

# Meta-Analysis of Incidence of Adverse Transfusion Reaction in Clinical Cases in China

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## Summary

Blood transfusion can cause some transfusion adverse reactions. In order to understand the incidence of adverse transfusion reactions, we performed a meta-analysis in Chinese hospitals. Of 809 literatures, seven studies involving a total of 211,050 patients with blood transfusion treatment were included in this meta-analysis. Meta-analysis showed that the total incidence of adverse reactions was 0.4% [95% CI (0.2, 0.9),  $P < 0.0001$ ]. Further subgroup analysis showed that the incidence of febrile and allergic reactions was 0.2% [95% CI (0.1, 0.5),  $P < 0.0001$ ] and 0.2% [95% CI (0.1, 0.3),  $P < 0.0001$ ], respectively. The common blood components caused adverse reactions were red blood cell, plasma, and platelet in clinical practice.

## Introduction

Blood transfusion has become a commonly irreplaceable treatment for clinical rescue. However, due to the potential risk of blood transfusion and adverse reactions, transfusion safety has become the focus of global concern [1,2]. Common transfusion adverse reactions have been reported to include fever, allergic reactions, and hemolytic reactions in China. Other adverse reactions might occur such as fluid overload, lung injury, destruction of red blood cells, graft-versus-host disease, infections, and complications of massive transfusion so on. However, there lacks a systematic reviews to clarify the incidence of adverse transfusion reactions. Therefore, we performed a meta-analysis in Chinese hospitals.

## Materials and Methods

### Inclusion and exclusion criteria

The included literatures were the observational studies. The subjects were the patients who received a blood transfusion therapy. The study must report the incidence of adverse reactions, and the retrieval date was set between January 1, 2014 and December 31, 2014. Reviews or commentaries, duplicated literatures, and case reports were excluded in this study. We used the preferred reporting items for systematic review and meta-analyses (PRISMA) statements [3,4] as the guidelines of this present meta-analysis.

### Retrieval strategy and data extraction

We searched the Chinese Biomedical Literature Database (CBM), Wanfang Database, Chinese Scientific Journals Full-text Database (VIP), China National Knowledge Infrastructure (CNKI), PubMed and EMBASE database by computer. Data extraction and quality assessment was independently performed by two researchers and any controversies were resolved by consensus.

### Statistical analysis

Statistical calculations were performed using Meta Analyst version 3.13 (Boston, MA, USA). Heterogeneity among the studies was evaluated by the Cochran's chi-squared test (Cochran's  $Q$ ) and the  $I^2$  statistics. Assessments of heterogeneity determined to adopt a random effects model or a fixed effects model. In this study, the Der Simonian-Laird method was used. A Begg's funnel plot was used for the assessment of publication bias.

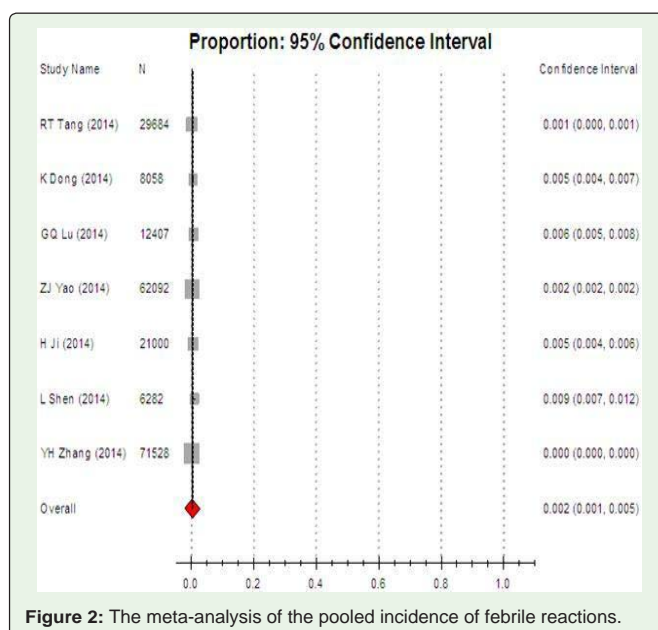
**Table 1:** The incidences and types of adverse reactions in this meta-analysis.

