

The Development and Growth of Children Aged under 5 years in Northeastern Thailand: a Cross-Sectional Study

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Abstract

Objective: The first five years of a child's life is a golden period of their development, contributing to their future learning skills and social and emotional abilities due to rapid gains in physical and development. This study aimed to estimate the prevalence of delays in development and growth among children aged 1-5 years and to explore their association with maternal age.

Methods: A cross-sectional survey was conducted in the Northeast of Thailand during April-September 2014. Seventy Thai mothers aged less than 34 years who were admitted to the postpartum ward of a regional hospital and their first child were included. Developmental delay among their first children was assessed by the Denver II, Thai version.

Results: Among the 70 children, 22.9% were suspected to have delayed development with delays in language (14.3%), gross motor (10.0%), personal-social (5.7%) and fine motor (2.9%) skills being the most common domains detected. A higher prevalence of language delay was found in boys (21.4%) compared to girls (9.5%) but the difference was not statistically significant. Children aged 36-62 months showed a higher delayed development, especially in the gross motor domain. The prevalence of underweight and stunting were common among children aged 12-35 months (6.2% and 15.6%, respectively) and wasting was higher among those aged 36-62 months (5.3%). Hyperactivity and showing anger when displeased were common.

Conclusion: A high prevalence of suspected delay was found among children aged 36-62 months. Suboptimal growth was common among those 12-35 months. Early identification of developmental delay and early interventions may have a substantial impact on financial, educational, and social costs in the future.

Keywords: Child development; Growth; Behavior

Introduction

The first five years of a child's life is a golden period for their development, fostering their future learning skills and social and emotional abilities due to rapid gains in physical and cognitive growth and development [1]. Developmental delay is strongly associated with impaired psycho-social and intellectual development and learning ability [2,3]. Maternal and child-related factors, which are both associated with child development, include socio-cultural, biological, and psycho-social factors [4]. Antenatal care attendance of mothers and birth order, premature status, birth weight and Apgar scores at birth of the child have also been reported to be associated factors for child development [5]. Maternal psychological distress during pregnancy is known to affect behavioral, cognitive, socio-emotional, and psychomotor development of infants, while postpartum distress is known to contribute to cognitive and socio-emotional development [6]. In addition, depression in pregnant adolescents was also found to be associated with higher developmental delays in infants [7].

The prevalence of child developmental delay varies from 5% to 40% depending on the characteristics of the study population and tools

used [8-13]. Tools for measuring child development should be designed to measure an individual's performance and provide a comparison of standardized norms [14,15]. The Denver II scale is an acceptable screening test for assessing development of children aged under-five years and has been standardized in both developed and developing countries [15]. The Denver II can be used by professionals or trained paraprofessionals [16].

A systematic review showed that suboptimal growth is an important biological risk factor for mortality and morbidity among children under the age of five years [17,18]. The Lancet series reviewing the maternal and child malnutrition in low-income and middle-income countries showed that the prevalence of stunting and wasting of children under five years was relatively higher in south Asia and sub-Saharan Africa [19]. Pregnant adolescents have a higher risk of malnutrition [19] which can result in growth failure [20,21] and developmental delay [14] and may subsequently reflect abnormal psychological behaviors in adolescence [4,22].

In Thailand, two previous studies using the Denver II for measuring child developmental delay were conducted, one in 2000 and the other in 2010, and found a prevalence of around 37% [23,24]. However, those studies did not explore the effect of maternal age and child behaviors [23-25]. The adolescent birth rate in Thailand has steadily

increased from 33.7 in 2001 to 53.8 per 1,000 women aged 15-19 years in 2012 across the whole country [26]. In the Northeast of Thailand, high rates of underweight and stunting [27] and restricted development among children aged 12-35 months [28] have been reported. This study aimed to estimate the prevalence of developmental delay and growth among children aged 1-5 years and to compare the differences in growth between mothers of different age groups and between children of different age and sex groups in the Northeast of Thailand. Identifying the magnitude of problems and the associated factors will be useful for future planning for detection and management.

