Original article

Natural history of untreated adult Immune Thrombocytopenia (ITP)

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Abstract:

Background: *International guidelines recommend that patients with Immune thrombocytopenia (ITP) presenting platelets > 30 x10^9/L should be followed-up without treatment. However, data on clinical courses and risk factors are limited.* ***Objective:*** *To determine the natural history and prognostic factors of untreated ITP.* ***Materials and Methods:*** *This retrospective cohort included adult ITP patients (platelet count 30-149 x10^9/L) at King Chulalongkorn Memorial Hospital from January 2015 to October 2022. Treatments were provided only to patients with platelet counts < 30 x10^9/L and/or major bleeding.* ***Results:*** *A total of 73 patients were included. The mean age was 62±16.64 years, and 56% were female. The median follow-up time was 3 years, comprising 272.48 patient-years. Seventeen patients (23.3%) subsequently required treatments, with an incidence rate of 6.24% per year [95% Confidence interval (CI), 3.88-10.0%]. In multivariate analysis, risk factors for requiring treatment were age < 35 years [adjusted hazard ratio (aHR) 3.93; 95%CI: 1.27-12.22, p = 0.018) and a maximum-minimum platelet count during follow-up (excluding counts at treatment initiation) ≥ 70 x10^9/L (aHR 2.89; 95%CI: 1.02-8.23, p = 0.047). Baseline platelet count did not predict outcomes, but persistently maintaining platelet counts > 100 x10^9/L for more than 3 or 6 months was associated with better prognosis. No severe bleeding related to thrombocytopenia was observed. The spontaneous recovery rate was 10% with an incidence of 2.57% per year (95%CI: 1.22-5.93%).*
Conclusions: *The majority of untreated ITP patients had a good prognosis. Adverse risk factors included younger age and wide fluctuations in platelet counts.*

Keywords : ● *Immune thrombocytopenia* ● *ITP* ● *Natural course* ● *Prognostic factors* ● *Untreated ITP*

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นิพนธ์ต้นฉบับ

ธรรมชาติวิทยาของผู้ป่วยโรคเกล็ดเลือดต่ำจากภูมิคุ้มกันทำลายเกล็ดเลือดแบบปฐมภูมิในผู้ใหญ่ (Immune Thrombocytopenia: ITP) ที่ไม่ได้รับการรักษาด้วยยา

ณิชา แซ่จัง และ พลภัทร โรจน์นครินทร์

ศูนย์ความเป็นเลิศด้านโลหิตวิทยา ภาควิชาอายุรศาสตร์ คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย และ โรงพยาบาลจุฬาลงกรณ์ สภากาชาดไทย

