affects the child's health. Many studies found the increased incidence of dental caries, obesity, and iron deficiency anemia (IDA) among these children. IDA is one of the health problems found in Thai children that reflects both poor health and malnutrition. The Royal College of Pediatricians of Thailand has recommended that parents wean bottle-feeding when children reach the age of 1 to 1½ years old. However, previous studies reported that only 8% of 1,038 Thai children aged 1-2 years successfully discontinued bottle-feeding. Therefore, we were interested to investigate parental knowledge and iron status in Thai children with prolonged bottle-feeding.*
Objective: *To evaluate parental knowledge of bottle weaning and iron status in Thai children aged 1½ to 2 years who were still bottle-fed.*
Material and Method: *A cross-sectional descriptive study was performed in 30 children who were bottle-fed, aged 1½ to 2 years, at Well-Child Clinic, Queen Sirikit National Institute of Child Health during the period of February 3rd-October 9th, 2012. The parents were interviewed using questionnaires on the practices and knowledge of bottle-feeding. Blood samples were collected for ferritin levels and complete blood count.*
Results: *The average age of the 30 children, who were still bottle-fed, was 19.3±1.5 months old. The primary caregivers were parents living in Bangkok. All of the parents finished Bachelor's degree or higher. Almost all of the caregivers (28/30) of unweaned children understood that bottle weaning was recommended for children aged 12-18 months old, and the food recommendation for a one-year-old child was 3 meals of food and 2-3 meals of milk per day. Blood samples showed iron deficiency in 43% of the children with delayed bottle weaning, which included 7% of IDA.*
Conclusion: *Delayed bottle weaning in young children was related to iron depletion.*

Keywords: *Delayed bottle weaning, Iron depletion, Iron deficiency anemia*

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Healthy eating habits[1] are necessary for achieving good health in growing children. Early childhood is the period where parents have the opportunity to imprint healthy eating habits and activities on their children. To promote healthy eating habits, the American Academy of Pediatrics[2] recommends bottle weaning before 18 months of age and encourage parents to use cups at 9 months old. However, prolonged use of the bottle beyond this age has been reported in many studies. Bonuck et al[3] analyzed data from the National Health and Nutrition Examination Survey (NHANES) III which was conducted in 3,027 children, aged 3-5 years, and found that the mean bottle weaning age was 18.78 months. Hammer et al[4] revealed that in 191 healthy, full-term infants, 40%, 16%, and 8% were bottle-fed at 24, 36, and 48 months, respectively. In addition, Safer et al[5] reported that 8.5% (14/85) of the 42-month-old children were still bottle-fed.

The Royal College of Pediatricians, Thailand[6] recommends parents to wean bottle- feeding when their children reach the age of 1 to 1½ years old. Nevertheless, health care providers encounter parents who bottle-feed beyond the recommended age. Sawasdivorn, et al[7] surveyed 1,038 Thai children and found that only 8% of children, aged 1-2 years, successfully

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discontinued bottle-feeding. Ratanachu-ek[8] found that the mean bottle weaning age was 3 years and 1 month, and 78.4% of children aged over 2 years old were still bottle-fed.

The 4th Thailand National Nutrition and Health Examination Survey[9] in 2009 reported that obesity and overweight were the up-coming health problems in children between 1-5 years of age. The prevalence increased from 5.8% in 1997 to 8.5% in 2009. Iron Deficiency Anemia (IDA) is also one of the health problems among Thai children. IDA is a result of poor health and nutrition.

In 2006, WHO[10] revealed that the prevalence of anemia in the Thai children aged less than 6 years was 25%. Unfortunately, national data iron deficiency anemia in the small children is currently not available. The only data available is from research. Chuansumrit et al[11] studied the iron status of one-year-old infants in a well-child clinic, and found IDA in one infant (1.4%) and iron deficiency without anemia in 5 infants (6.9%). A study on 140 full-term infants aged 9-12 month-old by Tantracheewathorn[12] found anemia in 47 infants (33.5%). The incidence of IDA in breastfeeding infants was significantly higher than Formula-feeding infants (25.7% vs. 2.9%, $p<0.001$) was. Several studies[13-19] also revealed that prolonged bottle-feeding results in dental caries and obesity.

Objectives

1) Evaluation of parental knowledge on feeding and bottle weaning in Thai children.

2) Assessment of iron status in Thai children aged 1½ to 2 years who were still bottle-fed.