Materials and Methods

Study design and participants

A cross-sectional survey was conducted in Nakhon Ratchasima province in the Northeast of Thailand during April-September 2014. In Thailand, the public hospitals providing the delivery services are available at all districts as a district hospital and in each province as a provincial hospital which some of provincial hospital is assigned to be the regional hospital for the region due to higher quality and services. Nakhon Ratchasima is the largest province of Thailand in terms of area and the second most populated province after Bangkok. The birth rate in 2015 was 9.4 per 1,000 population which was less than the national average (10.4 per 1,000) but higher than other provinces in the Northeast [29]. This province has a mixture of economy including industry, agriculture, and retail.

Multiparous women aged less than 34 years whose first child was aged between 1-5 years, and who were currently admitted to the postpartum ward of the regional hospital in the province were eligible for the study. The regional hospital of Northeast of Thailand was chosen due to high rate of deliveries around 8500 per year. All women who recently gave birth in the study hospital was screened with a screening checklist. Those who had experienced at least one previous pregnancy regardless of delivery status of which the interval between current and the first pregnancy was not longer than 5 years living within 60 km from the hospital with were included. Those with mental or neurological disorders leading to communication barriers were excluded. The first child of each woman were included for evaluation of growth and developmental delay. Children congenital anomalies were excluded. Sample size was calculated based on the previous prevalence of child developmental delay of 37% [24]. With a finite population of 200 delivered women based on inclusion and exclusion criteria during study period, confidence limit of 95%, and a precision of 10%, 63 children and their mothers were required.

Data collection

The criteria of women and the first child were checked with all delivered women in a consecutive basis, not by random until the number of sample size was completed as calculated considering the ratio of 1:1 for adolescent or adult age of women at the first pregnancy. Eligible mothers were visited by the principal investigator 2-3 days after they were admitted to the postpartum maternity ward. They were informed of the study and invited to participate. The mothers signed a consent form for their child's participation. The mothers were then interviewed privately and confidentially using a structured questionnaire administered by the principal investigator. At the end of the interview, and if the mother's first child was present, the Denver II, Thai version [30] which was recommended by the National Institute

for Child and Family Development, Thailand since 2008 was administered to measure the child's development. If the woman's first child was not present, an appointment for a home visit was made. Home visits were made by the principal investigator and one nurse who were both qualified in using the Denver II, Thai version.

Variables and definition

Outcome measures were poor growth and child developmental delay. Child growth and developmental delay was assessed using the Denver II, Thai version [30]. The 125-item scale was used to assess personal-social function (25 items), fine motor ability (29 items), language development (39 items), and gross motor ability (32 items). The interpretation was classified into "normal" or "suspected delay" based on the child's level of ability to perform a given task. A child would be considered as having suspected delay when the results showed two or more items under "caution" and/or one or more items under "delayed". In addition, improper child behavior within the past three months was measured using a checklist, completed by the mothers, and included (1) hyperactivity, (2) showing anger when displeased, (3) defying their parent/caregiver, (4) refusal to listen to reason, and (5) fear of strangers. The magnitude of each behavior was rated using a 5-point rating scale ranging from 1=lowest to 5=highest. Behaviors were classified as low (1-3) or high (4-5).

Suboptimal growth was assessed using the prevalence of underweight, stunting, wasting and overweight. Based on 2006 WHO growth standards [31], weight in kilogram, height in centimeter, and age in month of the children were converted to z-scores of weight-for-age, weight-for-height and height-for-age, respectively. Stunting, underweight and wasting were defined as having a z-score of more than two standard deviations below the reference for height-for-age, weight-for-age and weight-for-height, respectively. Anthropometric measurement for weight and height was taken using standard instruments. The height of children was recorded without shoes using a height-measuring board. The weight of the child was measured using a digital scale.

Independent variables included both maternal and child-related factors. Maternal factors included current age, pattern of pregnancy, educational achievement, employment status, income, age at first pregnancy, and circumstances and anxiety level during the first pregnancy. Pattern of pregnancy was classified into three mutually exclusive groups: repeat adolescent pregnancy, adolescent at first pregnancy and adult at current pregnancy, and repeat adult pregnancy. Anxiety level was measured by Thai Postpartum Depression Risk Scale (PDRS) [32]. Child-related factors included age, sex, primary caregiver, history of illness within the previous 12 months, type of birth delivery, term of delivery and birth weight.