บทคัดย่อ

บทนำ *แนวทางสากลแนะนำเกี่ยวกับผู้ป่วยโรคเกล็ดเลือดต่ำจากภูมิคุ้มกันทำลายเกล็ดเลือดแบบปฐมภูมิที่มีเกล็ดเลือดมากกว่า 30 x10^9/ลิตร ควรได้รับการติดตามโดยยังไม่ต้องให้การรักษาด้วยยา แต่อย่างไรก็ตาม ข้อมูลในปัจจุบันเกี่ยวกับการดำเนินโรคและปัจจัยเสี่ยงที่จะพยากรณ์โรคยังมีจำกัด* ***วัตถุประสงค์*** *เพื่อศึกษาธรรมชาติของโรคและปัจจัยพยากรณ์โรคของโรคเกล็ดเลือดต่ำจากภูมิคุ้มกันทำลายเกล็ดเลือดแบบปฐมภูมิที่ไม่ได้รับการรักษาด้วยยา* ***วิธีการศึกษา*** *การศึกษาแบบย้อนหลังในผู้ป่วยโรคเกล็ดเลือดต่ำจากภูมิคุ้มกันทำลายเกล็ดเลือดแบบปฐมภูมิ (จำนวนเกล็ดเลือด 30-149 x10^9/ลิตร) ที่โรงพยาบาลจุฬาลงกรณ์ ตั้งแต่เดือนมกราคม พ.ศ. 2558 ถึงตุลาคม พ.ศ. 2565 ผู้ป่วยจะได้รับการรักษาด้วยยาเมื่อจำนวนเกล็ดเลือดน้อยกว่า 30 x10^9/ลิตร และ/หรือ มีเลือดออกชนิดรุนแรง* ***ผลการศึกษา*** *มีผู้ป่วยทั้งหมด 73 ราย อายุเฉลี่ย 62±16.64 ปี เป็นเพศหญิงร้อยละ 56 ค่ามัธยฐานของระยะเวลาติดตามผู้ป่วย 3 ปี รวมระยะเวลา 272.48 ผู้ป่วย-ปี (patient-years) พบว่าผู้ป่วย 17 ราย (23.3%) จำเป็นต้องได้รับการรักษาด้วยยาในภายหลัง คิดเป็นอุบัติการณ์ 6.24%/ปี (ช่วงความเชื่อมั่น 95%CI: 3.88-10.0%) การวิเคราะห์พหุตัวแปรพบปัจจัยเสี่ยงต่อการเกิดเหตุการณ์ดังกล่าว ได้แก่ อายุ < 35 ปี [adjusted Hazard ratio (aHR) 3.93; 95%CI: 1.27-12.22, p = 0.018) และความแตกต่างระหว่างจำนวนเกล็ดเลือดสูงสุด-ต่ำสุดระหว่างการติดตาม (ไม่รวมค่าเกล็ดเลือดที่ต่ำจนต้องให้การรักษา) ≥ 70 x10^9/ลิตร (aHR 2.89; 95%CI: 1.02-8.23, p = 0.047) จำนวนเกล็ดเลือดตั้งต้นไม่ได้ทำนายผลลัพธ์ แต่การมีเกล็ดเลือดมากกว่า 100 x10^9/ลิตร ต่อเนื่องมากกว่า 3 หรือ 6 เดือน แสดงพยากรณ์โรคที่ดีกว่าอย่างมีนัยสำคัญ ไม่พบผู้ป่วยที่มีเลือดออกรุนแรงจากภาวะเกล็ดเลือดต่ำ อัตราการฟื้นตัวเองของโรคอยู่ที่ร้อยละ 10 หรือคิดเป็นอุบัติการณ์ร้อยละ 2.57/ปี (95%CI: 1.22-5.93%)* ***สรุป*** *ผู้ป่วยโรคเกล็ดเลือดต่ำจากภูมิคุ้มกันทำลายเกล็ดเลือดแบบปฐมภูมิที่ไม่ได้รับการรักษาด้วยยา ส่วนใหญ่มีพยากรณ์โรคที่ดี ปัจจัยพยากรณ์โรคที่ไม่ดี ได้แก่ อายุที่น้อย และความแกว่งของจำนวนเกล็ดเลือดที่มาก*

คำสำคัญ : ● *โรคเกล็ดเลือดต่ำจากภูมิคุ้มกันทำลายเกล็ดเลือดแบบปฐมภูมิ* ● *ธรรมชาติวิทยา* ● *ปัจจัยพยากรณ์โรค*
● *โรคเกล็ดเลือดต่ำจากภูมิคุ้มกันทำลายเกล็ดเลือดแบบปฐมภูมิที่ไม่ได้รับการรักษาด้วยยา*

วารสารโลหิตวิทยาและเวชศาสตร์บริการโลหิต. 2569;36:125-34.

