Denver Developmental Screening Test (DDST) Survey and Degree of Malnutrition Among Children Born to HIV Infected Mothers under the Prevention of Mother to-Child-Transmission (PMTCT) Program

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Objective: To examine morbidity experience, pattern of nutrition status and development of the children born to HIV infected mothers under the Prevention of Mother to Child Transmission (PMTCT) Program compared to the national standard.

Material and Method: In 2008, births given by mothers under PMTCT in five selected hospitals of Health Region 4 of Thailand between 2002 and 2006 were identified from the registered data and the medical records, were reviewed. Their homes were visited to collect the data.

Results: Among 138 mothers and 143 children studied, nobody died. Forty-four were healthy, 91 experienced mild episode of various infections and allergy within the past three months, one was admitted for pneumonia, two were HIV-positive, 53 were negative and the other 88 had no final blood tested. In the Denver Developmental Screening Test (DDST), all parameters were minimal, less than 5%. Overall, the suspected delay development is around 15.4%. For nutritional status assessment by height for age (HFA), weight for age (WFA) and weight for height (WFH) reported a quarter (23.1%) was stunting whereas 12.6% were thin and 5.6% were wasting, respectively.

Conclusion: Among the study PMTCT children, serious morbidity was rare. Nutritional deficiency was more common than delayed development.

Keywords: Nutritional status, Child development, HIV positive mothers, PMTCT

In 2000, Thailand started to implement a national program to prevent mother-to-child transmission (PMTCT) of human immunodeficiency virus (HIV), following successful trials and operational pilots. Free routine HIV testing and counseling during pregnancy, short course ZDV for the mother and ZDV syrup for the newborn and infant formula were provided. In 2001-2002, the program began adding a single dose of nevirapine for both mothers and newborn. Subsequently, this was adopted as the national regimen.

Amidst the strong policy and massive implementation, the effectiveness of PMTCT on child mortality, morbidity, growth and development had never been evaluated. The objective of the present study was, therefore, to document the afore-mentioned effectiveness in sample subjects in Health Region 4. The findings could be used to improve future care of this program.

Material and Method

The present study protocol was approved by the Ethics Committee, Prince of Songkla University. The investigation was a combination of retrospective cohort study, reviewing subject’s medical records and field visit for the children’s growth and development. Five collaborative hospitals in Health Region 4 participated in the project.

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HIV infection is defined if a child had two or more positive tests using polymerase chain reaction or one positive test by two different assays (e.g. enzyme immunoassay or rapid test) drawn at 18 months or longer interval or having an AIDS-defining condition(7,8).

Assuming that 90% of the subjects would have normal nutrition and development status and 95% confidence limit of this estimate being 5% below and above this value, the required sample size was 138 subjects(9). The hospital number, address and telephone number of PMTCT mother, delivered between 2002 and 2006, who were Thai were retrieved. Exclusion criteria were living beyond 30 km from the hospital, having serious congenital, and birth below 1,000 gm.

A semi-structured questionnaire was developed and pre-tested in a nearby province. The final version consisted of sections of socio-economic characteristics, health status of the parents and the child and health service used. To minimize recall error, information regarding history of access to HIV care, the child’s birth data, antiretroviral drugs administration, blood tested for HIV and other treatments were validated against medical records wherever possible.

Nutritional status included weight-for-age (WFA), height-for-age (HFA) and weight-for-height (WFH) values, divided into five levels with cutoff points at < -2 SD, < -1.5 SD, < +1.5 SD and ≥ +2 SD from age-specific means of Thai 1,999 standard growth curves(10,11). The interpretation of these parameters: WFA, HFA and WFH ≤ -2 SD were classified as thin, stunting and wasting, respectively.

Denver II Development Screening Test (DDST) was used to assess personal-social, fine-motor adaptive, language and gross-motor domains. In each domain, a child was suspected if he/she had 2-or-more “caution” or any “delayed” items. These two were defined as not able to pass the level where 75% and 90% of normal children of the same age could pass, respectively.

R program with Epicalc package(12) was used for data analysis. Descriptive statistics and cross-tabulation were done with Chi-squared test and Fisher’s exact test as appropriate. Statistical significance was set at < 0.05.

Results

Out of 188 women selectively retrieved from the database, 138 women and 143 children were completely approached and evaluated. The mothers had mean ± SD age of 29.5 ± 6.0 years. The majority were blue-collar workers (51.7%), having finished primary school education (62.2%), living together (93.0%), having less than 9,000 baht income per month (57.3%) and having antiretroviral drug prophylaxis (83.9%). Around three quarters (76.2%) had spontaneous vaginal delivery.

