

Original Article

Evaluating association between idiopathic thrombocytopenic purpura and hypertension

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Abstract: Purpose: The role of platelets in the pathogenesis of hypertension is not well known. The aim of this study was to ascertain if patients with immune thrombocytopenia (ITP) had different rates of hypertension. Materials and methods: Using the Nationwide Inpatient Sample (NIS) database, we analyzed the correlation between hypertension and ITP from the years 2002-2011. Results: We found no significant differences in the rate of hypertension between ITP and Non-ITP patients. For instance, in 2002, 25.90% of patients with ITP had a concurrent diagnosis of hypertension, compared with 26.53% of Non-ITP patients. Then in 2011, 31.95% of patients with ITP had a concurrent diagnosis of hypertension, compared with 32.31% of Non-ITP patients. Conclusion: Based on our large database, the presence of ITP does not appear to be associated with an increased or decreased risk of hypertension.

Keywords: Immune thrombocytopenia, idiopathic thrombocytopenic purpura, ITP, thrombocytopenic, hypertension, elevated blood pressure, auto immune thrombocytopenia

Introduction

Hypertension and platelet aggregation are well known for the roles they play in the pathogenesis of cardiovascular disease [1-13]. There is also data that suggests that a distinct and direct relationship exists between hypertension and platelet aggregation/activation [14, 15]. Potential mechanisms for this association include neurohumoral overactivity, endothelial dysfunction, platelet degranulation and decreased nitric oxide biosynthesis [16].

Interestingly, however, it is not well known if a lowered platelet count, conversely decreases the likelihood of developing hypertension. If this were to be the case, the clinical significance of such a finding would be substantial, particularly in patients with thrombocytopenia secondary to various causes (e.g., autoimmune, decreased platelet production, drug induced). Long-standing hypertension is associated with significant morbidity and is the most prevalent risk factor for premature cardiovascular disease [17]. It can lead to ischemic stroke, intracerebral hemorrhage, chronic kid-

ney disease and end-stage renal disease [13, 18-21].

We hypothesized that patients with a disease characterized by decreased platelet counts, namely idiopathic thrombocytopenic purpura (ITP), may have lower rates of hypertension. As there is a paucity of information in the literature concerning the topic, we chose ITP patients as surrogates for patients with lowered platelet count. Then we conducted a retrospective review using a large database to investigate any correlation between ITP and incidence of hypertension.

Methods

Data collection

For this study, the Nationwide Inpatient Sample (NIS) was utilized to conduct a retrospective review. This is a collection of hospital inpatient databases from the Healthcare Cost and Utilization Project (HCUP). The purpose of the NIS was to create a set of databases from which national trends in healthcare utilization, quality of healthcare and patient outcomes

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Table 1. Prevalence of hypertension in patients with ITP compared with general population over a 10-year period

	ITP	Non-ITP	P-value	Odds Ratio (C.I)
2002	25.90%	26.53%	0.13	0.97 (0.92-1.01)
2003	27.51%	27.92%	0.35	0.98 (0.94-1.02)
2004	27.96%	28.56%	0.16	0.97 (0.93-1.01)
2005	28.49%	29.33%	0.06	0.96 (0.92-1.00)
2006	29.66%	29.92%	0.57	0.99 (0.94-1.03)
2007	30.25%	29.40%	0.06	1.04 (0.99-1.09)
2008	32.04%	30.93%	0.01	1.05 (1.01-1.10)
2009	31.63%	31.23%	0.38	1.02 (0.98-1.06)
2010	30.90%	31.49%	0.17	0.97 (0.94-1.01)
2011	31.95%	32.31%	0.40	0.98 (0.95-1.02)

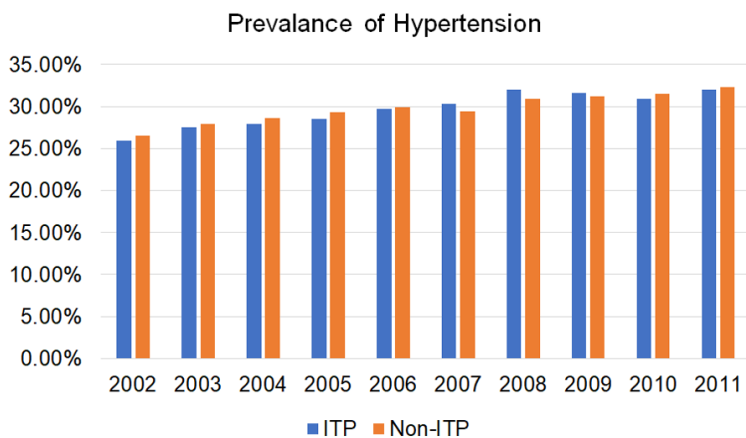


Figure 1. Prevalence of hypertension over a 10-year period in patients with ITP vs without ITP.

could be analyzed. From this database, we evaluated the presence of ITP and hypertension. Additionally, the presence of hypertension in patients with and without splenectomy was evaluated to investigate the association of this procedure with rates of hypertension in the ITP population. The International Classification of Diseases, ninth revision, and Modification (ICD-9-CM) coding was utilized. The following codes were selected: immune thrombocytopenic purpura (287.31) and hypertension (401.9). Data between the years 2002 and 2011 were examined. The NIS database can be found at www.hcup-us.ahrq.gov [22]. Inclusion was all patients who were admitted to the NIS participating hospitals with a primary and secondary diagnosis of ITP. Only inpatient subjects were included. Exclusion was patients with ITP who were not admitted to the participating NIS hospitals. Also patients with ITP who were not

coded as ITP in their discharge diagnosis were excluded.