Introduction and Objective

Immune thrombocytopenia (ITP) is a common autoimmune disease diagnosed by isolated thrombocytopenia after exclusion of other causes.[1] The pathophysiology is complex and involves autoantibodies produced by B cells, that bind to platelets and megakaryocytes, leading to platelet destruction by phagocytic cells and impaired platelet production, as well as abnormalities in cellular immunity.[2,3]

Adult ITP shows a bimodal age distribution: individual aged 20-30 years, with a predominance in females, and those over 60 years, with equal sex distribution.[4] The natural course and clinical manifestations of ITP are variable, ranging from mild skin and mucosal bleeding to massive exsanguination and life-threatening intracranial hemorrhage.[5,6] A platelet count above 30 $x10^9$/L rarely causes significant bleeding, whereas a count below 10 $x10^9$/L is often associated with clinical bleeding.[5,6] However, some ITP patients with severe thrombocytopenia may remain completely asymptomatic.[6]

The American Society of Hematology (ASH) 2019 guidelines recommend observation without medication for patients with platelet counts > 30 $x10^9$/L.[7] This recommendation aims to balance the risk of bleeding against the adverse effects of therapy, mainly corticosteroids.[5] Nevertheless, patients with thrombocytopenia who are managed with watchful waiting may experience fatigue, anxiety about bleeding, activity limitations and reduced productivity, all of which can impair health-related quality of life (HR-QOL).[8,9]

To date, relatively little information is available regarding the proportion of untreated ITP patients who later require treatments or who recover spontaneously. In addition, risk factors that predict subsequent severe thrombocytopenia need to be identified. Understanding the natural courses of untreated ITP would provide valuable information for both physicians and patients and may reduce the emotional distress among affected individuals.

Materials and Methods

Study Population

This study is a retrospective cohort of untreated adult patients with primary ITP. Patients were diagnosed based on a platelet count below 150 $x10^9$/L and exclusion of all other causes of thrombocytopenia using blood smear and/or bone marrow studies, as well as other clinical and laboratory investigations. They were followed up at the Hematology Unit of King Chulalongkorn Memorial Hospital, Thailand, from January 2015 to October 2022.

The ITP diagnostic criterion was modified from the ASH 2019 recommendation by using a platelet count threshold of < 150 $x10^9$/L to investigate the natural history of cases with platelet counts of 100-150 $x10^9$/L. The clinical course of this subgroup has not been clearly defined among Thai patients.

The inclusion criterion was untreated ITP patients aged at least 15 years. Exclusion criteria included patients with secondary causes of thrombocytopenia, such as 1) infections [e.g., hepatitis C virus (HCV), human-Immunodeficiency virus (HIV) or *Helicobacter pylori*), 2) hematologic or solid malignancy, 3) autoimmune diseases [e.g., systemic lupus erythematosus (SLE), rheumatoid arthritis (RA) or antiphospholipid syndrome (APS)], and 4) drug-induced immune thrombocytopenia (i.e., used of medications reported to be associated with thrombocytopenia, with timing compatible with its onset). Patients with comorbidities requiring antiplatelet and/or anticoagulant therapy that could increase bleeding risk, as well as those using herbal medicine during follow-up were also excluded.

This retrospective, chart-review study involving human participants complied with the ethical standards of the institutional and national research committees and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The Institutional Review Board of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand (IRB number 454/64), approved this study. Informed consent was waived according to the institution's IRB review.

Data Collection

Patient data were collected from systematically searched medical records, including sex, age at diagnosis, occupation, weight, height, body mass index (BMI), comorbidities, current medications, herbal medicine use (duration and dose), history of medical illnesses during follow-up, bleeding events (assessed by clinicians) and WHO bleeding scores (minor and major bleeding events were defined by modified WHO bleeding scores of 0-1 and 2-4 respectively).[10] Disease-related factors collected included duration of ITP (defined as the time from diagnosis by a hematologist until the last follow-up, the end of the study or the development of secondary causes of thrombocytopenia, whichever occurred first), complete blood count (CBC) at diagnosis, renal/liver function tests, viral serology, peripheral blood smear results, bone marrow findings (if available), CBC at the time physicians decided to initiate treatment, precipitating factors related to platelet drops (if any), final platelet counts at the last follow-up/end of the study and identification of the secondary causes of thrombocytopenia.

