The Impact and Disease Burden of Thalassemia in Thailand: A Population-Based Study in 2010

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Background: *Thalassemia is a common genetic disease in Thailand. However, current data on the impact and disease burden of thalassemia in Thailand remains limited.*
Objective: *To determine the admission rate, OPD visit rate, mortality rate, hospital cost, length of hospital stay, blood transfusion rate and major complications rate in patients with thalassemia.*
Material and Method: *The present study analyzed the data of inpatients and outpatients with a diagnosis of thalssemia according to ICD 10 coded D56, D56.0, D56.1, D56.2, D56.3, D56.4, D56.8 and D56.9 which came from nationwide health financing schemes in the fiscal year 2010.*
Results: *The overall admission rate and OPD visit rate were 154 and 562 per 100,000 populations and higher in children and adolescents. The overall mortality rate was 1.13 per 100,000 populations. The total healthcare cost was 744,998,997 Baht or US$ 23,486,727 per year. Blood transfusion rate was significantly higher among children and adolescents. The thalassemia-related complications commonly occurred at the second and the third decades of life.*
Conclusion: *The admission rate, OPD visit rate, blood transfusion rate were higher among children and adolescents. The total healthcare cost was high which was nearly 745 million Baht per year. The hospital cost, length of stay and major complications were increased with age.*

Keywords: *Thalassemia, Disease burden, Population-based study*

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Thalassemia is a common genetic disease worldwide, caused by mutations of the globin genes that result in anemia. Thalassemia is frequently found in Africa, Mediterranean, India and Southeastern Asia areas[1]. In the Southeast Asian countries including Thailand, the prevalence of α-thalassemia varied from 1-40%, β-thalassemia ranged from 0-11% and 0-70% for hemoglobin E. Particularly in northeastern Thailand, the prevalence of hemoglobin E is approximately 50%[1,2]. Previous studies have shown the economic burden of thalassemia in many countries including Thailand, United Kingdom, Taiwan, Myanmar and Sri Lanka[3-6]. The health burden, treatment and the consequence of thalassemia in the context of admission rate, OPD visit rate, mortality rate, length of hospital stay, hospital cost, rate of blood transfusion and rate of thalassemia-related complications in Thailand remains unclear.

The present research therefore studied the current status of the impact and the disease burden of thalassemia in Thailand.

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Objective

The primary objective was to determine the admission rate, mortality rate, length of hospital stay and hospital charge. The secondary objective was to investigate the rate of blood transfusion and the rate of thalassemia-related complications.

Material and Method

Patient population

This is a cross-sectional study. Data included inpatients and outpatients who appeared in the Medical Expensing Forms for the fiscal year 2010 (from October 1, 2009 to September 30, 2010) collected from nationwide Thailand healthcare databases including 1) the National Health Security Office (NHSO), 2) the Civil Servants

Benefit System from the Comptroller General's Department and 3) the Social Security Office. Data received by the analyst team was checked for the accuracy by looking for (a) overlapping information (b) visit dates (c) missing items (d) incorrect coding and (e) dating with the correct fiscal year.

Patients were classified into 9 age groups as follows: < 11, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80 and > 80 years.

Patient identification

The diagnosis of thalassemia was according to the ICD-10 coded D56.0 (6.9%), D56.1 (30.9%), D56.2 (0.3%), D56.3 (6.6%), D56.4 (0%), D56.8 (0.9%) and D56.9 (54.4%) from both primary and secondary diagnosis.

Blood transfusion

Blood transfusion was identified by the ICD 9-CM code 99.04 (transfusion of packed cell).

Thalassemia-related complications

Thalassemia-related complications were identified in thalassemia patients by the coexistence of the ICD 10 codes as follows: heart failure (I50, I50.0, I50.1, I50.9), pulmonary hypertension (I27.0, I27.2, I27.8, I27.9, I28.8), cholelithiasis (K80, K80.0, K80.1, K80.2, K80.3, K80.4, K80.5, K80.8) hypothyroidism (E03.1, E03.2, E03.8, E03.9) and spinal cord compression (G95.0, G95.2, G95.8, G95.9).