Material and Method

A cross-sectional descriptive study was performed in 30 children, aged 1½ to 2 years, who were still bottle fed and received regular health services at the Well-Child Clinic (WCC), Queen Sirikit National Institute of Child Health (QSNICH), during February 3rd-October 9th, 2012. The parents signed the consent and completed the questionnaire on feeding practices and their knowledge on bottle weaning. The pediatrician performed physical examination and growth assessment on the children before taking the blood samples to measure ferritin levels and complete blood count by lab technicians.

The definition of iron status is as follows[10,20]:

Iron depletion: serum ferritin <12 mcg/dL

Anemia: hemoglobin <11 g/dL

IDA: hemoglobin <11 g/dL and serum ferritin <12 mcg/dL.

Statistical analysis

SPSS version 16 was used for statistical analysis. Continuous data, such as body weight, height, age, and hemoglobin and ferritin levels were analyzed using percentage, range, and mean $\pm$ SD. Iron status and other variables were compared using Pearson's Chi-squared test. The p-values <0.05 was considered statistically significant.

Results

Thirty Thai children with delayed bottle weaning, who regularly visited the WCC, QSNICH, were included in the present study. Their ages were 18-24 months old, and the average age was 19.3$\pm$1.5 month-old. The ratio of boys to girls was 1:1.1. 80% of these children were the first child. Table 1 shows the family's characteristics of the children, which includes the parent's education, family's income, and primary caregiver. Almost all of the caregivers (29/30) of unweaned children understood that bottle weaning was recommended for children aged 12-18 months old, and food recommendation for a one-year-old child was 3 meals of food and 2-3 meals of milk per day.

Blood samples showed that the average hemoglobin and ferritin levels among the 30 children in the present study were 11.7$\pm$1.0 gm/dl (min-max = 8.8-13.4) and 34.4$\pm$32.8 mcg/dl (min-max = 3.94-176.4), respectively. Figure demonstrates the iron status of the children and showed that the prevalence of iron deficiency and IDA was 36% and 7%, respectively.

Table 2 demonstrates the analysis of risk factors that affects iron depletion (ferritin <12 mcg/dl) among children with delayed bottle weaning. Results showed that there were no association between eating behavior such as night feeding, the frequency of bottle usage per day and eating meat, fish or egg, and iron depletion status. Only one-third of these children drank milk from a cup or box, and 50% had night feeding.

Discussion

The present study demonstrated that almost all caregivers (28/30) understood bottle-feeding and weaning in young children. Although the caregivers understood that the child should stop bottle-feeding after 1-1.5 years old, children were still being bottle-fed. QSNICH implemented the "Bye-Bye Bottle Campaign" to promote parental health knowledge at the WCC for more than 5 years. These results suggest that the current parental health education did not

Table 1. Family characteristics of children who visited the WCC for routine health checkup, QSNICH, Thailand (n = 30)

	Number	Percent
Total population	30	
Child age, month	Min-max = 18-24	Mean ± SD = 19.3±1.5
Gender		
Boy	14	46.7
Girl	16	53.3
Child's order		
1	24	80
2 or 3	6	20
Growth parameter		
Normal weight for age	29	96.7
Over weight for age	1	3.3
Normal height for age	28	93.3
Over height for age	2	6.7
Family's income (Thai baht)		
<25,000	8	26.7
≥25,000	22	73.3
Father's education		
Under bachelor's degree	13	43.3
At least bachelor's degree	17	56.7
Mother's education		
Under bachelor's degree	13	43.3
At least bachelor's degree	17	56.7
Primary caregiver		
Parents	28	93.3
Others	2	6.7

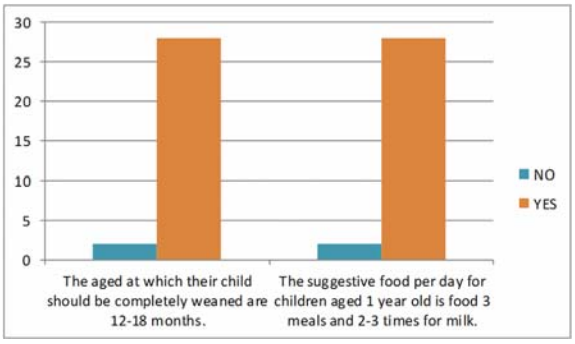

Fig. 1 Parent's knowledge on appropriate children feeding and bottle weaning (n = 30).