First author [Reference]	Allergic reactions	Febrile reactions	Hemolytic reactions	Other reactions	Number of cases
RT Tang [3]	19	15	0	2	29684
K Dong [4]	39	8	0	2	8058
GQ Lu [5]	78	27	0	6	12406
ZJ Yao [6]	115	93	0	0	62092
H Ji [7]	101	22	0	5	21000
L Shen [8]	58	55	0	2	6282
YH Zhang [9]	14	77	1	8	71528
Total cases	424	297	1	25	211050

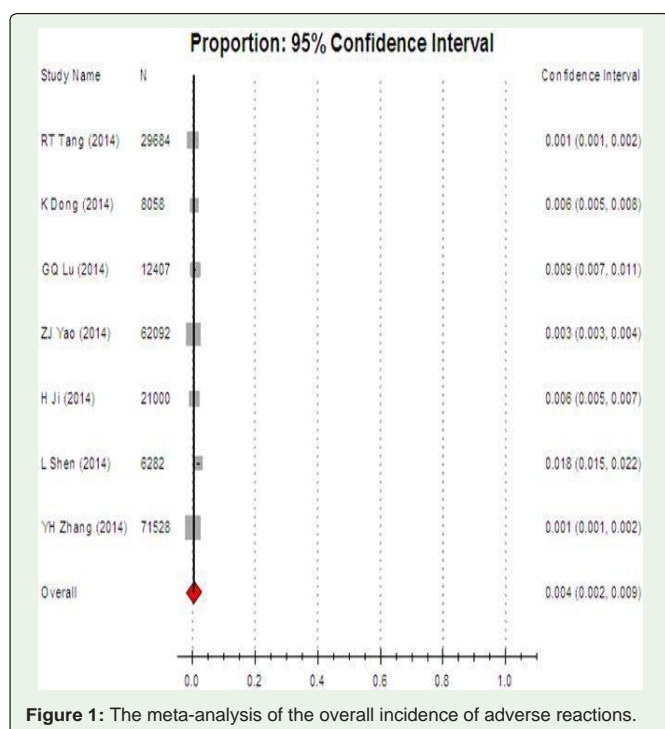
**Table 2:** The distributions of adverse reactions in each of blood components.

First author [Reference]	RBC	Plasma	PLT	Cryo	Total cases
RT Tang [3]	13	22	1	0	36
K Dong [4]	21	19	8	1	49
GQ Lu [5]	66	45	0	0	111
ZJ Yao [6]	87	102	17	2	208
H Ji [7]	55	49	22	2	128
L Shen [8]	66	43	6	0	115
YH Zhang [9]	14	37	49	0	100
Total cases	322	317	103	5	747

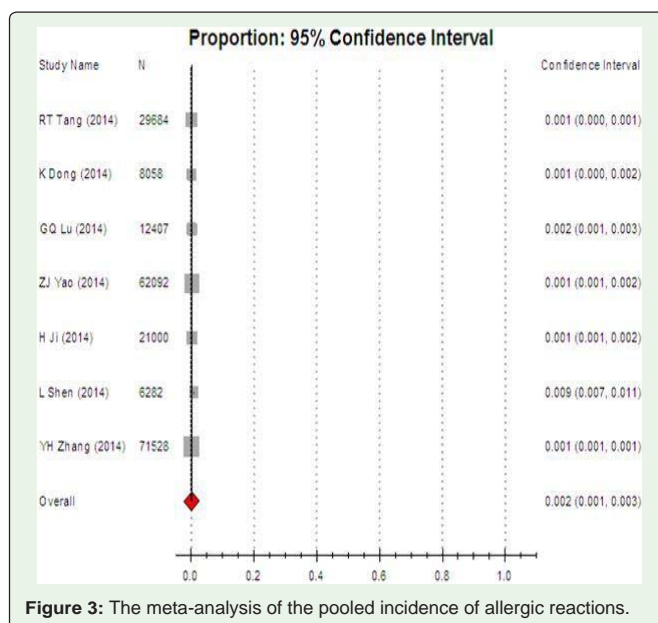
RBC: Red Blood Cell; PLT: Platelet; Cryo: Cryoprecipitate.