Outcome measures

The present study outcomes were the admission rate and OPD visit rate, in-hospital mortality rate per 100,000 populations in the same age groups given above. In addition, the length of hospital stays in days and hospital costs in Baht, blood transfusion rate and thalassemia-related complication rate per 1,000 admissions were analyzed.

Statistical analysis

The data were analyzed using the SPSS program version 16 and verified before final analysis. After a primary analysis of the data, the research team passed the primary analysis data to ten medical specialists in order to check the validity of the information. Upon confirmation of validity, the data were compared to the Ministry of Public Health's Statistics Report 2010 for trend congruence as well as the hospital's mortality reporting for each age and disease group for comparison with the national Death Registration of the Registry Administration, Ministry of Interior Affairs[7].

Ethics approval was provided by the Ethics Committee, Faculty of Medicine, Khon Kaen University.

Results

Admission rate and OPD visit rate

The total admissions and OPD visits were 96,289 and 350,850 times per year. The admission rates and OPD visit rates of the each age group are shown in Fig. 1. The overall admission rates and OPD visit rates were 154 and 562 per 100,000 populations. The OPD visit rate was higher than the admission rate in all age groups. Both the admission and the OPD visit rates were significantly higher in children and adolescents than older adults (Fig. 1).

Mortality rate

The total in-hospital deaths were 708 cases per year. The in-hospital mortality rates increased significantly with age (Fig. 2). The overall mortality rate was 1.13 per 100,000 population.

Hospital cost and the length of hospital stay

The total hospital cost for thalassemia patients in Thailand was 744,998,997 Baht or US $ 23,486,727 at the rate of 31.72 Baht per US $1 (2010 exchange rate)[8] per year with an average hospital cost of 7,555 Baht or US $ 238 per admission. The total length of hospital stays were 260,338 days per year with an average of 2.7 days per admission. The mean hospital cost (Fig. 3) and the length of hospital stay (Fig. 4) increased with age. Patients in the age groups of 31-40 and 41-50 years were higher than those in the younger or older groups.

Blood transfusion rate

The blood transfusion rate was significantly higher in the patients of the age groups of < 11 and 11-20 years old than in any other age groups (Fig. 5).

Thalassemia-related complications rates

Summary of the major complication rates in thalassemia are shown in Fig. 6. Among 5 major complications, heart failure was the highest at every age groups.

I. Heart failure; heart failure was a common complication in thalassemia. It was found in 11.99 per 1,000 admissions and significantly increased with age.

II. Cholelithiasis; the rate of cholelithiasis was 5.67 per 1,000 admissions, which showed an obvious upward trend from the age of 11-20 years old and is

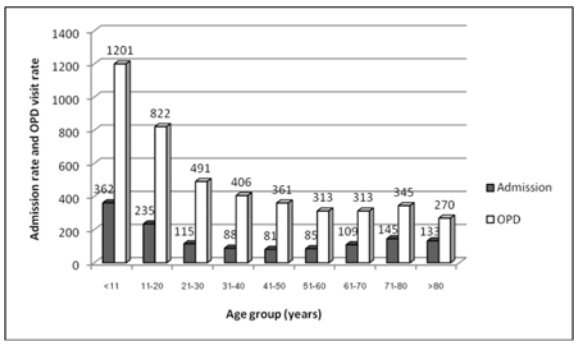

Fig. 1 Admission rate and OPD visit rate per 100,000 population by age group in 2010

