Research Article

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Frequency of Thrombocytopeniain neonatal intensive care units of Iran: A Systematic review and meta-analysis

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Abstract

Objective:
The aim of this study was to evaluate the Frequency of thrombocytopeniain neonatal intensive care units of Iran.
Method:
Two separate researchers conducted studies until November 2018 at international (PubMed, Google Scholar, and WOS) and national (SID and Magiran) databases in English and Persian, without any time limit. The key words used in the research strategy included: thrombocytopenia, Neonatal intensive care unit , NICU , prevalence , frequency , and Iran, which were combined with Boolean agents such as AND, OR, NOT. The final data extracted using the STAT 14.0 statistical software.
Results:
These 2 studies were conducted on 637 Iranian neonates. both of the 2 studies, provided cross-sectional data. both of the 2 studies, were from Tehran. The most commonly used sampling method was convenience (easiness),. The most common place to conduct the studies was in the hospital (n = 2). The prevalence of Thrombocytopeniain neonatal intensive care units of Iran was 28.9(95% CI: 25.5, 32.4; I^2 = 91.9)
Discussion:
the recognition of the increased risk of thrombocytopenia in neonates and the consideration of clinical signs and keeping platelet count provides the potential of hospitalization in NICU in order to make timely diagnosis and treatment possible.

Keywords: thrombocytopenia , Neonatal intensive care unit , NICU, prevalence

Introduction

The term "thrombocytopenia" refers to abnormal platelet counts of less than 150,000 per microliter(1). Platelets are nucleated cells that are derived from bone marrow megakaryocytes and remain in the normal state of the peripheral bloodstream for 10 days and play a very important role in primary and secondary homeostasis. Therefore, thrombocytopenia can be quite dangerous during pregnancy(1,2).The normal number of platelets in non-pregnant women is 150,000 to 400,000 per microliter; so, the risk of bleeding increases with decreasing platelet count(2). Therefore, people with a platelet count of less than 10,000 per microliter of blood are at high risk for severe hemorrhage.Thrombocytopenia is a hematologic disorder in infants admitted to the NICU, with an incidence of about 20-25%(3). Early diagnosis of thrombocytopenia and predisposing factors play an important role in reducing the risks of severe thrombocytopenic complications(4).Various studies have been conducted on risk factors associated with

thrombocytopenia. Despite the studies conducted in this field, the mechanisms of thrombocytopenia in newborns remain unknown in many cases(5). The proven cause of thrombocytopenia in the newborn is physiologically featuring immune thrombocytopenia, congenital, acquired, genetic, and drug infections, necrotizing enterocolitis, pregnancy-induced hypertension, intrauterine growth retardation, asphyxia and, finally, unknown causes of idiopathic disease. In a scientific classification, thrombocytopenia in neonates was divided into two groups of preterm (developing within 72 hours after birth) and post term (developing after 72 hours after birth)(6). There are very few cases of preterm thrombocytopenia developing due to immunological disorders such as DIC, autoimmune and alloimmuno thrombocytopenia(7). In most of these infants, various factors are involved including prenatal and maternal issues such as hypoxia in the fetus due to maternal gestational hypertension,maternal diabetes or intrauterine growth retardation(8,9). In the majority of cases of post term thrombocytopenia, infection or NEC functions as the main cause. In infants admitted to NICU, septicemia has a significant outbreak, a factors which can elongate Thrombocytopenia and, ultimately, cause death of the subject(10-12).

Materials and Methods

The present systematic investigation applies developed methods that are consistent with the accurate instructions in the PRISMA check list.

Inclusion and exclusion criteria:

Observational studies, including posting to editors, publications, poor quality articles (based on the Hoy's tool) and studies on adult subjects were only excluded from the study. Only articles in English and Persian are included.

Sampling methods and sample size

All observational studies with any sampling and statistical surveys were included in the present systematic study.

Research strategy

Two separate researchers conducted studies until November 2018 at international (PubMed, Google Scholar, and WOS) and national (SID and Magiran) databases in English and Persian, without any time limit. We examined a list of available articles sources for further related article searches. Specific research strategies have been developed using the MESH vocabulary explorer and free vocabularies, according to the PRESS standard, by a Health scientist librarian specializing in research on systematic review. We used the MEDLINE research strategy to investigate other databases. The key words used in the research strategy included: thrombocytopenia , Neonatal intensive care unit , NICU , prevalence , frequency , and Iran, which were combined with Boolean agents such as AND, OR, NOT.

Selection of research and data extraction:

Two separate researchers examined the titles and abstracts by considering qualifying criteria. After removing the repetitive research, the full text of the research was examined depending on the qualifying criteria and the required data was extracted.

To answer questions regarding qualifications, additional research information was obtained from the authors in case it is required. The general information (first author, province, and year of publication), research characteristics (sampling method, research design, location, sample size and bias risk), and the measurement of results (frequency of thrombocytopenia) were also collected.