Statistical analysis

Double data entry and validation were done using EpiData version 3.1. Data analysis was performed using R version 3.3 (The R Foundation for Statistical Computing, Vienna, Austria). Maternal and child-related factors were presented descriptively using mean and standard deviation (sd) for continuous variables and frequency with percentage for categorical variables. Prevalence of suboptimal growth, improper behavior and child developmental delay was stratified by children's age and sex and by maternal age. Factors independently associated with poor growth, improper behavior and child developmental delay were assessed using univariable and multiple

logistic regression. A p-value less than 0.05 was considered as significant.

Ethical consideration

The study was approved by the Institutional Ethical Committee of the Faculty of Medicine, Prince of Songkla University (EC number 57-003-18-9). The women signed the consent form for their participation and for the permission of their child to participate in the study.

Results

A total of 70 mothers and their first born child participated in the study. Characteristics of the mothers are described in Table 1. The mean (sd) age was 23.9 (4.7) years. Among those who were adolescent at their first pregnancy, 35% were adolescent at their current pregnancy. The highest educational achievement by the majority was lower secondary school (42.9%) and about half (51.4%) were employed at the time of the interview. More than half (57.1%) had an income below the annual Gross Provincial Product per capita line in 2011 (\$US 183 per month).

Characteristic	Frequency	Percentage
Current age		
Mean ± SD=23.9 ± 4.7 years		
Pattern of pregnancy		
Repeat adolescent pregnancy	12	17.1
Adolescent (first) and adult (current) pregnancy	22	31.4
Repeat adult pregnancy	36	51.4
Educational achievement		
Primary school	4	5.7
Lower secondary school	30	42.9
Higher secondary school	21	30.0
Diploma or higher	15	21.4
Employment status		
Unemployed	34	48.6
Employed	36	51.4
Monthly Income (\$US)		
< 183	40	57.1
≥ 183	30	42.9

Table 1: Demographic characteristics of the mothers.

Table 2 presents characteristics of the children. The mean (sd) age was 35.55 (15.02) months and the majority were female and living with their parents. About 20% were admitted to hospital at least once within the past 12 months.

Two-thirds of all mothers reported that their first pregnancy was unplanned. Three-fourths of children were born by spontaneous delivery, 29% were preterm birth and 11% had low birth weight. Almost all mothers (98.6%) received at least five antenatal care visits and 20% perceived anxiety during their first pregnancy.

Characteristic	Frequency	Percentage
Age (months)		
12-35	32	45.7
36-62	38	54.3
Sex		
Male	28	40.0
Female	42	60.0
Primary caregiver		
Parent	57	81.4
Mother and stepfather	7	10.0
Grandparents	6	8.6

Table 2: Demographic characteristics of the children.

Table 3 shows the prevalence of suspected developmental delay across the four domains by children's age group and sex and by maternal age. The prevalence of suspected developmental delay for any domain was 22.9%. The domain-specific prevalences were 14.3% (language skills) 10.0% (gross motor skills), 5.7% (personal-social skills) and 2.9% (fine motor skills). Boys had a higher prevalence of language delay (21.4%) compared to girls (9.5%) but the difference was not statistically significant. Children aged 36-62 months showed a higher delayed development, especially in gross motor skills, compared to children aged 12-35 months. Higher delayed development on personal-social and language was seen in males than females. The prevalence of delayed language development was similar in children from adolescent and adult mothers. The prevalence of delayed personal-social development was higher in children born to adult mothers but the difference was not statistically significant.

The prevalence of children's underweight, stunting, wasting and overweight are shown in Figure 1 (age-specific) and Figure 2 (sex specific). The prevalence of underweight and stunting were highest among those aged 12 to 35 months and the prevalence of wasting was highest among those aged 36 to 62 months. Underweight, overweight and stunting were more prevalent in males than females. However, these differences were not statistically significant.

Hyperactivity (45.7%) and showing anger when displeased (41.5%) were common. Fear of strangers (14.1%), refuses to listen to reason (15.7%) and defying parents/caregivers (17.1%) were less common (Figure 3). Differences of these behaviors between children from adolescent and adult mothers or mothers with or without anxieties were not significant.