**Figure 2:** The meta-analysis of the pooled incidence of febrile reactions.



**Figure 1:** The meta-analysis of the overall incidence of adverse reactions.



**Figure 3:** The meta-analysis of the pooled incidence of allergic reactions.

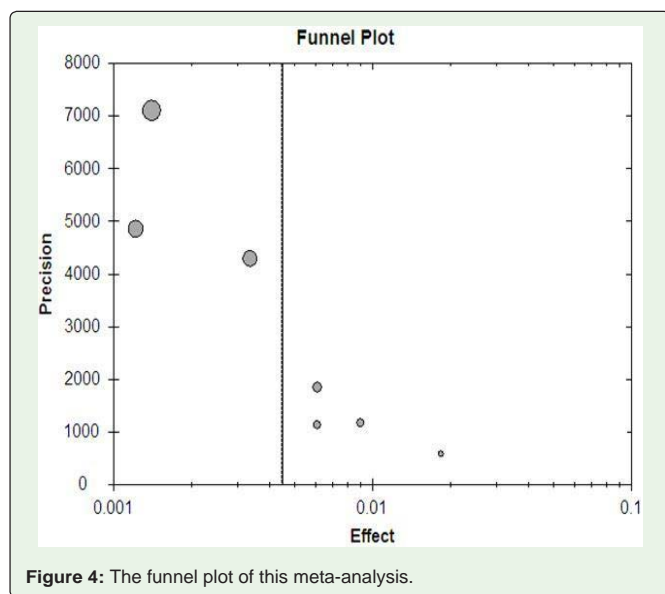


Figure 4: The funnel plot of this meta-analysis.

## Results

Of 809 literatures, seven studies involving a total of 211,050 patients with blood transfusion treatment were included in this meta-analysis [5-9]. The incidences and types of adverse reactions were seen (Table 1). The distributions of adverse reactions in each of blood components were presented in (Table 2). The results revealed that the common blood components caused adverse reactions were red blood cell, plasma, and platelet in clinical practice.

Meta-analysis showed that the total incidence of adverse reactions was 0.4% [95% CI (0.2, 0.9), random effect model,  $P < 0.0001$ ] (Figure 1). Further subgroup analysis showed that the incidence of febrile and allergic reactions was 0.2% [95% CI (0.1, 0.5), random effect model,  $P < 0.0001$ ] and 0.2% [95% CI (0.1, 0.3), random effect model,  $P < 0.0001$ ] (Figure 2 and Figure 3), respectively.

The asymmetry funnel plot revealed a publication bias occurred in this study (Figure 4).

## Discussion

Adverse effects of transfusions of blood products included hemolytic reactions, febrile reactions, allergic reactions, post-transfusion purpura, transfusion inefficacy, transfusion-associated acute lung injury (TRALI), and transmissible infections so on. However, according to this review, except the former three reactions, other adverse effects have rarely been reported. Hence, we didn't

perform the meta-analyses of these effects. This meta-analysis showed that the total incidence of adverse reactions in China was 0.4% [95% CI (0.2, 0.9)]. There only found one case with hemolytic reaction in this meta-analysis. Further subgroup analysis showed that the adverse reactions were febrile reactions and allergic reactions. The common blood components caused adverse reactions were red blood cell, plasma, and platelet in clinical practice, which might be related to the frequencies of these components. However, due to lack of the available relevant data, we couldn't give further classifications in this study. In addition, the asymmetry funnel plot revealed a publication bias occurred in this study.

The safety of blood and blood products should be overseen by Haemovigilance according to the requests of World Health Organization (WHO). In the UK this data is collected by an independent organization (Serious Hazards of Transfusion). Therefore, we believed that China should take more effective measures to enforce the surveillance of adverse effects of transfusions of blood products. We proposed that China should enforce the supervision on the clinical use of blood and build up a Haemovigilance information platform by internet in the future.

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