Quality assessment and abstraction:

Hoy's et al. tool was used to assess the methodological quality and the risk of getting away from the truth (bias) for each one of the observational studies. This tool evaluates 10 items for assessing the quality of studies in two dimensions such as foreign (items 1-4, target population, sampling frame, sampling method and the minimum deviation from response) and domestic credits (the issues 5-9 of the data collection method, case definition, research tool, data collection mode were assessed while the issue 10 of the bias evaluation was related to data analysis). The higher index indicated that the bias is likely to reduce and the lower index indicated the risk of more bias. The separate bias risk was investigated by two researchers. Consensus was used to solve the disagreements.

Data combination:

The final data extracted using the STAT 14.0 statistical software, including studies combined with

stock diagram and the frequency of thrombocytopenia, were assessed with random effect of the model.

Results

Selection of research: A total of 314 primary studies were reviewed from PubMed, Google scholar, SID, Magiran, and Web of Science from the beginning to November 1, 2018. Out of the 30 non-repetitive studies in the title and abstract of the screening process, 21 were excluded since their titles were unrelated. Out of the 9 studies, 2 had qualifying criteria. Out of 7 removed cases, 2 were reviews, one wasletter to the editor, and 4 did not meet the minimum quality requirements for inclusion in the article [Figure 1].
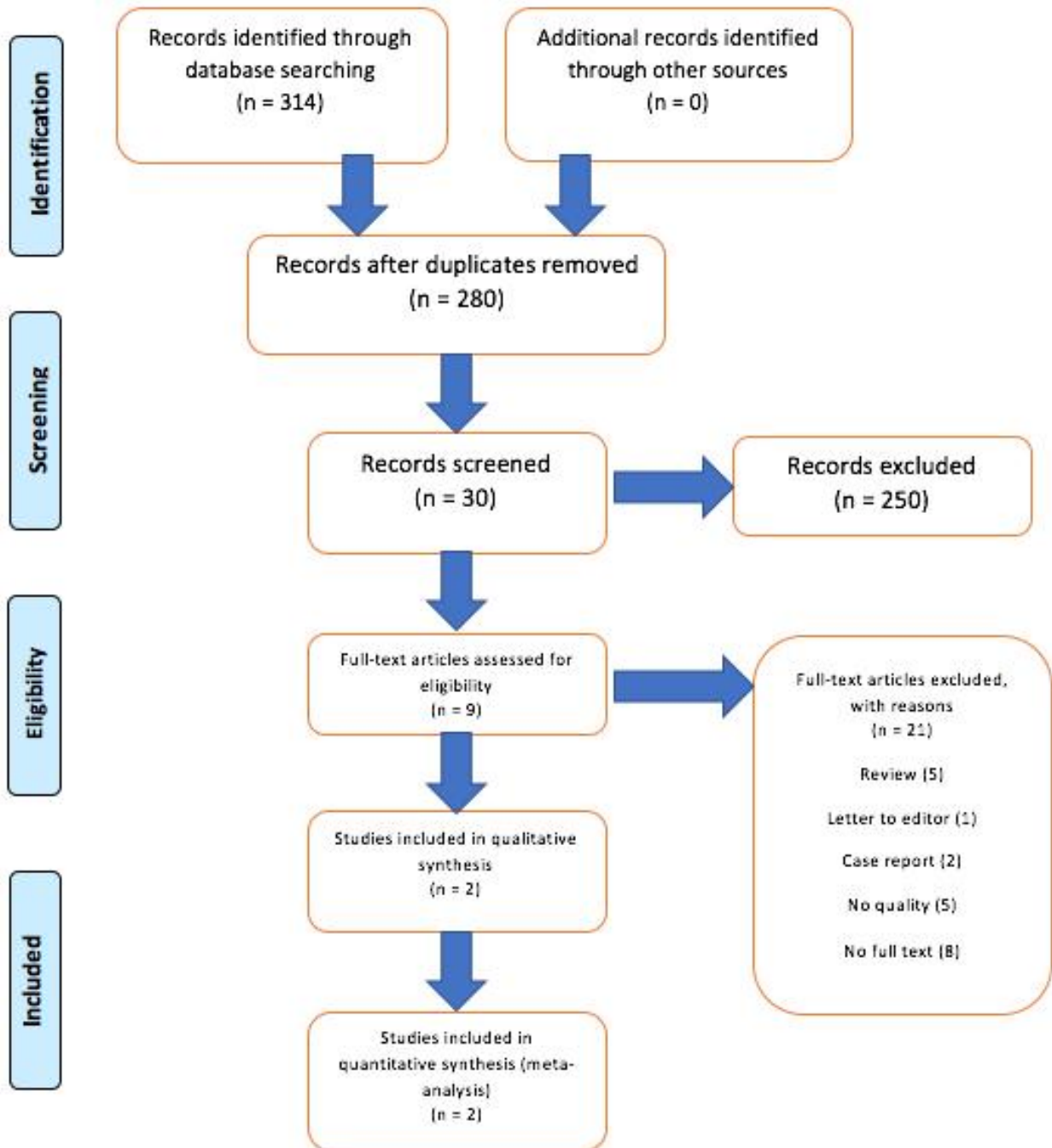

Fig 1. Study selection process

Research characteristics

These 2 studies were conducted on 637 Iranian neonates. both of the 2 studies, provided cross-sectional data. both of the 2 studies, were from Tehran. The most commonly used sampling method was convenience (easiness), (n = 2). Both of the studies had a low bias risk. The most common place to conduct the studies was in the hospital (n = 2).