Factor	Domain, n (%)					
	Total	Personal-social	Language	Fine motor	Gross motor	One or more domain
Age group (months)						
12-35	32	1 (3.6)	2 (6.3)	1 (3.1)	1 (3.1)	4 (12.5)
36-62	38	3 (7.9)	8 (21.1)	1 (2.6)	6 (15.8)	12 (31.6)
Sex						
Male	28	3 (10.7)	6 (21.4)	1 (3.6)	2 (7.1)	7 (25.0)
Female	42	1 (2.4)	4 (9.5)	1 (2.4)	5 (11.9)	9 (21.4)
Maternal age						
Adolescent	33	1 (3.0)	5 (15.2)	1 (3.0)	4 (12.1)	8 (24.2)
Adult	37	3 (8.1)	5 (13.5)	1 (2.7)	3 (8.1)	8 (21.6)
Total	70	4 (5.7)	10 (14.3)	2 (2.9)	7 (10.0)	16 (22.9)

Table 3: Prevalence of child developmental delay.

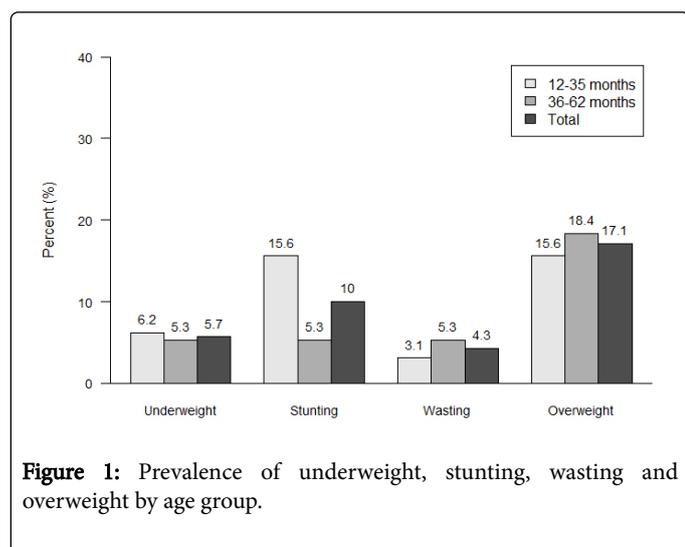


Figure 1: Prevalence of underweight, stunting, wasting and overweight by age group.

Discussion

A high prevalence of child developmental delay, stunting and overweight, and improper behavior (hyperactivity and showing anger when displeased) was found in children aged 1-5 years in the Northeast of Thailand. A higher prevalence of delayed development in children aged 36-62 months compared to other age groups and in children with adolescent mothers was seen but without statistical significance. A high prevalence of overweight was found in all child age groups and a higher prevalence of stunting was found in boys.

The prevalence of child developmental delay in our study was twice as high as that from studies in Iran and Turkey [9,13]; however, the tool used for measuring the development was different. Both these other studies used the Ages and Stages Questionnaire (ASQ) which asked the parents about children's activities and performances [14,15]. In contrast, the prevalence in our study was lower than previous studies conducted in Thailand in which the same tool was used [23,24].

The reason for the difference may be due to the different age groups of children and study settings as one of the studies was carried out in an armed conflict area [24]. Children aged 36-62 months in our study had a higher prevalence of delayed personal-social, language and gross motor skills. A similar result was seen in previous studies conducted in the USA and Taiwan which revealed that the prevalence increased by age [11,33]. Sex differences in the prevalence of developmental delay have also been described in another study [11].

Developmental delay of children aged 1-5 years born to adolescent mothers was higher but compared to those born to adult mothers the difference was not significant. Previous studies suggested that associations between child developmental delay and maternal age could be explained by socio-economic status, parenting behavior and home environment [22,34,35], and maternal depression [7]. In our study, those maternal associated factors were not significantly different between adolescent and adult mothers. In addition, children's birth weight and sex were also similar between these two groups.