Research questions

The primary research question was the proportion of untreated ITP patients who later required treatment due to bleeding and/or platelet counts below 30 $x10^9$/L. Secondary research questions included identifying risk factors for treatment requirement and determining the proportion of untreated ITP patients who spontaneously recovered. The outcomes of participants lost to follow-up were recorded as their last known status.

Variables

Age at diagnosis, sex and baseline platelet count were selected as predictive variables based on previous studies.[11,12] Platelet count fluctuation was included as a potential risk factor based on our clinical observations.

Statistical analysis

Based on the previously reported proportion of 15%[13] and 8% precision, the calculated sample size for this study was 77. Statistical analysis was performed using STATA 18. Descriptive statistics were used to describe proportion. Kaplan-Meier curves, log rank tests and proportional hazards regression (Cox regression) were used for risk factor analysis. Multivariate analysis was performed to confirm the significance of precipitating risk factors and to control for confounding factors. A p-values ≤ 0.05 was considered statistically significant.

Results

A total of 10,633 patients were identified through a search of ICD-10 codes for idiopathic thrombocytopenic purpura, other primary thrombocytopenia and thrombocytopenia, unspecified in the King Chulalongkorn Memorial Hospital database from January 2015 to October 2022. Seventy-three individuals were adult, untreated ITP patients who met the enrollment criteria.

Baseline characteristics are summarized in Table 1. The mean age at diagnosis was 62±16.6 years, ranging from 22-92 years. Forty subjects (56%) were female. The initial mean hemoglobin (Hb), white blood cell (WBC) count and platelet count were 13.2±1.8 g/dL, 6.1±1.7 $x10^9$/L and 92.4±30.9 $x10^9$/L, respectively. The median follow-up time was three years, with a total of 272.5 patient-years. Fifteen patients underwent bone marrow studies, all of which were compatible with ITP and showed no significant dysplasia. Bone marrow examination was not performed in 58 patients. MDS and autoimmune diseases were excluded based on negative histories, negative physical examinations and normal blood smear except for isolated thrombocytopenia.

The proportion of ITP patients who subsequently required treatment was 23.3% (17/73). The incidence rate was 6.2% per year (95%CI: 3.9-10%), as shown in Figure 1A. No identifiable precipitating factors related to platelet drops–such as medication, herbal medicine or infection–were observed before treatment requirement. Among the 17 patients requiring treatment, 70.9% required therapy within five years of diagnosis.

A post-hoc analysis was conducted to identify risk factors associated with treatment requirement. Significant factors included age < 35 years (aHR 3.9; 95%CI:

Table 1. Characteristics of ITP Patients Categorized by Natural History

	Total patients (n = 73)	Spontaneous recovery (n = 7)	No treatment required (n = 49)	Treatment required (n = 17)	*p* values*
Mean age at diagnosis (years) (SD)	62.1 (16.6)	58.0 (17.4)	65.6 (14.8)	53.8 (18.8)	0.029
Female (%)	41 (56.2%)	6 (85.7%)	23 (46.9%)	12 (70.6%)	0.060
Mean BMI (kg/m^2) (SD)	24.6 (4)	25.9 (3.7)	24.2 (3.9)	25.3 (4.3)	0.430
Comorbidities (%), e.g., DM, HT, DLP and CKD	53 (72.6%)	4 (57.1%)	39 (79.6%)	10 (58.8%)	0.160
Mean baseline Hb (g/dL) (SD)	13.2 (1.8)	12.9 (0.4)	13.2 (1.9)	13.4 (1.7)	0.807
Mean baseline WBC count (x10^9/L) (SD)	6.1 (1.7)	6.5 (1.9)	5.7 (1.6)	7.1 (1.7)	0.017
Mean baseline platelet count (x10^9/L) (SD)	92.4 (30.9)	69.4 (42.6)	98.9 (26.1)	83.2 (33)	0.020
Platelet count > 100 x 10^9/L for ≥ 3 months (%)	43 (58.9%)	4 (57.1%)	36 (73.5%)	3 (17.6%)	< 0.001
Platelet count > 100 x 10^9/L for ≥ 6 months (%)	39 (53.4%)	4 (57.1%)	33 (67.3%)	2 (11.8%)	< 0.001
Bleeding Event (%)					
● Major bleeding	2 (2.7%)	0 (0%)	1 (2%) **	1 (5.9%)	1.000
● Minor bleeding	9 (12.3%)	1 (14.3%)	4 (8.2%)	4 (23.5%)	0.368