Statistical analysis

The Statistical Package for Social Sciences (IBM SPSS Statistics 25.0, USA) software was used to perform retrospective univariate and multivariate analyses from 2002 to 2011 using NIS database to evaluate any association between ITP and HTN. For univariate analysis, chi-squared test was done for the ten consecutive years. For multivariate logistic regression analysis would be performed if univariate showed any significant association. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated for both analyses. A P -value ≤ 0.05 was considered statistically significant.

Results

Between the years of 2002 and 2011, we studied a total 106,653 patients with ITP and 79,636,090 patients without ITP. Using chi-square univariate analysis, we found no significant difference in the prevalence of hypertension in patients with ITP vs in patients without ITP. The year of 2008 was the only exception and the difference was very small (**Table 1** and **Figure 1**). In that year, 32.04% of patients with ITP had a concurrent diagnosis of hypertension, compared with 30.93% of non-ITP patients. The odds ratio for this year was 1.05 ($P=0.01$, CI 1.01-1.10). In 2002, 25.90% of patients with ITP had a concurrent diagnosis of hypertension, compared with 26.53% of non-ITP patients. Then in 2011, 31.95% of patients with ITP had a concurrent diagnosis of hypertension, compared with 32.31% of non-ITP patients. The odds ratio for 2002 was 0.97 ($P=0.13$; CI 0.92-1.01) and 0.98 ($P=0.40$; CI 0.95-1.02) in 2011 (**Table 1**). Lastly, univariate analysis of hypertension in ITP patients with and without splenectomy showed no significant difference between the two groups (**Table 2**).

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Table 2. Prevalence of hypertension in ITP patients with and without splenectomy over a 10-year period

Hypertension	ITP & Splenectomy	ITP & no Splenectomy	P-value	Odds Ratio (C.I)
2005	28.80%	28.50%	0.85	1.02 (0.85-1.22)
2006	33.90%	29.40%	0.03	1.23 (1.02-1.49)
2007	33.30%	30.10%	0.12	1.16 (0.96-1.41)
2008	32.00%	32.00%	0.99	1.00 (0.81-1.23)
2009	34.00%	31.50%	0.28	1.12 (0.91-1.38)
2010	35.60%	30.70%	0.04	1.25 (1.02-1.53)
2011	34.80%	31.80%	0.2	1.14 (0.93-1.39)
2012	37.40%	31.50%	0.02	1.30 (1.05-1.61)
2013	34.00%	32.20%	0.48	1.09 (0.87-1.37)
2014	29.00%	31.70%	0.34	0.88 (0.68-1.14)

Discussion

The effect of physiological conditions characterized by low platelet counts on the incidence of hypertension has not been thoroughly investigated. Platelets are known to play a role in increasing the risk for cardiovascular disease (CVD) [1-10]. Hypertension is also well known for increasing the risk for CVD [11-13]. Given these known associations, we hypothesized that patients with lowered platelet counts may have decreased rates of hypertension. We evaluated the presence of hypertension in patients with ITP, as the surrogate of a disease with low platelet counts. ITP is a condition defined by a reduction in platelet number with normal bone marrow [23-27]. Heterogeneous disorders that eventuate in the impairment of platelet production or survival are believed to play a role in the pathogenesis of the disease [28-33].

For this study we used the Nationwide Inpatient Sample (NIS) database to locate cases of patients with the diagnosis of ITP and hypertension. In our chi-square univariate analysis, we did not find a difference in the incidence of hypertension between the cohort of ITP patients and the cohort of non-ITP patients in 9 out of 10 years studied. Our findings suggest that platelet count may not play any significant role in the pathogenesis of hypertension. Furthermore, the presence of splenectomy does not appear to be associated with a difference in rates of hypertension in the ITP population.

Platelets potentiate thrombosis and subsequently CVD via various mechanisms: aggregation, stimulation of foam cell formation, induction of smooth muscle cell proliferation and as a source of lipids [7-9, 34]. However, despite the role of platelet in the pathogenesis of CVD, they appear to not have influence in the pathogenesis of hypertension [35, 36]. Unfortunately, there appear to be a lack of research on this specific topic to compare our findings to.

Conclusion

Our results do not suggest any favorable or adverse impact of a disease characterized by low platelet count, Idiopathic Thrombocytopenic Purpura, on the presence of hypertension.

Disclosure of conflict of interest

None.

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