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Should Blood Donors Be Routinely Screened for Glucose-6-Phosphate Dehydrogenase Deficiency? A Systematic Review of Clinical Studies Focusing on Patients Transfused With Glucose-6-Phosphate Dehydrogenase–Deficient Red Cells

Andre M.N. Renzaho [a,b,*], Eliette Husser [c], Michael Polonsky [d]

[a] Migration, Social Disadvantage, and Health Programs, Global Health and Society Unit, School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia
[b] Centre for International Health, Burnet Institute, Melbourne, Victoria, Australia
[c] Global Health and Society Unit, School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia
[d] School of Management and Marketing, Deakin University, Burwood, Victoria, Australia

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ABSTRACT

The risk factors associated with the use of glucose-6-phosphate dehydrogenase (G6PD)–deficient blood in transfusion have not yet been well established. Therefore, the aim of this review was to evaluate whether whole blood from healthy G6PD-deficient donors is safe to use for transfusion. The study undertook a systematic review of English articles indexed in COCHRANE, MEDLINE, EMBASE, and CINHAL, with no date restriction up to March 2013, as well as those included in articles' reference lists and those included in Google Scholar. Inclusion criteria required that studies be randomized controlled trials, case controls, case reports, or prospective clinical series. Data were extracted following the Preferred Reporting Items for Systematic Reviews using a previously piloted form, which included fields for study design, population under study, sample size, study results, limitations, conclusions, and recommendations. The initial search identified 663 potentially relevant articles, of which only 13 studies met the inclusion criteria. The reported effects of G6PD-deficient transfused blood on neonates and children appear to be more deleterious than effects reported on adult patients. In most cases, the rise of total serum bilirubin was abnormal in infants transfused with G6PD-deficient blood from 6 hours up to 60 hours after transfusion. All studies on neonates and children, except one, recommended a routine screening for G6PD deficiency for this at-risk subpopulation because their immature hepatic function potentially makes them less able to handle any excess bilirubin load. It is difficult to make firm clinical conclusions and recommendations given the equivocal results, the lack of standardized evaluation methods to categorize red blood cell units as G6PD deficient (some of which are questionable), and the limited methodological quality and low quality of evidence. Notwithstanding these limitations, based on our review of the available literature, there is little to suggest that G6PD-deficient individuals should be excluded from donating red blood cells, although transfusions of such blood may potentially have negative impacts on premature neonates or patients who need repeated transfusions, and thus, for this group, screening for G6PD deficiency may be appropriate.

Contents

Eliette Husser conducted the initial search and data extraction and performed the data analysis and summary as well as drafting the first manuscript. Andre Renzaho supervised the conduct of the study. He independently verified the data extraction, provided intellectual input into the data analysis and summary and the drafting of the article, and critically reviewed the manuscript. All authors have approved its submission.

* Corresponding author. Centre for International Health, Burnet Institute,Level 3, Burnet Building, 89 Commercial Rd, Melbourne, Vic 3004, Australia. Tel.: +61 3 99030802; fax: +61 3 99030556.
E-mail addresses: andre.renzaho@monash.edu (A.M.N. Renzaho), eliette.husser@monash.edu (E. Husser), michael.polonsky@deakin.edu.au (M. Polonsky).

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THE WORLD HEALTH Organization considers glucose-6-phosphate dehydrogenase (G6PD) deficiency as a significant public health issue [1]. Glucose-6-phosphate dehydrogenase-deficiency is one of the most common metabolic disorders of red blood cells (RBCs), estimated to affect about 400 million people globally [2]. There are approximately 200 different causative mutations for this enzyme deficiency that are specific to locations and ethnic or racial groups [3]. The most common variants of G6PD deficiency are the A variant and the Mediterranean variant [4].

