Prevalence of Thalassemia in Pregnant Women at Maharaj Nakorn Chiang Mai Hospital

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Objective : *To determine the prevalence of thalassemia including α-thalassemia-1 trait (SEA type), β-thalassemia trait, hemoglobin E (HbE) trait, homozygous HbE, the combination of α-thalassemia-1 (SEA type) and β-thalassemia trait, α-thalassemia-1 (SEA type) and hemoglobin E trait, and β-thalassemia hemoglobin E disease in pregnant women.*

Method : *A cross-sectional descriptive study was conducted on pregnant women who attended the antenatal clinic at Maharaj Nakorn Chiang Mai Hospital, from 1 August to 31 October 2001. All subjects had blood taken for diagnosis of thalassemia trait or diseases, based on quantitative electrophoresis, and PCR (polymerase chain reaction) technique*

Results : *516 pregnant women were recruited. 81.0% resided in Chiang Mai province, and the remainder were in other northern provinces of Thailand. The mean (± SD) age was 27.7 ± 6.3 years old. 5.6% of cases had anemia. Overall prevalence of thalassemia trait was 25.4% which were classified as follows: α-thalassemia-1 (SEA type) trait 6.6%, β-thalassemia trait 3.7%, hemoglobin E trait 11.6%, homozygous hemoglobin E 0.8%, the combination of α-thalassemia-1 (SEA type) and β-thalassemia trait 1.2% and the combination of α-thalassemia-1 (SEA type) and hemoglobin E trait 1.5%. Additionally, the authors also found β-thalassemia hemoglobin/E disease 0.2%.*

Conclusion : *The prevalence of thalassemia carriers among pregnant women at Maharaj Nakorn Chiang Mai hospital was high, indicating the necessity of a screening thalassemia program aimed at prevention and control of this disease.*

Keywords : *Prevalence, Thalassemia disease, Thalassemia carrier*

J Med Assoc Thai 2004; 87(12): 1415-8
Full text. e-Journal: *http://www.medassocthai.org/journal*

Thalassemia is an important problem in Thailand, especially in the North. The prevalence of overall alpha-thalassemia carriers, beta-thalassemia carriers and hemoglobin E carriers in the northern part of Thailand were reported to be as high as 30%, 9% and 13%, respectively[1-3]. One of the most effective control strategies is to implement a prospective screening program[4-6]. This program could identify the couples at risk who may have fetuses with severe thalassemia syndrome such as beta thalassemia major, hemoglobin (Hb) Bart's disease and beta-thalassemia/hemoglobin (Hb) E disease. Because of the cost-effectiveness of this program, the prevalence of thalassemia in pregnant women in each area should be identified and evaluated for optimal benefit. Although the prospective thalassemia screening program has been used in Maharaj Nakorn Chiangmai Hospital since 1994, the true prevalence has not been reported.

The objective of the present study was to determine the prevalence of thalassemia in pregnant women at Maharaj Nakorn Chiang Mai Hospital. Those included α-thalassemia-1 (SEA type) trait, β-thalas-

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semia trait, HbE trait, homozygous HbE, the combination of α-thalassemia-1 (SEA type) and β-thalassemia trait, α-thalassemia-1 (SEA type) and HbE trait and β-thalassemia/HbE disease.

Material and Method

A cross-sectional descriptive study was conducted on pregnant women, attending the antenatal clinic at Maharaj Nakorn Chiang Mai Hospital, from 1 August to 31 October 2001. All subjects had blood taken for diagnosis of thalassemia or hemoglobin E trait or diseases, based on quantitative electrophoresis, and PCR (Polymerase chain reaction) technique. All medical records were reviewed. All blood samples were sent for hemoglobin typing electrophoresis for diagnosis of beta-thalassemia and HbE trait or disease and PCR for diagnosis of alpha-thalassemia-1. The laboratory techniques used in the present study were described elsewhere[7-9]. In interpretation of hemoglobin typing, the HbA2 levels of below 4% represent normal, 4-10.0% represent beta-thlassemia trait, 10.1-30.0% represent HbE trait, 30.1-60.0% represent beta-thalassemia/HbE disease and 60.1-100.0% represent homozygous HbE.