Continuous data are expressed as means (Standard deviation), BMI, Body mass index; DM, Diabetes mellitus; DLP, Dyslipidemia; CKD, Chronic kidney disease

*p-values in the three groups: spontaneous recovery, no treatment required, treatment required

**One major bleeding event in the no treatment required group was due to traumatic bilateral subdural hematoma (SDH) after car accident (while platelet count 137 x10^9/L)

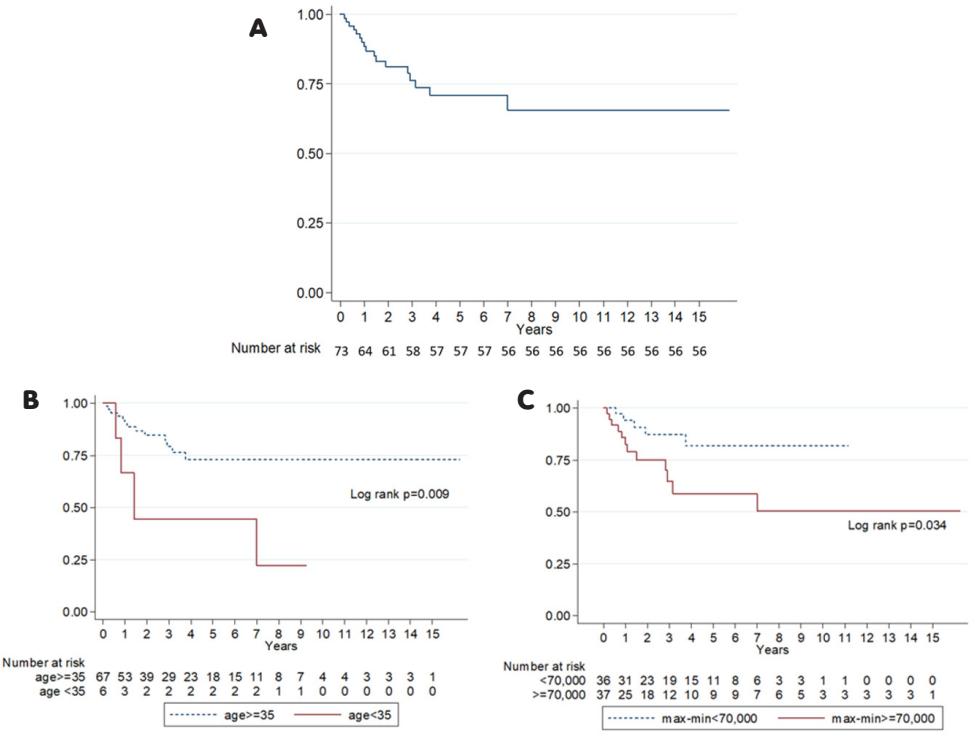


Figure 1 Treatment-free survival of untreated adult ITP A) Total patients, B) Stratification by age groups, C) Stratification by the differences between maximum and minimum platelet counts during follow-up

1.3-12.2; $p = 0.018$), as shown in Figure 1B, and variation in platelet counts ≥ 70 x10^9/L (aHR 2.9; 95%CI: 1.0-8.2; $p = 0.047$), as shown in Figure 1C. In the study population, the incidence of treatment requirement was 66.7% (4/6) among patients aged < 35 years, compared to 19.4% (13/67) in those aged ≥ 35 years. For platelet count variation, the incidence was 32.4% (12/37) among patients with variation ≥ 70 x10^9/L and 13.9% (5/36) among those with variation < 70 x10^9/L.