Children had mean ± SD gestational age at delivery of 38.7 ± 1.7 weeks, birth weight of 2,980 ± 406 grams, current age of 31.3 ± 14.3 months. A half (50.3%) was female. Over three quarters (76.9%) were given the first dose of nevirapine within 48 hours after birth, ZDV medication was completed in 74.8%. Only 2 in 143 children (1.3%) were HIV positive. Health status varied from healthy (30.1%), moderate (63.6%) and often sick (5.6%). One case had pneumonia and was hospitalized.

Table 1 compares the percentage of children suspected to have development problem among four surveys in Thailand(13-16) and the present study, using the same DDST. The percentage of each domain of the present study was the minimum, less than 5%. Overall, the suspected delay development was around 15.4%.

Table 2 compares nutritional status of children surveyed in 2004 and the present study. The percentage of thin (WFA ≤ -2 SD), stunting (HFA ≤ -2 SD) were 12.6% and 23.1% respectively in the present study was higher than those in the previous one of 6.9% and 8.3% respectively. Similarly, the percentage of wasting (WFH ≤ -2 SD) was higher (5.6% versus 4.9%).

Compared to the 2001 nation-wide survey results(17), the present study subjects had a higher risk for being in the lowest of WFA, HFA and WFH. There was no evidence that any demographic characteristic was associated with these parameters. Therefore, further breakdown was omitted.

Discussion

The PMTCT subjects were mainly from a relatively low socioeconomic background. Quite a few were diagnosed and given ARV therapy rather late in pregnancy and the majority still had vaginal delivery. Each of the four domains of the development screening test, Denver Developmental Screening Test (DDST) Survey, had suspected prevalence of less than 5%, which were distinctly lower than those in previous surveys(13-16). However, nutritional deficiency was more common. Almost a quarter were stunted. One in eight had extremely low WFA values and more than one in twenty were seriously wasting. Finally, none of the demographic characteristics or history of HIV
services utilization was associated with nutritional status and development outcome.

Among children who were born to HIV positive mothers, the reported mortality rate was lower than those in previous studies, especially in Thailand in the 1990’s (10%) where PMTCT had not been available. The impact of PMTCT in reduction of mortality in the present study, however, needs to be interpreted with caution. The selected patients included those who lived in a reachable distance and had been regularly followed-up. They might have lower mortality rate than the average PMTCT subjects. PMTCT effect on mortality needs to be evaluated with a larger study.

Previous studies reported common growth failure among HIV infected children (19,20). HIV could penetrate into the nervous system thus delaying neural behavior development. Chronic co-infections among the HIV positive children can result in pneumonia, diarrhea and other diseases leading to growth retardation (21-24). HIV infection often causes impairment of growth and development in children. Failure to gain weight could also be a direct consequence of HIV infection, secondary to HIV related illness, or be associated with the disease progression (25,26). The challenges left to the surviving PMTCT children were higher prevalence of malnutrition than delayed development.

As mentioned, high loss to follow-up of the patients in the present program and 26% missing subjects may bias the authors’ results toward better survival and health outcome. The incomplete information on HIV status of the study children did not allow the authors to assess the success rate of preventing HIV vertical-transmission.

In conclusion, among the present study PMTCT children, serious morbidity was rare. Nutritional deficiency was more common than delayed development.

References
1. Amornwichet P, Teeraratkul A, Simonds RJ, Naiwatanakul T, Chantharojwong N, Culnane M,

Table 1. Comparison of time-different DDST surveys among Thai early childhood population with the present study

<table>
<thead>
<tr>
<th>Year of study</th>
<th>No.</th>
<th>Percent suspect to delay developmental tasks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Social &amp; personal</td>
<td>Fine motor</td>
</tr>
<tr>
<td>1997 *(13)</td>
<td>3,063</td>
<td>14.3</td>
<td>30.4</td>
</tr>
<tr>
<td>1999 **(14)</td>
<td>3,042</td>
<td>3.2</td>
<td>10.1</td>
</tr>
<tr>
<td>2004**(15)</td>
<td>10,200</td>
<td>11.6</td>
<td>20.3</td>
</tr>
<tr>
<td>2007**(16)</td>
<td>1,548</td>
<td>6.2</td>
<td>8.1</td>
</tr>
<tr>
<td>Present study, 2008</td>
<td>143</td>
<td>0</td>
<td>2.1</td>
</tr>
</tbody>
</table>