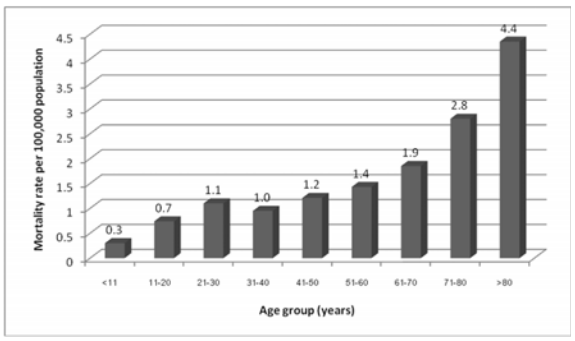

Fig. 2 In-hospital mortality rate per 100,000 population by age group in 2010

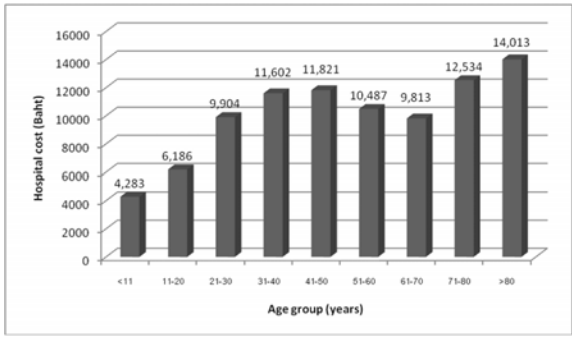

Fig. 3 Mean of hospital cost (Baht) in thalassemia by age group in 2010

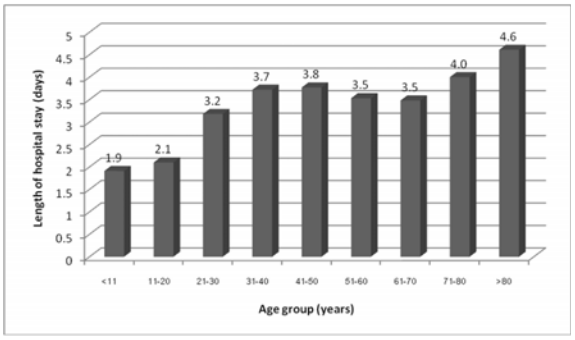

Fig. 4 Mean of length of hospital stay (days) in thalassemia by age group in 2010

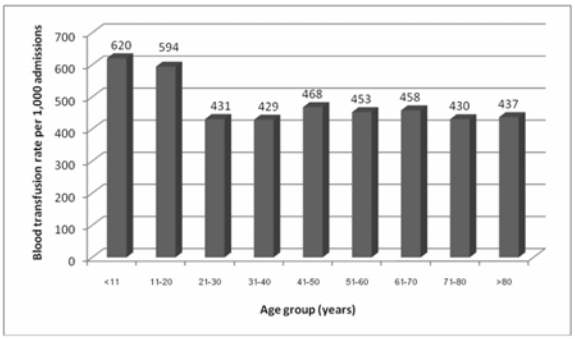

Fig. 5 Blood transfusion rate per 1,000 admissions in thalassemia by age group in 2010

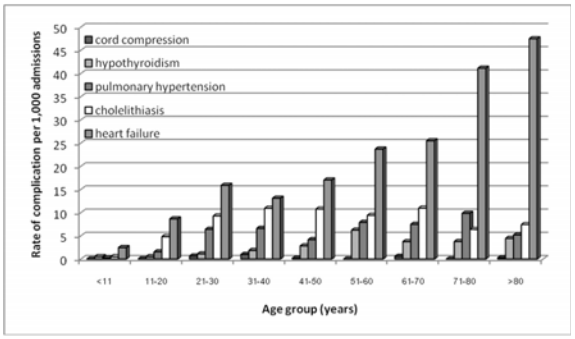

Fig. 6 The rate of major complication per 1,000 admissions in thalassemia by age group in 2010

more common in middle-aged patients.

III. Pulmonary hypertension; the rate of pulmonary hypertension was 3.37 per 1,000 admissions, and increased significantly at the age of 21-30 years.