A baseline platelet count < 100 x10^9/L during follow-up, showed a trend toward association with poor outcomes (Table 2), although statistical significance was not reached. Among 33 patients with baseline platelet counts > 100 x 10^9/L, 11.8% later required treatment. Platelet counts persistently > 100 x10^9/L for at least three and six months during follow-up were significantly associated with favorable outcomes (Table 2). Conversely, ITP duration and underlying cormobidities (diabetes mellitus, hypertension and/or dyslipidemia) were not associated with outcomes. Figure 2 illustrates platelet count trends in the cohort: patients, who ultimately needed treatments showed decreasing platelet counts, whereas counts remained stable in others.

The proportion of untreated ITP patients who spontaneously recovered was 10% (7/73), with an incidence rate of 2.6% per year (95%CI: 1.2-5.9%). Most spontaneous recoveries occurred within five years (Figure 3). No significant factor associated with spontaneous recovery was identifiede (Table 3). No patient developed secondary causes of ITP during follow-up.

Table 2. Risk factors associated with treatment requirement among untreated ITP patients

	Univariate Analysis				Multivariate Analysis			
	HR	**95%CI**		***p*-value**	**Adjusted HR**	**95%CI**		***p*-value**
Male	0.5	0.2	1.5	0.242				
Age at diagnosis < 35 years	4	1.3	12.5	0.016	3.9	1.3	12.2	0.018
Duration of ITP (years)	1	0.9	1.1	0.827				
Platelet counts								
- Baseline < 100 x10^9/L	2.9	0.9	8.9	0.063				
- Over 100 x10^9/L ≥ 3 months	0.1	0	0.5	0.001				
- Over 100 x10^9/L ≥ 6 months	0.1	0	0.4	0.002				
- Max-Min ≥ 70 x10^9/L	2.9	1	8.4	0.044	2.9	1	8.2	0.047

HR, hazard ratio; 95%CI, 95% Confidence Interval; Max-Min: Differences between the maximum and minimum platelet counts during follow-up excluding the counts that required treatment

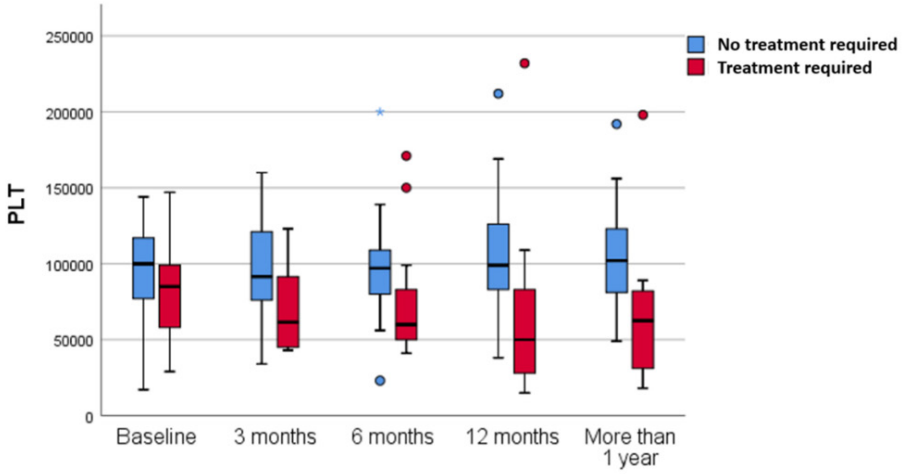


Figure 2 Trends of platelet counts of patients with no treatment required (blue) versus treatment required (red) during follow-up