Results

From 1 August to 31 October 2001, there were 516 pregnant women who attended the Antenatal clinic of Maharaj Nakorn Chiangmai Hospital. The mean (± SD) age was 27.7 ± 6.3 years (range 15-46 years). 418 (81.0%) resided in Chiang Mai province, 98 (19%) were from other northern provinces (17%) and from other parts of Thailand (2%). The most common occupations of the subjects were employee (56%), housewife (24%) and commercial (9%) respectively. Of 516 pregnancies, 240 (46.5%) were second gravida. 514 (99.6%) were singleton pregnancy. The prevalence of anemia during pregnancy was found to be 29 (5.6%). Among 516 cases, 113 cases were delivered in other hospitals. The remaining 403 cases delivered in Maharaj Nakorn Chiang Mai Hospital. 291 (72.2%) had normal delivery and cesarean section rate was 13.9% (56 cases). The mean gestational age at delivery and birth weight were 37.7 ± 3.0 weeks (18-42 weeks) and 2,928 ± 547.4 gms (250-4200 grams) respectively. The low Apgar scores (< 6) infant at 1 and 5 min were 39 (9.7%) and 14 (3.5%). Anomalies in the study group included abnormal hands, abnormal feet, Edward's syndrome (trisomy 18), exencephaly and beta thalassemia major.

The prevalences of thalassemia and hemoglobinopathy are shown in Table 2. Alpha-thalassemia trait (SEA type) was found in 6.6%, beta thalassemia trait 3.7%, HbE trait 11.6%, the combination of alpha thalassemia (SEA type) and beta-thalassemia trait 1.2% and the combination of alpha thalassemia (SEA type) and HbE trait 1.5% giving the overall prevalence of 25.4%. In addition, beta-thalassemia hemoglobin/HbE disease was 0.2%.

Cordocentesis was performed in 15 (3.0%) pregnant women at risk for having a child with severe thalassemia syndrome which were classified as follows: risk for Bart's hydrops fetalis in 5 cases (1.0%), risk for beta thalassemia major in 1 case (0.2%), and risk for beta thalassemia/HbE disease in 9 cases (1.8%). The outcome

Table 1. Demographic Characteristics

	Number (%)
Mean age ± SD (years)	27.7±6.3
Range (years)	15-46
Address	
Chiang Mai	418 (81.0)
Other northern	87 (16.8)
Other part of Thailand	11 (2.2)
Occupations	
Employee	289 (56.0)
Housewife	125 (24.2)
Merchant	47 (9.1)
Other	55 (10.7)
Parity	
Nulliparous	194 (37.6)
2nd Gravida	240 (46.5)
Multiparous	82 (15.9)
Hemoglobin	
< 10.0 g/dl	29 (5.6)
≥ 10.0 g/dl	346 (66.8)
No data	141 (27.6)

Data are presented as mean ± standard deviation or n (%)

Table 2. Prevalence of thalassemia and hemoglobinopathy

	Number	Percent
1. Normal	384	74.4
2. Heterozygosity for thalassemia or hemoglobinopathy	131	25.4
2.1 alpha thalassemia-1 trait SEA type	34	6.6
2.2 beta thalassemia trait	19	3.7
2.3 Hemoglobin E trait	60	11.6
2.4 Homozygous Hemoglobin E	4	0.8
2.5 alpha thalassemia-1 SEA type and beta thalassemia trait	6	1.2
2.6 alpha thalassemia-1 SEA type and Hemoglobin E trait	8	1.5
3. Beta thalassemia/HbE disease	1	0.2
Total	516	100.0

of these fetuses included 1 case of beta-thalassemia major, 1 case of beta-thalassemia HbE disease, and 8 cases of thalassemia carrier. The rest were normal.

Discussion

The prevalences of common thalassemia carriers vary from region to region. The prevalence figures are essential for planning the prevention and control program since it is the basic data for cost-effectiveness evaluation. Therefore, each institute should have its own data before implementation of the control program. The prevalence in the present study represents the extent of the problem at Maharaj Nakorn Chiang Mai Hospital and probably in the northern part of Thailand, though a small number of subjects migrated from other parts of Thailand, which may influence the true prevalence. The sample size in the present study was large enough for accurate estimation of the true prevalence of thalassemia in pregnancy at Maharaj Nakorn Chiang Mai Hospital.

The mean age of study group was 27.7 $\pm$ 6.3 years old and the most common career was employee. Most of these women were in the reproductive age and low socioeconomic class. This data may suggest that the prevention and control program should focus on the group with low incomes and effective family planning should be strongly stressed.