IV. Hypothyroidism; hypothyroidism was found in 1.56 per 1,000 admissions and higher in the elderly.

V. Spinal cord compression; spinal cord compression was rather rare, and was found in 0.25 per 1,000 admissions. In thalassemia spinal cord compression may imply extramedullary hematopoiesis. The rate of spinal cord compression was high among patients whose ages were 21-40 years old.

Discussion

The OPD visit rates were higher than admission rates in all age groups, suggesting that the majority of thalassemia patients in Thailand were treated

as outpatients. The OPD visit rates and the admission rates were significantly higher among children and adolescents. However, the mean hospital cost was lower and the mean hospital stay was shorter among children and adolescents when compared to the older adult groups. This apparent discrepancy may be explained as follows; most children and young adults with thalassemia were admitted to the hospital for blood transfusion, whereas the older adults were admitted mainly for complications which resulted in higher hospital costs and longer hospital stays. Support for this, blood transfusion rate was significantly higher in children and adolescents. The mean hospital cost and the length of hospital stays were significantly higher among patients in the age groups of 31-40 and 41-50 years compared to the younger age groups. This finding may be because the incidence of disease-related major complications were highest in these age groups, particularly in those patients with thalassemia major and thalassemia intermedia. In terms of the disease-related complications in thalassemia, the inadequate blood transfusion should be considered. Previous studies have shown that many thalassemia-related complications, for instance, heart failure, thrombosis, cholelithiasis, leg ulcers, pulmonary hypertension and spinal cord extramedullary hematopoiesis, were caused by inadequate blood transfusion[9-12]. Moreover, adequate blood transfusions could reverse some of these complications[13,14]. Thus, clinicians therefore should pay more attention to avoid inadequate blood transfusions in older adults to prevent the thalassemia-realated major complications.

At present, iron chelating drugs are widely used for the treatment of thalassemia-associated transfusion complications (iron-excess) and there is a local iron chelator in Thailand (GPOL1; Deferiprone) to which patients in all healthcare financing schemes have access. On the other hand, an increase in blood transfusions may lead to an increase in economic burden and medical resource utilization. Therefore, the best management for thalassemia is the prevention of new cases. In Israel, the cost-benefit of the nationwide screening program for thalassemia was evaluated and the results revealed that the cost benefit ratio of the screening program to the healthcare cost was 4.2:1[15]. The economic burden of thalassemia has been reported from various countries. In the United Kingdom[5] and Israel[15] a lifetime cost for β-thalassemia major was reported to □803,002 and USS 284,154. A study in Myanmar showed an annual cost was Kyats 1,108.6-1,208.7 per person and the median (range) cost per treatment visit was Kyats 21 (0-302)[3]. A recent study on the financial burden of thalassemia in Thailand showed that an average annual cost was USS 950 which included direct medical, non-medical and indirect costs[6]. The present study cannot demonstrate the annual healthcare cost per patients, but only the cost per admission was calculated due to the limitation of the available information from the database. Still, as shown in the results, the total healthcare cost for thalassemia per year was very high which was almost 745 million Baht or USS 23.5 million. These figures show that the financial burden of thalassemia is enormous in Thailand.

The thalassemia-related complications, particularly heart failure, increased with age. Cholelithiasis were found at the age of 11-20 years. Pulmonary hypertension and spinal cord compression frequently occur at the third decade of life. The finding of the present study is comparable to that previously reported by Taher A et al[16], in that the incidence of heart failure and hypothyroidism were high in patients older than 32 years. Spinal cord extramedullary hematopoiesis and pulmonary hypertension can occur at the age of 11-20 years, with the highest incidence in the third decades of life. Cholelithiasis can be found from the second decades of life onward[16].