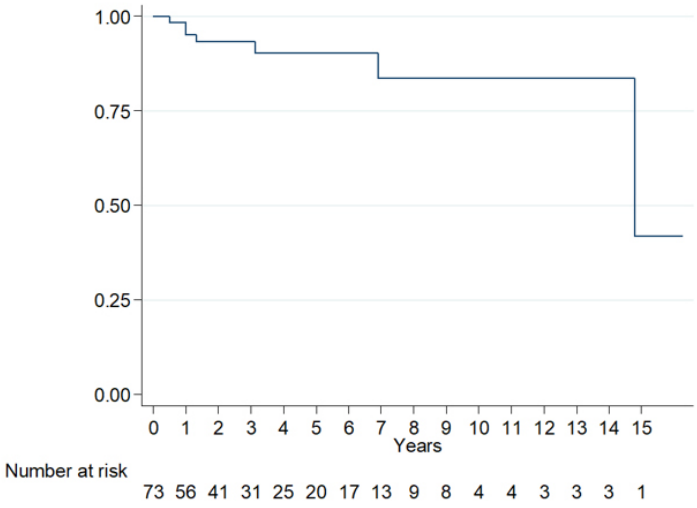


Figure 3 Spontaneous recovery of untreated ITP patients during follow-up

Table 3 Risk factors associated with spontaneous recovery in untreated ITP patients

	Univariate Analysis			
	HR	**95%CI**		***p*-value**
Male	0.3	0	2.4	0.242
Age at diagnosis < 35 years	0	0	26673	0.644
Duration of ITP (years)	1	0.8	1.2	0.678
Diabetes mellitus	1.3	0.2	7	0.778
Essential hypertension	1.4	0.3	7.1	0.662
Dyslipidemia	0.8	0.1	4.2	0.756
Platelet counts				
- Baseline < 100 x10^9/L	2.2	0.4	11.4	0.345
- Over 100 x10^9/L ≥ 3 months	0.9	0.2	4.2	0.925
- Over 100 x10^9/L ≥ 6 months	1.2	0.3	5.2	0.846
- Max-Min ≥ 70 x10^9/L	77.1	0.1	57,583.2	0.918

Bleeding events were assessed and recorded at each outpatient visit by hematologists and hematology fellows. Only two major bleeding events (2.7%) were documented: post-traumatic chronic bilateral subdural hematoma (WHO bleeding score 4) and lower gastrointestinal bleeding from colonic polyp (WHO bleeding score 2). Minor bleeding events (WHO bleeding score 1) totaled nine (12.3%) and included gingival bleeding, petechiae, purpura, small ecchymoses and hypermenorrhea. The patient with chronic bilateral subdural hematoma had a platelet count of 137 x10^9/L at the time of a car accident and did not require ITP-directed treatment.

A total of five deaths occurred in the group that did not require treatment; no deaths occurred in the spontaneous recovery group or the treatment-requirement group. All deaths were due to bacterial or COVID-19 pneumonia and were unrelated to ITP or bleeding.

Four participants were lost to follow-up. Their last known statuses before loss to follow-up indicated no treatment requirement.

Discussion

To our knowledge, this is the first study to identify predictive factors for treatment requirements in a cohort of untreated ITP patients. We found that age at diagnosis younger than 35 years was significantly associated with subsequent worsening of platelet counts. This may be due to a more active immune process in younger

individuals and suggests that the clinical course of ITP differs across age groups. Other risk factors were related to variations in platelet levels above 70 $x10^9$/L. Furthermore, platelet counts persistently over 100 $x10^9$/L were protective. To prevent multicollinearity, multivariate analysis including platelet counts persistently over 100 $x10^9$/L at three and six months was not performed. Notably, a platelet count > 100 $x10^9$/L at baseline was not a significant factor, suggesting that follow-up platelet measurements over time play an important role in determining prognosis.