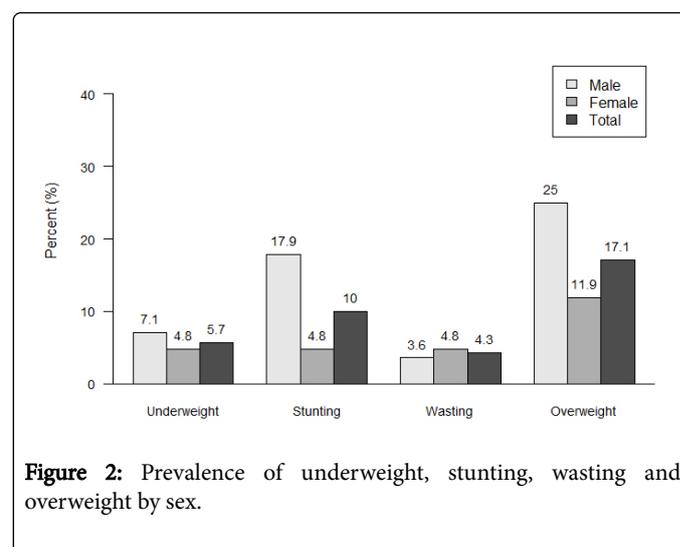
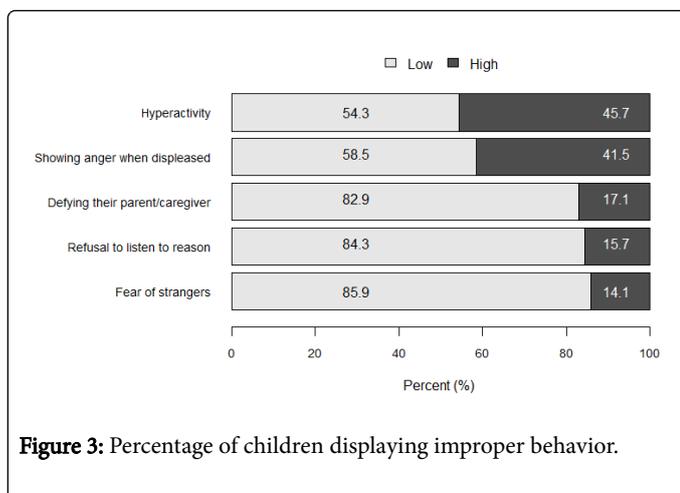


Figure 2: Prevalence of underweight, stunting, wasting and overweight by sex.



The prevalence of suboptimal growth in our study was below the accepted thresholds suggested by WHO (underweight <10%, stunting <20% and wasting <5%) [36]. Stunting and underweight are related to lower birth weight which was consistent with the explanation of growth development affects in early childhood [37,38]. However, among children aged 12-35 months the prevalence of stunting was higher than the WHO threshold and more detection of fine motor suspected delay which was supported by a previous study [39]. Underweight and stunting were more common among males compared to females and also among those aged less than two years, results similar to two previous studies [19,37]. In addition, the prevalence of overweight in our study was six times higher than the report of a Thai national survey in 1995 [40]. Overweight is becoming a matter of concern and attention needs to be paid to monitoring the trends of overweight among children in Thailand and around the world [41].

Almost half of children were reported as hyperactivity by their parent. A recent systematic review found that only one study an association between social behavior and language development but did not show statistical significance [42]. A previous study conducted in Norway showed that the most common mental condition in preschool children was attention deficit hyperactivity disorder [43]. In addition, preschool age children with hyperactivity were shown to be poor health outcomes in their later life [44]. A study in UK revealed that preschool-aged children with hyperactivity had a 17.6 times of general health compare to the control group which required mental health services and increased the criminal related problems [45]. Therefore, early detection with high-risk hyperactivity and proper treatment are necessary.

Developmental delay was measured by trained personnel who were qualified to use the Denver II, Thai version. Home visits were conducted to ensure a familiar environment was provided for the children during measurement. Some limitations were identified in our study. First, due to time constraints, we excluded families living more than 60 km from the hospital, thus generalizability to children living in remote areas is limited. Second, mother's recall bias on their exposure variables during their first pregnancy may have occurred. However, pretesting among women who delivered in the last five years was done and they all said that their memories were quite good. In addition, the mean period between first and current pregnancy in our study was only three years (sd=1.2). Third, the measurement of improper child behavior as one of independent variables was firstly constructed

without validity reliability test. Fourth, the sample size of our study was calculated based on the prevalence of abnormal child development, not for testing the association with other factors. Finally, our study aimed to measure the prevalence of developmental delay and growth, not associated factors, thus those factors were not measured.

In conclusion, a high prevalence of suspected developmental delay was found among children aged 36-62 months while poor growth was common in children aged 12-35 months. Hyperactivity was more common. Early identification of developmental delay with timely interventions may substantially reduce educational and social costs.

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