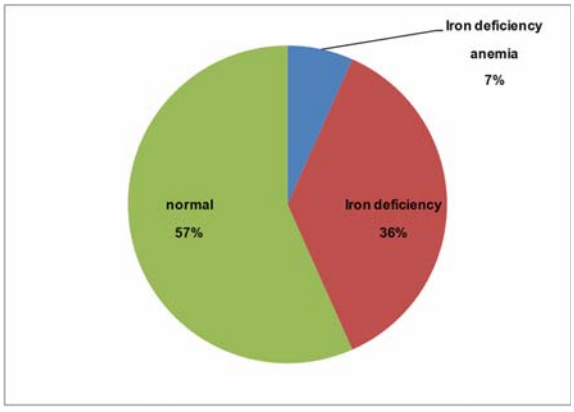

Fig. 2 Proportion of children with delayed bottle weaning by iron status group (n = 30).

promote healthy eating habit in their children.

Furthermore, 50% of the parents provided night feeding for their children. In 2007, a survey by Sawasdivorn et al[7] at QSNICH found that only 8% of 1,038 Thai children aged 1-2 years could stop bottle-feeding, and 88% of the caretakers did not know the recommended age of bottle weaning. However, the parental knowledge on bottle weaning in this study was higher than another study by Sawasdivorn et al, 5 years ago[21]. The older study surveyed bedtime bottle feeding in 12-36 months children and revealed that 87% of the parents provided night feeding, which is higher than the present study. The late weaning parents from Frazier's study were not aware of the current weaning recommendation at that time.

Graham et al[18] surveyed 35 Southeast Asian

Table 2. Prevalence of iron depletion among children with delayed bottle weaning by eating behavior and diet characteristics (n = 30)

Eating behavior and diet characteristics	Iron depletion		Normal iron status		*p*-value
	Number	Percent	Number	Percent	
Night feeding					0.23
Yes	8	53.3	7	46.7	
No	5	33.3	10	66.7	
Frequency of bottle feeding					0.57
1-2 time/day	0	0.0	1	100.0	
>2 time/day	13	44.8	16	55.2	
Egg					0.59
Everyday	8	44.4	10	55.6	
3-4 days/week	5	41.7	7	58.3	
Meat, fish					0.13
Everyday	11	52.4	10	47.6	
3-4 days/week	2	22.2	7	77.8	
Servings/meal					0.63
<7 table spoon	7	43.8	9	56.3	
≥7 table spoon	6	42.9	8	57.1	
Drink milk from cup/box					0.55
Yes	4	40.0	6	60.0	
No	9	45.0	11	55.0	

children and 73 children of other ethnicities, aged between 5 and 30 months, and showed that all 17 Southeast Asian toddlers were still bottle-fed by their second birthday, compared to 10 of 21 children of the same age from other ethnicities (48%). It can be implied that prolonged bottle-feeding had cultural influences. Nowadays, prolonged bottle-feeding remains a common feeding problem in Thai children. From our study, we suggest more innovative approaches to alter parental practices about age-appropriate bottle weaning in regards to culture and attitude of caregivers.

The present study had limitations in the small sample size, method, and the dietary data. The findings in the present study showed that there was an association between prolonged bottle-feeding and iron status. In Thailand, we do not have national data on IDA. Chuansumrit et al[11] surveyed the iron status of 72 one-year old infants at a well baby clinic and reported the prevalence of anemia to be 9%, IDA 1.4%, and iron deficiency without anemia 6.9%. A study on 140 full-term 9-12 month-old Thai infants[12] found that 33.5% of the infants had anemia. The incidence of IDA in breast-fed infants was significantly higher than formula-fed infants (25.7% vs. 2.9%, $p<0.001$). These studies show that anemia in young children is still a health problem in Thailand. Further large-scale surveys on iron depletion and/or IDA are highly warranted.

Sutcliffe et al[19] studied 150 healthy children, aged between 12-38 months, who were attending the well-child care, and found iron depletion in 37% of bottle-fed and 18% of cup-fed children. The study also found a significant association between bottle use and iron depletion, after 16 months of age. Several studies[14,16-19] revealed that the longer the duration of delayed bottle weaning, the higher the prevalence iron depletion. Moreover, children with delayed bottle weaning consumed more milk than non-bottle-fed group. Brotanek et al[17], studied data from NHNES III in 2,121 children, aged 1-3 years, and found iron deficiency in 9% of the children. With regard to age, the prevalence of iron deficiency among bottle-fed children was 3.8%, 11.5%, and 12.4% in children aged <12 months, 13-23 months, and 24-48 months, respectively ($p<0.001$). These studies[14,16-19] are consistent with the prevalence of iron depletion in one-third of the children with prolonged bottle-feeding in the present study.