This study revealed that 23.3% of untreated ITP patients subsequently required treatment. Treatment rates reported in previous publications by Bizzoni, et al., Stasi, et al. and Kueh, et al. were 9.8% (11/112),[12] 14.9% (13/87),[13] and 0% (0/5),[14] respectively. The lower percentage in the Bizzoni report may be explained by the older age of the study population, which had a mean age of 71 years. The study by Kueh included only a small number of untreated cases.

In this study, 10% of untreated adult ITP patients experienced spontaneous recovery tended to be younger females with lower baseline platelet counts and higher WBC counts (Table 1). These features may suggest heightened immune activity. For comparison, Stasi et al. reported a spontaneous resolution rate of 22.9% (20/87) rate,[13] whereas no such cases were noted in the studies by Bizzoni and Kueh studies.[12,14]

Our study confirms the safety of a watchful waiting strategy in mildly thrombocytopenic patients, as treatment was not required in the majority and some adults with ITP showed spontaneous recovery. The risk of major bleeding is low, and no bleeding-related mortality was observed.

No secondary cause was later identified in our study. The proportions of ITP patients who subsequently developed secondary causes were 10.9% (11/101),[12] 1.9% (4/208),[13] and 20% (6/30)[14] in the studies by Bizzoni, Stasi and Kueh, respectively. Most of these secondary causes involved autoimmune diseases such as SLE, APS and RA. Furthermore, the Bizzoni study, which included mainly elderly patients, reported several myeloid and other neoplasms, which are more common in aging populations. Another study by Stasi, et al. revealed that 12% of patients with borderline thrombocytopenia (platelet count range 100 $x10^9$/L to 150 $x10^9$/L) developed autoimmune disorders other than ITP during a 10-year follow-up.[15] More recently, Ayad, et al. investigated the long-term risk of developing hematologic neoplasia in patients with mild thrombocytopenia (platelet count range 100 $x10^9$/L to 149 $x10^9$/L). They reported 5-year and 15-year cumulative incidences of hematologic neoplasia of 6.7% and 15.7%, respectively.[16] The hematologic neoplasias in their study included myelodysplastic syndrome, myeloproliferative neoplasm and nonHodgkin lymphoma. Therefore, long term monitoring of patients with ITP is required.

A platelet count < 100 $x10^9$/L as the diagnostic threshold for ITP was used by ASH 2019 guidelines based on expert opinions, as they believed platelet counts of 100 $x10^9$/L or higher were unlikely to decrease further. However, our data suggest that a baseline platelet count of > 100 $x10^9$/L may still progress to ITP requiring treatments. Only persistent platelet counts > 100 $x10^9$/L for three to six months were significantly associated with good prognosis (Table 2). We propose that patients with platelet counts of 100 to < 150 $x10^9$/L at diagnosis should be followed closely.

Our study has limitations, including its retrospective nature and the absence of bone marrow studies among many participants. The cut-off age and platelet variations were derived from post-hoc analyses, limiting the ability to draw definitive conclusions. Nevertheless, this is intended to be a hypothesis-generating study that should be confirmed in a larger prospective investigation in the future.

Conclusion

In summary, adult ITP patients with platelet counts > 30 x10^9/L can be managed expectantly, and spontaneous recovery is possible. Younger age and platelet count trends may help predict treatment requirements.. Larger studies are warranted to verify these findings.

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None

Authors' contribution

Nicha Saejung and Ponlapat Rojnuckarin designed the study. Nicha Saejung acquired the data and analyzed. Nicha Saejung and Ponlapat Rojnuckarin interpreted the data. Nicha Saejung drafted the article. Ponlapat Rojnuckarin revised the intellectual content. Nicha Saejung and Ponlapat Rojnuckarin approved the final version of the manuscript.

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Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Declarations

Ethics approval and consent to participate

This retrospective chart review study involving human participants complied with ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The Institutional Review Board of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand (IRB number 454/64) approved this study. Informed consent was waived according to the institution's IRB review.

Competing interests

The authors declare no competing interests relevant to the content of this article.

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