* National Institute for Child and Family Development (NICFD)
** Department of Health, Ministry of Public Health

Table 2. Distribution of various nutritional indices of under-five year children in the current and 2004 studies based on national standard*

<table>
<thead>
<tr>
<th>Nutritional status group*</th>
<th>Weight for age</th>
<th>Height for age</th>
<th>Weight for height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current study (n = 143)</td>
<td>The study in 2004 (n = 3,147)</td>
<td>Current study (n = 143)</td>
</tr>
<tr>
<td>SD</td>
<td>2 (1.4)</td>
<td>223 (7.1)</td>
<td>2 (1.4)</td>
</tr>
<tr>
<td>&gt; +1.5 to 2 SD</td>
<td>1 (0.7)</td>
<td>121 (3.8)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>-1.5 to +1.5 SD</td>
<td>120 (83.9)</td>
<td>2,232 (70.9)</td>
<td>107 (74.8)</td>
</tr>
<tr>
<td>&lt; -1.5 to -2 SD</td>
<td>2 (1.4)</td>
<td>354 (11.2)</td>
<td>1 (0.7)</td>
</tr>
<tr>
<td>&lt; -2SD</td>
<td>18 (12.6)</td>
<td>217 (6.9)</td>
<td>33 (23.1)</td>
</tr>
</tbody>
</table>

* National Institute for Child and Family Development (NICFD)


การสำรวจโดย Denver Developmental Screening Test (DDST) และระดับทุโภชนาการระหว่างเด็กเกิดจากมารดาติดเชื้อเอชีวีในโครงการป้องกันการติดเชื้อจากมารดาสู่เด็ก

อุษา ยศรัศมี, วิศวศักดิ์ จงสุวัฒนวงศ์, อภิรดี แซ่ลิ่ม, นันท์นภัส พรุเพชรแก้ว

วัตถุประสงค์: เพื่อตรวจสอบประสบการณ์การเจ็บป่วย, สถานะรูปแบบของการเจริญเติบโต, และการพัฒนาของเด็กที่เกิดจากมารดา ในโครงการป้องกันการติดเชื้อจากมารดาสู่เด็กในประเทศในประชากรทั่วไป วัสดุและวิธีการ: ในปี พ.ศ. 2551 โดยเป็นการเก็บข้อมูลในคลินิกและโรงพยาบาลที่มีโครงการป้องกันการติดเชื้อจากมารดาสู่เด็ก นับแต่เดือนที่ผ่านมา รวมถึงการวิเคราะห์ข้อมูลในรูปแบบของร้อยละ การวิเคราะห์ข้อมูล: ผลการศึกษา: มารดา 138 คน และเด็ก 143 คน ไม่มีผู้เสียชีวิต ในจำนวนนี้ 44 ราย แต่เด็ก 91 ราย ประสบการเจ็บป่วยหลากหลายและโรคภูมิแพ้ใน 3 เดือนที่ผ่านมา เด็ก 1 ราย ของโรคปอดอักเสบเป็นโรคปลอดภัย สำหรับการตรวจเจ็บป่วยต่อไปใน 2 ราย โดยผลการตรวจไม่มีการติดเชื้อ สำหรับการตรวจผลบวก 2 ราย ได้แก่ 53 ราย โดยผลการตรวจบวกต่อไปใน 88 ราย ได้แก่ ผลการตรวจบวกต่อไปใน ห้องตรวจสุขภาพของการเจริญเติบโต สำหรับการประเมินสถานภาพด้านโภชนาการด้วยสัดส่วนสูงที่เหมาะสมกับอายุ (height for age - HFA) น้ำหนักที่เหมาะสมกับอายุ (weight for age–WFA) และน้ำหนักที่เหมาะสมกับส่วนสูง (weight for height–WFH) พบว่าราวหนึ่งในสี่ หรือร้อยละ 23.1 แต่เด็ก 23.1 แต่เด็กมีแต่เด็กมีผอมและผอม เพราะเปลี่ยนแปลงของลำดับสรุป: การศึกษาเด็กในโครงการป้องกันการติดเชื้อจากมารดาสู่เด็กในประเทศนี้พบว่ามีการเจริญเติบโตที่ดีในรูปแบบของร้อยละ และระดับทุโภชนาการ