Limitations

There are some limitations of the present study. Firstly, it was not possible to analyze thalassemia by type because the diagnosis of thalassemia was based on ICD-10 codes in which most of coding were thalassemia unspecified. The present study reported the overview of all types of thalassemia. Secondly, major complications were based on ICD-10 codes, hence there is a possibility of wrong diagnosis or wrong coding. Thirdly, blood transfusions in the present study were based on the ICD-9 CM code, hence there is the potential for under or over coding. The data, however, were randomly verified before final analysis. The results of the present study need to be interpreted in the context of its limitations.

Conclusion

The OPD visit rates were higher than admission rate, and higher in children and adolescents. Mortality rates were increased with age. Healthcare costs totaled almost 745 million Baht or USS 23.5 million per year which demonstrated the economic burden of thalassemia in Thailand. An average hospital cost and the length of hospital stay were higher in older adults.

The blood transfusion rates were significantly higher among children and adolescents which may be due to a high transfusion regimen. The major complications increased with age and commonly occurred at the second and the third decades of life.

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Potential conflicts of interest

None.

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ผลกระทบและภาระของโรคธาลัสซีเมียในประเทศไทย: การศึกษาในประชากรปี พ.ศ. 2553

ณัฐติยา เตียวตระกูล, กาญจนา จันทร์สูง, จิตติมา ศิริจีระชัย, ชินดล วานิชพงษ์พันธ์, แก้วใจ เทพสุธรรมรัตน์

ภูมิหลัง: *ธาลัสซีเมียเป็นโรคทางพันธุกรรมที่พบได้บ่อยในประเทศไทยอย่างไรก็ตาม ปัจจุบันข้อมูลด้านผลกระทบและภาระของโรคธาลัสซีเมียในประเทศไทยยังมีค่อนข้างจำกัด*

วัตถุประสงค์: *เพื่อทราบอัตราการนอนโรงพยาบาล อัตราการมาตรวจแผนกผู้ป่วยนอก อัตราการเสียชีวิต ค่าใช้จ่ายในโรงพยาบาล ระยะเวลาในการนอนโรงพยาบาล อัตราการรับเลือดและอัตราของภาวะแทรกซ้อนที่สำคัญในผู้ป่วยธาลัสซีเมีย*

วัสดุและวิธีการ: *ผู้นิพนธ์ได้ทำการวิเคราะห์ข้อมูลในผู้ป่วยในและผู้ป่วยนอกที่ได้รับการวินิจฉัยโรคธาลัสซีเมียตามรหัส ICD 10 คือ D56, D56.0, D56.1, D56.2, D56.3, D56.4, D56.8 และ D56.9 ที่ได้จากระบบประกันสุขภาพทั่วประเทศในปี พ.ศ. 2553*

ผลการศึกษา: *อัตราการนอนโรงพยาบาลและอัตราการมาตรวจแผนกผู้ป่วยนอกรวมเท่ากับ 154 และ 562 ต่อประชากร 100,000 คน ตามลำดับและสูงในเด็กและวัยรุ่น อัตราการเสียชีวิตรวมเท่ากับ 1.13 ต่อประชากร 100,000 คน ค่ารักษาพยาบาลรวมคือ 744,998,997 บาท หรือ 23,486,727 เหรียญสหรัฐต่อปี อัตราการรับเลือดสูงในเด็กและวัยรุ่นอย่างมีนัยสำคัญ ภาวะแทรกซ้อนที่สัมพันธ์กับธาลัสซีเมียเกิดได้บ่อยในช่วงทศวรรษที่สองและสามของชีวิต*

สรุป: *อัตราการนอนโรงพยาบาล อัตราการมาตรวจแผนกผู้ป่วยนอกและอัตราการรับเลือดสูงในเด็กและวัยรุ่น ค่ารักษาพยาบาลรวมสูงเกือบ 745 ล้านบาทต่อปี ค่าใช้จ่ายในโรงพยาบาล ระยะเวลาในการนอนโรงพยาบาลและภาวะแทรกซ้อนที่สัมพันธ์กับธาลัสซีเมียสูงขึ้นตามอายุ*