The overall prevalence of thalassemia trait in pregnancies at Mahraj Nakorn Chiang Mai Hospital in the present study was 25.4% which were classified to be α-thalassemia-1 (SEA type) trait 6.6%, β-thalassemia trait 3.7%, HbE trait 11.6%, homozygous HbE 0.8%, the combination of a thalassemia-1 (SEA type) and b thalassemia trait 1.2% and the combination of α-thalassemia-1 (SEA type) and hemoglobin E trait 1.5% and β-thalassemia/HbE disease 0.2%. These results were different from those in previous reports in Thailand, for example, α-thalassemia-1 trait of 9.9% in the central part of Thailand, β-thalassemia trait of 5.9%, 2.6 and 2.4 in the northern, central, and north-eastern part of Thailand, respectively, and HbE trait of 5-9%, 13-17%, 25-40% and 9-23%, in northern, central, north-east and southern part of Thailand respectively[10]. The prevalence of the present study may not represent the prevalence of thalassemia in the North of Thailand because most of the samples were from Chiang Mai province. The same study should be conducted in other parts to represent the true prevalence. The limitation of the present study is that the authors did not determine the prevalence of other several types of thalassemia or hemoglobinopathies, such as α-thalassemia-2, Hb constant spring etc. This study focussed on only the types causing severe thalassemia syndrome, which need prenatal control in a large scale.

It has been proved that one of the most effective prevention and control methods are the prospective screening program[5]. The program consists of the screening pregnant women and/or their husbands to identify carrier status followed by offerring prenatal diagnosis to the couples at risk of severe thalassemia syndrome, i.e. Hb Bart's disease, β-thalassemia major, and β-thalassemia/HbE disease. Determination of the cost-effectiveness of a prospective screening program should be considered. The high prevalence of thalassemia carrier demonstrated in the present study probably suggests the cost-effectiveness of a prospective screening program in prevention and control strategy of this disease in Maharaj Nakorn Chiang Mai Hospital.

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ระบาดวิทยาของพาหะและโรคธาลัสซีเมียในสตรีตั้งครรภ์

ชเนนทร์ วนาภิรักษ์, วิทวัส มุนินทร, ต่อพงษ์ สงวนเสริมศรี, พิศวาส ธนัญชยานนท์, ธีระ ทองสง

วัตถุประสงค์ *: เพื่อค้นหาความชุกของพาหะแอลฟ่าธาลัสซีเมีย-1 (SEA type), เบต้าธาลัสซีเมีย, ฮีโมโกลบินอี, รวมทั้งโรคฮีโมโกลบินอี, โรคเบต้าธาลัสซีเมีย/ฮีโมโกลบินอี ในสตรีตั้งครรภ์*

วิธีการ *: เป็นการศึกษาเชิงพรรณาแบบตัดขวาง ซึ่งทำการศึกษาในสตรีที่มาฝากครรภ์ในโรงพยาบาลมหาราชนครเชียงใหม่ ระหว่างวันที่ 1 สิงหาคม ถึง 31 ตุลาคม 2545 โดยทำการเจาะเลือดขณะมาฝากครรภ์ แล้วส่งตรวจแยกชนิดฮีโมโกลบินโดย electrophoresis เชิงปริมาณ และวิเคราะห์ยีนแอลฟ่าธาลัสซีเมีย-1 โดยเทคนิค polymerase chain reaction*

ผลการศึกษา *: สตรีตั้งครรภ์เข้าสู่การศึกษาจำนวน 516 ราย ส่วนใหญ่ (ร้อยละ 81.0) มีภูมิลำเนาอยู่ในจังหวัดเชียงใหม่ ที่เหลืออยู่ในจังหวัดอื่น ๆ ของภาคเหนือ อายุโดยเฉลี่ย (ค่าเฉลี่ย $\pm$ ค่าเบี่ยงเบนมาตรฐาน) 27.7 $\pm$ 6.3 ปี ประมาณร้อยละ 5.6 มีภาวะโลหิตจาง ความชุกโดยรวมของพาหะธาลัสซีเมียร้อยละ 25.4 ซึ่งจำแนกได้ดังนี้ คือ พาหะแอลฟ่าธาลัสซีเมีย-1 (SEA type) ร้อยละ 6.6 พาหะเบต้าธาลัสซีเมียร้อยละ 3.7 พาหะฮีโมโกลบินอีร้อยละ 11.6 ฮีโมโกลบินอีชนิดโฮโมซัยกัสร้อยละ 0.8 พาหะทั้งแอลฟ่าธาลัสซีเมีย-1 ร่วมกับเบต้าธาลัสซีเมียร้อยละ 1.2 และพาหะทั้งแอลฟ่าธาลัสซีเมีย-1 ร่วมกับฮีโมโกลบินอีร้อยละ 1.5 นอกจากนี้พบโรคเบต้าธาลัสซีเมีย/ฮีโมโกลบินอีขณะตั้งครรภ์ร้อยละ 0.2*

สรุป *: พาหะธาลัสซีเมียมีความชุกสูงในการศึกษานี้ บ่งชี้ให้ตระหนักถึงความจำเป็นที่จะต้องพิจารณาถึงการคัดกรองเพื่อควบคุมและป้องกันของโรค*