Conclusion and suggestion

The present study demonstrated that proper parental knowledge did not lead to appropriate bottle weaning. Results suggest we need more innovative

approaches to alter the parent's practices. Delayed bottle weaning was also found to be associated with iron depletion in young children.

Potential conflicts of interest

None.

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การศึกษาระดับธาตุเหล็กในเด็กเล็กที่ยังใช้ขวดนมและมารับบริการตรวจสุขภาพที่สถาบันสุขภาพเด็กแห่งชาติมหาราชินี

นัยนา ณีศะนันท์, ลลิลทิพย์ ลิ่มพาณิชย์

ภูมิหลัง: ภาวะขาดธาตุเหล็กเป็นปัญหาสาธารณสุขที่สำคัญ พบบ่อยในเด็กปฐมวัยของประเทศที่กำลังพัฒนาและเป็นสาเหตุสำคัญของภาวะโลหิตจาง อาการสมาธิสั้นและการเรียนรู้ช้ามีหลายการศึกษาพบว่าภาวะพร่องธาตุเหล็กสัมพันธ์กับการติดขวดนม และ/หรือการเลิกขวดนมช้า สถาบันสุขภาพเด็กแห่งชาติมหาราชินีได้ทำการศึกษา การใช้ขวดนมในเด็กปฐวัย เมื่อ พ.ศ. 2547-2550 พบว่าร้อยละ 92 ของเด็กอายุ 1-2 ปียังใช้ขวดนมเนื่องจากยังไม่เคยมีการศึกษาถึงความสัมพันธ์ของการเลิกขวดนมช้ากับภาวะขาดธาตุเหล็ก ดังนั้นผู้นิพนธ์จึงมีความสนใจที่จะศึกษาความสัมพันธ์ของระดับธาตุเหล็กกับการเลิกขวดนมช้าในเด็กไทยอายุ 1 ปี 6 เดือน-2 ปี เพื่อจะได้นำไปพัฒนาสุขภาพเด็กไทยให้ดียิ่งขึ้น

วัตถุประสงค์: เพื่อศึกษาพฤติกรรมและความรู้ของผู้เลี้ยงดูเด็กในเด็กอายุ 1 ปี 6 เดือน-2 ปี ที่มารับบริการสุขภาพที่คลินิกเด็กสุขภาพดี เรื่องการเลิกใช้ขวดนมในเด็กอายุ 1 ปี-1 ปี 6 เดือน และเพื่อศึกษาระดับธาตุเหล็กในเด็กอายุ 1 ปี 6 เดือน-2 ปี ที่ยังใช้ขวดนม

วัสดุและวิธีการ: เก็บข้อมูลจากกลุ่มตัวอย่างซึ่งเป็นเด็กอายุ 1 ปี 6 เดือน-2 ปี ที่มารับบริการที่คลินิกสุขภาพเด็กดีของสถาบันสุขภาพเด็กแห่งชาติมหาราชินี จำนวน 30 ราย ระหว่างวันที่ 3 กุมภาพันธ์ พ.ศ. 2555 ถึง 9 ตุลาคม พ.ศ. 2555 โดยใช้วิธีการวิจัยเป็นแบบ Cross-sectional descriptive study

ผลการศึกษา: เด็กอายุ 1 ปี 6 เดือน-2 ปี ที่ยังใช้ขวดนมจำนวนทั้งหมด 30 ราย อายุเฉลี่ย 19.3±1.5 เดือนพบว่าร้อยละ 93 ของผู้เลี้ยงดูมีความเข้าใจที่ถูกต้องเกี่ยวกับการเลิกใช้ขวดนมเมื่อเด็กอายุ 1 ปี 6 เดือน และควรให้เด็กอายุ 1 ปีขึ้นไป รับประทานอาหารตามวัย 3 มื้อ และพบว่าร้อยละ 36 (11 ราย) ของเด็กมีภาวะพร่องธาตุเหล็กและพบมีภาวะซีดจากการขาดธาตุเหล็กร้อยละ 7 (2 ราย) ไม่พบความสัมพันธ์ระหว่างพฤติกรรมการกินและชนิดของอาหารที่บริโภคกับภาวะพร่องธาตุเหล็กในเด็กอายุ 1 ปี 6 เดือน-2 ปี ที่ยังใช้ขวดนม

สรุป: การเลิกขวดนมช้าในเด็กไทยอาจจะมีความสัมพันธ์ต่อภาวะพร่องธาตุเหล็ก