Table 1. Studies included in the systematic review (N=2)

First Author	year	Provence	Sample size	Target population	Male-Female	Risk of bias
Alavi et al[19]	2005	Tehran	436	neonatal	0.65	Low
Nayeri et al[20]	2010	TEhran	201	neonatal	0.69	Low

Prevalence of Thrombocytopeniain neonatal intensive care units of Iran :

2 studies conducted on 637 neonates , were included in this meta-analysis. The prevalence of Thrombocytopeniain neonatal intensive care units of Iran was 28.9(95% CI: 25.5, 32.4; I^2 = 91.9)[Table 2].

Table 2 :prevalence of Thrombocytopenia in neonatal intensive care units of Iran

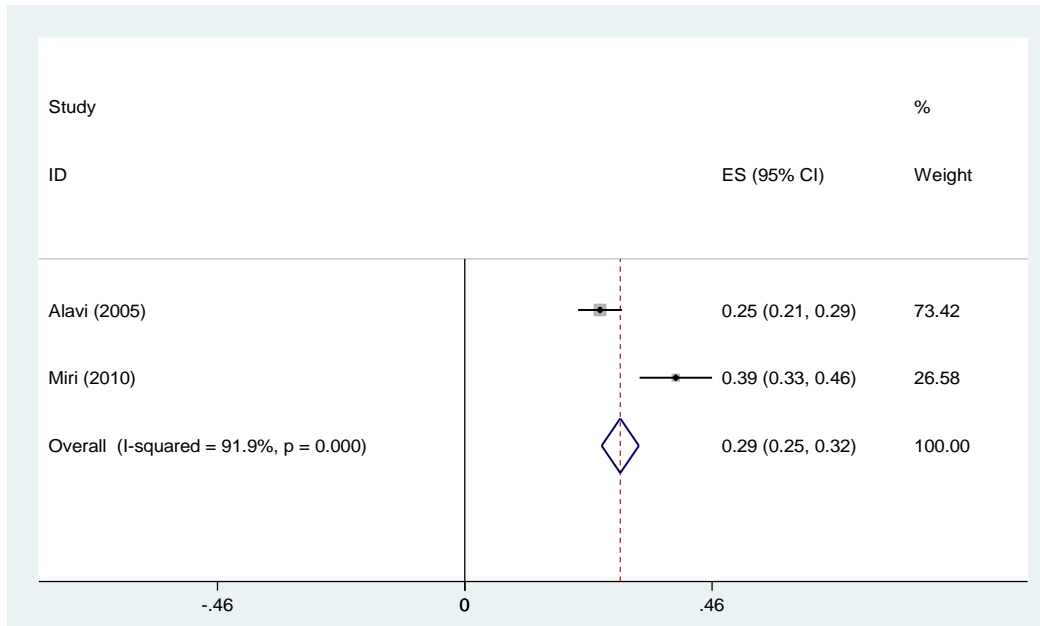| ID	First Author	Year	Province	ES	95% CI for ES		% Wight
					Low	Up	
1	Alavi et al	2005	Tehran	0.252	0.211	0.293	73.42
2	Nayeri et al	2010	Tehran	0.393	0.326	0.46	26.58
Sub-total Random pooled ES	------	-----	------	0.289	0.255	0.324	100

Fig. 2 :The prevalence of Thrombocytopenia in neonatal intensive care units of Iran and its 95% interval for the studied cases according to the year and the city where the study was conducted based on the model of the random effects model. The midpoint of each section of the line estimates the% value and the length of the lines showing the 95% confidence interval in each study. The oval sign shows Prevalence of Thrombocytopenia in neonatal intensive care units of Iran for all studies.

Discussion

The prevalence of Thrombocytopeniain neonatal intensive care units of Iran was 28.9(95% CI: 25.5, 32.4; I^2 = 91.9). One of the causes of neonatal preterm thrombocytopenia is immune deficiency including maternal autoimmune diseases or neonatal inflammation of thrombocytopenic pneumonia(13). Neonatal thrombocytopenic inflammation is due to the passage of neonatal antibodies from the placenta. These antibodies are against platelet antigens existing in the father but absent in the mother(14,15). Thrombocytopenia endangers the life of the infant in different aspects, including the risk of intracranial hemorrhages and neurological complications, lethal hemorrhage from the gastrointestinal tract, lung, umbilical cord, hemorrhage and bladder sites, and other complications caused by the injection of blood products such as platelets, studying the amount and necessity of prescribing of which is one of the concerns of neonatal medicine(16-18). Therefore, the recognition of the increased risk of thrombocytopenia in neonates and the consideration of clinical signs and keeping platelet count provides the potential of hospitalization in NICU in order to make timely diagnosis and treatment possible.

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