Clinical manifestations of G6PD deficiency include neonatal jaundice and acute hemolytic anemia arising from the oxidative stress on RBCs. Such oxidative stress can be triggered by some medications, an infection, or ingestion of fava beans [5]. However, most G6PD-deficient individuals are asymptomatic and unaware of their status throughout their lives; thus, the magnitude of the problem may be underestimated. A myriad of studies have assessed the prevalence of G6PD deficiency within and across regions globally and have been summarized in a recently published systematic review and meta-analysis by Nkhoma and colleagues [6]. The authors found that after adjustment for the assessment method, the prevalence of G6PD was highest in sub-Saharan Africa (8.5; 95% confidence interval [CI], 7.9%-9.1%), followed by North Africa and the Middle East (7.2; 95% CI, 6.6%-7.7%). The lowest prevalence was recorded in the Pacific (3.4; 95% CI, 2.7%-4.1%) and Europe (3.8; 95 % CI, 2.9%-4.7%). The total

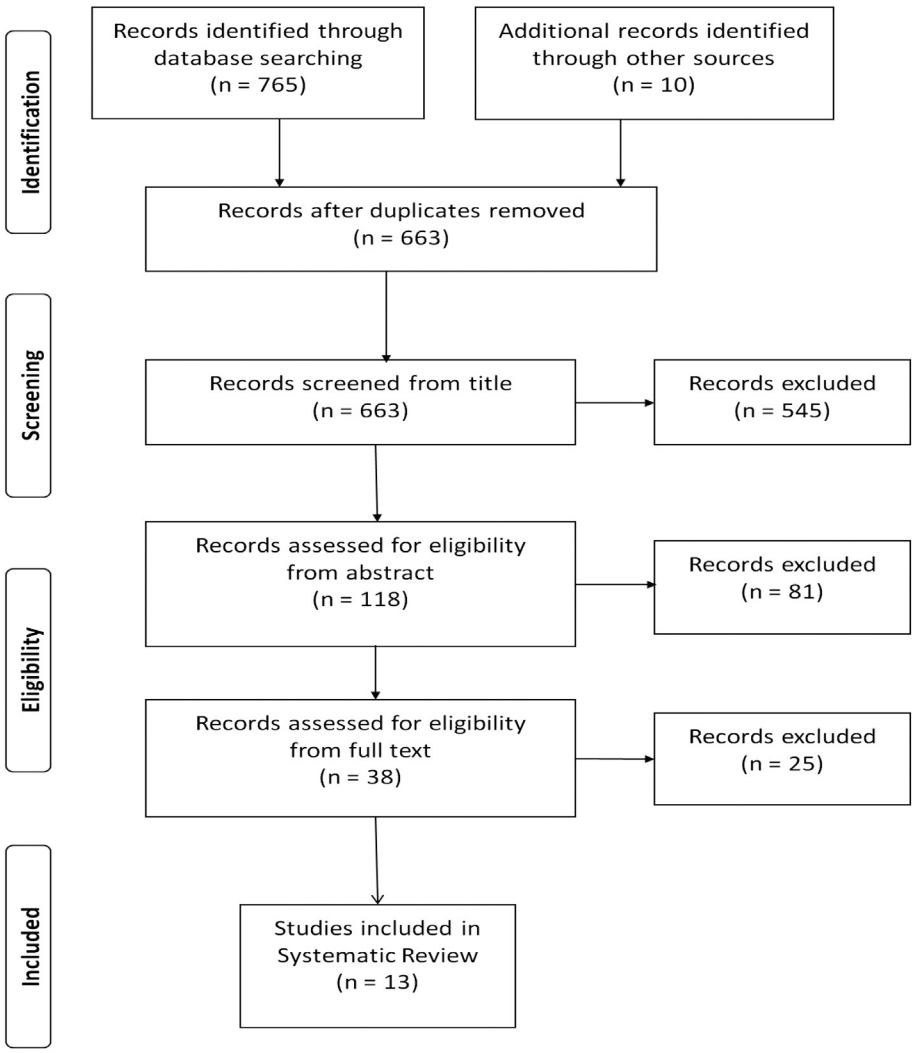

Fig. 1. Data extraction history.